

5 UNBOUND PLEASE

Akademiya Nauk SSSR

# FAUNA OF THE U.S.S.R.

## TRICHOPTERA

Volume II No.2

S.G. Lepneva

Larvae and Pupae of *Integripalpia*

Translated from Russian

Published for the Smithsonian Institution  
and the National Science Foundation, Washington, D.C.  
by the Israel Program for Scientific Translations







HEALTH SCIENCE LIBRARY  
STATE UNIVERSITY OF NEW YORK AT BUFFALO 3438

ZOOLOGICHESKII INSTITUT AKADEMII NAUK SSSR  
Zoological Institute of the Academy of Sciences of the USSR

New Series No. 95

# FAUNA OF THE U.S.S.R.

(Fauna SSSR)

## TRICHOPTERA

(Rucheiniki)

Volume II No. 2

S. G. Lepneva

LARVAE AND PUPAE OF *INTEGRIPALPIA*

(Lichinki i kukolki podotryada tsel'noshchupikovykh)

Chief editor: B. E. Bykhovskii

Editorial board: I. M. Gromov, A. S. Monchadskii, A. A. Shtakelberg,  
O. A. Skarlato, and A. A. Strelkov (Volume editor)

Izdatel'stvo "Nauka"  
Moskva-Leningrad  
1966

Translated from Russian

Israel Program for Scientific Translations  
Jerusalem 1971

HEALTH SCIENCE LIBRARY  
STATE UNIVERSITY OF NEW YORK AT BUFFALO

TT 70-50083

Published Pursuant to an Agreement with  
THE SMITHSONIAN INSTITUTION  
and  
THE NATIONAL SCIENCE FOUNDATION, WASHINGTON, D. C.

Copyright © 1971  
Israel Program for Scientific Translations Ltd.  
IPST Cat. No. 5725

Translated by A. Mercado  
Edited by Prof. O. Theodor

Printed in Jerusalem by Keter Press  
Binding: Wiener Bindery Ltd., Jerusalem

Available from the  
U. S. DEPARTMENT OF COMMERCE  
National Technical Information Service  
Springfield, Va. 22151

## Table of Contents

Foreword . . . . .	1
Taxonomic Index of Species . . . . .	3
II. Suborder Integripalpia Martynov . . . . .	11
Key to Families . . . . .	11
I. Family Phryganeidae Burmeister . . . . .	13
II. Family Limnophilidae Kolenati . . . . .	72
III. Family Goeridae Ulmer . . . . .	405
IV. Family Lepidostomatidae Ulmer . . . . .	437
V. Family Brachycentridae Ulmer . . . . .	461
VI. Family Calamoceratidae Ulmer . . . . .	499
VII. Family Odontoceridae Wallengren . . . . .	511
VIII. Family Molannidae Wallengren . . . . .	522
IX. Family Leptoceridae Leach . . . . .	540
X. Family Beraeidae Wallengren . . . . .	648
XI. Family Sericostomatidae Stephens . . . . .	662
Bibliography . . . . .	686
Alphabetic Index of Latin Names . . . . .	693
Errata . . . . .	700





## FOREWORD

Volumes V, VI, and VII of Fischer's *Trichopterorum Catalogus* (1964, 1965, 1966), which deal in part with the suborder Integripalpia, were published between the appearance of the first part of this work in 1964, dealing with the pre-imaginal stages of the suborder Annulipalpia in the USSR, and the appearance of the second part in 1966, which covers the Integripalpia. Fischer's work deals with the families Phryganeidae, Molannidae, Calamoceratidae, Odontoceridae, and Leptoceridae, the pre-imaginal stages of which are described here.

These volumes of Fischer's Catalogue contain many new synonyms, some of which are included here. This made it necessary to correct some names used in the introduction of the first part; these corrections appear at the end of this book ("Errata to Vol. II, No. 1"; p. 700).

During the preparation of the manuscript, we consulted Dr. F. Fischer, author of "*Trichopterorum Catalogus*" in the Netherlands. We are deeply grateful to him for his great courtesy and attention in answering our queries.

Figures 33, 35, 49, 65, 74, 88, 89, and 128 were prepared by the late S. M. Shteinberg. Most of the illustrations were made by N. L. Orshanskaya and M. N. Kandybina, to whom we are very grateful.

Our co-worker M. N. Kandybina spent much time and effort in the preparation of this work, laboratory studies, writing the manuscript, and in preparing samples, drawings, plates, etc. She showed great competence in her work, and we are very indebted to her for all her help.

We are also grateful to Senior Technician E. A. Tetyuev for his constant assistance in many aspects of our daily work and for the preparation of the additional list of references.

Our sincere thanks are also due to Professor Strelkov, editor of this work, who devoted his untiring assistance.



TAXONOMIC INDEX OF SPECIES\*

Suborder *Integripalpia* Mart.

I. Family *Phryganeidae* Burm.

	Page
1. Genus <i>Agrypnia</i> Curt.	
1. <i>A. pagetana</i> Curt. . . . .	18
2. <i>A. picta</i> Kol. . . . .	26
2. Genus <i>Agrypnetes</i> McL.	
1. <i>A. crassicornis</i> McL. . . . .	27
3. Genus <i>Phryganea</i> L.	
1. <i>Ph. bipunctata</i> Retz. . . . .	32
2. <i>Ph. grandis</i> L. . . . .	37
4. Genus <i>Dasystegia</i> Wall.	
1. <i>D. obsoleta</i> Hag. . . . .	39
2. <i>D. varia</i> Fabr. . . . .	41
5. Genus <i>Oligotricha</i> Ramb.	
1. <i>Ol. striata</i> L. . . . .	44
2. <i>Ol. lapponica</i> Hag. . . . .	47
6. Genus <i>Semblis</i> Fabr.	
1. <i>S. phalaenoides</i> L. . . . .	49
2. <i>S. atrata</i> Gm. . . . .	53
7. Genus <i>Oligostomis</i> Kol.	
1. <i>O. reticulata</i> L. . . . .	55
8. Genus <i>Hagenella</i> Mart.	
1. <i>H. clathrata</i> Kol. . . . .	56
9. Genus <i>Trichostegia</i> Kol.	
1. <i>Tr. minor</i> Curt. . . . .	60

\* [This index has been photographically reproduced from the Russian original. The pages indicated are Russian page numbers which appear in the left-hand margin of this text.]

II. Family *Limnophilidae* Kol.

Subfamily *Dicosmoecinae* Schmid

1. Genus *Dicosmoecus* McL.

1. <i>D. palatus</i> McL. . . . .	64
-----------------------------------	----

2. Genus *Ecelisomyia* Banks

1. <i>E. digitata</i> Mart. . . . .	71
-------------------------------------	----

3. Genus *Ironoquia* Banks

1. <i>I. dubia</i> Steph. . . . .	75
-----------------------------------	----

Subfamily *Neophylacinae* Schmid

1. Genus *Neophylax* McL.

1. <i>N. ussuriensis</i> Mart. . . . .	80
--	----

Subfamily *Apataniinae* Ulm.

Tribe *Baicalinini* Mart.

1. Genus *Thamastes* Hag.

1. <i>T. dipterus</i> Hag. . . . .	88
------------------------------------	----

2. Genus *Baicalodes* Mart.

1. <i>B. ovalis</i> Mart. . . . .	92
-----------------------------------	----

3. Genus *Baicalina* Mart.

1. <i>B. bellicosa</i> Mart. . . . .	97
2. <i>B. spinosa</i> Mart. . . . .	102
3. <i>B. thamastoides</i> Mart. . . . .	105

4. Genus *Baicalinella* Mart.

1. <i>B. foliata</i> Mart. . . . .	107
------------------------------------	-----

Tribe *Apataniini* Ulm.

1. Genus *Apatania* Kol.

1. <i>A. wallengreni</i> McL. . . . .	112
2. <i>A. subtilis</i> Mart. . . . .	116
3. <i>A. crymophila</i> McL. . . . .	120
4. <i>A. stigmatella</i> Zett. . . . .	124
5. <i>A. zonella</i> Zett. . . . .	128
6. <i>A. majuscula</i> McL. . . . .	131
7. <i>A. copiosa</i> McL. . . . .	135
8. <i>A. muliebris</i> McL. . . . .	138
9. <i>A. auricula</i> Forsl. . . . .	142

Subfamily *Limnophilinae* Kol.

Tribe *Limnophilini* Kol.

1. Genus *Nemotaulius* Banks

1. <i>N. punctatolineatus</i> Retz. . . . .	145
2. <i>N. admorsus</i> McL., larva nova . . . . .	151

2. Genus *Glyphotaelius* Steph.

1. <i>G. pellucidus</i> Retz. . . . .	154
---------------------------------------	-----

3. Genus *Grammotaulius* Kol.

1. <i>G. atomarius</i> Fabr. . . . .	157
2. <i>G. signatipennis</i> McL., larva nova . . . . .	161
3. <i>G. nitidus</i> Müll. . . . .	167
4. <i>G. sibiricus</i> McL. . . . .	170

4. Genus *Limnophilus* Leach

1. <i>L. rhombicus</i> L. . . . .	175
2. <i>L. politus</i> McL. . . . .	181
3. <i>L. abstrusus</i> McL. . . . .	185
4. <i>L. marmoratus</i> Curt. . . . .	186
5. <i>L. flavicornis</i> Fabr. . . . .	188
6. <i>L. stigma</i> Curt. . . . .	192
7. <i>L. nigriceps</i> Zett. . . . .	195
8. <i>L. decipiens</i> Kol. . . . .	198
9. <i>L. borealis</i> Zett. . . . .	200
10. <i>L. bipunctatus</i> Curt. . . . .	204
11. <i>L. lunatus</i> Curt. . . . .	207
12. <i>L. fuscicornis</i> Ramb. . . . .	209
13. <i>L. extricatus</i> McL. . . . .	210
14. <i>L. affinis</i> Curt. . . . .	213
15. <i>L. centralis</i> Curt. . . . .	216
16. <i>L. vittatus</i> Fabr. . . . .	218
17. <i>L. elegans</i> Curt. . . . .	222
18. <i>L. xanthodes</i> McL. . . . .	223
19. <i>L. sparsus</i> Curt. . . . .	224
20. <i>L. auricula</i> Curt. . . . .	226
21. <i>L. sericeus</i> Say . . . . .	227
22. <i>L. ignavus</i> McL. . . . .	228
23. <i>L. griseus</i> L. . . . .	228
24. <i>L. incisus</i> Curt. . . . .	231

5. Genus *Phacopteryx* Kol.

1. <i>Ph. brevipennis</i> Curt. . . . .	232
---	-----

6. Genus *Anabolia* Steph.

1. <i>A. soror</i> McL. . . . .	236
2. <i>A. nervosa</i> Curt. . . . .	241
3. <i>A. jurcata</i> Brauer . . . . .	242

7. Genus *Asynarchus* McL.

1. <i>A. amurensis</i> Ulm., larva nova . . . . .	245
2. <i>A. lapponicus</i> Zett. . . . .	248

Tribe *Stenophylacini* Schmid

1. Genus *Potamophylax* Wall.

1. <i>P. stellatus</i> Curt. . . . .	251
2. <i>P. nigricornis</i> Pict. . . . .	256
3. <i>P. latipennis</i> Curt. . . . .	262
4. <i>P. rotundipennis</i> Brauer . . . . .	263
5. <i>P. excisus</i> Mart., larva nova . . . . .	266

2. Genus *Hydatophylax* Wall.

1. <i>H. magnus</i> Mart., larva nova . . . . .	269
2. <i>H. nigrovittatus</i> McL., larva nova . . . . .	274
3. <i>H. infumatus</i> McL. . . . .	277

3. Genus <i>Stenophylax</i> Kol.	
1. <i>S. permistus</i> McL.	279
4. Genus <i>Halesus</i> Steph.	
1. <i>H. interpunctatus</i> Zett.	281
2. <i>H. tessellatus</i> Ramb.	285
3. <i>H. digitatus</i> Schrank	287
5. Genus <i>Anisogamodes</i> Mart.	
1. <i>A. flavipunctatus</i> Mart.	289
6. Genus <i>Micropterna</i> Stein	
1. <i>M. nycterobia</i> McL.	293
2. <i>M. lateralis</i> Steph.	294
3. <i>M. sequax</i> McL.	295
Tribe <i>Chaetopterygini</i> Stein	
1. Genus <i>Chaetopteryx</i> Steph.	
1. <i>Ch. sahlbergi</i> McL.	298
2. <i>Ch. villosa</i> Fabr.	301
2. Genus <i>Annitella</i> Klap.	
1. <i>A. obscurata</i> McL.	305
3. Genus <i>Chaetopterygopsis</i> Stein	
1. <i>Ch. maclachlani</i> Stein	307
Subfamily <i>Drusinae</i> Banks	
1. Genus <i>Drusus</i> Steph.	
1. <i>D. caucasicus</i> Ulm.	310
2. <i>D. trifidus</i> McL.	314
3. <i>D. discolor</i> Ramb.	316
2. Genus <i>Ecclisopteryx</i> Kol.	
1. <i>E. guttulata</i> Pict.	319
III. Family <i>Goeridae</i> Ulm.	
1. Genus <i>Goera</i> Steph.	
1. <i>G. pilosa</i> Fabr.	324
2. <i>G. sajanensis</i> Mart.	328
2. Genus <i>Silo</i> Curt.	
1. <i>S. pallipes</i> Fabr.	332
2. <i>S. proximus</i> Mart.	340
3. <i>S. nigricornis</i> Pict.	342
3. Genus <i>Lithax</i> McL.	
1. <i>L. obscurus</i> Hag.	347
2. <i>L. incanus</i> Hag.	348

IV. Family *Lepidostomatidae* Ulm.

1. Genus *Lepidostoma* Ramb.

1. <i>L. hirtum</i> Fabr. . . . .	350
-----------------------------------	-----

2. Genus *Dinarthrum* McL.

1. <i>D. pugnax</i> McL. . . . .	356
2. <i>D. reductum</i> Mart. . . . .	359
3. <i>D. tchaldyrense</i> Mart. . . . .	360

3. Genus *Crunoccia* McL.

1. <i>C. irrorata</i> Curt. . . . .	363
-------------------------------------	-----

4. Genus *Lasiocephala* Costa

1. <i>L. basalis</i> Kol. . . . .	368
-----------------------------------	-----

V. Family *Brachycentridae* Ulm.

1. Genus *Brachycentrus* Curt.

1. <i>B. subnubilus</i> Curt. . . . .	371
2. <i>B. montanus</i> Klap. . . . .	377
3. <i>B. caucasicus</i> Mart. . . . .	378

2. Genus *Oligoplectrodes* Mart.

1. <i>O. potanini</i> Mart. . . . .	381
-------------------------------------	-----

3. Genus *Oligoplectrum* McL.

1. <i>O. maculatum</i> Four. . . . .	387
--------------------------------------	-----

4. Genus *Micrasema* McL.

1. <i>M. sp. (bifoliatum?</i> Mart.). . . . .	393
2. <i>M. setiferum</i> Pict. . . . .	397

VI. Family *Calamoceratidae* Ulm.

1. Genus *Anisocentropus* McL.

1. <i>A. pallidus</i> Mart. . . . .	399
-------------------------------------	-----

2. Genus *Ganonema* McL.

1. <i>G. extensum</i> Mart. . . . .	404
-------------------------------------	-----

VII. Family *Odontoceridae* Wall.

1. Genus *Odontocerum* Leach

1. <i>O. albicorne</i> Scop. . . . .	408
--------------------------------------	-----

2. Genus *Psilotreta* Banks.

1. <i>P. kisoensis</i> Iwata. . . . .	414
---------------------------------------	-----

VIII. Family *Molannidae* Wall.

1. Genus *Molanna* Curt.

1. <i>M. angustata</i> Curt. . . . .	418
2. <i>M. albicans</i> Zett. . . . .	424
3. <i>M. submarginalis</i> McL. . . . .	427

2. Genus *Molannodes* McL.

1. <i>M. tincta</i> Zett. . . . .	428
-----------------------------------	-----

IX. Family *Leptoceridae* Leach

1. Genus *Athripsodes* Billb.

1. <i>Ath. aterrimus</i> Steph. . . . .	435
2. <i>Ath. cinereus</i> Curt. . . . .	441
3. <i>Ath. bilineatus</i> L. . . . .	444
4. <i>Ath. excisus</i> Mort. . . . .	446
5. <i>Ath. annulicornis</i> Steph. . . . .	451
6. <i>Ath. fulvus</i> Ramb. . . . .	455
7. <i>Ath. alboguttatus</i> Hag. . . . .	458
8. <i>Ath. senilis</i> Burm. . . . .	459

2. Genus *Homilia* McL.

1. <i>H. leucophaea</i> Ramb. . . . .	461
---------------------------------------	-----

3. Genus *Mystacides* Berth.

1. <i>M. azurea</i> L. . . . .	464
2. <i>M. sp.</i> , larva nova . . . . .	469
3. <i>M. dentata</i> Mart. . . . .	470
4. <i>M. longicornis</i> L. . . . .	470
5. <i>M. nigra</i> L. . . . .	475
6. <i>M. sibirica</i> Mart. . . . .	477

4. Genus *Triaenodes* McL.

1. <i>T. bicolor</i> Curt. . . . .	480
2. <i>T. conspersus</i> Ramb. . . . .	485
3. <i>T. sp.</i> . . . . .	487

5. Genus *Erotesis* McL.

1. <i>E. baltica</i> McL . . . . .	488
------------------------------------	-----

6. Genus *Leptocerus* Leach

1. <i>L. tineiformis</i> Curt. . . . .	491
2. <i>L. valvatus</i> Mart. . . . .	496

7. Genus *Adicella* McL.

1. <i>A. filicornis</i> Pict. . . . .	497
---------------------------------------	-----

8. Genus *Oecetis* McL.

1. <i>O. ochracea</i> Curt. . . . .	500
2. <i>O. intima</i> McL., larva nova . . . . .	505
3. <i>O. lacustris</i> Pict. . . . .	507
4. <i>O. jurva</i> Ramb. . . . .	509
5. <i>O. sp. 1</i> (larva nova) . . . . .	514
6. <i>O. sp. 2</i> (larva nova) . . . . .	516



X. Family *Beraeidae* Wall.

1. Genus *Beraea* Steph.

1. <i>B. pullata</i> Curt. . . . .	520
2. <i>B. maurus</i> Curt. . . . .	525

2. Genus *Ernodes* Wall.

1. <i>E. palpata</i> Mart. . . . .	526
2. <i>E. articularis</i> Pict. . . . .	527

3. Genus *Beraeodes* Eaton

1. <i>B. minuta</i> L. . . . .	528
--------------------------------	-----

XI. Family *Sericostomatidae* Steph.

1. Genus *Notidobia* Steph.

1. <i>N. ciliaris</i> L. . . . .	531
----------------------------------	-----

2. Genus *Sericostoma* Latr.

1. <i>S. pedemontanum</i> McL. . . . .	539
2. <i>S. personatum</i> Spence . . . . .	546
3. <i>S. grusiense</i> Mart. . . . .	548



13 II. Suborder INTEGRIPALPIA Martynov

**Full-grown larva.** Length 5–40 mm, suberuciform or eruciform. Abdomen in most families cylindrical or nearly cylindrical, rarely slightly flattened dorsoventrally. Mesonotum sclerotized except in one family; metanotum entirely membranous or with several small tergites. Abdominal segment 1 with 1 dorsal and 2 lateral tubercles, with rare exceptions. Tracheal gills restricted to abdomen, situated on the dorsal, pleural and ventral sides or on the ventral and dorsal sides only, usually consisting of 1–3 filaments, sometimes of 4 or more filaments. Lateral line present, rarely absent. Tergite of abdominal segment 9 small, situated in posterior part of segment. Anal legs short, claw small, massive, directed laterally.

The larvae live in portable cases which are tubes of different form, with a covering of detritus, sand grains, small stones or mollusk shells. In some cases the covering consists of pieces of stalks and leaves of plants or moss, bitten off by the larva. Rarely, in some species of Leptoceridae, the case consists only of silk, without covering.

**Pupa.** Length 4.5–5.0 to 30–35 mm. First abdominal segment with a process or ridges dorsally with serrations or spinules. Tracheal gills present on abdomen, with rare exceptions. Anal appendages rodlike, sometimes lobe-shaped. The pupae are situated in tubular cases closed by a membrane with openings of various form; the membrane is often sievelike. The cases are attached to the substrate or lie free on the bottom.

Mode of life and habitats. The larvae of Integripalpia have a wider ecological range than those of Annulipalpia. They inhabit a large variety of running and stagnant water bodies including springs, small and large streams and rivulets with slow or rapid current, rapids at the foot of mountains, in foothills, and in large rivers in the plains, floodplain water bodies, small and large dystrophic, eutrophic, and oligotrophic lakes, small temporary spring puddles, and on the surface of sedge and sphagnum lakes. Many species live among humid leaves or moss, on stones in the surf zone, or in areas of small, oozing springs. The larvae of one European genus which does not occur in USSR, *Enoicyla* Ramb., live outside the water.

Distribution. Cosmopolitan.

Key to Families

Full-grown larva

- 1 (4). Larva suberuciform.
- 2 (3). Mesonotum membranous or with a small median sclerite near the anterior margin.

- Prothorax ventrally with a large, horn-shaped process. Case made of plant, rarely mineral, particles arranged spirally or in rings; sometimes a piece of grass stem is used instead of a case . . . . . 1. **Phryganeidae** Burm. (p. 13)
- 3 (2). Mesonotum sclerotized. Horn-shaped process on ventral side of prothorax absent; Case in form of shield covered with sand grains or small detritus particles. . . . . 2. **Molannidae** Wall. (p. 522)
- 4 (1). Larva eruciform.
- 5 (16). Horn-shaped process on ventral side of prothorax absent.
- 6 (13). Metanotum membranous, without sclerites.
- 7 (8). Mid- and hind femora divided, consisting of a small basal part and an apical part which forms the greater part of the femur . . . . . 9. **Leptoceridae** Leach (p. 540)
- 14 8 (7). Mid- and hind femora not divided.
- 9 (10). Lateral line absent, replaced by an interrupted row of fine spinules and small sclerotized dots. . . . . 10. **Beracidae** Wall. (p. 648)
- 10 (9). Lateral line present.
- 11 (12). Mesonotum sclerotized; abdominal segment 1 without processes. . . . . 5. **Brachycentridae** Ulm. (p. 461)
- 12 (11). Mesonotum membranous or sclerotized only anteriorly; abdominal segment 1 with processes . . . . . 11. **Sericostomatidae** Steph. (p. 662)
- 13 (6). Metanotum with 4-6 small tergites.
- 14 (15). Metanotum with 4 tergites, including 2 median, more or less large, transverse sclerites, one behind the other. Case covered with sand grains. . . . . 7. **Odontoceridae** Wall. (p. 511)
- 15 (14). Metanotum with 6 or 2 tergites, 3 or 1 on each side; in the first case, the lateral sclerite is oblong, the median sclerites small, dot-shaped. Case characteristic, covered with detritus. Far East . . . . . 6. **Calamoceratidae** Ulm. (p. 499)
- 16 (5). Horn-shaped process on ventral side of prothorax.
- 17 (18). Anterior angles of pronotum pointed, directed anteriorly. Case tubular, covered with sand grains and small flat stones at the sides . . . . . 3. **Goeridae** Ulm. (p. 405)
- 18 (17). Anterior angles of pronotum not pointed.
- 19 (20). Abdominal segment 1 with 2 lateral processes, dorsal process absent. Larva small, case usually tetrahedral . . . . . 4. **Lepidostomatidae** Ulm. (p. 437)
- 20 (19). Dorsal and lateral processes present on abdominal segment 1. Larvae and cases vary considerably in size. . . . . 2. **Limnophilidae** Kol. (p. 72)

Pupa

- 1 (4). Antennae very long, coiled around posterior end of body.
- 2 (3). Mandibles with long, thin curved, and slightly thickened end. Length about 16 mm . . . . . 7. **Odontoceridae** Wall. (p. 511)
- 3 (2). Mandibles without distal filiform end. Pupa small (5-12 mm) . . . . . 9. **Leptoceridae** Leach (p. 540)

- 4 (1). Antennae as long as body or slightly longer, curved at the end but not coiled around body.
- 5 (6). Abdominal segment 1 with characteristic, large, conically-truncate dorsal process. Number of spurs 2, 4, 4 (rarely different). Anal appendages short, lobe-shaped with wide base and 4 terminal setae. Large (30–32 mm); case with plant particles arranged spirally or in rings; case rarely covered with mineral particles . . . . . 1. **Phryganeidae** Burm. (p. 13)
- 6 (5). Conical process on dorsal side of abdominal segment 1 absent. Case different.
- 7 (8). Dorsal side of abdominal segment 1 with a saddle-shaped process covered with spinules in each half. Anal appendages rodlike, rarely lobe-shaped . . . . . 2. **Limnophilidae** Kol. (p. 72)
- 8 (7). Saddle-shaped process on abdominal segment 1 absent. Anal appendages of different form.
- 9 (10). Hind tibiae with 2–3 spurs. Anal appendages rodlike . . . . . 5. **Brachycentridae** Ulm. (p. 461)
- 10 (9). Hind tibiae with 4 spurs.
- 11 (16). Number of spurs 2, 4, 4.
- 12 (13). Dorsal side of abdominal segment 1 with denticulate median appendage. Anal appendages short, lobe-shaped. Pupa small (7–8 mm). Case tetrahedral, covered with sand or detritus . . . . . 4. **Lepidostomatidae** Ulm. (p. 437)
- 13 (12). Dorsal side of abdominal segment 1 with processes of different form. Anal appendages thin, rodlike.
- 14 (15). Dorsal side of abdominal segment 1 with blunt, short processes with apical denticles laterally. Case covered with sand grains and small stones on the sides . . . . . 3. **Goeridae** Ulm. (p. 405)
- 15 (14). Dorsal side of abdominal segment 1 with small median protuberance. Case shield-shaped, covered with sand grains or detritus . . . . . 8. **Molannidae** Wall. (p. 522)
- 16 (11). Number of spurs 2, 2, 4.
- 15 17 (18). Lateral line absent. Maxillary palps of male distinctly 5-segmented . . . . . 10. **Beraeidae** Wall. (p. 648)
- 18 (17). Lateral line present. Maxillary palps of male indistinctly segmented . . . . . 11. **Sericostomatidae** Steph. (p. 662)

I. Family PHRYGANEIDAE Burmeister

**Full-grown larva.** Length 15–45 mm. Body flexible, with deep constrictions between segments. Head bent slightly downward (larva suberuciform) (see Vol. II, Part 1:9, Figure 2, C). Sclerites yellow or brownish. Pattern dark, usually distinct; abdomen and other nonsclerotized parts of live specimens green, sometimes bright green, or pinkish yellow. Large setae dark, some setae very long.

Head slightly oblong, slightly flattened dorsoventrally. Eyes situated some distance from anterior margin. Antennae situated at the margin near

seta 7, in form of a membranous tubercle with short sclerotized sensilla and a small, light seta. Frontoclypeus slightly widened near the anterior margin, with shallow lateral orientations. Gula narrow, long, with curved sides, extending from anterior to posterior margin of head; gular suture therefore absent; a rugose, brown, longitudinal margin on the sclerites lateral to the gula. Setae of head only primary, many of them long; seta 14 longer than the others, seta 10 well developed, seta 17 long.

Labrum wide, with deep median indentation inside which the surface is tuberculate; setae 1, 2, and 4 form thick, light spines. Mandibles slightly oblong, with large, sharp, distal tooth; dorsal blade of left mandible usually with 3 teeth, ventral blade with 2 teeth; right mandible with 2 teeth on the dorsal and ventral blade; median depression without brush, except in one genus; outer setae dark, moderately long in the basal part.

Sclerites of cardo dark, distinct; submentum light with an indistinct yellowish or whitish, thin, median sclerite which may be absent; mentum short, dark, reddish brown; galea cylindrical; maxillary palps short, segments of about the same length; labial palps relatively large, one-segmented.

Pronotum short in the middle, posterior part separated by a rugose transverse border from the other part; pattern dark, distinct; anterior-margin and secondary surface setae not numerous. Tergites on mesonotum, if present, situated in the middle of anterior third of segment; anterior-angle setae of meso- and metanotum, together with the primary seta, form a tuft of 6-10 setae on a thin, round, light yellowish or whitish sclerite with dark dots.

Prothoracic pleuron small, dark; anterior membranous tubercle-shaped process of separated trochantin with short distal seta and 2 small setae. Meso- and metathoracic pleura large, pleural suture in form of a black groove; episternum indistinct in form of a narrow brown stripe adjacent to the suture, epimeron larger, with black distal margin; trochantin in form of a black distal sclerite, divided from episternum by a small, light bar with the large, black seta of the trochantin, both small setae situated further distally; seta of epimeron situated near posterior margin.

Prothoracic sternite near posterior margin of segment in form of a small, dark, triangular sclerite. A large, light, horn-shaped process ("horn") situated anterior to the sternite, with blunt or pointed apex which bears the opening of Gilson's gland.

Forelegs more massive than midlegs, both about the same length; hind legs much longer, femur straight, rodlike. Trochanter of all legs not colored dorsally. The posterior of the 2 distoventral setae of the tibia situated ventrally at the apex in form of a thick, blunt spine, anterior seta situated subventrally some distance from the apex, also in form of a spine, but usually slightly longer and thinner. Some of the large, primary setae of the legs very long. Small, scale-shaped chaetoids in basal part of coxae; trochanters, femora, tibiae, and sometimes also tarsi, with a dense ventral comb of light, small or large spinules.

Abdominal segment 1 shorter than the following segments; dorsal process large, conical, with characteristic pointed apex; lateral processes with rounded apex, with small, dark, in some places divided, spinules, one of the primary lateral setae situated among the spinules, the second further basally.

Lateral line on segments 3-8 forming a ridge, covered with short, light, golden yellow setae. Gills single, on segments 1-8 or 1-7; segment 1 with only 2 ventral gills, segments 2-7 with 2 dorsal, 2 pleural, and 2 ventral gills, situated near the anterior and posterior margin; if present, gills of segment 8 always presegmental; some gills of segments 6 and 7 also sometimes absent. Dorsal and ventral gills directed toward the median line, where the gills of the right and left sides cross; presegmental pleural gills situated above the lateral line, directed toward the median line, as are the dorsal gills; posterior pleural gills larger than the others, directed posteriorly, situated on lateral line, the hairs of which extend to the gills.

Tergite of segment 9 small, situated in posterior part of the segment, usually hexagonal (one plane anteriorly, two on each side, and one posteriorly, (see Figures 27 and 28); medioanal setae at sides of posterior side long, thick setae of anterior angle situated on dark background, slightly curved, much shorter.

Anal legs short, massive, sclerite "b" covering the anal legs dorsally, laterally, and ventrally, where it is narrower near the inner margin; 3 large setae near the distal margin, one short seta in the median line and outside the sclerite. Sclerite "c" plate-shaped, near base of claw, with a small ventral seta.

Claw directed laterally, its dorsal side directed inward, ventral side outward, outer side upward, mediolateral side downward. Basal part of claw oblong, apical part sharply curved, with to 6 dorsal denticles at the curvature. Membranous bar wider in the middle, extending along the basal part in a narrow ventral stripe; seta 3 situated dorsally, dark, thick, longer than the others.

Case in form of straight or slightly curved, wide tube of regular, tetrahedral pieces of plants arranged spirally or in rings; particles rarely irregular in form and arrangement; case covered with plant and mineral fragments in 2 species. The larvae of some species use a part of the stalk of *Phragmites communis* or *Scolochloa festucacea*.

**Pupa.** Length 14-33 mm. Antennae reaching abdominal segment 6-8; scape of antenna thicker than other segments. Frons anteriorly with a more or less marked process of varying form, process sometimes tuberculate. Anterior margin of labrum with a small process in the middle; median seta usually shorter than the other 5, which are situated near the anterior angle.

Mandibles long, with well-developed, straight, or curved distal part, or short, nonfunctional, with rudimentary distal part; outer basal setae usually situated on a small tubercle.

Sheaths of forewings narrower than of hind wings. Natatorial setae present on tarsi of all legs or on mid- and hind tarsi only, dense on mid-tarsi, sparse on the others.

Abdominal segment 1 dorsally with a large process directed posteriorly and sclerotized to varying extent. Plates of holding apparatus situated presegmentally on segments 3-8 or 4-7, postsegmentally on segment 5; number of spinules on each plate 24-28, usually less. Lateral line with dense dark setulae on segments 4-8, continuing ventrally on the last segment and ending as small ring with a median gap; setae small and sparse on segment 3.

Anal appendages short, wide, lobe-shaped, pointed on the inner side or forming a short digitiform process; each lobe with 4 setae near posterior margin.

Pupal case resembling the larval case, usually longer, 45–50 mm long in large species; anterior and posterior opening closed by a sievelike, membranous operculum with large, dense meshes in most species; anterior membrane usually situated inside the case, but absent in some species. Case attached among plants near the shore, its anterior opening covered with moss or thin, narrow stalks and leaves of aquatic plants.

Mode of life and habitats. Stagnant water of various types, large lakes to small, swampy water bodies; slow rivers, brooks and rivulets, usually in forests, including draining ditches, among vegetation or on the bottom.

Distribution. Throughout the USSR. In addition, Europe, Asia, North Africa, North America, Chile.

17 Key to Genera

Full-grown larva

- 1 (14). Mesonotum entirely membranous, without sclerites.
- 2 (13). Thoracic segments and abdominal segment 1 without dark, longitudinal lateral stripes.
- 3 (12). Dark, median pattern or dots on frontoclypeus.
- 4 (11). Frontoclypeus with dark, longitudinal, median stripe of varying width, but not occupying the whole sclerite. Brush on mandibles absent. Large (18–40 mm).
- 5 (8). Median stripe of frontoclypeus uniformly wide or wider posteriorly, dark or slightly dark, almost entirely replaced by dense dots.
- 6 (7). Median stripe of frontoclypeus more or less widened posteriorly. Case with spirally arranged plant fragments, or part of a stalk of Gramineae. Fresh, usually stagnant water . . . . . 1. *Agrypnia* Curt. (p. 18)
- 7 (6). Median stripe of frontoclypeus uniformly wide, dark, occupying almost the whole sclerite, or slightly dark, sometimes replaced almost entirely by dots. Case with spirally or irregularly arranged plant or mineral particles. Brackish water of lakes and seashore . . . . . 2. *Agrypnetes* McL. (p. 28)
- 8 (5). Dark median stripe of frontoclypeus uniformly narrow.
- 9 (10). Head light ventrally or with a few dots which are not always distinct . . . . . 3. *Phryganea* L. (p. 34)
- 10 (9). Head with short, dark, longitudinal stripe ventrally on each side or with a large dark spot, with groups of dots . . . . . 4. *Dasystegia* Wall. (p. 44)
- 11 (4). Frontoclypeus completely or almost completely dark. Brush on mandibles present. Abdominal segment 1 without dorsal process. Larva medium sized . . . . . 9. *Trichostegia* Kol. (p. 70)
- 12 (3). Frontoclypeus light in middle, dark laterally . . . . . 8. *Hagenella* Mart. (p. 68)



- 13 (2). Two dark longitudinal stripes on the thoracic segments, abdominal segment 1, and sometimes also on several other abdominal segments . . . . . **5. Oligotricha** Ramb. (p. 50)
- 14 (1). Mesonotum with 1 or 2 small median sclerites near anterior margin.
- 15 (16). Frontoclypeus with dark pattern forming a horseshoe. Two small sclerites near anterior margin of mesonotum . . . . . **7. Oligostomis** Kol. (p. 64)
- 16 (15). Frontoclypeus with dark median pattern. One large, transverse sclerite with indistinct median suture near anterior margin of mesonotum . . . . . **6. Semblis** Fabr. (p. 56)

Pupa

- 1 (12). End of mandibles long, straight, or curved. Case with spirally or irregularly arranged plant particles.
- 2 (11). Anal lobes with or without a small median process posteriorly. Case 35–50 mm long, fragments arranged usually in a spiral, rarely irregularly.
- 3 (6). Mandibles strongly curved.
- 4 (5). Pupa large (25–33 mm). Labrum slightly or distinctly narrower posteriorly. Case large (35 mm), covered with spirally arranged, square, slightly oblong fragments of plants. Fresh stagnant water . . . . . **3. Phryganea** L. (p. 34)
- 5 (4). Pupa smaller (16–20 mm). Labrum markedly wider posteriorly. Case smaller (25–34 mm), covered with plant or mineral particles arranged spirally or irregularly. . . . . **2. Agrypnetes** McL. (p. 28)
- 6 (3). Mandibles almost straight or slightly curved.
- 7 (10). Dorsal median process of abdominal segment 1 concave at the end, with processes laterally . . . . . **1. Agrypnia** Curt. (p. 18)
- 8 (9). Anal lobes more or less pointed posteriorly. Case covered with reed fragments or spirally arranged plant particles.
- 9 (8). Anal lobes without pointed posterior process . . . . . **4. Dasystegia** Wall. (p. 44)
- 18 10 (7). Dorsal median process of abdominal segment 1 rounded at the end . . . . . **5. Oligotricha** Ramb. (p. 50)
- 11 (2). Anal lobes with short digitiform appendage posteriorly. Case about 25 mm long, plant particles usually irregularly arranged . . . . . **9. Trichostegia** Kol. (p. 70)
- 12 (1). Apex of mandibles reduced. Plant particles on case arranged in rings.
- 13 (16). Rudimentary apex of mandible in form of a small, pointed process. Postsegmental plates of segment 5 with 10–19 denticles.
- 14 (15). Frontal process of pupa strongly projecting . . . . . **8. Hagenella** Mart. (p. 68)
- 15 (14). Frontal process of pupa slightly projecting . . . . . **7. Oligostomis** Kol. (p. 64)

- 16 (13). Rudimentary apex of mandible forming a larger process.  
 Postsegmental plate of segment 5 with 23–28 denticles . . . . .  
 . . . . . 6. **Semblis** Fabr. (p. 56)

1. Genus *Agrypnia* Curtis

**Full-grown larva.** Length 18–25 mm. Median pattern of frontoclypeus in form of a dark stripe, wider posteriorly, almost reaching the frontal sutures; groups of dots laterally on the ventral side. Dark stripe in anterior third of pronotum widened in the middle of each half, sometimes extending to almost half the sclerite.

Case with fragments of stalks of Gramineae or plant particles arranged spirally.

**Pupa.** Length 16–22 mm. Anal lobes more or less pointed at the end. Case, as in the larva, moderately long, with sievelike membranes.

Mode of life and habitats. In vegetation of stagnant and slow water bodies; often in eutrophic lakes.

Distribution. USSR: European and Asiatic parts. In addition, Europe, Asia, North America.

Key to Species

Full-grown larva

- 1 (2). Median pattern wider posteriorly but usually not reaching frontal sutures . . . . . 1. **A. pagetana** Curt. (p. 18)  
 2 (1). Median pattern jug-shaped, markedly wider posteriorly, almost reaching or reaching frontal sutures . . . . . 2. **A. picta** Kol. (p. 28)

Pupa

- 1 (2). Labrum and anteclypeus about the same length. Case with reed fragments, rarely with spirally arranged particles . . . . .  
 . . . . . 1. **A. pagetana** Curt. (p. 18)  
 2 (1). Labrum and anteclypeus wider than long. Case with spirally arranged particles . . . . . 2. **A. picta** Kol. (p. 28)

1. *Agrypnia pagetana* Curtis

Ostwald, 1899: 78–80. — Struck, 1899: 197; 1900, Figure 2. — Siltala, 1902: 26–30, Plates I, II, Figure 60v. — Struck, 1903: 53–59, Plate I, Figure 3. — Ulmer, 1903: 40. — Thienemann, 1905b: 547, Figures 4, 5, 17, 18, 122. — Siltala, 1905: 19; 1907: 441–443, 445–446. — Ulmer, 1909: 240, 303, Figure 441b, 443b. — Lestage, 1921: 565–571, Figures 188, 190. — Lepneva, 1940: 208. — Wiggins, 1960: 1165, Figure 9.

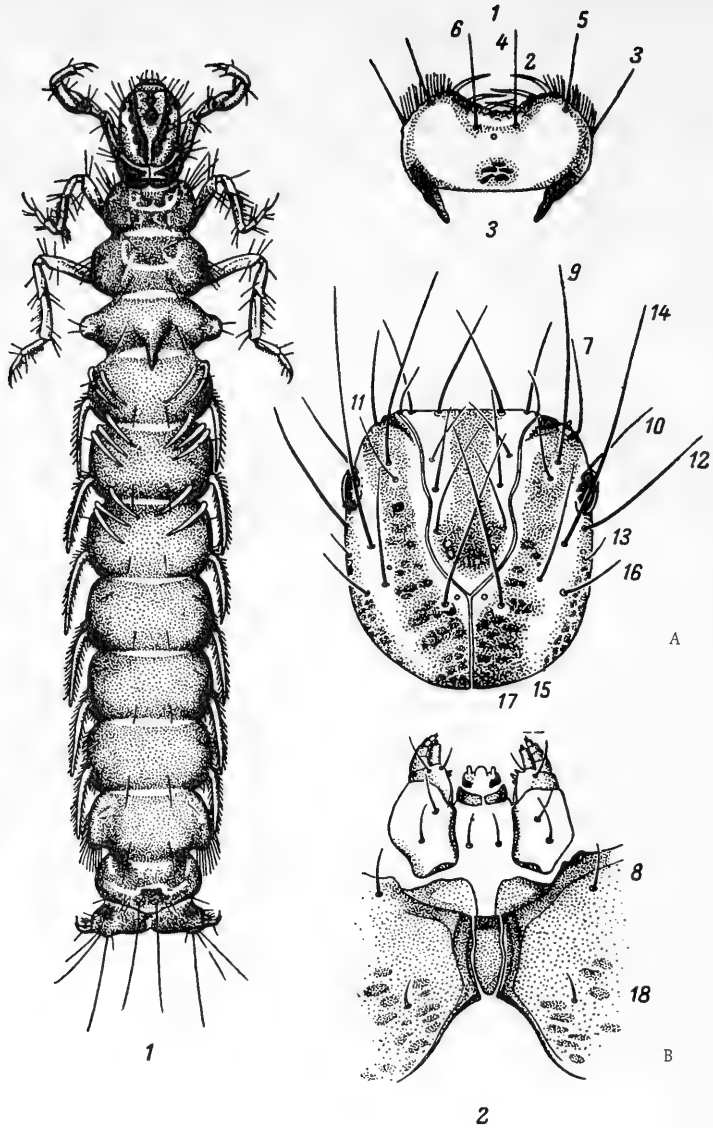
19 **Full-grown larva.** Length 22.0–24.5 mm (Figure 1). Head (Figure 2) slightly compressed dorsoventrally, yellow, with distinct dark pattern. Pattern on frontoclypeus widened juglike posteriorly, usually not reaching frontal sutures in the posterior angle (rarely reaching or almost reaching sutures); 4 asymmetrical dark dots in anterior part lateral to dark stripe; a curved transverse row of dark dots in the posterior part. Dorsal stripes distinct, with numerous dark dots; stripes extending from anterior to posterior margin of head, meeting near the coronal suture. Lateral lobes also distinct, with groups of dots; a large light area between dorsal and lateral stripes. Groups of large dots ventrally in each half. Gula brownish, with distinct, dark brown lateral margin. Setae usually dark, reddish brown.

Outer anterior-margin seta short, light, curved inward, situated at angle of sclerite; intermediate seta situated nearby, straight, thin, long; median, anterior-margin seta slightly thinner situated at some distance; anterior and middle frontal setae situated one behind the other (Figure 2, A), short, thin; posterior frontal setae slightly longer, dark, situated lateral to the wide part of the dark pattern. Seta 9 strong, long, on light line of dorsal stripe; seta 11 thin, short, situated behind seta 9; seta 7 strong, moderately long, situated near antenna; seta 10 short, situated lateral to the eye; seta 12 long, situated behind the eye; seta 14 the longest on the head, longer than seta 12, both of them dark, thick; seta 13 small, situated lateral to seta 14; setae 15 and 16 situated posteriorly in one row, thin, much shorter than seta 14; seta 17 situated near coronal suture, thin, large. Ventral seta 8 situated near anterior margin (Figure 2, B) short, thin; seta 18 situated in posterior part of head, small, thin, among group of dots.

Labrum (Figure 3) with deep median indentation of anterior margin, as characteristic for Phryganeidae, with a group of dark median dots posteriorly; sclerites of posterior angles dark brown, with blackish brown dots basally. Setae 1, 2, and 4 small, light, curved inward; seta 3 dark brown, straight, long, situated laterally and submarginally in middle of sclerite; seta 6 large, dark, situated lateral to median indentation; seta 5 similar, situated nearer the margin.

Mandibles (Figure 4), both right and left, with distinctly projecting apical tooth; upper blade of left mandible with 3 additional teeth, lower blade with 2 teeth; right mandible with one tooth on the upper blade, 2 on the lower blade, one of them large; outer setae brownish, slightly curved, dorsal apical seta slightly shorter than the ventral basal seta.

Submentum light, its sclerite thin, whitish, indistinct, heart-shaped; setae short, reddish brown, situated on sclerotized dots near the anterior margin, near the base of the round anterior-angle processes. Sclerites of cardo distinct, brownish, with a small thin seta; stipes light brown, with dark inner margin, setae thin, dark, basal seta situated on membrane, apical seta near anterior margin. Palpifer dark brown; median basal seta small, thick, light, apical seta situated on membrane near anterior margin. Galea cylindrical, with dark sclerite; setae and sensillae large; palps short, with dark brown sclerites, first segment slightly larger than the others, 4th segment small. Mentum blackish brown, horseshoe-shaped, short in the middle, with blackish anterior margin. Ventral sclerites dark, rodlike, with a small light seta at the distal margin; labial palpiger clearly defined, sickle-shaped, dark brown; labial palps relatively large, with brownish sclerite and thick terminal sensillae.



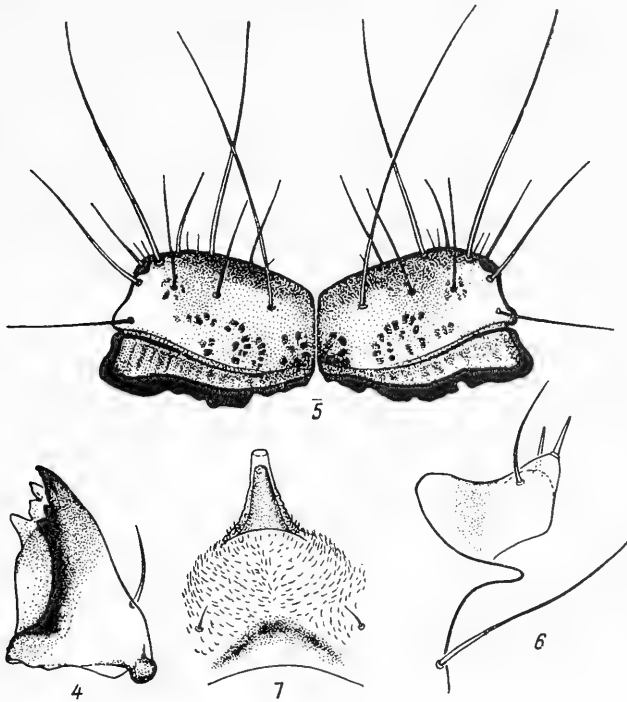
FIGURES 1-3. *Agrypnia pagetana* Curt.:

1 - full-grown larva; 2 - head, dorsal (A) and ventral (B); 3 - labrum.

Pronotum (Figure 5) short in the middle, blackish brown on posterior margin and on posterior third of lateral margin. Anterior part with a large dark area in middle of each half and reaching to half the length of the sclerite; a narrow, dark stripe near the anterior margin; posterior part with groups of small and large dots, especially numerous in middle

of each half. Setae dark reddish brown, except the small setae; 2-3 long or very long setae and 4-5 smaller setae at anterior margin; primary seta of anterior angle long, a short secondary seta and 2-3 small, thin setae nearby; middle with a large seta as long as that at the anterior angle, 2 large, long setae and several small setae; 2 thin, long setae situated near lateral margin, one of them near the anterior-angle seta, the other in middle of margin of sclerite.

(21)



FIGURES 4-7. *Agrypnia pagetana* Curt.:

4 - left mandible, ventral; 5 - pronotum; 6 - pleuron of prothorax; 7 - prothorax, ventral, with horn and sternite.

Anterior-angle area of meso- and metanotum with 8-10 brownish setae, including 3 long (one of them primary) setae, situated on convex, reddish brown sclerotized dots; anterior-margin seta large, dark; medioanal surface seta of the same size as anterior-angle setae; intermediate seta short, thin; lateral seta light, small.

Mesothoracic pleuron (Figure 6) with wide, short, blackish brown pleural groove; episternum light brown; epimeron dark brown, triangular; seta brownish, thin, situated near the posterior angle on the membrane; trochantin short, with small, brown sclerite and membranous apex, sclerite with a moderately long submarginal seta and 2 small distal setae.

Pleurites of meso- and metathorax in form of large, reddish brown sclerites, divided by the black, distally widened pleural suture into the smaller episternum and the larger epimeron; dark dots basally, on both sides along the suture; epimeron distally with short black margin near end of suture; episternum with small black projection of the suture, separated by a small membranous or slightly sclerotized area from the black margin of the trochantin; seta of trochantin situated on the bar, small setae at the margin; seta of epimeron situated near posterior margin.

21 Prothoracic sternite (Figure 7) in form of small triangular brown sclerite with a narrow anterior median process. Horn-shaped process short, white, with harder, yellowish end.

Forelegs (Figure 8, A, B) slightly longer than midlegs; ratio of length of legs 104:100:140. Legs yellowish brown, dots dark, setae reddish brown or yellowish.

Fore coxae oblong, slightly longer dorsally than the other segments, with numerous dark brown dots posteriorly; distodorsal indentation reaching middle of coxa; basodorsal groove with black margin. Setae reddish brown, all primary. Basodorsal anterior seta long, distodorsal anterior seta slightly thicker, posterior dorsal seta situated near middle of indentation, longer and thinner than basodorsal seta; both anterior setae relatively large; distoventral setae short, thin, of about the same length. Small, dense scale-shaped chaetoids with combs of light, sharp spinules at the base (Figure 8, C); larger and more numerous chaetoids ventrally and subventrally; bundles of microscopic, sharp chaetoids present in addition to large chaetoids.

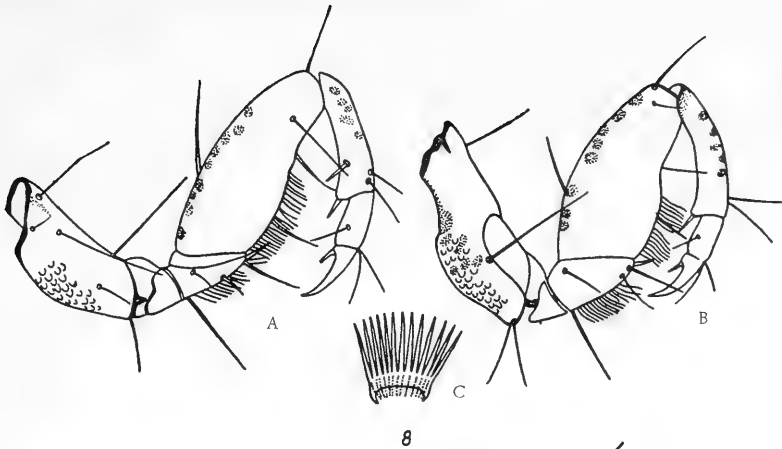
Posterior primary seta of trochanter short, dark brown, thin, situated subdorsally; anterior seta small, thicker than the posterior seta; distal seta of the 3 anterior ventral setae small, light, spiniform, situated apically, middle seta slightly larger, also light, basal seta long, thick; posterior apical seta similar, second ventral posterior seta shorter. A row of light, slightly rounded spines curved toward the distal side situated ventrally anterior to the ventral setae.

Femur convex dorsally, with a longitudinal row of large, dark, brown dots. Short basodorsal seta strong, apical, dorsal seta thin, brownish, slightly longer; anterior seta large, thick, dark brown, situated subventrally; posterior seta small, lighter, subdorsal; ventral comb in basal half formed by light chaetoids as on the trochanter, but here the chaetoids are straight and stronger; minute, blunt spinules anteriorly near chaetoids.

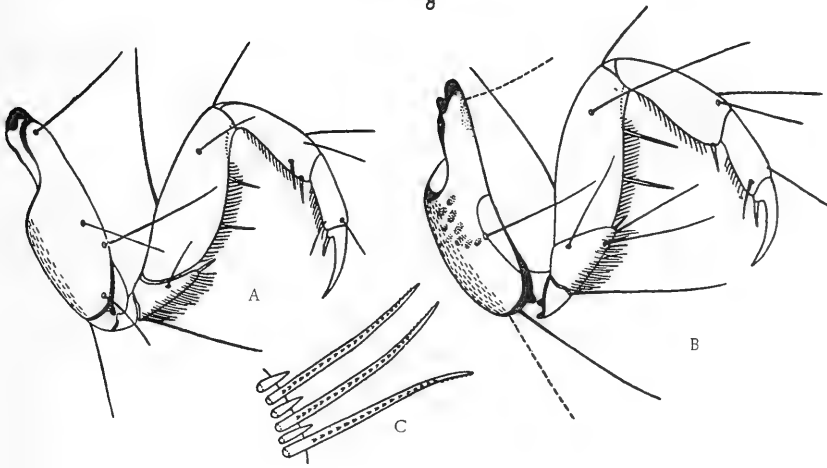
22

Tibia wider at the apex, with ventral process; large dark dots on the dorsal margin. Both dorsal primary setae situated subapically, yellowish, thin, posterior seta long, anterior seta short. A strong large, brown surface seta, and a thin, light, long, posterior seta laterally near the dorsal setae; ventral setae short, thick, spiniform, one of them situated distally on a process, the other slightly anterior to the basal seta.

Tarsus much shorter than tibia; anterior dorsal seta small, thin, posterior seta much larger and slightly thicker, both situated subapically, ventral setae situated laterally, subventrally, short, strong. Claw slightly curved, with a massive, blunt, basal spine.



8



9

FIGURES 8 and 9. *Agrypnia pagetana* Curt.:

8 — forelegs, left leg, anterior (A), right leg, posterior (B), pectinate spinules on anterior part of coxa (C); 9 — midlegs, left leg, anterior (A), right leg posterior (B), spinules of femur (C), including larger hairlike and small, blunt spinules (8, C and 9, C — after Siltala).

Mid- and hind coxae (Figures 9 and 10) slightly longer and narrower than fore coxae; distodorsal indentation extending to about middle of segment; basal part posteriorly with groups of large dark dots; as on the forelegs, there are large scale-shaped, overlapping chaetoids and numerous spinules. Basodorsal primary seta, thin and longer than on the forelegs. Anterior apical-dorsal seta slightly longer and thicker, situated near the middle of the depression; posterior dorsal seta thin; both anterior surface setae dark, thin, large; apical-ventral setae thin, long; anterior seta situated ventrally, posterior seta subventrally.

Hind trochanter longer than fore and mid-trochanter. Anterior seta light, short; posterior seta dark, long, both situated distally; short, light setiform spines ventrally anterior to the comb. Three anterior, primary setae: basal seta long, dark, situated on the neck; terminal apical seta small, spiniform; middle seta short, in the comb of light chaetoids; both posterior ventral setae long, situated subapically one behind the other.

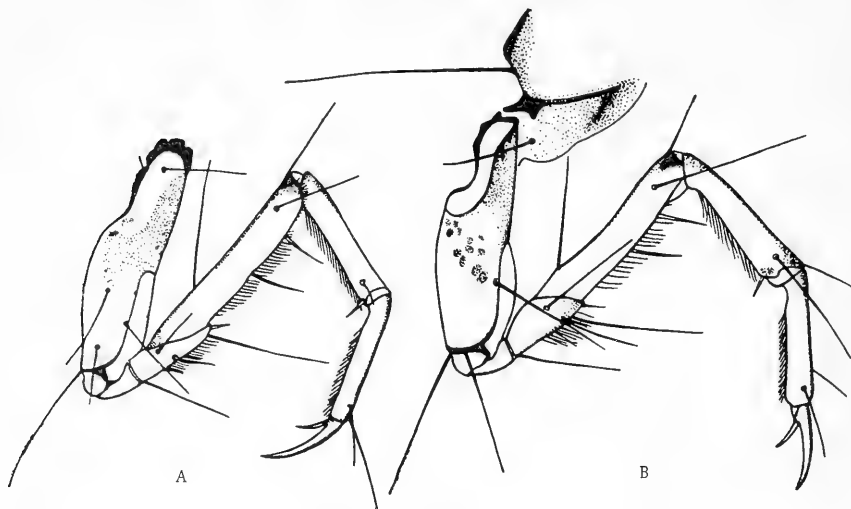


FIGURE 10. *Agrypnia pagetana* Curt. Hind legs: left leg, anterior (A), right leg, posterior (B)

Mid-femur resembling fore femur, with slightly convex dorsal margin. Hind femur straight, with parallel dorsal and ventral margin. Mid- and hind femora dorsally with a row of large dots, ventrally with a row of light, setiform chaetoids, as on the forelegs; small, blunt, brown spinules between chaetoids (Figure 9, C) extending also on the anterior distal margin. Basodorsal seta long, thin; apical-dorsal seta short, directed posteriorly; posterior seta long, anterior seta short, thinner, both dark apically; ventral setae short, spiniform, situated behind the comb in middle of segment.

Mid-tibia resembling fore tibia; hind tibia much longer, straight, narrow, like the femur. Tibia dorsally with large, dark brown spots, ventrally with a comb of light, sharp, dense spinules; absent distoventral process replaced by a short, blunt, brown spine; second ventral seta also spiniform, larger, and situated subapically and anteriorly; other 4 setae situated dorsally and subdorsally, 2 on each side, subdorsal seta strong, reddish brown, dorsal seta thin, light; posterior pair of setae on mid- and hind legs longer than anterior pair; anterior seta of hind tibia especially long.

Mid-tarsus: ventral setae dark distally, thin, short, posterior seta larger than anterior seta; posterior seta of dorsal pair black, long; anterior seta short, brownish. Hind tarsus: all 4 setae situated dorsally, close together;



distodorsal seta long, second dorsal seta shorter, situated slightly more basally; both setae thin, light; posterior surface seta long, dark, thick; anterior seta shorter and lighter.

Claw longer and thinner than on forelegs, with pointed basal spine.

24

Abdominal segment 1 shorter than following segments, with high pointed dorsal process and large, blunt lateral processes covered with characteristic spinules (Figure 11). Segments 2-8 equally wide, last 2 segments slightly longer than preceding segments. Lateral line on segments 3-7 in form of narrow ridge, covered with small, fine, brownish hairs. Gills on segments 1-7.

Dorsal gills on segments 2-7 situated near anterior and posterior margin, posterior gills situated slightly more medially than anterior gills, those on segments 6 and 7 shorter and thinner than on the preceding segments. Pleural gills on segments 2-7, anterior gill situated slightly more dorsal than the lateral line, posterior gill on the lateral line, the spinules of which become shorter and sparser, and continue from the outside and from the median line to the gills. Hairs of the posterior, pleural gill of segment 2 sparse and few, lateral line absent.

Ventral gills on segments 1-6 or 1-7; anterior gill of segment 1 situated in the middle, near the anterior margin on segments 2-6; ventral gills of segments 5-7 shorter than on the preceding segments.

Anterior-margin dorsal seta of abdominal segment 1 moderately large, dark, larger than on the following segments, situated close to the medioanal seta; medioanal seta situated lateral to the dorsal process, larger than the

other dorsal setae, as on the following segments, black, strong, on a light dot; intermediate anal and lateral anal setae small, thin, situated some distance from the median seta; both lateral setae well developed, thick,

Number and arrangement of gills of *A. pagetana* \*

Segment	Dorsal		Pleural		Ventral	
	1	2	1	2	1	2
1					1	1
2	1	1	1	1	1	1
3	1	1	1	1	1	1
4	1	1	1	1	1	1
5	1	1	1	1	1	1
6	1(0)	1(0)	1	1	1	1
7	1(0)	1(0)	1	1	1(0)	1(0)

\* This description of the arrangement of the gills has been accepted since Klapálek and Siltala. The numerals on the left indicate the number of the segment, beginning from the anterior to the posterior end. The scheme describes the right half of the segment; the first longitudinal line on the left represents the dorsal median line of the abdomen; the second longitudinal line separates the dorsal from the pleural surface, the third represents the lateral line, and the fourth separates the pleural from the ventral side. The left longitudinal column gives the dorsal surface of the segment; the middle column the pleural surface, and the right column, the ventral surface.

The other numerals indicate the number of filaments of the gill and its position on the segment. There are anterior-margin and posterior-margin gills, dorsal median and ventral median gills, gills situated dorsally and ventrally from the lateral line, and ventral median and ventral lateral gills.

The lateral line of the abdomen is represented as a continuous or dotted line, which is actually unnecessary, since its position between two rows of pleura' gills is evident. A zero indicates that there are sometimes no gills at this point.

dark. Abdominal segment 1 with 2 ventral setae; median seta thick, long, dark, near anterior margin of segment; second seta (apparently lateral) small, dark, situated on the anterior ventral gill some distance from the base of the gill.

25 Abdominal segments 2-8. Anterior-margin dorsal seta small, thin (Figure 12); anterior-angle seta slightly larger on segments 2-3 situated near the anterior-margin gill, on the following segments situated gradually more posteriorly toward the middle, on a small, sclerotized dot. Medioanal seta dark brown as on segment 1, relatively large on segments 7 and 8, long, thick, at the base, situated on a large, dark sclerotized dot; intermediate and lateral setae small, situated some distance from the medioanal seta on segment 2 gradually closer to medioanal seta on the following segments. Lateral line absent on segment 2, the lateral setae small, black, situated one behind the other, the anterior seta shorter and thinner than posterior seta. Lateral setae of following segments brown, slightly thickened, situated among the chaetae of the lateral line. Ventromedian seta small, thin, situated near anterior margin; lateral seta small, black, situated behind anterior ventral gill; intermediate seta the largest on the ventral side, dark, thick, situated in posterior part of the segment.

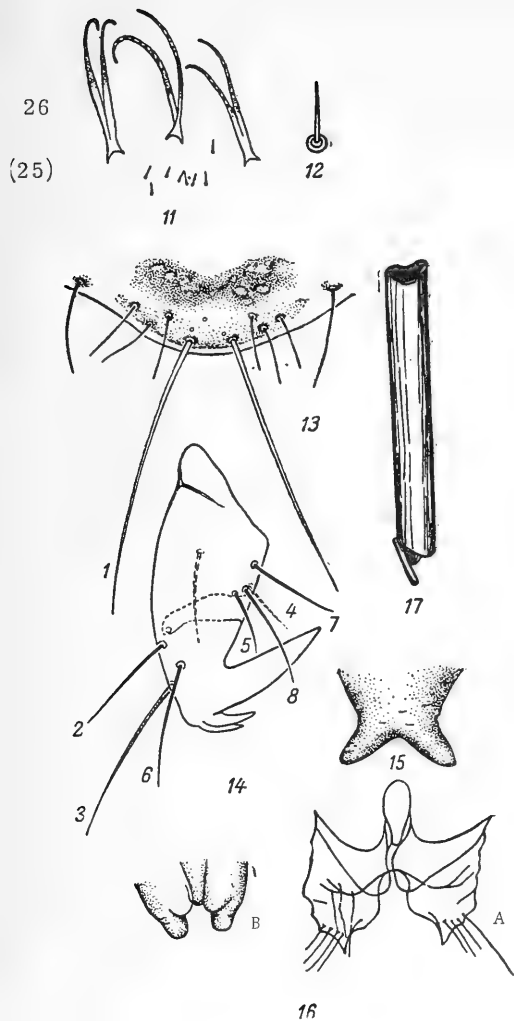
Dorsal side of segment 9 with a small, yellowish brown median sclerite posteriorly (Figure 13) with dark dots near anterior margin; posterior margin of sclerite with a thick, blackish brown, long medioanal seta, flanked by short, light, intermediate and lateral anal setae; anterior-margin seta situated before the intermediate seta, small, thin, displaced posteriorly, sometimes absent on one side; anterior-angle seta short, reddish brown, situated on a large sclerotized dot on the membrane near posterior angle; all 3 ventral setae situated in posterior part of segment, intermediate seta thick, black, longer than on the preceding segments, median seta small, situated more anteriorly, lateral seta small, thin.

Anal legs short; sclerite "b" yellowish brown, covering lateral and outer dorsal parts of the anal leg and part of the ventral side, where it forms a narrow mediobasal process; a reddish to dark brown spot dorsally near base of claw, 3 long, thick blackish brown setae, near posterior margin of spot, one of them slightly shorter and thinner than the others; a short, dark seta ventrally on the outer side. Sclerite "c" relatively large, with a small dark seta.

Claw (Figure 14) curved at a right angle, with 3 small denticles dorsally at the curvature; dorsal seta 1 small, thick; seta 2 larger, situated near dorsal margin of membranous bar; seta 6, situated nearby, laterally, short, thick; seta 3 situated distally, the longest on the claw; setae 7 and 8 situated ventrally near the base, yellowish, short; seta 5 short, situated laterally near seta 8; seta 4 small, situated medially near seta 8.

Case (Figure 17) usually consisting of a stalk of *Phragmites communis* or *Scolochloa festucacea*, open on both sides, slightly larger than the larva; rarely, as in *Phryganea*, covered with small plant fragments arranged in a spiral.

**Pupa.** Length of male pupae 16-17 mm, of female 20-22 mm. Antennae reaching segment 8-9 in male pupae, segment 4-5 in female pupae. Labrum and anteclypeus about as long as wide or slightly longer than wide.



FIGURES 11-17. *Agrypnia pagetana* Curt.:

11 - double, large, hairlike and small thin spinules of the lateral process of abdominal segment 1; 12 - small anterior dorsal seta of abdominal segment 3; 13 - tergite of abdominal segment 9; 14 - claw of the anal leg; 15 - dorsal process of abdominal segment 1 of pupa; 16 - end of body of male pupa (A), ventral appendages and penis sheath (B); 17 - case of pupa (11-12 and 15-17 after Siltala).

Anteclypeus with 3 setae, including a longer median and shorter lateral seta; labrum with 6 setae, 5 of them straight, long, situated near the anterior angle; the 6th shorter and thinner, yellow, situated slightly more medially. Apex of mandible narrow, almost straight, blade sharp, serrated; both outer setae short, situated near a small tubercle. Wing sheaths of male pupae reaching segment 5, of female, segment 4. All tarsi with natatorial setae, denser on the midlegs.

Dorsal process of abdominal segment 1 large, sclerotized, bifid (Figure 15). Lateral line, as usual in Phryganeidae, with dense, black, soft setae which are longer on the posterior segments. Gills of segments 2-7 arranged as in the larva, but posterior pleural gill without setae; anterior lateral gill sometimes present on segment 8. Holding apparatus on segments 4-7, number of spinules: IV:2-8; V:7-11+19-21; VI:6-13; VII:8-12.

In male pupae, anal appendages wide with a pointed process posteriorly (Figure 16, A), with 2 rounded processes ventrally on each side (Figure 16, B), one large and one small, corresponding to the deeply forked ventral appendages of the adult male genitalia; penis sheath short.

Case consists of a reed stalk (Figure 17), as in the larva, with sievelike covers at both ends; anterior cover more distant from the end than posterior cover.

Mode of life and habitats. Living on the bottom among the vegetation in stagnant and slowly running water.

Characteristic inhabitant of

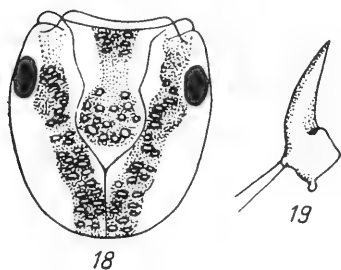
lakes. Adults occur in large numbers in overgrown lakes in the central zone of the European USSR in the first half of summer.

Distribution. USSR: European part, Middle Asia, Western and Eastern Siberia. In addition, Europe, Mongolia, China, North America (isolated occurrences).

## 2. *Agrypnia picta* Kolenati

Siltala, 1904c:16-19, Fig. 4:1905:9-10, Fig. 2; 1907:440-441; 1908b:11. — Ulmer, 1909:240, 303. — Lestage, 1921:556-557, 558, 565-571. — Lepneva, 1940:208.

**Full-grown larva.** Larger than *A. pagetana*, length 23-25 mm. Median dark pattern of frontoclypeus wider posteriorly than in *A. pagetana*, often occupying almost the whole posterior area and reaching the frontal sutures (Figure 18); dorsal stripes distinct, with large dots; lateral stripes short, lateral dots numerous. Ventral side of head light anteriorly, with dark dots posteriorly.



FIGURES 18 and 19. *Agrypnia picta* Kol.:

18 — head, dorsal; 19 — right mandible of pupa, ventral.

Setae on body as in *A. pagetana*.

Number of gills on posterior abdominal segments more constant than in *A. pagetana*; lateral presegmental gills present on segment 8.

Case, in contrast to that of *A. pagetana*, made mainly of large, not quite symmetrical plant fragments arranged in a spiral, sometimes 40 mm long; rarely part of a stalk of Gramineae.

**Pupa.** Length 17-20 mm. Labrum and anteclypeus slightly longer than wide.

Apex of mandible wider and more sharply curved than in *A. pagetana* (Figure 19). Dorsal gills of segments 6 and 7 situated only postsegmentally; presegmental lateral gills not always present on segment 8. Number of spinules of holding apparatus: IV:0-6; V:3-11+10-21; VI:6-13; VII:5-15.

Pointed process of anal appendages of pupa less large than in *A. pagetana*. Outer lobe of ventral appendages of male pupae almost reaching end of body, median lobe smaller, indistinct, penis sheath wide. Case as in the larva.

Mode of life and habitats. Overgrown stagnant water, often in swamps.

Distribution. USSR: European part, central and northwestern zones; southern Siberia, Amur region, Sakhalin, Kamchatka. In addition, Europe, China, Mongolia.

## 27 2. Genus *Agrypnetes* McLachlan

**Full-grown larva.** Length 20 mm. Head dark, with wide median stripe on frontoclypeus, occupying almost the whole sclerite, or head light, with bright dots on barely visible dorsal stripes.

Case made of plant or mineral particles.

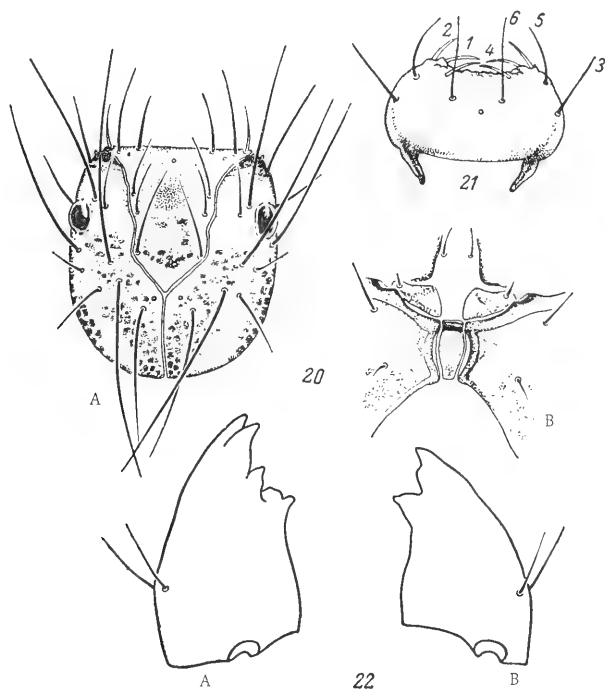
Mode of life and habitats. Brackish lakes; coastal waters of the Gulf of Finland.

Distribution. USSR: European part, northern, northwestern, and southwestern areas, Middle Asia. In addition, Mongolia.

### 1. *Agrypnetes crassicornis* McLachlan

Siltala, 1904c:19–25, Fig. 5; 1907:443–444.

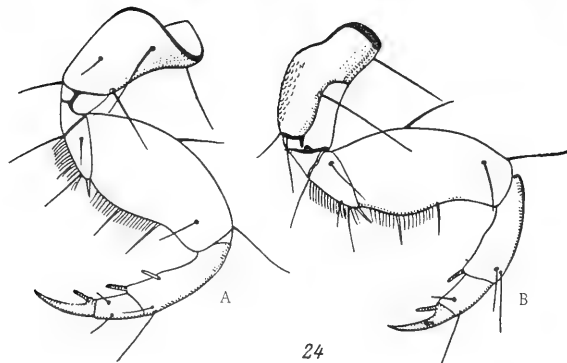
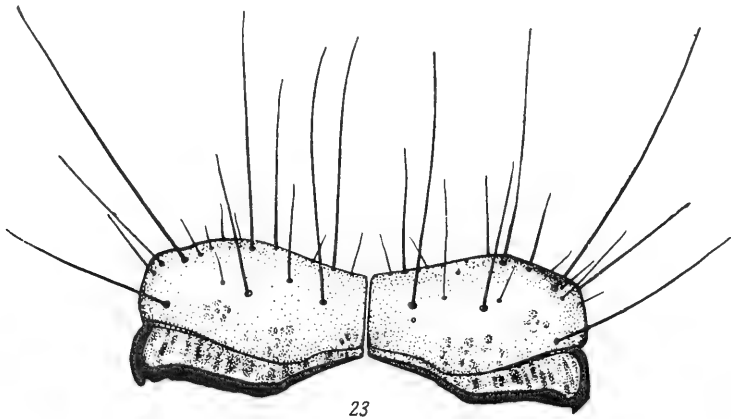
**Full-grown larva.** Length 16–20 mm. Coloration very variable; Siltala (1904:19–25) described dark larvae of greater size (length 20–25 mm) from the coastal zone of the Gulf of Finland, with a wide, dark pattern on the frontoclypeus and with wide, partly fused dorsal and lateral stripes on the head. Light specimens from the Aral Sea, Lake Uruskul in the Central Urals and lakes of Eastern Siberia are in the collection of the Zoological Institute of the USSR Academy of Sciences. The dark variety described by Siltala is characteristic of the population at the western border of the range of *A. crassicornis*.



FIGURES 20–22. *Agrypnetes crassicornis* McL.:

20 – head, dorsal (A) and ventral (B); 21 – labrum; 22 – mandibles, dorsal, left (A) and right (B).

28 Head longer than wide (Figure 20). Frontoclypeus either completely light with a group of reddish brown dots posteriorly, or with dots and distinct pale reddish brown median pattern which does not reach the anterior margin (Figure 20, A); dorsal and lateral stripes pale, reddish brown, sometimes absent and replaced by rows of dark dots. Large groups of lateral dots on light, slightly, or markedly dark background ventrally (Figure 20, B). Setae thin, reddish brown or lighter. Of the 3 anterior-margin setae, lateral seta short, light; intermediate seta, long, median seta, shorter, situated some distance from the other 2. Anterior and middle frontal setae short, light, posterior seta long. Setae 7 and 10 large, equally long; seta 9 nearly twice as long as the former 2; seta 11 situated behind seta 9, short, very thin; seta 12 situated behind the eye, thick, long; seta 13 small, light; seta 14, the longest on the head; setae 15 and 16 situated one near the other, further posteriorly, long; seta 16 shorter and thinner than 15; seta 17 thin, light, long. Of ventral setae (Figure 20, B), seta 8 short and thick, seta 18 small, light.



FIGURES 23 and 24. *Agrypnetes crassicornis* McL.:

23 — pronotum; 24 — forelegs: left, anteriorly (A) and right, posteriorly (B).

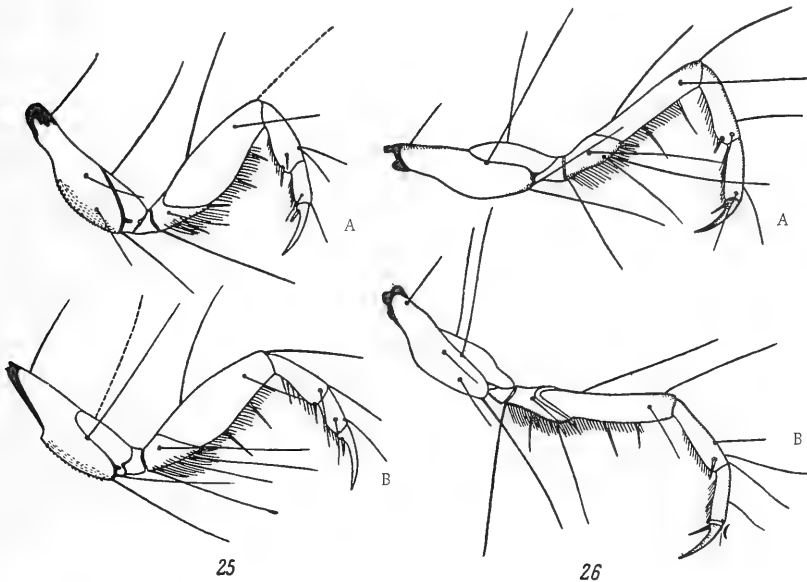
Labrum (Figure 21) with brown dorsal sclerite; dark posterior-angle sclerites reddish brown; setae 1 and 4 light, spiniform, situated near margin of indentation; seta 2 similar, slightly shorter; setae 5 and 3 on outer side of labrum, short, brown; seta 6 similar, situated anterior to median pit.

Mandibles (Figure 22) short, massive, with small, blunt, tubercle-shaped teeth. Dorsal blade of left mandible with 2 teeth in addition to apical tooth; ventral blade with a wide process. Right mandible with a short, median indentation; dorsal and ventral blade each with a similar small tubercle-shaped tooth lateral to the apical tooth.

29 Maxillolabium: setae of submentum situated on small sclerotized dots; stripes light yellow, with reddish brown inner margin; apical seta situated on the sclerite, basal seta on the membrane slightly shorter and lighter than the apical seta.

Pronotum (Figure 23) with narrow, slightly dark anterior margin, broadly dark in the middle in dark specimens; groups of dots in each half, sometimes also near the anterior angle. Large setae thin, very long, of variable length, often asymmetric; usually 2 long setae instead of one near anterior margin.

Meso- and metanotum with 8-10 anterior-angle setae on light whitish yellow sclerotized dots; 2-3 setae longer and thicker than the others.



FIGURES 25 and 26. *Agrypnetes crassicornis* McL.:

25 — midlegs: left, anterior (A), right, posterior (B); 26 — hind legs: left, anterior (A), right, posterior (B).

Prothoracic pleuron dark; mesepimeron and metepimeron whitish yellow, indistinct. Prothoracic sternite small, light; horn short, white.

Legs (Figures 24–26) light, without dots, with less marked chaetotaxy than in the species described above.

The subdorsal of the 2 anterior surface setae of the fore coxa (Figure 24, A), is not as large as in *A. pagetana* and *D. obsoleta*; the anterior of the 2 ventrodorsal setae of the tibia is smaller and thinner than the posterior and is a straight, thick, blunt spine, like the basal spine of the claw. Midleg as in Figure 25. Hind femur (Figure 26) slightly shorter than in the preceding species, with very long dorsal setae; hind coxa with very long ventral setae.

Abdominal segment 7 posteriorly with teat-shaped lateral tubercle near the base of the gill; segment 8 with similar but shorter and wider process.

Tergite of segment 9 (Figure 27) short, wider than in *A. pagetana*, light, without pattern or dots, except for dark sclerotized dots at the base of the setae. Medioanal setae long, reddish brown, margin between them slightly dark; anterior-angle setae long, slightly lighter and thinner than the medioanal setae; intermediate and lateral setae small, light.

Sclerite "b" reddish brown dorsally, with small spines near the posterior margin; a dark transverse plate further distally, with 3 long, thick, dark setae, of which the median and adjacent setae are longer than the lateral; ventral seta of sclerite short, dark brown. Sclerite "c" dark brown, seta spiniform, brown, shorter and thicker than the ventral seta.

Number and arrangement of gills of *A. crassicornis*

Segment	Dorsal	Pleural	Ventral
1			1 1
2	1 1	1 1	1 1
3	1 1	1 1	1 1
4	1 1	1 1	1 1
5	1 1(0)	1 1	1 1
6	1(0) 1(0)	1 1	1 1
7	1(0) 1(0)	1(0) 1	1 1
8	1(0)	1(0)	1(0)

Claw laterally with 3 dorsal denticles at the curvature (Figure 28). Setae 1 and 2 small, thin, situated in basal part; seta 3 long, dorsally situated near curvature of claw; seta 6 large, situated on the outside; setae 7 and 8 short, thin, situated in basal part; setae 5 thin, situated near seta 5; seta 4 small, light, situated near median line.

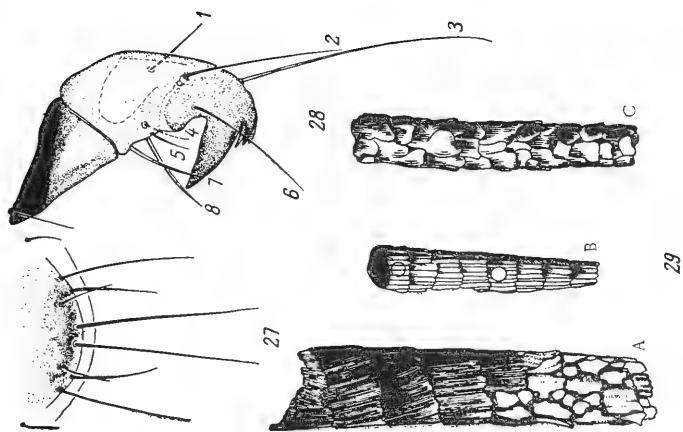
Case made of thick fragments of plants arranged in a spiral or of irregular pieces of lime, arranged smoothly but not always in a spiral; the material consists of pieces of mollusk shells or lime crusts from plants (Figure 29).

**Pupa.** Length 16–20 mm in male pupae, 19–22 mm in female pupae. Antennae reaching segments 6–7 in male pupae, segment 5 in female pupae. Head anteriorly

with a tuberculate process, separated by a deep fold from the anteclypeus. Labrum wide, shorter than in *A. pagetana*; median process blunt, barely visible. Mandibles (Figure 30) curved, with well developed basal tubercle.

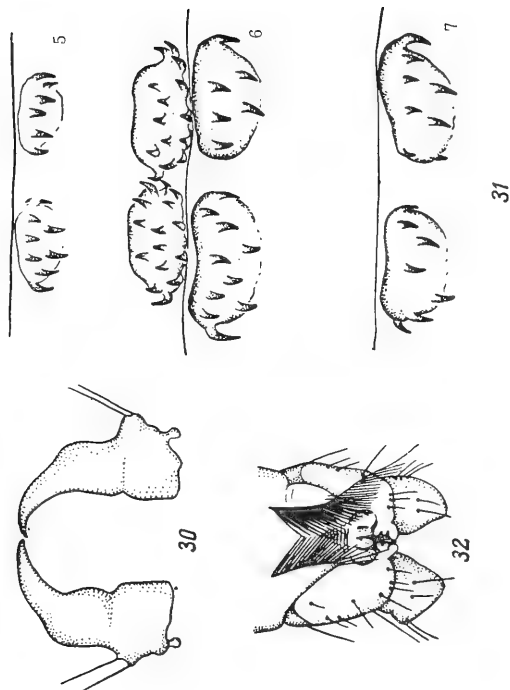
Dorsal process of abdominal segment 1 concave in the middle, with lateral processes. Holding apparatus on segments 5–7 (Figure 31); plates





FIGURES 27-29. *Agrypnetes crassicornis* McL.:

27 — tergite of segment 9; 28 — claw of anal leg; 29 — larval case made of plant and mineral particles (A); fragments of *Chara* (B); or *Fucus* (C). (29 B and C — after Siltala).



FIGURES 30-32. *Agrypnetes crassicornis* McL.:

30 — mandibles, ventral; 31 — plates of holding apparatus of abdominal segments 5-7 of male pupa; 32 — end of body of male pupa, dorsal (30 and 32 — after Siltala).

small on segment 5, large on segments 6–7. Number of spinules: V:6–9+9–21; VI:6–13 (17); VII:5–14. Gills as in the larva. Anal appendages (Figure 32) broadly triangular, with 4 short, dark setae; ventral appendages of male pupae with slightly curved sheaths; penis sheath bifid, shorter than the appendages.

Case as in the larva, but slightly shorter.

Mode of life and habitats. Stagnant water, often brackish; Aral Sea, coast of the Gulf of Finland.

Distribution. USSR: European part, the northern and northwestern areas, southeastern Urals, Transcaucasia, Middle Asia (Aral, Kurgal'dzhino). In addition, Mongolia.

### 3. Genus *Phryganea* Linné

**Full-grown larva.** Length 30–40 mm. Pattern of frontoclypeus in form of a narrow, dark, uniformly wide stripe, dorsal and lateral stripes dark, distinct; ventral pattern absent, but dots sometimes present.

Pronotum with wide, dark stripe near anterior margin; anterior-margin setae include 3 long setae, both lateral setae also long. Fore- and mid-femora with distinct, black, dorsal stripes. Fore tibia wider apically, posterior distoventral seta in form of a short, thick, blunt spine; anterior distoventral seta small.

Case straight, of spirally arranged plant fragments.

**Pupa.** Length to 20–33 mm. Mandibles bent almost at a right angle. Anal appendages short, broadly triangular.

Mode of life and habitats. In vegetation of stagnant and slowly running water, sometimes among detritus on the bottom on the open coast.

Distribution. USSR: European part, Siberia. In addition, Europe, China, Mongolia, Korea, Japan, North America.

## 32 Key to Species

### Full-grown larva

- 1 (2). Head light ventrally, without dots. Pronotum mainly light, with dark transverse stripe in anterior third; dots pale or absent in posterior part. . . . . 1. *Ph. bipunctata* Retz. (p. 35)
- 2 (1). Head ventrally with group of dots, which are not always distinct. Pronotum with dark dots posteriorly. . . . . 2. *Ph. grandis* L. (p. 42)

### Pupa

- 1 (2). Process of frontal sclerite not markedly projecting, slightly tuberculate. . . . . 1. *Ph. bipunctata* Retz. (p. 35)
- 2 (1). Process of frontal sclerite large, markedly projecting, with brown, tuberculate, transverse grooves. . . . . 2. *Ph. grandis* L. (p. 42)

1. *Phryganea bipunctata* Retzius (*Phryganea striata* auctorum)\*

Siltala, 1902:16–19, Figure 3. — Ulmer, 1903:38–39, Figures D, 1, 13, 23, 38, 75, 85, 91, 110, 125. — Thienemann, 1905b: Plate 19, Figures 120. — Siltala, 1904c:13; 1907:427–428, 430, 437–438, Figure 8g. — Ulmer, 1909:240, 302. — Lestage, 1921:580–591, Figure 196. — Lepneva, 1940:208. — Hickin, 1955:55–58, Figures 3, 5, 7.

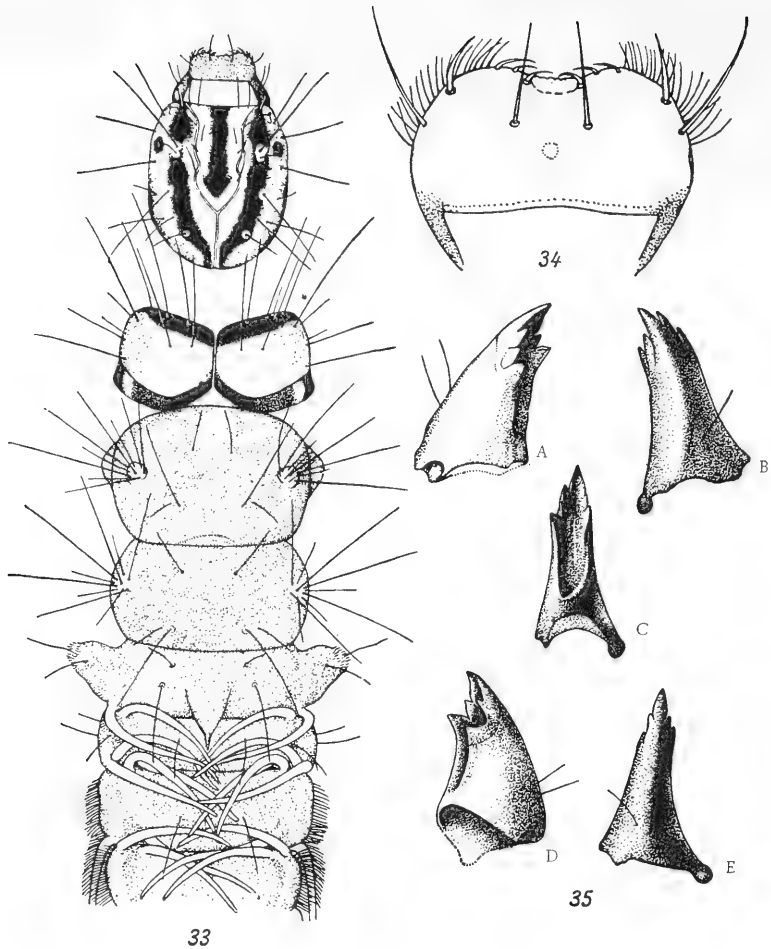
**Full-grown larva.** Length 30–40 mm. Head (Figure 33) oblong, mainly yellow. Frontoclypeus with wide, straight, brownish black median stripe; dots of transverse row in posterior part of sclerite visible only lateral to stripe. Dorsal and lateral stripes brownish black, distinct, the former from anterior margin to occipital foramen, where they almost meet near the coronal suture; dots indistinct on dark background of stripes; dots usually absent ventrally, pale when present. Lateral anterior-margin seta short, light, curved inward; intermediate and median setae much longer, thin, reddish yellow. Anterior-frontal setae light, curved inward; median frontal setae long, near curves of frontal suture; posterior frontal setae slightly longer, like the median setae, situated lateral to transverse row of dots. Seta 9 long, dark brown at the base, slightly thickened; seta 11 short, thin, light, situated behind seta 9; seta 7 situated ventral to antenna, like seta 10, shorter than seta 9; seta 12 large, situated behind eye; setae 14 and 15 dark brown, situated one behind the other in the median-posterior direction from seta 12 in light indentations near margin of dorsal stripe, the longest on head; seta 16 shorter, situated lateral to 15; seta 17 long, situated behind 16 near fork of epicranial suture. Ventral seta 8 brown, situated some distance from anterior margin; seta 18 small, light, setuliform.

Labrum (Figure 34) wide; dorsal sclerite brownish yellow; a whitish tuberculate area behind the deep median depression which is situated asymmetrically, slightly to the right. Seta 1 spiniform, light, small (smaller than in *Agrypnia*); seta 4 large spiniform, situated further posteriorly on each side near margin of median depression; seta 2 situated anteriorly, smaller than 4; seta 5 thick, short, curved inward; seta 3 larger, straight, thin, brownish, situated laterally near the margin; seta 6 the largest on the sclerite, situated on the surface behind the median depression.

Apical tooth of right and left mandibles (Figure 35) displaced slightly ventrally; dorsal blade of left mandible with 3 teeth, a large basal, and small intermediate teeth; ventral blade with 2 teeth, basal tooth large. Dorsal and ventral blades of right mandible with 2 teeth each: one small, the other basal, large, triangular. Outer setae brown; apical-dorsal seta shorter and thinner than the basoventral seta.

Maxillolabium (Figure 36). Mentum indistinct, whitish, both setae large, brown, situated on dark sclerotized dots; sclerites of cardo dark, seta small; stipes yellowish brown, both setae situated on the membrane, apical seta near sclerite, basal seta at a distance, both on sclerotized dots, brown. Palpifer and distal seta dark brown; sclerites of palp segments and galea the same. Mentum short, semicircular, shining blackish brown; rodlike ventral sclerites and sickle-shaped sclerites of palpifer thin, blackish, former with light seta.

\* It appears as *Phryganea striata* Linné in most publications.



FIGURES 33-35. *Phryganea bipunctata* Retz.:

33 — head, thorax and abdominal segments 1-4; 34 — labrum; 35 — mandibles: left mandible, dorsal (A), left mandible, lateral (B), right mandible, inner view (C), right mandible, dorsal (D), right mandible, lateral (E).

Pronotum (Figure 37) with wide, sharply defined, dark stripe in anterior quarter; anterior-margin setae, in addition to median seta, including another 2 setae of similar length, one of them in the middle, the other in the lateral area; long anterior-angle seta situated some distance from anterior margin; both thick lateral setae long, between them a long, thin seta. Medioanal surface seta much longer than median seta.

Prothoracic pleuron oblong-rhomboidal in episternal-epimeral area; seta of epimeron long, brown. Trochantin dark, teat-shaped process yellowish apically, dark elsewhere; seta of trochantin short, brown, setules large, light.

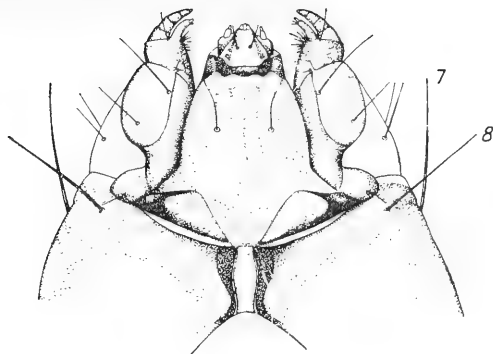
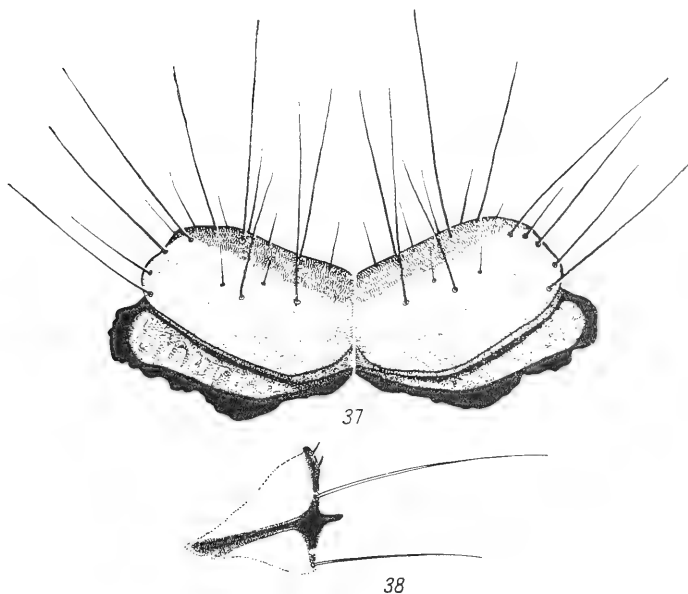


FIGURE 36. *Phryganea bipunctata* Retz. Ventral surface of head (partial) and maxillolabium



FIGURES 37 and 38. *Phryganea bipunctata* Retz.:

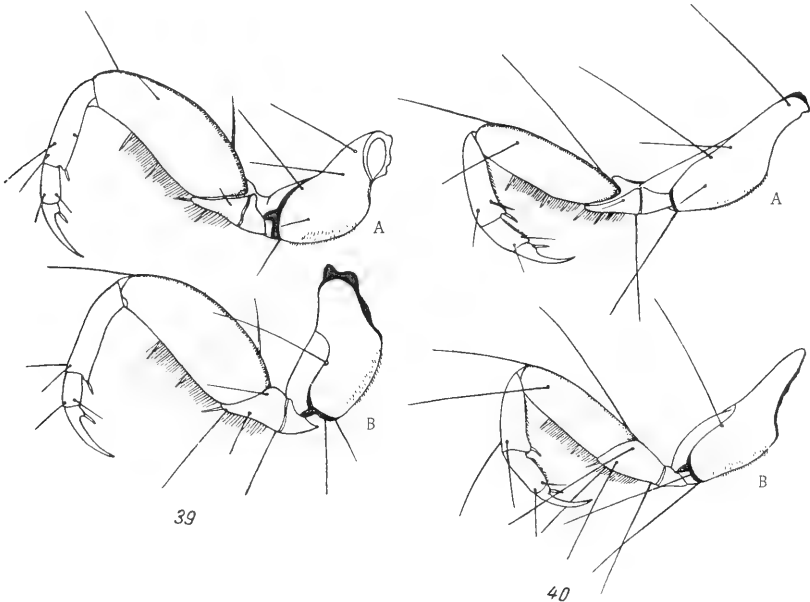
37 — pronotum; 38 — pleuron of mesothorax.

Pleurites of meso- and metathorax dark in epimeral area near suture; seta of trochantin longer than that of epimeron, both on sclerotized dots; setules yellowish, situated near distal margin of trochantin (Figure 38).

Forelegs massive, slightly shorter than midlegs; hind legs much longer; ratio of length of legs 96:100:143. Legs yellowish brown or brown; tibiae and tarsi darker than femora and coxae.

Fore coxa (Figure 39) with dark dorsal stripe anteriorly; dots on anterior surface; ventral and subventral scale-shaped chaetoids smaller than in *A grypnia*. Basal seta long, but shorter than anterior apical-dorsal seta; anterior of 2 long surface setae situated subdorsally, subapical seta short; posterior apical-dorsal seta long, situated near margin of indentation; the posterior apical-ventral seta longer than anterior.

Trochanter with short anterior and more or less long posterior seta; the basal of the 3 anterior ventral setae situated near the suture, apical seta in form of light, thin, pointed spine, middle seta spiniform, hidden among a dense row of light chaetoids; the subapical, posterior, ventral seta long, thick; a thin, shorter seta further basally.



FIGURES 39 and 40. *Phryganea bipunctata* Retz.:

39 — forelegs: right leg, anterior (A), left leg, posterior (B); 40 — midlegs: right leg, anterior (A), left leg, posterior (B).

35

Femur with a wide dark stripe dorsally; basodorsal seta short, thick; apical-dorsal seta thin, of medium length; posterior surface seta the same; anterior surface seta short, subdorsal; both primary ventral setae in form of light, thick spines; a row of uniformly light, feathered chaetoids between the setae and further basally on the ventral margin.

Tibia with 4 long setae distally, dorsally, and subdorsally; posterior apical-ventral seta in form of short spine on a process; anterior seta very small, situated further basally. Tarsus distally on the sides with

2 dorsal and 2 ventral, short, thin setae. Claw large, dark, longer than tarsus, with a blunt basal spine.

Mid-coxa (Figure 40) oblong, less massive than fore coxa; dorsal anterior stripe brownish, less dark than on forelegs, with scale-shaped chaetoids with deeply serrate margins ventrally and subventrally. Basodorsal seta large; anterior and posterior distodorsal setae slightly larger; one of the 2 anterior surface setae long, the second short; both distoventral setae long.

Anterior surface seta of trochanter short, posterior long; both posterior ventral setae and anterior-basoventral seta among the longest on the legs; anterior distoventral seta spiniform, sharp, middle seta the same, situated in a row of light chaetoids.

Femur with dark dorsal stripe, both dorsal setae and posterior seta long, anterior seta shorter, both ventral setae in form of yellowish spines in a row of small spinules.

Tibia distally with long, posterior subdorsal seta; 2 dorsal setae and anterior subdorsal seta shorter and thinner; both ventral setae spiniform: posterior distal and anterior setae situated subapically, the latter longer and thinner; spinules of ventral comb smaller than on femur.

Tarsus shorter than tibia, with a row of minute spinules ventrally, with one, short, thick seta on each side; 2 short, thin setae dorsally, anterior seta smaller than posterior. Claw with thick, blunt spine.

(36)

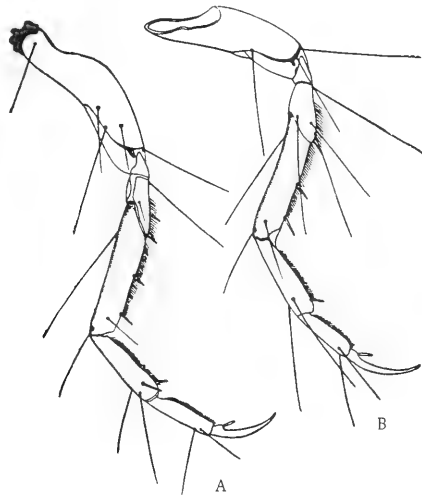


FIGURE 41. *Phryganea bipunctata* Retz.  
Hind legs: right leg, anterior (A), left leg,  
posterior (B)

Hind coxa (Figure 41) long, slightly dark dorsally on anterior side. Setae of coxa and trochanter as on midlegs.

Femur long, straight, rodlike, with nearly parallel dorsal and ventral sides, slightly dark dorsally; setae as on midlegs.

Tibia, straight, thin, with a ventral comb of spinules; anterior distal setae (dorsal and subdorsal) smaller than posterior setae, which are very long; anterior ventral seta situated subapically in form of a sharper and longer spine than the smaller posterior seta.

Tarsus long, almost as long as tibia; all 4 setae situated apically and subapically, both posterior setae longer than anterior setae, which are short and thin. Claw long, with thin, basal spine.

Abdominal segment 1 with high, conical, pointed dorsal process; blunt, lateral processes wide, apical spinules numerous, thick, dark. Lateral line on segments 3-8 with thin, dark, dense spinules which are longer in the posterior part of the segments.

Anterior-angle seta of each segment dark in middle; medioanal seta large, dark, longer on posterior segments, on segment 8 long, thicker, resembling this seta on segment 9 but slightly smaller; intermediate and lateral setae small, thin.

Gills on segments 1-8.

Tergite of abdominal segment 9 (Figure 42) yellowish brown, darker near anterior margin, with indistinct dots posteriorly and laterally. Medioanal seta long, thick; lateral seta longer; intermediate and anterior-angle setae light, thin, the latter anterior to the former; a yellowish anterior-angle seta on each side.

Sclerite "b" of anal legs brown or reddish brown, without dots; reddish brown dots near base of thick setae; 2 apical-dorsal setae thin, brown, of the same length; further laterally a dark but shorter seta; a short, thin seta situated closer to the median line and slightly anterior to the thick setae; ventral seta short, dark. Sclerite "c" brown, with wide, brown, outer margin; seta strong, dark brown.

Number and arrangement of gills of *Ph. bipunctata*

Segment	Dorsal	Pleural		Ventral
1				
2	1	1	1	1 1
3	1	1	1	1 1
4	1	1	1	1 1
5	1	1	1	1 1
6	1	1	1	1 1
7	1	1	1	1 1
8	1	1	0	1 0

Claw of anal legs dark brown at the end, with 2 large dorsal and one small median denticle at the curvature (Figure 42). Seta 1 short, situated dorsally in basal part; seta 2 long, situated outward near apex of



bar; seta 3 strong, situated more distally, median dorsal; seta 6 strong, situated further laterally; setae 7 and 8 situated ventrally, one behind the other, in basal part, straight, light; seta 5 situated lateral to 8, 4 further inward, 4 and 5 small, thin.

Case in form of a straight open tube, slightly narrower posteriorly, made of spirally arranged, symmetrical, quadrangular pieces of plants (see Vol. II, Part 1, Figure 98).

37

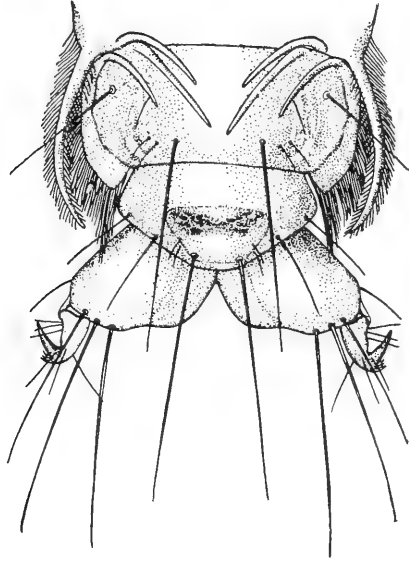
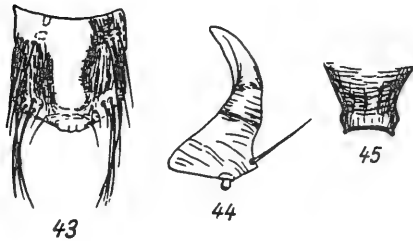


FIGURE 42. *Phryganea bipunctata* Retz.  
Posterior abdominal segments: segment 7, in part  
8, 9 and anal legs, dorsal



FIGURES 43-45. *Phryganea bipunctata*  
Retz. Pupa (after Siltala):

43 — anteclypeus and labrum; 44 — right mandible, dorsal; 45 — dorsal process of abdominal segment 1.

**Pupa.** Length 20–28 mm. Antennae reaching abdominal segment 7–8 in male pupae, segment 5 in female. Frontal sclerite convex, overhanging labrum but not as markedly as in *Ph. grandis*. Labrum (Figure 43) and anteclypeus uniformly wide, concave laterally; anterior margin with indistinct, blunt, rounded process with a small thin seta on each side; 5 dark long setae at some distance; median seta of anteclypeus long, outer seta short, intermediate seta of medium length. Mandibles (Figure 44) sickle-shaped, with rugose surface on curvature; basal setae short, situated on a small tubercle.

Dorsal process of abdominal segment 1 with sharp, angular processes on each side of apex (Figure 45). Lateral line with black setae, small and sparse on segment 3, dense and large further posteriorly, especially on segments 6 and 7, reaching ventral side on segment 8. Segment 1 without gills; gills of segments 2–8 as in the larva. Usual number of spinules on holding apparatus: III:0–1; IV:3–4; V:6–7+11–21; VI:7–8; VII:8–11; VIII:2–5.

Anal appendages with 4 short, thin setae near posterior margin.

Case attached among vegetation, anterior and posterior ends covered by tangled stalks and pieces of plants; tube with sievelike anterior and posterior closing membrane inside.

Mode of life and habitats. Stagnant and slowly running waters, in the vegetation zone, among plants and on the bottom.

Distribution. USSR: European part, Siberia, western part of Amur Region. In addition, Central and Northern Europe, Mongolia.

## 2. *Phryganea grandis* Linné

Réaumur, 1737:177, tab. XIV, fig. 1–4. — Rösely, Rosenhof, 1746–1749: 74–76, tab. XVII. — Kolenati, 1848:85. — Zaddach, 1854:62. — Walser, 1864: 65–66. — Hagen, 1864:240. — Meyer, 1867:167. — Packard, 1870:617, Fig. 606. — Preudhomme de Borre, 1870–1871:67. — Hagen, 1873:435–438. — Kolbe, 1888:295–299. — Wallengren, 1891:22. — Siltala, 1902:11–16, Fig. 2. — Ulmer, 1903:39. — Siltala, 1904a:147–148; 1904c:12. — Thienemann, 1905b: 518. — Ulmer, 1909:239, 302, Fig. 363b, 442. — Lestage, 1921:580, fig. 196, 200, 201. — Lepneva, 1940:208. — Hickin, 1942:134–137, Figures 1–9. — Tomaszewski, 1962:338, Figure 1.

**Full-grown larva.** Length 30–40 mm (Figure 46). Resembling *Ph. bipunctata* in form of body pattern and chaetotaxy, differing in minor structural details and coloration.

Head light yellow, with narrow, distinct reddish brown stripes. Median stripe of frontoclypeus not narrower anteriorly as in *Ph. bipunctata*, but wider than dorsal stripes and less dark. As in *Ph. bipunctata*, a large, bright spot at eye level near seta 9 on the dark dorsal stripes. A small spot behind the large spot. Seta 11 thin, light, situated near the small spot; setae 14 and 15 situated lateral to dorsal stripe, close to its margin in bright indentations; seta 17 thin, long, on light dot in posterior part of stripe. Lateral and dorsal stripes distinct. Sclerites on ventral side with dark margin lateral to gula and at margin of occipital foramen; groups of reddish brown dots, sometimes indistinct, in each half.

Light tuberculate area of median indentation of labrum larger than in *Ph. bipunctata*. Dorsal and ventral blades of right mandible with 2 teeth.

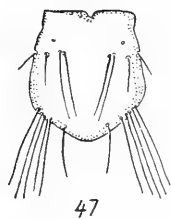
Pronotum with dark, sharply defined transverse stripe near anterior margin, as in *Ph. bipunctata*; surface slightly dark along median suture, each half with groups of small reddish brown dots in the middle.

Fore femur dorsally with sharp dark stripe, as in *Ph. bipunctata*; stripe less distinct on mid- and hind femora and tibia.

Abdominal segment 8 usually without dorsal anterior-margin gills, in contrast to *Ph. bipunctata*. Sclerite of abdominal segment 9 light yellow, with a brown stripe with reddish brown dots near anterior margin.



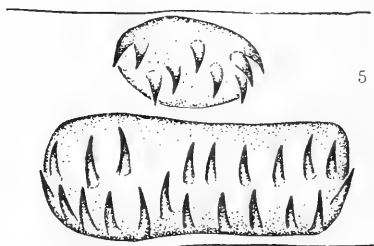
FIGURE 46:  
*Phryganea*  
*grandis* L.  
Larva case



47



A



5



VI

B

48

FIGURES 47 and 48. *Phryganea grandis* L. Pupa:

47 — anteclypeus and labrum; 48 — details of abdomen: dorsal process of segment 1 (A), spinules of holding apparatus of segments 5 and 6 (B). (47 and 48 A — after Siltala, 48 B — after Tomaszewski).

Case (Figure 46) in form of straight, wide tube with pieces of plants arranged in a spiral, slightly narrower posteriorly; spiral with 7–9 coils.

**Pupa.** Length 26–33 mm. Antennae reaching segments 7–8 in male pupae, segments 6–7 in female. Frontal sclerite forming a tuberculate, folded process curving over base of clypeus. Labrum and clypeus slightly narrower posteriorly (Figure 47). Dorsal process of abdominal segment 1 of slightly different form from that of *Ph. bipunctata* (Figure 48, A). Dorsal gills of abdominal segment 8 absent; spinules of holding apparatus more numerous than in *Ph. bipunctata* (Figure 48, B), usual numbers:

III:3-5; IV:6-8; V:6-11+15-25; VI:9-13; VII:10-16; VIII:5-13.

Anal appendages slightly wider; ventral processes of male genitalia larger at the base than in *Ph. bipunctata*.

Case 50-60 mm long, sometimes only 30-35 mm, and with only 5-6 coils in spiral; pupa sometimes situated in a reed fragment (Siltala, 1904a: 147-148).

Mode of life and habitats. Stagnant waters among vegetation. Recorded from freshened part of the Gulf of Finland.

Distribution. USSR: European part. In addition, Europe.

39

#### 4. Genus *Dasystegia* Wallengren

**Full-grown larva.** Length 22-27 mm. Pattern of frontoclypeus forming a straight, narrow, dark stripe, as in *Phryganea*. Head ventrally with dark stripes and spots.

Mode of life and habitats. Among vegetation or on the bottom.

Distribution. USSR: European part, Transcaucasia, Siberia. In addition, Europe, Iran, Mongolia, China, Japan, North America.

#### Key to Species

##### Full-grown larva

- 1 (2). Head ventrally with short dark parallel lateral stripes . . . . . 1. *D. obsoleta* Hag. (p. 44)  
2 (1). Head ventrally with a large dark spot on each side . . . . . 2. *D. varia* Fabr. (p. 47)

##### Pupa

- 1 (2). Abdominal segments 6-8 with a dorsal row of gills . . . . . 1. *D. obsoleta* Hag. (p. 44)  
2 (1). Dorsal row of gills on abdominal segments 6-8 absent . . . . . 2. *D. varia* Fabr. (p. 47)

#### 1. *Dasystegia obsoleta* Hagen\*

Siltala, 1902:19-22, Figure 4. - Ulmer, 1903:39, Figure 47. - Siltala, 1904c:15; 1907:428, 430. - Ulmer, 1909:239, 303, Figure 443b. - Lestage, 1921:591. - Lepneva, 1940:208. - Hickin, 1955:55-58, Figures 1, 2, 4, 6.

**Full-grown larva.** Length 24-27 mm. Resembling *A. pagetana* in form of body (Figure 49), coloration of sclerites, and other characters. Head with characteristic pattern. Median pattern of frontoclypeus in form of straight, narrow, clearly defined dark stripe, crossed by a curved row of dots. Dorsal stripes of head (Figure 49) narrow, distinct, with

\* See Fischer, 1964. Trichopteronum Catalogus, V:26-34. It appears in the literature as *Phryganea obsoleta* Hag., *Prophryganea obsoleta* Hag., *Agrypnia obsoleta* Hag.

small, dark, indistinct dots; lateral stripes the same. Ventral side, anterior area on each side with a wide short dark stripe, continued posteriorly as a group of dark dots (Figure 50).

Number and arrangement of gills of *D. obsoleta*

Segment	Dorsal	Pleural	Ventral
1	1		1 1
2	1 1	1 1	1 1
3	1 1	1 1	1 1
4	1 1	1 1	1 1
5	1 1	1 1	1 1
6	1 1	1 1	1 1
7	1 1	1 1	1 1
8	1 0	1 0	1 (0) 0

Labrum (Figure 51) as in *A. pagetana*. Dorsal blade of left mandible (Figure 52, A) with 3 teeth in addition to terminal tooth, 2 large and one small blunt tooth between them; dorsal blade of right mandible (Figure 52, B) with one tooth, ventral blade with 2 teeth, one smaller, blunt, apical, and one larger basal tooth.

A dark transverse stripe in anterior third of pronotum (Figure 53) with sharply defined posterior margin, in contrast to *A. pagetana* and *A. picta*; dark dots near margin in posterior part; blackish brown median spots near base of suture.

Legs as in Figures 54, 55, 56; chaetotaxy resembling that in *A. pagetana*.

Gills on segments 1-8.

40 Tergite of segment 9 (Figure 57) slightly dark near anterior margin, with large dots.

Anal legs and chaetotaxy as in *A. pagetana*.

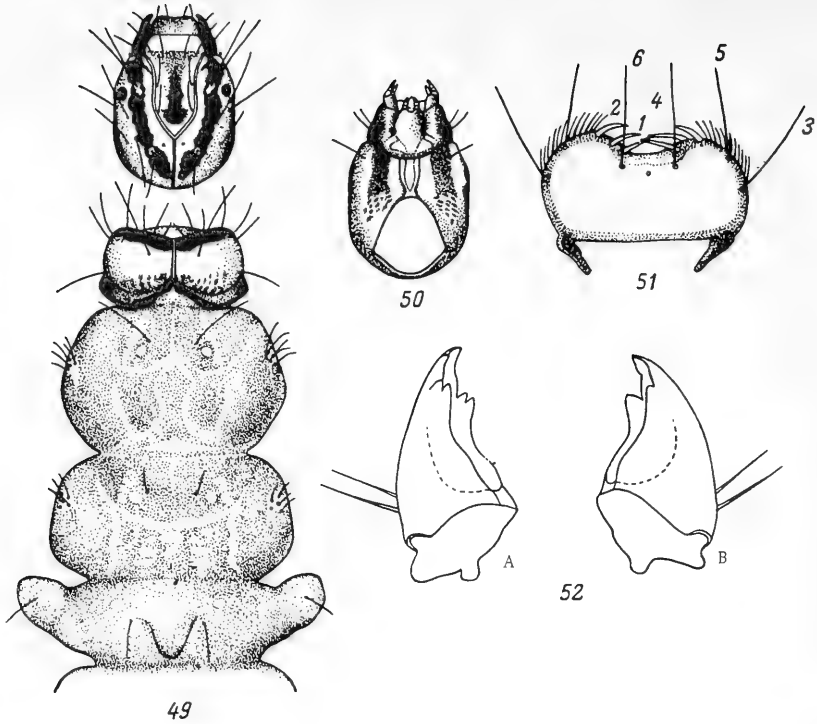
41 Case (Figure 58) 35 mm long, usually made of narrow plant particles arranged in 9-10 turns of spiral.

**Pupa.** Length 14-15 mm. Mandibles slightly curved as in *A. pagetana*; tubercle near setae higher. Gills present on segments 2-7, as in the larva, segment 8 with only dorsal and pleural anterior-margin gills, but no ventral gills. Number of spinules of holding apparatus: IV:0-7; V:5-10+9-18; VI:7-13; VII:6-11.

Anal appendages rounded posteriorly, ventral processes large (Figure 59), penis sheath short.

Case 25-30 mm or to 45 mm; anterior and posterior ends closed by sievelike membranes with numerous holes.

(40)



FIGURES 49-52. *Dasytastia obsoleta* Hag.:

49 - head, thorax and abdominal segment 1, dorsal; 50 - head, ventral; 51 - labrum; 52 - mandibles: dorsal, left (A) and right (B).

(40)

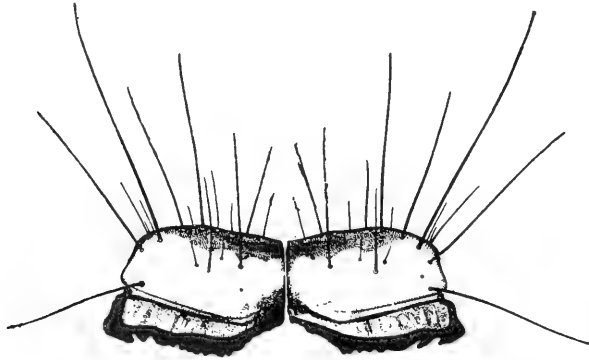
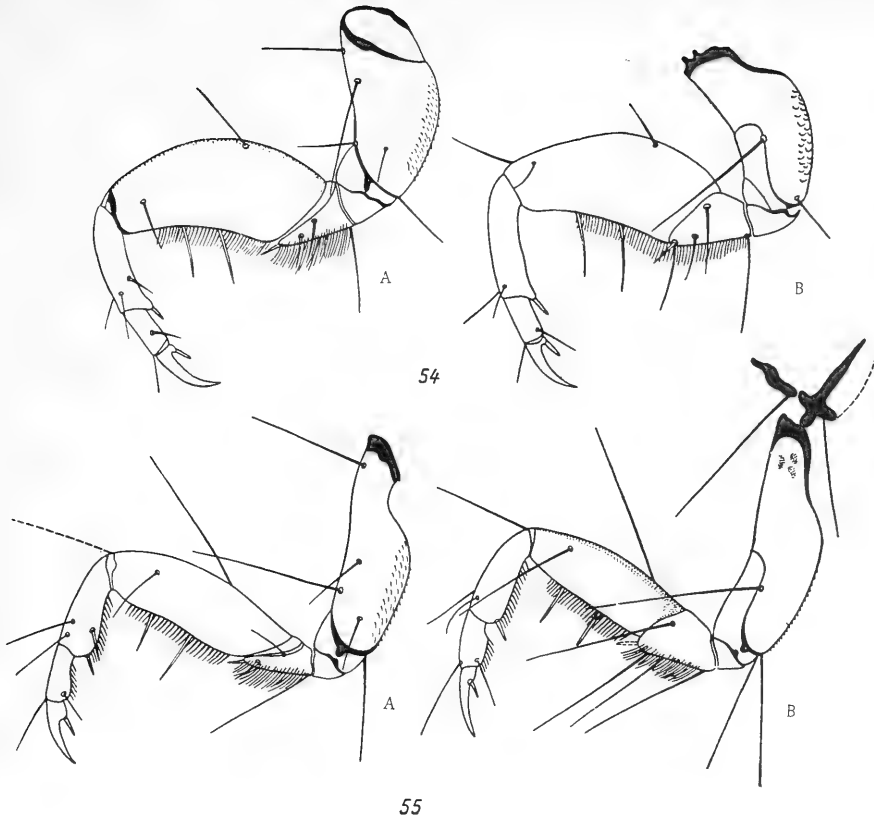


FIGURE 53. *Dasytastia obsoleta* Hag. Pronotum

Mode of life and habitats. Small, overgrown, stagnant water bodies and in the vegetation of lakes.

Distribution. USSR: European part, Siberia. In addition, Northern and Central Europe, Mongolia (Kosogol), North America (Canada).



FIGURES 54 and 55. *Dasystegia obsoleta* Hag.:

54 — forelegs: right, anterior (A), left, posterior (B); 55 — midlegs: right, anterior (A), left, posterior (B).

## 2. *Dasystegia varia* Fabricius \*

Siltala, 1903a:7-8, Figure 2; 1904c:13-15, Figure 3. — Ulmer, 1909:239, 303. — Lestage, 1921:591. — Lepneva, 1940:208. — Hickin, 1953:39-40, Figures 1-4.

42

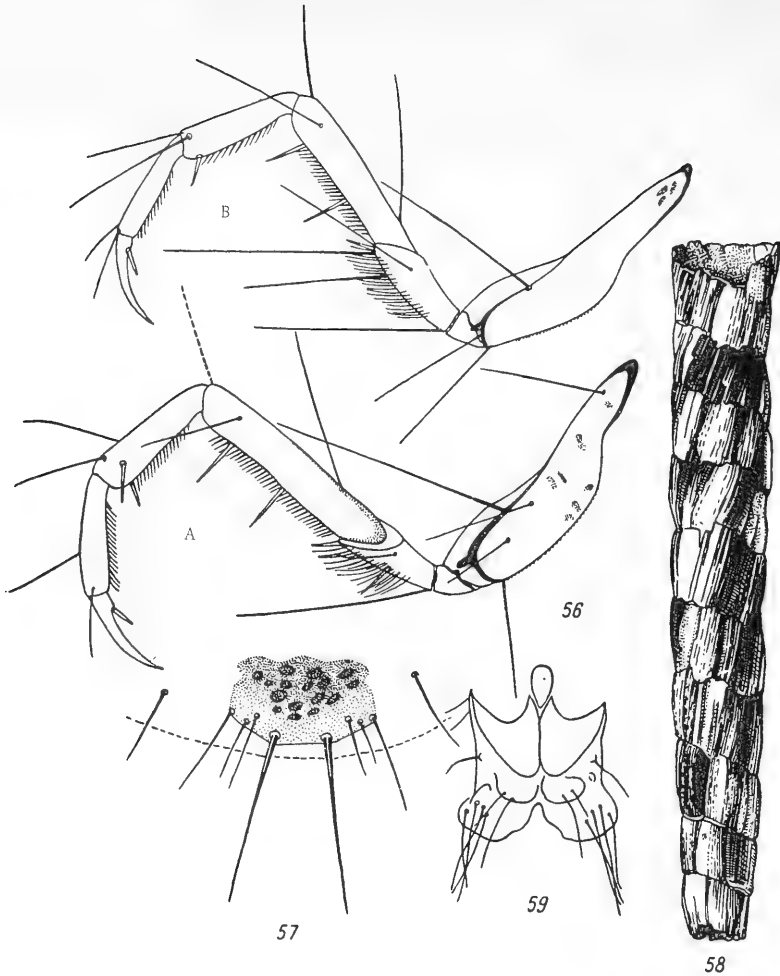
**Full-grown larva.** Length 22-25 mm (Figure 60). Pattern on dorsal surface of head as in *D. obsoleta* (Figure 61, A), ventrally on each side with one, large, dark spot and dark dots behind it (Figure 61, B). Dorsal and ventral blades of right mandible with a large tooth and a small denticle.

Pronotum with narrow, sharply defined, dark stripe near anterior margin, with brownish dots on each side of the tergite posteriorly.

Gills on segment 8 absent. Large, dark dots near anterior margin of tergite of segment 9.

Case (Figure 60) 25-50 mm long, made of small pieces of plants arranged in 7-9 turns of spiral.

\* The species appears in the literature as *Phryganea varia*, *Prophryganea varia*, *Agrypnia varia*.



FIGURES 56-59. *Dasytorgia obsoleta* Hag.:

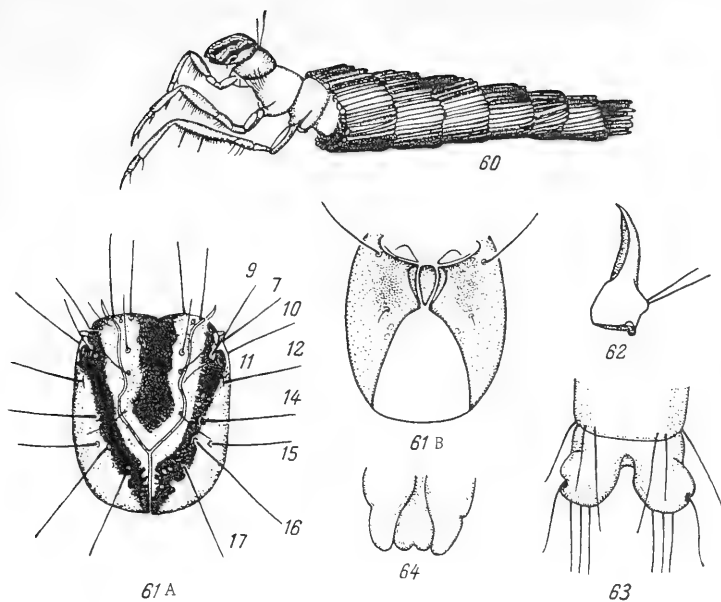
56 - hind legs: right, anterior (A), left, posterior (B); 57 - tergite of abdominal segment 9; 58 - case of larvae; 59 - posterior end of male pupa, ventral (59 - after Siltala).

43

**Pupa.** Length 16-21 mm. Mandibles (Figure 62) as in *D. obsoleta*. Holding apparatus on abdominal segments 4-7 or 5-7; plate of segment 4 small, if present. Number of spinules: IV:1-0; V:3-10+8-13; VI:5-11; VII:5-12. Dorsal gills present on segments 2-4, pleural and ventral gills on segments 2-7. Anal appendages (Figure 63) as in *D. obsoleta*, short, rounded posteriorly; penis sheath reaching posterior margin of ventral appendages (Figure 64).

Case as in the larva.





FIGURES 60-64. *Dasytorgia varia* Fabr.:

60 - larva in case, lateral; 61 - head, dorsal (A) and ventral (B);  
 62 - right mandible of pupa, dorsal; 63 - posterior end of male pupa,  
 dorsal; 64 - ventral appendages and penis sheath of male pupa (60  
 and 61 A - after Hickin, with modifications; 62-64 - after Siltala).

Number and arrangement of gills of *D. varia*

Segment	Dorsal		Pleural		Ventral	
1					1	1
2	1	1	1	1	1	1
3	1	1	1	1	1	1
4	1(0)	1	1	1	1	1
5	1(0)	1(0)	1	1	1	1
6	1(0)	0	1	1	1	1
7	1(0)	0	1(0)	1	1	1(0)

Mode of life and habitats. Small, overgrown, stagnant water bodies.

Distribution. The European USSR. In addition, Europe.

5. Genus *Oligotricha* Rambur (*Neuronia* Stephens)

44 **Full-grown larva.** Length 20–24 mm. Frontoclypeus with or without dark median pattern; dorsal stripes near coronal suture not close together. Two wide, dark stripes on pronotum and the membranous parts of mesothorax, metathorax, and abdominal segment 1; they continue in some specimens on the following abdominal segments. Gills present on segments 1–8. Claw of anal legs with 3 large dorsal denticles.

Case straight, smooth, made of symmetrical fragments of plants arranged in 6–8 forms of spiral.

**Pupa.** Length 15–18 mm. Frontal sclerite slightly convex anteriorly. Mandibles with short, blunt apex; basal tubercle large, with 2 long setae. Dorsal process of abdominal segment 1 with rounded apex. Anal appendages irregularly rhomboidal, with 4 thick, relatively long setae; ventral appendages of male short, rounded posteriorly.

Case 30–40 mm long, with about 10 turns of spiral.

Mode of life and habitats. Stagnant and slowly running water, small ponds, puddles, peat deposits, and draining ditches.

Distribution. USSR: European part, northern, western, and central areas, Siberia, the Far East. In addition, Northern and Central Europe, North China, North America.

Key to Species

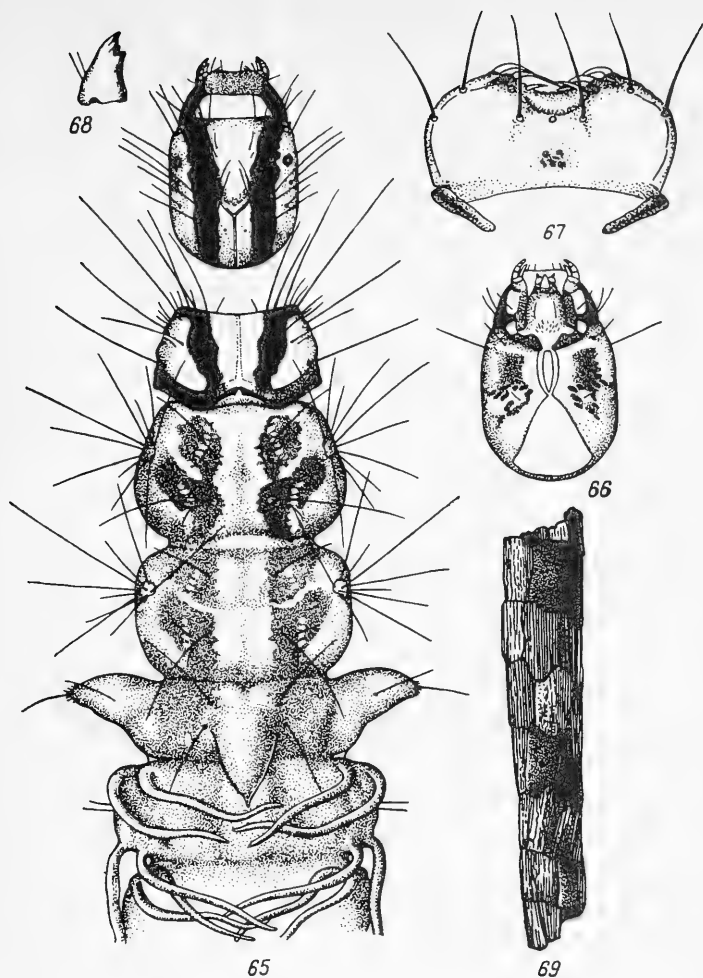
Full-grown larva

- 1 (2). Frontoclypeus mainly light, without dark, median pattern . . . . . 1. *O. striata* L. (p. 50)
- 2 (1). Frontoclypeus with dark, posteriorly wider median pattern . . . . . 2. *O. lapponica* Hag. (p. 54)

1. *Oligotricha striata* Linné (*Neuronia ruficrus* Scopoli)

Klapálek, 1893:5–8, Figure 1. — Struck, 1903:121, Plate I, Figure 4. — Ulmer, 1903:41; 1903b:189–191, Figures 14–18. — Siltala, 1904c:5–6. — Ulmer, 1909:238, 303, Figure 443a. — Lestage, 1921:572–579, Figure 192 a, d, e, j, g, i. — Lepneva, 1940:208. — Hickin, 1944:9–12, Figures 1–9.

**Full-grown larva.** Length 20–22 mm. Sclerotized areas mainly light golden yellow; pattern distinct, brownish. Head (Figure 65) slightly oblong. Frontoclypeus without pattern; anterior-angle areas slightly dark. Dorsal stripes straight, wide, extending from anterior margin of head to occipital foramen, at first close to frontal sutures, but in area of fork and further posteriorly more distant from the suture, leaving a light area on each side of the coronal suture. Lateral stripes narrow, slightly dark, with dense, large dots which do not reach the occipital foramen. A dark, wide stripe ventrally in each half; a transverse row of 3 large, dark dots on the band, a group of small dots posteriorly (Figure 66).



FIGURES 65-69. *Oligotricha striata* L.:

65 - head, thorax and abdominal segments 1-3, dorsal; 66 - head, ventral;  
67 - labrum; 68 - left mandible, dorsal; 69 - larval case.

Outer, anterior-margin seta of frontoclypeus short, light; intermediate and median setae thin, brown, much longer. Frontal setae brown, thin, anterior and middle setae short, posterior setae much smaller. Seta 9 situated on light base near outer margin of dorsal stripe, long, black; seta 11 situated further posteriorly, short, thin; seta 7 thinner and smaller than 10, which is short, thick, black; seta 12 situated behind the eye on light background, and directed anteriorly; seta 14 the longest on the head, situated close to margin of dorsal stripe; seta 13 small, situated between 12 and 14; setae 5 and 6 situated close to outer margin of dorsal stripe, seta 15 longer; seta 17 thin, long, almost as long as seta 15. Ventral side: (Figure 66) seta 8 short, seta 18 small, curved inward, in a group of large dots.

Labrum (Figure 67) as in *Semblis* with a golden brown dorsal sclerite without dots. Setae 1, 2, and 4 light, spiniform; seta 1 situated close to

margin of median indentation; seta 2 in form of small blunt spine; seta 4 thin, curved, close to median indentation; setae of opposite sides crossing each other at the end; setae 3, 5, and 6 thick, dark brown, seta 6 larger than the others.

Left mandible (Figure 68) with 3 teeth on dorsal blade and 2 teeth on ventral blade; right mandible with 2 teeth on each blade; outer setae relatively long, distodorsal seta situated close to apex of basal depression, ventrobasal seta on the ventral ridge.

Maxillolabium (Figure 66): sclerites of cardo yellowish with chestnut brown, narrow margin; seta small. Submentum indistinct, whitish, thin, setae thick, blackish, on dark sclerotized dots. Stipes light brown; apical seta situated near margin, larger than basal seta, which is situated on a sclerotized dot on the membrane. Palpifer, galea, and segments of maxillary palp with yellowish brown sclerites; distal seta of palpifer situated on the membrane anterior to the sclerite; basal seta small, median and short; close to the base, palp short. Submentum dark reddish brown; ventral sclerites, sclerites of palpiger and labial palps chestnut brown; seta of ventral sclerite small, dark.

46 Pronotum (Figure 65) mainly yellow, with chestnut brown posterior margin; each half of tergite with an oblique dark stripe; narrow brown margin near base of median suture; distinct dots on the stripes, lateral to the stripe and in the posterior part. A dark, very long seta near anterior margin; one short and one longer, thin seta in the middle, 2 short, light setae laterally; anterior-angle seta black, long, 2 small thin setae lateral to it; the posterior of the 2 dark, lateral setae long, the anterior slightly shorter; 2 large setae in the anterior half — one long, thick, close to inner margin of dark stripe, the other slightly shorter, near outer margin of stripe; one, small, thin seta on each side near the latter seta.

Meso- and metathorax with a wide dark longitudinal dorsal stripe as on the prothorax, but stripe crossed by the narrow, light, respiratory line; a row of small, light dots along dorsal stripe of meso- and metathorax, slightly oblique in the anterior part, straight in the posterior part. A short anterior-margin seta situated close to median margin on the dark stripes in the anterior part; dark medioanal seta long, situated in posterior part; intermediate and lateral seta small; anterior-angle setae in groups of 9–10 on round, yellowish sclerites, most of the setae long.

Epimeron of meso- and metathorax chestnut brown, with dark dots at the base.

Prothoracic sternite brownish, lighter in middle, with dark chestnut-brown lines laterally.

Legs dark brown, without pattern, as in *Agrypnia* and *Phryganea*, with some differences in chaetotaxy. Coxae with very small ventral and subventral covering spinules. Claws thin, sharp.

Fore coxa slightly oblong. Ventral and apical setae of fore trochanter spiniform, moderately long, resembling the primary, ventral setae of the femur, but slightly darker, basal seta of trochanter longer and thinner. Light spiniform ventral setae of femur relatively large, of the same length, light yellow, several times as long as the spinules at their base. Tibia wider distally, with large distoventral process which slightly resembles that of *Molanna*; the posterior of the 2 distoventral setae of the tibia situated on the process in form of a short, thick, blunt spine, the anterior situated subapically, thin, light, sharp, spiniform.

Number and arrangement of gills of *O. striata*

Segment	Dorsal		Pleural		Ventral
1					1 1
2		1	1		1 1
3		1	1		1 1
4		1	1		1 1
5		1	1		1 1
6		1	1		1 1
7		1	1		1 1(0)
8		1	1		

47 Ventral spiniform setae of mid- and hind femora thick, apical setae shorter, darker, and thinner than basal setae. Subapical anterior distoventral seta in form of thick, reddish brown spine, like the posterior apical ventral seta, but slightly longer and thinner; both apical ventral setae of hind tibia thick, spiniform, dark brown, situated closer to each other than on the midlegs.

Dorsal process of abdominal segment 1 long, pointed (Figure 65); a dark, longitudinal stripe between the median and lateral processes, wider but less distinct than on the thoracic tergites; small anterior-margin seta and large medioanal setae situated in the middle on the dark stripe; anterior-angle seta situated on the lateral process, which has a crown of small, light, spiniform chaetoids, and a large lateral seta. The dark parallel lines are also distinct on the abdominal tergites in well marked specimens, so that there are 2 wide, dark parallel stripes from the dorsal stripes of the head to the posterior margin of segment 8, as described by Miall (1895). The stripes are distinct in lighter larvae in anterior part of body, indistinct or absent posteriorly.

Tergite of abdominal segment 9 small, chestnut brown, darker in middle, surrounded by wide, light stripe; medioanal seta black, long, almost twice as long as the segment, lateral seta moderately long, dark; intermediate seta and anterior-margin seta short, light; anterior-angle seta situated near 47 sclerite, short, thick, dark, smaller than lateral seta.

Sclerite "b" of anal legs brownish at the base, with dark reddish brown marginal stripe near the dorsal setae apically; setae dark, situated on the membrane, on large dark sclerotized dots; mediodistal seta short, thin, ventral seta shorter, thick. Sclerite "c" yellow, with brownish outer stripe; seta short, dark.

Claw with 3 large, dorsal denticles in a row; middle denticle smaller; seta 1 short, dark; seta 2 long, situated near dorsal margin of bar; seta 3 dark brown, long, the longest on the claw; seta 6 thick, situated on outer side; ventral setae 7 and 8 relatively large, light, straight; seta 5 situated near 8, small, light, in form of thin spine; seta 4 similar but slightly smaller.

Case made of pieces of plants arranged in 7–8 turns of spiral (Figure 69).

**Pupa.** Length 14–18 mm. Frontal sclerite swollen at base, with wide, brown stripe in old pupae. Antennae with short scape, filiform, reaching abdominal segment 6 in male pupae. All 6 setae of labrum situated near anterior margin, thick, black, of about the same length. Apex of mandibles blunt, short; outer setae relatively large, thick, situated near tubercle. Natatorial setae on mid-tarsi less dense than usual, sparse on fore and hind tarsi. Dorsal process of abdominal segment 1 large, with slightly concave apex. Setae of lateral line dense, dark, especially long on segment 8. Gills on segments 2–8; a dorsal and a ventral gill near anterior margin of segment 8. Holding apparatus on segments 3–7; number of spinules: III:4–6; IV:4–5; V:4–5+6; VI:5–7; VII:4–6.

Anal appendages pointed posteriorly, with 4 long, black, thick setae. Sheath of ventral appendages of male genitalia forming wide blunt processes; penis sheath short.

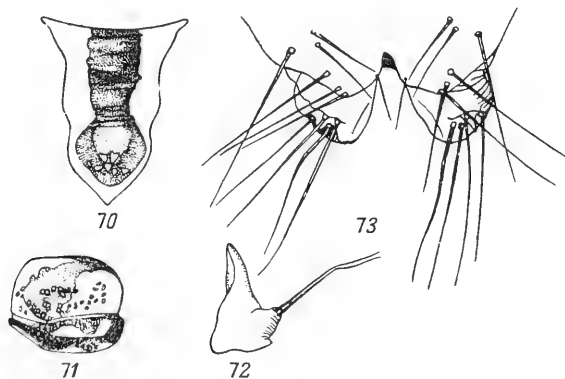
Pupal case to 24 mm long, among littoral vegetation.

**Mode of life and habitats.** Stagnant and slowly running water, usually swampy, with brown peaty water; often in peat deposits and draining ditches.

**Distribution.** Northern, central, and western territories of the European USSR. In addition, Northern and Central Europe.

## 2. *Oligotricha lapponica* Hagen (*Neuronia lapponica* Hag.)

Siltala, 1905:5–9, Figure 1. — Lestage, 1921:572–579, Figure 192c.



FIGURES 70–73. *Oligotricha lapponica* Hagen (after Siltala):

70 — frontoclypeus; 71 — pronotum; 72 — left mandible of pupa, ventral; 73 — anal lobes of female pupa, ventral.

**Full-grown larva.** Length to 24 mm. Sclerotized areas mainly yellow. Frontoclypeus (Figure 70) with dark brown median pattern, wider posteriorly, almost adjoining frontal sutures, with a transverse row of light dots posteriorly. Dorsal stripes wide, with dark dots posteriorly; dark spots and dots ventrally. Labrum and mandibles as in *O. striata*.

Number and arrangement of gills of *O. lapponica*

Segment	Dorsal	Pleural		Ventral
1				1 1
2	1 1	1	1	1 1
3	1 1	1	1	1 1
4	1 1	1	1	1 1
5	1 1(0)	1	1	1 1
6	1 0	1	1	1 1
7	1(0) 0	1	1	1 1
8		1		

Pronotum (Figure 71), as in *O. striata*, with wide, dark oblique stripe, which is wider in the middle and with dark dots; large groups of dark dots lateral to the stripes, 2-3 dots in the middle.

Mesonotum, metanotum, and abdominal segment 1 with 2 parallel, longitudinal, wide stripes which, together with the bands of pronotum and the dorsal bands of the head, form a pattern characteristic for the genus. Legs as in *O. striata*.

Gills on segments 1-8.

Postsegmental, pleural gill of segment 2 covered with fine hairs, in contrast to *O. striata*.

Claw of anal legs with 3 dorsal denticles.

Case made of spirally arranged fragments of plants.

**Pupa.** Length about 20 mm. Antennae reaching end of abdominal segment 4. Frontal process and labrum as in *O. striata*. Mandibles with short, blunt apex, outer tubercle long, both setae long (Figure 72).

Dorsal process of abdominal segment 1 as in *O. striata*, with straight or concave posterior margin. Spinules of holding apparatus: III: 3-6; IV: 3-8; V: 5-8+5-13; VI: 5-8; VII: 3-8. Gills on segments 2-8.

Anal appendages (Figure 73) short, 4 terminal setae black, almost of the same length.

Case usually 20-40 mm long, its anterior end covered by interwoven plants.

Mode of life and habitats. Stagnant and slowly running, small water bodies, usually swampy.

Distribution. North and northwestern areas of the European USSR, Siberia, the Far East. In addition, Northern Europe, North China, North America (Alaska).

## 6. Genus *Semblis* Fabricius (*Holostomis* Mannerheim)

**Full-grown larva.** Length 25–45 mm. Sclerites yellow or reddish yellow, with dark pattern; abdomen pinkish during life. Head oblong, with pattern resembling that of *Phryganea* and *Agrypnia*. Pronotum without dark stripe at the anterior margin, or stripe interrupted in the middle and not reaching anterior margin. Mesothorax with small median tergite.

Coxae without ventral chaetoids. Femora as in *Phryganea*, with small, dark dorsal stripe. Fore tibia without distoventral process. Claw of forelegs with adjacent light basal spine, claw almost as long as tarsus; claws of mid- and hind legs shorter with normal basal thick spine.

Claw of anal legs with 5 or 6 dorsal denticles.

Case 40–50 mm long, slightly curved, markedly narrower posteriorly, made of large, regular fragments of plants arranged in rings.

49 **Pupa.** Frontal sclerite slightly convex anteriorly, not darker than other parts of head. Labrum wide, with relatively short anterior submarginal setae. Mandibles with rudimentary apex; dorsal tubercle near setae absent.

Dorsal process of abdominal segment 1 with rounded apex. Gills present on abdominal segments 2–8. Plates of holding apparatus on segments 3–8 or only on abdominal segments 4–7; spinules more numerous than in *Phryganea* (see p. 42).

Case to 48 mm long, wide, made as by the larva.

Mode of life and habitats. Stagnant and running water, including humin-rich forest brooks in the plains, quarries and small, swampy lakes; among vegetation on the bottom.

Distribution. Northern, northwestern, and central areas of the European USSR, Siberia, the Far East, Sakhalin. In addition, Northern and Central Europe, Mongolia, North China, Korea, Japan.

### Key to the Species

#### Full-grown larva

- 1 (2). Pattern of frontoclypeus in form of straight, narrow stripe. Dorsal bands narrow; pronotum light, with narrow, dark, oblique stripe in each half. . . . . 1. *S. phalaenoides* L. (p. 57)
- 2 (1). Stripe on frontoclypeus wider posteriorly. Dorsal stripes wide. Pattern of pronotum different; dark, transverse stripe at anterior margin absent . . . . . 2. *S. atrata* Gm. (p. 61)



## 1. *Semblis phalaenoides* Linné \*

Siltala, 1902:30–33, Figure II. — Ulmer, 1903:42, Figure 48; 1909:238, Figure 364 b. — Lestage, 1921:555, 572–579, Figure 192 f. — Raciecka, 1925: 1–8. — Lepneva, 1940:208.

**Full-grown larva.** Length to 45 mm. Sclerites brownish yellow, membranous areas reddish. Head slightly oblong, sides nearly parallel in the middle (Figure 74). Tentorial pits with dark dot; stripe on frontoclypeus, narrow, slightly wider posteriorly, not reaching posterior angle. Dorsal stripes straight, narrow, not fused near occipital foramen; light spots near setae 9 and 17 small, indistinct; indistinct light dots on both sides of coronal suture; posterior end of lateral stripes curved slightly ventrally, groups of indistinct dots ventrally on each side near occipital margin. Setae slightly lighter than in *Phryganea* but similar in form and arrangement.

Labrum (Figure 75) yellow, reddish anteriorly, tuberculate near median pit; anterior margin rugose, with depressions at the site of setae; setae 1, 2, and 4 light, spiniform; seta 1 situated on each side of median depression, near margin; seta 2 short, thick; seta 4 near median indentation thick at the base, curved, thin at the end; setae 3 and 5 situated laterally one behind the other, reddish brown; seta 6 slightly larger, situated behind seta 4; all 3 setae slightly blunt, without thin end. Median pit small, situated behind seta 6; posterior-angle sclerites reddish yellow.

Mandibles (Figure 76) oblong; distal tooth prominent, larger than the others; dorsal blade of left mandible with 3 teeth, basal tooth sharp, larger than the others; ventral blade with 2 small teeth. Right mandible with 2 teeth on dorsal blade, a small tooth near the distal tooth and a large tooth; ventral blade with 2 small teeth. Outer setae brownish, thin, dorsal seta slightly longer and thinner than ventral seta.

Submentum (Figure 77) brownish, like stipes, sharply separated from the membrane; setae short, brown; cardo with dark brown stripe at anterior and posterior margin. Palpifer, galea, and maxillary palps dark brown; galea long, almost as long as palp. Mentum wide, short, dark brown; ventral sclerites, palpiger, and labial palps the same.

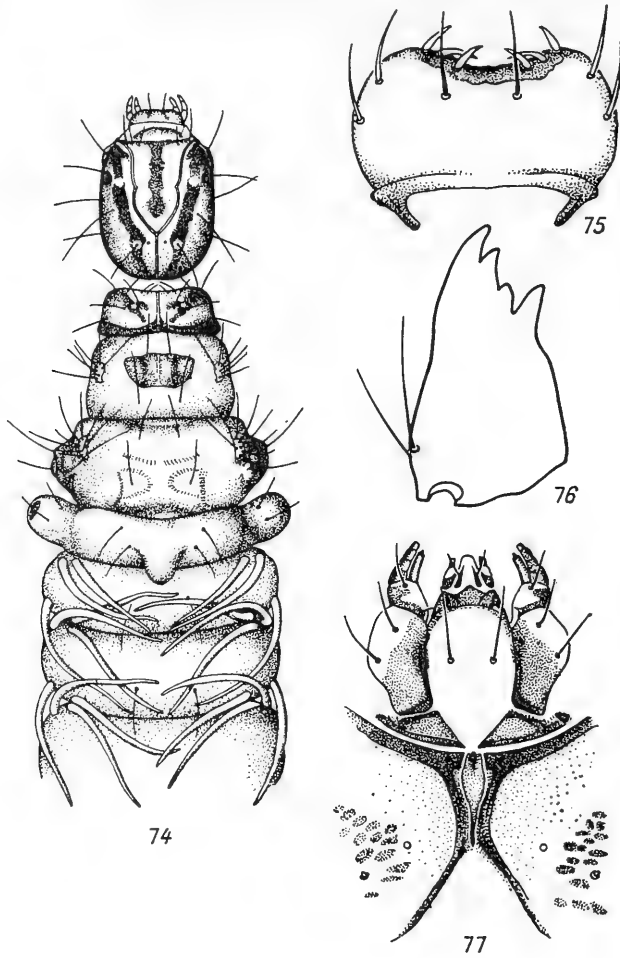
Pronotum mainly reddish yellow; posterior area, separated by transverse suture, only slightly dark without large dark dots; the wide dark stripe characteristic for the pronotum of *Phryganeidae* extends diagonally across the whole sclerite and not along the anterior margin (Figure 74); small dots lateral to stripe in the middle of each half of the sclerite. Chaetotaxy as in *Phryganea* and *Agrypnia*, but the large anterior-margin, anterior-angle, and medioanal setae shorter.

Mesonotum small, divided by median suture, with a dark longitudinal stripe in each half; this unites with the oblique stripe of pronotum and lateral stripe of head into a broad dark stripe extending on each side on the head and dorsally on pro- and mesonotum. Mesonotum with short brown anterior-margin seta situated on yellow spot medially to the stripe. Anterior-angle setae 9–10 in number, brown, situated on a round, thin, yellow sclerite, with red tubercle-shaped dots at the base. Two setae longer

\* The species appears in the literature also as *Holostomis phalaenoides*.

51 than the others; medioanal seta brown, moderately long, situated on small, narrow, yellowish, transverse sclerite together with the thin, small, intermediate seta and lateral seta, which stand one behind the other.

(50)



FIGURES 74-77. *Semblis phalaenoides* L.:

74 - head, thorax, and abdominal segments 1-4; 75 - labrum, dorsal;  
76 - left mandible, dorsal; 77 - head and maxillolabium, ventral.

Anterior-angle group and surface setae of metanotum similar; anterior-margin seta small, situated on a small yellow sclerite.

Propleuron with reddish brown, rhomboidal episternum-epimeron; pleural suture black, narrow; trochantin with pointed apex, seta brown.

Pleurites of meso- and metathorax brown, dark near pleural suture; setae dark brown.

Prosternite small, triangular with a brownish stripe; horn white, dense, hard.

Legs reddish brown; forelegs slightly longer than midlegs; hind legs much longer; large setae reddish brown; coxae without chaetoids.

Fore coxa oblong; basodorsal seta thick, shorter than the anterior apical dorsal setae; posterior apical dorsal seta longer and thinner; the subdorsal of the 2 anterior surface setae large, the second shorter; both apical ventral setae short, light, equally long.

Trochanter with short anterior seta and longer posterior seta; ventrodistal seta in form of light, curved spine; basoventral seta smaller, spiniform, situated near the suture, yellowish; anterior, intermediate, ventral seta small, inconspicuous among the large, light chaetoids; the subapical of the 2 posterior ventral setae moderately long, the other short, situated more basally, among the chaetoids.

Femur with convex dorsal and almost straight ventral surface; basodorsal seta short, thick; apical dorsal seta light, thin, shorter; anterior surface seta short, posterior slightly longer; ventrodistal seta situated subapically, in a small depression, in form of a short, thick, curved, light spine; basoventral seta shorter, situated in basal third; spinules of ventral row very small.

Tibia and tarsus apparently fused, forming a slightly curved segment.\* Tibia straight, thin, not wider distally, without distoventral process which is characteristic for the other genera; posterior distoventral seta in form of short, light spine curved to the surface; second ventral seta situated subapically, in form of small spinule; other 4 setae situated dorsally and subdorsally near apex. Tarsus narrower distally; dorsal setae straight, thin, short, situated apically and subapically one behind the other; both ventral setae spiniform, situated subapically, anterior smaller than posterior. Claw large, slightly curved, basal seta in form of light spine, curved to the claw.

Midlegs slightly shorter than forelegs, coxae and femora thinner, tibiae and tarsi more massive. Dorsal setae of coxa longer than on midlegs, anterior distodorsal seta as long as posterior; anterior surface setae as on the fore legs, distoventral setae dark, much longer. Trochanter oblong; anterior seta short, posterior very long, as long as posterior setae of coxa; a distal long, yellowish sharp spine ventrally and anteriorly; basal seta situated near suture, long; intermediate seta short, spiniform, inconspicuous among the light chaetoids; subapical posterior seta long, situated near a slightly shorter, more basal seta.

Femur shorter and thinner than in forelegs; basodorsal seta very long, brown; apical-dorsal seta thin, short, lighter; posterior surface seta long, anterior short, thick; both ventral setae in form of thick, sharp, yellowish spines, larger than on forelegs; row of spinules sparse.

Tibia wider apically; posterior distoventral seta in form of short thick spine, anterior situated apically, thick, spiniform; setae at apex 2 situated anteriorly and 2 posteriorly, subdorsal setae longer and thicker than the dorsal setae. Tarsus shorter than tibia, its setae short, thin, 2 situated anteriorly and 2 posteriorly. Claw with short, thick, basal spine.

\* As in *S. atrata*, see Figure 85.

52 Hind coxa slightly longer than on midlegs but with similar chaetotaxy; trochanter similar in form and chaetotaxy. Femur long, rodlike, with nearly parallel dorsal and ventral sides; dorsal setae as on midlegs, surface setae longer; ventral primary setae in form of large spines with thin, light end. Chaetoids of ventral comb larger and sparser than on midlegs. Tibia and tarsus straight, thin, almost of the same length. Tibia slightly wider apically, posterior distoventral seta in form of short brown spine, anterior apical ventral seta thick, dark; the 4 other setae, as on midlegs, forming pairs anteriorly and posteriorly near apex, subdorsal setae dark, longer and thicker than the thin dorsal seta. Similarly, tarsal setae 2 anterior and 2 posterior, dorsal and subdorsal, anterior setae longer than posterior. Claws as on midlegs.

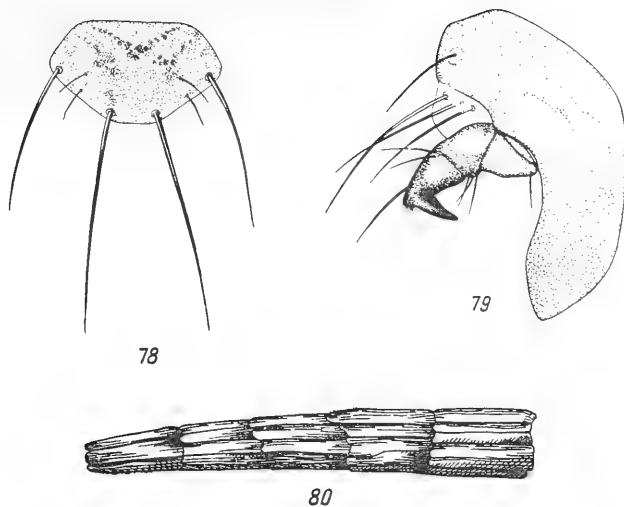
Number and arrangement of gills of *S. phalaenoides*

Segments	Dorsal	Pleural	Ventral
1			1 1
2	1 1	1	1 1
3	1 1	1	1 1
4	1 1	1	1 1
5	1 1	1	1 1
6	1 1	1	1 1
7	1 1	1	1 1
8	1	1	1

Dorsal process of abdominal segment 1 not as long and pointed as in *Phryganea*; both lateral processes wide, large, nearly cylindrical. Abdominal chaetotaxy as in *Phryganea*. Arrangement of gills as in *Phryganea*.

Tergite of segment 9 slightly dark anteriorly, with a pattern of stripes and dots (Figure 78); median setae dark reddish brown, lateral setae thick, dark, shorter than medioanal setae, larger than in *Agrypnia* and *Phryganea*; intermediate and anterior-margin setae thin, large, lateral setae smaller.

Sclerite "b" of anal legs (Figure 79) reddish brown with darker dots. Three distodorsal setae dark brown, thick, long, situated on large, dark, sclerotized dots connected by a yellowish sclerotized bridge; outer seta slightly shorter and thinner than the other two; median seta situated subapically, thin, golden brown, longer than in *Phryganea*; ventral seta brown, thick. Sclerite "c" yellowish, with brownish outer stripe; seta small.



FIGURES 78-80. *Semblis phalaenoides* L.:

78 — tergite of abdominal segment 9; 79 — sclerite of anal leg and claw;  
80 — larval case. (80 — after Siltala).

53 Claw reddish brown, darker distally with 3 large dorsal denticles near curvature, another 3 small denticles more basally. Seta 1 short, thick, situated at the base; setae 2 long, situated near dorsal margin of membranous bar; seta 6 situated on outer side; seta 3 long, situated dorsally above the denticles; ventral setae 7 and 8 straight, thick, yellowish; seta 5 situated lateral to 8; seta 4 situated on other side of longitudinal membranous stripe of base; both small and thin.

Case to 70 mm long, slightly curved, narrower posteriorly, made of large fragments of sedge, arranged in 5-6 turns (Figure 80).

Mode of life and habitats. Small, stagnant or slowly running water, often swampy.

Distribution. Northern, western, central, and eastern (Urals) parts of the European USSR, Siberia, the Maritime Territory, Sakhalin. In addition, Northern and Central Europe, Mongolia, Korea, North China, Japan.

## 2. *Semblis atrata* Gmelin \*

Siltala, 1904c:9-12, Figure 2.

**Full-grown larva.** Length 25-30 mm. Sclerites mainly brownish yellow, pattern reddish brown, dots distinct, large; setae thick, black. Head as in *S. phalaenoides*. Frontoclypeus (Figure 81) with posteriorly wider median pattern, with a curved row of minute dots; 2 dark dots situated medially to the median frontal setae; posterior frontal setae

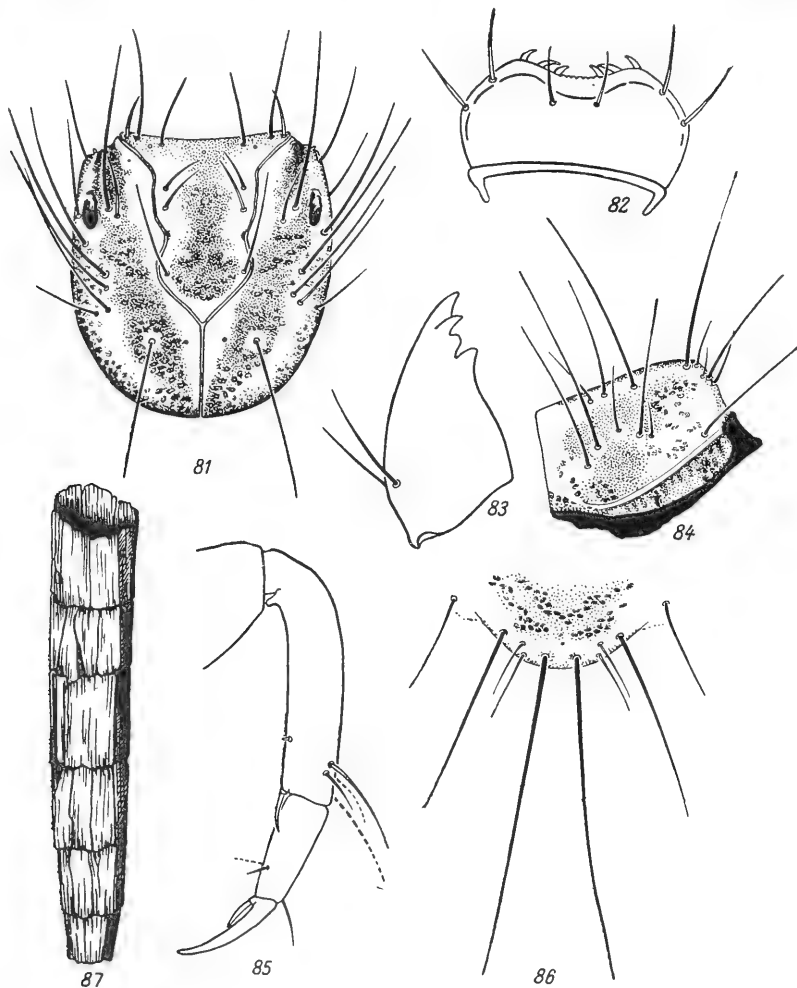
\* The species appears in the literature as *Holostomis atrata*.

thick, black. Dorsal stripes wide, close to the coronal suture; large light spots near setae 9 and 17; narrow lateral stripes reaching occipital margin; dark dots on and between stripes small, distinct; setae 12 and 14 thick, black, of about the same length. Groups of dots posteriorly on each side of the ventral surface.

Labrum (Figure 82) and setae as in *S. phalaenoides*.

Left mandible (Figure 83) with 3 teeth in addition to apical tooth on dorsal blade, ventral blade with 2 teeth. Right mandible with 2 teeth on dorsal and ventral blades, basal tooth large.\* Mandibles with blackish outer setae.

(54)



FIGURES 81-87. *Semblis atrata* Gmel.:

81 - head, dorsal; 82 - labrum; 83 - left mandible, dorsal; 84 - pronotum; 85 - tibia, tarsus, and claw of foreleg; 86 - sclerite of segment 9; 87 - case of larva.

\* Siltala (1904c, Figure 2) shows a mandible of *Semblis atrata* without teeth. The larva was probably in the premolting stage, when the teeth are indistinct.

Pronotum light, yellowish, with narrow, reddish brown anterior margin; posteriorly, margins brownish. Each half of sclerite with characteristic smoke brown pattern on light background, darker and wider anteriorly (Figure 84); rows and groups of brown and dark brown dots on the light and dark areas; posterior area of sclerite light brown, with small dots, anteriorly bordered by a sharp rim, posteriorly and laterally with wide black margin.

Anterior-angle seta long, dark reddish brown; one such seta and several thinner, short, and long setae near anterior margin; one moderately long and 3 small setae at the lateral margin; a seta as long as the anterior-angle seta, 3 long setae, and 3-4 small setae on the surface.

Meso- and metanotum as in *S. phalaenoides*, chaetotaxy the same; reddish brown longitudinal stripe of median sclerite of mesonotum indistinct, with small, dark dots, which are distinct in light specimens.

Pleurites of meso- and metathorax light yellow, with reddish black pleural suture, epimeron with a group of small dots at the base; setae as in *S. phalaenoides*.

Legs as in *S. phalaenoides*, fore tibiae and tarsi apparently fused (Figure 85). Mid- and hind coxae with distinct, light yellow, dorsal, and reddish brown, ventral areas, with numerous small dots at the base.

Processes of abdominal segment 1 as in *S. phalaenoides*, dorsal process smaller than lateral processes and blunt. Segment 8 with presegmental ventral gills, sometimes also with presegmental lateral gills.

Tergite of segment 9 (Figure 86) with sharp pattern of dots at the base; medioanal and anterior-angle setae thick, black. Sclerite "b" of anal legs with small dots, with blackish brown posterior margin, similar margin at base of sclerite "c". Claw as in *S. phalaenoides*, with 3 large and 3 small dorsal denticles.

Case smooth, slightly curved, to 43 mm long, made of pieces of plants arranged in 7-8 circles (Figure 87).

54 **Pupa.** Frontal sclerite slightly inflated near base of clypeus, not darker than other parts of head. Labrum with 6 short setae near anterior margin, the 2 outer setae longer than the others. Mandibles without outer tubercle, with short, narrow apex. Presegmental plates of holding apparatus on segments 4-7 large, with numerous spinules, on segments 3 and 8 with small spinules or without spinules; number of spinules III:0-15; IV:15-19; V:17-24+23-28; VI:18; VII:20-23; VIII:0-18. Gills present on abdominal segments 2-7.

Anal appendages short, forming a blunt median process, with rugose, posterior margin. Ventral appendages of male pupae small; penis sheath wide, bifid.

Pupal case 35-48 mm long, made as in the larva, both ends covered on the outside with moss and pieces of plants.

55 Mode of life and habitats. Forest brooks and other small water bodies.

Distribution. Northern, northwestern, and central parts of the European USSR, Siberia, the Maritime Territory, Sakhalin. In addition, Northern Europe, Mongolia, Japan.

## 7. Genus *Oligostomis* Kolenati

**Full-grown larva.** Length 20–23 mm. Dark median pattern on frontoclypeus absent; seta 17 on head shorter. Mesonotum with 2 small, median sclerites near anterior margin. Gills on segments 1–7.

Case made of fragments of plants arranged in rings.

**Pupa.** Length 19 mm. Frontal sclerite with small anterior process. Distal end of mandibles rudimentary. Gills present on abdominal segments 2–7.

Mode of life and habitats. Running, peaty, water bodies.

Distribution. Northern, central, and western parts of the European USSR. In addition, Central and Northern Europe, Japan, North America.

### 1. *Oligostomis reticulata* Linne

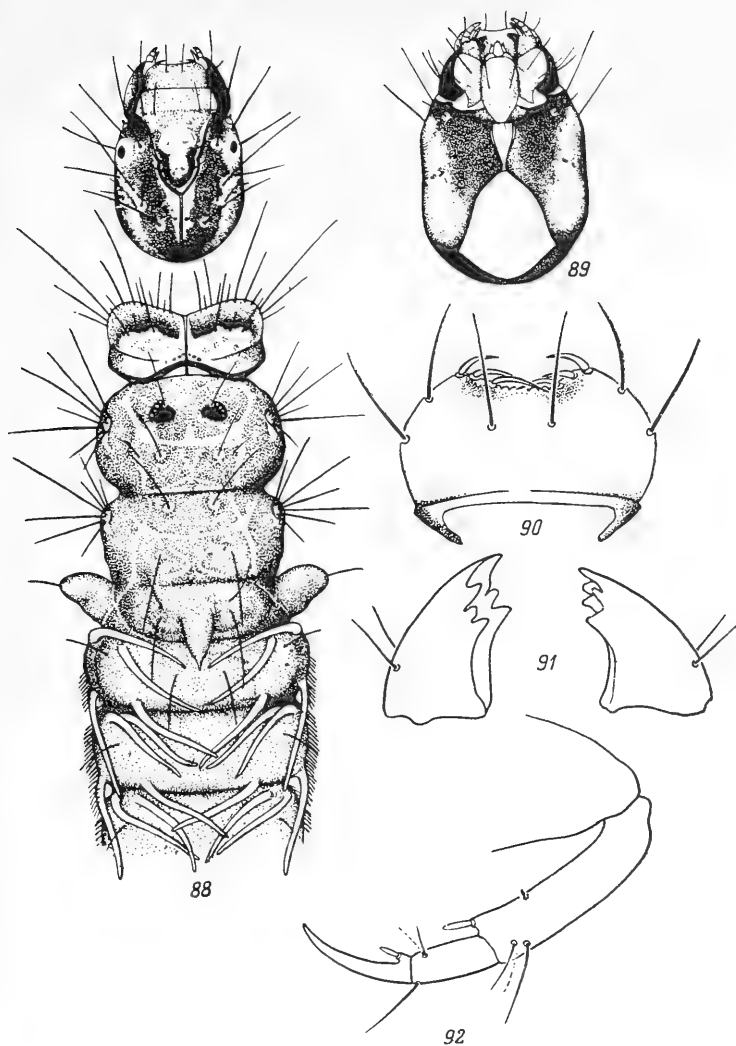
Struck, 1903:59–65, Plate I, Figure 5, Plate VII, Figures 14, 15, 16, 19, 20, 22. — Siltala, 1903a:4–6, Figure 1. — Ulmer, 1903:41, Figure 93. — Siltala, 1904c:6. — Ulmer, 1909:238, 302, Figures 365, 459 c. — Lestage, 1921: 555–558, 572–579, Figure 192. — Lepneva, 1940:208, Figure 8.

**Full-grown larva.** Length 20–23 mm. Ground color of sclerites yellow, in some places brownish yellow; pattern distinct, brownish. Head (Figure 88) slightly oblong; frontoclypeus wide anteriorly, its posterior part much smaller than the rest; 4–5 dark dots forming a transverse row, median dots sometimes lighter; middle with 2 dark dots on each side. Wide, dark, dorsal stripes from the anterior margin; they separate posteriorly close to the frontal sutures, so that the posterior angle is light or they fill the posterior angle; in the latter case, the pattern is U-shaped, which is characteristic for the genus; a few, large, lighter dots on the stripes; lateral stripes wide, chestnut brown, less dark than the dorsal stripes, distinct, with numerous dots; similar small dots on light background between the dorsal and lateral stripes; ventral side of head almost entirely chestnut brown, with several indistinct large dots.

Lateral anterior-margin seta (Figure 88) short, light; median seta slightly larger, dark; intermediate seta thicker and darker than median seta; frontal setae dark, anterior one small, situated near the stripe, middle seta long, closer to frontal suture, posterior setae slightly longer than middle seta, situated near suture. Setae 9 and 11 situated on a large, light spot, seta 9 long, dark brown, seta 11 thin, as long as middle frontal seta; seta 7 longer and thicker, seta 10 short, straight, light; seta 12 situated laterally on light background, almost as long as 9; seta 13 dark, small; seta 14 situated in a light indentation of the dorsal stripe, thick, longer than other setae; setae 15 and 16 short, thin; seta 17 situated on a large, light dot, less long and thin than in the other genera, brown, markedly shorter than seta 14. Ventral seta 8 small, thin, spiniform; seta 18 slightly smaller, situated on light spot (Figure 89).

Labrum (Figure 90) reddish brown, without pattern; median depression with 5–6 tubercles anteriorly; seta 1 inconspicuous, small, procumbent; seta 2 in form of light, blunt spine; seta 4 situated on margin of depression, light, tapering, crossed; setae 5 and 6 larger than in *Phryganea*, dark brown; seta 3 smaller and lighter.





FIGURES 88-92. *Oligostomis reticulata* L.:

88 - head, thorax and abdominal segments 1-4; 89 - head, ventral; 90 - labrum;  
 91 - mandibles, dorsal; 92 - tibia, tarsus, and claw of forelegs, anterior.

Mandibles (Figure 91) oblong; left mandible with 3 teeth on dorsal blade and 2 on ventral blade; right mandible with 2 teeth on each blade; outer setae short.

Submentum (Figure 89) light, median sclerite indistinct, setae dark, large, situated on small sclerotized dots.

Pronotum (Figure 88) smoke brown near anterior margin, with dark brown transverse stripe in anterior third; a group of dots lateral to the

56 stripe; lateral to these, a distinct, light yellow area; sclerite light brown, behind the stripe, with light spots and groups of dots near the setae. Anterior margin between the long anterior-margin seta and the similar anterior-angle seta also with a longer and 2 small setae, further inward a long, 2 short and 3-4 small setae; 3 small setae lateral to the primary anterior-angle seta; both lateral setae long, posterior seta situated some distance from the lateral margin, thinner and slightly shorter than anterior. Surface with a long medioanal seta, a moderately long middle seta, 1 short, and 2 small setae laterally.

57 Median sclerites of mesonotum (Figure 88) small, yellowish, indistinct, much smaller than in *Semblis*; a reddish brown spot with 3-5 large dots on each sclerite; a blackish large anterior-margin seta on separate sclerotized dots near the anterior margin; anterior-margin seta of metanotum the same; medioanal setae of both segments long; intermediate and lateral setae situated one behind the other, thin, small, all 3 setae situated on yellow sclerotized dots; anterior-angle setae of meso- and metanotum in groups of 7-9 situated on a white sclerite; brownish yellow dots at base of setae. Propleuron mainly brownish, membranous apex of trochantin lighter. Pleurites of meso- and metathorax in epimeral area near suture slightly dark, without dots. Seta of epimeron short, seta of trochantin much longer and thicker.

Number and arrangement of gills of *O. reticulata*

Segment	Dorsal	Pleural		Ventral
1				1 1
2	1 1	1	1	1 1
3	1 1	1	1	1 1
4	1 1	1	1	1 1
5	1 1	1	1	1 1
6	1 1	1	1	1 1
7	1 1	1	1	1 1

Legs reddish brown, without pattern. Ratio of length of legs 108:100:122. Coxae with very small, scale-shaped chaetoids ventrally and subventrally.

Fore tibia as in *Semblis*, wider apically, with small distoventral process with a brown spine directed along the tarsus as in *Semblis*, not laterally as usual (Figure 92).

Distoventral seta of trochanter very large, in form of a thin, curved, light spine; medioventral seta shorter, thick, bright yellow; primary basal

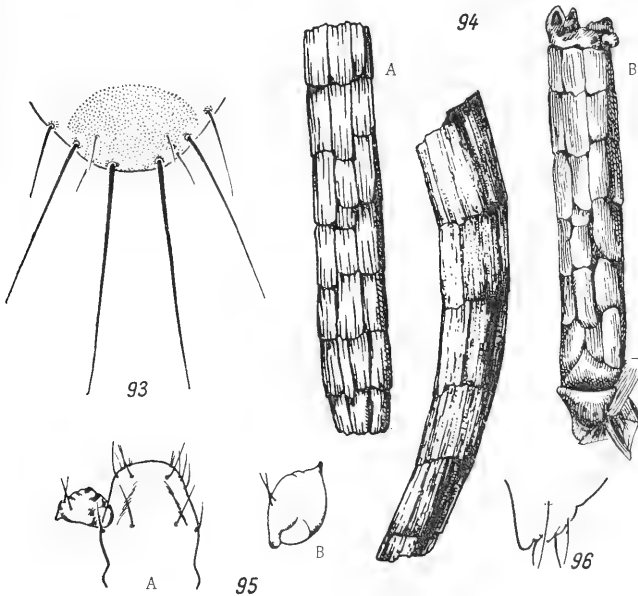
seta of trochanter shorter than apical. Anterior seta of femur short, thin, situated subapically; ventral setae of femur very long, thin, transparent, longer than basal seta of trochanter; ventral chaetoids short, dense, of uniform size.

Ventral chaetoids of mid-femur relatively large, longer in basal area than in apical area, as in *Semblis*. Anterior subapical seta of tibia in form of blunt, thick spine, like the posterior distoventral seta, but slightly longer and thinner.

Ventral setae of hind femur yellowish brown, thick; distoventral seta of trochanter the same, as long as distoventral seta of femur; chaetoids relatively large, longer in the basal than in the apical area but not as thick as in *Semblis*.

Dorsal process of abdominal segment 1 conical, pointed. Gills present on segments 1-7.

(58)



FIGURES 93-96. *Oligostomis reticulata* L.:

93 - tergite of abdominal segment 9; 94 - case of larva (A) and pupa (B); 95 - labrum, anteclypeus and left rudimentary mandible of pupa, dorsal (A), left rudimentary mandible of pupa, ventral (B); 96 - right anal lobe of female pupa, lateral. (94, B, 95, A, 96 - after Siltala; 95, B - after Ulmer).

Tergite of abdominal segment 9 (Figure 93) light yellow, with a transverse submarginal stripe of large dark reddish brown dots anteriorly, smaller dots on each side; medioanal setae long, black; lateral setae, in contrast to *Oligotricha*, equally thick, long; anterior-margin and intermediate setae thin and light.

Sclerite "b" of anal legs yellowish brown, slightly darker near distal margin, with groups of reddish brown dots dorsally and laterally; 3 long, distal, setae brownish black, seta in middle on sclerotized dot, 2 others on a sclerotized bar, lateral seta shorter and thinner than the others, short median seta hairlike, ventral seta shorter but thicker. Sclerite "c" with dark stripe at the base; seta small, light.

Claw with 2 large dorsal denticles at the curvature and 3 smaller denticles above them; seta 1 situated at the base, short, thick; seta 2 situated on the outer side subdorsally near membranous bar; seta 3 situated in distal part of dorsal side, slightly shorter than the claw; ventral setae 7 and 8 straight, yellowish, thick, extending to apex of claw; seta 5 situated near 8, shorter and thinner; seta 4 slightly larger, thin, situated close to inner margin of ventral part of membranous bar.

Case straight or slightly curved, tapering slightly posteriorly, smooth, made of particles of plants arranged in 6-7 rings (Figure 94).

**Pupa.** Length 19 mm. Antennae reaching abdominal segment 4; front sclerite with small anterior process. Labrum oblong (Figure 95, A), distal part of mandibles rudimentary (Figure 95, B). Mid- and hind tarsi with dense natatorial setae, fore tarsi with sparse setae. Dorsal process of abdominal segment 1 with slightly sclerotized apex. Gills present on segments 2-7. Holding apparatus on segments 3-7, number of spinules: III:11; IV:12-14; V:10-16+11-19; VI:11-16; VII:15-16. Anal appendages with rounded median process (Figure 96).

Case as in the larva, to 30 mm long, smooth; anterior opening covered with moss.

Mode of life and habitats. Rapidly or slowly running small, water bodies with peaty water, draining ditches, outflow of dystrophic lakes; full-grown larvae appear in late autumn and early spring.

**Distribution.** Northern, northwestern, central, and western parts of the European USSR. In addition, Northern and Central Europe.

## 8. Genus *Hagenella* Martynov

**Full-grown larva.** Frontoclypeus dark laterally, without median pattern. Fore tibia, as in *Semblis*, not wider distally, with light distoventral seta.

Mesonotum without median sclerites.

Case almost uniformly wide, slightly curved, made of plant fragments arranged in rings.

**Pupa.** Length 16-18 mm. Frontal sclerite anteriorly with large grooved process. Natatorial setae of tarsi reduced, absent on forelegs, sparse on hind legs, less sparse on midlegs. Anal appendages slightly sclerotized.

Case to 30-40 mm long.

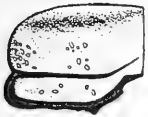
Mode of life and habitats. Small, overgrown, swampy water bodies.

**Distribution.** European USSR, except in the southern part, Siberia, the Amur Region, Sakhalin. In addition, Northern and Central Europe, Japan.

## 1. *Hagenella clathrata* Kolenati

Struck, 1904:1-7, Figures 1-5. — Siltala, 1904c:6-8, Figure 1. — Ulmer, 1909:239, 302, Figures 439, 440. — Lestage, 1921:555-557, 572-579, Figure 192. — Lepneva, 1940:208.

**Full-grown larva.** Length 20-22 mm. Head oblong. Frontoclypeus without dark median pattern, with dark stripes laterally which are fused posteriorly; lateral stripes wider in dark specimens, sometimes greater part of sclerite dark, except for the posterior angle; sclerite with a transverse, posterior row of dots. Dorsal and lateral stripes wide, with numerous dots; groups of dots on each side on the ventral surface.



97



98

FIGURES 97 and 98.  
*Hagenella clathrata* Kol. (after Siltala):

97 — pronotum; 98 —  
case of pupa.

Labrum, mandibles and maxillolabium as in *Oligostomis reticulata*.

Pronotum (Figure 97) brownish in anterior third, with a wide, transverse, dark stripe some distance from anterior margin, dark dots in posterior part. Median sclerites absent.

Legs yellowish brown. Fore tibia, as in *Semblis*, not wider distally; anterior ventrodiscal seta reduced to a small spinule; posterior ventrodiscal seta in form of thin, light spine, procumbent.

Tergite of abdominal segment 9 uniformly brown; lateral setae large but shorter than medioanal setae.

Claw of anal legs with 3 denticles.

Case resembling that of *Semblis*, large, to 35-40 mm long, slightly curved, made of rectangular fragments arranged in 6-8 rings.

**Pupa.** Length 15-18 mm. Antennae reaching abdominal segment 6. Frontal sclerite anteriorly with large, grooved, rounded process with small lateral tubercles. One of the 6 setae of labrum much longer than the others. Mandibles with reduced apex, as in *Oligostomis*.

Fore tarsi without natatorial setae, sparse on mid-tarsi, hind tarsi with a few setae.

Gills on abdominal segments 2-7 and presegmental on segment 8. Spinules of holding apparatus: III:6-11; IV:7-14; V:9-17+10-17; VI:8-13; VII:6-15.

Case longer than that of larva, to 40 mm long, with 6-10 rings (Figure 98), anterior end covered with moss.

**Mode of life and habitats.** Small swamps, ditches, puddles, and other small, overgrown, stagnant water bodies.

**Distribution.** Northwestern, central, and western parts of European USSR. In addition, Central and Northern Europe.

9. Genus *Trichostegia* Kolenati (Nannophryganea Martynov)

**Full-grown larva.** Length 15–18 mm. Dorsal side of head mainly dark. Brush present in median depression of right and left mandible.

60 Fore tibiae with ventral comb of small spinules. Dorsal process on abdominal segment 1 absent.

Case straight, smooth, made of plant fragments, sometimes with mineral particles as well, arranged in rings or irregularly.

**Pupa.** Length 10–13 mm. Mandibles long, with well developed, slightly curved apex. Mid-tarsi with a few natatorial setae. Anal appendages with large median process.

Case as in the larva, 22–23 mm long.

Mode of life and habitats. Small, stagnant water bodies.

Distribution. Northern, central, and western parts of European USSR. In addition, Northern, Central, and Western Europe.

1. *Trichostegia minor* Curtis \*

Kolenati, 1848:87. — Hagen, 1864:240; 1873:440. — Wallengren, 1891:26. — Struck, 1900:8, Figure 5. — Siltala, 1902:22–26, Figure 5. — Struck, 1903:44–53, Plate I, Figure 2; Plate V, Figures 1–8. — Ulmer, 1903:37–38. — Siltala, 1904c:16, 26–27. — Ulmer, 1909:239, 302, Figures 366, 441 a. — Lestage, 1921:555–558, 580–591. — Hickin, 1954:174–176, Figures 1–7.

**Full-grown larva.** Length 15–18 mm (Figure 99). Ground color of sclerites yellowish; pattern blackish brown. Dark median pattern of frontoclypeus occupying nearly the whole sclerite except the posterior angle (Figure 100); anterior angles less dark than the other surface. Dorsal stripes wide, dark; lateral stripes lighter, large dots on and between stripes. Ventral surface dark, except a narrow stripe near 61 occipital foramen (Figure 101). Large dark spots on the stripes near setae 9, 14, 15, and 17.

Labrum short, wide. Left mandible with 3 teeth on dorsal blade and 2 on ventral blade; right mandible with 2 teeth on each blade; basal tooth large; both mandibles with a brush of short chaetoids in basal part of median depression.

Pronotum (Figure 99) dark brown, lighter at anterior margin, with dark transverse stripe, groups of dots in each half of tergite posteriorly.

Legs brown. All coxae ventrally and subventrally with small covering chaetae; in contrast to other genera, fore tibia with a comb of small, light spinules, like mid- and hind tibiae; claws of fore- and midlegs as long as tarsi; claw of forelegs with blunt basal spine, claws of mid- and hind legs with sharp basal spine.

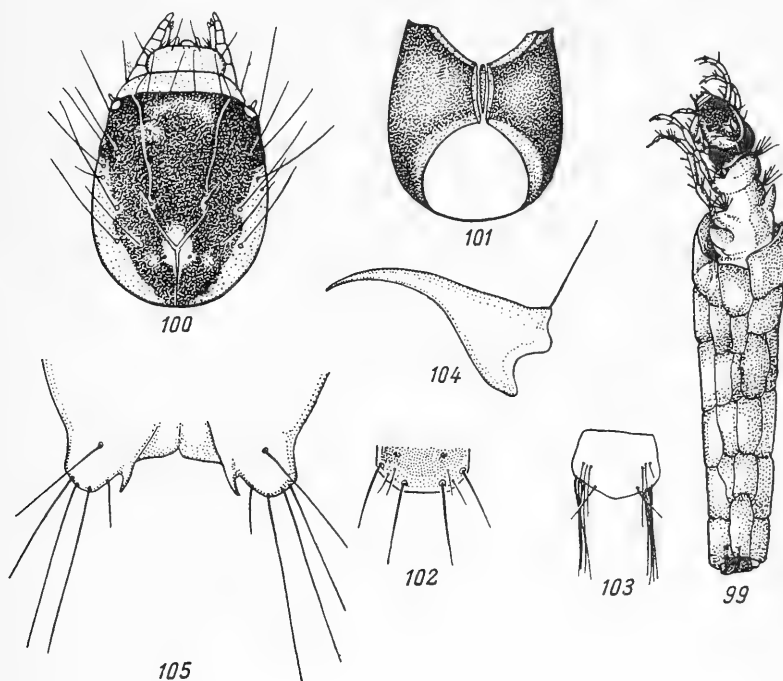
Dorsal process of abdominal segment 1 absent, replaced by a small tubercle; lateral processes large, well developed. Small setae of lateral line dark. Gills on segments 1–7 (ventral); segment 8 only with ventral presegmental gills.

\* The species appears in the literature as *Phryganea minor* Curt., *Nannophryganea minor* Curt. (Fischer, 1964:167–174).

Tergite of abdominal segment 9 dark anteriorly, with minute dots; median seta long, lateral seta shorter (Figure 102). Claws of anal legs with 2 large dorsal and 3 smaller denticles behind them.

Case straight (Figure 99), made of fragments of sedge or other plants, fragments arranged in rings or irregularly; mineral particles are sometimes used.

(60)



FIGURES 99–105. *Trichostegia minor* Curt.:

99 – larva in case; 100 – head, dorsal; 101 – head, ventral; 102 – tergite of abdominal segment 9; 103 – anteclypeus and labrum of pupa; 104 – right mandible of pupa; 105 – posterior end of female pupa, dorsal (99–102 – after Hickin, the others after Siltala).

**Pupa.** Length 10–13 mm. Frontal sclerite convex anteriorly, without the grooves and tubercles characteristic for *Phryganea*. Labrum short (Figure 103), narrower posteriorly; the median of the 6 anterior-margin setae smaller than the other 5 large setae. Mandibles (Figure 104) long, apex pointed; slightly curved; a tubercle near base of small seta.

Natatorial setae sparse on mid-tarsi. Dorsal process of abdominal segment 1 with characteristic, posteriorly rounded process. Gills present on segments 2–7, sometimes on 2–8; postsegmental pleural gills sometimes absent on segment 7; only presegmental ventral and dorsal gills on segment 8, or gills absent. Number of spinules of holding apparatus: III:3–5; IV:2–5; V:3–6+5–9; VI:3–6; VII:4–5.

Anal appendages wide, short, with median finger-shaped process posteriorly (Figure 105).

Pupal case to 23 mm long; anterior sievelike cover about 5 mm from the end; both ends of pupal case covered with moss.

Mode of life and habitats. Ponds, small swamps, and other small stagnant water bodies.

Distribution. Northern, central, and western parts of European USSR. In addition, Northern, Central and Western Europe.

## II. Family LIMNOPHILIDAE Kolenati

**Full-grown larva.** Head usually almost as long as wide, sometimes slightly oblong. Eyes far from anterior margin; antennae usually in middle between eyes and anterior margin; sensillae small. Frontoclypeus with wide anterior part and deep lateral indentation. Ventral surface short in middle. Gula small, triangular, reaching or almost reaching occipital foramen. Pattern of dark stripes and spots present, or head uniformly dark, without pattern. Only primary setae usually present; sometimes several small secondary setae on head.

Labrum with deep median indentation and short sclerites at posterior angles. Mandibles short, chisel-like; distal margin wide, with small, blunt denticles or without teeth, smooth; brush short, situated near dorsal margin of mandible. Submentum with 2 longitudinal sclerites; stipes wide; maxillary palps with short segments.

Pronotum and mesonotum sclerotized. Metanotum with 3 pairs of small, characteristically arranged tergites, of which the anterior median sclerites are sometimes fused, the lateral sclerites oblong. Sternites present on prothorax only, or sometimes on all 3 thoracic segments in form of small sclerites or dots.

62 Ventral horn large, slightly sclerotized, blunt. Pleurites large, with secondary setae on meso- and metathorax.

Forelegs shorter and more massive than the others; mid- and hind legs similar, hind legs thinner and shorter than midlegs. Secondary setae in basal part of leg (coxa, trochanter and femur) usually present in small numbers.

Abdominal segment 1 with a dorsal and lateral processes; dorsal process smaller than lateral processes. Lateral line present on segments 3-8. Gills on segments 1-8, in dorsal, pleural, and ventral rows, with 1, 2, 3, rarely 4-12 or more, filaments.

Sclerite of segment 9 transverse, with several secondary setae including a single medioanal seta. Anal legs short, with large sclerite "b". Claw small.

Case of varying form, with a covering of plant or mineral particles, sometimes large and made of large rods and pieces of detritus.

**Pupa.** Body usually cylindrical. Labrum short, wide, with indistinct median process, with small anterior-margin seta and 5 long surface setae with hooked end. Lateral seta of anteclypeus smaller than the 2 others.

Mandibles massive at the base; apex narrow, pointed, without serration or with serrated blade.

Midlegs usually of natatorial type with rows of setae on tarsal segments 1-4.



Abdominal segment 1 with large, saddle-shaped dorsal process or with 2 small lateral processes. Holding apparatus on segments 3—7 or 3—8; postsegmental plates on segment 5 transverse.

Anal appendages rodlike, narrow, slightly curved at the end, rarely lobe-shaped as in *Lepidostomatidae*; anal rods reduced, small, and thin or absent in pupae living outside water.

Case as in the larva, attached to the substrate by varying methods, or pupae lying free on the bottom. Anterior and posterior openings of case closed by a membrane which may be sievelike or with only a few holes; case covered with plant fragments, sand grains, rarely with small stones.

Mode of life and habitats. Running and stagnant water, on stones, on sand-detritus bottom, or among vegetation; rarely on solid, slightly silty bottom in the sublittoral.

Distribution. Throughout the USSR. In addition, Europe, Asia, North America, western zone of South America, Mediterranean coast of Africa, some localities on the Pacific coast of Australia.

### Key to Subfamilies

#### Full-grown larva

- 1 (4). Anterior margin of pronotum rounded, projecting anteriorly, covering the head from above.
- 2 (3). Only primary setae on head; metanotum with a pair of small, anterior, median sclerites . . . . . **2. Neophylacinae** Schm. (p. 95)
- 3 (2). Small secondary setae present on head in some species; metanotum without median anterior sclerites . . . . . **3. Apataniinae** Ulm. (p. 103)
- 4 (1). Anterior margin of pronotum slightly projecting, straight or slightly concave.
- 5 (6). Light lines on head in some species, as in *Lepidostomatidae*. Fore femur generally resembling mid- and hind femora but slightly shorter and wider; tibia rodlike, slightly wider distally. Gills of varying structure . . . . . **1. Dicosmoecinae** Schm. (p. 74)
- 6 (5). Light lines on head absent. Fore femur short, massive; tibia wide, short, markedly wider distally.
- 7 (8). Pronotum with sharp, transverse ridge ("hump"). Gills single. Length 8—14 mm . . . . . **5. Drusinae** Banks (p. 388)
- 8 (7). Pronotum without "hump." Gills with 1, 2, or 3 filaments. Larva medium-sized or large, 30—32 mm . . . **4. Limnophilinae** Kol. (p. 177)

#### Pupa

- 1 (2). Anal appendages wide, lobe-shaped or rodlike, small and thin . . . . . **1. Dicosmoecinae** Schm. (p. 74)
- 2 (1). Anal appendages narrow, rodlike.
- 3 (8). Apex of mandibles relatively slightly narrowed, medium blade angular, serrated. Gills single.

- 63 4 (5). Mandibles long, median blade projecting, knifelike. Anterior membrane with a few, small holes near dorsal margin . . . . . 3. *Apataniinae* Ulm. (p. 103)
- 5 (4). Mandibles of normal length.
- 6 (7). Ends of case covered with a small, flat stone above the membrane, as in *Odontoceridae* . . . . . 2. *Neophylacinae* Schm. (p. 95)
- 7 (6). Ends of case covered with sand grains above the membrane . . . . . 5. *Drusinae* Banks (p. 388)
- 8 (3). Apex of mandibles strongly narrowed, usually not serrated. If wider and serrated, blade straight, not angular as in *Drusinae*. Gills with 1, 2, or 3 filaments . . . . . 4. *Limnophilinae* Kol. (p. 177)

1. Subfamily *DICOSMOECINAE* Schmid

**Full-grown larva.** Length 11–23 mm. Head oblong. Secondary setae absent. Forelegs similar to mid- and hind legs, but shorter and slightly thicker. Gills of anterior abdominal segments with one or 10–12 filaments; some genera (*Imania* Mart.) without gills. Case made of mineral particles, rarely of plant particles, curved, with flattened ventral side.

**Pupa.** Length 11–21 mm. Median blade of mandibles serrated. Dorsal process of abdominal segment 1 deeply concave; presegmental plates with 2–3 large denticles, postsegmental plates with 7–10 small denticles. Anal appendages wide, lobe-shaped or thin, rodlike.

Case as in the larva; anterior and posterior membranes with a varying number of holes.

Four genera of this subfamily in the USSR: *Dicosmoecus* McL., *Ecclisomyia* Bks., *Ironoquia* Bks., *Imania* Mart. According to the morphology and ecology of the pre-imaginal stages, all these genera could be placed in different tribes.

Mode of life and habitats. Phytophagous and detritophagous, living on stony or detritus bottom.

Distribution. European USSR, Siberia, Far East, Kamchatka, Sakhalin. In addition, Asia, except its southern and southwestern parts, North America, and the western shore of South America.

Key to Genera

Full-grown larva

- 1 (4). Head uniformly dark. Gills with 1–4 filaments. Case made of sand grains or of sand grains and detritus.
- 2 (3). Larva large, 22–23 mm. Gills with 4 filaments . . . . . 1. *Dicosmoecus* McL. (p. 75)
- 3 (2). Larva 11–12 mm long. Gills with one filament . . . . . 2. *Ecclisomyia* Bks. (p. 84)
- 4 (1). Head yellowish brown with pattern of dark stripes and spots. Gills with 10 or more filaments. Case made of detritus . . . . . 3. *Ironoquia* Bks. (p. 88)

Pupa

- 1 (4). Gills with one or 4 filaments. Anal appendages short, lobe-shaped. Case made of sand grains.
- 2 (3). Length 19–21 mm. Gills of anterior segments with 4 filaments. Anal appendages rounded, lobe-shaped. Case made of large sand grains, slightly curved, narrower posteriorly, 23–24 mm long. . . . . 1. *Dicosmoecus* McL. (p. 75)
- 3 (2). Length 11–12 mm. Gills with one filament. Anal appendages pointed, lobe-shaped. Case made of detritus, 12–13 mm long. . . . . 2. *Ecclisomyia* Bks. (p. 84)
- 4 (1). Gills with 10–12 filaments. Anal appendages in form of small, narrow rods. Case made of detritus. . . . . 3. *Ironoquia* Bks. (p. 88)

1. Genus *Dicosmoecus* McLachlan

**Full-grown larva.** Length to 23 mm. Head and thoracic sclerites dark, with fine light lines and dots. Gills of anterior abdominal segments with 4 filaments. Case made of sand grains, or sand grains anteriorly, detritus posteriorly, slightly curved.

**Pupa.** Length 16–21 mm. Mandibles with straight, denticulate medium margin. Gills as in the larva. Anal appendages rounded, lobe-shaped. Case attached at the anterior end.

64

Mode of life and habitats. Mountain brooks and rivulets, oligotrophic lakes. One species inhabits small, slow brooks in plains, or drainage ditches with a slow current.

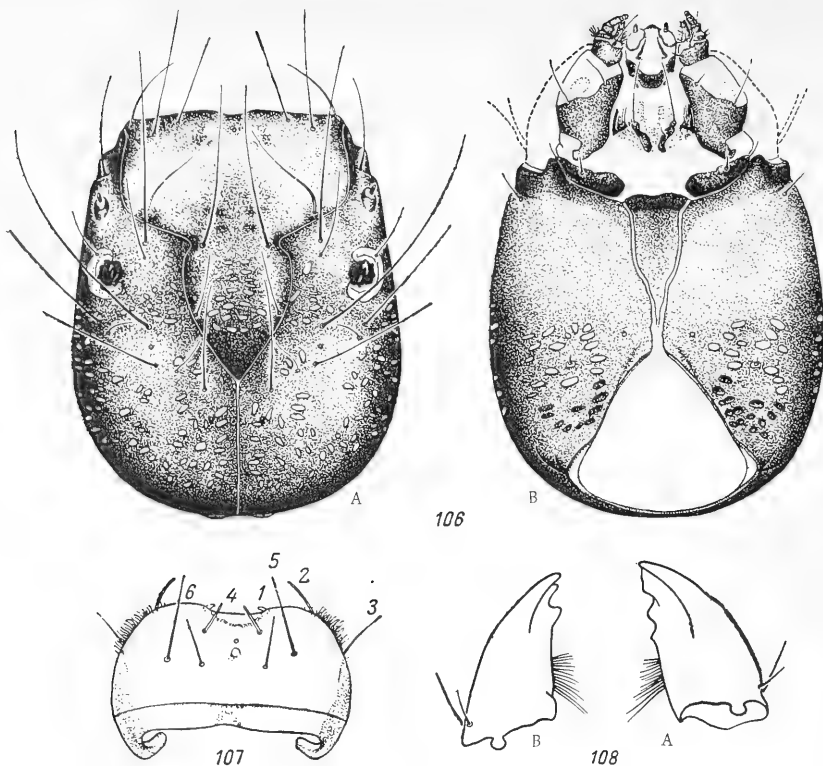
**Distribution.** Southeastern part of European USSR, Siberia, Altai, Sayans, the Far East, Kamchatka, Sakhalin. In addition, Japan, North America.

1. *Dicosmoecus palatus* McLachlan

Lepneva, 1949:176–179.

**Full-grown larva.** Length 22–23 mm. Head oblong (Figure 106). Frontoclypeus: sides lighter than middle anteriorly, brownish near anterior margin, with 3 indistinct dark dots in the middle; 3 such dots in the middle on each side before curvature of frontal sutures; posterior part with large, wedgelike pattern of light dots. Similar dots on dorsal and lateral stripes; large groups of light and dark dots ventrally on each side. Gula triangular, long (Figure 106, B).

Median and intermediate anterior-margin setae reddish brown, large, the intermediate slightly longer; lateral seta light like the anterior frontal seta, curved inward, procumbent; middle frontal seta dark, long, posterior frontal seta short, light. Setae 9, 14, and 15 long, 9 and 14 dark brown, thick; 15 lighter and thinner; seta 11 short, thin; seta 7 slightly larger; seta 10 light, smaller; seta 12 moderately long, brown; setae 13 and 16 light, 16 larger, curved inward; seta 17 large, dark.



FIGURES 106-108. *Dicosmoecus palatus* McL.:

106 - head, dorsal (A) and ventral (B); 107 - labrum; 108 - mandibles, ventral: left (A) and right (B).

65 Labrum (Figure 107), wide, with rounded anterior angles; dorsal sclerite reddish brown, posterior-angle sclerites wide, short, curved ventrally. Seta 1 situated near median indentation in form of short, light, blunt spine; setae 2 and 4 in form of small, thick, light spines; seta 3 normal, short; surface setae 5 and 6 large, 6 shorter, with blunt end.

Mandibles (Figure 108) massive, black; distal margin brownish, wide, with 5 small blunt teeth; brush golden yellow, situated close to dorsal margin; outer setae situated basally, light, dorsal seta larger than ventral.

Maxillolabium (Figure 106, B). Sclerites of cardo narrow, massive, black laterally, reddish brown in middle, with 2 small, light, outer submarginal setae. Submentum large, thin, yellowish with median longitudinal reddish brown stripes and dark, lateral, triangular areas; a large, golden brown primary seta and a small secondary seta on the stripes; one short and 2 small secondary setae in the triangular areas. Stipes large, brown, both setae situated near the apex, outer setae slightly lighter and larger. Palpifer dark brown, short; median-apical seta situated on membrane on a small sclerotized dot; mediobasal seta small. Maxillary

palp small, thick, with short segments, third segment slightly longer than the others. Mentum short, dark brown. Ventral sclerites in form of thin brown rods; seta yellowish, near distal margin. Sclerite of palpiger in form of a thin, curved stripe covering the base of the small labial palp with its brownish sclerite.

Thoracic tergites reddish brown. Pronotum (Figure 109) with narrow anterior margin and part of lateral margin; posterior margin black laterally, yellowish brown in the middle; process on posterior angle wide, round; groove in anterior third slightly dark in middle; an indistinct dark stripe along median suture, which is wider posteriorly, with X-shaped pattern of light dots. Anterior-angle and medioanal setae larger than others; in addition to the short and long setae, dense, small, spine-shaped setae on surface.

Mesonotum (Figure 109) with narrow, anterior margin; posterior margin dark; posterior angle and a small area of lateral margin broadly black. Tergites of metanotum large; anterior-median sclerites situated on a light, slightly sclerotized, elliptical area; lateral sclerites oblong, with an oblique transverse black stripe; setae situated in anterior part of sclerite, dots in middle and posteriorly; setae as in Figure 109.

Pleurite of prothorax in form of a narrow sclerite; pleural suture black; epimeron lobe-shaped, with a small seta; episternum brownish; trochantin small, black, blunt, with a small subapical seta and a smaller, light setule. Sclerites of meso- and metapleuron large, with long, black, pleural suture; episternum larger than epimeron, with indistinct dots and thick, short, secondary setae; primary setae long, situated distally close to the suture; epimeron without dots, with a large dark distal primary seta and several secondary setae.

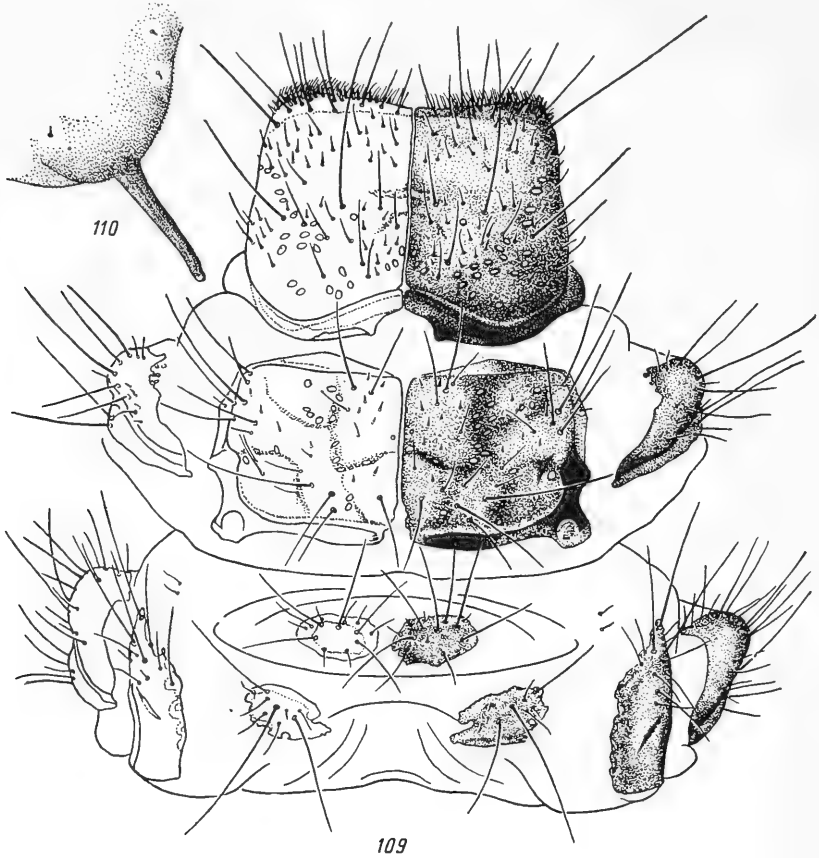
Prosternite reddish brown, trapezoidal, with small dark sclerites laterally. Horn blunt, dark (Figure 110). Mesothorax with 2 large and several smaller dots ventrally on each side. Metathorax with 2 large and 3-4 small dots on each side ventrally.

Legs dark brown. Forelegs shorter and more massive than midlegs; hind legs slightly longer and thinner. Ratio of length of legs 79:100:103.

Fore coxa (Figure 111) markedly shorter than femur. Femur slightly convex dorsally, slightly concave in apical half ventrally. Tibia short, curved at the base, wider apically. Primary setae of fore coxa (Figure 111, A, B) as follows: basodorsal seta long; posterior of the 2 distodorsal setae situated near apex of depression, anterior more distally; both anterior surface setae dark, thick, branched at apex (Figure 111, C); posterior distoventral seta smaller than anterior; secondary setae situated dorsally and subdorsally at the anterior margin, less numerous at the posterior margin, subdorsal anterior seta large, branched at apex (Figure 111, C); several secondary setae on the anterior and ventral surface and distally.

Primary, posterior seta of trochanter (Figure 111, B) short, thick; anterior seta of characteristic form, branched apically (Figure 111, D); anterior ventral setae, apical and subapical, in form of thick spines, apex of subapical seta consisting of 2 branches; in some specimens these setae  
66 resemble the anterior seta but are very short, appearing as if they are broken spines (Figure 111, D); primary basoventral seta long; both posterior setae

situated near distal margin, one long, the other shorter; several secondary setae in apical and basal parts of trochanter. Large, whitish, feathered chaetoids, curved toward apex ventrally in the distal third; small, light, blunt and pointed spinules near the chaetoids.



FIGURES 109 and 110. *Dicosmoecus palatus* McL.:  
109 -- thoracic tergites; 110 -- horn of prothorax.

Primary basodorsal seta of femur short, slightly curved; apical-dorsal slightly longer; anterior and posterior setae short, the former at the apex, the latter near the ventral margin at the base; 2 primary large, yellowish, sharp spines ventrally, the basal spine smaller, sometimes divided apically; together with the primary setae, there are 5-6 secondary setae at the margin in form of massive yellowish spines; between these are small, transparent to light, pointed spinules which may be isolated, in rows or in groups; secondary dorsal and surface setae few, short, thin (Figure 111); some setae of the subventral row sometimes divided apically; several, curved, whitish chaetoids ventrally near the base, resembling those on the trochanter.

67

Dorsal and subdorsal primary setae of tibia arranged in 2 pairs, apical and subapical; dorsal setae of apical pair longer than the others; further basally at the margin are similar thin secondary setae, 2 large and a short seta; primary distoventral setae in form of 2 thick spines; 3 pairs of similar secondary setae further basally at the margin, sometimes also a single spine; number of ventral spinules varying, sometimes there are only 2 or one pair of ventral spines in addition to the distal pair, without a single spine.

Tarsus dorsally with 2 thin setae near apex; both apical-ventral setae short, light; several small spinules between the setae and further basally.

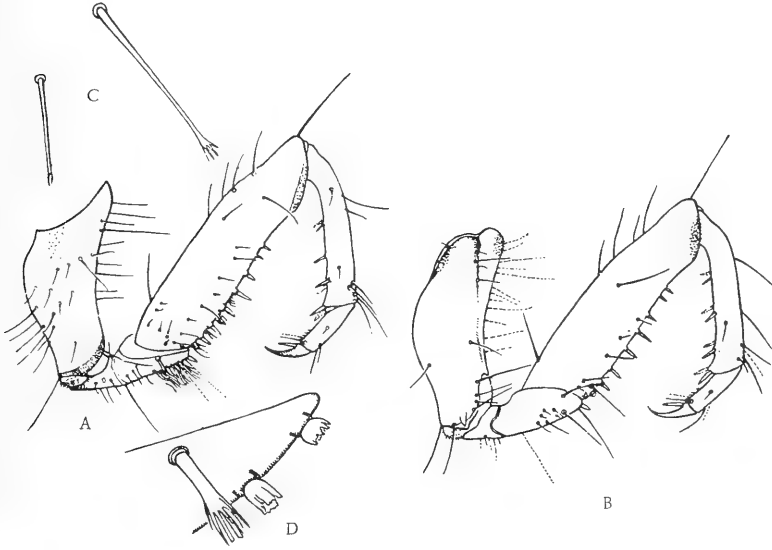


FIGURE 111. *Dicosmoecus palatus* Mcl. Foreleg, anterior (A) and posterior (B); anterior surface and large subdorsal secondary seta of coxa (C); distal part of trochanter, anterior (D)

Seta of claw in form of large, thick, blunt spine at the base. Mid- and hind legs (Figures 112, 113) similar; coxa long, slightly shorter than femur; femur almost straight, rodlike; tibia slightly wider distally; hind tarsus slightly longer than mid-tarsus.

68

Chaetotaxy of coxa uniform. Anterior and posterior primary setae of mid-trochanter (Figure 112) small, thick; anterior distoventral seta in form of thick, light spine; intermediate seta thick, short; basal seta long as is posterior distoventral seta; posterior subapical seta slightly shorter; secondary setae not numerous in basal and apical part; a row of curved light chaetoids ventrally on distal part.

Anterior and posterior setae of femur short, thick, situated in distal part; primary ventral setae in form of 2 sharp, large spines, secondary setae at the margin in form of 5-6 short, blunt or pointed spines; fewer small

spinules among the setae than on the forelegs; dorsal and surface setae as in Figure 112. Tibia dorsally with 2 pairs of thin, long setae in apical part, 2 thin, long, and one short seta, one behind the other further basally; ventrodiscal setae in form of 2 thick spines; 2 pairs of similar spines and a single spine further basally; 2-3 secondary setae posteriorly and anteriorly on the surface. Tarsus with 2 dorsal setae, distal and subdorsal, both thin; a similar large seta ventrally; small spinules between the setae and more basally; 2 secondary surface setae, anteriorly and posteriorly. Claw with large, basal spine.

(67)

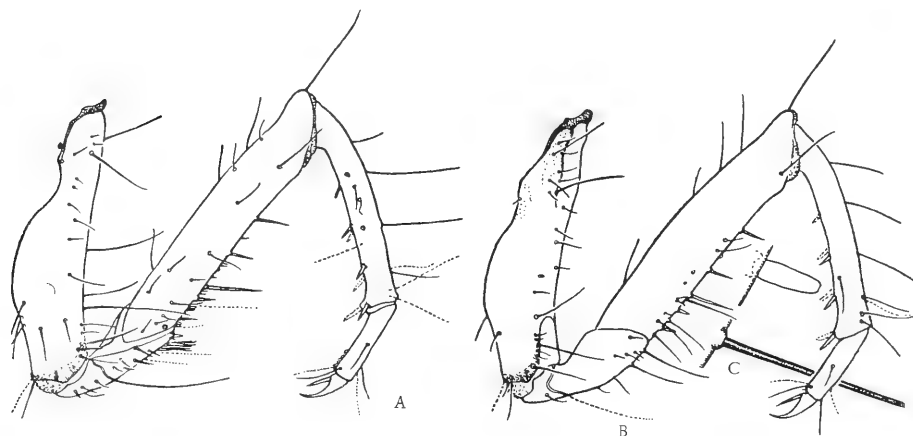


FIGURE 112. *Dicosmoecus palatus* McL. Midleg: anterior (A) and posterior (B), primary and one secondary ventral seta of femur (C)

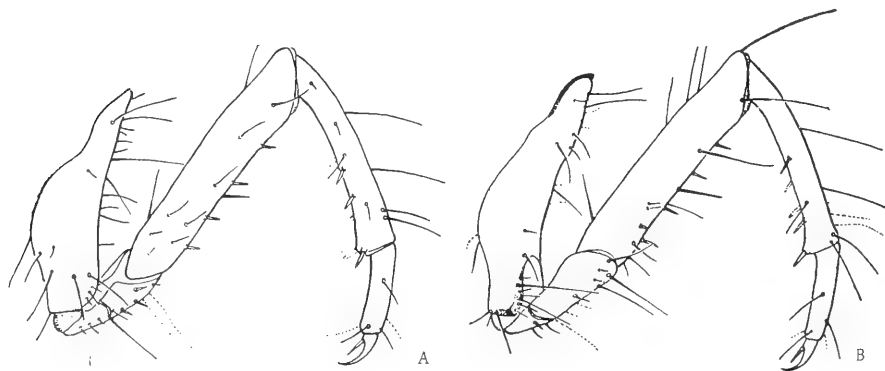


FIGURE 113. *Dicosmoecus palatus* McL. :Hind leg, anterior (A), posterior (B)

Chaetotaxy of hind legs (Figure 113) resembling that of midlegs, but with fewer white hairlike chaetoids on the trochanter; sparse, minute spinules present only basally at ventral margin of femur.



Arrangement of gills and number of gill filaments of  
D. palatus

Segment	Dorsal	Pleural		Ventral
2	4 4	4	4	4 4
3	4 4	4	3	4 4
4	4 4	3	3	4 4
5	3 3	2	2(3)	3 4
6	3 2(3)	0	0	3 4
7	3			3 3

Abdominal segment 1 slightly darker and shorter than the others; dorsal and lateral processes of moderate length; segment with short, thick, black setae on small sclerotized dots lateral to the dorsal process and dorsal to the lateral processes; similar dots and setae ventrally on a large elliptical median elevation and small, rounded lateral elevations.

Lateral line on segments 3-8 with fine, dense, golden brown hairs.

Gills on segments 2-7 (Figure 114).

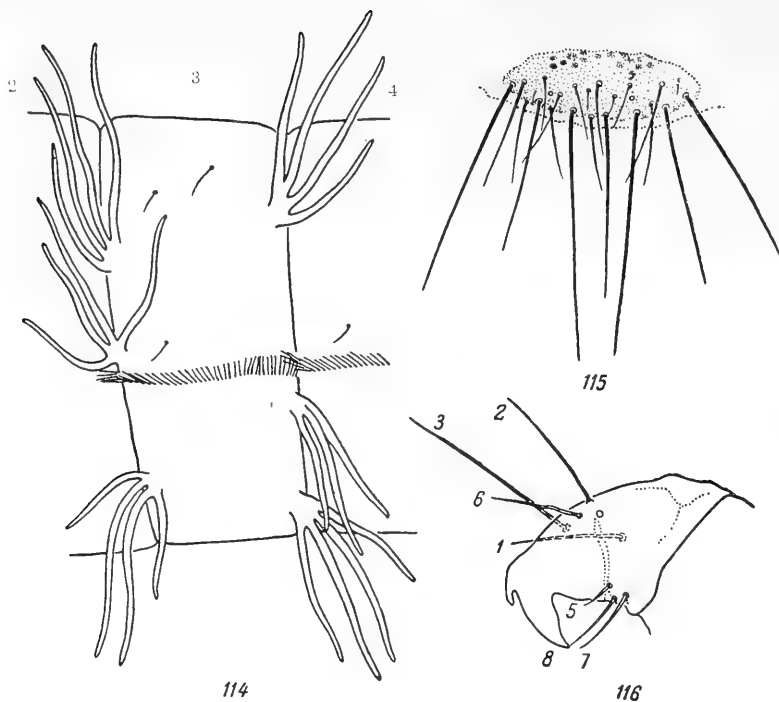
Tergite of abdominal segment 9 (Figure 115) golden brown, short, transverse, with 2 rows of small dots near anterior margin; medioanal seta thick, long; anterior-angle seta almost the same; thin, long, intermediate setae and a lateral seta between them and also an anterior-margin seta, which is similar but slightly smaller; 10-12 secondary setae, including 2 large, long setae, situated submarginally between the medioanal setae; the secondary median setae may be of different lengths in some specimens, like the lateral and intermediate primary setae.

Sclerite "b" of anal legs chestnut brown, with 4 long, black, marginal setae dorsally, with one black, long and 2 short, thin setae distally; distoventral seta short, thin; dorsal surface of sclerite with 10-12 secondary setae.

Sclerite "c" triangular, reddish brown, with broad, black, outer margin; a small, blackish brown seta near the posterior angle.

Claw (Figure 116) basally, and partly apically, reddish brown with blackish curved apex and 2 dorsal denticles; setae 1, 2, and 3 situated dorsally, thin; seta 6 thick, dark, situated on outer side; seta 5 small, situated near suture; seta 4 small, situated in basal area, thick; setae 7 and 8 light, of equal length.

Case (Figure 117) to 26-28 mm long, slightly curved, slightly compressed dorsoventrally, rounded posteriorly, made entirely of detritus by young larvae, while made posteriorly of detritus and anteriorly of sand grains by larvae of medium age, full-grown larvae make case entirely of dense, large, sand grains; sand grains larger on sides of case; ventral side flattened, posterior opening round.



FIGURES 114–116. *Dicosmoecus palatus* McL.:

114 — gills of abdominal segment 3; 115 — tergite of segment 9; 116 — claw of anal leg, outer view.

(70)

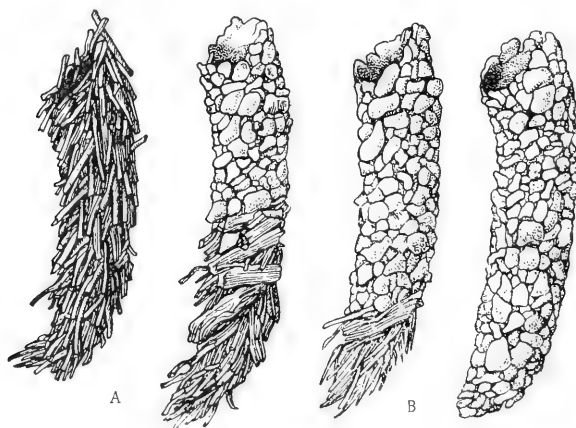


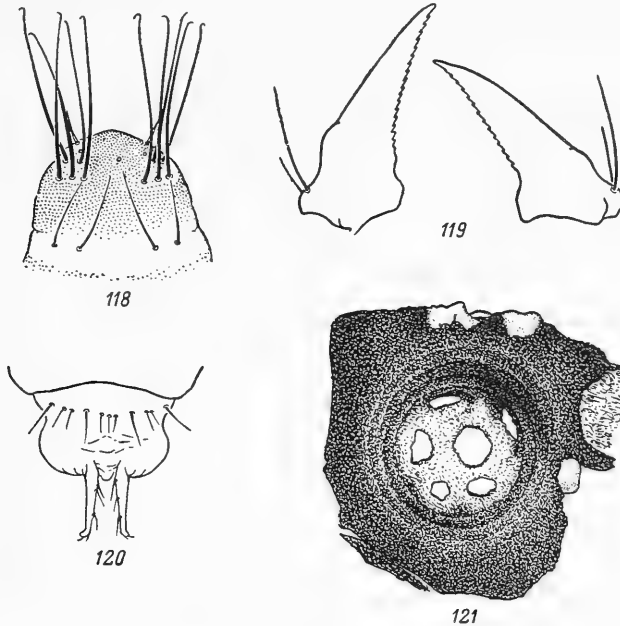
FIGURE 117. *Dicosmoecus palatus* McL. Cases of young (A) and full-grown (B) larvae

**Pupa.** Length 16–17 mm in male pupae, 18–19 mm in female pupae. Antennae of male pupae slightly longer than body, antennae of female pupae reaching beginning of segment 5.

Labrum (Figure 118) rounded anteriorly, with a small, sometimes indistinct, median process; anterior-margin seta small, situated lateral to median process; other 5 setae long, hooked; 3 setae of anteclypeus markedly shorter and thinner.

Mandibles (Figure 119) long, basal part separated by a fold; blade straight, serrated, dorsal seta larger than ventral.

(70)



FIGURES 118-121. *Dicosmoecus palatus* McL. Pupa:

118 - labrum; 119 - mandibles, dorsal; 120 - posterior end of body;  
121 - posterior covering membrane.

Wing sheaths reaching abdominal segment 6 in male pupae, shorter in female pupae. Dorsal process of abdominal segment 1 brown apically, saddle-shaped. Lateral line on segments 4-8, with small, light setae anteriorly, from end of segment 5 with dense, long chestnut brown setae, near median line on ventral side of segment 8 of female pupae, reaching to the base of the genital appendages in male pupae. Holding apparatus on segments 3-7 in form of brown plates with large black hooks; presegmental plates small, postsegmental plates transverse; number of hooks: III:2-3; IV:3-2; V:3+9-13; VI:3; VII:3-4. Four setae at the base of each anal rod. Anal rods short, straight, brown, finely tuberculate, with 3 small, thick, asymmetrically situated setae at the median margin, apically and subapically, with 2 small, curved, reddish brown setae (Figure 120).

Ventral genital appendages of male pupae long, projecting almost to end of short, thin anal rods (Figure 120).

Pupal case 23-24 mm long, made of coarse sand grains, rounded posteriorly, attached to the substrate at its anterior end by lateral strands

of short, brown filaments; dorsally, close to the point of attachment, anterior end of case covered by a membrane with 8–10 holes; posterior opening of case small, round, membrane with numerous holes (Figure 121).

Mode of life and habitats. Lakes, clear brooks, mountain rivers and rivulets, on stones, on solid bottom of sand and detritus, close to shore, often in large numbers, a few specimens occur deeper, to 9 m.

Distribution. Northeastern part of the European USSR, West and East Siberia; Altai, Sayans, the Maritime Territory, Sakhalin, Shantar Islands. In addition, Mongolia.

## 2. Genus *Ecclisomyia* Banks (*Praecosmoecus* Mart.)

**Full-grown larva.** Medium-sized, at most 12–13 mm long. Head and thoracic sclerites dark, without pattern. Forelegs short. Gills single. Case straight, of uniform width, made of small and large sand grains, with rough surface.

**Pupa.** Labrum with rounded anterior margin. Mandibles with serrate median blade. Wing sheaths reaching segments 3–4. Holding apparatus on segments 3–7. Anal appendages short, lobe-shaped, curved, pointed; subapical setae thick, long. Case, as in the larva, with dome-shaped anterior and posterior end; holes in membranous parts among sand grains of cover.

Distribution. USSR: Kamchatka, Kurile Islands, the Maritime Territory and Amur Region, Sayans, Altai. In addition, North America, including Alaska and California.

## 1. *Ecclisomyia digitata* Martynov (*Praecosmoecus digitatus* Mart.)

Lepneva, 1949: 179–180, Figures 38–40.

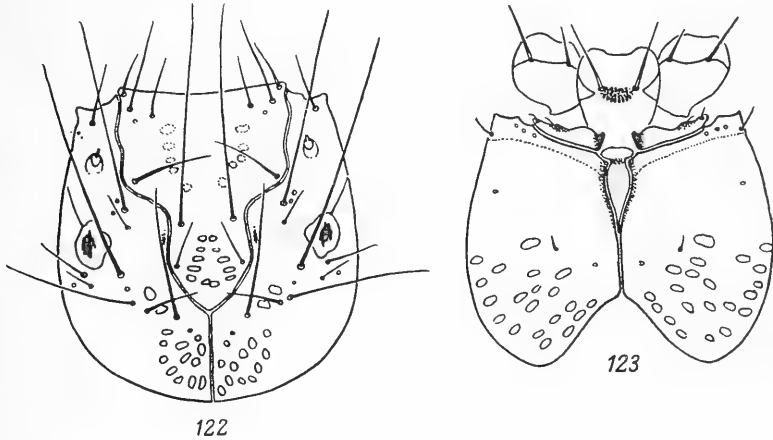
**Full-grown larva.** Length 11–12 mm. Head (Figure 122) chestnut brown, slightly lighter laterally near occipital foramen; dots visible only in preparations. Eyes on light area, far from anterior margin; antennae situated between eye and base of mandible. Frontoclypeus with wide anterior part; posterior part with triangular pattern of large reddish brown dots; similar dots lateral to coronal suture on the dorsal and lateral stripes and ventral side. Median and intermediate anterior-margin setae brown, moderately long; lateral anterior-margin seta light, curved; anterior frontal seta the same, intermediate frontal seta long, one of the longest on the head; posterior frontal seta short, thin, dark. Seta 9 dark, long; seta 11 situated further posteriorly, short; seta 7 short, situated near anterior margin; small, light seta 10 situated laterally in front of eye; seta 12 situated behind eye, moderately long; setae 13 and 14 situated in the middle, 13 small, 14 thick, dark, longest on the head; seta 15 thin, long; seta 17 slightly longer and thicker; seta 16 short, procumbent, light. Ventral setae 8 and 18 small, thin. Gula in form of oblong triangle, slightly narrower anteriorly; gular suture longer than gula (Figure 123).

Dorsal sclerite of labrum golden brown, median indentation shallow; setae as in *Dicosmoecus*; seta 1 small, light, spiniform; setae 2 and 4 in form of larger, blunt, light spines; seta 3 short, light brown; setae 5 and 6 brown, larger than the others, situated on the surface.

Mandibles short, black, reddish brown, at distal margin, with 4 small, blunt teeth; brush of light chaetoids near dorsal margin of median depression; outer setae thick, dark, ventral seta smaller than dorsal.

Sclerites of cardo in form of oblong, reddish brown plates with large, black, lateral spots; setae small, light. Submentum laterally in form of reddish yellow triangular areas connected by a transverse band of dense teat-shaped processes; light setae near anterior margin of the band (Figure 123). Stipes reddish yellow, setae small, light, outer setae slightly larger. Palpifer brown; distal seta light, small; basal median seta small; galea small, wide, reaching third segment of palp. Mentum in form of reddish brown semicircle; ventral sclerites narrow, slightly curved, yellow, rodlike, with a small yellow seta; palpiger bracketlike, brown; labial palp one-segmented, relatively large, with light sensilla.

72



FIGURES 122 and 123. *Ecclisomyia digitata* Mart.:

122 — head, dorsal; 123 — gula and part of maxillolabium.

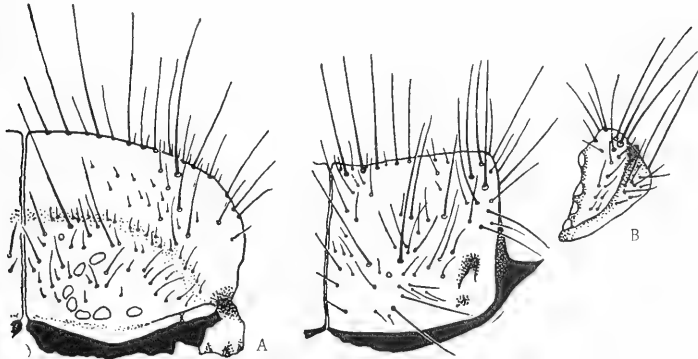


FIGURE 124. *Ecclisomyia digitata* Mart.: Pronotum (A), mesonotum (B)

Pronotum (Figure 124, A) covering segment completely, reddish brown, without pattern, with black posterior margin; posterior angles light, brownish; groove in anterior third with indistinct dark band in middle; dots large (in preparations); setae as in Figure 124.

Mesonotum (Figure 124, B) covering the segment except the margin, reddish brown, lighter posteriorly; posterior margin narrow, dark brown; lateral process blackish brown; a small dark reddish brown spot on surface near the process; dots small.

Anterior-median sclerites of metanotum large, triangular, situated close to median line; posterior sclerites broadly separated, pale yellow; lateral sclerites forming a bracket, brown, with reddish brown transverse band of 3 large dots; setae only in anterior part.

73 Pleurite of prothorax dark reddish brown, groove of pleural suture and basal margin of the epimeron blackish; seta of epimeron short, thick, situated near the suture; trochantin forming a rooflike dark plate, its seta small, light. Horn of prothorax grayish brown. Sternite small, yellowish.

Mesopleuron large, chestnut brown, with a dark, narrow stripe on the pleural suture; primary setae situated distally, thick, large, together with a group of secondary setae. Metapleuron lighter, epimeron in form of narrow, oblong plate, setae dark.

Legs uniformly reddish brown, without pattern; ratio of length of legs 70:100:96; setae brown or light brown; secondary setae not numerous.

Fore coxa slightly shorter than femur, massive; basodorsal seta long, thick, situated among small secondary setae; a short anterior and a long posterior seta dorsally, 3 large secondary setae further distally; anterior setae short, thick; distoventral setae moderately long, anterior larger than posterior; secondary surface setae sparse, mostly short; a number of long setae ventrally.

Anterior and posterior setae of trochanter small, thick; anterior apical-ventral seta light brown, long; distoventral anterior seta and middle anterior seta forming small brownish spines; both posterior setae long, large, situated apically and subapically; ventral side with light chaetoids, dense in apical part.

Femur convex dorsally, almost straight ventrally; primary basodorsal seta short, apical-dorsal seta slightly longer, both brownish; secondary dorsal setae light, not numerous; anterior primary setae short, thick, brown, posterior situated subventrally in basal area, lighter and thinner; 4 small, thick, spiniform, secondary setae anteriorly on the surface, 5-6 thinner setae posteriorly; 2 ventral, primary setae forming thick, large, yellowish spines; there are also small thick spinules at the margin, and several curved light spinules at the base.

Tibia slightly curved, wider apically; both distoventral setae in form of thick, blunt light yellow spines; minute spinules further basally; other setae thin, situated close to apex, dorsally and subdorsally, one anteriorly and 3 posteriorly. Tarsal setae distal, thin, light, 2 on the dorsal and 2 on the ventral side, anterior setae smaller than posterior. Claw thick, basal seta yellow, blunt, spiniform.

Mid-coxa long; basodorsal seta large, situated in a row of smaller, secondary setae; anterior distodorsal seta thick, large, posterior long, situated in a row of similar secondary setae; several short setae

subdorsally and anteriorly; anterior primary setae brown, thick, situated one behind the other in the distal area; primary distoventral setae moderately long, anterior larger than posterior; secondary setae ventrally.

Anterior and posterior setae of trochanter small; the basal of the 3 anterior ventral setae thick, long, the apical forming a small, thick spine, the middle seta short; both posterior setae long, situated apically and subapically; anterior area with sparser, light chaetoids than on the forelegs.

Femur slightly concave ventrally, slightly wider apically; a large basal seta, a long apical, and several thin, secondary setae dorsally; anterior and posterior setae short, situated close to apex; anterior and posterior surface with several small secondary setae; 3 large, pointed, light spines, 2 of them primary, ventrally; light spinules at the margin; several hairlike, light chaetoids like those on the trochanter at the base.

Tibia slightly curved; chaetotaxy as on forelegs. Tarsus straight; setae thin, 2 situated dorsally and 2 subventrally on sides of segment, posterior larger than anterior setae. Claw thinner than on forelegs, basal spine thin, light, brown.

Hind coxa resembling mid-coxa in form and chaetotaxy. Anterior and posterior setae of trochanter the same; distoventral anterior seta in form of light pointed spine, middle seta spiniform, short, light brown, basal seta brown, straight, long; both posterior setae also brown and large; apical part with a few light hairlike chaetoids.

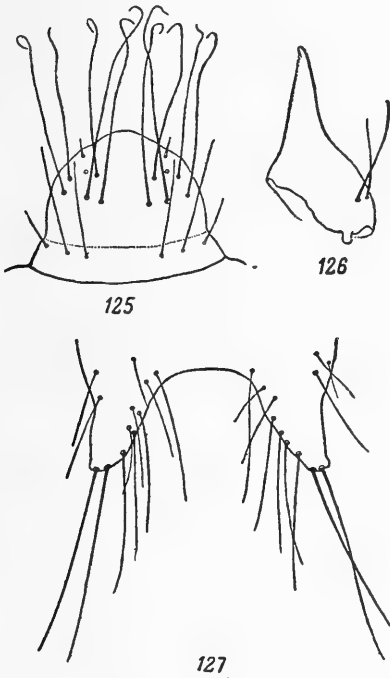
Femur straight, rodlike, wider apically; dorsal setae as on midlegs; anterior surface seta short, posterior situated subventrally near apex, brown, long; primary, ventral setae straight, brown, pointed, slightly longer, thick; 2 similar secondary setae near them.

Tibia slightly curved; both distoventral setae in form of short, light, blunt spines; the anterior distal of the 4 dorsal setae long, dark brown, the other 3 shorter, lighter and thinner. Dorsal setae of tarsus situated apically and subapically, the latter larger; distoventral setae shorter, light. Claw as on midlegs.

Abdominal segment 1 with short, small, thick, sparse setae dorsally

lateral to the median process and at the base of the lateral processes; ventral surface with small, sparse black setae on a slightly convex, transverse area.

(74)



74

FIGURES 125-127. *Ecclisomyia digitata* Mart. Pupa:

125 - labrum and anteclypeus; 126 - left mandible, ventral; 127 - anal appendages.

Lateral line from middle of segment 3 to beginning of segment 8. Gills single, only dorsal and ventral gills on segments 2-7; on segment 2 close to posterior margin, on segments 3-7 presegmental and postsegmental; lateral gills absent.

Tergite of segment 9 brown; medioanal and anterior-angle seta thick, long, blackish brown; intermediate and lateral seta thin, moderately long; 5-7 short, thin secondary setae.

Sclerite "b" of anal legs brown; a thick, long, black seta in the angle between median and distal margin; 2 setae at inner margin, 3 at the distal margin, outer surface with a group of 5-7 setae, ventral seta small, brown. Sclerite "c" yellow, outer margin blackish brown, seta small. Claw brownish, with a dorsal denticle.

Case straight, cylindrical, with rough surface, made of sand grains and small stones which project at some points; length 12-14 mm.

**Pupa.** Length 12.0-12.5 mm. Antennae reaching end of segment 8 in male pupae, end of segment 6 in female pupae, scape with small setae. Labrum (Figure 125) light, rounded anteriorly; anterior-margin seta small, transparent; 5 surface setae, long, golden brown, with hook-shaped end. Setae of anteclypeus thin, relatively short, outer seta smaller than the other 2. Mandibles (Figure 126) light brown; median blade coarsely serrate, slightly convex in the middle, barely curved distally.

Wing sheaths reaching segment 4 in male pupae, segment 3 in female. Midlegs natatorial, setae grayish brown, on tarsal segments 1-4; claw-shaped processes blunt, large, with microscopic spinules.

Lateral line from end of segment 5 to 8; setae dense, grayish brown, ventral ends close together in male pupae. Dorsal process of abdominal segment 1 rugose basally, slightly sclerotized, yellowish, projecting posteriorly in form of 2 short golden brown denticulate lobes; holding apparatus on segments 3-7, presegmental plates small, yellowish, postsegmental plates dark, transversely oval; spinules dark brown, numbers as follows: III: 3-4; IV: 3-4; V: 3-4 + 14-15; VI: 4-5; VII: 3-4.

Anal appendages (Figure 127) short, lobe-shaped, narrower distally, curved laterally, with pointed, denticulate end; setae as in Figure 127.

Case as in larva, straight, made of sand grains and small stones, 13-14 mm long, closed at each end by a dome-shaped membrane covered with a mosaic of fine sand grains and with small holes between the grains. Case attached to a stone by solid ligaments.

75 Mode of life and habitats. Brooks, streams, and small, clear mountain rivulets; on stones, in shallow water; this species is abundant in the Altai in small, pure mountain rivulets flowing into Lake Teletskoe (Korbu, Yan-Chili, etc.), in the Western Sayans and their foothills, rivulets Olen'ye, Sobach'ya, Rudnaya, etc.

Distribution. USSR: Sayans, northern and central Altai.

### 3. Genus *Ironoquia* Banks (*Allophylax* Banks, Caborius Navas)

**Full-grown larva.** Length 15-18 mm. Head and thoracic sclerites light, with distinct pattern of dots.



Gills on abdominal segments 1—8 or 2—8, with tufts of 8—24 filaments, some filaments bifid or trifid.

Case cylindrical, slightly curved anteriorly, made of flat, smoothly arranged particles.

**Pupa.** Length 15—16 mm. Wing sheaths reaching to abdominal segment 3. Midlegs natatorial with short, sparse setae. Anal appendages absent or in form of thin, small rods.

Mode of life and habitats. Small, usually slowly running water bodies; the pupae of some species live in moist soil.

**Distribution.** Western, northwestern, and central parts of European USSR. In addition, Central and Northern Europe, North America.

### 1. *Ironoquia dubia* Stephens

Struck, 1899: 326, Figure 25; 1900: Figure 8; 1903: 102—104, Plate II, Figure 7. — Ulmer, 1903: 70—71, Figure 50. — Siltala, 1904c: 61—62, Figure 14a. — Ulmer, 1909: 255, 313. — Döhler, 1914: 39—41, Figures 9—11, 16, 17, 25—29. — Lestage, 1921: 703—704, Figure 241. — Lepneva, 1940: 213—214.

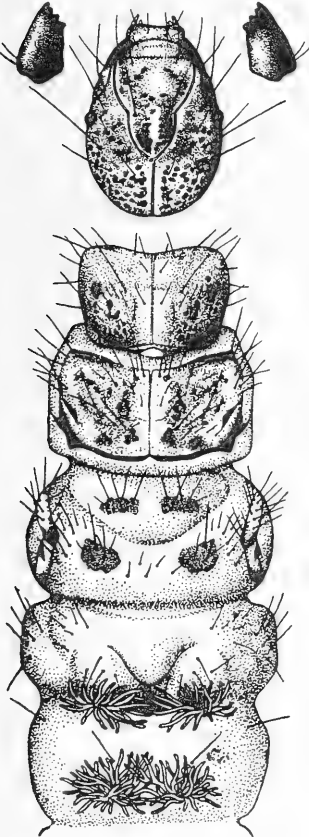


FIGURE 128. *Ironoquia dubia* Steph. Mandibles, head, thorax, abdominal segments 1—2, dorsal

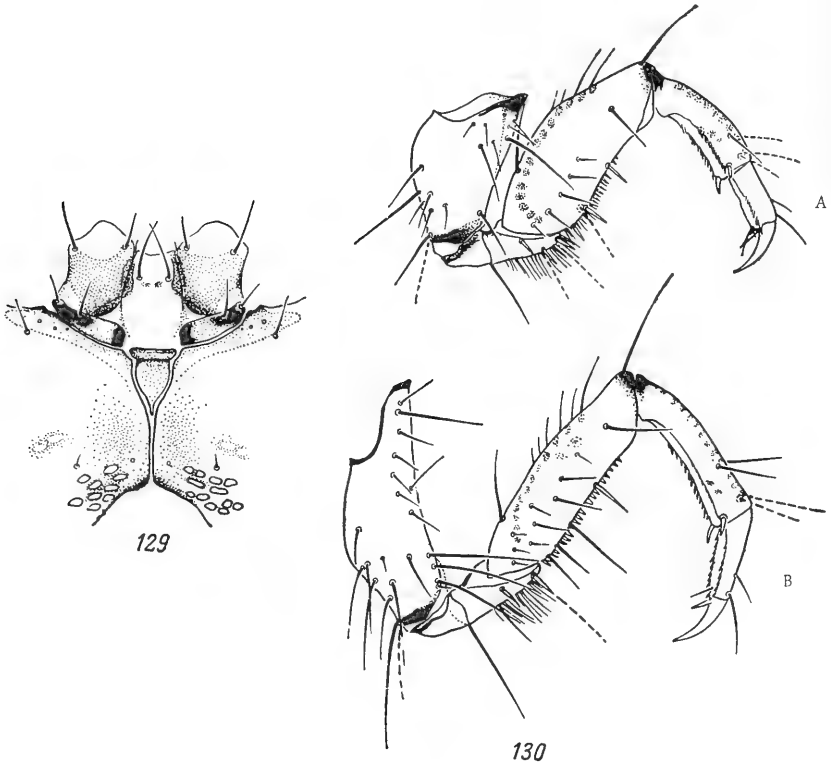
**Full-grown larva.** Length 15—17 mm. Head light, with distinct pattern (Figure 128); ground color dirty light yellow; stripes and spots light brown, dots light or light with dark margin; frontoclypeus dark laterally, with light spots in the middle which are large anteriorly and smaller in the middle and posteriorly.

Dorsal stripes light brown, indistinct to fork of frontal sutures; a light area along coronal suture; groups of dots on the stripes; posterior part of head with large dots dorsally and on the lateral stripes; similar dots ventrally lateral to occipital foramen. Gula oblong, with curved sides, gular suture almost as long as gula. Intermediate seta slightly smaller than median seta, both black, thick; lateral seta thin, light, curved; anterior frontal seta the same; middle frontal seta black, situated near tentorial pit; posterior frontal seta small, yellowish. Seta 9 long, thick, situated between eye and tentorial pit; seta 11 thin, short, situated behind 9; seta 10 small, light, situated lateral to anterior margin of eye; seta 7 brown, short, situated near anterior margin; seta 14 situated further posteriorly and medially, thick, black, the longest on the head; seta 12 situated behind the eye, short, thin, brown; seta 13 small,

situated slightly posteriorly to 12 and 14; seta 15 black, large; seta 16 procumbent, short, light; 17 in posterior angle of frontal sutures. Ventral seta 8 small, brown, at anterior margin; seta 18 small, light.

76 Dorsal sclerite of labrum reddish brown, a large, dark brown spot near the median indentation; sclerites of posterior angles narrow, curved sharply downward. Setae 1, 2, and 4 in form of light spines, setae 3 yellowish, short; setae 5 and 6 thick, dark brown, situated lateral to dark spot and the pit, 5 larger than 6.

Mandibles short, black basally and on greater part of surface reddish brown at apex (Figure 128); right and left mandibles with 4 large teeth; yellowish chaetoids near dorsal margin; outer setae situated near base, dark dorsal seta slightly larger than the short, light ventral.



FIGURES 129 and 130. *Ironoquia dubia* Steph.:

129 — anterior margin of head, gula, and part of maxillolabium, ventral; 130 — legs: foreleg, anterior (A), midleg, anterior (B).

Cardo (Figure 129) yellowish brown, with wide, black median margin and a blackish brown, large spot in the distal part, a light seta anteriorly near the outer margin, a brownish seta a short distance inward, both short, thin. Submentum (Figure 129) largely membranous, with yellowish brown sclerites anteriorly; a large, triangular, outer sclerite and 2 small, median

sclerites; median sclerite dot-shaped, with a large, dark brown seta. Stipes yellowish, with wide, blackish brown, median stripe posteriorly, outer seta long, brown, distal seta short, dark brown. Palpifer brown, with large, triangular, blackish brown, outer spot, distal seta dark brown, mediobasal seta small, light; galea cylindrical, broad, short, reaching middle of 3rd segment of palp; palps short, with brown sclerites, 1st segment shorter than 2nd; 4th segment small, sensillae light. Submentum brown, with wide, blackish brown, transverse stripe; median indentation deep; ventral sclerites in form of oblong, yellowish brown plates, seta small, light, thick; sclerite of palpiger yellow, horseshoe-shaped, palps small, cylindrical; sclerites yellowish brown, sensillae large, light.

77 Pronotum (Figure 128) with broad, light, dirty yellow, longitudinal, median stripe; surface light brownish, darker brown in area of dots; groove slightly dark in anterior third lateral to light median area; anterior margin narrow, reddish brown; posterior margin brown, markedly broader laterally, with blackish brown outer margin; a sharp reddish brown stripe, interrupted in middle of each half, extending along posterior margin from the median suture to the posterior angle. Anterior-angle seta submarginal, long, black; in front of it, 4 black, moderately long setae at the margin; a dark, short, inward-curved seta in middle of anterior area; long, black, medioanal seta near the light stripe; area of dots with long and short black setae and 12-14 small setae; 2 short, thick, black setae in middle of lateral margin among a number of other setae.

Mesonotum (Figure 128) with light, dirty white, broad, median stripe along the suture, elsewhere brownish, darker in the middle of each half and at lateral margin; anterior margin laterally with a wide, reddish brown stripe; posterior margin with a narrow, brownish transverse stripe; posterior angle with a large, blackish brown spot at the margin; a small, oblique, dark stripe some distance from anterior margin of spot; a row of 3 dots further anteriorly and inward from the stripe. Dark, median part of each half with large, chestnut brown dots, in a characteristic wedge-shaped pattern anteriorly, isolated or in groups of 3-4 dots posteriorly; 2 small and 2 larger dots on light background of the median stripe. Setae more numerous than on pronotum; 3 anterior-margin setae (some distance from the margin), of which the median is larger, the lateral smaller than the others; 2 dark, long, and 1 short setae at the anterior angle; 4 short or moderately long setae at the lateral margin, 3 setae some distance from the margin of which the anterior is one of the longest on the sclerite; medioanal surface seta situated posteriorly in area of dots, thick, long; 2 thick black seta close to outer margin of punctate area, one of these short, the other moderately long; 2 short, thin setae lateral to median suture. There are also small or minute setae on the sclerite.

Sclerites of metanotum (Figure 128) light brown, relatively large, with black or dark brown setae. Median anterior sclerites triangular, transverse, situated close together; primary anterior-margin seta large, black; complement of secondary setae consisting of 5-6 dark, smaller ones and several small, brownish setae. Posterior pair of sclerites slightly larger; medioanal seta black, long, intermediate and lateral seta thin, short, brownish; 9-10 small secondary setae. Lateral sclerites oblong, with dark oblique stripe and 2-3 large dark dots; a long, black, primary anterior-angle seta in anterior part; 18-20 secondary setae of different length; posterior part without setae.

Propleuron with a deep, short, black groove along the pleural suture; epimeron brown, seta dark, situated near suture, short, thin; episternum dark brown, with black margin and dense, large dots near suture. Trochantin black, small brown at distal margin; seta short, straight, thick, brownish; both small seta light, close together.

Pleurites of meso- and metanotum triangular, brown and light brown, pleurite of metanotum larger and slightly oblong; episternum with short distal margin adjoining pleural suture; pleural suture narrow with a group of dots basally on each side; dots also present in distal part of episternum; primary seta of episternum situated at the margin, black, longer than the others; seta of epimeron also situated distally, slightly smaller; secondary setae dark like the primary setae, and number 18–20 and 28–30, situated distally and on the surface, short, long and small.

Legs brown, with rows of large, dark brown dots at the base and in the middle of coxae and on dorsal side of femora and tibiae; distal part of trochanters ventrally with light, dense, slightly curved chaetoids; femora, tibiae and tarsi with small, dense, light spinules. Large setae usually black or dark brown.

Basodorsal seta of fore coxa (Figure 130, A) thick, moderately long; anterior distodorsal seta short, thick; posterior long, filiform at the end, situated near base of dorsal depression; 2 dark, long, secondary setae and a short, thin, light brown seta at the margin of dorsal depression; both anterior, primary setae short, thick, one in the apical area, light yellowish brown, blunt, the second in the basal area, pointed, dark; anterior surface subdorsally and subventrally with several small secondary setae, primary distoventral setae black, thick, moderately long; anterior one ventral in most specimens, slightly longer than the posterior subventral, rarely about the same length, or the posterior slightly thinner and longer than the anterior; a thick, long, black seta and several short, small setae ventrally in group of secondary setae.

78

Anterior seta of trochanter small, light brown; posterior one larger, short, black, pointed, a small secondary seta nearby; basoventral seta dark brown, straight, thick, pointed; both posterior ventral setae the same, slightly larger; anterior-ventral setae situated apically and subapically in form of small, light, thick spines.

Femur convex dorsally, slightly convex in basal area ventrally, slightly concave in distal area; distodorsal primary seta moderately long, thick, larger than the short basal seta; dorsal complement of secondary setae consisting of 3 thick, brown, short setae and 3 small light setae; anterior seta short, black, thick, situated subapically; posterior seta the same, situated subventrally in basal area; posterior surface with 4 short, thick, brown secondary setae resembling posterior seta of trochanter; a surface row of 5 smaller setae of different size anteriorly; primary ventral setae represented by 2 large, light, thick spines; a similar but smaller spine close to basal margin of segment, together with several light, curved chaetoids resembling those on the trochanter.

Tibia massive; distal part uniformly wide; dorsal side posteriorly with a row of large dark dots, similar dots at the base. Primary ventral setae represented by 2 blunt, light, distal spines, the anterior smaller and situated subventrally; dorsal group apically and subapically with 4 thin,

light, setae, one projecting and longer than the others. Tarsus straight, short, relatively thick; the posterior of the 2 dorsal setae situated distally, longer than the others, brown; anterior seta small, light, subapical; both ventral setae thin, dark.

Mid-coxa (Figure 130, B) oblong, with slightly concave dorsal surface; dorsal depression shallow; basodorsal seta long, black; anterior apical dorsal seta longer and thinner, situated near depression, 2 secondary setae further distally, close together, one of them shorter; posterior apical dorsal seta slightly longer; the row consists of 2 very long, 2 long, and several short, yellowish, secondary setae; basodorsal area with a number of thin secondary setae, including long setae; a row of 6 thick, dark, small, and short setae subdorsally; anterior primary setae thick, black, moderately long, situated in distal area; distoventral seta long, black, anterior slightly longer than posterior; several large and small brownish secondary setae ventrally in the apical area.

Anterior seta of trochanter submarginal, small, brown, thick; posterior seta thinner, short, dark brown, near 2 small secondary setae; the distal of the 3 anterior-ventral setae in form of a large yellow spine, middle seta short, thick, dark, basal seta black, long; both posterior setae the same, apical seta longer than subapical.

Femur longer and narrower than on forelegs; dorsal side slightly convex, ventral side slightly concave distally; basodorsal seta short, black; apical-dorsal seta dark, long; secondary setae in distal area consisting of 5 small, light setae and a short brownish seta; anterior seta subapical, short, black, posterior one situated closer to ventral margin, dark but thinner and slightly longer; anterior surface with several short and thick, dark brown, secondary setae; posterior surface with a row of 4 short, thin setae resembling posterior seta of trochanter, and 2 small, secondary setae. Ventral primary setae represented by a large yellowish spine and a thick, long, black, spiniform seta; further basally, 2 similar secondary setae.

Tibia narrow, slightly wider distally, with row of dots on posterior surface; 2 thin setae dorsally, a long, light, anterior seta and a short, dark posterior seta; 2 short, thin setae close together subapically; primary distoventral setae in form of 2 thick brown spines, anterior situated subventrally and slightly thinner than posterior.

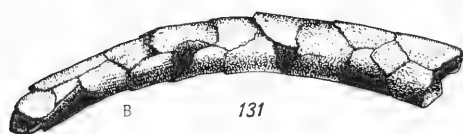
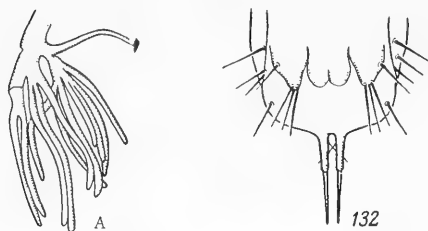
Tarsus straight, narrow, about half as long as tibia; dorsally, a straight, thin, long, light brown seta slightly shorter but thicker than on the tibia; subapical seta short, light; both ventral setae short, thin, brownish.

Claw long, thick; basal seta in form of a yellow spine.

Hind legs resembling midlegs in size and form.

Femora slightly shorter, wider, distally; ventral side straight, dorsal side slightly convex. Tarsus slightly longer than tibia. Large basodorsal seta of coxa shorter and slightly thinner than on midlegs; anterior distoventral seta markedly longer than posterior. Posterior surface seta of trochanter long, thin, black, larger than on midlegs, 3 secondary setae nearby; posterior distoventral seta very long, twice as long as the basoventral seta. Posterior seta of femur thin, longer than on mid-femur; primary ventral setae represented by a yellow spine and large, black, spiniform setae; spine longer than on midlegs, seta shorter; further basally, the large setae are arranged as on the midlegs, with thick, short setae

nearby; a large, black seta with filiform end distal to the spine; it is absent on the midlegs; in contrast to those on midlegs, the setae of the posterior surface row are long and filiform. Hind tarsus without distodorsal setae of the midleg, but with a brown subapical dorsal seta which is longer and thicker than the others. Claw slightly longer and narrower than on midlegs.



FIGURES 131 and 132. *Ironoquia dubia* Steph.:

131 — ventral gill of abdominal segment 4 (A), larval case (B); 132 — posterior end of female pupa, ventral. (131, A — after Siltala; 132 — after Döhler).

Abdominal segment 1 with large dorsal and lateral processes. Lateral line present on segments 3–8; gills on segments 1–8, with 4–23 filaments (Figure 131, A), dorsally and ventrally, also on pleural segments 2–3.

Sclerite of segment 9 yellow, with pale, indistinct grayish dots; medioanal and anterior-angle setae black, long; intermediate and lateral setae short, thin; a thin, secondary seta between the medioanal setae, sometimes accompanied by a small seta.

Sclerite "b" of anal legs yellow; setae black; mediolateral angle seta thick, the longest on the sclerite, together with 2 other setae at the distal margin; a thick, long, seta and a distal outer seta which is

thinner, and moderately long; ventral seta short, thin; 2–3 small setae on dorsal surface. Sclerite "c" yellow, with blackish outer stripe; seta small, reddish brown. Claw light, with dark apex, dorsally with 2 denticles one above the other; seta 1 short, 2 and 3 long; seta 6 small, situated on outer side of distal part; seta 4 small, near 8; seta 5 on outer side, slightly larger; setae 7 and 8 light, straight, close together, situated basally.

Case 16–18 mm long, slightly curved, with smooth surface, made of large, flat plant particles arranged symmetrically in a mosaic; posterior end covered with fine plant particles, with large opening in the middle (Figure 131, B).

**Pupa.** Length 16 mm. Antennae reaching middle of abdominal segment 5, scape with 7 small setae. Labrum light, soft; setae relatively short; anterior pair marginal, smaller than the others. Mandibles with wide basal part; distal part narrower, slightly curved at the base; median blade coarsely serrated; outer setae thick, of the same length.

Wing sheaths reaching abdominal segment 3. Mid-tarsi with short, sparse setae on segments 1–4; setae sparser on the 2 proximal segments of hind tarsi, sometimes also on 3rd segment. Holding apparatus on abdominal segments 3–7; number of spinules: III:2–3; IV:2–3; V:2–3+5–7; VI:2–3; VII:2–3. Lateral line on segments 5–8 with short, dense setae; segment 4 posteriorly with several small setae. Gills as in the larva. Segment 9 short, with 9 large setae near posterior

margin. Anal rods (Figure 132) very small, hard and denticulate at the end, each with 3 setae which are longer than the rod: one median basal, 2 subapical, all thick, strong, dark. Ventral appendages of male pupa obliquely truncate, penis sheath bifid.

Pupal case as that of larva; anterior and posterior ends covered with flat plant particles; anterior and posterior membranes with small holes.

Number of gill filaments in *I. dubia*

Segment	Dorsal	Pleural		Ventral
1	7-8			7-16
2	22-23 24-25		7	12-18 21-22
3	20-22 19-21	9		14-15 22-23
4	12-14 11-13			10-12 19-20
5	10-11 9-11			9-10 11-12
6	8-9 10-11			7-8 7-8
7	8-9 10-12			7-8 13-14
8	5-6			4-7

Mode of life and habitats. Feeding on detritus in overgrown, ditches, and in brooks and streams with a slow current; the pupa probably lives outside the water.\*

Distribution. Northwestern, western, and central parts of European USSR. In addition, Central and Northern Europe.

## 2. Subfamily NEOPHYLACINAE Schmid

**Full-grown larva.** Medium-sized, 11-14 mm long. Head oblong, bent ventrally; eyes almost in middle of head; antennae close to anterior margin; frontoclypeus large, with large, wide, anterior part, and narrow posterior part; gula narrow.

Labrum with broad, membranous, anterior margin. Mandibles long, without teeth; brush of chaetoids in median depression of mandible.

Pronotum long, its anterior margin projecting and covering head. Mesonotum markedly smaller. Anterior and posterior pair of median

\* Large numbers of full-grown larvae occur in road ditches in the Zaluch'e area in the Kalinin Region. Although the larvae were ready for pupation, we did not find any pupae after the larvae had disappeared.

tergites of metanotum small, lateral tergite dark, large, oblong. Prothoracic horn small, brownish. Dorsal and lateral processes of abdominal segment 1 with slightly sclerotized apex. Gills single. Case made of sand grains, with small stones laterally, narrower posteriorly, flattened ventrally.

**Pupa.** Length 10–14 mm. Antennae longer than body, curved at end. Labrum with broadly rounded, slightly projecting median process. Mandibles with wide, straight, apical part and slightly serrated in middle. Anal rods thin, not wider basally.

Mode of life and habitats. Rheobiont, phytophagous; mountain brooks and rivulets; on stones overgrown with algae.

Distribution. USSR: Altai, Sayans, Maritime Territory and Amur Region, Sakhalin. In addition, Central Himalayas, China, Tibet, Japan, North America, eastern Australia.

## 1. Genus *Neophylax* McLachlan (*Halesinus* Ulmer)

Full-grown larva\*

Mode of life and habitats. Rheophilic, in brooks and rivulets, mainly in mountains.

Distribution. USSR: Altai, Sayans, Maritime Territory and Amur Region, Sakhalin. In addition, China, Himalayas, Japan, North America.

### 1. *Neophylax ussuriensis* Martynov

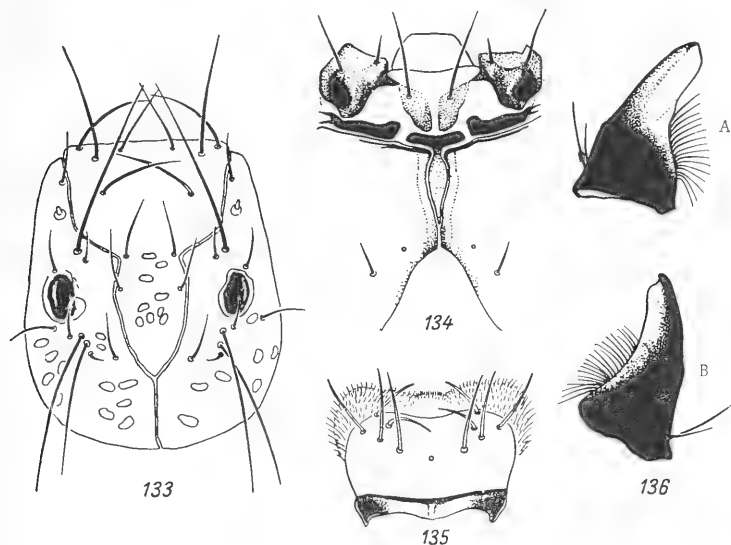
Lepneva, 1949:182–184, Figures 41–51.

**Full-grown larva.** Length 12–14 mm. Sclerites and most membranous areas with tuberculate surface. Head (Figure 133) oblong. Eyes situated at about mid-length of head. Antennae situated in middle between eye and anterior margin, with dark sensilla. Frontoclypeus wide and large anteriorly, with small median indentation, posterior part narrow, much smaller. Head mainly chestnut brown, darker near anterior margin, with light brown lateral stripes from the fork to the curvature of the frontal sutures, with light brown areas along the gula and in each half ventrally. Gula narrow, pointed posteriorly. Dots large, light; anterior part of frontoclypeus with 2 dots on each side and one dot further posteriorly, large light dots in a characteristic wedge-shaped pattern on posterior part; similar dots on the dorsal and lateral stripes; dots indistinct on sides of ventral surface. Large setae black; anterior-margin setae, especially the long median seta, dark; lateral seta transparent, short, curved inward; anterior frontal seta the same, light, procumbent, slightly longer; middle frontal seta small, light, near the tentorial pit; several small light setae on each side, in the posterior part, including the posterior primary seta, situated in the middle of that part. Seta 7 dark brown, situated between antenna and anterior margin; seta 9 long, thick, larger than the others; seta 11 some distance posteriorly, small, light brown; seta 10 on light

\* A diagnosis cannot be given, as the larvae of the 2 other genera of the subfamily are not known.



background anterior to eye, small, brown; setae 12 and 13 situated behind the eye, 12 short, dark, 13 small, light; black setae 14 and 15 situated medially one behind the other; seta 16 short, procumbent; seta 17 small, dark, situated near suture, anterior to the fork; on the ventral side, seta 8 (Figure 134) situated close to anterior margin, small, dark, seta 18 small, pointed, light brown, situated among dots.



FIGURES 133–136. *Neophylax ussuriensis* Mart.:

133 – head, dorsal; 134 – anterior part of head, gula and part of maxillo-labium, ventral; 135 – labrum; 136 – left mandible, dorsal (A) and ventral (B).

Labrum (Figure 135) with wide, membranous anterior margin; dorsal sclerite tuberculate, chestnut brown; posterior margin and posterior angle sclerites blackish brown; sclerite with shallow median indentation; seta 1 barely visible on membrane among hairs; setae 2 and 4 transparent, thick, curved inward, close to anterior margin; seta 3 situated in anterior angle, short, brown; setae 5 and 6 dark, slightly larger.

Mandibles long, black, without teeth; brush near dorsal margin of median depression, chaetoids light, yellowish; outer setae dark brown, dorsal seta much longer than the ventral (Figure 136).

Pregula black, projecting beyond margin of head, fused with gula, forming a characteristic, T-shaped sclerite (Figure 134); sclerites of cardo large, dark brown in middle, with large, black spots on inner side and laterally, both setae small, one light, the other brownish; median sclerites of submentum in form of 2 yellowish brown, oblong plates with a brown long seta near anterior margin; lateral sclerites triangular, brownish; stipes reddish brown, with large black lateral spot; submarginal distal setae brown, lateral longer than median. Palpifer broad, dark brown,

with black outer spot, membrane with one dark brown distal and a small, light median seta; galea short, in form of tubercle with large sensillae; palp short, segments of about the same length, 2 proximal segments with open, dark sclerites, and much wider than the following 2 segments; 3rd segment with dark lateral spot; 4th segment light, with large sensillae.

Mentum in form of a narrow, transverse ring with a dark black stripe; ventral sclerites oblong, brown, seta brownish, subapical; palpiger large, horseshoe-shaped, brownish; labial palp yellowish, with large sensillae.

Pronotum (Figure 137) with projecting anterior margin; anterior angles rounded; surface yellowish, with indistinct, light brown pattern consisting of a longitudinal median stripe along the suture and curved stripes in each half; anterior margin broad, with pinkish brown stripe; anterior margin with a dense row of blunt, thick, and smaller, pointed, light spines; posterior margin broad, with a narrow black transverse stripe, interrupted in each half; process of posterior corner large, reddish brown, with broad black margin; surface with light brown, distinct dots, smaller along the suture, large, round and oblong in each half and in posterior area. Sclerite with primary and secondary setae, except in the punctate posterior area; secondary setae spiniform, thick, short, and small, black and light, and several, thin, short, setae; primary anterior-angle seta black, moderately long, at some distance from the margin; medioanal seta longer; intermediate seta slightly shorter than the anterior-angle seta; the other 2 setae situated among secondary setae.

Mesonotum smaller than pronotum, each half of about the same length and width; color chestnut brown, yellowish in the posterior angle with a reddish brown, oblique stripe; anterior margin with black stripe in middle; lateral margin broadly black; process of posterior corner with large, round, light spot; posterior margin laterally with a narrow brown area. Dots large, light; each half of tergite with a pair of indistinct small dots near suture. Secondary setae black, short, and small, thick, less numerous than on pronotum, absent on the posterior angle; anterior-margin primary seta moderately long, situated in the middle; anterior-angle seta long, situated some distance behind the angle; medioanal seta situated in posterior area, thinner than the others.

Tergites of metanotum of the anterior median pair smaller than those of the posterior pair; both pairs small, grayish brown, pale, with irregular outline; setae black; anterior-margin primary seta of first pair of tergites thick, long, flanked by several secondary setae; medioanal seta of posterior pair long, thick, their intermediate and lateral setae smaller, and few secondary setae; lateral sclerites much larger than median sclerites, oblong, dark brown, with wide, almost straight lateral margin.

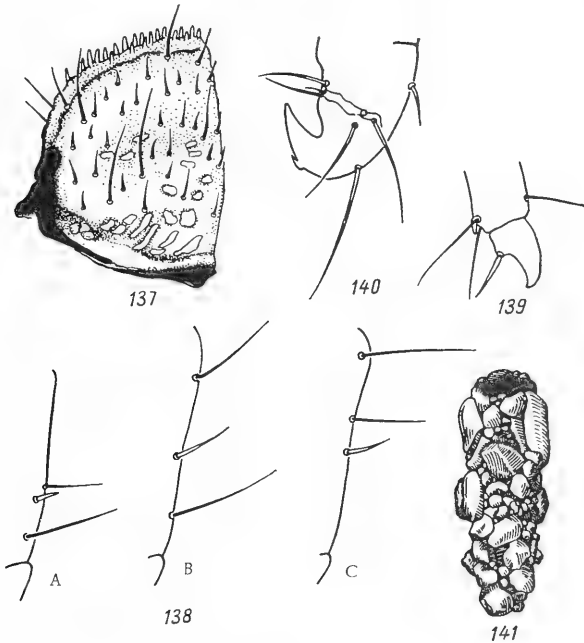
Dark transverse stripe replaced by a large spot and light oblique streaks; setae restricted to apical area; primary anterior-angle seta long, thick, subapical near an almost equally long secondary seta; the other 10-11 secondary setae short or small.

Propleuron in form of small, oblong sclerite with deep, black suture groove; epimeron reddish brown, with wide black basal margin and narrow, dark brown, apical margin; a black seta near the suture; episternum dark brown; trochantin with small black sclerite, seta strong, black, setules light.

Mesopleuron large, triangular, epimeron narrow, with black posterior margin; episternum much larger, yellowish brown; pleural suture in form of a thin, black stripe; distal margin of sclerite broadly black posteriorly; seta of episternum short, black; seta of epimeron smaller and thinner; 11-12 secondary setae on episternum; 2-3 on epimeron. Metapleuron oblong, suture in form of narrow black stripe; episternum basally and anteriorly with large dots; epimeron narrow, with wide black posterior margin, interrupted subapically; distal margin of sclerite broadly black near the suture, further posteriorly with long brownish process; primary seta of epimeron short, thin, near margin, together with 2-3 smaller secondary setae; process of epimeron also with a group of secondary setae; primary seta of episternum black, moderately long, situated before the spot, in a group of 11-12 smaller secondary setae.

Prosternite in form of single, golden brown sclerite near posterior margin of segment; small, oblique, reddish brown sclerites anteriorly on each side, between them, a small horn which is no longer than the median sternite. The 2 mesosternites situated laterally close to posterior margin; a large, reddish brown sclerotized dot situated lateral to each mesosternite. Metasternites similar but smaller, grayish brown.

Legs reddish brown; apical margin of coxa and trochanter blackish; tibia and base of tarsus black or blackish brown; large dots present on basal part of tarsus and subdorsally on posterior surface of femora and tibiae of all legs. Ratio of length of legs 81:100:98. All setae primary, except on tarsi, most of the large setae brown or dark brown.



FIGURES 137-141. *Neophylax ussuriensis* Mart.:

137 - pronotum; 138 - ventral setae of femur of fore- (A), mid- (B) and hind (C) legs; 139 - end of tarsus and claw of hind leg, posterior; 140 - claw of anal leg, lateral; 141 - larval case.

Primary basodorsal seta of fore coxa short; anterior dorsal seta smaller and thinner, together with 2–3 small secondary setae; posterior dorsal seta thin, long, dark brown, situated near depression; 4 similar thin, long, secondary setae and 2–3 small setae at the margin; both anterior surface setae light brown, small, subdorsal; several small secondary setae anteriorly and ventrally; distoventral setae light brown, the short posterior seta markedly larger than the small anterior seta.

Trochanter dark brown; anterior seta small, light brown, blunt or forked; posterior seta thick, dark brown, short, pointed, both situated distally; basoventral seta in form of long, thick, light yellow spine; distal and middle, anterior ventral setae in form of small, yellow spines, both posterior setae long, brown, thick, situated apically and subapically; some light, isolated, curved chaetoids.

Femur long; slightly convex dorsally; apical dorsal seta short, dark brown; basodorsal seta slightly smaller; anterior seta situated subapically, short, dark; posterior seta situated near base, thick, long, dark brown; primary ventral setae (Figure 138, A) in form of a similar, but shorter seta and a short, light spine.

84 Tibia long, wider distally; distoventral setae in form of 2 small, thick, yellow spines; other 4 setae situated dorsally, the posterior apical, and anterior subapical seta long, dark brown, the other 2 dorsal, short, thin, brownish. Tarsus narrower distally; both distoventral setae short, thin, brownish; small, thick spinules near them; dorsal setae long, brown, subapical seta nearly twice as long as apical seta. Claw brown, curved; basal seta in form of straight, transparent spine with filiform end.

Mid-coxa long; basal seta short, dark brown; anterior distodorsal seta slightly larger, thick; several small, brown secondary setae situated more basally at the margin; posterior distodorsal seta situated near depression, long, thin; 3 thin, long, secondary setae, more distally, one thick, short seta and 2–3 small setae further basally; both anterior, primary setae small, situated apically; anterior and ventral side with several small brownish secondary setae; posterior distoventral seta short, light brown; anterior seta half as long.

Anterior seta of trochanter small, brown; posterior dark brown, short, thick; anterior apical-ventral seta in form of thick, pointed, yellow spine; middle seta similar, light, spiniform; basoventral seta long, brown; both apical and subapical posterior setae the same.

Femur rodlike, slightly convex dorsally; basodorsal seta short, brown; apical-dorsal dark brown, slightly longer and thinner; anterior primary seta small, reddish brown, situated subapically; posterior seta subventral near apex, dark brown, moderately long, the basal of the 2 ventral setae, long, the other short, spiniform, closer to middle of segment, both brown (Figure 138, B).

Tibia long, slightly shorter than femur, slightly wider apically; distoventral setae in form of 2 small, yellow spines; 2 dorsal setae situated apically and subapically; posterior subapical seta long, anterior apical seta the same, slightly shorter, both brown. Tarsus narrower distally, longer than on forelegs; ventrodorsal setae as on fore tarsus; distodorsal seta thin, yellowish, short; subapical seta long, brown. Claw large, curved; basal spine transparent, light, filiform at the end.

Hind legs resembling midlegs, with the following differences: basodorsal seta of coxa longer and thicker; both anterior and posterior distodorsal setae also long; secondary dorsal setae of coxa more numerous than on midlegs, setae short and long. Posterior seta of trochanter dark brown, long. Femur straight, shorter than mid-femur, wider apically; both ventral setae situated almost in the middle (Figure 138, C), basal seta in form of small yellowish spine, apical seta short, spiniform. Tarsus and claw as in Figure 139.

Dorsal process of abdominal segment 1 slightly sclerotized, a row of 12-13 long, thin, black setae and several small setae lateral to it; lateral processes slightly darker than other surface; ventral side convex, slightly sclerotized, covered with small setae; small, sausage-shaped, white appendages on a thin stalk lateral to convex area (gill?). Lateral line on segments 2-8 with small, dark hairs. Single gills on segments 2-7; filaments of gills long.

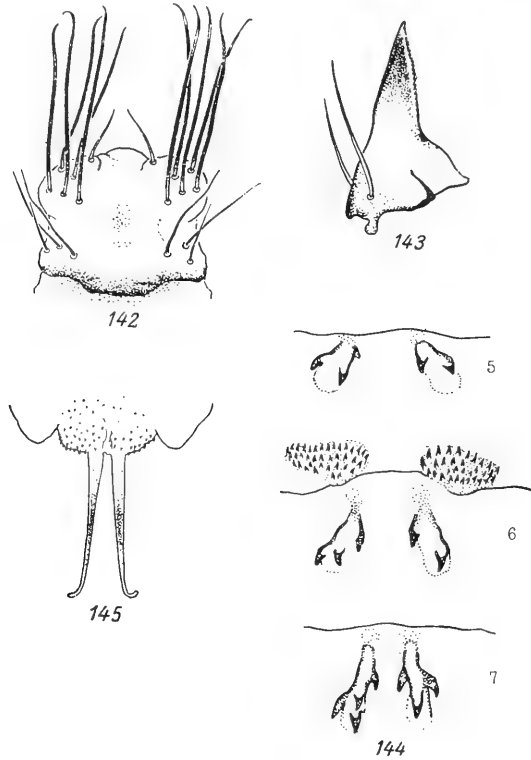
Tergite of segment 9 chestnut brown, with light spots; posterior margin with scalloped margin; medioanal seta long, black; intermediate and lateral seta thin; anterior-angle seta dark, thick, long, resembling the medioanal seta; 2 setae between the medioanal setae, one short, the other long, light; sometimes 1-2 additional, light setae near the margin.

Number and arrangement of gills of  
*N.ussuriensis*

Segment	Dorsal	Pleural		Ventral
2	1 1		1	1 1
3	1 1	1	1	1 1
4	1 1	1		1 1
5	1 1			1 1
6	1 1			1 1
7	1 1			1 1

Sclerite "b" of anal legs brownish to dark brown, darker and blackish ventrally; indistinct, large light spots near base on dorsal side; 3 large black setae near apex, one median in the angle, another nearby, both long, thick; lateral seta long, thinner, a moderately long, dark seta subapically near the median margin; ventral seta short, black. Sclerite "c" brown, with broad black outer margin; seta short, light. Claw (Figure 140) dark reddish brown, blackish at the curvature and at the base; membranous bar on the outer side, narrow in middle, wider basally; dorsal denticle large, light brown. Seta 1 on dorsal side of basal area, short, thick, light; seta 2 subdorsal, situated on outer side, long; seta 3 medially in distal area,

straight, thick, longer than the others; seta 6 at margin of base, short, thick; basoventral setae 7 and 8 short, light, 7 slightly larger; 5 and 4 not seen (probably present but very small).



FIGURES 142-145. *Neophylax ussuriensis* Mart. Pupa:  
 142 - labrum and anteclypeus; 143 - right mandible, ventral;  
 144 - dorsal hooks of plates of abdominal segments 5-7; 145 -  
 anal appendages.

Case 15.0-18.5 mm long (Figure 141), made of coarse sand grains, slightly curved, tapering posteriorly, with slightly flattened ventral surface, small stones and coarse sand grains laterally; posterior end with membrane with a round opening covered above by a small stone, leaving only a semicircular slit; this slit is sometimes also closed with a small stone, so that entire posterior opening is covered.

**Pupa.** Length 12-14 mm. Antennae slightly longer than body, slightly curved at the end; scape longer and thicker than following segments, with 3 black setae of moderate length and 2 small setae; segment 2 with small brown tuberculate area, tubercles with several longer black, and 18-20 small, light setae. Labrum (Figure 142) wide, light brown in middle, with darker brown median stripe, slightly sclerotized laterally, whitish;

anterior margin broadly membranous, with rounded median process; seta 1 small, light, situated on the membrane near the process; other setae situated on sclerite, large, black, hooked at the end. Mandibles (Figure 143) blackish brown; distal part relatively wide, median blade serrated; basal setae dark, about the same length. Wing sheaths reaching end of segment 4. Midlegs natatorial; golden setae on tarsal segments 1-4.

Abdominal segment 1 dorsally with brownish sides, and a thick brownish black ridge posteriorly, with small denticles in the middle. Lateral line from end of segments 5-8; setae dense, grayish brown. Gills absent. Holding apparatus on segments 3-7; presegmental plates of 2 posterior segments oblong, with denticles in the middle and laterally; plates yellowish brown, denticles dark brown or blackish; number of denticles: III:2-3; IV:2-3; V:2-4+ 30-32; VI:2-4; VII:3-5 (Figure 144).

Anal rods (Figure 145) long, thin, brown, thin, light, hook-shaped terminally, with small, needlelike spinules more numerous at end of rod.

86 Genital appendages of male pupae short; penis sheath bifid.

Case 16-17 mm long, flattened ventrally, made of sand grains and small stones, with larger stones at sides; anterior opening covered by a flat stone which leaves a transverse slit ventrally and dorsally, the slit crossed by strands of tissue; ventral slit larger than dorsal, its ventral margin with several large, thick, dark brown strands of tissue which attach the anterior end to a stone; posterior end also covered by membrane and concealed by a small stone, but the stone is more convex, sometimes of irregular shape; 1 or 2-3 large disks on thick stalks around the small stone; both posterior and anterior ends of the case thus are attached to the stone.

Mode of life and habitats. Rheobiont; phytophagous, in brooks and small mountain rivulets, on stones, in shallow water, at a depth of 0.1-0.5 mm.

Distribution. USSR: Altai, Sayans, Maritime Territory and Amur Region, Sakhalin. In addition, Japan.

### 3. Subfamily APATANIINAE Ulmer

**Full-grown larva.** Small to medium-sized, 5-16 mm long. Head convex dorsally, short ventrally to length of gula; frontoclypeus relatively large; pattern absent or indistinct, dots indistinct, light; large setae relatively thin; a number of short, thick setae among the smaller setae; head sometimes with secondary setae.

Labrum with broadly membranous anterior margin; posterior-angle sclerites oblong. Mandibles spatulate; apex without teeth, smooth, sometimes finely serrated.

Dorsal side of prothorax strongly convex, ventral side short; pronotum with projecting anterior margin, posterior margin also curved, lateral margin very short; transverse groove in anterior third absent, in contrast to *Limnophilinae*. Dots as on the head. Posterior margin of segment with only a median, broad, dark, transverse stripe.

Mesonotum with broadly membranous posterior margin, with slightly, sometimes incompletely, sclerotized posterior part; dots dark, some of them

distinct, border absent, except the posterior angle spot, which is very large in Apataniini. Metanotum without anterior and posterior median tergites; lateral tergites indistinct posteriorly.

Propleuron with small, short epimeron; mesopleuron large, darker and larger than metapleuron.

Prothoracic horn absent in some genera.

Forelegs shorter than mid- and hind legs, in contrast to Limnophilinae.

Dorsal and lateral processes of abdominal segment 1 low, ventral surface of segment convex, padlike. Ventral elliptical areas on segments 2-7 or 2-8. Lateral line formed by small, light, hairlike, spinules. Gills single, dorsal and ventral rows only; gills rarely absent.

Case made of sand grains, narrower posteriorly, curved, flattened dorsoventrally; surface smooth or rough, with larger sand grains laterally.

**Pupa.** Length 5-9 mm. Median blade of mandibles with characteristic process, serrated apically, with dense, light, thin spinules basally. Spinose dorsal processes of abdominal segment 1 situated almost laterally; lateral row of gills absent. Anal rods thin, tapering posteriorly, usually crossed. Case attached at anterior end; opening covered by membrane facing substrate, leaving a crescent-shaped stripe with holes; membrane at posterior end covered with sand grains, with several holes.

Mode of life and habitats. Cool, clear, running water, springs, mountain brooks and rivulets, in littoral zone of large rivers, open shore of lakes.

**Distribution.** The European and Asiatic parts of the USSR. In addition, Europe, Asia, North America.

87 Key to Tribes\*

Full-grown larva

- 1 (2). Medium-sized, 10-15 mm long, rarely 17-18 mm. Submentum without median sclerites. Hairlike, light chaetoids in ventral part of trochanter or in basal part of femur absent. Gills present on segments 2-3, rarely on 2-4, or only on segment 2, usually postsegmental; one genus also with dorsal presegmental gills.  
Lake Baikal . . . . . 1. **Baicalinini** Mart. (p.104)
- 2 (1). Usually small, 6-9 mm long, rarely 10-11 mm. Submentum with median sclerites. Hairlike, light chaetoids present in ventral distal part of trochanter of fore- and hind legs and in basal part of fore femora. Presegmental and postsegmental gills on segments 1-6.  
Widely distributed . . . . . 2. **Apataniini** Ulm. (p.134)

1. Tribe **Baicalinini** Martynov (Thamastini Schmid)

See Schmid, 1953:110, 1955:77; Lepneva, 1964:670 for tribe Baicalini.

**Full-grown larva.** Length 9-16 mm. Head markedly narrower than pronotum, slightly oblong, directed downward and slightly posteriorly.

\* The subfamily contains 3 tribes, of which 2 occur in the USSR; the 3rd tribe, Moropsychini, is distributed in Japan, Burma, Assam, and India (Schmid, 1954:60-71).



Mesonotum, metanotum and abdominal segment 1 are the widest part of the body. Prothorax and mesothorax convex dorsally, especially in nonsclerotized posterior part of mesonotum; the body forms a blunt angle at anterior margin of metathorax, forming a more or less conspicuous hump.

Legs without the characteristic light chaetoids of *Apataniini* in distal part of trochanter and at base of femora. Gills usually present only on abdominal segments 2–3, only postsegmentally, rarely also on segment 4. Case made of coarse sand grains, with rough surface.

Mode of life and habitats. Littoral zone of Lake Baikal, on firm bottom, on stones, stony deposits, and on sandy-stony, and sandy bottom; among sparse vegetation, usually at a depth of 2–10 m; often in large numbers on stones. The species of this tribe avoid silt bottom. Phytophagous; young larvae feed on microbenthos, full-grown larvae also eat large filamentous algae and plants with narrow, delicate leaves, such as *Myriophyllum* (Bebutova, 1941:86–87).

Distribution. USSR: Lake Baikal. Absent outside USSR.

Key to Genera\*

(except *Radema* Hag.)

- 88 1 (4). Horn on prothorax absent. Gills on abdomen present.  
 2 (3). Small secondary setae present singly on head. Gula in form of nearly equilateral triangle with blunt, dark posterior angle and almost straight sides . . . . . 1. **Thamastes** Hag. (p. 105)  
 3 (2). Small secondary setae present in large numbers on head. Gula slightly oblong, with curved sides, posterior angle lighter than other parts of sclerite, sometimes slightly produced and pointed . . . . . 2. **Baicalodes** Mart. (p. 111)  
 4 (1). Horn on prothorax present.  
 5 (6). Gills present . . . . . 3. **Baicalina** Mart. (p. 116)  
 6 (5). Gills absent or rudimentary, and only on segment 2 . . . . . 4. **Baicalinella** Mart. (p. 130)

1. Genus **Thamastes** Hagen

**Full-grown larva.** Length 9–13 mm. Head dark chestnut brown; gula in form of a nearly equilateral triangle; secondary setae of head small,

\* Schmid (1953:110) placed the genera *Baicalina* Mart., *Baicalinella* Mart. and *Baicalodes* Mart. in a single, broadly defined genus, *Radema* Hagen. This does not take into account the morphological characters of the larvae, however. In fact, the larvae of these genera (Martynov, 1914:51–74; 1924:93–96) differ in a number of important biologic and taxonomic aspects, including the structure of the sclerites and especially the development of the covering sclerites, form of the gula, chaetotaxy of the head, presence or absence of a prothoracic horn, and presence and number of gills. Such characters are used in other groups for the definition of genera and even higher categories, up to subfamily. Moreover, the larvae of *Baicalina* Mart. and *Baicalinella* Mart. placed by Schmid in the genus *Radema* differ from the larvae of *Thamastes* much more markedly than do the larvae of *Baicalodes* Mart.; the larvae of the latter 2 genera show a number of close resemblances. We retain, therefore, the genera *Baicalodes* Mart., *Baicalinella* Mart., and *Baicalina* Mart. in addition to *Radema* Hag. and *Thamastes* Hag. The larvae of *Radema* Hag. (*R. infernale* Hag., *R. setosum* Mart., *R. uncinatum* Mart.) are unknown. We assume that they are more closely related to *Apatania* than to the larvae of other *Baicalinini*.

isolated; seta 15 shorter and thinner than 14. Pronotum lighter than head, long in the middle; large spinules at anterior margin light, not numerous. Mesonotum with narrow, light, median stripe; spot in posterior angle small, pinkish. Gills on abdominal segments 2-3. Case markedly narrower posteriorly, flattened dorsoventrally, made of sand grains and a few small stones.

Mode of life and habitats. Open shore of Lake Baikal, mainly on stones.

Distribution. USSR: Lake Baikal. Absent outside USSR.

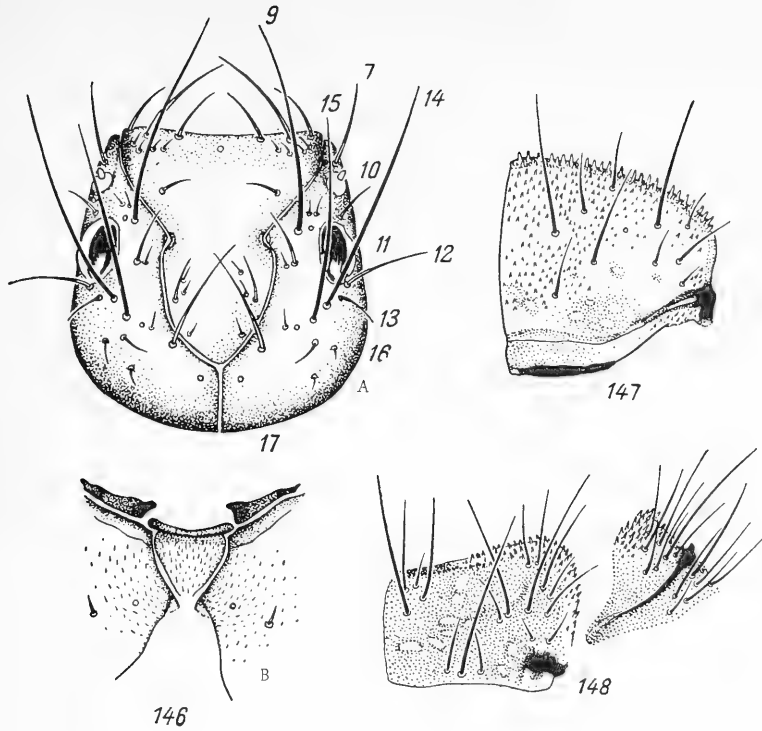
### 1. *Thamastes dipterus* Hagen

Bebutova, 1941:100-103, Figures 82-96. - Levanidova (Bebutova) 1945, dissertation:41-49, Plate V, Figures 2-5. - Lepneva, 1964:669-676, Figures 1, 5, 9, 15, 19.

**Full-grown larva.** Length 10-12 mm. Head (Figure 146, A) short, mainly uniformly chestnut brown, dots light, indistinct. Frontoclypeus large, wide; a small reddish brown speck instead of the tentorial pit; 3 pale, widely separated large dots on each side of the median pit; several indistinct dots in middle and posterior part of sclerite; wedge-shaped pattern absent. Eyes on large light area; indistinct, light, large dots lateral to dorsal stripes near branches of frontal sutures and coronal suture; similar dots in longitudinal rows behind the eye. Ventral surface darker than dorsal side, lighter near occipital foramen, with large, indistinct, pale dots. Gula forming an almost equilateral triangle; posterior angle blunt, dark (Figure 146, B).

Median anterior-margin seta short, thick; intermediate seta brown, nearly twice as long as median seta; lateral seta short, light. Anterior frontal seta the same, medifrontal seta small, thin, light, posterior frontal seta thin, light brown; 2-3 small, light, secondary setae near the anterior-margin setae; 2 similar setae inward to the posterior frontal seta. Short, brown seta 7, situated before the antenna; seta 10 situated near eye, small, light; setae 9 and 14 reddish brown, long, thicker and much longer than the others; seta 14 slightly longer than 9; seta 11 thin, moderately long, light brown, situated behind 9; seta 12 the same; seta 13 small, light; seta 15 thin, light brown, about  $\frac{2}{3}$  as long as 14; seta 16 small, procumbent, thin; seta 17 near suture anterior to fork, light brown, moderately long, thick; four small secondary setae near seta 9, one in the area of seta 14; ventral seta 8 short, brown, almost as long as 7; seta 18 small, light, thick.

89 Labrum, with broadly membranous anterior margin; membranous pads on sides of anterior margin densely covered with thin light hairs; dorsal sclerite reddish brown, anterior margin of sclerite with dark processes between an oval median indentation and truncate lateral areas; posterior-angle sclerites oblong, thin, reddish brown at the base, light at the end. Seta 1 situated on the membrane, small, thin; seta 2 situated near process, blunt, light; seta 4 similarly situated near process; seta 3 in anterior angle at some distance from margin, yellowish; setae 5 and 6 large, brown, with filiform end.



FIGURES 146-148. *Thamastes dipterus* Hag.:

146 - head, dorsal (A) and ventral, anterior part (B); 147 - pronotum; 148 - mesonotum and mesopleuron.

Mandibles reddish brown, large, about half as long as head, spatulate, without teeth; brush on dorsal margin consisting of light, sparse chaetoids; the dorsal of the 2 outer setae short and brown, the ventral light, thin, very small.

Cardo forming a narrow, brown plate with large black spots, on the inner and outer sides; outer seta light, small; 2nd seta situated on the spot, yellowish, larger. Submentum largely membranous, whitish; seta short, thin, situated on membrane. Stipes yellowish brown; outer seta thin, brown, median seta darker, of the same length. Palpifer large, brown; distal seta reddish brown, median seta small, light. Palp short, 1st segment much wider than the following, last segment only slightly smaller than the penultimate segment. Galea tubercle-shaped, with large sensillae. Mentum in form of narrow, reddish brown semicircle; ventral sclerites forming grayish bands; seta small, brownish. Palpiger narrow, horseshoe-shaped, dark at the base, small, shorter than apex of labium.

Pronotum yellowish to light brown, longer in middle, short laterally (Figure 147). Anterior margin narrowly brownish; 15-16 large, light,

yellowish spines larger than those on the surface at the lateral margin; a brown border at the short lateral margin; posterior margin wide, brownish, only a medium stripe instead of the 2 black transverse stripes; process at posterior angle small, with narrow, dark outer stripe. Dots on the surface pale, large, lighter than the background, forming an indistinct X-shaped pattern, and small groups of dots laterally near the posterior margin; each half of sclerite with 2 large, light brown dots in the middle. Setae few, as in Figure 147; anterior-margin, anterior-angle, and medioanal surface setae moderately long, dark brown, larger than the others. Horn absent.

Mesonotum (Figure 148) light brown, slightly sclerotized near posterior margin, with median indentation; anterior margin with narrow, rust brown stripe lateral to the suture; a narrow, whitish stripe with irregular, jagged lateral outline along the median suture; lateral margin light, with a small reddish spot at the posterior angle; dots light chestnut brown, forming a transverse median row, 3 large dots in each half, and an oblique row of small dots at the anterior angle; setae dark brown, as in Figure 148; anterior-margin seta brown, long, anterior-angle seta long, slightly displaced posteriorly; these 2 setae and the primary medioanal seta longer than the others.

Anterior median tergites of metanotum absent, each replaced by 4 large and 2 small setae; posterior median tergites replaced by a large, medioanal, primary seta and 2-3 smaller setae; lateral tergites light brownish, distinct only anteriorly, with a transverse band in form of large pinkish dot and fine streaks; anterior part with 9-10 setae, including 2 long ones: the primary anterior-angle and one secondary seta.

Propleuron with a large, rhomboidal black spot instead of a groove; epimeron short, broadly oval, its inner margin with a narrow, reddish brown stripe and 2 short dark setae (primary and secondary) near the suture; episternum reddish brown; trochantin relatively large, with broad, black base, seta dark, situated near base, setules small, light situated more apically.

Mesopleuron (Figure 148) reddish brown, darker and larger than metapleuron; pleural suture in form of a narrow stripe, 2 large, chestnut brown dots on the side of the epimeron near the suture; epimeron without dots; a group of small, reddish spinules in the apical angle; 8-9 setae near apex of episternum, 6-7 on epimeron; both primary setae and 2-3 secondary setae longer and thinner than the others, dark brown.

Metapleuron pale brownish; epimeron produced ventrally; episternum with 11-12 setae which are not uniform, as stated by Babutova (1941:101, Figure 89), but differ in size; epimeron with 13-15 setae on the whole process, not only in the posterior part; primary seta situated near the suture, and 2-3 secondary setae dark brown and longer than the others.

Legs (Figure 149) brown. Ratio of length of legs 69:100:94. Fore femur similar to mid-femur. Fore and mid-trochanters with long posterior primary seta. Secondary setae of all femora thin, most of them small, concentrated dorsally on the anterior and posterior surface.

Fore femur slightly convex dorsally, with straight ventral margin; primary ventral setae situated in basal area close to each other, in form of 2 light spines, apical spine twice as large as and slightly thinner than

basal spine; posterior primary seta situated basal to the spines, as long as the subapical ventral seta of the trochanter. Primary ventral setae of mid-femur situated basally, in form of a light, thick, pointed spine, and a brown, long seta situated more basally; posterior primary seta situated ventrally, some distance from the apex, dark, longer than the ventrodiscal setae of the trochanter. Primary ventral setae of hind femur situated in the basal area, in form of light spine and a brown long seta more distally; posterior, primary seta long, situated ventrally, like the ventral setae of the trochanter.

Dorsal and lateral processes of abdominal segment 1 wide, large; ventral padlike convexity with short black setae. Abdominal ventral elliptical areas on segments 2-7. Lateral line on segments 3-7, with fine, light, whitish hairs. Gills situated postsegmentally on segments 2 and 3.

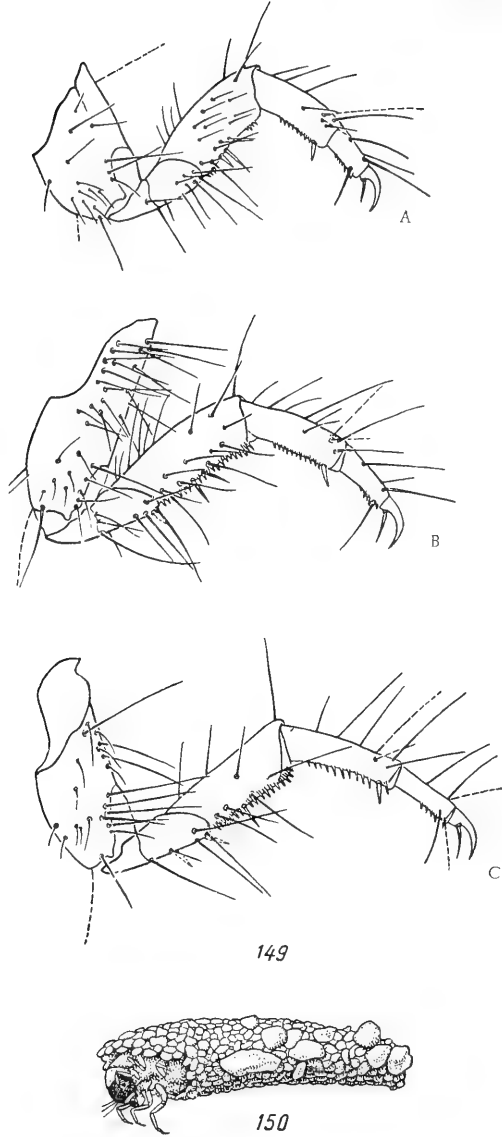
91 Tergite of abdominal segment 9 chestnut brown, irregularly rectangular, with large, light dots laterally and near the posterior margin; posterior margin almost straight, medioanal setae long, thick, chestnut brown, anterior-angle seta shorter and thinner, situated subapically near the lateral margin; intermediate seta also long; lateral seta short, thin; a thick, long, and a short, thin seta between the medioanal setae; 5-6 setae on the surface.

Sclerite "b" of anal legs dark chestnut brown; dorsal apical seta dark brown, thick, long, the adjacent seta the same, slightly thinner; lateral seta much smaller, moderately long, reddish brown, subapical seta short, grayish brown, both thin; ventral seta small, thick, brown. Sclerite "c" light brown, short, of irregular form, its outer margin wide, reddish, with a small, thin, light seta near the margin.

Claw separated into a large, brown, basal part and a smaller, entirely sclerotized, dark, apical part which forms a massive denticle; seta 1 short, dark brown, situated basally on the inner side; seta 3 also dark, larger, situated on base of apical part; seta 2 situated further dorsally near end of suture, thin, yellowish; seta 6 short, pale, situated further apically on the outer side; ventral setae 7 and 8 light, situated close together near the base; seta 5 small, situated lateral to 8; seta 4 light, small, situated inward near the suture.

Case 11-15 mm long, conical, curved, slightly flattened, made of sand grains; with smooth ventral surface and a dorsal hood projecting anteriorly; coarse sand grains laterally, as is typical for Apataniinae; posterior end narrow, covered by a brown membrane with a small, round hole (Figure 150).

92 **Pupa.** Length 7-8 mm. Antennae reaching end of abdominal segment 7. Labrum short, yellowish, anterior margin rounded; seta 1 small, light, situated on each side of middle. Middle with 5 large, reddish brown setae with slightly curved, but not hooked, end; 2 setae of anterior row slightly shorter and thinner than the 3 posterior setae. Anteclypeus light; median and intermediate setae moderately long, thin, lateral seta small, light. Mandibles with subapical process on the median margin; blade serrated on the process, with a row of light spinules almost to the base. Wing sheaths almost reaching abdominal segment 3. Mid-tibiae with a row of dense, long, natatorial setae; segments 1-4 of mid-tarsi with 2 rows of such setae.



FIGURES 149 and 150. *Thamastes dipterus* Hag.:  
149 — legs, posterior: foreleg (A), midleg (B), hind leg (C);  
150 — case.

Abdominal segment 7 with small, brown, sclerotized lateral processes with 6–7 large spinules at the posterior margin. Holding apparatus on segments 3–7 consisting of small, slightly oblong brownish plates with

large and small hooks as follows: \* III:3+3; IV:3+1; V:(anteriorly) 4+1, (posteriorly) 9-10; VI:3+2; VII:4+2.

Gills on segments 2-3, as in the larva. Lateral line from end of segment 5 to 8, consisting of long, thin, delicate, grayish white setae.

Case slightly shorter than in the larva, to 10 mm long; posterior opening as in the larva.

Mode of life and habitats. On stones among vegetation; microphytophagous; open shore of Lake Baikal.

Distribution. USSR: Lake Baikal. Not known outside USSR.

## 2. Genus *Baicalodes* Martynov

**Full-grown larva.** Slightly larger than *Thamastes*, usually 14.0-14.5 mm. As in *Thamastes* and in contrast to *Baicalina*, sclerites of head (except gula), pronotum, and mesonotum mainly smooth, without spinules. Small, light, secondary setae more numerous than in *Thamastes*. Gula larger than in *Thamastes*.

Horn absent. Gills on abdominal segments 2-3.

Case 15-20 mm long, made of large sand grains, curved, tapering posteriorly, with rough surface.

Mode of life and habitats. Open shore of Lake Baikal.

Distribution. USSR: Lake Baikal. Not known outside USSR.

### 1. *Baicalodes ovalis* Martynov

Bebutova, 1941:97-99, Plate 4, Figures 51-60. — Levanidova (Bebutova), 1945, Dissertation. — Lepneva, 1964:669-676, Figures 2, 6, 10, 16, 20.

**Full-grown larva.** Length 12.0-14.5 mm.\*\* Head (Figure 151, A) mainly chestnut brown; area anterior to the eye, spot of tentorial pit, and small areas lateral to the gular suture reddish brown; dots light. Wedge-shaped pattern on frontoclypeus pale, dots of posterior row more distinct; large light dots along the epicranial suture, behind the eye, and ventrally near the occipital foramen. Gula reddish brown, its posterior angle slightly lighter, pointed; gula and area lateral to it densely covered with small spinules (Figure 151, B).

Median anterior-margin seta yellowish, thick; intermediate seta brown, long, both setae slightly flattened, lateral seta short, light. Anterior frontal seta the same, middle seta small, light, spine-shaped, posterior seta thin, long, brown; 2-3 small, secondary light setae in the area of the anterior-margin setae; 5-6 such, light, small setae posteriorly along the suture. Seta 7 short, brown; seta 10 small, spine-shaped, light; setae 9 and 14 brown, long, slightly thickened; seta 11 thin, some distance from 9, near the posterior margin and the light ocular area; seta 12 thicker, brownish, slightly longer;

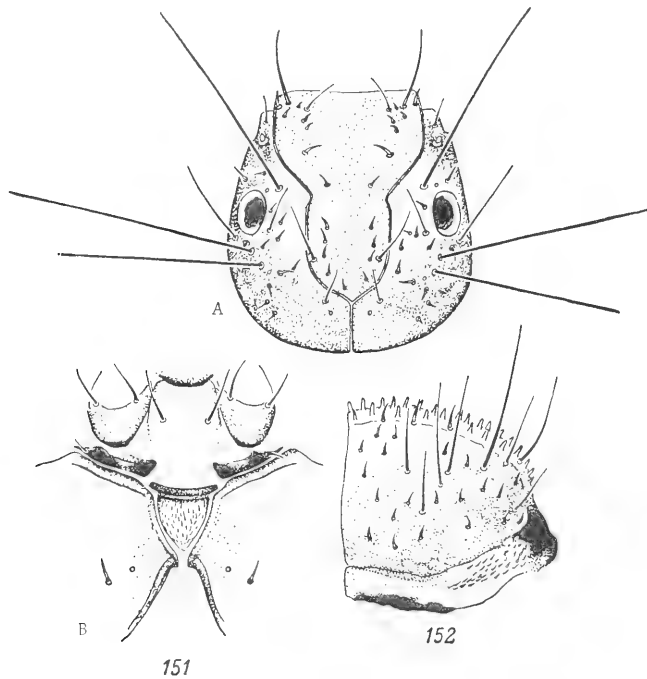
\* The 1st figure refers to large denticles; the 2nd, to small denticles.

\*\* Measurements from material in the Zoological Institute of the USSR Academy of Sciences. Published measurements are larger, 16-18 mm (Bebutova, 1941:97).

seta 13 small, spine-shaped, slightly larger than 10; seta 15 situated behind 14, very long, slightly shorter than 14; seta 16 short, light, resembling the secondary seta; seta 17 situated anterior to the fork near the suture, short, yellowish, thick. Ventral side: seta 8 small, dark, seta 18 light, slightly smaller than 8; in the area between setae 9 and 15, there are 7-8 small secondary light setae.

93 Dorsal sclerite of labrum light brown; anterior-margin processes reddish brown; posterior margin with broad blackish brown stripe in the middle; posterior-angle sclerites narrow, brown; setae as in *Thamastes dipterus*. Mandibles large, mainly black, pinkish apically, without teeth; dorsal margin with a brush of light, short, chaetoids which become very small near the apex.

Maxillolabium as in *Th. dipterus*. Cardo with large median and outer black spots.



FIGURES 151 and 152. *Baicalodes ovalis* Mart.:

151 — head, dorsal (A) and ventral, anterior part (B); 152 — pronotum.

Pronotum (Figure 152) pale yellowish; anterior margin grayish brown, with numerous short, thick, brown spinules; 1st marginal row consisting of 20-21 spinules directed anteriorly; 2nd row less regular, with 14-16 spinules directed more upward; 6-7 small, pointed spinules close to the margin; lateral margin short, without spinules. Posterior part of tergite with 2-3 dots near the median suture on each side; middle of each half with



2 large brownish dots; dots also near anterior angle and close to posterior margin. Posterior margin pale yellowish, separated by a sharp, chestnut brown stripe from the other surface; short, black stripe near posterior margin on each side; process at posterior angle with large black outer spot at the base, brown apically, with a longitudinal group of small, light spinules near the spot. Setae as in Figure 152; in addition to the primary and large secondary setae, there are also small, sparse, light, slightly flattened, secondary setae.

Mesonotum pale yellowish, indistinct posteriorly and laterally; anterior margin laterally with indistinct, narrow, brownish stripe or without a stripe; dots large, sharp, pale, not darker or only slightly darker than the tergite; a thin, curved, oblique, streak at posterior angle; posterior and lateral margins pale; posterior angle with a short, oblique, black sclerotized stripe; a group of 7–8 small spinules near the anterior angle. Setae reddish brown, anterior-margin, primary, anterior-angle, and medioanal setae long, the last larger than the others.

94 Setae of metanotum reddish brown; 5 thick, long setae at the site of the anterior median sclerites, primary seta longer than the others; 4 setae at the site of the posterior lateral sclerites, medioanal seta long, the other 3 much shorter and thinner; lateral sclerite pale, light brownish, represented only by an anterior and a median area, a transverse band consisting of a large, reddish brown dot, and fine, oblique, brown, streak; anterior area with 5–6 setae, long primary, anterior-angle seta and 2 secondary setae.

Propleuron with broad, black, pleural groove; trochantin dark, with small, thick, brown seta; epimeron yellow, with reddish brown median margin, seta strong, brown, moderately long.

Mesopleuron yellowish, with thin, brown stripe indicating pleural suture; episternum with 2–3 large dots, small spinules near the anterior angle; both primary setae long, brown; episternum with 3–6 secondary setae, epimeron with 2–3. Metepisternum smaller than mesepisternum, without dots; metepimeron with ventral process; setae more numerous, both primary setae long, as on mesothorax, brown setae more numerous than 95 others; metepisternum with 3–5 secondary setae, metepimeron with 8–10.

Legs (Figure 153, A, B, C) irregularly colored. Coxae brown; femora and tibiae chestnut brown in distal half dorsally, and subdorsally, elsewhere light brown like trochanters and tarsi; claws brown.

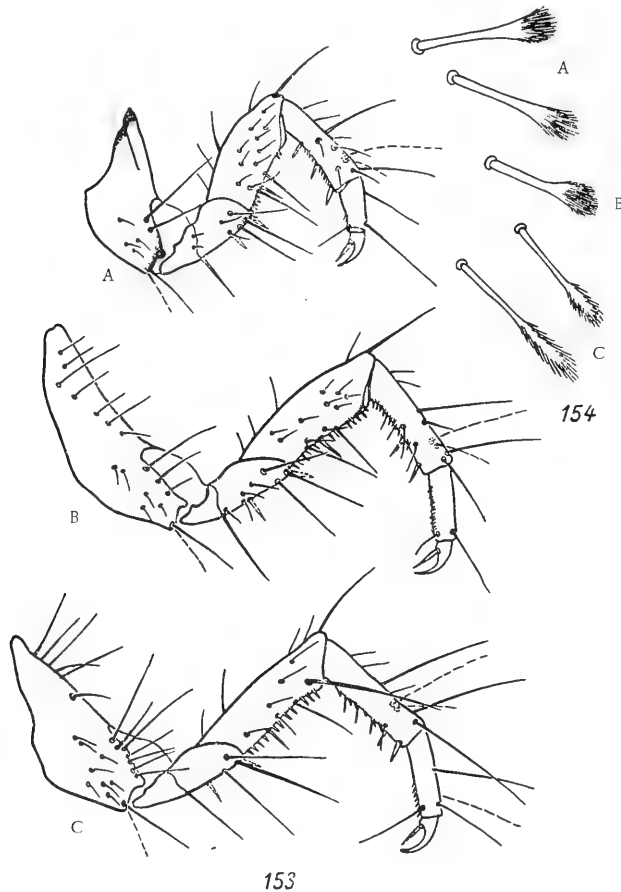
Fore trochanter, with relatively large, moderately long posterior seta; anterior primary seta short, thick, light, branched at the end, like the anterior primary surface setae of the coxa (Figure 154, A, B); both anterior ventral setae forming short, thick, light spines, subapical spine situated some distance from the apical spine, basal to the long, brown posterior ventral setae; basoventral seta grayish, thick, moderately long; a number of short, small secondary setae on the surface, most of them feathered apically; several, small spinules ventrally; fine covering spinules situated dorsally and subdorsally, as on the femur.

Primary ventral setae of femur situated basally, in form of a large light spine and a more apical, light, spine-shaped seta; long, reddish brown, posterior, primary seta near the spine; several, small, short, secondary setae, some of them feathered at the end on the anterior and posterior

surface, e. g., the 4 setae of the subventral row (Figure 154, C). Ventral comb formed by several spinules near the basal margin and 2-3 apically.

Primary apical ventral setae of tibia forming 2 thick, brown spines; further basally, a comb of spinules and 3 short, secondary setae in the form of a thick, light, basal spine and 2 thin light spines, a posterior and an anterior, situated in the middle of the segment, the anterior feathered at the end. Other setae of tibia and tarsi as in Figure 153, A. Basal seta of claw in form of light, pointed spine which is only little shorter than the claw.

(94)



FIGURES 153 and 154. *Baicalodes ovalis* Mart.:

153 — right legs, posterior: foreleg (A), midleg (B), hind leg (C); 154 — setae of foreleg: anterior primary setae of coxa (A), primary seta of trochanter (B), secondary subventral setae of femur (C).

Anterior primary seta of mid-trochanter light, thick, divided, as on the forelegs; both anterior setae of coxa similar, but thinner; posterior primary

seta of trochanter moderately long; anterior apical ventral seta forming a short, thick, blunt, light spine, second anterior ventral seta closer to the basal, also a light spine, but longer and thinner; basoventral seta brown, long, like the 2 ventral setae. Posterior, primary seta of femur situated ventrally, near middle of segment, brown, long; primary apical ventral seta in form of large, light spine, basoventral seta brown, long, like the posterior; ventral comb of spinules extending along the whole segment. Ventral comb of tibia interrupted, spinules very small, several secondary, short, light spines ventrally and subventrally. Basal seta of claw in form of light spine, not longer than on the forelegs.

Number and arrangement of gills of *B. ovalis*

Segment	Dorsal	Ventral
2	0	0
	1	1
3	0	0
	1	1

Primary anterior seta of hind trochanter light, short, branched as on the midlegs; posterior seta larger, long, brown. Posterior primary seta of femur long, brown, situated near apex; primary apical ventral seta situated subapically, slightly smaller; a short, light spine ventrally in middle of segment; ventral comb of spinules extending along the whole segment. Spinules of the ventral comb of tibia sparse, small; secondary ventral spinules short, light, 5 of them posteriorly, 2-3 anteriorly. Basal seta of claw light, thin at the end.

Dorsal and lateral processes of abdominal segment 1 large, lateral processes displaced ventrally.

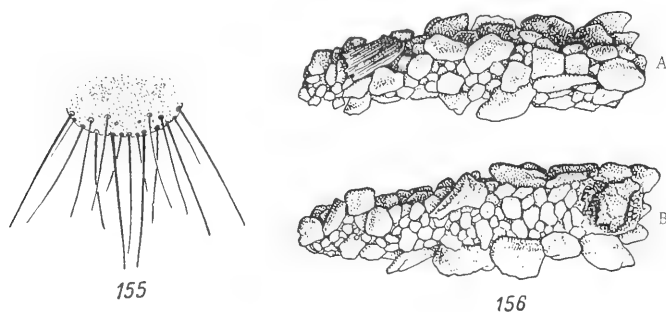
Lateral line from segment 2 to beginning of segment 8; hairs small, pinkish. Gills only postsegmental on segments 2-3, dorsal gills longer and thinner than ventral.

Sclerite of abdominal segment 9 (Figure 155) pale, indistinct anteriorly and laterally; its anterior part with large dots; medioanal setae long, black or dark brown; anterior-angle setae slightly shorter; intermediate and lateral seta varying in size, the seta situated on the point of the intermediate one longer than the lateral seta, sometimes very long; sometimes both setae almost of the same size or seta replacing the lateral is larger than the intermediate and very long; the proportions may differ on both sides; 1, 2, or 3 setae between the medioanal setae, middle seta long, slightly thinner than the medioanal seta; one seta between the medioanal and the anterior-angle seta in addition to the 2 primary setae; 2-3, thin, long, brown setae on each side in the basal area.

96

Sclerite "b" of anal legs light brown, with reddish brown, wide apical margin laterally and ventrally; median apical setae and neighboring setae black, long; lateral and subapical seta on median margin reddish brown, long, thinner and almost half as long as the median seta; ventral seta

small, dark; no setae on the surface. Sclerite "c" wide, irregularly triangular, with reddish brown outer margin; basal seta small, light. Claw light brown basally, dark reddish brown apically; seta 1 short, seta 3 long, both brown; seta 2 situated dorsally above end of suture, light, yellowish, long; seta 6 brown, small, situated lateral to seta 2, near end of suture; seta 7 small, dark brown, situated ventrally; seta 8 slightly more apically near the margin on the membrane; seta 5 small, situated laterally on the margin; seta 4 situated ventrally on the membrane.



FIGURES 155 and 156. *Baicalodes ovalis* Mart.:

155 — dorsal sclerite of abdominal segment 9; 156 — case of larva, lateral (A) and ventral (B).

Case (Figure 156) 15–20 mm long, made of large coarse sand grains, with rough surface, curved, tapering posteriorly, slightly flattened ventrally. The flattening of the case is accentuated by coarse gravel grains, situated closer to the ventral margin; while the case is being made, its posterior end may remain attached for a long time; such long cases with narrow, uninhabitable posterior end, a remnant of the preceding stage, may be 25–26 and even 30 mm long. The walls often contain small mollusk shells in addition to sand grains. Anterior end of case truncate; posterior end covered by a brown membrane with scattered, large, sand grains and an asymmetrical round hole; periphery of membrane sometimes with several small holes also.

Mode of life and habitats. Usually on sandy, stony places and sand on the open and overgrown shore, especially among *Draparnaldia*, deeper than other species, 5 to 15–20 m; rarely found above 5 m and below 20 m.

Distribution. USSR: Lake Baikal. Not known outside USSR.

### 3. Genus *Baicalina* Martynov

**Full-grown larva.** Relatively large, 10–16 mm. Head, thorax, legs, and abdomen with dense cover of small spinules. Gula oblong, tapering posteriorly, much longer than wide, with curved sides. Frontoclypeus without

secondary setae. Pronotum with comb of large, thick spines near anterior margin. Horn present. Gills postsegmental on segments 2-4, presegmental on segment 2, sometimes also on segment 3. Tergite of abdominal segment 9 always with 10-11 secondary setae, some of them well developed.

Case made of coarse sand grains, rough in part or entirely, 11-21 mm long, with irregular surface.

Mode of life and habitats. On stones in the littoral.

Distribution. USSR: Lake Baikal. Not known outside USSR.

97 Key to Species

Full-grown larva

- 1 (2). Gula narrow, about twice as long as wide . . . . . 2. *B. spinosa* Mart. (p. 123)
- 2 (1). Gula less long.
- 3 (4). Presegmental gills present on abdominal segment 3 . . . . . 1. *B. bellicosa* Mart. (p. 117)
- 4 (3). Presegmental gills on abdominal segment 3 absent . . . . . 3. *B. thamastoides* Mart. (p. 127)

1. *Baicalina bellicosa* Martynov

Bebutova, 1941:92-94, Figures 18-31. — Lepneva, 1964:669-676, Figures 3, 7, 11, 13, 17.

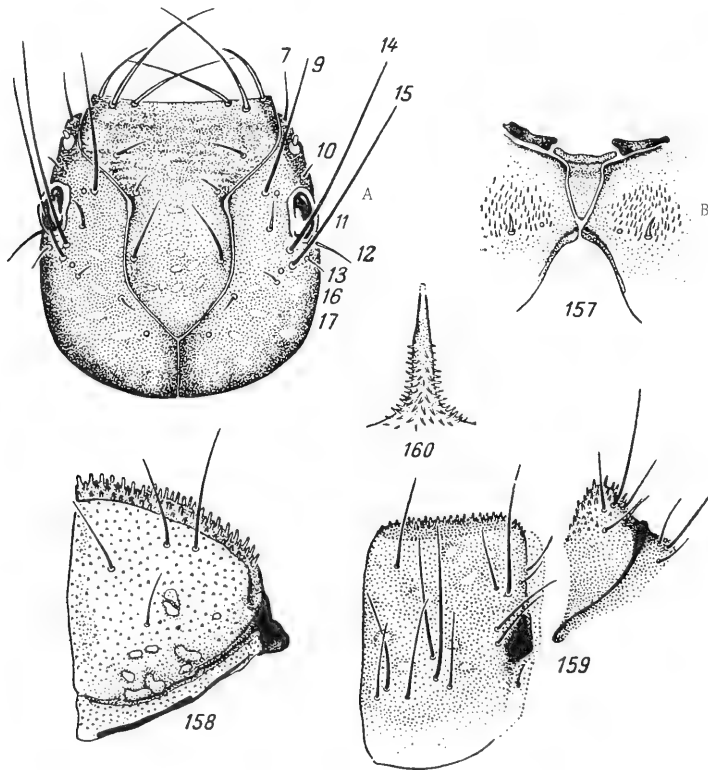
**Full-grown larva.** Length 10-14 mm. Head chestnut brown (Figure 157, A) due to darker spinules on light brown background. In contrast to the species described above, the spinules have the form of wide, conical tubercles with slightly curved apex. Eyes large, on light background; antennae light basally, with thick, dark sensilla. Dots light, large, bright in some places; tentorial pit dark. Frontoclypeus anteriorly with several indistinct, lighter transverse bands; posterior area with sharp wedge-shaped pattern. Area before the eye near antenna and to anterior margin dark; 4 large sharp dots lateral to posterior part of frontal sutures; several similar dots further laterally and behind the eye. Groups of large, conical, dark spinules lateral to gula (Figure 157, B). Anterior-margin intermediate seta thick, moderately long, brown; median seta smaller, yellowish; lateral seta short, thin, light; anterior frontal seta smaller, middle frontal seta small, posterior frontal seta strong, long. Seta 7 short, thin, situated anterior to the palp; seta 9 near anterior margin, moderately long, reddish brown; seta 11 situated near posterior margin of eye, very thin, small; seta 10 small, light; seta 12 short, thin, lateral to light periocular area; seta 13 small; seta 14 long; seta 15 situated posteriorly nearby, similar, both thicker than 9; seta 16 small, thin; seta 17 short, thin; ventral seta 8 small, strong, dark brown; seta 18 slightly smaller, brown.

Dorsal sclerite of labrum chestnut brown, with anterior processes which almost reach the margin; membranous stripe at anterior margin less broad than in the preceding species; posterior-angle sclerites large, light brown at the end. Seta 1 blunt, small, situated anteriorly near end of

process; seta 2 lateral to process, blunt, small; seta 4 similar, situated near process; seta 3 short, pointed, yellowish, situated laterally near margin; setae 5 and 6 brown, situated on the surface.

Mandibles black, narrowly reddish brown near distal margin; brush of chaetoids light, long; outer setae small, brown. Cardo with large median and outer black spot, brown in middle. Submentum light yellowish, slightly sclerotized; setae small, light. Stipes brownish to brown at posterior margin; median seta short, brownish; outer seta larger, yellowish. Palpifer chestnut brown; apical seta short, brown; basomedian seta small, light. Galea short, tubercle-shaped. Maxillary palp short, 3 apical segments of the same length, basal segment longer. Mentum in form of reddish brown semicircle, shorter in the middle; ventral sclerites grayish, with small light seta. Palpiger narrow, curved. Palp small, with brown sclerites and dark sensillae.

(98)



FIGURES 157-160. *Baicalina bellicosa* Mart.:

157 - head, dorsal (A) and ventral (B); 158 - pronotum; 159 - mesonotum and mesopleuron; 160 - prothoracic horn.

Pronotum (Figure 158) covering the whole surface of the segment in the middle but less developed laterally because of the marked dorsal convexity of the first 2 thoracic segments; median suture long and sides

98 short. Surface yellowish light brown, with numerous dark brown spinules; pronotum chestnut brown. Anterior margin reddish brown, with a comb of large, blunt, thick, yellowish spines. Lateral margin reddish brown with small, dense spinules. Posterior margin yellowish, with smaller brown spinules, with distinct chestnut brown stripe anteriorly; posterior margin with black stripe in the middle, narrowly chestnut brown more laterally; process at posterior angle small, brownish, with small, reddish brown spinules and separated by a black stripe; a similar stripe near the outer margin; a large, black spot extending to the lateral margin near the process. Dots light brown, with darker outline; 2 dots close together in middle of each half; 8-10 similar dots near the posterior margin; setae thin, pinkish brown, not numerous, as in Figure 158.

Mesonotum (Figure 159) flat, situated in the anterior, most convex part of the segment, leaving a membranous, posterior area. Sclerite yellowish, with reddish brown spinules; spinules larger but sparser in the middle, which appears, therefore, lighter than the sides. Middle of each half with large brownish dots with dark outline. Anterior margin pinkish brown, broader toward the middle. Anterior angle and lateral margin pale. Posterior angle with a large reddish black triangular or rhomboidal spot. Posterior margin of sclerite convex, indistinct. Setae pinkish brown; anterior-angle and medioanal setae longer and thicker than on pronotum.

99 Metapleuron well developed, light yellowish brown; a transverse band with a small reddish brown spot and larger brownish spot; setae of anterior part chestnut brown, 6 large and 3 smaller, thin setae; primary anterior-angle setae larger than the others.

Proepimeron slightly darker than pronotum, brownish, with dark spinules; seta situated distally, short, chestnut brown. Trochantin with large black spot; seta light, short. Mesopleuron (Figure 159) resembling lateral parts of mesonotum in color and spinules; process of anterior angle lighter, with larger and lighter spinules; epimeron with narrow stripe reaching the suture and without spinules. Episternum with 8-9 setae, epimeron with 6-7. Metapleuron lighter, yellowish, brownish near the suture; surface spinules small, sparse, absent in some places, larger distally; setae chestnut brown; epimeron including posterior-angle process with 14-15 setae; episternum with more densely standing setae; primary setae, as on mesothorax, longer and thicker than the others.

Prothoracic horn light brown, tapering, light at the end (Figure 160). Sternite consisting of 2 small, grayish brown sclerites in posterior part of segment.

Legs shining brown; ratio of length of legs 77:100:92; spinules on coxae and femora of fore- and midlegs dense, less dense on hind legs.

Fore coxa densely spinulose dorsally, posteriorly and ventrally; only spinules of anterior surface larger in the middle (Figure 161, A). Basodorsal primary seta of coxa, long, brown; both apical dorsal setae brownish, the posterior thinner and slightly longer than the others; primary anterior setae light pinkish brown, short, uniformly thick, divided at the end; both apical ventral setae moderately long; the anterior ventral setae light brown; posterior setae situated subventrally, dark. Only a few isolated, light, small setae, large secondary setae absent.

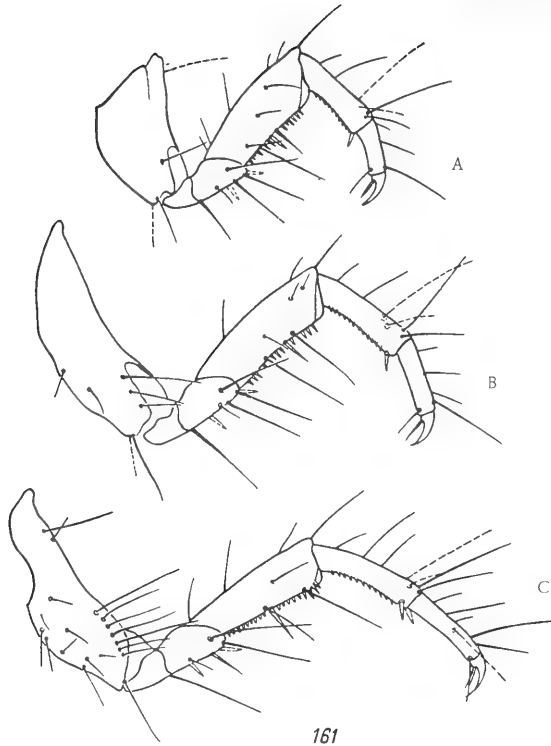


FIGURE 161. *Baicalina bellicosa* Mart. Right legs, posterior: foreleg (A), midleg (B) and hind leg (C).

Trochanter spinulose, except part of dorsal surface; primary anterior seta short, yellowish, thick, divided apically, posterior seta thin, moderately long; anterior ventral setae apical and subapical in form of short, blunt, yellowish spines, basoventral spine thick, moderately long, both posterior ventral spines brownish, long, the subapical shorter than apical spine.

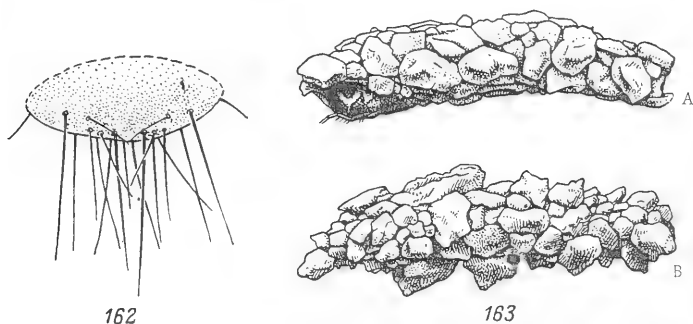
Dorsal and posterior sides of femur with small spinules which are thinner and smaller than on the trochanter; anterior surface mainly smooth; a ventral comb of 17–18 large spinules; primary apical dorsal seta light brown, moderately long, basodorsal seta short, light; apical and basal parts with a small, light, secondary seta; short, brown, anterior primary seta situated subventrally in middle of segment; secondary setae on anterior surface small, light, one of them in basal area and another subdorsally in apical area; primary ventral setae close to each other on the margin, in form of a thick, blunt, basal spine and a light, spine-shaped, short seta more apically; posterior primary seta situated basal to the ventral setae, chestnut brown, long; posterior surface with 3 thin, short, secondary setae, the larger situated subventrally near the posterior.

100

Tibia and tarsus covered entirely with minute spinules. Setae light, transparent; apical dorsal seta of tibia yellowish; 3 small, light secondary setae on the tibia and one on the tarsus in addition to primary setae. Basal seta of claw transparent, thin at the end.



Mid-coxa (Figure 161, B) spinulose posteriorly, partly so dorsally and ventrally in anterior; spinules not as large as on anterior side of foreleg; primary basodorsal part seta thin, brown, long; anterior apical dorsal seta slightly shorter, posterior seta thicker, reddish brown, moderately long; 3 similar thick, but short, secondary setae at the margin; both primary anterior setae short, thick, pointed, subdorsal seta reddish brown, second seta lighter; posterior surface with a similar secondary seta; anterior apical ventral seta short, the posterior situated subventrally, moderately long, both brown; a short, thick, brownish, and a small, light, secondary seta further basally at the margin.



FIGURES 162 and 163. *Baicalina bellicosa* Mart.:

162 — tergite of abdominal segment 9; 163 — larval case, lateral (A) and dorsal (B).

Trochanter with spinules as on the coxa; primary anterior seta light brown, thick, slightly divided apically; anterior apical ventral seta in form of short, blunt, light spine, second spine situated more basally, near the suture; basoventral seta long, light brown, thick; both posterior ventral setae the same, a light secondary seta near the second situated further basally.

Femur with minute spinules posteriorly and on part of anterior surface; spinules much smaller than on coxa; ventral comb with 18–20 large spinules. Primary apical dorsal seta brown, moderately long, basodorsal seta light, shorter; apical and basal parts with a small, thin, light secondary seta; anterior primary seta situated subventrally some distance from the apex, short, thick, brown; posterior primary seta situated slightly more basally near the ventral margin, brown, long, basoventral seta the same, apical ventral seta situated nearby, in form of large, sharp, light spine, both in middle of femur; anterior and posterior surface with a small thin secondary seta in apical and basal parts. Tibia and tarsus densely covered with minute spinules; setae light; tibia and tarsus with 2, thin, light secondary setae basal to the primary setae. Basal seta of claw light, thin, hairlike at the end.

Hind coxa (Figure 161, C) mainly smooth, with minute spinules only at the base dorsally and in anterior part subdorsally. Primary basodorsal seta long, larger than on midlegs, near 2 small secondary setae; anterior apical

dorsal seta short, brown, moderately long; posterior apical dorsal seta large, reddish, several smaller but similar thick, reddish brown, secondary setae near margin of indentation; anterior primary setae short, pointed thick, apical seta brown, ventral seta light, grayish; posterior apical ventral seta reddish brown, long, anterior apical ventral seta light brown, shorter; secondary surface setae of coxa more numerous than on midlegs.

101 Trochanter with small spinules ventrally and subventrally; anterior seta small, light, posterior seta long, reddish brown; basoventral seta light brown, thick, long, the other 2 anterior ventral setae light, forming a thick, pointed, apical spine and a thin, short, spine-shaped seta situated much more basally; posterior apical-ventral seta brown, thick, long, subapical seta light, curved, moderately long, a short, light, secondary seta more basally.

Surface of femora smooth, without spinules; ventral comb with 19–20 large spines; primary apical, dorsal, seta light brown, moderately long; basodorsal seta short, light; one secondary dorsal seta in the apical part, another in the basal part; anterior primary seta, as on midlegs, situated subventrally in the apical area, short, brown; posterior primary seta situated near the ventral margin apically, long, reddish brown; primary ventral setae close to each other in middle of segment, represented by a more apical, brown, moderately long seta and a large, pointed, light spine; secondary setae of anterior surface situated subventrally — 4 thin, short setae, a moderately long, thin seta apically on posterior side. Tibia and tarsus covered with small spinules and with 2 basodorsal secondary setae. Basal seta of claw, as on midlegs, light, thin at the end.

Dorsal process of abdominal segment 1 small, moderately high; lateral processes wide, flat apically, with a hard, round area covered with minute pinkish spinules; similar spinules present on the elliptical convex ventral area. Lateral line from middle of segment 2 to end of segment 8, with small, thin, brownish hairs.

Gills in dorsal row on segments 2–3 presegmental and postsegmental, postsegmental in ventral row, on segments 2–4; gills of segment 4 sometimes present on one side only.

Number and arrangement of gills of *B. bellicosa*

Segment	Dorsal	Ventral
2	1 1	1
3	1 1	1
4		1 (0)

Ventral elliptical areas small, distinct, on segments 2–7. Tergite of segment 9 (Figure 162) brownish, covered with small, pinkish brown spinules; spinules larger near posterior margin;\* anterior part with a small, light

\* Not shown in Figure 162.

spot laterally, without spinules. Large setae dark, brownish; thin and small setae brown or light brown; medioanal and anterior-angle setae thicker than the others, the latter situated slightly inward, not at the margin but subapically and not in the outer angle; 2 other setae between the medioanal setae, one of them long, dark (shorter and thinner than the primary setae), the other moderately long, brownish, thin; 5 large setae at the margin between the anterior anal setae and the anterior-angle setae, including an intermediate and a lateral primary seta, 2 of them long, slightly shorter than the median setae; a thin, pinkish moderately long seta near the marginal setae, also a small seta lateral to the anterior-angle seta near the margin.

Sclerite "b" of anal legs pale yellowish, pinkish posteriorly, laterally and ventrally, dorsally with pinkish brown spinules, larger spinules near the anterior margin; lateral surface with scale-shaped, pectinate tubercles instead of spinules; a median and a neighboring seta dorsally, long, thick, black, the lateral seta reddish brown, thin, moderately long; distoventral seta short, brown; median margin with thin, brownish, moderately long seta. Sclerite "c" yellow, with scale-shaped, pectinate tubercles with wide, reddish, dark brown outer margin; seta small, thin, brownish at the base.

Claw brownish and finely spinulose at the base, smooth, reddish brown and densely sclerotized apically; seta 1 situated on the median side, short, light at the base; seta 2 light, moderately long, seta 6 short, both situated near end of suture, seta 6 laterally, reddish brown; seta 3 smaller than 2, situated on the inner side in the apical area, thick, brownish; basoventral seta 7 and 8, situated close together at the margin and on the membrane, both light and slightly curved at the end; seta 5 situated near 8, small, light; seta 4 situated more median, small, light, slightly thicker.

Case (Figure 163) 11–15 mm long, made of coarse sand grains, roughly constructed, its ventral surface sometimes smoother but with one or several coarser grains among the more smoothly arranged grains; dorsal surface forming a heap of coarse sand grains, always coarser and sometimes with small stones laterally. Anterior end of case forming a large, convex, dorsal hood, anterior opening directed downward, its margin level with the ventral surface; posterior opening covered by a membrane with one large or 2–3 smaller holes. Posterior membrane of pupal case with 3–4 openings.

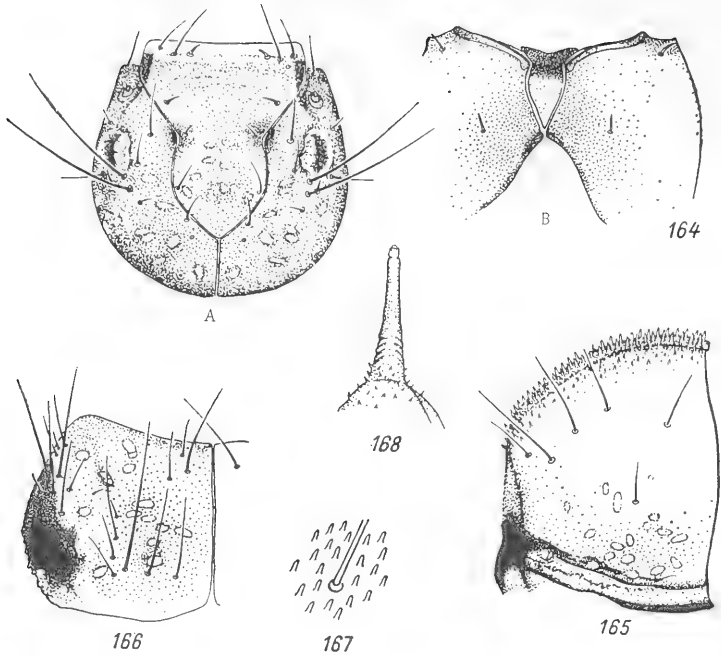
Mode of life and habitats. On stones, at a depth of 2–5 m, rarely at 10 m, isolated specimens even deeper.

Distribution. USSR: Lake Baikal. Not known outside USSR.

## 2. *Baicalina spinosa* Martynov

Bebutova, 1941:90–92. — Lepneva, 1964:669–676, Figure 21.

**Full-grown larva.** Length 12–16 mm. Sclerites of head (Figure 164, A) tuberculate; dorsal spinules smaller or slightly different from those of the preceding species, conical, blunt, or tapering to a small, light filament; no spinules laterally behind the eye; groups of small, blunt spinules (not large or sharp as in *B. bellicosa*) present only lateral to gula. Gula brown, long, relatively narrow, more than twice as long as wide, smooth anteriorly, with small spinules in the middle and posteriorly (Figure 164, B).



FIGURES 164–168. *Baicalina spinosa* Mart.:

164 — head, dorsal (A) and ventral (B); 165 — pronotum; 166 — mesonotum;  
 167 — spinules and base of seta of mesonotum; 168 — prothoracic horn.

Seta 9 shorter than in *B. thamasoides*, thin. Setae 14 and 15 of about the same length, 15 slightly lighter and thinner.

103 Pronotum (Figure 165) yellowish, completely spinulose, spinules smaller near the posterior margin; anterior margin chestnut brown, with a comb of large, blunt spinules; lateral margin without spinules; surface with large dots; setae as in Figure 165; posterior margin separated anteriorly by a chestnut brown stripe with 2 light spots; middle of margin posteriorly with a sharp, dark, reddish brown stripe; small spinules on the light surface of the margin; process at posterior corner reddish brown, sparsely spinulose, separated from the inside by a brown stripe, basal spot large, blackish brown.

Mesonotum (Figure 166) yellowish light brown; spinules dense, small, blunt, chestnut brown (Figure 167); slightly dark in the punctate area and near the anterior corner, less dark than in *B. bellicosa* and *B. thamasoides*; anterior margin on each side of the median suture with a small, indistinct, brown stripe; dots large, light, in some places with dark outline; spot at posterior angle large, brownish black, with reddish brown margin, and with oblique striation in form of small, narrow, dark brown stripes. Setae chestnut brown, as in Figure 166; anterior-margin seta moderately long; a few secondary setae present.

Metathorax with a larger number of secondary setae than in *B. bellicosa* and *B. thamasoides*; setae chestnut brown; 14–16 setae on the site of the anterior median sclerite, most of them moderately long, primary anterior-margin and 2–3 secondary setae longer than the others; 3 setae

on the site of the posterior median sclerite, including a long medioanal seta; 1–4 setae between the above group and the lateral sclerites; lateral sclerites light brown, their posterior part whitish, incompletely sclerotized; transverse band consisting of 2 large chestnut brown dots and reddish brown streaks; posterior part with whitish dot; anterior part with large brownish dot and 11–15 long setae including a primary seta at the anterior angle.

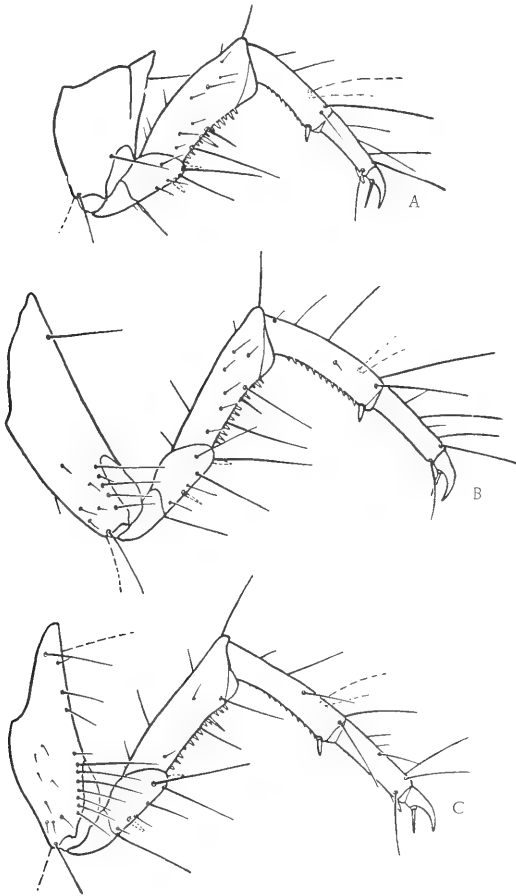


FIGURE 169. *Baicalina spinosa* Mart. Right legs, posterior: foreleg (A), midleg (B), hind leg (C).

Propleuron brown in area of epimeron, spinulose, with short, basal, reddish brown stripe in the middle; seta short, thin, reddish brown. Mesopleuron yellowish brown, with small dots near the suture basally; spinules dense, larger near anterior angle of episternum, smaller along the suture; epimeron without spinules along the suture; setae chestnut

brown, both primary setae much longer and thicker than the secondary setae, which number 7–8 on the episternum, 5–6 on the epimeron. Metapleuron lighter, whitish, brownish with indistinct punctation near the suture; episternum with small spinules near the anterior angle only; epimeron without spinules; setae chestnut brown, primary setae less sharply differing from the secondary setae than on the mesothorax, secondary setae almost as long as the primary setae; episternum distally with 15–16 secondary setae, epimeron including ventral process, with 29–31 setae.

Prosternite indistinct, whitish, spinulose. Horn brown, light apically, darker basally, with small spinules (Figure 168).

Legs brown; punctation coarse; ratio of length of legs 82:100:102.

104 Fore coxa (Figure 169, A) less spinulose than in the preceding species; middle of anterior surface with small spinules; both primary anterior setae situated in basal part, short, thick, light brown, divided apically in finger-shaped form of 5–6 large and 1–2 thin lobes; dorsal seta situated outside the spinulose area; basodorsal seta moderately long; posterior apical dorsal seta longer; both setae brown; anterior apical dorsal seta short; both primary apical ventral setae moderately long, brownish, posterior seta slightly larger; one secondary seta on the anterior surface, 2 small, thin setae on the posterior surface. Anterior seta of trochanter short, thick, divided apically, basal ventral seta light, spine-shaped. Primary ventral setae of femur situated close together, as in all species of *Baicalina*, in form of 2 light spines, the basal spine thick and blunt, the apical thin, sharp, moderately long; posterior primary seta brown, long, situated in the middle between the posterior margin and the basal spine.

Number and arrangement of gills of *B. spinosa*

Segment	Dorsal	Ventral
2	1 1	1
3	1 1	1
4	1 (0) 1 (0)	1

Anterior seta of mid-trochanter (Figure 169, B) short, blunt, thick; posterior seta moderately long, thin; anterior apical ventral seta in form of light blunt spine; second anterior ventral seta, as in *B. bellicosa*, in form of a larger, light spine situated much more basally, closer to

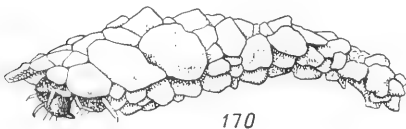


FIGURE 170. *Baicalina spinosa* Mart.  
Larva in case, lateral

the suture than to the spine; baso-ventral seta long, posterior apical seta slightly larger, subapical seta the same, all 3 setae brown; posterior surface with 2 thin light secondary setae instead of a single seta as in *B. bellicosa* and *B. thamas-toides*.

Ventral setae of mid-femur in form of light, long, sharp spine in the middle and a long brown seta more basally; posterior primary seta the same, situated subventrally near the apical ventral seta.

Posterior seta of hind trochanter (Figure 169, C) thin, long; posterior apical ventral seta the same, both brown; posterior subapical seta shorter, light, slightly brownish. Posterior primary seta of femur situated subventrally near the apical margin, long, dark brown; both primary ventral setae situated in middle of segment, the basal (posterior) seta light brown, moderately long, about in the middle, the second ventral seta in form of thin, long, sharp, light spine not situated as in *Thamastes*, but much more apically.

Dorsal and lateral processes of abdominal segment 1 large. Ventral abdominal elliptical areas present on segments 2—7. Lateral line from segment 2 to beginning of segment 8.

Gills on segments 2—4, presegmental and postsegmental dorsally, the former shorter and thinner than the latter, postsegmental only ventrally; gills of segment 4 smaller than on the anterior segments, sometimes absent on one side.

Sclerite of segment 9 light, whitish, sometimes with pale brownish margin, large; anterior margin with 3—4 large grayish dots laterally; covering chaetoids in the middle only, small, scale-shaped, pectinate apically, with minute spinules; some spinules larger than the others. Setae numerous, long primary anterior-angle and medioanal setae situated near the posterior margin, most of the secondary setae also long; 3 thick, long setae and 2 thin, much smaller setae between the medioanal setae; 6—7 setae between the anterior-angle and the medioanal seta, including setae situated more laterally in the angle; surface subapically with 2 setae on each side, one short, yellowish, the other brown, moderately long.

Sclerite "b" of anal legs light brown dorsally, its apical margin with a reddish brown stripe laterally and ventrally; chaetoids scale-shaped, combs of spinules, as on segment 9; median apical dorsal seta blackish brown, long, neighboring seta much shorter, contrary to usual, lateral seta thinner, moderately long, subapical seta on the inner margin brown, short, thin, ventral seta brown, thick, moderately long. Sclerite "c" yellowish brown, spinulose; seta small, brown, some distance from the basal angle.

Claw dark brown, including basal part; setae as in *B. bellicosa*.

Case (Figure 170) 14—18 mm, rarely 20 mm long, made of medium-sized and coarse sand grains, with rough surface, curved, tapering posteriorly; dorsal surface strongly convex, with sand grains of different size; ventral surface slightly flattened but rough, with coarse sand grains; sides of case with larger sand grains, especially posteriorly; posterior end covered by membrane with a large round or elliptical hole.

Mode of life and habitats. Shore of Lake Baikal, on stones, usually at a depth of 2—5 m.

Distribution. USSR: Lake Baikal. Not known outside USSR.

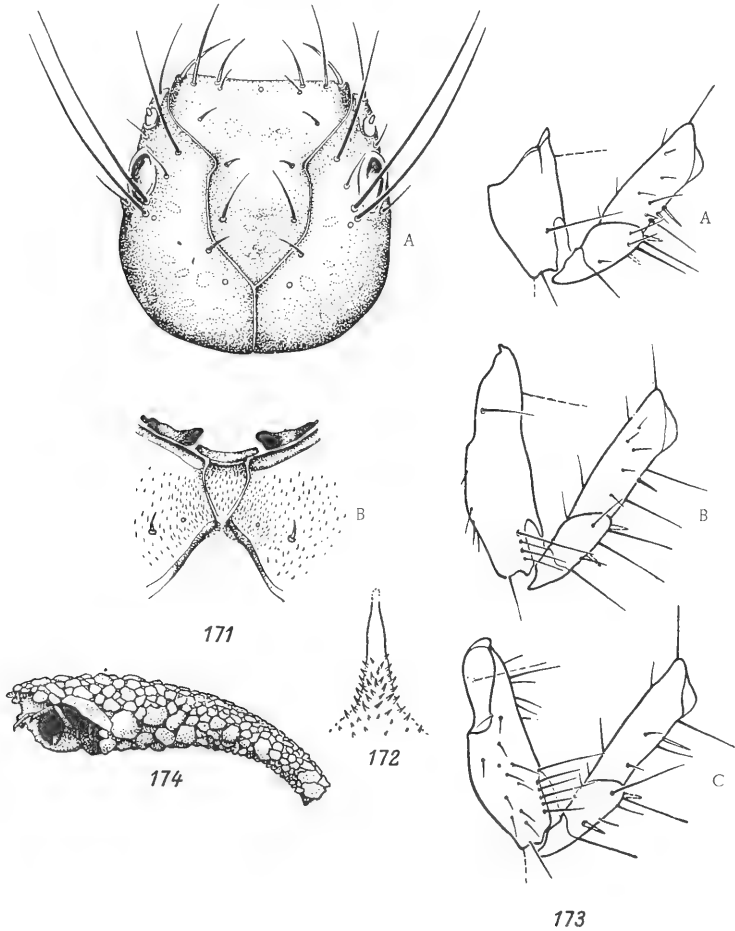
### 3. *Baicalina thamastoides* Martynov

Bebutova, 1941:94—96, Figures 32—49. — Lepneva, 1964:669—676.

**Full-grown larva.** Length 10—12 mm. Head (Figure 171, A) darker than *B. bellicosa*; sclerites light brownish, spinules dark brown, dots

106 more distinct; frontoclypeus anteriorly of more uniform color than in *B. bellicosa*; dots brighter; wedge-shaped figure in posterior area distinct, 10–11 brown dots; those lateral to epicranial suture large, brownish, behind the eyes smaller and light, their number and arrangement as in *B. bellicosa*; the lighter, ventral areas without spinules near the occipital foramen, with large whitish dots; spinules lateral to gular suture larger than the dorsal spinules. Gula oblong, with large spinules (Figure 171, B).

(105)



FIGURES 171–174. *Baicalina thamastoides* Mart.:

171 — head, dorsal (A) and ventral (B); 172 — prothoracic horn; 173 — coxa, trochanter and femur of right legs, posterior: foreleg (A), midleg (B), hind leg (C); 174 — case.

Setae lighter than in *B. bellicosa*, arrangement similar; setae 14 and 15 long and thick, thicker and almost twice as long as the tapering, shorter seta 9.



Dorsal sclerite of labrum chestnut brown, with minute spinules; anterior-margin processes reddish; setae 5 and 6 brownish; seta 3 grayish; the other setae light; arrangement and form of the setae as in *B. bellicosa*.

Mandibles reddish apically in some specimens, thinner than in *B. bellicosa*, yellowish at the margin, black basally; brush of chaetoids light, setae situated basally, dorsal seta short, brown; ventral light, small.

Pronotum whitish; spinules lighter than in *B. bellicosa*, brown, larger near the anterior margin, which is narrow, chestnut brown; lateral margin slightly wider, with smaller spinules; surface with brownish dots, one dot in the middle lateral to the median suture, 2 dots further posteriorly; large dots on small, brown area in each half near the posterior margin, small dots anteriorly on light background in the same group, 4 large dots anteriorly and laterally; posterior margin wide, separated by a chestnut brown stripe from the other surface, its middle brownish, with minute spinules, with black stripe posteriorly, light laterally and with larger spinules; posterior-angle process of posterior margin small, reddish brown, with a few, small, dark spinules, and divided from the rest of the margin by narrow black stripe, base of process with large, reddish black spot. Anterior-angle and medioanal seta moderately long, pinkish brown, other setae lighter, their arrangement and size as in *B. bellicosa*.

Number and arrangement of gills of *B. thamastoides*

Segment	Dorsal	Ventral
2	1 1	1
3	1	1
4	1 (0)	1 (0)

Mesonotum without curved posterior process, in contrast to *B. bellicosa*; median suture very thin posteriorly; anterior margin with wide pinkish brown stripe lateral to median suture; spinules covering the whole tergite; greater part of surface chestnut brown, light brown posteriorly; a large whitish area in the middle, sides with white stripe without spinules; dots brown or light brown; spot at posterior angle large, blackish, with reddish brown outline; small, oblique, narrow, dark band; anterior-angle seta situated more posteriorly, this and the medioanal seta pinkish brown, longer than the others.

Metanotum with 5–6 brown setae, 3 of them moderately long, on the site of each anterior median sclerite; 3 setae on the site of each posterior median sclerite; medioanal seta long, brown, second seta moderately long, third seta small; a small brown sclerite at the base of the setae. Lateral sclerites slightly sclerotized posteriorly, light brown, with a large brownish dot and an indistinct posterior border; a transverse band of dark streaks and groups of chestnut brown dots; anterior area with 10–11 chestnut brown setae, 3 of them, including the primary seta, moderately long.

Prothoracic horn dark brown (Figure 172), shorter, wider at the base than in the form preceding, with light apex, and small spinules basally, almost to the middle. Sternite barely visible, consisting of 2 fused, triangular, indistinct, brownish areas.

Legs uniformly brown. Coxae with large dots basally. Anterior surface of fore coxa with spinules only in the middle, these spinules lighter and smaller than in *B. bellicosa*; large spinules situated singly, basally, and ventrally to the anterior primary spinules. Posterior primary seta and ventral primary setae of femur equally spaced at base (Figure 173, A).

Postsegmental gills present on segments 2-4, presegmental gills dorsally on segment 2, segment 3, in contrast to *B. bellicosa*, without gills.

Ventral elliptical areas on segments 2-7 small, distinct.

Tergite of segment 9 light brown, with large, pale dots near anterior margin; setae chestnut brown, medioanal setae and the anterior-angle setae moderately long; fewer secondary setae than in *B. bellicosa*.

107 Sclerite "b" of anal legs light brownish, with reddish brown spinules dorsally, spinules larger near the inner margin; lateral and ventral areas with scale-shaped, thin spinules; distodorsal setae dark reddish brown, lateral setae thinner and markedly shorter than the other two; median margin with a brown, thin, moderately long seta; setae absent on the surface among the spinules; ventral seta brown, thick, moderately long. Sclerite "c" yellowish, with brownish spinules and dark reddish brown outer margin; basal seta short, yellowish brown. Claw and its setae as in *B. bellicosa*.

Case 11-15 mm long (Figure 174), made of smaller and more smoothly arranged sand grains than in *B. bellicosa*, conical, strongly curved, with coarser grains laterally; anterior opening markedly truncate, with dorsal hood; posterior opening covered with dark brown membrane with a large central hole.

Mode of life and habitats. On stones, at a depth of 2-5 m, usually on stones overgrown with green algae and diatoms.

Distribution. USSR: Lake Baikal. Not known outside USSR.

#### 4. Genus *Baicalinella* Martynov

**Full-grown larva.** Medium-sized, 9-11.5 mm. Sclerites of head dorsally and ventrally with dense spinules, except for the occipital stripe and the dots; secondary setae absent. Gula broad, narrower posteriorly, with curved sides. Thoracic sclerites with covering spinules; row of large spines on anterior margin of pronotum absent. Prothorax with horn. Gills absent, or rudimentary if present, on abdominal segment 2. Tergite of abdominal segment 9 pale whitish, with 2-3 secondary setae.

Case made of coarse sand grains, conical, strongly curved, crudely made.

Mode of life and habitats. Open areas of the shore, usually at a depth of 5-10 m; single specimens occur deeper.

Distribution. USSR: Lake Baikal. Not known outside USSR.

#### 1. *Baicalinella foliata* Martynov

Bebutova, 1941:99-100, Figures 67-81. — Lepneva, 1964:669-676, Figures 4, 8, 12, 14, 18, 22.

**Full-grown larva.** Length 9.0–11.2 mm. Head chestnut brown dorsally (Figure 175, A), with dark reddish brown stripe in antennal area anterior to eye to anterior margin. Dorsal and ventral surface densely spinulose, except for a narrow band around occipital foramen; ventral spinules smaller and less dense; a large, bare area near occipital foramen. Gula small, wide, finely spinulose, with rounded sides (Figure 175, B). Frontoclypeus punctate anteriorly, distinct wedge-shaped pattern of 9 large brown dots on posterior part; 2 dots on each side lateral to frontal sutures near tentorial pit and lateral to posterior part of the wedge-shaped pattern; 3 large dots more posteriorly on each side some distance from the coronal suture; several dots on the sides behind the eye.

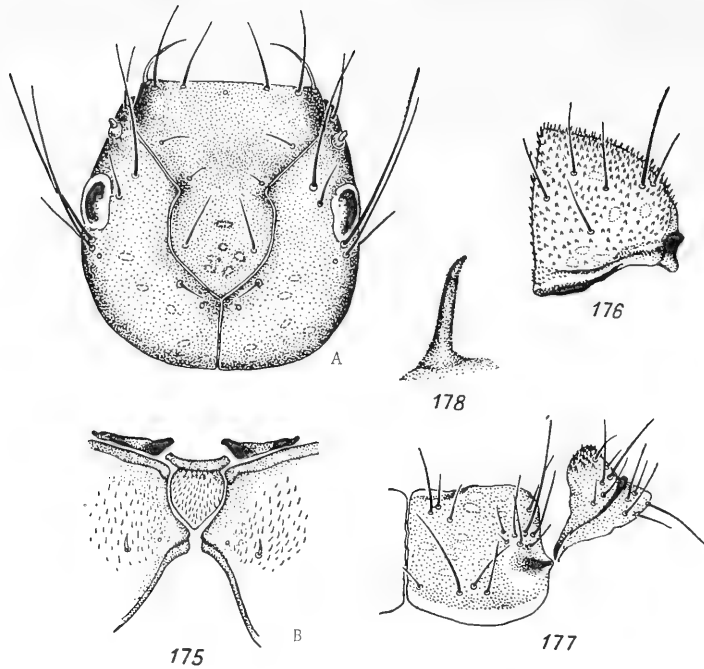
Anterior-margin setae moderately long, brown, intermediate seta longer than median seta, lateral seta short, light, curved; anterior-frontal seta the same, slightly thinner, procumbent; middle frontal seta small; posterior frontal seta brownish, thin, long. Seta 7 situated anterior to antenna, short, dark brown, thin. Seta 8 also dark, slightly shorter and thinner. Seta 10 small, light, situated anterior to the eyes, as is seta 13. Seta 9 moderately long. Seta 11 short, very thin, level with middle of eye. Seta 12 short, thicker, light brownish. Seta 14 situated behind the eye, long, much longer but thinner than 9, brown. Seta 15 situated nearby posteriorly, light brown, almost as long as 14, but thinner. Seta 16 small, thin. Seta 17 situated anterior to the fork, short, very thin, brownish at the base. Ventral seta 18 small, spine-shaped, sharp, only slightly smaller than seta 8.

Dorsal sclerite of labrum short, occupying slightly more than half the surface; almost the whole anterior part broadly membranous; processes lateral to wide median indentation, reddish brown, only slightly darker than other part of the sclerite. Posterior-angle sclerites thin, oblong, brown. Seta 1 light, relatively large, situated on the membrane; seta 2 slightly larger, yellowish, situated near the process; seta 4 small, light, situated at the angle of the indentation; seta 3 short, light, situated laterally near margin; setae 5 and 6 large, yellowish.

Mandibles long, black, reddish distally; hairs of brush transparent, light; outer setae situated basally, dorsal seta short, ventral one small, both brown.

Pronotum (Figure 176) mat white, with several large, indistinct, light brownish dots; surface outside dots finely spinulose. Anterior and lateral margin grayish brown, with small, thin spinules. Posterior margin light brownish, its spinules as on the surface but smaller; posterior margin with black stripe in the middle, dark brown laterally; process of posterior angle dark reddish brown, separated by a short, black stripe with large black spot basally. Setae brown, primary anterior-angle seta larger than the others (Figure 176).

Mesonotum (Figure 177) darker in middle, light chestnut brown, snow white laterally, entire surface densely spinulose except the dots. Anterior margin in form of reddish brown stripe in the middle, lighter laterally; spot at posterior angle reddish brown, oblique, adjacent to brown area; oblique streaks form an indistinct band. Setae (Figure 177) reddish brown, primary anterior-margin seta, anterior-angle seta situated near lateral margin, medioanal seta situated near posterior margin, moderately long and thicker than the others.



FIGURES 175-178. *Baicalinella foliata* Mart.:

175 — head, dorsal (A) and ventral, anterior (B); 176 — pronotum; 177 — mesonotum and mesopleuron; 178 — prothoracic horn.

Setae of metanotum pinkish brown. Site of each anterior median sclerite occupied by 4 medium-sized and one very small, thin seta; primary seta moderately long, larger than the others. Site of each posterior median sclerite occupied by 3 setae; one moderately long median, one short intermediate, and one small lateral seta. Lateral sclerites weakly sclerotized, with large pinkish brown spot on site of transverse band; posterior part of sclerite indistinct, anterior part whitish, with 5-6 setae, primary anterior-angle seta longer than others.

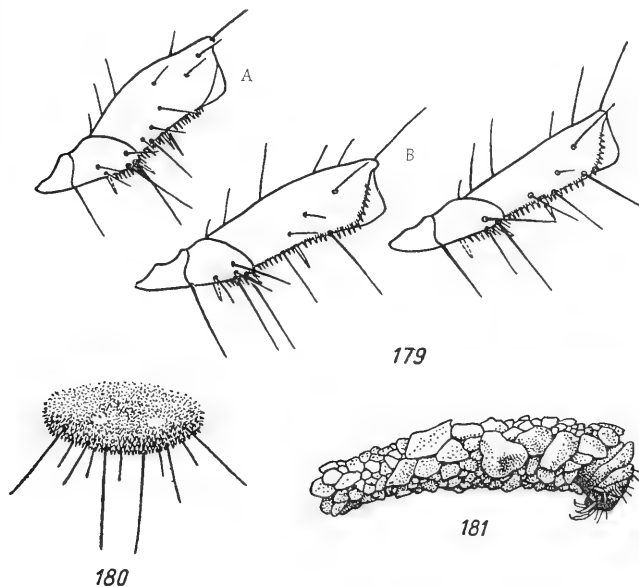
Mesopleurite (Figure 177) light brownish, with whitish anterior angle and narrow, reddish, dark brown, pleural suture; surface spinulose, spinules of light anterior angle larger than the others; setae pinkish, 8-9 on episternum, 4-5 on epimeron, both primary setae moderately long, thicker than the others. Metapleurite lighter; pleural suture the same; episternum with smaller and sparser spinules than on mesothorax; epimeron mainly without spinules.

Prothoracic horn (Figure 178) brownish, short, with small spinules in middle; sternite absent.

Legs (Figure 179) uniformly brown, more or less covered with small spinules; coxae spinulose ventrally and on greater part of anterior and posterior surface; ratio of length of legs 76:100:96.

Both primary anterior setae of fore coxae short, brownish, uniformly thick, divided at the end. Anterior primary seta of trochanter the same;

posterior seta brown, moderately long; anterior ventral setae apical and subapical; forming short, thick, light, blunt spines, situated some distance from each other; basoventral seta light, moderately long, spine-shaped, posterior ventral setae light brown, moderately long, situated close together apically and subapically; a few spinules of the ventral comb between the setae distally. Primary ventral setae of femur situated close together, in form of light, sharp spines, apical spine longer and thinner than basal, and forming almost a spine-shaped seta, posterior seta situated slightly basally, brown, thick, moderately long. Ventral comb of spinules extending along the whole segment.



FIGURES 179-181. *Baicalinella foliata* Mart.:

179 - trochanter and femur of right legs, posterior: foreleg (A), midleg (B), hind leg (C); 180 - tergite of abdominal segment 9; 181 - case.

Anterior ventral setae of mid- and hind trochanter pointed; anterior surface seta short, light brownish, divided at the end, as on the forelegs.

Posterior seta of mid-trochanter moderately long, slightly larger than on forelegs; basoventral seta light brown, long; posterior apical ventral seta also long but darker, brown; posterior subapical seta shorter and thicker. Apical ventral seta of mid-femur in form of large, light, sharp spine in middle of the segment; basoventral seta situated nearby, long, brown; primary posterior seta situated subapically, similar but thinner; ventral comb of thick, blunt, sparse spinules extending along whole segment.

Primary posterior seta of hind trochanter moderately long; basoventral and posterior subapical setae of the ventral primary setae spine-shaped, light,

brownish, and moderately long, both much shorter than the posterior apical ventral seta. Posterior seta of femur situated subventrally near the distal margin, long, brown; distoventral seta brownish, long, shorter than the posterior seta; basoventral seta in form of light, large spine; both setae situated close together in middle of segment.

Dorsal process of abdominal segment 1 low; lateral processes larger, situated more ventrally.

Lateral line extending from middle of segment 2 to beginning of segment 8, thin, consisting of very fine hairs. Ventral elliptical areas on segments 2-3. Gills absent or rudimentary and dorsal, barely visible, postsegmental on abdominal segment 2.

Tergite of abdominal segment 9 (Figure 180) light, whitish, indistinct, with dense, small, pinkish spinules; 2-3 large dots without spinules laterally; setae brown, medioanal setae relatively thin, moderately long, anterior-angle setae situated apically on the sides, slightly longer, intermediate and lateral seta short, thin; a similarly thin, slightly brownish seta between the median setae; a brown, moderately long seta lateral to the median setae; a small, light seta sometimes present among the spinules near the dots.

Sclerite "b" of anal legs whitish yellow, with reddish brown distal stripe laterally and ventrally; surface densely spinulose, as on sclerite "c"; setae reddish brown, median and the neighboring seta long, lateral seta moderately long, ventral seta short, thick; inner margin with short, brown subapical seta. Sclerite "c" light yellowish, with broad reddish brown outer margin; seta light, small.

Claw chestnut brown at the base, with dark reddish brown distal part; setae 1, 2, 3, and 6 light brown, seta 6 small, thin, other setae light; chaetotaxy as in the species just described.

Case 12-16 mm long, curved, made of coarse, loosely attached sand grains, grains on the ventral surface no smaller than on the dorsal surface (Figure 181); larger sand grains on sides of anterior part; oblique, anterior opening, posterior opening closed by membrane with a central hole.

**Pupa.** Pupal case shorter than larval case, anterior opening closed by sievelike membrane loosely covered with sand grains, similar posterior membrane with several small holes.

**Mode of life and habitats.** Open shore of Lake Baikal, at a depth of 2-6 m, rarely 10 m, usually on sandy or sandy-stony bottom, rarely on stones, sometimes among vegetation; it avoids silt and does not occur on silt bottom.

**Distribution.** USSR: Lake Baikal. Not known outside USSR.

## 2. Tribe Apataniini Ulmer

**Full-grown larva.** Length 5-12 mm. Sclerites of head rough, spinulose. Submentum with 2 small, not always distinct, sclerites ventrally. Anterior margin of pronotum without the comb of large spines characteristic for the Baicalinini. Dark spot in posterior angle of mesonotum always large, distinct, position constant. Apical ventral part of fore trochanter and basoventral part of femur with large, hairlike chaetoids directed distally, as

in the Limnophilinae. Secondary chaetotaxy of head, thorax, and legs richer than in Baicalinini. Tergite of segment 9 usually with a large number of secondary setae.

Case built more carefully than in Baicalinini, consisting mainly of small sand grains, markedly flattened ventrally, with large grains only at lateral margin.

Mode of life and habitats. Stagnant and running water from brooks and streams to large rivers in the plains and large deep lakes; shallow water, sometimes at a depth of only a few cm; lakes and large rivers, mostly in the littoral zone, on solid bottom of stone, clay, or firm sand; avoids swampy waters and silt.

Distribution. Throughout the USSR. In addition, Europe, Asia, North America.

The species, the larvae of which are described below, were previously considered as belonging to a single genus, *Apatania* Kolenati, 1848, sensu lato. This was also the view of Martynov until 1918 (Martynov, 1914:26-51); later, Martynov (1918:56-63) accepted the division of the genus *Apatania* Kolenati s.l. into 2 more narrowly defined genera, *Apatania* s.str. Wall. and *Apatelia* Wall., according to Wallengren (1891:87-89). Schmid recently (1953:109-119, 144-167; 1954a: 1-53; 1955:80-84) returned to the broad definition of the genus *Apatania* Kolenati, 1848, dividing the genus into 5 species groups. The larvae of 3 of these groups: wallengreni, stigmatella, and fimbriata, are described here; the species of the first 2 groups were previously placed in the genus *Apatania* Wall.; those of the 3rd group in the genus *Apatelia* Wall. In contrast to the tribe Baicalinini, the following descriptions of the larvae show that there are no marked morphological differences between the species of *Apatania* Wall. and *Apatelia* Wall. (e. g., presence of horn, gills, structure of sclerites); the groups differ mainly in coloration, sometimes markedly, and also in minor morphological characters. Studies of the larvae of Apatanini show clearly that the genus *Apatania* Kolenati should be accepted in its broad sense, and we accept this in the present work.

The larva of *Apatania bulbosa* Mart., a species placed by Schmid (l. c.) in the genus *Apataniana* Mos., is not known with certainty; the larva of *A. bulbosa* described provisionally (Lepneva, 1949:181) differs from the larvae described here in its distinct coloration; it has a dark, reddish brown head with clearly defined, wedge-shaped punctation of the frontoclypeus, a dark pronotum (in contrast to the light pronotum of most species of *Apatania*) and a different, cylindrical, slightly curved case; it inhabits mountain streams and rivulets. The larva of the only species of *Apatidelia* Mosely (*A. martynovi* Mos., East China) is unknown.

The characters of the tribe described above are based on the larvae of *Apatania* Kol.

## 1. Genus *Apatania* Kolenati

**Full-grown larva.** See description of tribe.

Mode of life and habitats. Clear water bodies of different size, stagnant or running; streams and brooks; littoral zone of rivers and lakes;

usually on a bottom of stone, sand and stone, pebble, or sand; rarely in the sublittoral, to a depth of 30 m in Lake Teletskoe, to 7 m or slightly deeper in Karelian lakes.

Distribution. Throughout the USSR. In addition, Europe, China, Japan, Mongolia, Pakistan, Assam, Burma, North America.

### Key to Species

#### Full-grown larva

- 1 (8). Head blackish, dark brown, or brown; gula wide, short, or oblong-heart-shaped; seta 15 much shorter, thinner, and usually lighter than 14; ventral gills present on segment 6.
- 2 (7). Head blackish or dark brown; gula short, wide, almost as long as wide; if present, gills of abdominal segment 1 only dorsal.
- 3 (4). Head blackish; large setae 9 and 14 black; gula short oval; gills present on abdominal segment 1 . . . . . 5. *A. zonella* Zett. (p. 158)
- 4 (3). Head and large setae 9 and 14 dark brown or chestnut brown; gula of different form; gills of abdominal segment 1 present or absent.
- 5 (6). Gula triangular, with straight or almost straight sides; dorsal gills of abdominal segment 1 usually present, sometimes absent; ventral gills present on segments 6 and 7; Middle Asia . . . . . 7. *A. copiosa* McL. (p. 167)
- 6 (5). Gula with curved sides; dorsal gills absent on abdominal segment 1; ventral gills only on segment 6; Europe . . . . . 8. *A. muliebris* McL. (p. 171)
- 7 (2). Head brown; gula large, oblong-heart-shaped, with truncate or bluntly rounded posterior end; northern species . . . . . 6. *A. majuscula* McL. (p. 162)
- 8 (1). Head brown, rarely dark or light brown; gula narrow, oblong; seta 15 smaller than 14 or almost as long; abdominal segment 6 with or without gills.
- 9 (12). Head dark brown, chestnut brown, or brown; gula very narrow; gills absent on abdominal segment 1.
- 10 (11). Head dark brown or brown; seta 15 much shorter than 14; gills present on abdominal segment 6; Caucasus . . . . . 2. *A. subtilis* Mart. (p. 142)
- 11 (10). Head chestnut brown; seta 15 moderately long, only slightly smaller than 14; abdominal segment 6 with or without gills; Siberia . . . . . 3. *A. crymophyla* McL. (p. 148)
- 112 12 (9). Head light brown; gula wider; gills on segments 1 and 6 present or absent; mainly a northern species.
- 13 (14). Gills absent on abdominal segments 1 and 6.
- 14 (13). Gills present on abdominal segments 1 and 6.
- 15 (16). Gula with curved sides; seta 15 markedly shorter than 14 . . . . . 4. *A. stigmatella* Zett. (p. 153)
- 16 (15). Gula oblong-triangular, with straight sides; seta 15 long, almost as long as 14 . . . . . 9. *A. auricula* Forssl. (p. 175)



## 1. *Apatania wallengreni* McLachlan

Lepneva, 1928:81-83, Plate II, Figures 1-4.

**Full-grown larva.** Length 7-8 mm. Sclerites of head (Figure 182, A) brown, covered with small spinules; area near occipital foramen broadly light brown, smooth, without spinules. Eyes on large light area; antennae closer to anterior margin than to eye. Frontoclypeus slightly dark near anterior margin and posteriorly near sutures; tentorial pits dark brown; spinules on frontoclypeus thin, sharp, dense in the anterior part laterally, sparse elsewhere. Surface slightly dark laterally to posterior branch of frontal sutures and before eye; spinules lateral to frontal sutures, dense, needle-shaped; surface behind eye and ventrally slightly tuberculate, with a reticulate pattern; middle of ventral surface slightly dark, lighter posterior area with brownish punctation; lateral to gular suture spinules single, thin, needle-shaped; tuberculate reticulate area with minute spinules which may be blunt or sharp, arranged in rows, or singly on crests. Gula brownish, oblong (Figure 182, B), almost twice as long as wide, with blunt posterior end; spinules sparse, small, needle-shaped; pregula orange-brown, like the anterior margin of the head.

Most setae thick, pinkish brown; median and intermediate, anterior-margin setae moderately long, latter seta slightly longer, lateral seta light, thick basally, filiform apically; anterior-frontal seta also light but shorter, middle seta small, thin, situated near tentorial pit, posterior seta moderately long, brownish basally and thick, filiform apically; small secondary setae light, thick, larger, short and moderately long, pinkish brown, situated mainly in the anterior angle.

Seta 7 situated anterior to antenna, moderately long; seta 9 long; seta 14 slightly longer, less thick; seta 15 situated posteriorly nearby, thinner, long but slightly shorter than 14; other setae much smaller, brownish, or light; seta 11 situated near posterior margin of eye close to margin of light area, short; seta 10 situated anterior to eye, slightly smaller; seta 12 situated laterally behind eye, thin, short; seta 13 situated nearby, small; seta 16 situated behind 15, light; seta 17 situated near suture anterior to the fork, short, smaller than the posterior frontal seta; ventral seta 8 small, brown, thick; seta 18 smaller, light. Secondary setae arranged longitudinally from the antennae, laterally along the frontal sutures, short and small, brownish and light.

Dorsal sclerite of labrum brownish; posterior-margin stripe and base of posterior-angle sclerites orange-brown; seta 1 small; setae 2 and 3 large, light, thick, slightly smaller than the brown setae 5 and 6; seta 3 situated at the margin, yellowish, or slightly posterior to 5; setae 3, 5, and 6 with long, filiform end.

Pronotum (Figure 183) mainly light brownish, whitish near anterior margin and laterally; anterior margin yellowish, lateral margin reddish brown, blackish at the base near black posterior-angle spot; surface and posterior-margin area with large, indistinct, pale brownish dots; spinules minute, pointed, in rows, rarely singly, situated on surface or on small ridges which in some places lack spinules or are indistinctly serrated; in contrast to *Baicalinini*, anterior-margin spinules very small but larger than surface spinules; posterior margin yellowish, separated by a light

brownish groove with small, single spinules in the middle; transverse stripes dark reddish brown; posterior median stripe blackish laterally; anterior stripe longer and narrower, extending toward median suture; posterior-angle process small, whitish yellow, with broad, reddish brown lateral margin separated by a brownish stripe. Primary setae brown, relatively short, thick; moderately long anterior-margin seta, anterior-angle seta, and medioanal seta larger and thicker than the others; secondary setae numerous on the whole surface, small, most of them light or brownish, those situated near the lateral margin longer, almost as long as the primary setae; anterior-margin area with small, transparent, secondary setae, one or two thick, light lateral setae near the anterior angle larger than the others.

113  
114 Mesonotum (Figure 184) lighter than pronotum, with thin, median suture, indistinct posteriorly; middle of anterior margin with indistinct brown stripe, interrupted by median suture; middle of each half with light brown area characteristic for the tribe, with large brownish dots laterally; middle with 2 large dots; anterior area with 2 rows of smaller dots forming a wedge, posterior and lateral areas whitish; large posterior-angle area broadly reddish brown, with a dark brown angular spot, and a small reddish stripe extending to anterior third of lateral margin; posterior margin white, indistinct. Surface with minute spinules situated singly on tubercles or in rows on ridges; some tubercles and ridges without spinules. Setae reddish brown, most of them thick; primary setae, anterior-margin, anterior-angle, and medioanal, larger than the others; of 23–24 secondary setae, 9–10 are moderately long or short, and small, situated in middle anteriorly, 7–8 near posterior margin, and laterally, including anterior-angle and lateral groups.

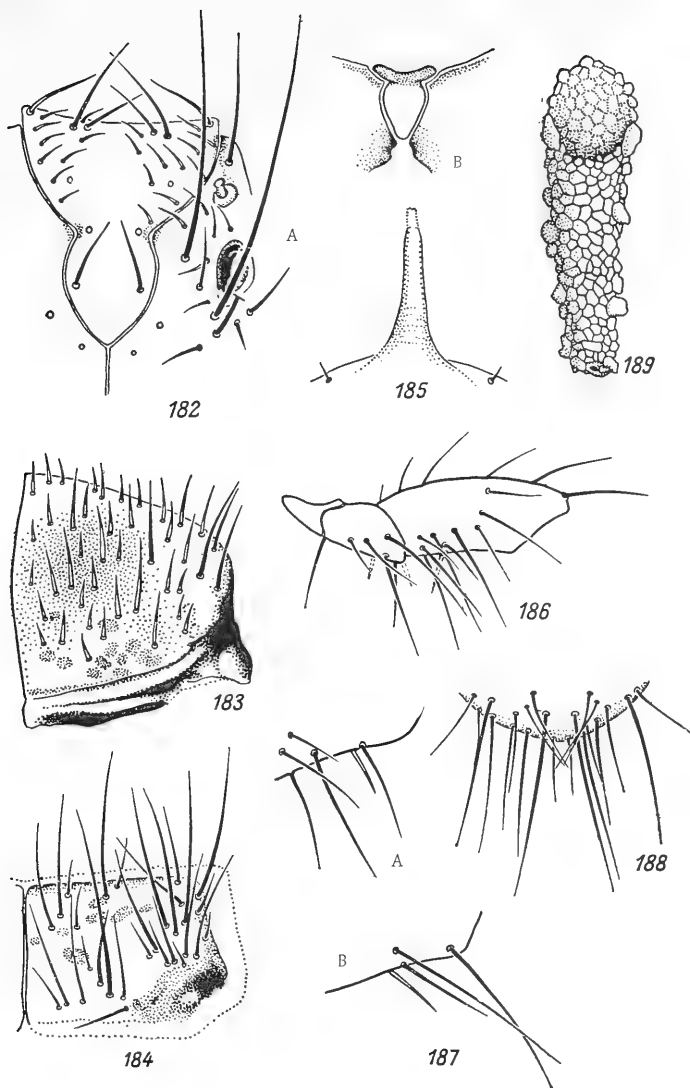
Setae of metanotum lighter and thinner, pinkish brown; 11–12 setae at site of anterior-margin sclerites, 4 setae on site of posterior median sclerites; lateral sclerites indistinct posteriorly, transverse band reddish brown, with thin striated, anterior part white, with 14 setae, primary seta and 2–3 secondary setae longer than the others.

Propleuron with dark reddish brown pleural suture; epimeron yellow, with broad, reddish brown median margin; seta moderately long, thin, situated near the suture; trochantin yellowish brown, with dark reddish brown spot, seta short, light.

Horn grayish, short, with light apex (Figure 185); median sternite of prothorax barely visible, whitish.

Legs light brown, of uniform color, with reddish brown margin between coxa and trochanter and femur and tibia. Ratio of length of legs 73:100:98.

Fore coxa (Figure 186) with wide, reddish brown margin spot at base; sparse spinules dorsally and on the entire surface, small, singly or in rows of 2–3; setae brown, relatively thin, large; basodorsal seta moderately long, 5 smaller, thin, secondary setae at the base; anterior distodorsal seta small, light; long posterior seta near end of distodorsal depression; 2 thick, moderately long secondary setae further distally at margin; anterior surface setae short, light, divided apically, widely separated subdorsally near basal margin and subventrally between basal and apical areas; anterior distoventral seta light, short; posterior seta brown, slightly smaller; 2–3 thin, short, subventral secondary setae, and a moderately long ventral seta posteriorly.



FIGURES 182-189. *Apatania wallengreni* McL.:

182 — part of head, dorsal (A) and ventral (B); 183 — pronotum; 184 — mesonotum; 185 — prothoracic horn; 186 — fore trochanter and femur, posterior; 187 — ventral margin of femur of midleg (A) and hind leg (B), posterior; 188 — tergite of abdominal segment 9; 189 — larval case.

Trochanter (Figure 186) with small spinules similar to those on the coxa except in dorsal and anterior subdorsal areas. Primary anterior seta short, divided apically, posterior seta thin, moderately long; basoventral seta light, spine-shaped, moderately long; anterior distoventral seta in form of short light spine; subapical seta also spine-shaped, but thinner and longer; moderately long, brown posterior ventral setae situated close together near the distal

margin; 2 secondary setae subventrally and slightly more basally, one of them short, the other moderately long; a row of light, hairlike chaetoids among the primary setae ventrally. Femur convex dorsally, ventral margin straight; spinules very sparse along whole segment on posterior side but only in distal area on the anterior side; primary distodorsal seta moderately long; basodorsal seta shorter; 2-3 thin secondary setae in apical area and 2 small setae in basal area; anterior seta situated in middle of segment, short, divided; both ventral setae situated basally close together in form of light spines; posterior seta situated more basally, brown, long; posterior surface with a row of 8 secondary setae, 3 of them moderately long; a row of thick spinules at the ventral margin. Tibia with 2 secondary subdorsal setae anteriorly in addition to the primary setae, the basal secondary seta long. Segments with sparse spinules.

Mid- and hind legs as in Figure 187. Base of fore coxa dorsally and subdorsally with dense tubercles with rounded or pointed end; further distally, on the posterior and anterior sides, small, thin, needlelike spinules resembling those on the forelegs and situated singly or in rows of 2-3. Trochanter and femur of mid- and hind legs with few, sparse spinules, except on ventral side; tibia with a small number of spinules; tarsus without spinules except distoventral spinules. Setae, with few exceptions, brown or light brown, relatively thin.

115 Basodorsal seta of mid-coxa long, situated in dorsal row of similar and smaller, thin, secondary setae; margin of distodorsal indentation anteriorly with a long, reddish brown primary seta and 2 large secondary setae, a long, primary seta and 5-6 smaller secondary setae near the posterior margin; both anterior primary setae short, pointed, situated distally; 4-5 short, thin, secondary setae on anterior surface; posterior surface with 9-10 small and relatively large secondary setae, 2-3 small, light setae ventrally; primary distoventral setae short, anterior seta thick, slightly lighter than the brown posterior seta. Anterior seta of trochanter short, thick, posterior one moderately long; anterior ventral setae in form of 2 light spines, one of them apical, the other markedly subapical; primary, basoventral seta grayish, thick, moderately long; posterior, apical and subapical setae brown, long; 2 thin, short, secondary setae posteriorly near suture; a hairlike, light chaetoid near base of distoventral setae.

Distodorsal seta of mid-femur relatively thick, moderately long; basodorsal seta thin, much longer than the apical seta; 2 long, thick, secondary dorsal setae apically and 2 small setae basally; anterior primary seta situated some distance from the apex, short, thick, brown; long, brown posterior seta situated subventrally in middle of segment; primary distoventral seta in form of large, light, sharp spine near posterior seta; second ventral seta moderately long, brownish, situated near the base (Figure 187, A); anterior surface with 2 secondary setae basal to the primary seta; posterior surface with 8 thin, short and moderately long secondary setae. Primary setae of tibia situated among dorsal and posterior secondary setae; anterior surface subdorsally with 3 secondary setae, one of these thicker, moderately long.

Number and arrangement of gills of *A.wallengreni*

Segment	Dorsal	Ventral
2	1 1	1
3	1 1	1
4	1	1
5		1

Primary basodorsal seta of hind coxa situated in a group of 11–13 secondary setae including several moderately long setae; 2 setae situated more distally on the dorsal surface; 3 setae situated anteriorly near the distodorsal indentation; the primary and one of the secondary setae markedly long, nearly half as long as the coxa; 6–9 setae near the posterior margin of the indentation, including one long primary and 2 secondary setae of nearly the same size; anterior surface distally with 2 primary setae, both of them short, thin, situated more proximally with 7–8 small, secondary setae and a large seta; posterior surface with 6–7 short, secondary, short and moderately long setae, 2–3 small setae ventrally; primary distoventral setae short, anterior lighter and larger than posterior. Anterior seta of trochanter short, light, thick, posterior seta brown, thin, longer than the segment; basoventral seta light, grayish, thick, long; anterior ventral setae in form of 2 light spines, one of them apical, the other nearer the basal seta; posterior distoventral seta moderately long, less than half as long as the posterior surface seta; subapical seta short, light, thick at the base; a small secondary seta subventrally near the suture on the posterior surface. Anterior primary seta of femur short, brown, thick, situated apically, posterior seta situated subapically near the ventral margin, long but shorter than the posterior seta of the trochanter; both primary ventral setae situated in middle of segment (Figure 187, B), distal seta moderately long, brown, proximal seta in form of a large, light, thin spine; anterior and posterior surfaces with 3 secondary setae. Secondary setae of tibia and tarsi situated singly on the dorsal and subdorsal surface.

Lateral line on segments 3–7; hairs light, very short. Gills on segments 2–5.

Tergite of abdominal segment 9 (Figure 188) pale grayish, brownish near anterior margin; medioanal seta pinkish brown, thick, long, much thicker and longer than the anterior-angle seta; 5 setae between the medioanal and the anterior-angle setae, one of them sometimes as long as the anterior-angle seta, the others short, thin.

Sclerite "b" of anal legs slightly sclerotized, whitish, brownish near the distal margin; median angle seta thick, dark reddish brown, neighboring seta smaller, brown, as long as the medioanal seta of the tergite of segment 9; lateral seta short, thin; subapical seta of inner margin moderately long, both light brown; ventral seta small, light.

Sclerite "c" whitish yellow, with broad, indistinct, reddish brown, lateral margin; seta small, light. Claw yellowish basally, reddish brown apically; seta 1 situated in middle of basal part, thick, light, relatively large; seta 3 situated in apical part, longer and thinner; seta 2 situated dorsally near end of suture; seta 6 situated near suture, small, thin, light; ventral setae 7 and 8 light, large; seta 5 smaller, situated laterally between 7 and 8; seta 4 small, light, situated ventrally near the margin.

116 Case 9—10 mm long, made of sand grains, narrower posteriorly, flattened dorsoventrally, with large dorsal hood anteriorly; larger sand grains at the sides and around the anterior opening; posterior end covered by membrane with a round central hole (Figure 189).

Mode of life and habitats. Cool, clear water, streams, brooks and rivulets, larger rivers, rapids, open shore of lakes, on a bottom of stone, and sand with stones; in streams in the North, sometimes on firm sandy bottom overgrown with mosses (*Fontinalis* sp. and *Hippuris* sp.).

Distribution. Northern and northwestern parts of the European USSR. In addition, Europe, especially Finland, Poland, Sweden, Norway, England.

## 2. *Apatania subtilis* Martynov

Martynov, 1926:44—45.

**Full-grown larva.** Length 7—8 mm. Head (Figure 190, A) mainly chestnut brown dorsally and laterally before and behind eye; large, light brown spots lateral to coronal suture; a narrow, whitish brown stripe near occipital foramen; eyes situated on large, light, whitish area; ventral surface mainly brown, dark brown laterally, light brown anteriorly, with large, whitish, brown spots near occipital foramen. Frontoclypeus with large, sharply defined anteriorly, yellowish brown spot in middle posterior to dark tentorial pits; small, sharp, chestnut brown dots of wedge-shaped pattern; several large, indistinct dots lateral to posterior branches of frontal sutures and apex of coronal suture.

Dark dorsal areas with relatively large, dark, tubercles with round apex; tubercles become smaller at boundary of the lighter area, pointed or form thin spinules with a thick base; a transverse stripe of these and smaller, needle-shaped spinules in rows of 2—3 in the posterior part divides the dark from the light, smooth area. Lateral surface tubercles wider and lower, almost adjoining; ventral surface with reticulate pattern except for a smooth, light occipital area; cells forming ridges near lateral or anterior margin; ridges in some places serrated with one or several spinules. Gula oblong, chestnut brown, irregularly triangular, with curved sides, rounded posterior corner, and finely tuberculate surface (Figure 190, B).

Intermediate and median anterior-margin setae blackish brown, moderately long, the latter smaller than the former; lateral seta light, moderately long, slightly curved; anterior frontal seta brown, slightly larger; middle frontal seta thinner, shorter, light brown; both directed inward; posterior frontal seta brown, thick, moderately long. Secondary setae brownish, 18—20 small, short to moderately long setae on sides of anterior part: 11—12 small, light setae in posterior part along sutures.

Seta 7 thin, dark, moderately long; seta 9 blackish brown, thick; seta 14 long, similarly dark, very large, almost as long as width of head; setae 10 and 11 short, brown, situated near anterior margin of eye, seta 11 at level of middle of eye; seta 12 slightly larger, brown, thin; seta 13 small, situated near 14; seta 15 shorter than 14, thin, brown, situated posterior to 14; seta 16 situated behind 15, short, brown; seta 17 thick, black, moderately long. Ventral seta 8 short, thin, brown; seta 18 relatively large, light, about half as long as 8.

Dorsal sclerite of labrum dark brown basally, with large, dark tubercles; distal part lighter; median indentation with reddish process; seta 1 small; seta 2 situated at margin of process, small, light, thick; seta 4 situated on the membrane, slightly larger; seta 3 similar, situated near margin; setae 5 and 6 blackish brown, 5 larger than 6.

Mandibles black, with pinkish apex; brush consisting of a row of 24–26 paired, light, feathered chaetoids; outer, dorsal seta short, blackish; ventral seta smaller, light brown.

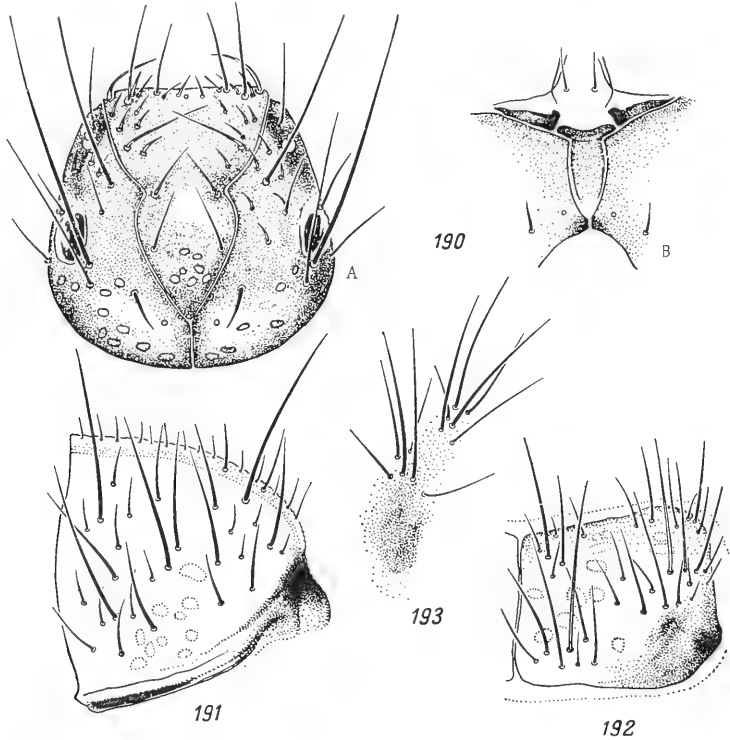
Sclerites of cardo transverse, almost entirely black, with small, reddish brown, median area; 1st seta small, yellowish; 2nd outer seta very small, light. Submentum small, light brown, with indistinct anterior margin; seta on membrane anterior to the sclerite moderately long, grayish brown. Stipes yellowish brown, with reddish brown posterior stripe and dark brown median stripe; setae grayish brown, distal seta short; outer seta slightly larger. Palpifer and palps chestnut brown; distal seta blackish; median seta small, light. Mentum reddish brown. Ventral rods and sclerites of palpiger yellowish.

Pronotum (Figure 191) dark brown or chestnut brown in the middle, slightly darker laterally and near the median suture, light brown at the anterior margin; anterior part brownish; posterior part with a large, yellowish brown area and a group of large, distinct, chestnut brown dots; similar or darker dots laterally in middle of sclerite. Surface with small, scale-shaped tubercles with serrated apex or with several thin apical spinules; light areas with smaller, sparser tubercles; spinules situated on the smooth surface in some places. Broad posterior margin separated anteriorly by narrow reddish brown stripe with minute tubercles and spinules and black stripes divided by a smooth, reddish brown space; posterior median stripe wide, short, black; anterior stripe the same laterally, elsewhere reddish brown, very narrow, extending almost to median suture. Process at posterior angle with a small reddish brown area, and a few tubercles and spinules; lateral margin broad, black, fused with the black posterior-angle spot. Large primary setae, anterior-margin, anterior-angle, and medioanal, black, moderately long; secondary chaetotaxy, as in other species of *Apatania*, consisting of large, usually dark, short to moderately long, and small, light, basally thick setae, which cover the sclerite more or less uniformly; setae of anterior-margin area small, light, sparse, those of anterior angle short, thin.

Mesonotum (Figure 192) chestnut brown in almost the whole anterior area and part of the middle; anterior-margin area darker; anterior margin with narrow reddish brown stripe in middle of each half; large, distinct, brown dots near posterior margin and laterally on dark area; similar dots in lateral area on lighter brownish surface; lateral margin with narrow,

reddish brown stripe; large, dark, posterior-angle area black laterally near posterior and lateral margins, chestnut brown elsewhere, with a narrow, brownish band of oblique streaks with light middle. Surface finely and densely tuberculate, except on dots and at posterior angle. Large setae of sclerite black, anterior-angle and medioanal setae long, anterior-margin seta shorter; most secondary setae in anterior and lateral areas brown, black, moderately long, and thin, of varying size.

(117)



FIGURES 190-193. *Apatania subtilis* Mart.:

190 - head, dorsal (A) and ventral (B); 191 - pronotum; 192 - mesonotum; 193 - lateral sclerite of metanotum.

Metanotum with 10-12 large, black setae; at site of each anterior-margin sclerite a long, black medioanal seta, and 2 thin, dark, short, primary setae on site of each posterior median sclerite. Lateral sclerite whitish anteriorly, with large, chestnut brown basal stripe and a large chestnut brown dot; transverse band dark brown; posterior part of sclerite indistinct; anterior part with 12 setae, primary seta and several secondary setae long or moderately long. (Figure 193).

Proepimeron with wide, black, outer margin; surface dark reddish brown, with fine spinules; seta dark brown, moderately long. Trochantin mainly black, partly reddish brown; seta short, dark.

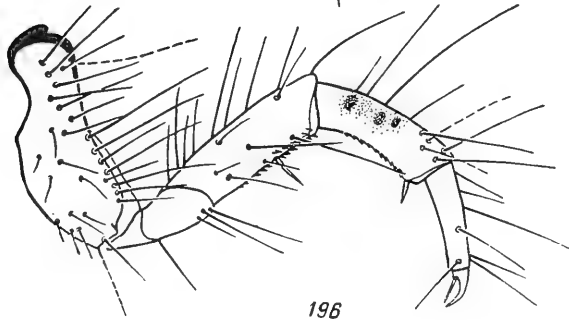
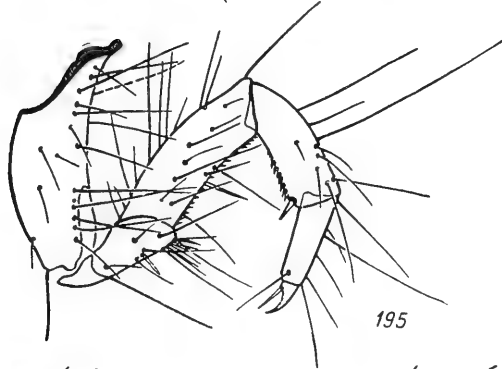
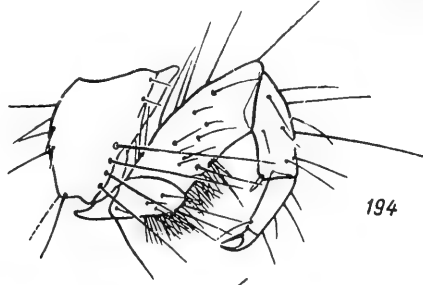


Legs reddish brown, with a black spot between femur and tibia; femora and tibiae subdorsally with large, brown, indistinct spots; ratio of length of legs 77:100:99. Coxae dorsally and subdorsally with large, dense, scale-shaped tubercles, serrated or with fine spinules at the margin; spinules of posterior surface smaller and sparser; femora and tibiae with a ventral row of small, light, sharp spinules; such a row also on fore and mid-tarsi.

Basodorsal seta of fore coxa (Figure 194) dark, thick, moderately long; anterior distodorsal seta small, dark brown, posterior seta blackish brown, long, situated in a row of dark secondary setae; anterior primary setae short, branched apically; distoventral setae moderately long, posterior seta darker and larger. Anterior seta of trochanter small, branched, light brown, posterior seta short, dark; basoventral seta light, thick, moderately long; posterior distoventral setae dark brown, slightly larger, anterior setae in form of 2 thick, light spines; light, curved chaetoids situated distally among the setae, as in basal part of femur; 3 small, thin, secondary setae situated subventrally in posterior part. Apical dorsal seta of femur blackish brown, thick, moderately long; basodorsal seta thin, brown, slightly longer; primary anterior seta short, light brown, branched apically, like the corresponding setae on trochanter and coxa; primary ventral setae situated anteriorly in basal part in form of large yellowish spine and a light, spine-shaped, moderately long seta, posterior primary seta slightly larger, blackish brown, thick, situated basal to the spines; secondary setae as in Figure 194. Tibia and tarsus as in Figure 194; secondary distodorsal seta situated in the middle of the tibia, longer than the primary setae.

Primary basodorsal seta of mid-coxa (Figure 195) moderately long, brown; anterior distodorsal seta thick, moderately long, a slightly smaller secondary seta further distally; posterior distodorsal seta long, dark brown; 4 smaller, secondary setae situated more distally; anterior primary setae of distal part short, thick, dark brown. Primary anterior seta of trochanter light brown, short, thick, branched; posterior seta thin, moderately long; basoventral seta long, light, grayish brown; both posterior, apical ventral setae long, brown, shorter than the basal seta; anterior distoventral setae in form of large, sharp, light spines; group of light, curved chaetoids near base of distal spine; 3 small, thin, posterior, secondary setae; anterior surface with a small, light, apically branched secondary seta. Dorsal margin of femur convex, ventral margin almost straight; apical dorsal seta thick, blackish brown, moderately long, basodorsal seta thin, brown, slightly longer; several secondary setae together with the primary ones; anterior seta short, thick, dark brown; posterior seta situated subventrally in middle of segment, black, moderately long; primary, distoventral seta in form of light, large, sharp spine; basoventral seta situated closer to base of segment, blackish brown, shorter than the posterior seta; secondary setae of anterior surface consisting of 3 short, dark, and 3 small, light setae; those of posterior surface, 5 short, dark, and 4 small, light setae. Primary, dorsal apical and subapical setae of tibia thin, moderately long, brown; one of the secondary dorsal setae, the largest on the leg, dark, long; posterior surface with 2 large, dark, secondary setae, and 2 small, light setae; anterior surface with 2-3 thick, short, subdorsal setae directed distally; both distoventral setae in form of thick, light spines; distal part ventrally with small sparse

spinules. Tarsus dorsally with 2 thin, moderately long, primary, distal setae and several secondary setae, one of them larger than the primary setae; primary ventral setae short, thin.



FIGURES 194–196. *Apatania subtilis* Mart.:

194 – foreleg, posterior; 195 – midleg, posterior; 196 – hind leg, posterior.

Basodorsal seta of hind tarsus (Figure 196) moderately long, situated in group of large secondary setae; 4 anterior distodorsal setae forming a row which includes the primary seta, all thin, moderately long; 7 posterior distodorsal setae, including a black, long primary seta; 4 black, moderately long setae among the secondary setae; primary anterior setae short, brown; secondary setae numerous (23–24), situated in spinulose basal and middle area of segment; one basal seta long, black, almost as long as basodorsal

seta; posterior surface with 11–13 secondary setae; primary distoventral setae thick, moderately long, anterior seta brown, slightly larger than dark brown posterior seta. Anterior seta of trochanter short, light brown, branched apically; posterior seta long, brownish black; posterior distoventral seta the same; basoventral seta also long, grayish; apical and subapical anterior, ventral setae in form of large spines; posterior subapical seta forming a short, light, thick spine, in contrast to other species of the genus. Femur with slightly convex dorsal, and straight ventral margin; basodorsal seta moderately long, thinner, and slightly longer than brown apical dorsal seta; several smaller secondary setae between primary setae and more basally; anterior primary seta short, thick, dark brown, posterior seta situated ventrally in the subapical area, black, long; ventral setae in middle of segment situated close together and forming a short, yellowish, spine-shaped seta, and a more basal, light, large spine; posterior surface with several thin secondary setae; subventral area with 2 large, dark brown setae; anterior surface with 6 small setae, including 2 larger light setae. Tibia thinner than on midlegs, with markedly widened apex.

Lateral line on segments 2–7 in a row of small, white hairs; 2–3 reddish dots above the hairs near anterior margin of segments 3–6.

Number and arrangement of gills of *A. subtilis*

Segment	Dorsal	Ventral
2	1	1
	1	1
3	1	1
	1	
4	1	1
5		1
6		1

Tergite of segment 9 chestnut brown, with 2 large, darker dots near anterior margin; large setae black; primary medioanal setae thick, strong, long, larger than anterior-angle setae; 3 setae between them, including 2 thick, moderately long setae; 8–9 setae including an intermediate and a lateral primary seta between medioanal and anterior-angle setae; 3–4 setae lateral to anterior-angle setae; surface with 3 setae on each side.

Sclerite "b" of anal legs with small tubercles; distal median seta thicker and longer than the medioanal seta of the sclerite of the segment 9; neighboring seta much shorter and thinner; lateral seta moderately long, brown, thin; subapical seta thinner, equally long, ventral seta short, thin. Sclerite "c" yellowish, with broad, dark, reddish brown lateral margin; seta small, light.

Claw chestnut brown, dark reddish brown apically, without dorsal denticle; seta 1 situated in middle of basal area, short; seta 2 light, grayish, thin,

relatively long, situated dorsally near end of suture; seta 6 short, situated on distal side of suture; seta 3 situated distally, as is seta 2, light, moderately long; seta 7 and 8 short, light; seta 5 situated laterally near 8; seta 4 situated inward from 8, small.

Anterior part of case flattened ventrally and made of small sand grains; dorsal side of anterior part with larger, coarser grains; sides with still larger grains; difference between dorsal and ventral walls less marked in posterior part.

Mode of life and habitats. Small, running water bodies, streams, brooks and mountain rivulets, on stones; phytophagous.

Distribution. USSR: Caucasus from Ordzhonikidze [North Ossetia] to Georgia.

### 3. *Apatania crymophila* McLachlan

Levanidova, 1962:192-193, Figures 2, 3.

**Full-grown larva.** Length 7-9 mm. Head (Figure 197, A) mainly chestnut brown dorsally, whitish gray posteriorly; frontoclypeus darker laterally than in the middle, with light brown posterior angle and a group of large, light dots at site of wedge-shaped pattern. Several similarly large, but less distinct dots laterally along posterior branch of frontal sutures and lateral to coronal suture; ventral surface mainly light; median area near gular suture brownish, dark brown posteriorly. Frontoclypeus with a regular network of small, needle-shaped spinules on small tubercles or on the surface; lateral surface with smaller spinules on ridges behind eye, 1 or 2 spinules in each row larger than the others; ventral surface reticulate; marginal ridges with small denticles or fine spinules; spinules singly or in pairs on smooth surface near gular suture. Gula (Figure 197, B) brown, long, with round posterior angle and sparsely spinulose surface.

121 Median and intermediate anterior margin setae dark brown, moderately long, the former slightly shorter; lateral anterior-margin seta light, curved inward, filiform apically; anterior frontal seta, exceptionally large, longer, and slightly thicker than anterior-margin setae, and resembling the intermediate seta; middle and posterior frontal setae light, small. Anterior part of frontoclypeus, including anterior angle, with 17-19 light and brownish setae, short and small, of different thickness; posterior side laterally with 6-10 small setae. Seta 7 situated anterior to antenna, moderately long; seta 10 shorter, both brown; seta 9 long, thick, reddish brown; seta 14 also dark but longer, about as long as width of head; seta 11 thin, at level of middle of eye, moderately long; seta 12 slightly larger, light; seta 13 small, light; seta 15 thin, long, slightly shorter than 14; seta 16 situated behind 15, small, light; seta 17 brown, short, situated anterior to fork of frontal sutures; ventral seta 8 relatively large, dark brown, thin; seta 18 small, light. About 20-22 secondary setae from antenna to level of seta 17 lateral to frontal sutures small and light.

Pronotum (Figure 198, A) yellowish, with distinct anterior angle; anterior margin brownish, merging gradually with darker brown lateral margin;

middle with brown, transverse, wide curved stripe; large, pale brownish dots lateral to stripe and in posterior area; surface with small, serrated tubercles, some of them flattened; posterior margin wide, its light part yellowish and finely tuberculate, with 2 black stripes, a broad, median posterior, and a longer, anterior lateral stripe, partly or completely fused in some specimens. Process at posterior angle almost entirely dark, near large, black spot at posterior angle, with a shallow, reddish brown indentation posteriorly. Primary anterior-margin seta moderately long, blackish brown; other primary setae dark brown, thin; large secondary setae brown or light brown; a few light brown setae on surface and near lateral margin; except for a few, the small, thick, secondary setae are light yellowish and regularly distributed; anterior margin with a comb of 17–18 thick, light, spine-shaped setae as in spinulose comb of Baicalinini.

Mesonotum (Figure 199, A) with chestnut brown, median, dark area anteriorly, and a darker, reddish brown stripe at anterior margin; middle brown, posterior light brown, merging gradually with light posterior marginal area; dark area with small, dark, rounded tubercles; a light, yellowish stripe without tubercles extending almost from anterior angle to posterior margin; surface with large, dark brown, and smaller, brownish dots; anterior angle and lateral margin with wide, distinct, black border near a large, black area at posterior angle; oblique streaks of black area in form of narrow dark band on oblong, reddish brown spot; primary and secondary setae dark brown; medioanal seta long, larger than the others; anterior-margin and primary anterior-angle setae also long but slightly shorter and thinner.

Metanotum with 8–9 thin, brown, moderately long setae on site of anterior-margin sclerites; posterior median sclerites in form of small, whitish plates with a large, indistinct, pale dot; lateral sclerites short, indistinct posteriorly; with a large reddish brown spot laterally at concave margin; with 2 large dots on site of transverse band in the middle.

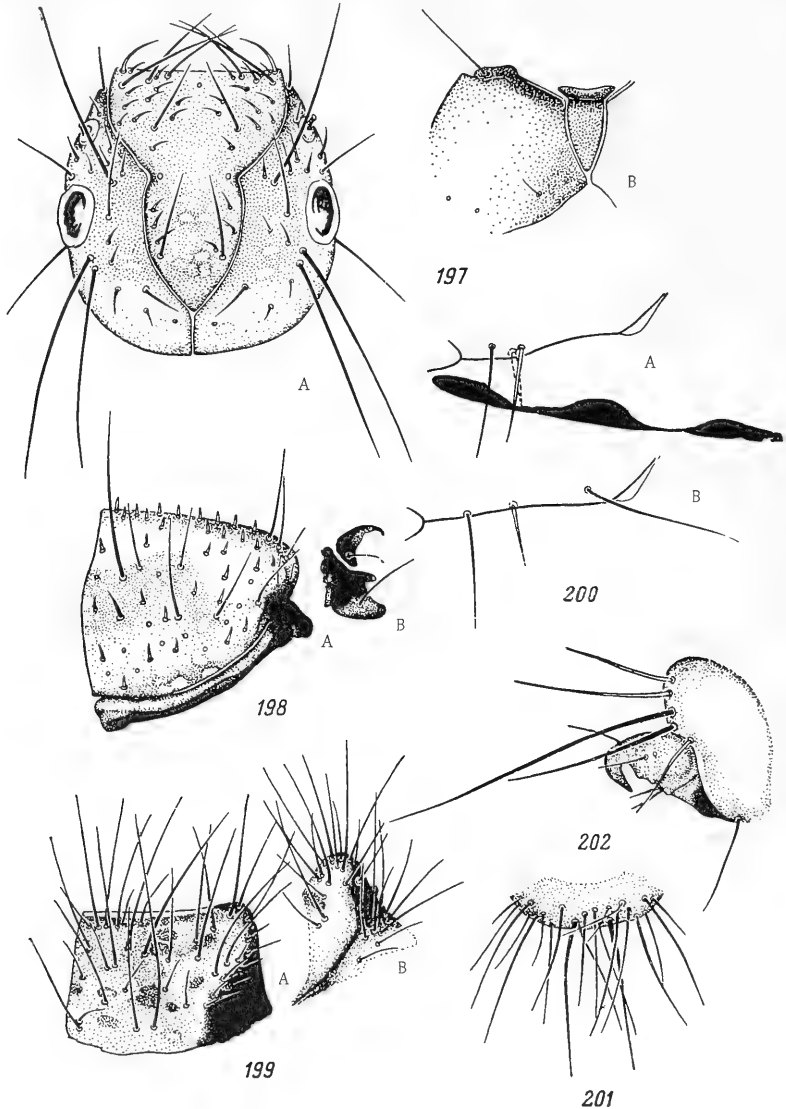
Proepimeron reddish brown; seta situated some distance from suture, blackish brown, moderately long, longer than in species just described (Figure 198, B). Mesopleuron as in Figure 199, B. Prothoracic horn brownish, short, with light apex.

Legs yellowish brown; basal margin of coxa black dorsally and ventrally, dark reddish brown anteriorly and posteriorly; segments dark apically in some places; spinules small, more numerous on the coxae. Ratio of length of legs 74:100:97. Large setae brown or dark brown.

Basal dorsal seta of fore coxa moderately long, dark brown, situated near a thin, lighter, and slightly shorter secondary seta; 2 setae dorsally near anterior margin of indentation, the primary seta moderately long, thick; secondary seta thinner and slightly smaller; a long dark brown primary seta and 4 secondary setae near posterior margin; anterior primary setae of coxa light brown, thick, branched apically, situated in basal and apical area; distoventral setae short, posterior brown, anterior shorter and lighter; secondary setae of anterior surface consisting of a short basal and 2 subventral setae.

Anterior seta of trochanter short, light brown, branched apically; posterior seta short, dark brown; basoventral seta light, thick, moderately

122 long; both anterior ventral setae in form of short, thick spines, one of them distal, the other situated in the middle between suture and apex; light, curved chaetoids between spines, as on basal margin of femur; posterior ventral setae situated close together apically and subapically, the former larger; posterior surface with 3 secondary setae.



FIGURES 197–202. *Apatania crymophila* McL.:

197 — head, dorsal (A) and ventral (B); 198 — pronotum (A) and propleuron (B); 199 — mesonotum (A) and mesopleuron (B); 200 — ventral margin of fore femur (A) and mid-femur (B), posterior; 201 — tergite of abdominal segment 9; 202 — part of anal leg and claw, lateral.

Apical dorsal seta of femur brown, moderately long, basodorsal seta slightly larger; anterior seta short, strong, situated subventrally in basal part about in middle of segment; primary ventral setae situated more apically, in form of a light, thick, moderately long, apical spine-shaped seta and an adjacent large, yellowish, blunt spine; posterior seta situated basal to spines, dark brown, moderately long (Figure 200, A); anterior surface with a small, brownish, secondary seta in apical area, and 2 similar setae in basal area.

Primary dorsal and subdorsal setae of tibia situated in pairs apically on posterior side and subapically on anterior side; more basally on dorsal surface, 2 long, brown, secondary setae longer than primary setae of femur and coxa; other secondary setae consisting of 2 small, light, dorsal and 4 subdorsal setae, 2 of them situated posteriorly, 2 anteriorly. On tarsus, in addition to primary setae, a long, brown, secondary, dorsal seta, slightly smaller than that on tibia; remaining 4 secondary setae thin, light, small. Basal seta of claw light, large.

Basodorsal seta, and one of the mid-coxa secondary dorsal setae long; posterior distodorsal seta the same; 5-7 secondary marginal setae, including 1-2 similarly long seta, more distally on posterior side; 3-4 anterior distodorsal setae, including a moderately long primary seta. Anterior seta of trochanter yellowish, short, thick; posterior seta short, dark, thin; basoventral seta grayish, thick, long; primary ventral setae in form of 2 light spines, the basal spine nearer the suture than on forelegs; both long posterior ventral setae situated close together; 3 posterior, secondary setae short. Basodorsal seta of femur moderately long, larger than apical ventral seta in form of light, thin, short spine in middle of segment; basoventral seta brownish, thick, moderately long (Figure 200, B). Tibia with a very long, thick, brown, secondary seta dorsally in the middle, the longest seta of midlegs; primary distodorsal seta and 2 secondary dorsal setae also very long. One secondary seta of tarsus almost as long.

Number and arrangement of gills of *A.crymophila*

Segments	Dorsal	Ventral
2	1 1	1
3	1 1	1
4	1	1
5		1
6		1 (0)

Primary basodorsal seta of hind coxa long, relatively thin; a number of secondary setae, including 2 similar long basal setae more distally; 4 anterior, distodorsal setae, including a primary seta, all moderately

long; 6 secondary posterior distodorsal setae in addition to long, thick, primary seta. Anterior seta of trochanter short, light; brown posterior seta longer than setae of the coxa; posterior apical ventral seta long; apical seta light, moderately long; both anterior ventral setae in form of light, sharp, widely spaced spines; basoventral seta grayish, thick, long, like the apical ventral seta. Basodorsal seta of femur only slightly longer than apical dorsal seta; short, thin anterior primary seta situated distally; posterior seta brown, long, larger than the dorsal setae, situated ventrally; one almost equally long, basoventral, secondary seta; primary ventral setae situated in middle of segment, apical one short, thick, spine-shaped, the basal one situated nearby, in form of a large, sharp, light spine. The subdorsal of the 2 long primary, distodorsal setae of the tibia, contrary to the usual, dark brown, longer than brown dorsal seta; 2 secondary dorsal setae also large, longer than posterior seta of the femur; 2 long, brown dorsal secondary setae in middle of tarsus.

Lateral line on segments 2-7. Gills on segments 2-6; dorsal presegmental gills of segments 2-3 small, thin; postsegmental gills of these segments with thick, long filaments; ventral postsegmental gills of segments 2-3 smaller than dorsal gills, those of segments 4-5 small, and on segment 5 also thin.

Tergite of segment 9 grayish, with indistinct punctation, without spinules; setae numerous, medioanal setae blackish brown, longer and thicker than anterior-angle setae; the other 25-27 setae, short and moderately long, dark brown and blackish (Figure 201).

Sclerite "b" of anal legs (Figure 202) pale grayish, brown laterally and ventrally at distal margin, with small spinules in rows of 2-4; medio-distal seta larger than others, thick, black, long; neighboring seta dark brown, much shorter, thick; lateral seta thin, brown, moderately long; apical and subapical median margin setae similar, the former slightly longer; ventral seta thin, moderately long. Sclerite "c" reddish brown, with broad, blackish brown lateral margin; seta light, thin, relatively large.

Claw reddish brown distally, with a small dorsal denticle; seta 1 short, light, thick; seta 3 brown, moderately long, situated near base of distal part, both setae subdorsal; seta 6 situated near suture margin, moderately long; seta 2 situated near end of suture, slightly longer; both setae thin, brown; ventral setae 7 and 8 light, thick; setae 5 and 4 small, situated basally, the former lateral, the latter medial.

Case 7-8 mm long, made of small sand grains, slightly curved, narrower posteriorly; dorsal surface convex, ventral surface flattened; separate large sand grains at sides of ventral margin.

Mode of life and habitats. Running water: cool rivers and rivulets, close to the surface, at a depth of less than 1 m, in parts with slow current; in springs with a summer temperature not over 12-13°; on stony bottom among vegetation; feeding on diatoms.

Distribution. Northeastern part of the European USSR (Bol'shezemel'skaya Tundra, Northern Urals), Western Siberia (Kara Tundra, Tomsk), Altai, Eastern Siberia (Minusinsk and Krasnoyarsk, lower reaches of Yenisei, Lower Tunguska, Kolyma delta, lower reaches of Lena and Yakutsk, Anadyr), Kamchatka, Maritime Territory and Amur Region, Shantar Islands. In addition, Canada.



#### 4. *Apatania stigmatella* Zetterstedt

Lepneva, 1949: 180–181. — Flint, 1960:28, Figure 10.

**Full-grown larva.** Length 7–8 mm. Head (Figure 203, A) brown dorsally, anteriorly in the middle, and partly along coronal suture; posterior part yellowish near occipital foramen; ventral surface light brownish, white near occipital foramen; sclerite with chestnut brown median margin near gular suture. Dark part of dorsal surface with small spinules, some thick at the base or situated on small tubercles; a transverse stripe of smaller spinules between dark and light area; spinules situated on surface singly or in rows; ventral surface reticulate with denticles or rows of spinules on margin of cells; middle with larger single spinules on smooth surface near gular suture. Gula pale brownish, in form of an oblong triangle with rounded sides (Figure 203, B) and posterior angle; posterior half with small, isolated spinules.

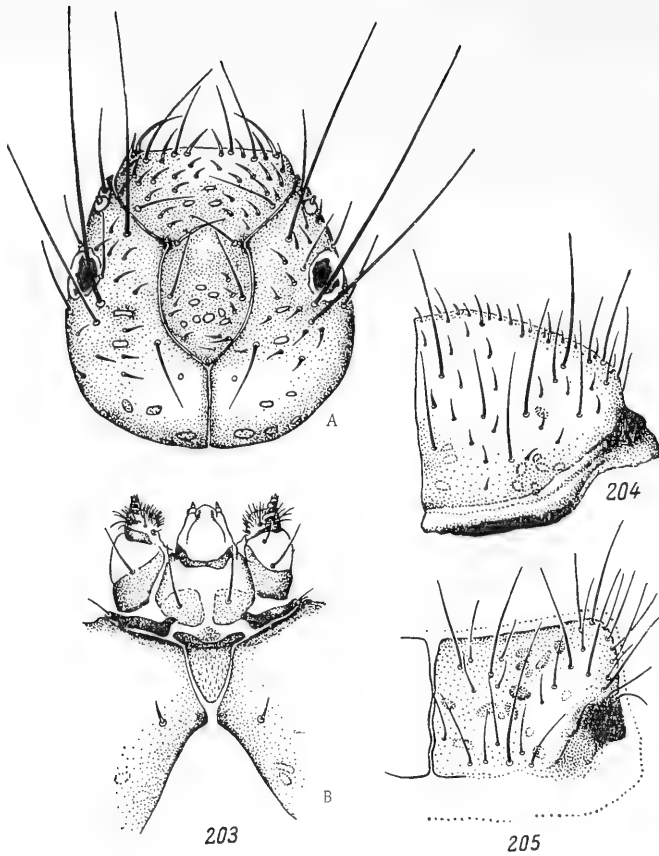
Median and intermediate anterior-margin setae reddish brown, thick, moderately long, the former slightly shorter; lateral anterior-margin seta short, light; anterior-frontal seta light, longer than lateral; median frontal seta small, posterior seta moderately long, thin, light brown basally. Seta 7 thin, brown, moderately long; seta 10 short, light brown, situated laterally anterior to eye; seta 9 thick, long, reddish brown; seta 11 situated posteriorly near middle of eye, thin, light; seta 14 largest on the head, larger than 9; seta 13 situated nearby laterally, light, small; seta 12 moderately long, light; seta 15 situated behind 14, brown, thin, long, but shorter than 14; seta 16 short, light; seta 17 moderately long, brown, thick basally, filiform apically, situated anteriorly flanking the fork of frontal sutures; ventral seta 8 brown, short, thick; seta 18 small, light. Anterior part of frontoclypeus with 12–13 secondary setae laterally, 3–4, sometimes most of them, reddish brown, the others light; posterior part with 4 small, secondary setae laterally; 18–19 small, light, secondary setae laterally to frontal sutures between suture and eye, from antennae to level of seta 17; these setae are shorter than in anterior part, but also thick; several dark setae usually anteriorly and laterally, in area of seta 9.

Dorsal sclerite of labrum yellowish, with small, dense spinules on small tubercles. Seta 1 small; setae 2 and 4 relatively large, light, pointed, situated on membrane and on sclerite flanking median indentation; setae 5 and 6 situated lateral to median indentation, brown, 5 larger than 6; seta 3 situated lateral to 5, brown, slightly smaller.

Mandibles long, black, with pinkish brown, distal part; brush situated near dorsal margin, consisting of 29–30 light feathered hairs; dorsal lateral seta brownish, short, much larger than small, light, ventral seta.

Sclerites of cardo (Figure 203, B) light yellow in middle, black in lateral parts, with a small, light seta laterally. Submentum in form of small brownish plates; setae short, thin, brownish. Stipes light brownish; setae short, about the same length. Palpifer light brown; distal seta, short, grayish brown, situated on process; median seta small, light.

Palps and galea short. Mentum in form of a narrow, reddish brown semicircle; ventral rods long, grayish, with a small, light, apical seta. Palpiger horseshoe-shaped, relatively large, light.



FIGURES 203-205. *Apatania stigmatella* Zett.:

203 - head, dorsal (A) and ventral (B); 204 - pronotum; 205 - mesonotum.

Pronotum (Figure 204) mainly pale yellow, whitish in some places; anterior margin rounded, with well defined anterior angle; anterior margin indistinct, grayish white; lateral margin yellowish; middle of sclerite with a wide, transverse, brownish pattern with concave inner margin, the pattern pale and indistinct in light specimens; a few, large, pale brownish dots laterally near median suture and at posterior margin. Surface with rows of small spinules on ridges and more densely in lateral area, sparser, without ridges, and in rows or singly in middle area. Posterior margin wide, separated by a narrow rust brown stripe, its light part with small tubercles; 2 dark stripes or only a broad, posterior, dark stripe, the latter black in the middle and reddish brown laterally; process of posterior angle with yellowish, tuberculate, light part, lateral margin of process wide, reddish black, fused with dark, posterior-angle spot. Primary setae chestnut brown, anterior-angle, anterior-margin, and medioanal setae moderately long, the first larger than the other two; a few, thin,

secondary setae in area of primary setae and laterally; small, thick, secondary setae on whole surface, lighter, whitish, more numerous than in *crymophila*; in contrast to *crymophila*, comb of spinules at anterior margin absent.

126 Mesonotum (Figure 205) with dark, ridged, and tuberculate median area; anterior part brownish, with a narrow, chestnut brown anterior submarginal stripe; distinct brown dots posteriorly and lateral to dark area, some dots dark and larger than others; large reddish brown posterior-angle area, oblique streaks forming a narrow, rust brown band. Primary and large, secondary setae chestnut brown; small, secondary setae light brown; anterior-margin, medioanal, and anterior-angle primary setae, and one anterior-angle secondary seta reddish brown, moderately long, longer and thicker than the others.

Metanotum with 7-8 moderately long, brownish, and 6-7 small, setae on site of each anterior median sclerite; posterior median sclerites in form of large white plates, sometimes indistinct, with a long, brown, primary, and 2 small, thin setae; 5-6 thin, brownish setae between median and lateral sclerite; lateral sclerite indistinct, posteriorly, its middle reddish brown, with dark, dense, blackish striation; anterior part of lateral sclerite whitish, light brownish basally, with 8-10 brown setae, including 4-5 thicker, 127 long setae together with primary seta.

Proepimeron brown, finely tuberculate; seta dark brown, moderately long, situated in middle; lateral margin wide, short, blackish brown; seta of trochantin thin, light, relatively large.

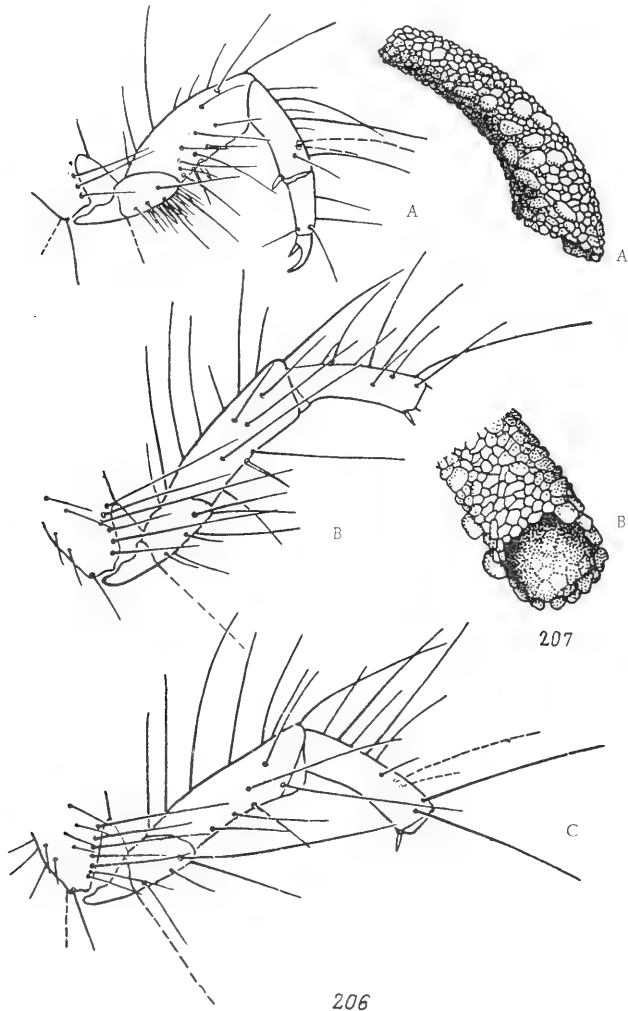
Legs light brown or yellowish brown; coxa with black or blackish brown basal margin; segments with blackish brown or brown ends at articulation between trochanter and femur, and between femur and tibia; ratio of length of legs = 83:100:98.

Primary anterior setae of fore coxa (Figure 206, A) short, thick, light brown, branched apically. Anterior seta of trochanter the same; posterior seta short, reddish brown, thick; basoventral seta light, thick, moderately long; both posterior ventral setae thick, long, brown; anterior ventral setae in form of 2 light, thick, yellowish spines; small, light, hairlike chaetoids distally between spines; similar chaetoids in basal part of femur. Primary apical dorsal seta of femur moderately long, brown; basodorsal seta larger, thin, long, light brown; both primary, ventral setae situated basally in form of light spines, one of them thick, large, yellowish, situated more distally, the other thin, pointed, longer; posterior seta situated basal to primary setae, brown, long, like distal seta of trochanter. Apical and subapical primary setae of tibia thin; both dorsal setae light brown, thin, long; 6-7 secondary setae, short, thin and moderately long, thicker setae further basally; subdorsal area anteriorly with 2 short, thick, brown secondary setae. Primary dorsal setae of tarsus thin, short, light; one secondary dorsal seta moderately long.

Distodorsal indentation of mid-coxa anteriorly with 3 brown, moderately long setae, including the primary seta; posterior distodorsal, primary seta very long, situated at depression; further distally, 5-6 similar, dark brown, secondary setae (Figure 206, B). Posterior seta of trochanter moderately long; anterior seta thick, short; both brown; basoventral seta light, very long; posterior apical ventral seta also long; subapical seta shorter; both

anterior ventral setae in form of light, sharp spines, one of them apical, the other much more basal. Primary distodorsal seta of femur long, larger than distodorsal seta; anterior surface seta brown, thick, situated in distal part; posterior seta situated subventrally in the middle, thin, brown, moderately long; primary distoventral seta situated slightly more basally, in form of light, sharp spine; basoventral seta situated nearer to basal margin. Secondary dorsal setae of tibia, including 2 long brown setae, longer than primary setae. One of secondary dorsal setae of the tarsi also longer than others (primary and secondary setae).

(126)



FIGURES 206 and 207. *Apatania stigmatella* Zett.:

206 – posterior view of legs: foreleg (A), midleg (B) and hind leg (C);  
207 – case, lateral (A), anterior end, ventral (B).

Number and arrangement of gills of  
*A. stigmatella*

Segment	Dorsal	Ventral
1	1	
2	2 (1) 1	1
3	2 (1) 1	1 (0) 1
4	1	1 1
5		1
6		1

Hind coxa with 2 thick, long, brown setae among those at anterior margin of distodorsal indentation, posterior margin of indentation with 6-7 setae, 5-6 of them long and thick, including the primary seta. Posterior seta of trochanter very long, but thinner than distodorsal setae of coxa; anterior seta short, thick, as on the midlegs; basoventral seta light, moderately long; posterior apical ventral seta long, light brown; subapical seta light, short, curved; both anterior ventral setae in form of 2 small, thin, light spines, one of them apical, the other nearer to basal suture; secondary setae of trochanter and other segments as in Figure 206, C. Primary basodorsal seta of femur thin, light brown, long, much longer than the apical dorsal seta; posterior primary seta situated in distoventral part, longer than tibia; primary distoventral seta in form of large, thin, light spine, situated in middle; basoventral seta very thin, brownish, moderately long. Primary apical and subapical setae of tibia thin, long; 2 basal, secondary setae longer and thinner; 2 secondary dorsal setae of tarsi also longer than the primary setae.

Lateral line on segments 2-7 consisting of small light hairs. Gills on segments 1-6; dorsal presegmental gills of segments 2-3 usually with 2 filaments.

Tergite of segment 9 light brown, with coarse, brownish punctation near anterior margin; medioanal seta black, or blackish brown, long, much longer and thicker than the others; anterior-angle setae thin, brown, slightly shorter; the other 16-21 setae, including primary intermediate and lateral setae, short and moderately long, brown, most of them thin.

Sclerite "b" of anal legs chestnut brown, with small spinules in rows; median distal and neighboring seta black, the former thick, long, the second slightly smaller and thinner; lateral seta brown, thin, moderately long; subapical seta of median margin the same; ventral seta short, thick. Sclerite "c" light yellow, with broad, brownish lateral margins; seta light, small, thin.

Claw light brown at the base, reddish brown apically, with 2-3 small, dorsal spinules; seta 1 short, thick, light, situated in middle of basal part;

seta 3 dark reddish brown, situated subdorsally on inner side of distal part; seta 2 light grayish, situated dorsally at end of suture; seta 6 situated near end of suture, brownish, thin; ventrobasal setae 7 and 8 thick, light, situated near margin; seta 5 small, situated laterally nearby; seta 4 also small, light situated near the opposite margin of sclerite.

Case 8–9 mm, made of small sand grains, slightly curved, narrower posteriorly, with flattened ventral side; anterior part with several large sand grains laterally (Figure 207); anterior opening wide directed ventrally; posterior opening covered by membrane with a large hole.

Mode of life and habitats. Open littoral zone of lakes, on stones, sand and stones, pebbles, rarely on sand, at a depth of 0.2–6.0 m, isolated specimens as deep as 30 m. In rivers and rivulets close to the bank, on solid bottom.

Distribution. Northern part of the European USSR (Kola Peninsula, Lake Umbozero, Lake Vud-Yarvi, Arkhangel'sk Region, Northern Urals, Western Siberia, Altai (Lake Teletskoe, central Altai). In addition, northern Europe (Finland, Sweden, Norway), North America.

## 5. *Apatania zonella* Zetterstedt

Siltala, 1908:19–21. — Levanidova, 1960:419–421, Figures 8–9.

**Full-grown larva.** Length 8–10 mm. Head (Figure 208, A) blackish brown dorsally, blackish near tentorial pit and at posterior angle of frontoclypeus, less dark in the middle\*; dark, rounded tubercles anteriorly and in the middle, becoming smaller near smooth posterior part, with hairlike apical spinules or being replaced by spinules on smooth surface. Frontoclypeus with 3 large, chestnut brown dots lateral to median pit; middle with 2 similar dots; posterior part with smaller, distinct, brownish dots on area of the wedge-shaped pattern. Dots less distinct lateral to posterior branch of frontal sutures and coronal suture; large brown dots behind the eye; spinules between dots wider, with asymmetrical apex. Ventral surface of head mainly reticulate, its lateral and median parts chestnut brown; small, thick spinules near gular suture. Gula broad, short (Figure 208, B), with curved sides; tubercles few, brownish; pregula forming a narrow, transverse, dark reddish brown stripe.

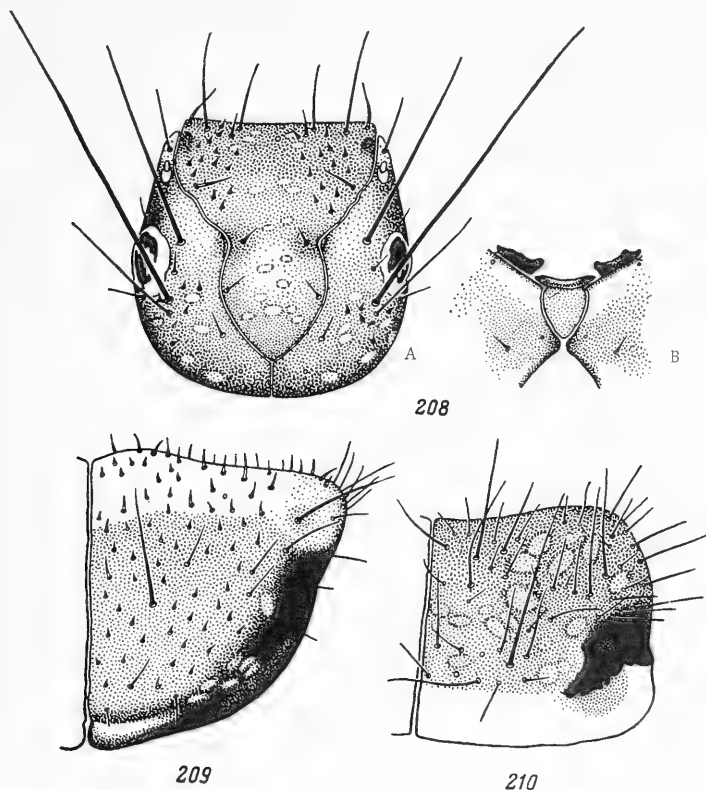
Intermediate and median anterior-margin setae black, thick, slightly curved, the former larger than the latter; lateral seta light, short, curved inward; anterior frontal seta the same, slightly yellowish; middle frontal seta situated near tentorial pit, smaller and thinner; posterior frontal seta short, dark brown, thin; 23–29 secondary setae laterally in anterior part, and 13–15 posteriorly along frontal sutures, most of them brownish, small; some of them larger, dark brown, or light. Seta 7 black, thick, moderately long; seta 9 black, long, thick; seta 14 larger; seta 10 situated before the eye, short, light; seta 11 thin, short, brownish, at level of middle of eye; seta 12 situated behind the eye, short, dark brown; small seta 13 situated lateral to and near 14; seta 15 almost half as long as 14, situated behind 14, thin, blackish brown; seta 16 situated behind 15, brownish, small; seta 17 short, thick, brown basally, filiform apically; 29–30 very small, thin,

\* Specimens from Novaya Zemlya are darker.

brownish secondary setae lateral to frontal sutures from antennae to fork. Ventral seta 8 short, thin, brown; seta 18 small, light.

Labrum smoke brown posteriorly and near median pit, blackish brown near posterior margin; posterior angle sclerites reddish brown. Setae 1 and 2 light; 4 and 3 light brownish; 5 and 6 thick, dark brown, 6 shorter than 5.

(129)



FIGURES 208-210. *Apatania zonella* Zett.:

208 - head, dorsal (A) and ventral (B); 209 - pronotum; 210 - mesonotum.

Mandibles black, reddish brown distally; brush with light chaetoids; lateral dorsal seta short, blackish; ventral seta thin, light, about  $\frac{1}{3}$  as long as dorsal seta. Sclerites of cardo black laterally and in the middle, with a small median reddish brown area; setae small, yellowish, lateral seta thin, smaller. Submentum small, brownish, thin; both setae moderately long, situated on membrane before sclerites, brown. Stipes yellowish, posteriorly and with reddish brown stripe in middle, setae short, thick, dark brown. Palpifer and palps chestnut brown; distal seta situated on membrane, small, thick, dark brown; mediobasal seta small, brown. Mentum forming a narrow, reddish brown semicircle, with a dark stripe; ventral rods narrow, smoke brown, with a small, light seta. Palpiger narrow, horseshoe-shaped, thin.

Pronotum (Figure 209) short laterally, anterior margin convex; surface mainly dark brown, anterior quarter with a broad light yellowish white stripe; dots on dark surface light brown, distinct, a few lateral and near posterior margin. Dark surface densely covered with dark, rounded tubercles which are smaller and sparser on light anterior area, pointed in some places. Primary anterior-angle seta black, thick, moderately long, thick basally, a few thin secondary setae, most of them short, brownish, some of them longer; some setae dark, thicker; small, light, yellowish, basally thick setae on whole sclerite; middle of anterior margin with a row of small setae resembling anterior comb of spinules in Baicalinini; 130 posterior margin with brownish part covered with small, blunt, dark spinules and with a black posterior submarginal stripe; process at posterior angle almost entirely black, fused with black posterior-angle spot.

Mesonotum (Figure 210) dark brown in middle; anterior-margin area with blackish median part; posterior and lateral areas chestnut brown; surface covered with dense, dark, rounded tubercles; posterior-angle area black, large, irregularly rhomboidal, smooth; oblique streak in form of indistinct, narrow, dark stripe on a small reddish spot. Primary, and most secondary, setae black; primary anterior-angle seta, and one secondary seta large; primary anterior-margin seta and primary medioanal seta the same; the other 45-46 setae differing in size, most of them thin.

Metanotum with 7-8 thin black setae on site of anterior median sclerite; posterior median sclerite represented by slightly thickened membrane with a grayish spot, a long, black, medioanal seta, and 2 small, thin setae; 5 setae anterior and lateral to the spot. Lateral sclerite grayish anteriorly; posterior part lighter, indistinct; transverse band forming a large, dark brown spot with narrow, dark streaks.

Propleuron with broad, black, pleural suture; epimeron pale yellowish; tubercles darker and larger at the base, a narrow black stripe near median margin; seta thick, moderately long, black, situated in middle between suture and distal margin. Trochantin mainly black, rounded apically, with a large, grayish, primary seta; setules small, one dark, the other light.

Mesepisternum chestnut brown, with 2 large, smoke brown dots near anterior margin; similar dots basally along black, pleural suture. Metapleuron lighter, smoke brown; pleural suture black, accompanied by small dots.

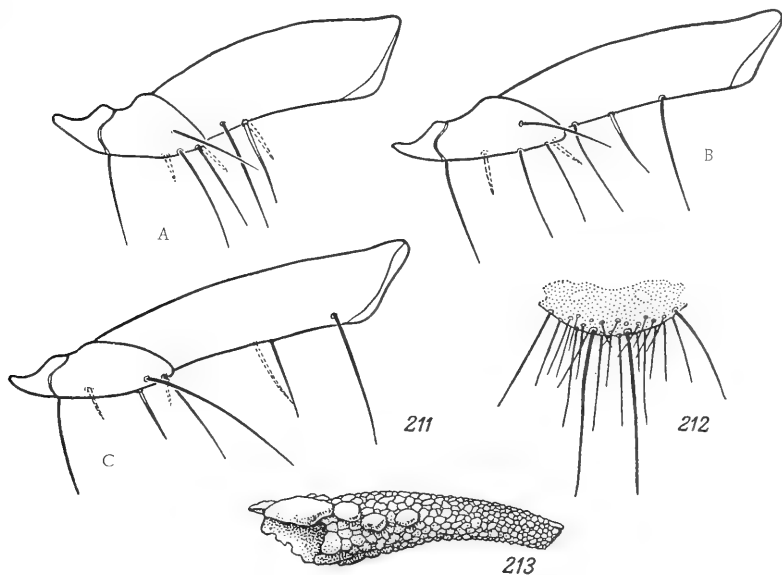
Legs (Figure 211) blackish dorsally and subdorsally; including the tarsi; coxae dark ventrally; hind trochanter the same; coarse punctation on the coxae, femora, and tibiae. Base of coxa with dense, dark, rounded tubercles dorsally, becoming scale-shaped with serrated or spinulose end subdorsally; small spinules in rows of 2-3 or singly more ventrally; trochanters, femora, and tibiae with smaller, sparser, covering spinules in some places. Large setae mostly black. 131

Basoventral seta of fore trochanter light, spine-shaped, moderately long, much smaller than posterior distoventral seta; corresponding seta of mid- and hind legs long, light brown, slightly larger than posterior distoventral seta; subapical ventral posterior seta of hind legs in form of large, pointed yellowish spine, slightly longer than anterior ventral setae. Primary anterior setae of fore femur situated close together, in form of 2 spines: one of them large, pointed, light; the other yellowish, thick, shorter, situated



more distally (Figure 211, A); posterior seta moderately long, dark, situated nearby basal to spines. Posterior seta of mid-femur thick, long, brownish black, situated in the middle; apical ventral seta situated more basally, forming a thin, light spine; basoventral seta situated near basal margin, blackish, thick, long, like primary posterior seta (Figure 211, B); ventral primary setae of hind femur situated in middle of segment, apical ventral seta thick, brown, moderately long, situated near a thick seta, basoventral seta forming a large, thin, light spine; posterior primary seta situated subventrally near the apex, blackish brown, long, resembling long posterior seta of trochanter (Figure 211, C).

(130)



FIGURES 211-213. *Apatania zonella* Zett.:

211 - trochanter and femur, posterior of foreleg (A), midleg (B) and hind leg (C); 212 - tergite of segment 9; 213 - case.

Lateral line on segments 2-7 with minute dense hairs. Gills on segments 1-6.

Tergite of segment 9 chestnut brown, with coarse punctation near anterior margin; tubercles absent; serrated ridges or spinules in some places; large setae thick; medioanal setae black, thick, long but not as long as in the preceding forms; anterior-angle setae shorter and much thinner; 3 setae between medioanal setae; 5 setae between medioanal setae and the anterior-angle setae, including 2 primary setae; 10 small, brown, thin setae submarginally on surface; a small seta lateral to the sclerite (Figure 212).

Number and arrangement of gills of  
*A. zonella*

Segment	Dorsal	Ventral
1	1	
2	1 1	1
3	1 1	1
4	1	1
5	1	1
6		1

Sclerite "b" of anal legs dark brown, with dark, keel-shaped, serrated tubercles. Distal median seta thick (thickest of the whole body), black, longer than medioanal seta of segment 9; neighboring seta much shorter and thinner; lateral seta moderately long, thin; subapical seta of median margin thin; all 3 setae black; ventral seta short, blackish. Sclerite "c" light brown; lateral margin wide, black, with large median process; seta small, light brown. Claw yellowish brown basally, dark brown apically, with reddish brown end; median seta 1 situated in basal part, short, strong; seta 2 situated laterally, near end of suture, moderately long; seta 6 smaller, situated near distal margin of suture; seta 3 situated on median side of distal part, moderately long; ventral seta 7 thin, situated on sclerite; seta 8 slightly thicker, situated on membrane near margin; seta 5 small, situated on sclerite near 8; seta 4 small, situated on median side of ventral area, on sclerite; all 4 setae light.

Case 8—9 mm long, slightly curved, tapering posteriorly, made of small and medium-sized sand grains, smoothly arranged; sides, sometimes also dorsal side, with isolated sand grains, smoothly arranged; anterior opening with dorsal hood, directed ventrally; several large sand grains on lateral margin, also dorsally before pupation; posterior end rounded, closed by membrane with an irregular hold (Figure 213).

Mode of life and habitats. Springs; small, spring-fed brooks; mountain brooks and rivulets.

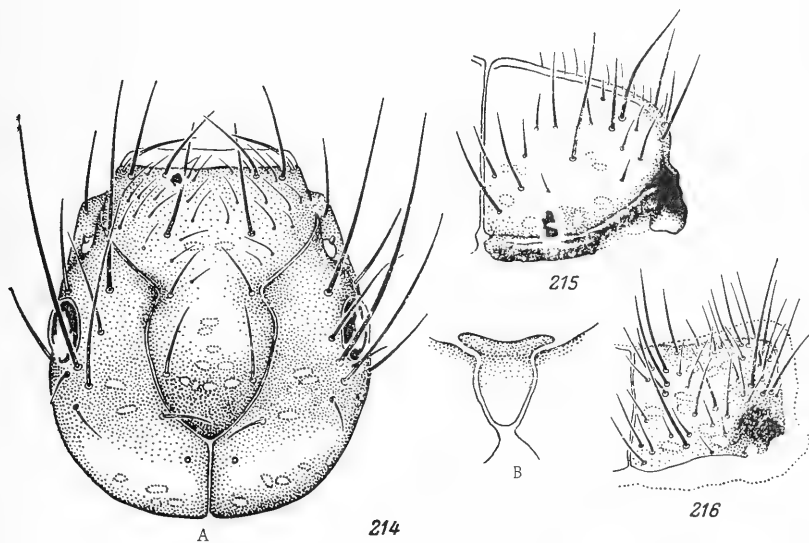
Distribution. Northern, northwestern, and western parts of the European USSR, Altai, northern Kazakhstan, Western and Eastern Siberia, Maritime Territory and Amur Region. In addition, Northern Europe (Scandinavia), Mongolia, Greenland, North America.

## 6. *Apatania majuscula* McLachlan

Levanidova, 1962:190—192, Figure 1.

**Full-grown larva.** Length 9—10 mm. Head (Figure 214, A) mainly dark on dorsal side, rust brown, covered with blunt, rarely pointed tubercles;

132 posterior part near occipital foramen smooth, brownish, without spinules; minute spinules, singly or in rows of 2-4, situated between smooth and tuberculate area, lateral to fork of frontal sutures. Eyes on light background; antennae in form of small, light tubercle; sensilla dark brown. Frontoclypeus light brown anteriorly, with sparser, mostly pointed spinules; 2 large, indistinct dots behind light area; tentorial pits and posterior angle dark brown; wedge-shaped pattern, situated on lighter background, consisting of 11 brownish dots; spinules between dots smaller, sparse; several large dots behind eye. Ventral surface brownish laterally, mostly reticulate, margin of cells in some places serrated or with minute, needle-shaped spinules; spinules near gular suture situated on smooth surface, singly or in rows; posterior part behind reticulate part with a large, smooth whitish brown area without spinules, with several large, indistinct dots. Gula (Figure 214, B) pale brownish, large, about half as wide as long, with round or bluntly truncate posterior corner; surface with small, sparse spinules with thick base, singly or in rows of several.



FIGURES 214-216. *Apatania majuscula* McL.:

214 - head, dorsal (A) and ventral (B); 215 - pronotum; 216 - mesonotum.

Primary setae mainly reddish brown, some of them darker. Median and intermediate anterior-margin setae moderately long, the intermediate longer; lateral anterior-margin seta moderately long; anterior frontal seta and lateral seta situated closer to medianline than usual; middle and posterior setae small, thin. Seta 7, contrary to usual, smaller than anterior frontal seta, dark brown, thin; seta 10 light, slightly shorter than 7; seta 9

thick, long, markedly (almost a third) shorter than thick, long, dark brown seta 14; seta 11 thin, light, moderately long; seta 12 the same, thicker, light brown; seta 13 situated inward, small, strong, seta 15 brown, long, shorter than 14; seta 16 situated behind 15, light, small; seta 17 short. Ventral seta 8 short, brown; seta 18 light, small.

Labrum light brown, setae as in the foregoing species, but lighter, setae 5 and 6 light brown.

Mandibles as in *A. zonella*. Cardo forming narrow, transverse rods, area between wide, black, median stripe and black, lateral half, reddish brown; 1st seta in form of small, short, light spine; 2nd (lateral) seta very small, thin. Submentum very thin, indistinct, pale yellowish; setae moderately long, light brownish.

133 Pronotum brown, its posterior part with pale, sparse, grayish brown dots (Figure 215); anterior angle more or less distinct; anterior margin slightly rust brown; posterior-angle spot black, with small, reddish brown process anteriorly at lateral margin. Tubercles on surface in some places simple, blunt, most of them pointed or bifid, with or without apical spinules; posterior margin separated from other surface by an indistinct brownish stripe, its light part with small tubercles; dark stripe at posterior margin broadly black at middle, reddish, dark brown laterally; process at posterior angle mainly black, with a small, light, reddish brown tuberculate area. Primary anterior-angle seta chestnut brown, moderately long, other primary setae and some secondary setae smaller, brown; thin secondary setae light, short and moderately long; small, light, thick, secondary setae which are characteristic for the genus *Apatania* are less numerous than in the preceding forms, and are situated mainly in middle of tergite.

Mesonotum (Figure 216) brownish in middle; darker in middle of each half; dots large, chestnut brown; dark area flanked by a whitish brown light stripe; anterior margin with narrow, rust brown stripe in each half; anterior angle light; lateral margin brownish; entire surface covered with dark, blunt tubercles; posterior-angle spot large, mainly black, dark reddish brown on the inner side, with a dark narrow stripe of oblique streaks. Primary and secondary setae chestnut brown; medioanal seta, anterior-margin seta, and anterior-angle setae (1 primary and 2-3 secondary) moderately long, larger than others.

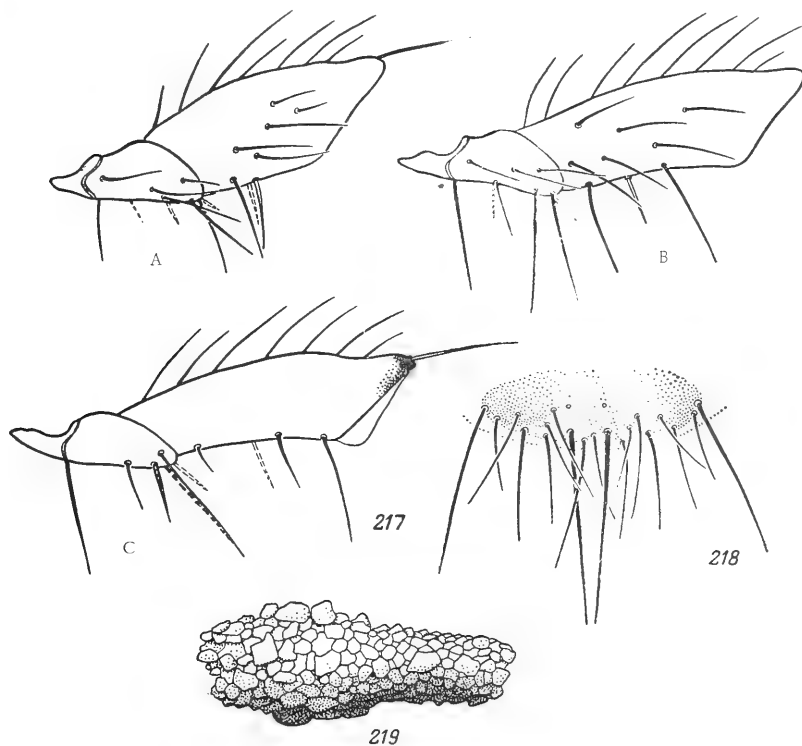
134 Lateral sclerite of metanotum indistinct posteriorly, brownish; transverse band reddish brown, with oblique black striation; anterior part light brown; 20-21 setae, chestnut brown; primary anterior-angle seta, and 3-4 secondary setae long, larger than the others; tubercles on surface small, more sparse than on pronotum and mesonotum.

Legs yellowish brown; articulation between femur and tibia with black spot.

Fore and mid-coxae dorsally and subdorsally with dense, scale-shaped tubercles with apical serration or minute spinules; small spinules situated more ventrally; similar spinules, singly or in rows, on all other segments of fore- and midlegs. Hind coxae with tubercles and spinules only on basal part and in smaller numbers; trochanter with only a few distal spinules; femora with spinules ventrally only; tibiae and tarsi with numerous spinules. Chaetotaxy as in *A. zonella*; setae, except the light setae, brown, rarely dark brown. Primary ventral setae of fore femur situated

close together basally (Figure 217, A); anterior submarginal seta in form of large, pointed, slightly yellowish spine, seta near posterior margin forming a longer, thinner, light spine; primary posterior surface seta situated basal to spines, brown, moderately long. Both primary ventral setae of mid-femur situated basally, apical ventral seta in form of large, moderately long, light spine, basoventral seta situated near base, thick, moderately long; posterior primary seta situated in posterior area, brown, moderately long; distance between the 2 ventral setae and to the posterior seta about the same (Figure 217, B). Primary ventral setae of hind legs situated in middle of segment some distance from each other, apical ventral seta moderately long, brown, basoventral seta in form of large, thin, light spine; posterior primary seta dark, long, situated subventrally near apex (Figure 217, C).

(133)



FIGURES 217 - 219. *Apatania majuscula* McL.:

217 trochanter and femur, posterior, of foreleg (A), midleg (B) and hind leg (C); 218 - tergite of segment 9; 219 - case.

Lateral line from end of segment 2 to 7. Gills on abdominal segments 1-6; ventral gills larger than dorsal gills; dorsal postsegmental gills longer than the presegmental gills.

Number and arrangement of gills of *A. majuscula*

Segment	Dorsal	Ventral
1	1 (0)	1 (0)
2	2 (1) 1	1
3	1 (0) 1	1
4	1 (0) 1	1
5	1 (0)	1
6		1

Tergite of abdominal segment 9 chestnut brown, with 2–3 large, indistinct dots laterally on anterior margin; medioanal setae blackish brown, thicker and slightly longer than anterior-angle setae; 3–4 setae between medioanal setae; 3–4 setae on tergite surface; a small, thin seta lateral to the anterior-angle seta (Figure 218).

Sclerite "b" of anal legs dark chestnut brown, dark brown on the ventro-distal side, its surface with large brownish dots, with dense scale-shaped tubercles, dorsally, minute spinules at margin. Median distal seta thick, black, long; neighboring seta shorter and thinner; lateral seta thin, moderately long; both reddish brown; a thin, light brown seta subapically near median margin; a short seta on the surface. Sclerite "c" light brown, with very broad, dark reddish brown lateral margin; basal seta small, thick, light. Claw brown proximally, with reddish brown basal margin; apical part dark brown, with thick, dark reddish brown apex; seta 1 short, thick, situated on median side of basal part; seta 3 light, moderately long, situated in distal part; seta 2 large, light, situated subdorsally on the outer side; seta 6 thin, brown, short, situated subdorsally and laterally near end of suture; ventral basal setae 7 and 8 light, situated on membrane near margin; seta 5 small, light, situated distally nearby; seta 4 slightly larger, situated medially.

Case 10–11 mm long, conical, slightly curved, with smooth walls made of small sand grains; several larger sand grains laterally in anterior part (Figure 219); posterior end covered by a brown membrane with a large hole.

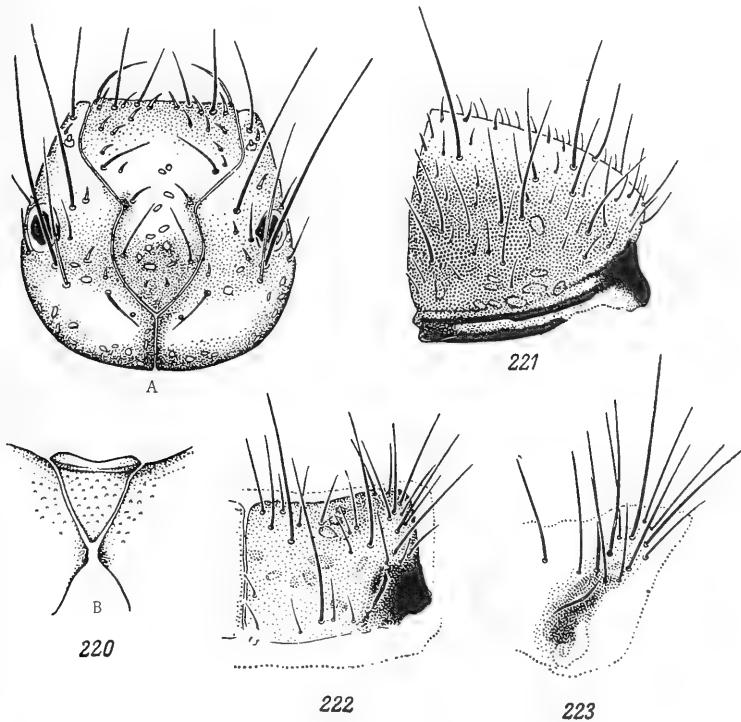
Mode of life and habitats. Usually in running water, in small, mountain tributaries of Lake Baikal, at a depth of a few centimeters; in the Angara at a depth of 1.0–1.5 m, rarely to 4 m, sometimes in the littoral of spring-fed lakes; in bays and creeks of Baikal Area; on stony bottom with boulders, pebbles, small rock deposits, rarely on sand with some admixture of silt; phytophagous.

Distribution. Northern part of the European USSR (Arkhangel'sk Region, isolated records (McLachlan, 1874–1880:214); Eastern Siberia; widely distributed in the Yenisei basin, particularly in the Baikal Area, and near Khabarovsk.

7. *Apatania copiosa* McLachlan

Martynov, 1927:476-477, Plate XXIII, Figures 3-6.

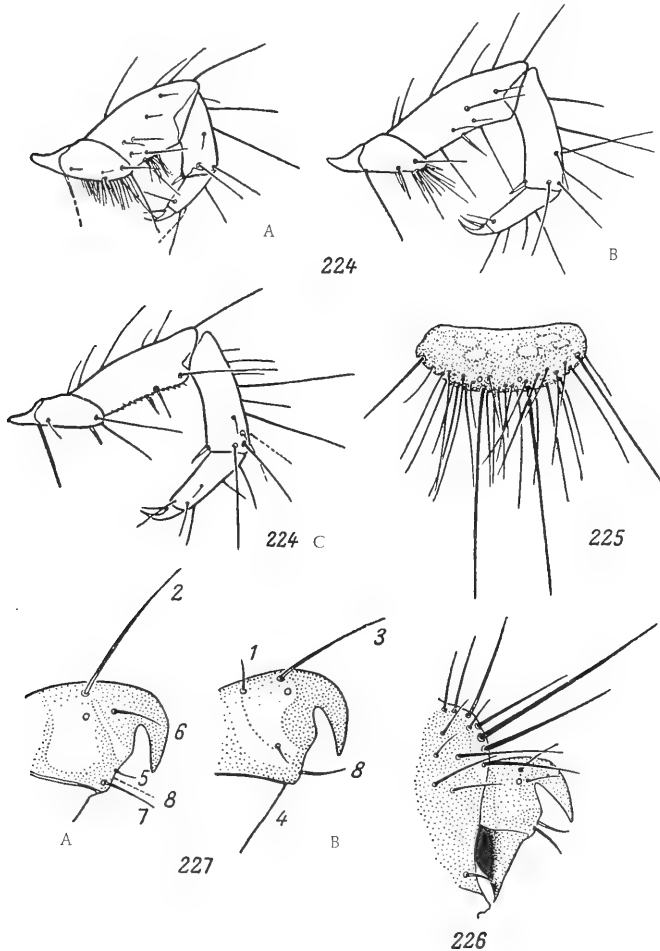
**Full-grown larva.** Length 5-6 mm. Head (Figure 220, A) chestnut brown, dorsally; eyes situated on large light spot; antennae situated near seta 7; greater part of head with small blunt or pointed spinules, area near occipital foramen smooth; border between the tuberculate and smooth areas with small spinules, single or in rows of 2-4. Frontoclypeus with indistinct punctation anteriorly; middle with whitish brown spot between dark tentorial pits; large, distinct, brown dots on place of wedge-shaped pattern. Posterior branch of frontal sutures with 3 large, brown dots, brown dots on each side; similar dots lateral to coronal suture and behind eye. Ventral surface of head mainly reticulate, brown, light brown near anterior margin and at gular suture; posterior part whitish brown, with large dots near occipital foramen. Gula (Figure 220, B) light brown, broadly triangular, slightly longer than wide, with rounded posterior angle and finely tuberculate surface. Primary and secondary setae as in Figure 220. Setae 9 and 14 blackish brown; seta 15 light brown, shorter than 14; seta 8 thin, short, brown; seta 18 small, light.



FIGURES 220-223. *Apatania copiosa* McL.:

220 - head, dorsal (A) and ventral (B); 221 - pronotum; 222 - mesonotum; 223 - lateral sclerite of metanotum.

Labrum chestnut brown in the middle, with small spinules, with dark blackish brown stripe posteriorly; anterior and part of lateral areas yellowish; setae 5 and 6 large, chestnut brown, thick basally; seta 3 grayish, much smaller, other setae light, 2 slightly larger than 4. Mandibles mainly black, pinkish brown near apex; basal chaetoids of brush longer than apical chaetoids. Cardio, in contrast to the forms described above, forming a short, wide plate, reddish brown, with black median spot and blackish brown lateral spot; setae small, light. Submentum in form of 2 thin, almost square, plates with brownish posterior and lighter anterior parts; setae short, dark brown.



FIGURES 224–227. *Apatania copiosa* McL.:

224 – legs, posterior (except coxa); foreleg (A), midleg (B) and hind leg (C);  
 225 – tergite of segment 9; 226 – left anal leg and claw, lateral; 227 –  
 claw of left anal leg, lateral (A), right anal leg, inner view (B).



Pronotum (Figure 221) mainly chestnut brown, darker near median suture than in lateral and posterior areas; anterior quarter of tergite light yellowish, with distinct anterior angle; anterior margin brownish; lateral margin darker; posterior-angle spot small, black. Tubercles of dark part keel-shaped, divided into 2, 3, or 4 parts, pointed or with small spinules; spinules simple in the light area, dense in the anterior angle, sparse in the middle; dots large, light brown, distinct; posterior margin with reddish brown, spinulose part; black stripe wide, divided in the middle; posterior-angle process with small, light spot and a large, black, lateral margin fused with the black, posterior-angle spot. Anterior-angle and anterior-margin primary setae blackish brown, larger than others; other primary and large secondary setae chestnut brown; thin secondary setae not numerous, lighter, brownish; small, thick, light setae basally, characteristic for *Apatania*, in different parts of the tergite.

Mesonotum (Figure 222) chestnut brown, darker anteriorly, with dark brown anterior margin, lighter laterally and posteriorly; posterior part light brown; spinules in middle dark, small, in rows of 2, 3, or 4; spinules in lighter lateral and posterior parts paler, smaller and sparser; posterior-angle area large, dark reddish brown, with large, black spot and coarse, black, oblique streaks. Setae as in Figure 222; medioanal seta and anterior-angle setae, 1 primary and 2 secondary, blackish brown, longer than the others.

Number and arrangement of gills of *A copiosa*

Segment	Dorsal	Ventral
1	1 (0)	
2	2 (1) 1	1
3	2 (1) 1	1 (very small) 1
4	1	1
5	1	1
6		1
7		1

Posterior median tergites of metanotum in form of small, thin, grayish plates with 3 setae, a long, thick medioanal, and 2 thin setae, one of them moderately large, the other short. Lateral tergite (Figure 223) in contrast to the species of *Apatania* described above, without transverse band but with a large chestnut brown, oblong spot with narrow, black striation in the middle; 3 brownish dots posteriorly and medially to the spot; anterior

part pale brownish, whitish submarginally, with 10–12 dark setae, of which primary anterior angle seta and one secondary seta are longer than others.

Proepimeron tongue-shaped, reddish brown, with dark tubercles; lateral margin black, with a small, dark brown area; seta near suture thin, blackish. Prosternite represented by a small, yellowish area of harder integument. Horn relatively large, blunt, pale grayish.

Legs (Figure 224) yellowish brown; coxae blackish dorsally and over a varying part of basal area; articulation between femur and tibia black; femora with indistinct dorsal dots. Tubercles of fore- and mid-coxae situated dorsally and on posterior side of basal part; tubercles of hind coxa smaller, sparser, situated on anterior subdorsal side; dorsal tubercles of legs blunt or pointed, the other tubercles flat, scale-shaped, serrated or with small spinules. Fore femur with convex dorsal and almost straight ventral side; tibiae wide distally; tarsi narrower distally. Mid-femur convex dorsally, slightly concave ventrally; tarsus almost as long as tibia, narrower distally, as on forelegs. Hind femur shorter than mid-femur, wider distally, slightly convex dorsally, with almost straight ventral side; hind tibia and tarsus longer and narrower than on the midlegs. Setae partly shown in Figure 224. Anterior primary setae of fore coxa and trochanter (Figure 224, A) bifid apically; primary ventral setae of fore femur situated basally, represented by a more apical, thin, light, moderately long spine, and a massive, thick, yellowish more basal spine; posterior primary seta moderately long, dark, situated between spines and basal margin. Distoventral (anterior) seta of mid-femur situated in middle of segment, forming a large, thin, grayish spine; basoventral seta moderately long, thick, dark, situated closer to basal margin of femur (Figure 224, B); primary posterior seta thinner, slightly longer, dark, situated ventrally, some distance from distoventral seta. Primary ventral setae of hind femur situated in middle of segment, forming a thin, pointed, light spine, and short, dark, spine-shaped seta; primary posterior seta situated ventrally near apex, long, dark brown (Figure 224, C).

138 Lateral line on segments 2–7, light; moderately long hairs at posterior margin of each segment.

Gills on segments 1–7; dorsal gills larger than ventral gills.

Tergite of segment 9 (Figure 225) light chestnut brown, with 2–3 large, light dots on each side anteriorly. Medioanal setae blackish brown, much longer and thicker than anterior-angle setae; chaetotaxy as in Figure 225.

Sclerite "b" of anal legs chestnut brown, with 3–4 large, pale, indistinct dots (Figure 226); median distal seta black, long, much larger than medioanal seta of tergite of segment 9; neighboring seta almost equally thick, black, but about half as long; lateral seta dark brown, thinner, moderately long; subapical seta of median margin slightly longer, reddish brown; a second similar seta basally nearby; distoventral seta thick, dark brown; surface with 9–10 thin, brown setae, some of them short, others moderately long.

Sclerite "c" yellow, with broad, distinct, dark reddish brown lateral margin; seta small, light.

Claw brown basally (Figure 227), with a larger, lighter area on median side; apical part dark reddish brown, with a transverse groove at curvature. Seta 1 situated basally, short, thick, light; seta 2 situated dorsally near

end of the suture, brown, thin, moderately long; seta 3 slightly darker and thinner, situated on median side of distal part; seta 6 situated laterally in distal part, smaller; all ventral setae, light; setae 7 and 8 similar, situated submarginally on sclerite and nearby on membrane; seta 5 situated laterally, very small; seta 4 slightly larger, situated medially near margin.

Case 6—7 mm long, slightly curved, strongly convex dorsally, narrower posteriorly, made of medium-sized sand grains, arranged not very smoothly; ventral surface almost flat; larger grains situated subventrally on the sides, forming a narrower, flat, ventral surface.

Mode of life and habitats. Cool, rapid mountain brooks; upper reaches of large mountain rivers; rapids, near waterfalls, springs and spring-fed brooks.

Distribution. USSR: mountainous parts of Middle Asia.

## 8. *Apatania muliebris* McLachlan

Klapálek, 1889:241—242; 1893:35—37, Figure 10. — Struck, 1903:101. — Ulmer, 1903:75. — Lestage, 1921:682—687. — Nielsen, 1942:567—587, Figures 147—159.

**Full-grown larva.** Length 5.0—8.2 mm; habitus as in Figure 228. Head (Figure 229) light brown; eyes on light spot; frontoclypeus slightly dark near anterior margin, area of tentorial pits with large dark dots, surface lighter between dots. Ventral side of head (Figure 229, B) slightly darker laterally. Gula slightly oblong, with rounded sides (Figure 232).

Seta 14 longer than the others, as long as width of head; seta 15 slightly shorter, thick, lighter. Secondary setae, small, light, relatively thick, setuliform (according to Nielsen, 29—34 setae on the frontoclypeus, 29—35 on large lateral sclerites).

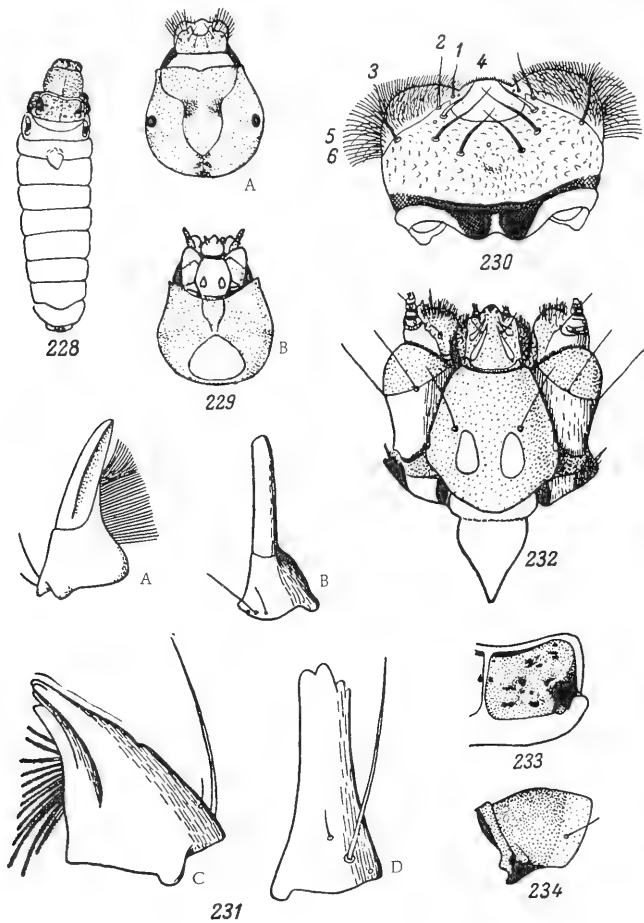
Labrum brown, with dark dot; a blackish groove at posterior margin; posterior-angle sclerites brown; setae as in Figure 230.

Mandibles spatulate (Figure 231, A, B), without teeth but distal teeth are present in the 1st stage (Figure 231, C, D); dorsolateral seta short, brown, ventral seta small, light.

Submentum (Figure 232) oval; seta long, situated near distal margin; stipes light brown, with brown posterior stripe. Palpifer light brown, with anterior process bearing a thick, distal seta near its base; median basal seta small, light. Maxillary palp short, wider basally; 1st segment almost as long as 2 following segments together, with short, open lateral sclerite; 2nd and 3rd segments of the same length; 4th segment smaller. Submentum dark brown, in form of short semicircle; ventral rods narrow, long, with small, light seta. Palpiger large, semicircular.

Pronotum (Figure 234) yellowish anteriorly, also lighter laterally; posterior margin brownish, with black, median submarginal stripe; a large, black spot near base of posterior-angle process; surface with several lighter dots. Primary setae short (anterior-angle seta about  $\frac{1}{3}$  of width of head); secondary setae appearing in 2nd stage, also short; light, anterior-margin setae situated some distance from margin (dark anterior-margin setae absent), other secondary setae distributed on whole tergite, small, light or dark, thin, curved anteriorly or slightly thick.

Mesonotum grayish brown, with slightly darker dots (Figure 233); anterior margin with narrow black stripe in middle; posterior-angle spot large, black. Primary medioanal seta dark, moderately long, larger than others; some secondary setae large.

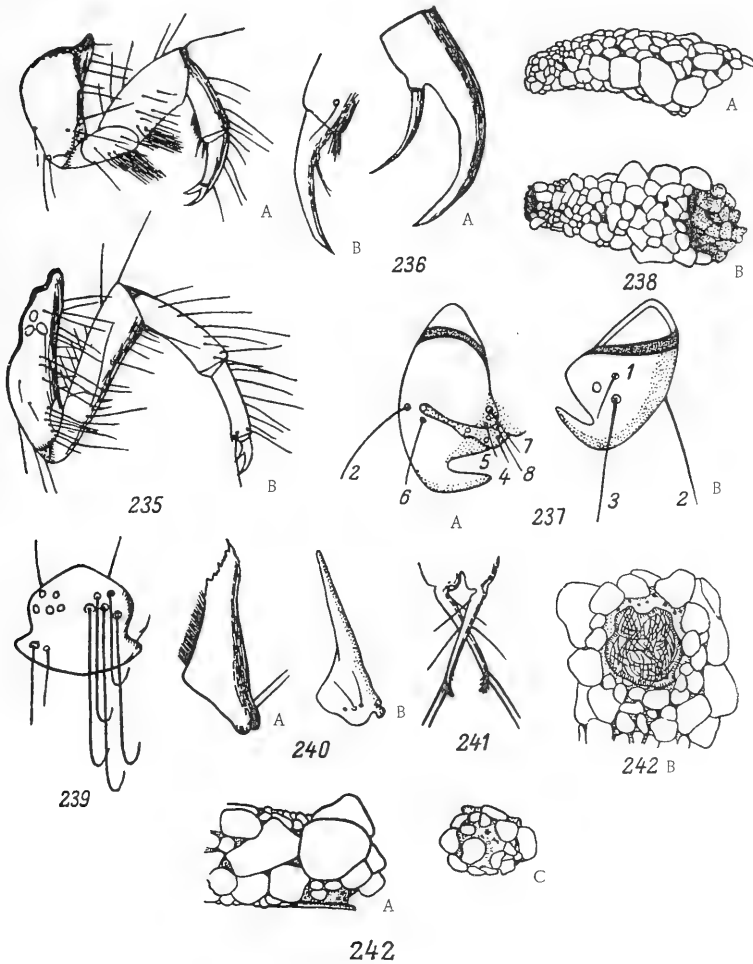


FIGURES 228-234. *Apatania muliebris* McL. (after Nielsen):

228 - 5th stage larva; 229 - head, dorsal (A) and ventral (B); 230 - labrum; 231 - right mandible of 5th stage, ventral (A) and lateral (B) left mandible of 1st stage, ventral (C) and lateral (D); 232 - gula and maxillolabium; 233 - mesonotum; 234 - pronotum.

Metanotum mainly membranous; posterior median sclerite small, pale, with 3 primary setae, 2 of them moderately long; lateral sclerite dark brown, with distinct, blackish, transverse stripe and a large, dark dot near median margin; 2 pale dots with indistinct outline near posterior margin; 24-30 secondary setae in anterior part of lateral sclerite together with primary anterior-angle seta.

Propleuron mainly brownish yellow, with black pleural suture. Episternum and trochantin dark, blackish. Epimeron with black stripe dorsally. Seta of trochantin thick; setules or secondary setae absent. Mesopleuron dark brownish; metapleuron slightly lighter; both sclerites with dark dots; 27–29 setae on mesopleuron, 48–53 on metapleuron (Nielsen, 1942:571).



FIGURES 235–242. *Apatania muliebris* McL. (after Nielsen):

235 – foreleg (A) and hind leg (B), posterior; 236 – claw of midleg of 5th stage larva, posterior (A) of 1st stage larva, anterior (B); 237 – claw of right anal leg, lateral side (A), median side (B); 238 – case of 4th stage larva, lateral (A), ventral (B). Pupa: 239 – anteclypeus and labrum; 240 – left mandible, ventral (A), right mandible, lateral (B); 241 – anal rods, dorsal; 242 – pupal case: anterior end, lateral (A) and ventral (B), posterior end, posterior (C).

Prosternite in form of small, median sclerite, dark brown posteriorly, with several fused brownish dots laterally. Mesosternite represented by brown, sclerotized dots.

Legs as in Figure 235; ratio of length of legs 75:100:96; coxae brownish yellow, with blackish dorsal margin; other segments brown; hind coxae and femur shorter than on midlegs, hind tibia and tarsus slightly longer.

141 Setae as in Figure 235; anterior distal surface seta of fore coxa bifid; light, hairlike, ventral chaetoids in distal part of trochanter and near base of femur of forelegs; midlegs with such chaetoids on trochanter only; hind legs without chaetoids. Claws strongly curved in full-grown larva; basal seta moderately long, thin apically (Figure 236, A); claw of 1st stage larva slightly curved, with small, spine-shaped seta (Figure 236, B).

Abdominal segment 1 with high, pointed, dorsal process (Figure 228); lateral processes wide, low, without sclerite; ventral side of segment convex, padlike. Ventral elliptical areas on segments 2-8.

Lateral line from segment 2-7, with fine hairs.

Gills with a single filament, on segments 2-6, pre- and postsegmental on dorsal side, postsegmental only on ventral side. Gills absent in the 1st and 2nd stage larvae.

Development of gills in the 3 last stages (after Nielsen)

Segment	3rd stage		4th stage		5th stage	
	dorsal	ventral	dorsal	ventral	dorsal	ventral
2	1	1	1 (0) 1	1	1 1	1
3	1	1	1 (0) 1	1	1 1	1
4			1	1	1 1	1
5				1	1 (0)	1
6				1 (0)		1

Tergite of segment 9 small, grayish, with 4-5 large, dark dots near anterior margin; posterior margin indistinct in middle; 28-33 setae (Nielsen, 1942:572).

Sclerite "b" of anal legs brownish, with 5-6 large, dots with dark outline laterally at anterior margin; setae short, thick. Sclerite "c" yellowish, with black dorsal margin. Claw (Figure 237) without dorsal denticle, dark brown basally, brownish apically; setae 1 and 3 directed medially, the former short, thin; seta 2 situated subdorsally lateral to the apex of membranous bar; seta 6 situated more distally, shorter than 2; setae 7 and 5 situated basally on sclerite, seta 8 and small seta 4 situated basally on membrane.

Case (Figure 238) made of sand grains, slightly curved, narrower posteriorly, flattened ventrally; the smallest grains at posterior end and ventrally, largest grains laterally and near anterior end; these "lateral

pebbles" differ in form from the others and are firmly attached to the basal tissue; posterior end covered by a membrane with an irregular hole, usually with 1 or 2 small sand grains. The case of the earlier stages is relatively wider and without characteristic form; a lateral row of small stones appears only in 4th stage larvae.

**Pupa.** Length 5.4–8.7 mm. Antennae reaching end of body; antennal segments 1–2 with a tuft of setules. Labrum (Figure 239) with median process, and separated from anteclypeus by lateral indentations. Anteclypeus with thin setae; lateral seta short, 2 other setae slightly longer. Anterior-margin seta of labrum relatively large; labrum with 5 other setae, 3 of them thick and long, 2 thin, moderately long; all of them with hooked end; median pit of labrum asymmetrical, displaced to the left.

Mandibles (Figure 240) long; median blade flat distally, concave, serrated, with dense, small spinules at margin more basally; lateral setae small, almost of same length, dorsal seta thick, ventral seta much thinner.

Wing sheaths reaching posterior end of abdominal segment 4 or 5. Midlegs of natatorial type; setae thin, pale, situated dorsally near apex of tibia and on tarsal segments 1–4, ventrally on tarsi only, last 2 segments with small and delicate setae.

Abdominal segment 1 with lateral processes covered with small spinules. Holding apparatus on segments 3–7; number of spinules III:3–5; IV:3–5; V:2–4 + 5–8; VI:2–3; VII:2–5. Lateral line pale, on segments 5–8.

Anal rods (Figure 241) thin, curved at end, with small brown spinules; 2 setae in proximal and 2 in subapical part, seta near base of gill smaller than others.

Pupal case (Figure 242) attached to a stone at anterior end so that a strip of membrane with 14–16 holes remains at anterior margin; a thin membrane covers anterior area in contact with the stone; posterior membrane with 2–4 small holes. Adults hatch by gnawing through upper wall of case.

Mode of life and habitats. Brooks with rapid current, 0.4–0.8 m/sec., on stones.

Distribution. Northwestern areas of USSR, rare.\* In addition, Europe.

## 9. *Apatania auricula* Forsslund

Kachalova, 1961:199–203, Figures 1–3.

**Full-grown larva.** Length 8 mm. Head (Figure 243) almost uniformly light brown, slightly darker in some places; light punctation in posterior part of frontoclypeus and lateral to coronal suture; eyes on a large yellowish spot. Ventral side of head brownish; gula in form of narrow triangle.

Labrum yellowish, with dark stripe at posterior margin, without dark punctation.

\* The collections of the Zoological Institute of the USSR Academy of Sciences contain 4 specimens from Lopukhinka near Leningrad, collected in August 1894 by L. V. Bianki, and determined by A. V. Martynov.

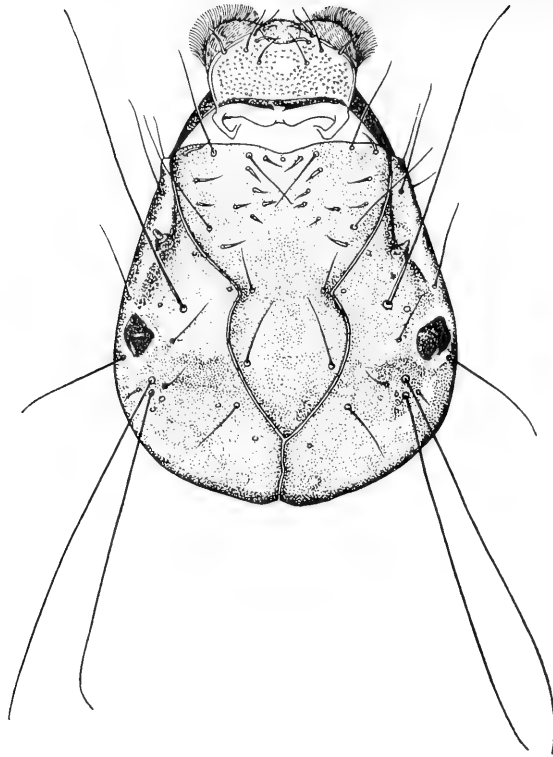


FIGURE 243. *Apatania auricula* Forssl. Head, dorsal

143 Mandibles black, blades with reddish yellow margin; dorsal brush formed by a row of chaetoids which become smaller near apex; lateral setae small, of about the same size.

Pronotum mainly brownish, with yellowish anterior part; posterior margin narrow, black, wide laterally at posterior angles.

Number and arrangement of gills of *A. auricula*

Segment	Dorsal	Ventral
1	1	
2	1	1
3	1 1	1
4	1	1
5	1	1
6		1



Mesonotum brownish, with small black dots; posterior-angle spot large, black. Lateral tergites of metanotum yellow, with a large, dark spot; small, dark spots sometimes present near posterior margin.

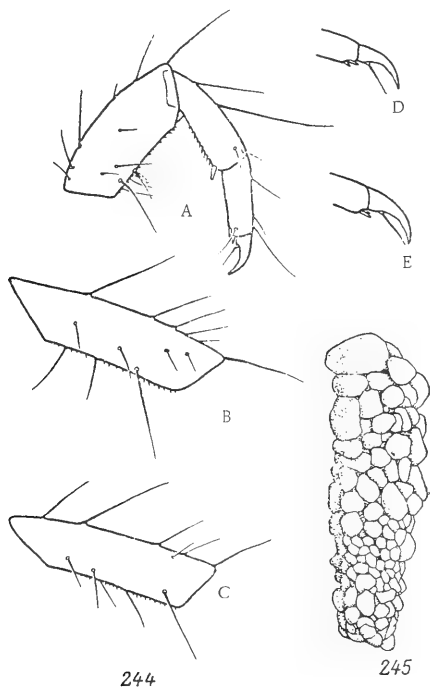
Legs as in Figure 244. Basal seta of claw of forelegs not reaching apex; corresponding seta of mid- and hind legs reaching apex (Figure 244, D, E).

Lateral line consisting of short grayish hairs on segments 2-7. Gills on segments 1-6.

Segment 9 and anal legs as in *A. muliebris*. Case the same (Figure 245).

Mode of life and habitats. Lakes close to shore, on stones, often in large numbers; rarely on pieces of wood and on shells of large mollusks.

Distribution. USSR: Latvia. In addition, Northern Europe (Ireland, Sweden, Finland), Poland.



FIGURES 244 and 245. *Apatania auricula* Forssl.:

244 — legs, posterior (in part): foreleg (A), mid-femur (B), hind femur (C), end of tarsus and claw of midleg (D) and of hind leg (E); 245 — larval case, dorsal.

#### 4. Subfamily LIMNOPHILINAE Kolenati

**Full-grown larva.** Length variable, 10-35 mm. Head wide. Eyes far from anterior margin but in anterior part of head; antennae nearer to base of mandibles than to eye. Gula with curved sides, sometimes with long,

filiform, posterior end. Head with distinct pattern of dots, stripes, and spots, rarely uniformly dark. Only primary setae on head; seta 14 the longest, often as long or almost as long as width of head.

Labrum wide, with distinct median indentation and rounded anterior angle; posterior-angle sclerites dark, curved ventrally; setae as in Figures 247 and 418.

144

Mandibles short, black; teeth blunt, small, near distal margin.

Sclerites of cardo transverse with large, dark, median spot and dark, lateral stripe. Submentum consisting of 2 sclerites in each half: a lateral and a median. Stipes large; lateral seta larger than 2nd seta. Palpifer large; galea short, lobe-shaped; maxillary palp short, almost as long as palpifer. Mentum in form of a wide, dark semicircle; ventral sclerites oblong; seta subapical, small; labial palps well developed, narrow, with distinct sensillae; labium dome-shaped.

Pronotum with distinct, sometimes dark, transverse groove in anterior third, which divides sclerite into 2 unequal parts: a more or less flat, sometimes dark anterior part, and a convex posterior part usually with a distinct, punctate pattern; dots of posterior part forming 2 oblique short rows meeting near median suture in a characteristic X-shaped figure.

Gills with 1-3 filaments.

Case straight, rarely slightly curved, made of detritus, plant fragments or sand grains, sometimes with rough, irregular surface.

**Pupa.** Length 8-26 mm. Labrum with rounded anterior margin; median process inconspicuous; setae as in Figure 239; mandibles with relatively narrow, slightly serrated distal part.

Abdominal segment 1 with a wide, saddle-shaped dorsal process. Holding apparatus on segments 3-8. Gills with 1-3 filaments. Anal rods straight, slightly narrower posteriorly, with 4 small, dark setae.

Case as in the larva; membranes with numerous, often sievelike holes.

Mode of life and habitats. Stagnant and running water; among vegetation, on stones, on bottom of detritus or sand and detritus.

**Distribution.** Throughout the USSR. In addition, Europe, Asia, North America, northern coastal belt of Africa.

## Key to Tribes

### Full-grown larva

- 1 (2). Larvae of different size; head with some dark dots; pattern usually consisting of stripes and spots; seta of submentum situated on a sclerotized dot; gills with 3 filaments on anterior abdominal segments, 1 or 2 filaments on posterior segments; case made of fresh plant particles, detritus, mollusk shells, rarely sand grains . . . . . 1. **Limnophilini** Kol. (p.179)
- 2 (1). Larvae usually medium-sized or large; head with numerous dark dots, usually without a shaded pattern; setae of submentum situated on a small transverse plate; gills with a single filament; case smooth, made of mineral particles, rarely of detritus.
- 3 (4). Large species, rarely small; larvae of large species 20-25 mm long; case made of sand grains, small stones, or pieces of detritus . . . . . 2. **Stenophylacini** Schm. (p.313)

- 4 (3). Larvae medium-sized, 15–18 mm long; case made of sand grains and detritus . . . . . **3. Chaetopterygini** Stein (p.373)

1. Tribe **Limnophilini** Kolenati

**Full-grown larva.** Size varying. Head with pattern of stripes and spots. Pronotum with dark stripe in groove in anterior third, sometimes without a stripe. Tergites of metathorax distinct. Gills of anterior abdominal segments with 2–3 filaments.

Case made of detritus, coarse vegetable debris, sometimes bulky, made of sand grains or mollusk shells.

Mode of life and habitats. Usually in stagnant or slow-running water.

Distribution. Throughout the USSR. In addition, Europe, Asia, North America.

145 Key to Genera

Full-grown larva

- 1 (6). Large forms, 32–34 mm long; head and thoracic segments light; pattern consisting of dots or of dots and stripes; case made of large fragments of leaves or stems, 40–45 mm long; stagnant water.
- 2 (3). Frontoclypeus with dark, uniformly narrow, longitudinal stripe; dorsal stripes distinct, forming a characteristic horseshoe pattern near coronal suture; case dorsally and ventrally made with large, rounded, longitudinally arranged, overlapping leaf fragments which project laterally, or of thin, flat pieces of detritus . . . . . **1. Nemotaulius** Banks (p.180)
- 3 (2). Frontoclypeus with punctate pattern, sometimes with T-shaped pattern anteriorly, characteristic for Limnophilini.
- 4 (5). Head slightly dark dorsally; punctation distinct only in posterior part; frontoclypeus with dark T-shaped pattern; case as in *Nemotaulius* . . . . . **2. Glyphotaelius** Steph. (p.191)
- 5 (4). Head with fine punctate pattern; dorsal stripes absent or barely visible; case made of spirally arranged large plant fragments . . . . . **3. Grammotaulius** Kol. (p.194)
- 6 (1). Medium-sized or small forms; head with pattern of dots or stripes and spots, or largely or entirely dark; case varying in form, made of detritus or sand grains.
- 7 (10). Head with punctate pattern.
- 8 (9). Pattern fine, distinct; punctation mainly fine, on light background; case made of longitudinally arranged pieces of detritus, with rough surface . . . . . **7. Asynarchus** McL. (p.307)
- 9 (8). Dots large, fused in some places, on dark background; case made of sand grains and detritus particles, including 1–2 large, longitudinally arranged particles longer than the case itself . . . . . **6. Anobolia** Steph. (p.295)

- 10 (7). Pattern consisting of stripes, spots, and dots, or head almost or completely dark.
- 11 (12). Head completely dark; primary apical ventral seta of fore femur strong, twice as long as or more than basal seta, which forms a light, thick spine; case trihedral, made of flat plant fragments. . . . . 5. *Phacopteryx* Kol. (p. 291)
- 12 (11). Coloration of head variable; primary apical ventral setae of fore femur different, usually both spine-shaped; case made of detritus, often bulky, or made of sand grains, smooth, sometimes slightly curved . . . . . 4. *Limnophilus* Leach (p. 214)

1. Genus *Nemotaulius* Banks

Distribution. Central, western, and northern parts of the European USSR; Western and Eastern Siberia, Maritime Territory, Amur Region, Sakhalin, Kurile Islands, Kamchatka. In addition, Central and Northern Europe, Korea, Japan, North America.

Key to Species

Full-grown larva

- 1 (2). Pattern of head light; case made of fragments of leaves . . . . . 1. *N. punctatolineatus* Retz. (p. 180)
- 2 (1). Pattern darker; case made of detritus fragments . . . . . 2. *N. admorsus* McL. (p. 188)

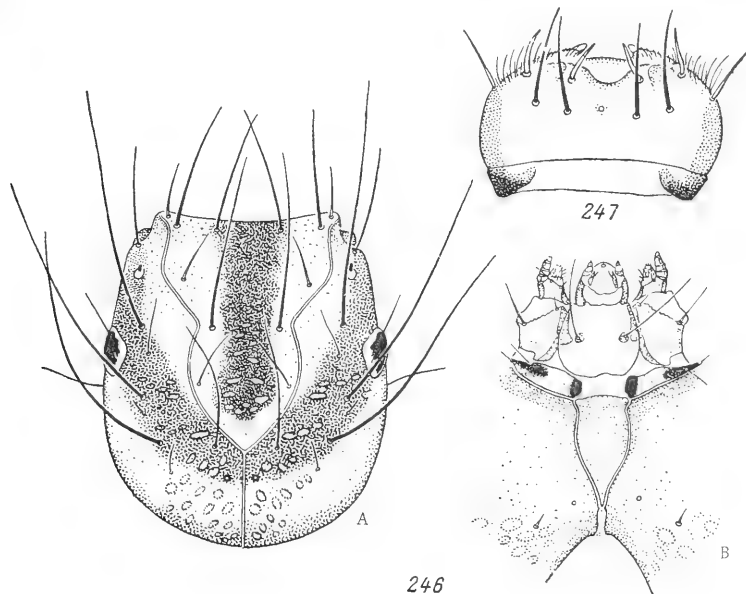
1. *Nemotaulius punctatolineatus* Retzius (*Glyphotaelius punctatolineatus* Retzius)

Degeer, 1778:403-405, Plate XIV, Figures 1-5. - Siltala, 1902:39-42, Plate I, Figure 7, Plate II, Figure 7. - Struck, 1903:Plate VII, 4. - Ulmer, 1903:50. - Siltala, 1904c:32; 1907:492-495, 506, Figures II b-d, h-k, n-s. - Ulmer, 1909:255-256, 314, Figure 383. - Wesenberg-Lund, 1910-1911:93-102, Figures 1-32. - Lestage, 1921:712-722, Figures 247 b, c, d, g, h, j, 248, 250. - Lepneva, 1940:215, Figure 160, 1 and 2.

146

**Full-grown larva.** Length 27.5-32.0 mm. Head (Figure 246, A) yellow, with distinct brownish pattern; punctuation coarse, light; sclerites with small spinules. Frontoclypeus with uniformly narrow, brownish, longitudinal median stripe with a characteristic, distinct, wedge-shaped pattern of light dots posteriorly; punctuation indistinct anteriorly; dorsal stripes uniformly wide, brownish, extending from anterior margin to coronal suture and joining there, forming a horseshoe pattern characteristic for the species; eyes at level of tentorial pit near outer margin of stripes; antennae closer to anterior margin than to eye, situated near median margin of stripes;

sensilla small, dark; posterior part of dorsal stripe with 2 short, transverse rows of 3–4 light dots; several large and small dots lateral to coronal suture. Head darker around occipital foramen, more broadly on ventral side than elsewhere. Lateral stripes absent, replaced by punctation; large punctate areas on dark background laterally on ventral side of posterior part. Gula with pointed posterior end inside wide gular suture (Figure 246, B).



FIGURES 246 and 247. *Nemotaulius punctatolineatus* Retz.:

146 – head, dorsal (A) and ventral (B); 247 – labrum.

Median and intermediate anterior-margin setae dark brown, thick, the latter longer than the former; lateral anterior-margin seta short, light, thin, slightly curved; anterior frontal seta the same, slightly larger; middle frontal seta strong, brown, long; posterior frontal seta short, dark, both thin. Seta 9 thick, long, blackish brown, situated near median margin of dorsal stripe; seta 11 situated posteriorly, thin, small; seta 10 situated in periorcular area near anterior margin of eye, small, thin, brown; seta 14 situated near lateral margin of stripe, thick, blackish brown, the longest on the head; setae 13 and 12 situated laterally nearby, the former small, the latter thin, brown, short; seta 15 brown, long, situated posteriorly near lateral margin of stripe; seta 16 short, thin, curved, brown, situated nearby posteriorly on light background; seta 17 on dark background lateral to fork of frontal sutures, strong, dark, long. Ventral seta 8 small, yellowish brown; seta 18 small, situated in punctate area.

Dorsal sclerite of labrum (Figure 247) yellow, with broad, reddish brown lateral margin; median depression brown; posterior-angle sclerites

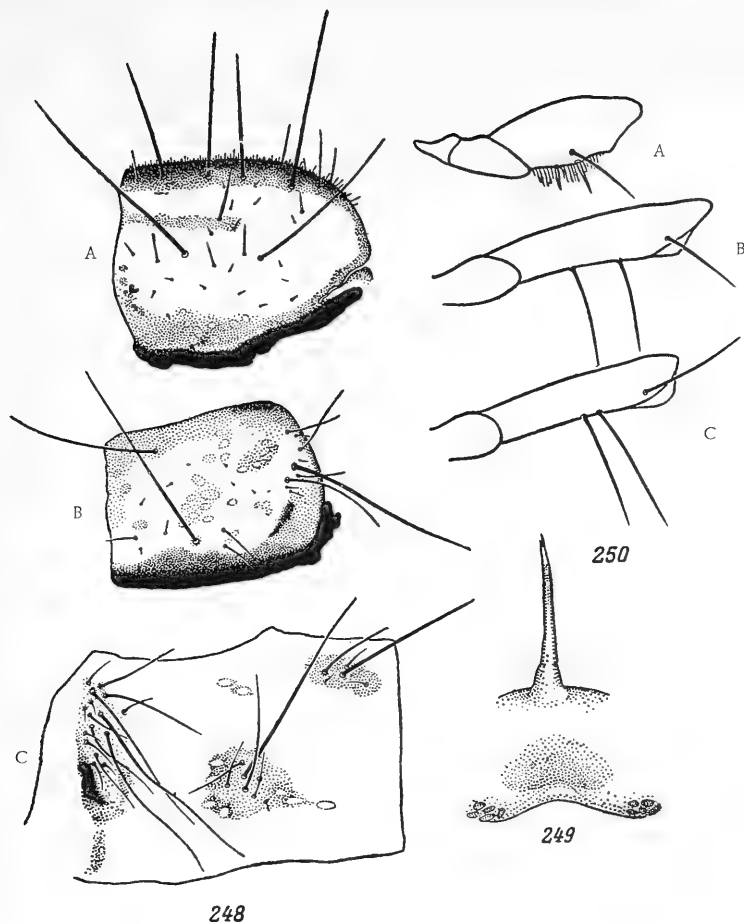
blackish brown, curved ventrally; seta 1 situated anteriorly near depression, forming a blunt, thick, short, yellowish spine; setae 2 and 3 transparent, light, situated near anterior margin, the former a thick inward-curved spine, the latter straight, short, spine-shaped; seta 4 brownish, short, thick, spine-shaped, situated near median depression some distance from posterior margin; setae 5 and 6 situated on surface lateral to median pit, thick, large, brownish.

Mandibles massive, black, with reddish brown apex; middle tooth largest of all 5 distal teeth of left mandible; second tooth from ventral margin largest of 5 teeth of right mandible; median brush situated distally near dorsal margin on left mandible, proximally on right mandible; lateral setae situated basally, ventral seta short, light, dorsal longer and thicker.

Sclerites of cardo yellowish; median margin dark reddish brown, transverse stripe the same, both setae small, light. Lateral sclerites of submentum (Figure 246, B) triangular, reddish brown; seta situated on small dark sclerotized tubercle, brownish, thin, moderately long. Stipes yellowish; lateral seta resembling that of submentum, median seta shorter and thinner. Palpifer reddish brown; distal seta brown, almost as long as palp; median seta small, light. Segments of palp with brownish sclerites. Galea short, brown. Mentum wide, reddish brown; ventral sclerites in form of long, reddish brown rods; seta light, subapical. Sclerites of palpiger bracket-shaped, yellowish, distinct. Palp with brownish sclerite. Labial cone dome-shaped; silk glands with conspicuous opening.

Pronotum yellow, with narrow, black, anterior margin and anterior angle; lateral margin narrow, brown; posterior margin reddish brown, with broad, transverse black stripe; process at posterior angle yellowish brown, with narrow, blackish brown lateral stripe; a dark brown band posterior to anterior margin; a dark groove in anterior third of sclerite; punctation light, distinct, forming an X-shaped median pattern, and 2 large groups in middle of each half; some dots larger than others (Figure 248, A). Three anterior-margin setae situated submarginally, black, moderately long; anterior-angle seta also dark, longer, situated some distance from the anterior margin; 2 small, thin, secondary setae and a short, thin seta laterally; medioanal seta situated in posterior part of sclerite some distance from median suture, long, black, longer than anterior-angle seta; lateral surface seta moderately long, black; intermediate seta short, thin, situated between the above 2 setae; 2-3 small secondary setae medially, a short, thick, brown seta near median suture; other secondary setae small, light, distributed on sclerite.

Mesonotum (Figure 248, B) yellow, with dark reddish brown, anterior margin near angle; lateral margin narrowly dark brown in anterior half, and broadly black in posterior half; whole posterior margin also broadly black; a wide brownish transverse stripe in anterior submarginal area; a reddish brown stripe with several large dots at posterior margin; posterior angle brownish, separated by a narrow stripe with an oblong, reddish brown spot in middle. Punctation in form of 2 diverging rows at anterior angle and groups of dots in each half; anterior third with 2 dots, near median suture one large, the other small.



FIGURES 248–250. *Nemotaulius punctatolineatus* Retz.:

248 – pronotum (A), mesonotum (B), metanotum (C); 249 – horn and sternite of prothorax; 250 – right trochanter and femur of foreleg (A), midleg (B) and hind leg (C), posterior.

Anterior-margin seta situated near suture, black, long; anterior-angle seta and medioanal seta the same but longer, the former near lateral margin at beginning of an oblique stripe; a number of secondary setae nearby, a moderately long, black, and 2 short, thin, brown setae, 2–3 additional small setae closer to the anterior angle; medioanal seta situated in each half near posterior margin; intermediate and lateral seta thin, brown, 2–3 small setae medially, a short, strong, black seta nearer to suture; other secondary setae small, light or dark, situated in different parts of sclerite.

Tergites of metathorax pale grayish; anterior median tergites larger than posterior tergites, latter with large, white, lateral dots; lateral

tergite oblong, with a transverse band consisting of 2 irregular, dark reddish stripes and grayish dots; several similar dots on surface. Anterior-margin primary seta long, black, situated on anterior tergite together with 2–3 thin, short, secondary setae; medioanal seta longer, situated on posterior tergite; intermediate seta moderately long; lateral seta short, both black, 2–3 secondary setae nearby; anterior-angle seta situated in anterior third of lateral tergite among 17–18, much smaller, secondary setae (Figure 248, C).

Propleuron mainly yellowish brown; groove of pleural suture black; epimeron lobe-shaped, with dark brownish stripe near posterior margin; a small, dark seta near groove; epimeron yellowish brown; trochantin broadly black basally, seta small, brownish; light, relatively large, setules near anterior margin.

148 Pleurites of meso- and metathorax triangular, light brown, the latter with a yellowish process around coxa; groove of pleural suture narrow, dark brown, with large black spot distally; primary setae black, thick, moderately long; secondary setae large distally, small and thin on surface.

Prosternite in form of a small, brownish sclerite near posterior margin; anterior part with a large, curved horn with a small basal sclerite (Figure 249). Meso- and metasternites situated laterally at posterior margin in form of small, narrow, brownish sclerites.

Legs brown; mid- and hind tibiae and tarsi light brown; ratio of length of legs = 56:100:98.

149 Fore coxa massive and short, with light punctation basally; basodorsal seta thick, black, moderately long; 2–3 small, thin, secondary setae basally; anterior apical dorsal seta small, posterior seta black, long; primary anterior setae short, brown, thick, pointed, spine-shaped; apical ventral setae moderately long, dark brown, posterior seta slightly larger than anterior; anterior surface with 3–4 short, brown, secondary setae, posterior surface with a dark, moderately long seta, ventral side with 2 similar setae.

Anterior seta of trochanter small, thick, brown; posterior seta short, strong, dark; anterior apical ventral seta in form of short, thick, light brown spine; intermediate seta slightly smaller; basal seta situated near suture, moderately long, brown; both posterior ventral setae the same, situated apically and subapically; white, moderately long, hairlike chaetoids near distal setae, a row of 10–12 dense, yellowish spinules near the chaetoids.

Femur convex ventrally and dorsally; punctation light, indistinct in some places; apical dorsal seta thin, brown, long; basodorsal seta short; dorsal side with 2 secondary setae distally, one small, the other short; anterior seta short, thick, light brown, situated subdorsally in distal part; posterior seta moderately long, thick, dark, situated subventrally in middle of segment; primary ventral setae in form of 2 yellowish, thick, spines, one of them large and situated in middle of segment, the other smaller, situated more basally; a row of small, dense, light yellowish spinules ventrally; basal part with thin, light chaetoids like those on trochanter, in addition to spinules (Figure 250, A).

Tibia almost uniformly wide, ventrally with small, light spinules arranged longitudinally, and smaller than on femur; primary distoventral setae in form of 2 thick, blunt, brown spines; primary dorsal setae



moderately long, light, situated subapically in 2 pairs, anterior and posterior, the anterior seta of posterior pair thicker than others.

Tarsus much shorter than tibia, slightly tapering distally; 8–10 ventral spinules, smaller than on tibia; distal seta of 2 dorsal setae moderately long; both subventral setae short, thin, posterior larger than anterior. Claw thick, large, slightly curved; seta forming a short, blunt spine.

Mid-coxa oblong, with light punctation posteriorly; basodorsal seta thick, situated in group of 3–4 small, thick, secondary setae; 2–3 light, thin setae situated more distally in middle of segment; posterior, distodorsal seta long, thick; anterior seta almost the same; a moderately long seta anteriorly; a similar and 2 smaller setae posteriorly; anterior primary setae thick, moderately long; 3–4 small secondary setae situated more basally; 5–6 such setae posteriorly along segment; both distoventral setae long, anterior larger than posterior; a long and 2 moderately long setae ventrally and subventrally in distal third.

Anterior seta of trochanter small, light brown; posterior seta thick, short, dark, a small, brown, secondary seta more basally; anterior apical ventral seta in form of thin, sharp, long spine; intermediate and basal setae dark, long; intermediate seta shorter; both posterior setae the same; distal seta longest on trochanter, situated near spine; distal third with 8–10 small, yellow spinules and several, thin, white chaetoids before setae.

Femur long, rodlike, slightly wider distally; dorsal side slightly convex, ventral side slightly concave distally, with a longitudinal row of 60–65 small, yellow spinules, a similar number of smaller to minute, light spinules along segment anteriorly. Apical dorsal seta long, black; basodorsal short, thick; anterior primary seta the same; posterior seta moderately long, situated near distal margin; secondary setae: 2 thin, light setae dorsally in distal part, one of them moderately large, the other short; anterior surface with 7–8; posterior surface with 6–7 small, thick, dark setae; primary ventral setae moderately long, black, of about the same size, basal slightly shorter (Figure 250, B).

Tibia straight, thin, slightly shorter than femur, slightly wider distally; 30–36 ventral spinules along segment; primary, distal, ventral setae in form of 2 thick, reddish brown spines; both distal setae of 4 thin brown dorsal primary setae, long, anterior subapical seta moderately long, posterior much shorter and thinner than others; 3 dark, short, secondary setae on anterior surface, posterior surface with one brown secondary seta.

Tarsus shorter and thinner than tibia; ventral spinules 23–25, lighter and smaller, distal spinules larger than the others; primary apical dorsal seta long, brown, longer than the setae of the tibia, subapical seta thin, moderately long, grayish brown; both subventral setae darker, reddish brown, posterior slightly larger than anterior. Claw slightly curved, long, its basal seta in form of a small, thick spine.

The 3 primary dorsal setae of hind coxa long; 20–21 secondary setae, mainly at posterior margin, of different size, from black setae as long as the primary setae to small, thin setae; anterior primary setae thick, longer than on mid-coxa; a row of 6–7 thin, short, secondary setae more basally; posterior surface with 7–8 short, secondary setae and 2–3

150 moderately long setae. Posterior seta of trochanter long, in contrast to that of mid-trochanter, black; further basally 4-5 secondary setae including a moderately long seta near the primary seta; other setae, ventral spinules, and hairlike chaetoids as on midlegs. Femur straight, wider distally than on midlegs; posterior, primary seta slightly larger than on midlegs; primary ventral setae situated close together in distal part, the basal shorter both black, thick (Figure 250, C). Primary setae of tibiae long, slightly larger than on midlegs; 2 small, light, anterior secondary setae, 2 dark, short, posterior secondary setae. Dorsal subapical seta and posterior subventral seta of hind tarsus moderately long, the former much longer than thin, light distodorsal seta; anterior subventral seta thin, light, smaller than posterior.

Dorsal process of abdominal segment 1 high; lateral processes wide, blunt. Lateral line with short, grayish brown hairs on segments 3-8; segment 7 laterally with teat-shaped processes dorsal to the lateral line. Gills on segments 2-8.

Number of filaments and arrangement of gills of  
*N. punctatolineatus*

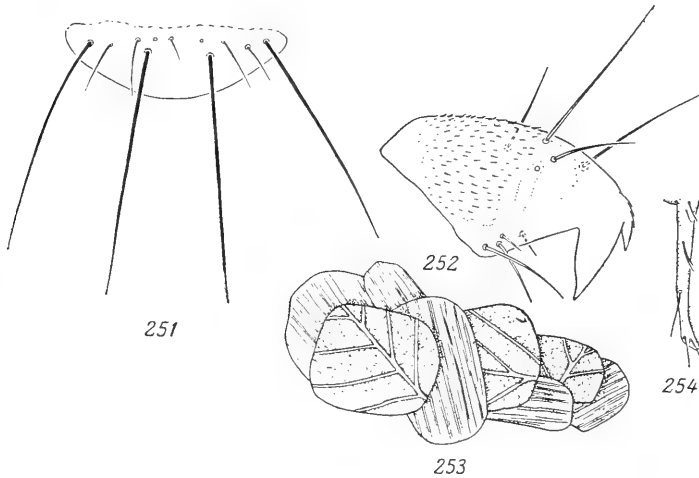
Segment	Dorsal	Pleural		Ventral
2	3	3		3
	3		3	3
3	3	3		3
	3		2	3
4	3	2		3
	3		2	3
5	3-2	1		3
	2		1	2
6	2			2
	2		1	2
7	2			2
	2		1	2-1
8	2			2-1

Tergite of segment 9 (Figure 251) slightly sclerotized, grayish, with coarse, light punctation at anterior margin; setae black, medioanal setae and anterior-angle setae thick, long, situated on brown, sclerotized dots; intermediate and lateral seta thin, moderately long; a moderately long, and 1-2 short setae between the medioanal setae.

Sclerite "b" of anal legs brownish, its ventral process with dark brown anterior margin; mediolateral seta black, long, an almost equally thick and a smaller seta more laterally near margin, both black, thick, the latter thinner; median margin with 2 moderately long and 1 thin seta; all black; ventral seta moderately long, reddish brown, thick; 7-8 black dorsal surface setae, including a moderately long, a short, and 5-6 small setae. Sclerite "c" brownish, with broad reddish brown median margin; basal seta short, thin, black.

Claw (Figure 252) brown, with reddish brown, basal margin; apex reddish black; dorsal denticle large, reddish brown, with 7-9 small, light spinules basally; setae brown, except ventral setae; seta 1 situated subdorsally in basal part, short, thick, reddish brown; seta 2 situated dorsally above suture, thin, long; seta 3 situated on median side subdorsally in distal part, thick, moderately long; seta 6 situated laterally near end of suture, short, thin, dark brown; ventral setae 7 and 8 transparent, light, slightly curved; seta 5 small, light, situated laterally on outer side of 8; seta 4 situated medially, short, thick, yellowish.

(151)



FIGURES 251-254. *Nemotaulius punctatolineatus* Retz.:

251 - tergite of abdominal segment 9; 252 - claw of left anal leg, lateral; 253 - larval case; 254 - anal rod of pupa. (253 - after Hickin; 254 - after Siltala).

Case 30-36 mm long, made of plant particles of varying size, the smaller in lateral walls, the larger in dorsal and ventral walls, consisting of large overlapping pieces of leaves so that the anterior piece covers part of posterior piece; dorsal row longer than ventral row, upper anterior leaf larger than the others, with rounded anterior margin which projects beyond the margin. When the larva comes out of tube, its anterior end is covered by the projecting leaf. In late spring and in the first half of summer, a period of intensive feeding and growth, fragments of the fresh vegetation are added to the case; when vegetation dies in autumn, and in early spring, the case is dark as the larvae spend these seasons on the bottom and use fallen leaves as building material. However, the case retains its form. The case sometimes consists of smaller and different fragments and is more tubular. The case is rarely built of unusual material, e. g., large spheres of *Nostoc*; such cases have a characteristic form. The change in form of the case as a function of growth and according to the plant material used is shown in Figure 253, and in Vol. II, Part 1, Figure 112.

151

**Pupa.** Length 20–25 mm. Antennae reaching end of segment 8 in male pupae, end of segment 6 in female pupae.

Mandibles with very narrow apex; median blade slightly serrated. Wing sheaths reaching middle of segment 4 or beginning of segment 5; posterior margin of sheath of forewings with a shallow indentation, as in the adult. Mid-tarsi natatorial, segment 1 of hind tarsus also natatorial.

Dorsal process of abdominal segment 1 long, large, saddle-shaped, with small spinules. Holding apparatus on segments 3–7; number of spinules: III:1–3; IV:2–6; V:4–6+11–24; VI:3–6; VII:3–6. Gills as in larva.

Anal rods (Figure 254) slightly wider at the end, slightly curved upward; 2 small setae near their base; one of the 4 small, dark setae situated in basal part of rod, the second in middle, the other 2 apically.

Before pupation or some time before hibernation, the larva changes the case by replacing the laterally projecting leaf fragments with less large fragments. The larva attaches the pupal case and covers it with loosely interwoven, large fragments; the anterior and posterior sievelike membranes are situated inside the case some distance from the end; anterior membrane with about 20, posterior with to 40 holes.

Mode of life and habitats. Stagnant water, among vegetation in the littoral zone of lakes; detritophagous. Full-grown larvae appear in early spring, the first pupae in May.

Distribution. Northern, northwestern, western, and central parts of the European USSR; Western and Eastern Siberia, including Baikal area. In addition, Europe.

## 2. *Nemotaulius admorsus* McLachlan,\* larva nova

152 **Full-grown larva.** Length 30–32 mm. Head mainly reddish brown (Figure 255, A); stripes distinct, as in *N. punctatolineatus*, dark brown or blackish brown; median stripe of frontoclypeus broader than in *N. punctatolineatus* and reaching middle frontal setae; anterior punctation, dark; wedge-shaped pattern of posterior part consisting of small, light dots. Dorsal stripes as in *N. punctatolineatus* joined at coronal suture and forming a characteristic dark, curved pattern; dots not light\*\* as in *N. punctatolineatus*, but dark, dots on stripe indistinct, dots lateral to coronal suture distinct, chestnut brown. Lateral stripes absent, replaced by sparse punctation; a small, indistinct, grayish spot anteriorly, connected with dorsal stripes by a narrow, dark, transverse bridge; short, longitudinal rows of 4–5 distinct, chestnut brown dots on a brownish gray background near occipital foramen from coronal suture to lateral stripes. Ventral surface dark posteriorly, with small, chestnut brown dots. Gula light, with long posterior end (Figure 255, B).

Setae as in *N. punctatolineatus*; setae 9 and 14 as long as in that species.

Labrum golden brown; setae 1, 2, 3, and 4 light; 5 and 6 dark brown; setae setae as in *N. punctatolineatus*.

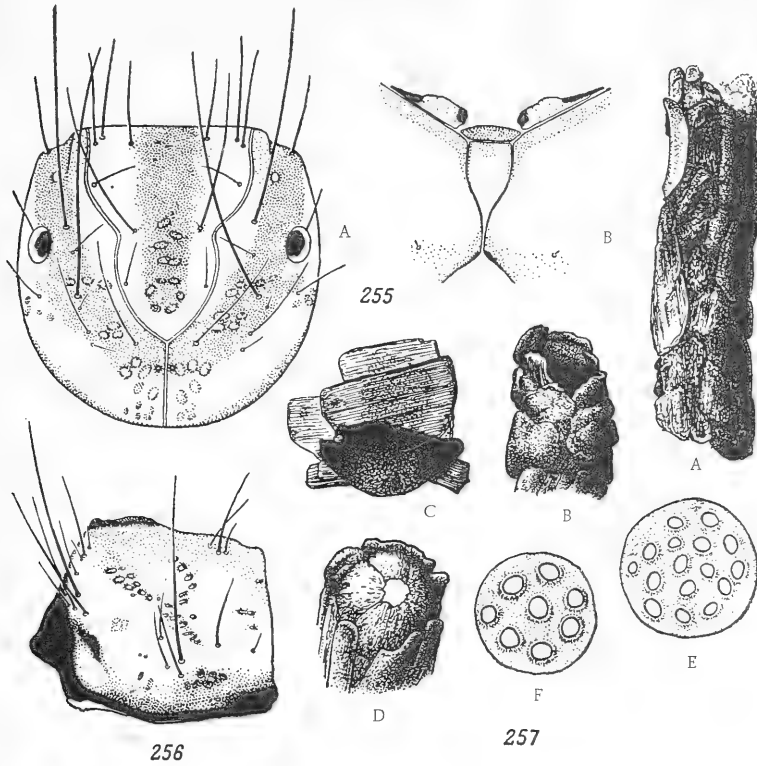
Mandibles black, oblong; right mandible with 4 large teeth and a small tooth; left mandible with 5 teeth; brushes orange-yellow; lateral setae small, light, situated basally, dorsal slightly larger than ventral.

\* *Glyphotaelius admorsus* McL. of authors. The species was determined by I. M. Levanidova, who reared the larvae into pupae and adult males.

\*\* According to preparations.

153 Maxillolabium reddish brown; mentum dark reddish brown; cardo and base of palpifer with black spots.  
 Pronotum mainly light brown, anterior third dark brown near anterior margin; groove in anterior third broadly dark brown in middle.

(152)



FIGURES 255-257. *Nemotaulius admorsus* McL.:

255 - head, dorsal (A) and ventral (B); 256 - mesonotum; 257 - case of full-grown larva (A), anterior end (B), case of young larva (C), posterior end of pupal case (D), sievelike membrane of pupal case: anterior (E) and posterior (F).

Mesonotum (Figure 256) light brown; anterior angle with blackish brown margin on anterior side, lateral margin light, or with a row of pinkish brown dots; posterior half (posterior  $\frac{2}{3}$  in some specimens) with wide, black, lateral margin and large lateral process (both larger than in *N. punctatolineatus*); the blackish or dark reddish brown spot of posterior angle not situated in middle (as in *N. punctatolineatus*), but close to anterior margin, almost adjacent to black lateral margin.

Black transverse stripe of lateral sclerite of metanotum darker and wider than in *N. punctatolineatus*.

Legs reddish brown, darker than in *N. punctatolineatus*; fore femur with straighter ventral side, without a small process at base of disto-

ventral seta. Form and chaetotaxy of legs similar in the 2 species.  
Ratio of length of legs = 56:100:94.

Lateral line from middle of segment 3 to end of segment 8; hairs small, brownish; a number of pinkish sclerotized dots above hairs in anterior half of segments III:6-8; IV:8-9; V:4-8; VI:14-6; VII:4-4; VIII:4-5.

Gills on segments 2-8.

Number and arrangement of gills of *N. admorsus*

Segment	Dorsal	Pleural		Ventral
2	3	3		3
	3		3	3
3	3	3		3
	3		3	3
4	3	3		3
	3		2	3
5	3	2		3
	3		2	3
6	2	2		3
	2		2	3
7	2	1		2
	2		1	2
8	2	0		2

Tergite of segment 9 pale, whitish, often with fine, pinkish punctation at anterior margin. Medioanal seta and anterior-angle seta long, black; intermediate and lateral seta short, brownish; usually no setae between medioanal setae.

Sclerite "b" of anal legs light brown, with pinkish dots; median and neighboring seta dorsally at distal margin long, black, thick; 3rd apical dorsal seta and median subapical seta shorter and thinner; ventrodorsal seta black, moderately long; 2 similar surface setae; there are also 2 thin, short setae at median margin and in punctate area, and 2-3 small setae (surface setae of *N. punctatolineatus* more numerous but smaller). Sclerite "c" reddish brown, with broad, reddish black margin; seta small, thin. Claw reddish brown, with 2 dorsal denticles, brownish black at the apex; setae as in *N. punctatolineatus*.

Case (Figure 257, A) 36-40 mm long, made of small fragments of tree detritus, usually flat, thin pieces, like leaves, arranged obliquely or in a longitudinal pattern; surface fairly or perfectly smooth; ends open (Figure 257, B). The case of young larvae (Figure 257, C) of stages 1-3 (larval length 10-11 mm, length of case 15-16 mm) is made, as in *N. punctatolineatus*, in form of a tube with an upper and lower layer of green leaf fragments, overlapping transversely so that fragments project laterally; this seems to be typical for the genus. Full-grown larvae of *N. admorsus* live in slow-running water; transition to a more rapidly

running environment is accompanied by reconstruction of the case with replacement of the light plant material with heavier tree detritus. The case of the American species *N. hostilis* Hag. is similarly covered with vegetable fragments, arranged mainly longitudinally (Lloyd, 1921:43, Figure 50).

**Pupa.** Length 22–24 mm. Antennae reaching end of segment 7 or beginning of segment 8. Anteclypeus and labrum yellowish brown; 3 setae of anteclypeus dark brown, thin, moderately long; seta 1 of labrum thick, small, light, curved inward, other 5 setae black, curved at end, arranged in 2 rows of 2 and 3 setae. Mandibles reddish brown, distal part with broad base, median blade straight, serrated. Wing sheaths reaching abdominal segment 5; sheath of fore wings with deep indentation at distal margin. Midlegs of natatorial type; comb with golden brown setae on tarsal segments 1–4, setae of dorsal row slightly longer and denser than ventral setae; segment 1 of hind tarsi also with sparse setae.

154

Dorsal process of abdominal segment 1 brown, its distal margin coarsely rugose, blackish; distal lobes of the process with thick black spinules lateral to saddle-shaped depression. Holding apparatus on segments 3–7, number of hooks: III:2–3; IV:3; V:3–4+19–21; VI:3; VII:4; plates of segment 3 asymmetrical, much smaller than the others, left sclerite in form of a large sclerotized dot and much smaller than the right. Lateral line from posterior margin of segment 5 to segment 8, where setae of right and left rows are dense ventrally, dark grayish brown, and almost touch each other.

Sheath of male genitalia in form of 2 small inner lobes and 2 larger outer lobes.

Anal rods dark brown, tapering distally, slightly wider at the end; setae thick, black, the first situated basally, the 2nd in the basal third, the 3rd and 4th situated apically and subapically.

Pupal case attached at anterior end; anterior and posterior end rounded and protected by small particles of detritus (Figure 257, D). The sievelike membrane at anterior end is slightly larger than the posterior membrane and has numerous small holes; posterior membrane with fewer, but larger, holes (Figure 257, E, F).

Mode of life and habitats. Stagnant and slowly running waters; overgrown biotopes, on plants and on bottom among vegetation; older stages on bottom in open environment.

Distribution. USSR: Sakhalin, Kurile Islands, Maritime Territory, Khabarovsk area. In addition, North China, Japan.

## 2. Genus *Glyphotaelius* Stephens

**Full-grown larva.** Head with dark, T-shaped pattern on frontoclypeus; dorsal stripes indistinct. Anterior third of pronotum dark, middle of groove no darker than the other part. Tergite of abdominal segment 9 with distinct, dark, anterior, submarginal spots.

Mode of life and habitats. Small, stagnant water bodies with abundant detritus on bottom.

Distribution. European USSR, Caucasus, Altai. In addition, Europe, Asia Minor, Iran.

### 1. *Glyphotaelius pellucidus* Retzius

Degeer, 1778: Plate XI, Figures 9–11, Plate XII, Figures 13–18. — Pictet, 1834:147, Plate VIII, Figure 4. — Struck, 1899:198–199, Figure 78; 1900:Figure 14. — Ostwald, 1901:109. — Struck, 1903:86, Plate I, Figure 7. — Ulmer, 1903:50, Figures 76, 126; 1903b:191–195, Figures 19–22. — Siltala, 1903a:9–11, Figure 3; 1904c:32. — Ulmer, 1909:257, Figure 386. — Lestage, 1921:712–722, Figure 247 e, i, k. — Hickin, 1946:61–65, Figures 1–9. — Lepneva, 1940:215.

**Full-grown larva.** Length 20–23 mm. Head (Figure 258) mainly light brown: frontoclypeus with large, T-shaped, dark pattern, resembling that of most species of *Limnophilus*, occupying anterior part of sclerite; longitudinal stripe wider posteriorly, with dark, wedge-shaped pattern of punctation; area around tentorial pits lateral to frontal suture light yellowish, as is the narrow periorcular area; groups of dots lateral to coronal suture, on site of lateral stripes, and ventrally at occipital foramen. Gula as in Figure 259.

Dorsal sclerite of labrum (Figure 260) yellowish brown, with deep median depression; lateral margin reddish brown; setae as in the other species of *Limnophilini*; setae 5 and 6 large, black.

Mandibles short, mainly black; teeth blunt, small, situated distally (Figure 261).

Pronotum (Figure 262) yellowish brown, its anterior third dark brown, with blackish brown anterior margin; groove in anterior third not dark in the middle; punctation black or blackish brown. Mesonotum (Figure 262) yellowish brown, its dark punctation not uniformly distinct; lateral margin with broad blackish brown part; posterior angles and  
155 posterior margin black.

Legs yellowish brown; base of coxae and dorsal side of femora and tibiae with dark punctation; chaetotaxy as in *N. punctatolineatus*.

Abdominal segment 1 with large dorsal and lateral processes; ventral process low, elliptical; setae small, black.

Lateral line on segments 3–8; hairs grayish black. Gills on segments 2–7.

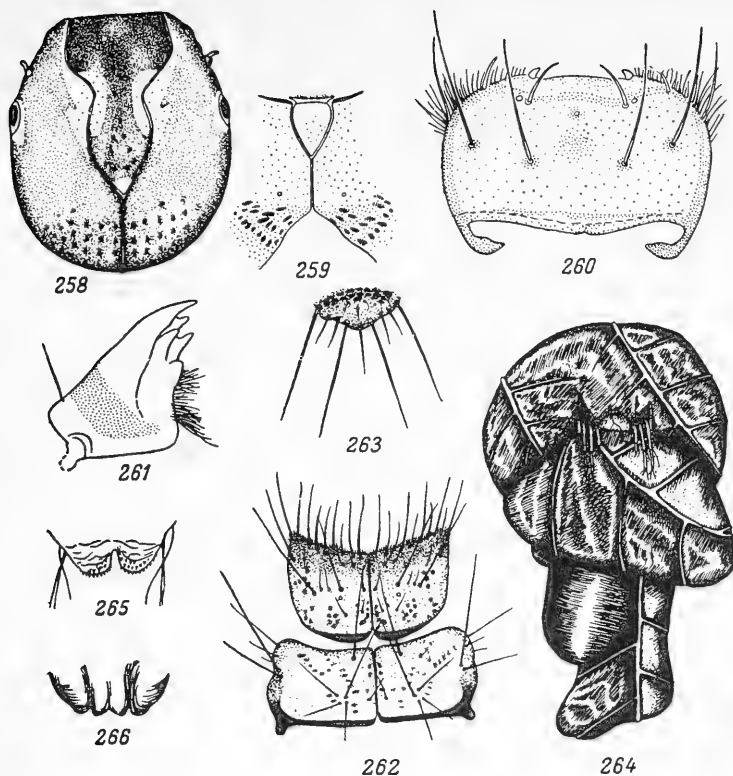
Tergite of segment 9 brownish, with row of dark submarginal dots anteriorly; setae as in Figure 263.

Claw with a large dorsal denticle.

Case as in *Nematotaulius punctatolineatus* (Figure 264).

**Pupa.** Length 19–21 mm. Antennae reaching end of segment 6 or beginning of segment 7; scape almost twice as long as pedicel, both with several short setae. Labrum, as in most species of *Limnophilini*, with small, round, median process; seta 1 small, situated near anterior margin; sides with 5 large, black, hooked setae. Distal part of mandibles wider than in *Nematotaulius punctatolineatus*; median serration slight.





FIGURES 258-266. *Glyphotaelius pellucidus* Retz.:

258 - head, dorsal; 259 - head, ventral; 260 - labrum; 261 - left mandible, dorsal; 262 - pro- and mesonotum; 263 - tergite of abdominal segment 9; 264 - larval case, ventral; 265 - dorsal process of abdominal segment 1 of male pupa; 266 - penis sheath and ventral appendages (265 - after Ulmer; 266 - after Siltala; the rest after Hickin).

Wing sheaths reaching abdominal segment 4; distal margin of sheath of fore wings with less marked indentation than in *N. punctatolineatus*. Midlegs natatorial; first 2 segments of hind tarsus with sparse natatorial setae.

Process of abdominal segment 1 with deep, median, apical incision and with small spinules (Figure 265). Holding apparatus on segments 3-7; number of spinules: III:3-4; IV:2-5; V:3-4+10-23; VI:3-5; VII:3-4; spinules large. Filaments of gills more numerous than in the larva, 87, one of the largest numbers among the large species of *Limnophilini*.

Anal rods long, with 4 small, black setae, 2 of them subapical. Sheath of ventral appendages of male genitalia slightly shorter than penis sheath (Figure 266).

The pupal case sometimes retains its flat form because of the large plant fragments on the dorsal and ventral side; membranes covering anterior and posterior end with numerous large holes.

Mode of life and habitats. Small biotopes in lakes, ponds, and swampy water bodies the bottom of which is covered with fallen leaves.

Distribution. Northwestern and western parts of the European USSR. In addition, Europe, except Northern and Southern parts.

Number and arrangement of gills of *G. pellucidus*

Segment	Dorsal	Pleural		Ventral
2	3	3	2	3
	3			3
3	3	2	2	3
	3			3
4	2	2	1	3
	2			3
5	2	1	1	3
	2			3
6	2			2
	2			2
7	2			2
	2			2
8	2			

### 3. Genus *Grammotaulius* Kolenati

**Full-grown larva.** Length to 35 mm. Head light, with distinct punctate pattern; dorsal stripes barely visible, usually absent. Mesonotum shorter and narrower than pronotum. Claw of anal legs with 2 dorsal denticles. Case made of large, long, plant particles arranged in a more or less distinct spiral.

Mode of life and habitats. Small, stagnant, overgrown water bodies with abundant detritus.

Distribution. The European USSR, Western and Eastern Siberia, Far East, Kamchatka. In addition, Europe, Iran, Japan, North America.

#### Key to Species

##### Full-grown larva

- 1 (2). Head light brownish; median stripe on frontoclypeus and dorsal stripes more or less distinct; case long, narrow, length of visible ends of second and following turns of spiral covering about one half of first turn . . . . . 1. *G. atomarius* Fabr. (p. 195)
- 2 (1). Coloration of head similar or different; case shorter and wider, or with different spiral covering.
- 3 (6). Spiral of case cover, as in *G. atomarius*, consisting of long plant fragments, which are sometimes narrow; first turn of spiral always much larger than following turns.

- 4 (5). Head light, yellowish; median stripe of frontoclypeus and dorsal stripes absent; length of visible ends of second and following turns of cover usually less than half the length of first turn. . . . . 2. *G. signatipennis* McL. (p. 201)
- 5 (4). Head brownish, as in *G. atomarius*; median stripe on frontoclypeus and dorsal stripes indistinct; length of second and following turns of covering of case longer than first turn . . . . . 4. *G. sibiricus* McL. (p. 212)
- 6 (3). Head brownish; median stripe on frontoclypeus and dorsal stripes on head distinct; spiral arrangement of fragments not always distinct; case usually made of thin stalks of plants or small, less regular plant fragments . . . . . 3. *G. nitidus* Müll. (p. 208)

157 1. *Grammotaulius atomarius* Fabricius

Degeer, 1778: Plate XIII, Figures 18–21. — Walser, 1864:42–43. — Ulmer, 1902 b:429–432. — Struck, 1903:86, Plate I, Figure 8. — Ulmer, 1903:50, Figures C, 2, 14, 24, 86, 94, 111. — Siltala, 1904 c:31–32. — Ulmer, 1909:261, Figure 392. — Lestage, 1921:722–728. — Lepneva, 1940:215, Figure 5. — Hickin, 1954:89–92, Figures 1–8.

**Full-grown larva.** Length 28–30 mm; sclerites mainly whitish yellow; punctation and large setae reddish brown. Head (Figure 267, A) slightly oblong, with distinct, punctate pattern; antennae situated nearer to seta 7 than to eye, sensilla dark. Frontoclypeus anteriorly with 2 pairs of dots on each side, 2 further dots posteriorly and medially; posterior part with distinct large, wedge-shaped pattern; surface slightly dark in some places.

Dorsal and lateral stripes indistinct, brownish or pale; ventral surface with indistinct brownish area laterally in the anterior part; 2 transverse rows of dots on site of dorsal stripes behind eye; punctation also present lateral to coronal suture, between the stripes and on site of lateral stripes; reddish brown punctation laterally on ventral surface, especially near occipital foramen.

Median anterior-margin seta and intermediate anterior-margin seta moderately long, the latter slightly larger, lateral anterior-margin seta short, transparent, curved inward; anterior frontal seta also light, procumbent, middle frontal seta long, reddish brown; posterior seta small, thin, brownish. Seta 7 moderately long, thick; seta 9 thick, long; seta 11 situated posteriorly, small, brownish; seta 10 short, light; seta 12 situated behind eye, moderately long; seta 14 thick, longer than others; seta 13 situated nearby, thin, light brown; seta 15 thin, long; seta 17 thick, dark, moderately long, situated in angle of frontal sutures. Ventral seta 8 small, light brown; seta 18 very small, situated among dots. Gula long (Figure 267, B).

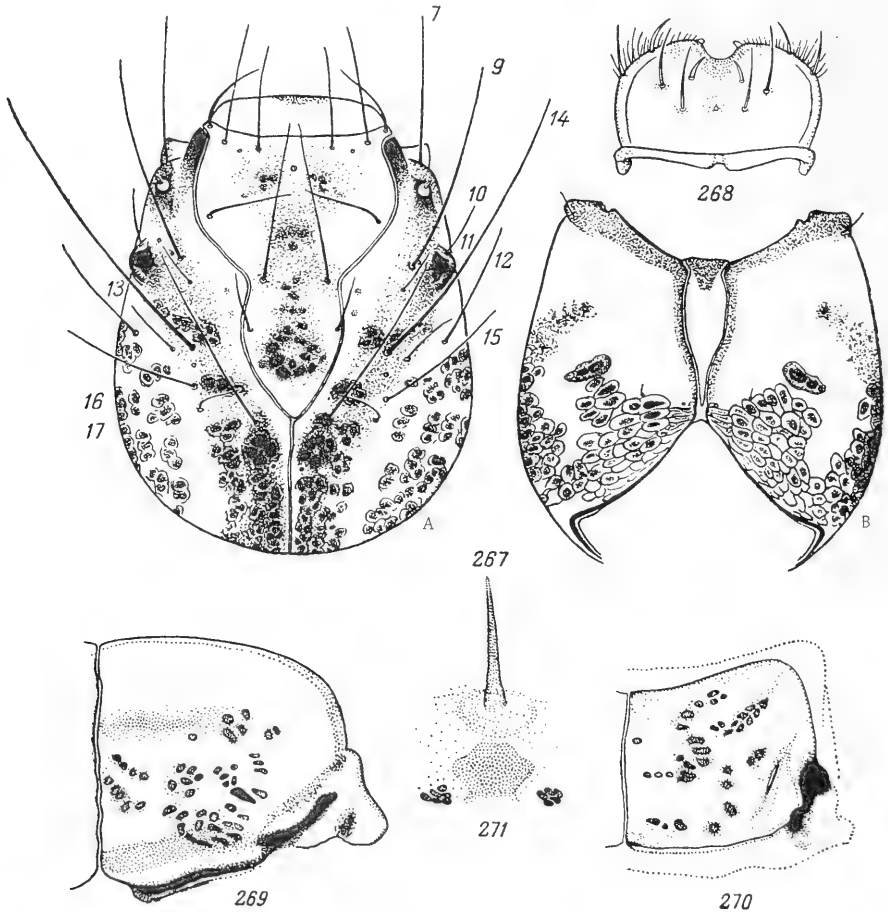
Labrum (Figure 268) with deep median indentation; dorsal sclerite dark reddish brown; posterior-angle sclerites black at the curvature or on greater part of surface. Mandibles black, with narrow reddish brown margin distally; left mandible with 5 blunt, small, distal teeth, middle tooth larger than others; right mandible with 4 distal teeth, ventral tooth

larger than the others; median brush of left mandible larger than that of right mandible; lateral setae dark, short, the dorsal larger than ventral.

Pronotum with narrow, reddish brown anterior and lateral margin; posterior margin and whole tergite light brown, with 2 black, transverse stripes; posterior-angle process with narrow brown lateral margin and 3 large dots; anterior third of tergite not dark, groove with wide, golden brown stripe in the middle (Figure 269). Setae slightly longer, lighter, and thinner than in *Nemotaulius*.

Mesonotum lighter than pronotum, whitish brown; anterior and lateral margin light; posterior margin narrow, brownish; posterior angle broadly black; stripe at posterior angle in form of a thin line, with a narrow, oblong, reddish brown spot in middle. Punctuation (Figure 270) reddish brown, distinct. Large setae dark brown.

(158)



FIGURES 267-271. *Grammotaulius atomarius* Fabr.:

267 - head, dorsal (A) and ventral (B); 268 - labrum; 269 - pronotum; 270 - mesonotum; 271 - horn and sternite of prothorax.

Tergites of metathorax light brownish; anterior and posterior median sclerites small, of equal size; 3-4 pale sclerotized dots lateral to anterior median sclerites. Setae dark reddish brown; anterior-median sclerite with a moderately long, thick, primary seta, and 2-3 secondary setae, one of them sometimes moderately long; medioanal seta of the 3 primary setae of posterior median sclerite long, the intermediate and lateral setae short, thin; if present, secondary setae small. Lateral sclerite with reddish transverse stripe; 2 dots in anterior part and 3-4 pale dots in posterior part; anterior-angle seta moderately long, among 10-11 secondary setae of different size.

Propleuron mainly light; pleural groove brownish basally, black apically; epimeron with narrow, brown stripe posteriorly and on median side, primary seta short, situated near suture, a small secondary seta nearby; trochantin black basally, with a short seta.

158 Mesopleuron large; mesepisternum large; mesepimeron narrow, oblong; pleural groove in form of a narrow, dark brown stripe with black, rhomboidal, distal spot, large dots basally lateral to stripe; similar dots on mesepisternum; primary setae situated distally, thick, moderately long; 6-7 smaller, distal, secondary setae, and 11-14 moderately long to small surface setae. Metapleuron, whitish brown, with less distinct punctation; primary setae the same, slightly shorter; 4-5 secondary, distal setae; 5 surface setae on metepisternum and 2 on metepimeron.

Prosternite in form of small, indistinct, brownish, median sclerite, with group of distinct, dense, chestnut brown dots laterally; horn large, grayish brown (Figure 271). Sternites of meso- and metathorax dot-shaped, 6 large, distinct brown dots laterally on mesothorax, and 3-4 whitish dots on metathorax.

Legs light brown, with distinct punctate pattern; ratio of length of legs 60:100:94; secondary setae fewer than in *Nemotaulius*; large setae dark brown or reddish brown.

159 Fore coxa resembling that of *Nemotaulius punctatolineatus*; dots large, chestnut brown, situated basally and ventrally on anterior side and subventrally on posterior side; posterior subdorsal side of basal part with a thin, reddish brown stripe with 6-7 light dots. Anterior basodorsal seta thick, moderately long, dark brown, situated in group of 4 thin secondary setae; anterior distodorsal seta thin, light brown; posterior distodorsal seta long, situated near apex of distodorsal depression; 3 reddish brown, smaller setae situated more distally near depression; both primary anterior setae short, light brown, thick; 2 small and 3 thin, short, light, secondary setae situated on anterior surface and subventrally; primary distoventral setae moderately long, thick, reddish brown, posterior slightly larger.

Anterior seta of trochanter small, thick, chestnut brown; posterior seta short, thick, dark brown; primary anterior setae of ventral surface forming large, light, yellowish spines, one apical, and one subapical; basal seta moderately long, reddish brown; both posterior setae also long, apical seta larger than subapical; distal part with thin, light, hairlike chaetoids, and a row of small spinules between setae.

Femur slightly convex dorsally, almost straight ventrally, without protuberance characteristic for the other genera, and without a distal

concavity; posterior side with 2–3 basal dots; a row of 8 dots subdorsally. Basodorsal seta short; apical dorsal seta moderately long, reddish brown; 2 light, thin, secondary dorsal setae; anterior seta short, reddish brown; posterior seta moderately long, thick, situated subventrally in basal part of segment; ventral setae in form of 2 thick, light spines, basal spine smaller, situated near posterior seta (Figure 272, A); a number of small, light spinules at ventral margin, several light chaetoids basally, in addition to spinules, like those on trochanter.

Tibia almost half as long as femur, slightly broader distally, nearly parallel dorsal and ventral side, with a row of large, subdorsal dots posteriorly. All setae primary, as on the tarsus; 2 pairs of more or less long setae dorsally, one pair apical, posterior and subdorsal, the other anterior and subapical, the dorsal seta of each pair thin, light; the other thick, brown, the apical dorsal seta longer than the others; distoventral setae in form of 2 short, thick spines; a row of small, light spinules ventrally.

Tarsus slightly narrower distally; apical dorsal seta brownish, moderately long; subapical seta short, light; both ventral setae situated subapically, short, thin, posterior longer than anterior; ventral margin with small spinules.

Claw thick, with blunt, basal spine.

Mid-coxa oblong, with chestnut brown punctation basally on anterior side and subventrally on posterior side. Most of the large setae black or brownish black. Basodorsal primary seta thick; apical dorsal setae long, thick, situated near apex of depression, posterior of them slightly larger; 2 secondary setae on anterior side near depression, 6, including 2 long setae posteriorly; 16–20 small, thin and thick, short secondary setae dorsally and subdorsally; both anterior setae short, thick; distoventral setae moderately long, posterior one slightly longer; 4–5 secondary, including 2 thick, moderately long, setae ventrally and subventrally; anterior and posterior surface with 1–2 small secondary setae.

Trochanter with 5–6 large dots posteriorly; anterior seta light brown, thick; posterior seta dark, thin, both small; anterior distoventral seta forming large, pointed, yellowish spine; middle seta moderately long; dark, basal seta larger; posterior distal seta long, thick; subapical seta thinner, moderately long, one small secondary seta dorsally; distal part with thin, light feathered chaetoids and a row of small, transparent spinules ventrally.

Femur straight, rodlike, with large, chestnut brown dots apically on anterior side and basally and subdorsally on posterior side. Basodorsal seta thin, brown; apical dorsal seta long, black; 2 thin, short, secondary setae subapically; anterior seta situated subapically, moderately long; posterior seta situated apically, long, both dark; primary ventral setae situated in middle of segment, thick, dark brown, of equal size, moderately long; sparse, light spinules ventrally (Figure 272, B).

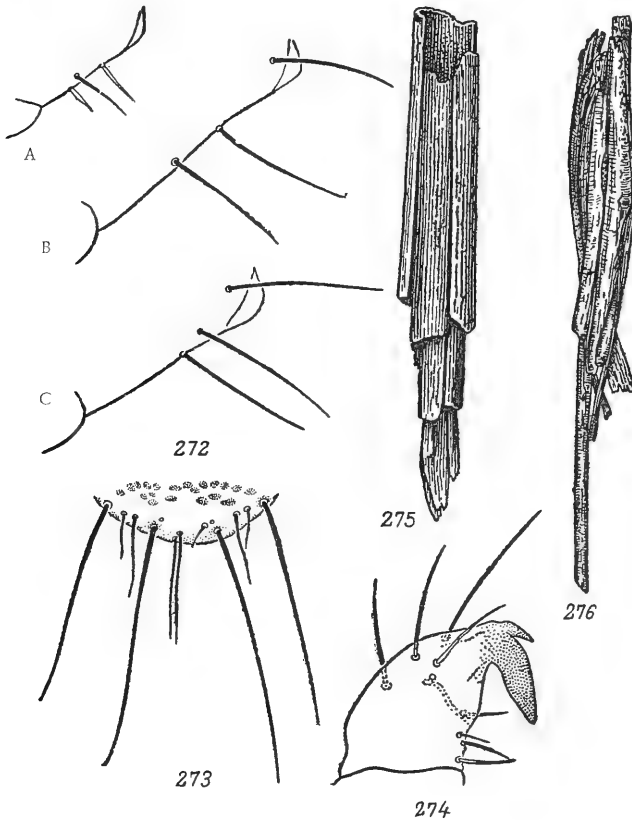
Tibia straight, slightly wider distally; anterior side with subdorsal row of dots; posterior side of distal part with 3 large dots; 4 dorsal setae paired, situated subapically anteriorly and apically posteriorly, each pair consisting of a long, dark seta and a shorter, thin, light seta; distoventral setae in form of 2 thick, large spines; small, light spinules ventrally. Tarsus straight, narrow; apical dorsal seta dark brown, longer than tarsus;

subapical seta lighter, thin, moderately long; apical ventral setae thin, brown, posterior of them longer, reaching end of claw. Claw thin, slightly curved; basal seta in form of thick, pointed spine.

The hind legs differ from the midlegs as follows: 1) secondary dorsal and distal setae of coxa larger and more numerous; 2) posterior seta of trochanter long, almost as long as posterior distoventral seta; 3) femur slightly shorter than on midlegs, with wider apex (Figure 272, C); 4) posterior, primary seta of femur longer than ventral setae; 5) both ventral setae of femur situated close together in apical part, the basal of them shorter, lighter, and thinner; 6) apical dorsal seta of tibia longer than on midlegs; apical dorsal seta of tarsus shorter.

Dorsal process of abdominal segment 1 large, conical, pointed; lateral processes wide, large; ventral convexity elliptical.

Lateral line on segments 3-8, gills on segments 2-8.



FIGURES 272-276. *Grammotaulius atomarius* Fabr.:

272 - ventral margin of right legs, posterior: foreleg (A), midleg (B) and hind leg (C); 273 - tergite of the abdominal segment 9; 274 - claw of anal leg; 275 - larval case; 276 - pupal case.

Tergite of segment 9 pale, brownish, with large dots at anterior margin; medioanal setae black, long; anterior-angle seta shorter and thinner, intermediate seta moderately long, lateral seta short; both thin, brownish; a brown, moderately long seta between medioanal setae (Figure 273).

Sclerite "b" of anal legs light brown, with large, brown dots basally and on surface; a long, thick, black seta in median distal angle; similar, long but thinner seta nearby, lateral seta brown, less large; a thin, black, moderately long seta near median margin; ventral seta dark brown, short, thick. Sclerite "c" light brown, with broad, black, lateral margin; basal seta small, brown.

Claw (Figure 274) dark brown, with a large dorsal denticle; setae brown, except ventral setae; seta 1 situated subdorsally in basal part, thick, relatively large; seta 2 thin, moderately long, situated laterally at end of suture; seta 6 short, situated near suture in apical part; seta 3 situated dorsally in apical part, relatively long; setae 7 and 8 short, light; seta 5 small, light, situated laterally near seta 8; seta 4 light, but slightly larger, situated inward from 8.

Case (Figure 275) straight, tapering posteriorly, made of large plant fragments 18–20 mm long and attached longitudinally at anterior end, forming a spiral of 3–4 turns. The material usually consists of pieces of sedge or leaves of Gramineae, oblong particles of detritus, or blackened leaves of trees. Length of case 40–50 mm.

Number and arrangement of gills of *G. atomarius*

Segment	Dorsal	Pleural		Ventral
2	3	3		3
	3		3	3
3	3	3		3
	3		3	3
4	3	2		3
	2		2	3
5	2	2		2
	2		2	2
6	2		1	2
	2			2
7	2		1	1
	2			
8	2			

**Pupa.** Length 18–21 mm. Antennae reaching segment 8. Clypeus with 3 black setae; labrum brownish, seta 1 small, light, situated laterally, other 5 setae black, hooked at end. Mandibles blackish red-brown; distal part relatively wide, slightly curved, serrated; lateral setae short, black.

Wing sheaths with rounded ends, reaching the abdominal segment 6; mid-tarsi with dense natatorial setae; sparse setae on hind tarsi.



Dorsal process of abdominal segment 1 dark brown, narrower apically, with short black setae lateral to saddle-shaped indentation. Holding apparatus on segments 4-7, number of spinules: IV:4-5; V:4-5+17; VI:3-4; VII:3-4. Lateral line consisting of dense, grayish black setae on segments 5-8. Gills as in larva.

Dorsal surface of segment 9 with 4 setae on each side, including 3 thick, moderately long, black setae and a thin, small, brownish seta.

Anal rods slightly wider at end, curved laterally, covered with small spinules, especially in posterior part, with a small, thin seta basally, terminal third with a slightly larger seta, apical part with 2 strong, larger setae.

Pupal case with a sievelike membrane anteriorly and posteriorly; anterior membrane situated at anterior margin, posterior membrane at a marked distance from posterior margin. Case covered with fragments of sedge or other plants, loosely attached at one end so that it becomes spindle-shaped (Figure 276).

Mode of life and habitats. Small water bodies with rich vegetation; littoral vegetation of lakes; phytophagous and detritophagous.

Distribution. European USSR, especially northwestern, western, central, and southern parts, Caucasus. In addition, Europe.

## 2. *Grammotaulius signatipennis* McLachlan, larva nova

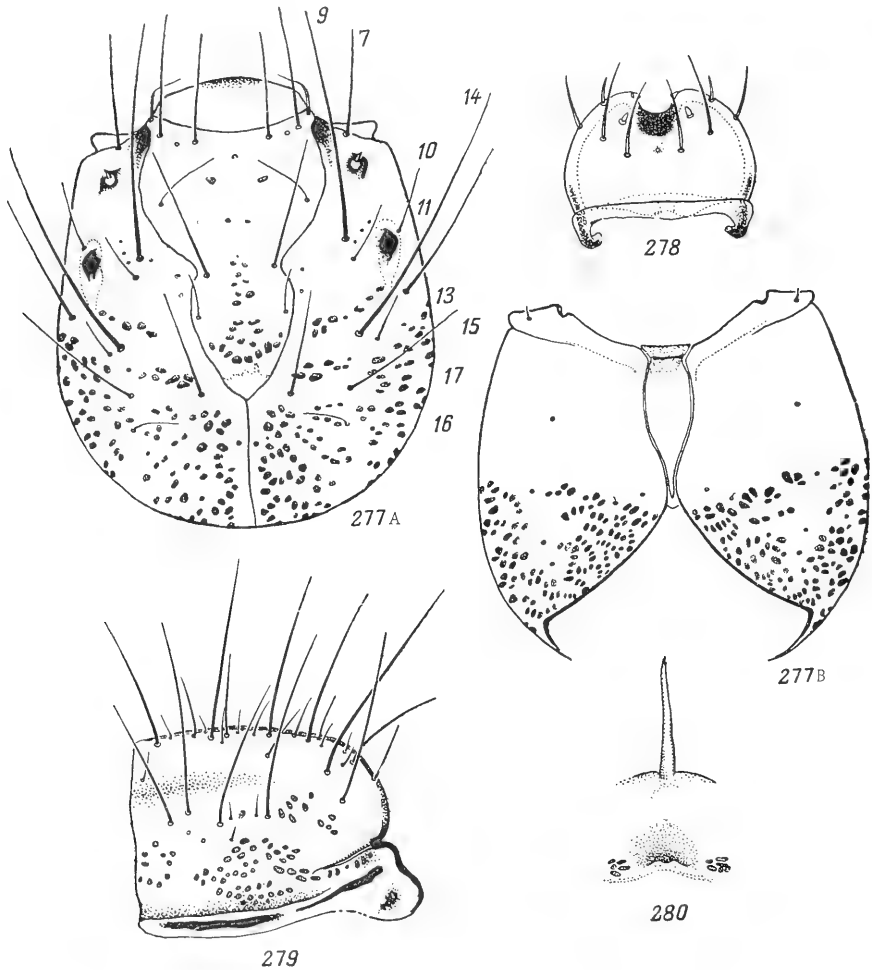
**Full-grown larva.\*** Length 26-32 mm. Head (Figure 277, A) yellowish or light yellowish, dark reddish brown near base of mandibles, blackish brown near antennae. Frontoclypeus with narrow, golden brown stripe near anterior margin; posterior angle and middle of anterior part light brown; anterior part laterally with 3 pale dots; 3 median dots slightly posteriorly; posterior part with large, wedge-shaped, punctate pattern, including curved posterior row of larger and darker dots. Dorsal and lateral stripes absent, these areas divided by a stripe from eye to seta 16, and slightly lighter than other surface; 2 transverse rows of 3-4 dots in area of dorsal stripes; rows and groups of numerous, dense dots lateral to coronal suture and in area of lateral stripes; groups of numerous dots on a lighter background ventrally lateral to occipital foramen. Anterior submarginal stripe slightly lighter than remaining head surface; gula the same, its posterior end prolonged as in *G. atomarius*. Most setae, including the thin setae, black.

Median and intermediate anterior-margin seta large, thick, black, moderately long, the latter slightly larger; lateral anterior-margin seta short, light, curved inward; anterior frontal seta the same, procumbent; posterior frontal seta short, light; seta 7 black, moderately long, like anterior median seta; setae 9 and 14 thick, long; seta 14 larger than 9; setae 11 and 13 situated posterior to 9 and 14, black, short, thin; seta 10 situated near eye, thin, brown; seta 12 strong, situated behind eye; seta 17 situated at angle near frontal sutures, thick, moderately long; seta 15 slightly shorter, thin, blackish brown; seta 16 light, short, curved. Ventral side: seta 8 small, brown; seta 18 very small, light (Figure 277, B).

\* Described from material from Bel'skoe village in Kalinin Region, 10 June 1950, a swampy puddle; depth 0.2-0.6 m, with sedge and moss; larvae, pupae, and adults, collected by S. Lepneva and A. Chistyakova.

Dorsal sclerite of labrum (Figure 278) light brown; posterior margin pinkish brown in middle; lateral margin broadly brown, blackish brown posteriorly; posterior-angle sclerites black laterally and posteriorly; median anterior depression deep, dark; seta 1 in form of small, blunt, light spine; anterior-margin seta 2 and seta 4 forming small, blunt, light spines; seta 3 spine-shaped, short, transparent, yellowish; setae 5 and 6 thick, dark brown, situated close together lateral to median pit.

(163)



FIGURES 277-280. *Grammotaulius signatipennis* McL.:

277 - head, dorsal (A) and ventral (B); 278 - labrum; 279 - pronotum; 280 - prothoracic horn and sternite.

Mandibles black; teeth small, blunt, situated near apex; right mandible with 5 teeth, ventral tooth larger than others; left mandible with 4 teeth, 2nd tooth from ventral margin larger than the others; median brushes forming small tufts of 9-11 short, yellowish chaetae near dorsal margin.

Sclerites of maxillolabium slightly darker than in *G. atomarius*. Cardo with black median and lateral stripes and a dark narrow stripe at posterior margin; lateral seta dark brown, second seta black. Submentum brown; setae on sclerotized dots large, blackish brown. Stipes brown, darker basally; median seta short, lateral seta moderately long, both dark brown. Palpifer reddish brown, black basally; apical seta dark, large, reaching end of segment 3 of palp; basal seta small, light. Galea short, lobe-shaped. Mentum black laterally and basally, reddish brown in middle of anterior margin. Ventral sclerites oblong, narrower apically; seta light. Palpiger horseshoe-shaped, reddish brown. Sclerites of palp yellow; sensillae light.

Pronotum (Figure 279) lighter than head, light smoke brown; anterior margin with narrow, golden brown stripe; anterior angle rounded. Posterior margin with narrow black stripe; posterior-angle process with 3 large, fused, pinkish brown dots, with black lateral margin. Groove in anterior third of sclerite slightly dark in middle. Dots small, pinkish brown, forming a large, X-shaped pattern, a wedge-shaped pattern at anterior corner, and groups laterally in posterior part. Anterior-margin area with 7 large, black, thick, moderately long, submarginal setae and 7–8 thin, short and moderately long, black setae between them; small, light, sparse setae situated at anterior margin. Anterior third of sclerite with a long, thick, black anterior-angle seta, a shorter, thin, black, secondary seta posterior to it; one median and one lateral primary surface long, black, but shorter and thinner than anterior-angle seta; intermediate seta much smaller; a thick, moderately long, black seta near median suture before X-shaped pattern; a large, secondary seta situated behind intermediate seta; a few, small, secondary setae in anterior third and middle of sclerite.

163 Mesonotum light brown, grayish brown, or uniformly pale near median suture, in each half, lighter than pronotum; anterior margin narrow and golden brown or barely visible in the middle, broader laterally, with a golden brown stripe; posterior margin narrowly black or brownish black; posterior angle wider, reddish black; posterior-angle area with a reddish brown, oblique stripe; dots small, pinkish brown, narrow in middle, forming a median group of 7–8 dots; dense groups of dots in middle, a wedge-shaped, punctate pattern at anterior angle, and a row of dots near posterior margin. Setae black, except smallest setae; primary anterior-margin seta moderately long, situated some distance from margin, thick, strong, near a small secondary seta; anterior-angle group including a long, thick, black, primary seta; 2–3 moderately long, black secondary setae, and 7–9 small, brownish secondary setae; primary surface setae situated in posterior part; medioanal seta long, black, thick; intermediate situated slightly posteriorly and laterally, short, thin, black, lateral seta thinner and smaller; secondary setae: 2–3 small, near primary setae, a large seta near suture and 4–5 very small setae in different parts of sclerite.

164 Tergites of metathorax pale, anterior and posterior sclerites light brown, lateral sclerites, whitish yellow, with a narrow, oblique, reddish brown, transverse stripe, with 2–3 dots anteriorly, 6–7 posteriorly. Chaetotaxy of anterior pair of sclerites: primary anterior-margin seta moderately long, black; 2 of secondary setae almost the same, other 7–8 setae thin, more or less long, or small, brown. Chaetotaxy of posterior pair of sclerites: primary, median seta moderately long, thick; intermediate seta almost the same, dark; lateral seta thin, moderately long, or short; 3–4 secondary

setae thin, small. Chaetotaxy of lateral sclerites: setae of anterior-angle group situated before stripe; primary, anterior-angle seta long, thick, black; 2-3 black, very long, slightly thinner secondary setae; 9-10 other setae short to moderately long, thin, some of them very small, brownish.

Propleuron brownish; pleural groove broadly black; episternum and epimeron with narrow, golden brown, distal margin, posterior margin of epimeron narrow, reddish black, seta moderately long, black; trochantin with broad black basal stripe, with a short black seta and 2 light setules apically.

Mesopleuron yellowish brown, pleural groove in form of narrow, reddish brown stripe, a rhomboidal black spot distally; dense, pinkish dots along the stripe; distal margin of episternum and epimeron near groove with a narrow brownish stripe; episternum with small, pinkish brown dots in 3 rows; primary setae of episternum and epimeron situated distally, black, moderately long; episternum with 4 marginal setae, epimeron with a black seta almost as large; surface of episternum with 9-10 small setae, epimeron with 2-3.

Metapleuron similar, with paler dots; outer lateral part of epimeron with 8-10 black setae near apex, some of them as long as primary setae.

Prosternite in form of yellowish, pentagonal plate with brown, posterior middle part, with groups of 4-6 pinkish, dense dots laterally. Horn light, long (Figure 280). Ventral side of mesothorax with lateral rows of sclerotized dots near posterior margin. Metathorax with paler, fewer, often white and indistinct, dots.

Legs light brown, resembling those of *G. atomarius*; ratio of length of legs 62:100:94; with few exceptions, primary, and large secondary setae black.

Fore coxa with a group of large dots posteriorly and basally; anterior basal seta thick, black, accompanied by several small secondary setae; anterior apical dorsal seta short, posterior apical dorsal seta long; 5-7 much smaller, secondary setae dorsally between primary setae; anterior surface with 2 short, thick, light brown primary setae, as in *G. atomarius*, one in basal and one in the apical part; 8-9 short to moderate-sized, thin, secondary setae anteriorly and subventrally between primary setae; 2 thick, moderately long setae ventrally; both apical, ventral, primary setae the same, the posterior longer than the anterior (Figure 281, A).

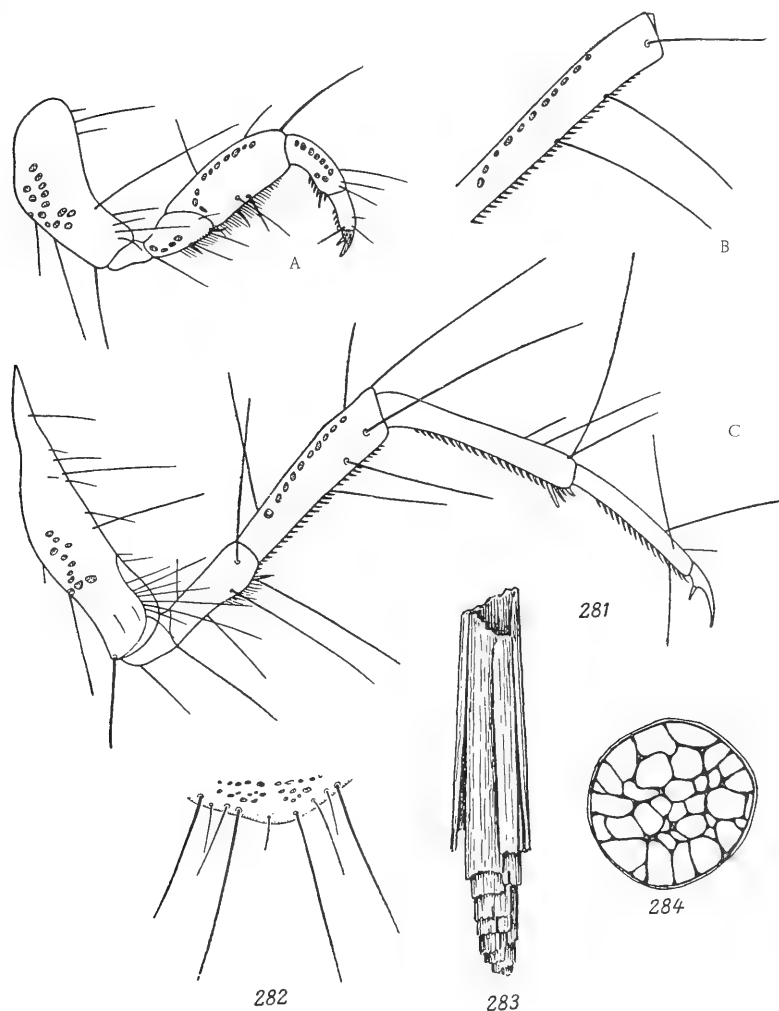
Trochanter with 2-3 large, and several small, dots on posterior surface lateral to suture; anterior seta small, light brown, thick; posterior seta thin, short, black; anterior ventral setae situated apically and subapically in form of short, blunt, yellow spines, the basal near suture, thick, black, moderately long; both posterior ventral setae shorter, of about the same length; an apical row of curved, light chaetoids and microscopic spinules near the setae.

Femur with longitudinal rows of large dots in dorsal part of anterior side and in basal and subdorsal parts of posterior side; basodorsal seta short, thick; apical dorsal seta moderately long, 3-4 small, thin secondary setae basal to the latter seta; anterior seta short, situated subapically, posterior seta moderately long, black, situated subventrally in the middle of femur; primary ventral setae forming 2 large, yellow spines lateral to posterior seta, apical spine larger than basal; small brownish spinules at ventral margin; several light chaetoids basally, as on trochanter.

Tibia dorsally with an anterior and posterior longitudinal row of dots; posterior surface with 3 large dots. Dorsal setae brown, in an apical posterior and a subapical anterior pair; setae of 1st pair situated close together, dorsal seta thin, longer than others; anterior seta of 2nd pair thicker than others, short, curved, golden brown; apical ventral setae forming short, thick spines; small spinules ventrally, the apical larger than the others.

Apical dorsal seta of tarsus blackish brown, moderately long; subapical dorsal seta situated near anterior margin, shorter and lighter; posterior of 2 apical ventral setae darker and longer than anterior. Claw short, thick basally, with thick, blunt spine.

(165)



FIGURES 281-284. *Grammotaulius signatipennis* McL.:

281 - right leg, posterior: foreleg (A), part of mid-femur (B), hind leg (C); 282 - tergite of abdominal segment 9; 283 - larval case; 284 - membrane of pupal case.

165 Mid-coxa oblong, punctate dorsally, also ventrally, subventrally, and in some parts of ventral margin on posterior side; setae, except the smallest, black. All 3 primary dorsal setae long, posterior apical seta larger than the others; secondary dorsal setae near posterior margin, including 2 thick, moderately long setae, others small, sparse; a small, thin, secondary seta situated anteriorly near the apex; posterior side with 2 thin and 2 large, moderately long setae; both primary anterior setae black, thick, larger than on forelegs; apical ventral setae moderately long, posterior slightly larger than anterior; ventral side with a large and 2-3 small, secondary setae.

Trochanter with a longitudinal row of dots posteriorly; anterior seta light brown, small, thick, posterior seta short, thin; anterior apical ventral seta forming a large, yellowish brown, thick spine, middle seta black, moderately long; basal seta and both posterior setae long, black; subapical seta smaller than other 2; ventral side apically with several, large, white chaetoids and a row of small, yellowish spinules.

166 Femur slightly wider distally, with slightly convex dorsal side; posterior side dorsally, and anterior side subdorsally with rows of dots. Primary basodorsal seta short, apical dorsal seta moderately long, both black; anterior seta situated subapically, short, posterior seta situated apically, moderately long; primary ventral setae thick and moderately long, like the posterior seta, basal seta slightly larger; a number of small, light spinules ventrally (Figure 281, B).

Tibia slightly wider apically, with large, apical, submarginal dot dorsally between anterior and posterior pairs of setae, and with posterior dorsal and anterior subdorsal rows of dots along segment. On dorsal side, the subdorsal posterior seta of apical pair black, thick, the posterior dorsal seta brown, thin, also long; anterior subdorsal seta of the apical pair moderately long, thick, blackish brown, anterior dorsal seta short, thin, brownish; both apical ventral setae forming thick brown spines, the anterior slightly curved; small light spinules ventrally, the 2 apical spinules larger than others.

Number of filaments and arrangement of gills of *G. signatipennis*

Segment	Dorsal	Pleural		Ventral
2	3	3		3
	3		3	3
3	3	3		3
	3		3	3
4	3	3		3
	2		2	3 (2)
5	2	2		2
	2		2	2
6	2	2		2
	2		2	2
7	2	1		2
	2		2	2
8	2			2

Tarsus straight, slightly narrower apically, without punctation; apical dorsal seta black, long, one of longest of leg; subapical seta thin, dark, moderately long, smaller than apical dorsal seta of tibia; both ventral setae thin, large, dark, posterior slightly longer than anterior. Claw thin, slightly curved, with thick, pointed, basal spine:

Hind legs differing from the midlegs as follows: 1) primary, dorsal setae of coxa of about the same size, longer than on midlegs 9; 2) secondary setae of coxa more numerous, dorsal setae, including several large setae, as large as primary setae; 3) posterior seta of trochanter large, about as long as posterior distoventral seta, but thinner; 4) posterior seta of femur longer than on the midlegs and almost as long as distodorsal setae; 5) primary ventral setae of femur situated close together in distal part, apical seta almost as long as posterior seta, second ventral seta much shorter; 6) dorsal subapical seta of tarsus moderately long, black, apical seta short, thin, brownish (Figure 281, C).

Dorsal process of abdominal segment 1 conical, pointed, directed posteriorly; lateral processes wide, with flat, slightly sclerotized grayish apex; setae situated on sclerotized dots, as on tergites of the metathorax, black, short, or moderately long; anterior-margin group consisting of 3 setae together with primary seta; group of posterior surface setae including a moderately long, medioanal seta which is thicker than others, and 2-3 small, secondary setae; anterior-angle group with 4-5 than the others, with short, thin, primary seta. Ventral elliptical area with lateral groups of 5-7 thin, short, and small setae situated on small whitish areas.

Lateral line on segments 3-8; hairs short, golden brown; each side with 2-3 or 4-6 small, pinkish, sclerotized dots dorsal to hairs on segments 4-8. Gills on segments 2-8.

Sclerite of segment 9 brownish with 2 rows of small pinkish dots near anterior margin and 2-3 dots posteriorly; setae black; medioanal seta long, thick, anterior-angle seta almost the same, intermediate and lateral seta thin, short, latter smaller than former (Figure 282).

Sclerite "b" of anal legs yellowish brown; distal margin with a narrow, reddish brown stripe laterally and ventrally. Setae black; a long, thick, dorsal seta in medioanal angle; a similar, large seta, and a third one, shorter and thinner than first two, laterally and distally; a thin, moderately long seta at median margin, and 2 small, thin setae slightly submarginally; surface with 2-3 small, thin setae in the punctate area. Sclerite "c" light, whitish brown, with broad, black, lateral margin; seta situated basally, short, black. Claw light, reddish basally, with 3 dorsal denticles and a group of small spinules. Thin, dark seta 2 situated laterally near suture; seta 6 situated nearby; setae 1 and 3 dark brown, seta 1 situated in basal part, short, thicker than the other setae; seta 3 situated apically, thick, longer than others; all 4 ventral setae light, yellowish; setae 8 and 7 thickened basally, straight or slightly curved, small, seta 5 situated laterally, close to seta 8; seta 4 small, medial to 8.

Case as in *G. atomarius*, but shorter (Figure 283), built of long plant fragments, arranged in a spiral and attached only at anterior end; fragments narrower than in *G. atomarius*; spiral usually with 3-4 turns, first turn much larger than following; material of cover usually consisting of sedge

leaves. Case open posteriorly or covered by membrane with convex outer side and with large round hole; membrane covered with smoothly arranged, small fragments of leaves.

**Pupa.** Length 20 mm. Antennae reaching abdominal segment 6, scape longer than other segments; apical margin of pedicel and basal margin of next segment with one common group of 9–10 small, brown setae. Clypeus and labrum brownish; each side of clypeus with 2 thin, short, brown setae, and a small, light seta; anterior margin of labrum with indistinct median process; a narrow, reddish brown sclerotized stripe at ventral margin; seta lateral to process small, yellowish; 5 other setae thick, black, hooked at end, situated on tubercles. Mandibles reddish brown; distal part relatively short, wide, with blunt apex and almost straight median margin; blade with barely visible serration.

Wing sheaths blunt apically, reaching middle or end of abdominal segment 4. Midlegs natatorial, with dense setae on tarsal segments 1–4; tarsal segments 1–3 of hind legs with sparse setae.

Dorsal process of abdominal segment 1 large, narrower toward saddle-shaped apex, blackish brown, rugose, with 4 large transverse, dorsal folds and 4 thin setae on each side; apical lobes blackish, with small, black spinules. Lateral line on segments 5–8; setae dense, grayish black. Gills on segments 2–8. Holding apparatus on segments 4–7; postsegmental plates of segment 5 large; number of denticles: IV: 3–6; V: 5–6 + 31–34; VI: 4–5; VII: 2.

Segments 8–9 dorsally with 4 setae near posterior margin, 3 of them black, large, the 4th (intermediate, near the medioanal seta) small, brown. Anal rods thicker at the end, curved upward and laterally; 1st of the 4 setae small, light, yellowish, situated in middle; other 3 setae blackish brown, thick, situated one behind the other on median side at thick distal end of rod.

Pupal case 35–40 mm long. Sievelike, anterior and posterior membranes with large holes and narrow strands between them as usual in *Grammotaulius* (Figure 284).

Mode of life and habitats. Small, swampy, overgrown water bodies.

**Distribution.** Northern, western and central parts of the European USSR, Western and Eastern Siberia, Kamchatka, Maritime Territory, Shantar Islands. In addition, Finland, Scandinavia.

### 3. *Grammotaulius nitidus* Müller

Struck, 1900:17, Figure 6 c.

**Full-grown larva.\*** Length 22 mm. Head (Figure 285, A) darker than in foregoing described species. Frontoclypeus brown anteriorly, chestnut brown at anterior angle and near tentorial pits; posterior part light brown, narrowly brownish along sutures; anterior part laterally with dense groups

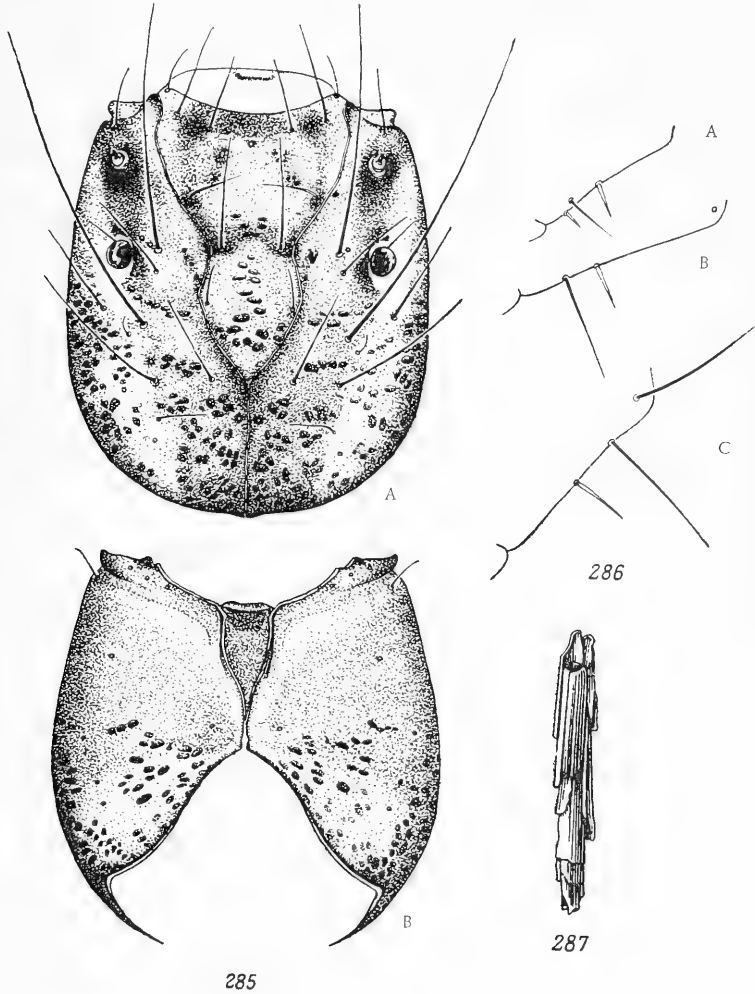
\* Described from a specimen from a spring puddle in Karelia, 23 May 1952, and 2 specimens from the collection of E. M. Kheisin; the larvae are identical with those from cocoons of full-grown pupae (3 specimens) collected on 1 July 1919 in the Caucasus, Lake Madatapa, determined by A. V. Martynov as *G. nitidus*.



of 2-3 or 3-4 small dots behind median pit; a group of similar dots in middle near tentorial pits; posterior part with wedge-shaped pattern of large dots.

168

Dorsal stripes distinct, connected near coronal suture with large dots in transverse rows; lateral stripes also dark, with numerous dots; space between stripes light, whitish near eye. Ventral side of head (Figure 285, B) brownish, light, with large, brown dots near occipital margin. Gula brown, with long, thin, posterior end. Median and intermediate anterior-margin setae black, setae 7, 8, 9, 12, 14, 15, and 17 also black; lateral anterior-margin seta light; anterior frontal seta and setae 13 and 16 also light, pale yellowish, curved inward, almost procumbent; posterior frontal setae and setae 8, 10, and 11 thin, short, brown, 11 larger than others; ventral seta 18 very small, situated in punctate area.



FIGURES 285-287. *Grammotaulius nitidus* Müll.:

285 - head, dorsal (A) and ventral (B); 286 - ventral margin of right femur of fore-leg (A), midleg (B) and hind leg (C), posterior; 287 - larval case (287 - after Struck).

Dorsal sclerite of labrum dark brown; median depression not darker or only slightly darker than other surface; setae 5 and 6 dark brown; seta 3 yellowish, other setae light, as in species just described.

Mandibles black, resembling those of *G. atomarius*, less short than in *G. signatipennis*; right mandible with 4 distal teeth, left mandible with 3; chaetoids of median brushes light yellow, relatively large; lateral setae as in other species of *Grammotaulius*, small, light, dorsal seta slightly larger than ventral.

Maxillolabium as in *G. atomarius*, sclerites and setae slightly darker; base of palpifer and mentum reddish black; setae of submentum reddish brown.

169

Pronotum brown; groove in anterior third slightly dark in middle; anterior margin narrowly reddish black; stripes of posterior and lateral margin of posterior-angle process the same; punctation distinct, chestnut brown. Mesonotum mainly brown, its posterior angles broadly light brown; anterior margin laterally with a narrow, reddish brown stripe; posterior margin with distinct, narrow, reddish black stripe and small, brown, lateral cross stripes; margin black at posterior angle. All large setae black.

Tergites of metathorax pale, indistinct; sides of metanotum with chestnut brown sclerotized dots behind anterior median tergites. Setae black, anterior-angle, and medioanal primary setae longer than the others.

Number and arrangement of gills of *G. nitidus*

Segment	Dorsal	Pleural	Ventral
2	3 3	3 3	3 3
3	3 3	3 3	3 3
4	3 3	3 (2) 3	3 3
5	2 2	2 2	3 3
6	2 2	0 2	3 3
7	2 2	0 2	3 2
8	2 0	0 0	2 0

Propleuron chestnut brown, with black pleural groove; pleurites of meso- and metathorax slightly lighter, pleural suture black apically, reddish brown basally; punctation and chaetotaxy as in *G. atomarius*.

Prosternite distinct, pentagonal, thin, brownish, dark at posterior margin, with dense, lateral groups of chestnut dots posteriorly. Mesothorax ventrally with similar dots laterally on posterior margin.

Legs as in *G. atomarius*; ratio of length of legs 67:100:97. Large setae black.

Primary ventral setae of mid-femur (Figure 286, B) of different length, situated basally, the apical seta in form of a thin, yellow spine, the other a much longer, black seta (they are thick, dark setae of equal length and form in *G. atomarius* and *G. signatipennis*). Primary ventral setae of hind femur also different, one of them a large, thin, yellow spine in middle of segment, the other a long, black, distal seta (these setae are of equal form, long, dark, situated close together in distal part in the foregoing 2 species).

Dorsal process of abdominal segment 1 slightly pointed. Lateral line on segments 3-8.

Sclerite of abdominal segment 9 grayish brown, with reddish brown dots with dark outline laterally and at anterior margin; medioanal setae black, long; anterior-angle setae black, shorter, and thinner; intermediate and lateral seta thin, short, brown, former larger than latter; 2 thin, moderately long, brown setae between medioanal setae. Sclerite "b" of anal legs whitish yellow, with indistinct, grayish punctation, and a narrow, reddish brown stripe at posterior margin ventrally and laterally; median, apical seta long, black; a slightly shorter black seta nearby at apical margin, a thin, black, moderately long seta laterally; a short black seta on ventral side; one thin black seta apically near median margin, a small black seta more basally some distance from the margin; surface with 2-3 short, black setae. Sclerite "c" pale yellow, with fine punctation and broad, black, lateral margin.

Claw pale brownish basally, dark reddish brown apically, with 3 dorsal denticles; seta 1 situated subdorsally, thick, short, reddish brown; dorsal setae 2 (lateral) and 3 (median) thin, brown, relatively long; lateral seta 6 short, thin, situated subdorsally near end of suture; seta 5 smaller, thin, situated subventrally on side of basal part near seta 8; ventral setae 7 and 8 light, short, thick; median seta 4 small, light, situated near 8.

Case as in *G. atomarius*; length to 45 mm (Figure 287).

**Pupa.** Length 20.5-21.0 mm. Antennae of male pupae reaching abdominal segment 8. Anteclypeus and labrum brownish; 2 short setae of anteclypeus brown, thin, lateral seta small, light; median process of labrum indistinct; seta 1 of process small, light; other 5 setae large, thick, blackish brown, hooked at end. Mandibles dark reddish brown; distal part wide basally; median blade straight, serrated; lateral setae brown, moderately long, dorsal seta slightly larger than ventral. Midlegs natatorial, tarsal segments and first segment of hind tarsi with sparse setae.

Dorsal process of abdominal segment 1 large, brown, rugose dorsally, the bifid apex with reddish brown lobes with 16-20 small, thick, black spinules. Holding apparatus on segments 4-7 with the following number of hooks: IV:3-2; V:3-4+18-20; VI:3-5; VII:2-3.

Anal rods 1.2 mm long, slightly wider apically, with large, reddish brown setae; 1st seta situated near end of basal third, 2nd seta close to end of middle third, 3rd and 4th setae situated subapically and apically.

Case, as in *G. atomarius*, with large-meshed, sievelike membranes.

Mode of life and habitats. Small, overgrown water bodies, especially swampy spring puddles.

Distribution. Northwestern, western, central, and southern parts of the European USSR, Caucasus, Western Siberia, Middle Asia. In addition, Europe, Iran.

#### 4. *Grammotaulius sibiricus* McLachlan

Siltala, 1908b: 11-14.

**Full-grown larva.** Length 29 mm. Head (Figure 288) wide, grayish or reddish brown. Punctuation in anterior part of frontoclypeus and wedge-shaped pattern of posterior part distinct; posterior angle light. Dorsal stripes indistinct, slightly dark, with 2 transverse rows of dots; distinct, dots with dark outline lateral to coronal suture, on site of lateral stripes and ventrally.

Number and arrangement of gills of *G. sibiricus*

Segment	Dorsal	Pleural		Ventral
2	3 3	3	3	3 3
3	3 3	3	2-3	3 3
4	3 2 (3)	2	2	3 (2) 2
5	2 2	2 (1)	1-2	2 2
6	2 2	1 (0)	1-2	2 2
7	2 2		1	2 2
8	2 -			2 (1)

Number and arrangement of gills of pupa of *G. sibiricus*

Segment	Dorsal	Pleural		Ventral
2	3 3	3	3	3 3
3	3 3	3-2	3	3 3
4	3 3	2	2	3 3
5	3 3	2	1	3 3
6	3 3-2	1	1	3 3
7	2			3
8	2			

Transverse groove of pronotum (Figure 289) slightly dark in middle; anterior third slightly darker than other surface.

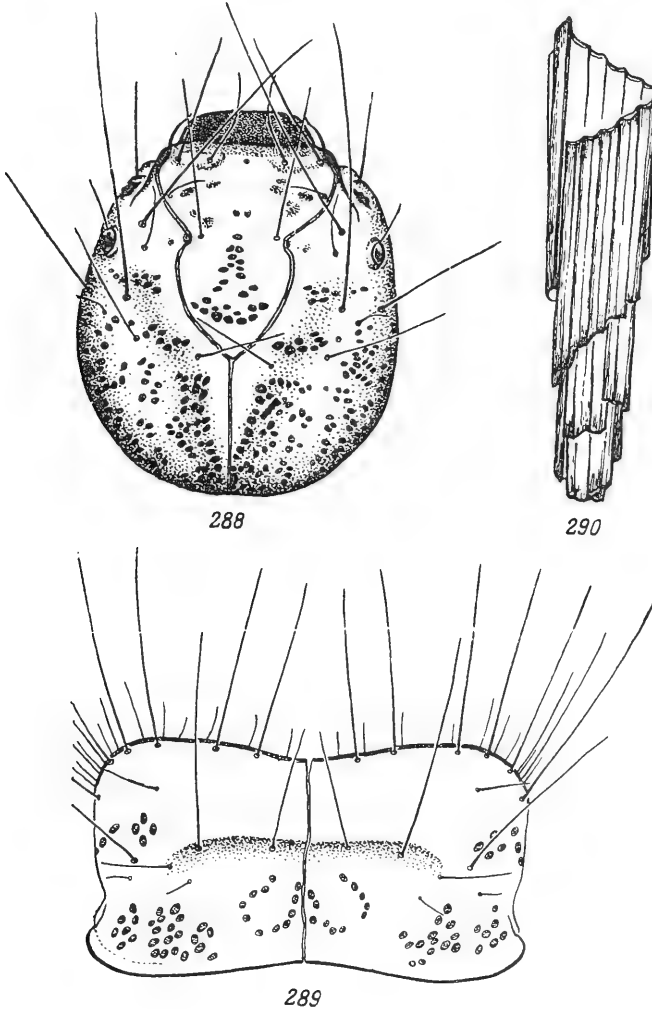
Legs brownish, with indistinct punctation. Gills on segments 2-8.

Tergite of segment 9 with thick, moderately long, medioanal and anterior-angle seta; intermediate and lateral seta thin; a moderately long seta between the medioanal setae.

Claw of anal legs with 2 or 3 dorsal denticles.

Case to 50 mm long (Figure 290), made of long plant particles, usually sedge leaves, arranged longitudinally in 3-4 turns of a spiral; posterior end open; case not as long as in *G. atomarius*.

171



FIGURES 288-290. *Grammotaulius sibiricus* McL.:

288 - head, dorsal; 289 - pronotum; 290 - larval case.

**Pupa.** Length about 17–18 mm. Antennae reaching abdominal segment 8. Mandibles with broad distal part; median blade almost straight.

Wing sheaths reaching end of abdominal segment 6. Midlegs natatorial, hind tarsi with sparse setae.

Holding apparatus on segments 3–7; number of spinules: III:4–5; IV:4; V:5+13; VI:4–6; VII:4–5.

Anal rods 1.1 mm long, first 2 setae situated in basal quarter, other 2 apically and subapically.

Pupal case shorter than larval case, 30 mm long; anterior and posterior ends covered with interwoven stalks of moss above the sievelike membrane.

Mode of life and habitats. Small, swampy water bodies with rich vegetation.

Distribution. Northern, northwestern, and central parts of the European USSR; Western and Eastern Siberia, Altai, the Yakutsk area. In addition, Finland, Japan.

#### 4. Genus *Limnophilus* Leach

**Full-grown larva.** Length 10.5–28.0 mm. Head wide, short, about as long as wide in most species; coloration either light with a distinct pattern of stripes and dots, or dark, with indistinct bands, or whole head dark, with light spots and dots; dots distinct only in posterior part of frontoclypeus. Mandibles short, black; teeth at distal margin blunt, small.

Pronotum with distinct X-shaped, median, punctate pattern; anterior third of sclerite light as on other surface, or more or less dark; groove in anterior third sometimes with a dark stripe in middle. Forelegs much shorter than the mid- and hind legs; secondary setae few, present only on coxae and femora.

Gills on segments 2–7 or 2–8, with 3 filaments on anterior segments, 1 or 2 filaments on middle and posterior segments. Tergite of segment 9 with few, small, secondary setae; 1–2 setae usually between medioanal setae. Anal legs short, thick; sclerite "b" with large, dark, mediodistal angle seta, and a few thin, small, secondary setae. Claw small, with 1–3 dorsal denticles; setae as usual in subfamily.

Case made of plant or mineral particles, or of different material: small or large fragments of plants or detritus, arranged regularly (*L. stigma*) or irregularly, case often very bulky (*L. rhombicus*); cases made of mineral particles usually have smooth walls with small to medium-sized sand grains, shells of mollusks or Ostracoda, some of them slightly flattened dorsoventrally, flattened ventrally, slightly curved.

**Pupa.** Length 9–22 mm. Antennae reaching abdominal segments 7–8. Labrum and anteclypeus divided by a deep groove; labrum with 5 large, hooked setae of about the same length. Distal part of mandible wide basally; median blade serrated, with slightly concave apex. Wing sheaths reaching abdominal segments 4–5. Midlegs natatorial, with dense rows of setae on the tarsal segments 1–4; hind tarsi with sparse setae.

Dorsal process of abdominal segment 1 large, saddle-shaped, with a deep, median depression between lateral lobes, which bear large, black spinules. Lateral line on segments 5–8, with dense, dark setae. Gills on segments 2–7 or 2–8; gills of anterior segments with 3 filaments, as

in the larva. Holding apparatus segments 3-6 or 3-7; postsegmental plates with a few hooks. Anal rods slightly narrower distally, ends curved laterally.

Mode of life and habitats. Detritophagous and phytophagous, some species feed on animals if plants are not available. Stagnant water; some species in running water.

Distribution. Throughout the USSR. In addition, Europe, Iran, Pakistan, Mongolia, China, Japan, North America.

Key to Species

Full-grown larva

- 1 (16). Coloration of head and pronotum distinct, consisting of stripes and dots; frontoclypeus more or less broadly dark in anterior part, other surface with wide, dark, longitudinal stripe forming a T-shaped figure together with anterior stripe; anterior third of pronotum dark; case made of fine or coarse detritus, fragments of plants, mollusk shells; sand grains sometimes present among other material.
- 2 (9). Dark transverse stripe in anterior part of frontoclypeus, wide, almost reaching or reaching frontal sutures; indentation shallow, brownish or yellowish, sometimes with indistinct outline, in middle of anterior margin.
- 173 3 (8). Ventral surface of head, including gula, grayish brown; groove in anterior part of pronotum with or without dark stripe in middle; case bulky, with rough surface, made of large pieces of detritus, arranged obliquely and transversely, or more or less smooth, with fine pieces of detritus, small fragments of stalks, or mollusk shells.
- 4 (7). Anterior third of pronotum blackish brown; groove without dark stripe in middle.
- 5 (6). Gills usually present on segment 8 . . . . . 2. *L. politus* McL. (p. 227)
- 6 (5). Segment 8 usually without gills . . . . . 4. *L. marmoratus* Curt. (p. 233)
- 7 (4). Anterior third of pronotum brown; groove with dark stripe in middle . . . . . 5. *L. flavicornis* Fabr. (p. 236)
- 8 (3). Ventral surface slightly dark in some places; gula usually light; groove in anterior third with dark stripe in middle; case made of plant particles, arranged regularly and transversely so that middle of case is usually wider than ends, and case is barrel-shaped; case sometimes made of fragments of moss, wide, almost spherical. . . . . 6. *L. stigma* Curt. (p. 240)
- 9 (2). Dark transverse stripe in anterior part of frontoclypeus less wide, not reaching frontal sutures; light median indentation near anterior margin of stripe sometimes deep, dividing dark area into 2 parts.
- 10 (13). Groove in anterior third of pronotum without dark stripe in middle; case made of coarse particles of tree detritus, sometimes bulky, or of small pieces of detritus, rarely with sand grains among detritus.

- 11 (12). Stripes and spots reddish brown; lighter median indentation in dark area of anterior part of frontoclypeus deep; gula light; prosternite in form of a thin, yellowish brown sclerite with dark sclerotized dots laterally. . . . . 1. **L. rhombicus** L. (p. 218)
- 12 (11). Stripes and spots darker, blackish brown in some places; median indentation in dark area of anterior part of frontoclypeus shallow or indistinct; gula dark; prosternite forming an entire sclerite, yellowish in middle, brown laterally, with black, confluent sclerotized dots; Siberia. . . . . 3. **L. abstrusus** McL. (p. 231)
- 13 (10). Groove in anterior third of pronotum with dark stripe in middle; case usually covered symmetrically with plant particles or detritus, often trihedral.
- 14 (15). Abdominal segment 2 without presegmental lateral gills . . . . . 7. **L. nigriceps** Zett. (p. 234)
- 15 (14). Abdominal segment 2 with presegmental lateral gills . . . . . 8. **L. decipiens** Kol. (p. 248)
- 16 (1). Head light, with distinct dark, or more or less dark, punctation, with indistinct punctation, or uniformly dark, sometimes with only a small, light area in angle of frontoclypeus; anterior third of pronotum light or slightly dark, groove in anterior third, usually with dark stripe in middle; case of varying structure, made of plant or mineral particles.
- 17 (20). Head and pronotum mostly light, with large distinct dots.
- 18 (19). Median stripe of frontoclypeus and dorsal stripes pale, barely visible, or absent; case made of large, longitudinally arranged plant fragments . . . . . 9. **L. borealis** Zett. (p. 251)
- 19 (18). Frontoclypeus mainly light; posterior part with distinct punctation; anterior part with dark spots near tentorial pits; dorsal stripes pale, short (beginning from eye), darker anteriorly than posteriorly; case smooth, made of sand grains and detritus particles . . . . . 10. **L. bipunctatus** Curt. (p. 255)
- 20 (17). Head more or less dark, brown, or darker; punctation sometimes indistinct.
- 21 (32). Head moderately dark.
- 22 (27). Case made of plant fragments.
- 23 (26). Head brown or reddish brown; groove in anterior third of pronotum with dark stripe in middle; case made of plant fragments, straight, narrower posteriorly.
- 24 (25). Larva large, 17–18 mm long; ventral surface with pale, sometimes indistinct groups of dots near occipital foramen; case 20–34 mm long, built of overlapping, large plant fragments. . . . . 17. **L. elegans** Curt. (p. 278)
- 174 25 (24). Larvae small, 11–13 mm long; ventral surface with distinct, dark groups of dots near occipital foramen; case 14–17 mm long, smooth, made of small and large plant fragments. . . . . 21. **L. sericeus** Say. (p. 285)
- 26 (23). Head and pronotum brownish; groove in anterior third of pronotum without dark stripe in middle; case smooth, conical, slightly curved, made of small, transversely arranged plant particles . . . . . 19. **L. sparsus** Curt. (p. 281)



- 27 (22). Case different.
- 28 (31). Case made of sand grains and plant particles.
- 29 (30). Head and thoracic sclerites brown; frontoclypeus dark brown, posterior angle, spots near tentorial pits and median spot yellowish; dorsal stripes distinct, with lighter space between them and lateral part of head; pronotum yellowish brown, groove in anterior third dark in middle; case slightly curved, narrower and rounded posteriorly, made mainly of sand grains with small, smooth fragments of detritus . . . . . 14. *L. affinis* Curt. (p. 267)
- 30 (29). Head and thoracic sclerites darker; head chestnut brown, with small, sometimes indistinct, light spot in angle of frontoclypeus, with black punctation in posterior part and lateral to coronal suture; transverse groove in anterior third of pronotum broadly black in middle; case slightly curved, narrower posteriorly, with smooth surface, made mainly of plant particles and sand grains, the latter predominating before pupation . . . . . 23. *L. griseus* L. (p. 287)
- 31 (28). Case made of sand grains. Head of uniform color, chestnut brown, with distinct black punctation in posterior part; frontoclypeus with light posterior angle; pronotum yellowish brown, groove dark in middle; case made of fine sand grains, often with a thin layer of silt above sand grains, which forms a smooth, polished surface . . . . . 13. *L. extricatus* McL. (p. 263)
- 32 (21). Dorsal side of head uniformly dark or color different.
- 33 (40). Head dark or dark with a small, light spot in angle of frontoclypeus; groove in anterior third of pronotum with or without dark middle part.
- 34 (37). Primary ventral setae of mid- and hind femora forming a yellow spine and a thick, black seta; case made of small sand grains or of sand grains and detritus, smooth, slightly curved.
- 35 (36). Dorsal side of head entirely dark, without light spot; ventral surface also mainly dark, gula slightly dark; groove in anterior third of pronotum with distinct, dark, transverse stripe in middle; case smooth, narrow, markedly narrower posteriorly, made of sand grains, sometimes with small pieces of detritus, its anterior end with small dorsal indentation . . . . 16. *L. vittatus* Fabr. (p. 274)
- 36 (35). Angle of frontoclypeus with small light spot; ventral side of head dark in some places, gula light; groove in anterior third of pronotum slightly dark in middle; case made of sand grains, less smooth, less narrow posteriorly, with smooth anterior end . . . . . 15. *L. centralis* Curt. (p. 270)
- 37 (34). Both primary ventral setae of mid- and hind femora thick, short, black; case made of plant particles, sometimes with a few fine sand grains.
- 38 (39). Larva small, 10–12 mm long; light spot in angle of frontoclypeus very small or absent; pronotum and mesonotum lighter than head; posterior surface seta of fore femur situated subventrally between 2 primary ventral setae; case straight, smooth, made of small, irregular plant particles, sometimes with a few sand grains . . . . . 20. *L. auricula* Curt. (p. 283)

- 39 (38). Larva larger, to 16 mm; pronotum, mesonotum, and head dark brown; posterior surface seta of fore femur situated basal to primary ventral setae; case straight, smooth, slightly narrower posteriorly, made of large, brown, leaf fragments of varying size . . . . . 22. *L. ignavus* McL. (p. 286)
- 40 (33). Head colored differently; groove in anterior third of pronotum, dark in middle.
- 41 (44). Pattern on frontoclypeus consisting of large, distinct dots, divided from dorsal stripes by a more or less distinct, light space; dorsal stripes present; pronotum light, with distinct, dark punctation, and a dark stripe in anterior third.
- 175 42 (43). Head mainly yellowish brown, pattern more or less distinct; dark pattern on frontoclypeus wider anteriorly, resembling pattern of species of the *rhombicus* group, posterior angle with small light spot; dorsal stripes distinct, with distinct dark punctation; anterior third of pronotum slightly dark, without punctation; abdominal segment 2 without lateral, presegmental gills; ventral presegmental gills and dorsal presegmental gills of segment 2 sometimes also of segments 3-4, with 2 filaments; case straight, rough, made of dark, longitudinally or obliquely arranged plant particles of different size; sand grains, or mica platelets present at anterior end of older cases; case before pupation built of sand grains and dark fragments of detritus . . . . . 11. *L. lunatus* Curt. (p. 258)
- 43 (42). Larva darker; frontoclypeus almost entirely dark; dorsal stripes less distinct, head with coarse punctation; anterior third of pronotum with coarse punctation; abdominal segment 2 with lateral presegmental gills; ventral and dorsal presegmental gills of abdominal segments 2-3 with 3 filaments; case made of sand grains, slightly curved, slightly narrower posteriorly . . . . . 12. *L. fuscicornis* Ramb. (p. 261)
- 44 (41). Frontoclypeus entirely dark, with indistinct punctation; dorsal stripes on dark background, invisible or indistinct; pronotum dark, groove of anterior third with dark stripe.
- 45 (46). Punctuation of frontoclypeus and dorsal stripes indistinct; claws narrow, long; case straight, made of small, thin, irregular leaf fragments . . . . . 24. *L. incisus* Curt. (p. 290)
- 46 (45). Frontoclypeus dark, without punctation; dorsal stripes with indistinct punctation; claws short, thick; case straight, made of different, longitudinally arranged plant particles . . . . . 18. *L. xanthodes* McL. (p. 280)

1. *Limnophilus rhombicus* Linné

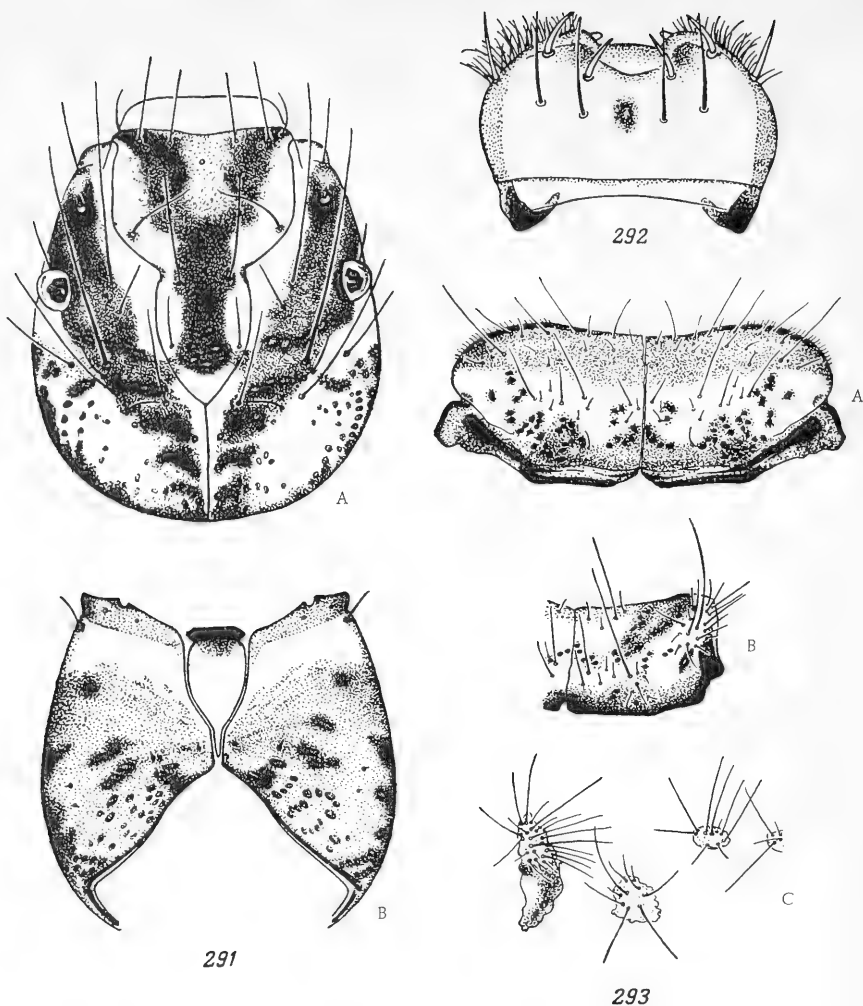
Rösel von Rosenhof, 1746:71-74, Plate XV, Figure 1, Plate XVI, Figure 3. - Pictet, 1834:149-151, Plate IX, Figure 1, a-d. - Kolenati, 1848:26. - Hagen, 1864:243. - Meyer, 1864:161. - Walser, 1864:54-58. - Lampert, 1900:202, Figure 74. - Struck, 1900:20, Figure 33 a-d. - Ulmer, 1901:223-226, Figure 1. - Siltala, 1902:43-48, Plate IB, 8 a-e, Plate IIA, 8 f-t. - Struck, 1903:74, Plate I, 15. - Ulmer, 1903:59, Figure F; 1903b:197. - Siltala, 1907:495-496, 507-510. - Ulmer, 1909:257-259, Figure 387b. - Lestage, 1921:729-731, 744, 748, Figure 255 e, m, t. - Lepneva, 1940:212-215, Figures 159, 160. - Ross, 1944:185-186, Figure 648. - Hickin, 1948:54-56, Figures 1-10. - Flint, 1960:49, Figure 24.

**Full-grown larva.** Length 18–24 mm. Main color of head (Figure 291) shining, light brown, stripes dark brown, blackish brown in some places; eyes on whitish background; antennae closer to anterior margin than to eye, sensilla dark. Pattern on frontoclypeus in form of uniformly wide median stripe and 2 diverging broad stripes in anterior part divided by a deep, lighter median indentation; in light specimens, posterior ends of indentation reach light bars at base of branches; in dark specimens, the bars are barely visible or absent; punctation distinct posteriorly even in dark specimens but less distinct anteriorly. Dorsal stripes (Figure 291, A) extending from anterior to posterior margin of head, darker in middle; transverse rows of dots on slightly dark or almost light background lateral to coronal suture. Lateral stripes consisting of several longitudinal rows of dense, distinct dots on a grayish brown background which extends also to ventral side; large groups of dark dots on dark background near occipital foramen. Gula (Figure 291, B) light. Large setae dark brown, small setae brown, some setae light. Intermediate of 3 anterior-margin setae slightly longer than median, lateral light, large; anterior frontal seta the same; middle frontal seta moderately long; posterior seta small; seta 9 thick, long; seta 14 larger and thicker; seta 7 short, thick; seta 10 situated anteriorly, lateral to the eye, light; seta 11 situated behind 9, small, thin; seta 12 moderately long; seta 13 small, thin, situated near 14; seta 15 thin, moderately long; seta 16 situated behind 15, short, adpressed; seta 17 situated near fork of frontal sutures, longer and thicker than 12. Ventral seta 8 small, strong; seta 18 small.

176 Labrum (Figure 292), with smoothly rounded anterior angles and a deep median indentation. Dorsal sclerite shining brown; median indentation with dark spot; posterior-angle sclerites blackish brown at curvature. Seta 1 situated near anterior margin of median indentation, forming a small, blunt, transparent spine; seta 4 situated near posterior margin of indentation, short, spine-shaped, blunt, thick; seta 2 light, situated near anterior margin; seta 3 situated laterally, short, light; setae 5 and 6 situated on surface lateral to median indentation, thin, larger than others.

Mandibles black; brush of left mandible consisting of 2 tufts, brush of right mandible of a single larger tuft; left mandible with 4 large teeth and a small, dorsal denticle apically; right mandible with 4 teeth of different size near apex, 2 dorsal teeth blunt, short; 2nd tooth from ventral margin larger than the others on both mandibles; lateral setae short, dorsal seta light brown, slightly larger than light, thin, ventral seta.

Pregula reddish brown; sclerites of cardo transverse with broad, reddish brown median margin, their lateral half dark reddish brown, other half lighter, shining brown; lateral seta light, small, 2nd seta small, brown. Triangular process on lateral sclerites of submentum reddish brown, distinct; median sclerites in form of 2 small rounded reddish brown plates; setae dark brown, moderately long. Stipes reddish brown; lateral seta grayish brown, moderately long, median seta darker, thicker. Palpifer large, moderately long, blackish brown laterally; apical seta dark brown, longer than palpifer; basal, median seta small, light; palp relatively large, segment 3 longer than others; galea half as long as palp, with large apical sensillae. Mentum dark reddish brown; ventral sclerites rod-shaped, seta short, light. Palpiger horseshoe-shaped, relatively wide; palp slightly longer than median lobe, with mat brown sclerite.



FIGURES 291-293. *Limnophilus rhombicus* L.:

291 - head, dorsal (A) and ventral (B); 292 - labrum; 293 - pronotum (A), mesonotum (B) and tergites of metanotum (C).

Pronotum (Figure 293, A) with uniformly wide anterior, anterior-angle, and lateral margin; median and lateral areas brown, other surface blackish brown; posterior margin reddish brown, with 2 wide, black stripes, one median, the other lateral; lateral process with narrow, black, lateral margin; a large, reddish brown dot near posterior margin of process. Anterior third of sclerite uniformly brown, without a dark stripe in middle of groove, reddish brown posteriorly; middle yellowish; dots coarse, reddish brown, with dark outline, forming an X-shaped figure in the middle, a large group on a dark background near posterior margin, and 4-5 dots laterally on a light background.

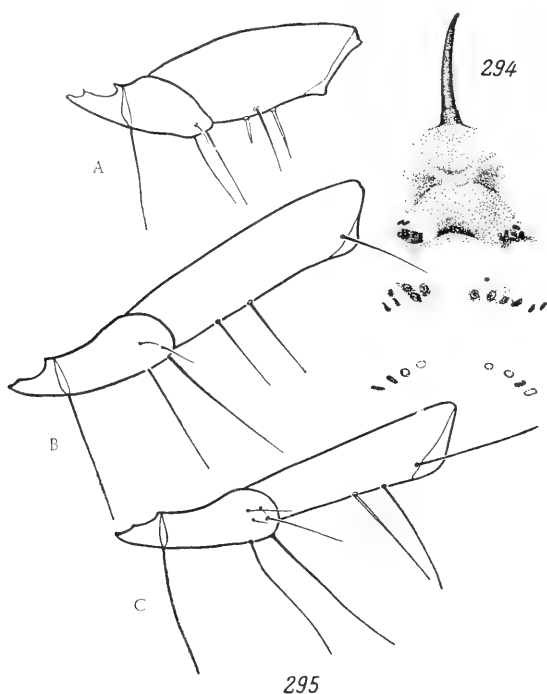
Thick setae brown or blackish brown; 5 anterior-margin setae thick, moderately long, situated immediately behind black margin; anteriorly, at margin and anterior part of lateral area a number of small, thin, light setae, including 3-4 larger brownish setae; a thin, moderately long seta laterally. Primary anterior-angle seta situated on dark background, some distance from margin, moderately long, blackish brown; medioanal seta large, similar, situated on light background; lateral surface seta moderately long; intermediate seta short, both reddish brown; secondary setae few, short to small.

Mesonotum (Figure 293, B) smaller, covering the segment incompletely; narrow, blackish brown stripe near anterior margin; lateral margin posteriorly with wide, reddish brown stripe; posterior margin the same and small space with 2 large dark dots laterally; surface light in anterior angle and laterally near dark posterior angle; middle of sclerite brown, with a transverse row of dots, and 2 oblique rows of darker dots laterally; stripe near posterior margin darker than other surface, reddish brown; middle of sclerite yellowish brown between dots and stripe. Of the primary setae, primary anterior-margin, anterior-angle, and medioanal surface setae blackish brown, long, thick; intermediate seta short, lateral seta moderately long, both thin, situated near medioanal seta. Secondary setae: 3-4 dark, short, reddish brown, and one small, light seta near anterior-margin seta; 3-4 similar setae near posterior surface ones; anterior half of sclerite laterally with 18-20 dark, secondary setae which are short to moderately long, and a small, light seta, all situated near large, primary, anterior-angle seta, which is situated more posteriorly; area of median suture with a short seta in anterior part and a moderately long seta in posterior part.

177 Tergites of metanotum (Figure 293, C) grayish brown, anterior sclerites elliptical, posterior pair rounded, lateral sclerites oblong, bracket-shaped, lighter anteriorly than posteriorly, with reddish brown striation, a brown spot, and 2 large dots in middle. Large setae of sclerites thick, black or blackish brown, including primary and secondary setae of different size, and several small yellowish secondary setae; anterior sclerites with 6-7 large and 5-6 small setae; posterior sclerites with 3-4 large setae including primary medioanal seta, 3-4 short, thin, and 6-7 small setae; lateral sclerites anteriorly with 2-3 long, thick setae including primary anterior-angle seta, and 20-22 smaller setae of different size, including 3-4 short, light setae.

178 Propleuron with broad, black, pleural groove; episternum and epimeron reddish brown, epimeron with black lateral spot, with dark brown margin, seta short, brown, situated near suture; trochantin black, with subapical yellow spot, seta thin, brown, moderately long. Mesopleuron reddish brown, pleural groove black; basal half with a row of dense, brown dots along groove; 2 large dots on surface; epimeron narrower, with 2-3 indistinct dots; setae black or dark brown; episternum apically and subapically with a thick, long seta, and 10-11 thin setae of different size, including 4-5 small setae; epimeron distally with 2 thick, moderately long setae, a primary and a secondary, 4 short and 6 small, thin setae on surface. Metapleuron longer and lighter, yellowish brown; pleural stripe reddish black, adjacent dots of basal area, light brown; episternum with 3 large dots, subapically, a thick, long, primary seta, and 8-9 secondary setae

apically and surface with 5–6 short to moderately long, thin setae; epimeron apically with 2 long, thick setae, a primary and a secondary, surface with 6 setae, including 3 small, thin setae, 10–11 short to moderately long setae posteriorly and at anterior margin of ventral process.



FIGURES 294 and 295. *Limnophilus rhombicus* L.:

294 – horn and sternites of thorax; 295 – right trochanter and femur of foreleg (A), midleg (B), and hind leg (C), posterior.

Prosternite (Figure 294) thin, yellowish, with a dark brownish stripe at the base and groups of 5–6 large, dense, lateral dots. Horn relatively small, narrow, light basally, mainly yellowish brown. Mesothorax ventrally with lateral rows of 5–6 large, dark, sclerotized dots near posterior margin; metathorax with similar, but light or slightly grayish, dots ventrally.

Legs brown, dark brown in some places, with large, distinct, dark dots; ratio of length of legs 62:100:95; large setae black or dark reddish brown.

Fore coxa massive, slightly shorter than femur; punctation present ventrally, subventrally, and basally. Anterior basodorsal primary seta thick, moderately long; apical dorsal seta short, thin; secondary dorsal setae situated at margin, basally, on anterior surface, 9–11 small, thin setae together; posterior apical dorsal seta long, black, situated near end of indentation; 2 moderately long and 2 small, thin setae further distally; primary, anterior setae yellowish, short, thick, situated in apical and basal

parts; posterior surface with 2 short, thin, dark, secondary setae; distoventral setae moderately long, posterior larger than anterior; middle of coxa with 3-4 thick, moderately long, and 12-14 smaller, secondary setae ventrally and subventrally.

Anterior seta of trochanter short, yellowish; posterior seta small, dark, thin; the basal of the 3 anterior ventral setae moderately long, brown, situated near suture, apical and subapical setae forming short, thick, yellow spines; posterior, apical ventral seta moderately long, subapical seta slightly shorter; distoventral area with light, large chaetoids and fine spinules (Figure 295, A).

179 Femur with large anterior and posterior dots on dorsal side, posteriorly with 3-4 similar dots at base. Basodorsal seta short, apical dorsal seta moderately long; several small secondary setae between primary setae at margin on distal half; anterior seta small, thick, blackish brown, posterior seta also dark, moderately long, situated subventrally in basal part between primary ventral setae (closer to basal seta); primary ventral setae forming 2 thick, yellow spines, the apical larger than the basal seta; a number of small, dense, light spinules ventrally at margin; several long, curved, light chaetoids among spinules near the base.

Tibia shorter and thinner than femur, with dark punctation subdorsally on anterior and posterior side; dorsal setae arranged in 2 pairs, apical and subapical, one seta of each pair moderately long, thin, the other smaller; apical ventral setae forming short, thick spines, anterior spine dark brown, posterior yellow; a row of small spinules ventrally. Tarsus straight, half as long as the tibia; apical dorsal seta moderately long, thin, yellowish; subapical seta small, light; anterior and posterior subventral setae short, thin; small spinules on ventral side.

Claw blunt, straight, at base thick, slightly curved apically; basal seta in form of straight, light spine.

Midlegs longer than the other legs; coxa slightly longer than femur; ventral, subventral, and posterior basal areas with coarse punctation. Basodorsal seta moderately long, thick; 7 small, secondary setae in basal part near anterior margin; also 3 moderately long, and 3-4 small setae near posterior margin; anterior distodorsal seta moderately long; 2 secondary setae distally; posterior distodorsal seta long; 3-4 thin, moderately long, and 3-4 small, secondary setae at margin in apical part, a secondary seta at the base; both primary anterior setae short, thick, dark brown, situated distally; middle of posterior surface with 2 smaller, thin, short, secondary setae, and several small setae; posterior distoventral seta moderately long, anterior seta slightly larger; ventral side with a long, a short, and 3-4 small, secondary setae.

Trochanter with coarse punctation ventrally and on posterior side; anterior seta light, short, thick; posterior seta short, thick, dark; a small secondary seta of similar form and color further basally; a small, spine-shaped, thin, brown, secondary seta together with 2 setules dorsally; anterior side ventrally with a long, dark, basal, primary seta near suture; anterior distoventral seta in form of large, yellow spine; middle seta short, brownish; posterior apical ventral seta thick, large, longer than basal seta; subapical seta slightly shorter; light distoventral chaetoids and small spinules less numerous than on forelegs (Figure 295, B).

Femur rod-shaped, wider and slightly curved distally, with rows of large dots subdorsally anteriorly and posteriorly; several dots posteriorly near the base. Apical dorsal seta black, moderately long; basodorsal seta short, brown, 2 small, brown secondary setae between primary setae; anterior seta short, thick, dark reddish brown, situated subapically; posterior seta situated apically near ventral margin, dark, longer; primary ventral setae situated basally, large, thick, spine-shaped, one seta longer and brown, the other situated more basally, dark brown; small, dense, light spinules at margin.

Tibia rodlike, slightly curved and wider distally, punctate subdorsally at anterior and posterior margins; 3 large dots subapically on posterior side; anterior seta of subapical pair brownish, longer and thicker than adjacent light, thin seta; apical pair formed by a more posterior, brown, moderately long seta and a smaller, more anterior, light yellowish seta; ventral setae forming blunt, thick spines, a brown anterior and a yellow posterior spine; a row of light spinules at margin.

Tarsus straight, almost uniformly wide, about half as long as tibia, with indistinct punctation at dorsal margin; apical dorsal seta thin, long, dark brown, longer than the apical dorsal seta of tibia; subapical seta short, light; the posterior of 2 subventral setae dark, longer than light anterior seta; a number of small spinules ventrally.

Claw thick at base, slightly curved distally, often blunt, seta in form of a short, thick spine.

Hind legs (Figure 295, C):

1. Coxa with much more numerous secondary dorsal setae, especially on posterior side, than midlegs; some of these setae large, black, as large as primary setae.

2. Posterior seta of trochanter moderately long, black, longer and thicker than on midlegs, accompanied by larger secondary setae.

3. Femur straight, markedly wider apically; posterior seta and both ventral setae moderately long, larger than on midlegs, ventral setae situated in middle of segment, distal seta dark brown or blackish, the other slightly shorter, brown.

4. Distodorsal seta of tibia longer than dorsal setae of tarsi; subapical seta much larger than short, thin apical seta; anterior subventral seta of tarsus short, light, thin, posterior seta moderately long, brown, almost twice as large.

Abdominal segment 1 shorter and darker than following segments. Dorsal process wide, conical, pointed; lateral processes lower, blunt, domelike; median swelling of ventral surface posteriorly with a dark, sclerotized area. Setae black, smallest seta brownish.

180

A moderately long, anterior-margin seta and 4-5 short and small secondary setae lateral to dorsal process. Surface setae of posterior part consisting of 3 primary setae, including the large medioanal seta, and 6-7 smaller secondary setae; anterior-angle seta short, situated dorsally with 5-6 smaller secondary setae near lateral process; 2 short, lateral setae and a small secondary seta ventrally near process; a group of 18-20 small setae lateral to median ventral swelling in anterior part, and 11-12 such setae in posterior part on a dark membranous area.

Lateral line from beginning of segment 3 to end of segment 8, with small, thin, golden brown, hairlike spinules.



Tergite of segment 9 (Figure 296) mainly yellowish, reddish brown near anterior margin, with indistinct, dark punctation; setae black or blackish brown; medioanal seta and anterior-angle seta thick, long, former larger than latter; lateral seta short, intermediate seta moderately long, both thin; a thin, moderately long seta between medioanal setae; 13-14 short and small, superficial secondary setae.

Number and arrangement of gills of *L. rhombicus*

Segment	Dorsal	Lateral		Ventral
2	3	3		3
	3		3	3
3	3	3		3
	3-2		2-3	3
4	2-3	2		3-2
	2		2-1	3-2
5	2-3	1(0)		2-3
	2		1-2	2-3
6	2	1(0)		2
	2-1		1(0)	2-1
7	2	1(0)		2-1
	1(0)			2-1
8	1(0)			1(0)

Sclerite "b" of anal legs light brown, dark brown laterally, with several, large, dark dots, a narrow, reddish, distal stripe laterally and ventrally; setae black; median and neighboring seta situated near distal margin, both thick, long; lateral seta moderately long, thinner; a moderately long and a smaller seta at median margin, both thin; 4-5 short, thick setae near basal margin; 6-7 small setae on surface; ventral seta situated distally, short, thick.

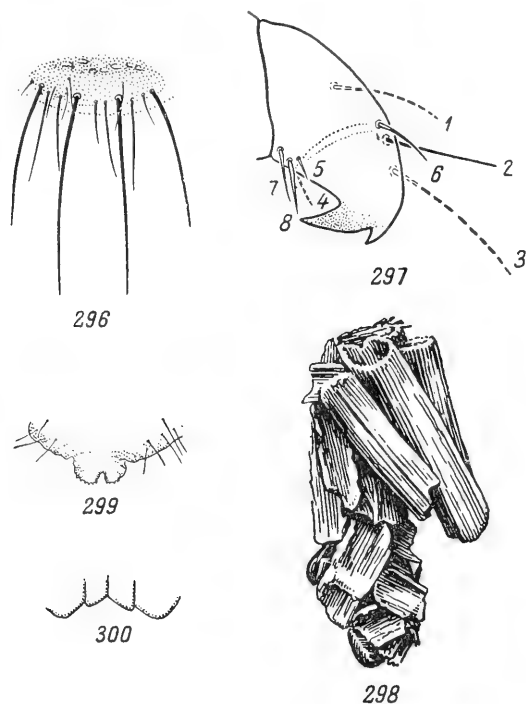
Sclerite "c" yellowish, with broad, black lateral margin; basal seta situated near the margin, small, reddish brown.

Claw (Figure 297) yellowish brown, blackish at curvature, with a large, dorsal denticle, dark reddish brown apically; dorsal setae dark brown; seta 1 short, thick, slightly curved, situated basally; seta 2 thin, moderately long, situated near dorsal margin; seta 3 also large, situated in middle of distal part; seta 6 situated laterally near suture, short, thin; ventral setae 7 and 8 short, light; lateral seta 5 small; median seta 4 slightly larger, both light and situated laterally near seta 8.

Larval case (Figure 298) made of detritus fragments, transversely or obliquely arranged; if fragments are small, the case is relatively smooth, slightly curved, narrower posteriorly, anterior opening obliquely truncate, posterior opening covered by a membrane with a large, round hole; the edge of some fragments projects above smooth surface. If fragments are numerous, case has a characteristic appearance: particles are attached only in the middle and project laterally; case of full-grown larvae may

have a thick cover of tree or reed particles about 2 cm large; its walls often contain mollusk shells, sometimes sand grains, in addition to detritus; anterior part is sometimes made of sand grains and posterior part of detritus; whole case rarely made of sand grains before pupation.

(181)



FIGURES 296-300. *Limnophilus rhombicus* L.:

296 - tergite of abdominal segment 9; 297 - claw of left anal leg, lateral; 298 - case; 299 - dorsal process of abdominal segment 1 of pupa; 300 - sheath of penis and genital appendages of male pupa (299, 300 - after Siltala).

**Pupa.** Length 17-20 mm. Antennae reaching abdominal segment 8 or end of body. Anteclypeus and labrum divided by a deep groove; anteclypeus with 3 setae, a small, light lateral seta, an intermediate, and a median seta, both thick, black, former larger than latter. Labrum brownish, with rounded anterior process; seta 1 small, light, situated lateral to process, other 5 setae projecting upward, large, golden brown, hooked at end, of about equal length, situated laterally on elevation near anterior margin.

Mandibles dark brown, pointed, with slightly convex, serrated blade; setae short, situated basally; dorsal seta black, much larger than brownish ventral seta.

181

Wing sheaths reaching middle or end of abdominal segment 5. Midlegs natatorial; tarsal segments 1-4 with yellowish brown setae, shorter and sparser than usual; segments 1-4 of hind tarsi with sparse setae.

Abdominal segment 1 with large dorsal process with rugose surface; saddle-shaped median indentation at posterior margin shallow, lobes with small black denticles (Figure 299) laterally.

Lateral line from end of segments 5-8, with dense, thin, brownish setae. Holding apparatus with reddish brown plates; denticles black, numbers as follows: III:4; IV:2; V: 3+16-17; VI:3-4; VII:3-4.

Segment 9 strongly convex laterally, with 4 setae above each rod, 3 setae large, thick, black, one (near median seta) small, light; ventral surface with 4 short, thick, black setae. Anal rods long, narrower posteriorly, thick at end, curved laterally; one of 4 small setae situated basally, thick, black, 2nd seta in about middle, light; other 2 setae large, black, situated subapically behind each other; dark, but slightly smaller and thinner, seta near basal seta. Sheath of male genitalia consisting of 4 lobes, lateral lobes larger, the smaller lobes form the penis sheath (Figure 300).

Pupal case more or less smooth, covered with interwoven plants and with a thick, coarse membrane at ends; only 2-3 holes in membrane at posterior end, divided by narrow bars.

Mode of life and habitats. Detritophagous, phytophilous, in small, sunlit water bodies, including ponds and lakes, marshy areas, in vegetation of lakes and slow rivers, and in calm, detritus-rich biotopes on open shore; common in ditches, small calm brooks, and near river banks.

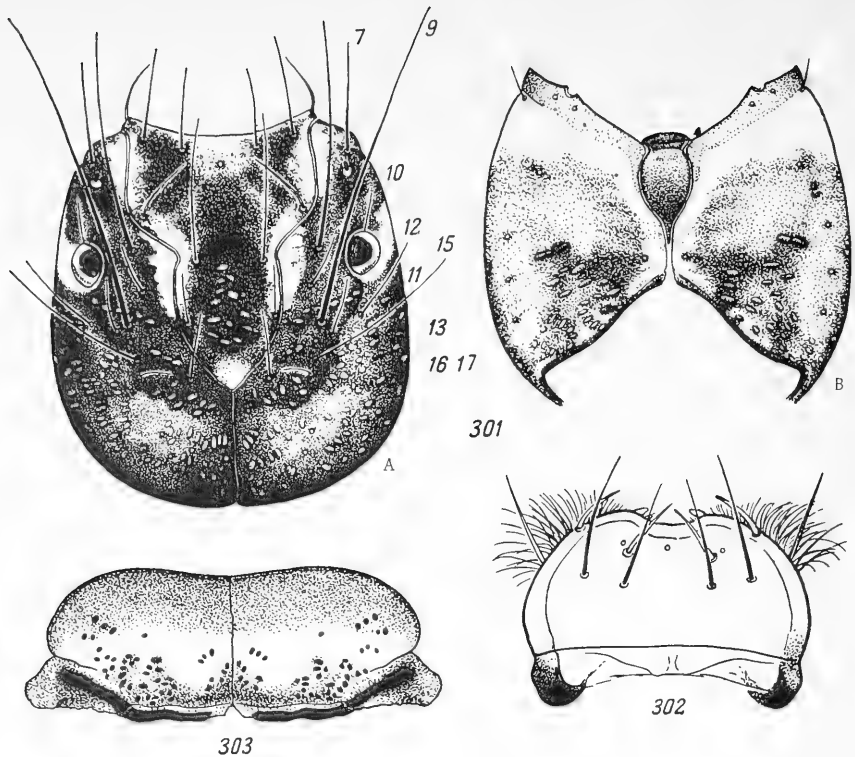
Distribution. European USSR, Western and Eastern Siberia, Altai, Sаяns, Middle Asia. In addition, Europe, North America.

## 2. *Limnophilus politus* McLachlan

Meyer, 1867:164-165. — Struck, 1900, Plate IV, Figure 31. — Ulmer, 1903:58. — Siltala, 1903a:12-15, Figure 4, a-k; 1904c:49; 1907:498, 507-510. — Ulmer, 1909:259, Figure 389. — Lestage, 1921:729-732, 742, 748. — Lepneva, 1940:212, 215, Figure 159 h. — Hanna, 1956b:139-144.

**Full-grown larva.** Length 19-21 mm. Head pattern (Figure 301, A) darker than in *L. rhombicus*; dark T-shaped figure on frontoclypeus wide anteriorly, reaching frontal sutures laterally, with lighter brownish yellow median area near anterior margin; this indentation is relatively deep in light specimens and area near anterior frontal seta is less dark, so that the darker part, which resembles head pattern of *L. rhombicus*, stands out clearly against the lighter brownish background in these specimens; posterior part of sclerite with large dots forming a wedge-shaped figure, and several small dots on dark, uniformly wide stripe. Dorsal stripes dark, extending from anterior to posterior margin, narrower posteriorly near coronal suture; distinct black dots on stripes, and also lateral to them in posterior part; lateral stripes also distinct, with rows of dark dots; a broad, dark space between stripes behind eyes. Ventral surface of head mainly brownish laterally, with groups of large dark dots, and with a light stripe near anterior margin and along gular suture. Gula dark in its greater part or entirely (Figure 301, B).

Setae (Figure 301) as in *L. rhombicus*. Labrum slightly darker (Figure 302) than in *L. rhombicus*. Mandibles as in *L. rhombicus*.



FIGURES 301-303. *Limnophilus politus* McL.,

301 - head, dorsal (A) and ventral (B); 302 - labrum; 303 - pronotum.

Anterior and lateral margin of pronotum (Figure 303), narrow, dark brown; posterior margin with wide black stripe with space in middle; process at posterior angle chestnut brown, with 3 light dots posteriorly; surface dark in anterior third, without dark area in middle of groove; this area chestnut brown, middle yellowish, posterior part dark near margin; punctuation as in Figure 303.

Mesonotum reddish brown; anterior margin with short, dark brown stripe near angles; lateral margin, with wide, reddish black margin which is fused with posterior margin except in anterior third; process at posterior angle with a yellowish brown indentation with 3-4 dark dots posteriorly; primary anterior-angle, anterior-margin, and medioanal setae, long, larger than in *L. rhombicus*.

Tergites of metathorax chestnut brown, distinct; primary, anterior-margin seta long, 9-10 secondary setae of different size; posterior median sclerites with long, primary, medioanal seta and with 11-12 other setae; lateral sclerites with transverse band of reddish brown streaks and punctuation laterally, posterior part also with several dots; anterior part with 20-21 setae, including a long, primary, anterior-angle seta.

Propleuron reddish brown, with blackish brown pleural groove; epimeron with narrow dark stripe on median side, seta of epimeron situated on surface near suture, short, thick, blackish, a thin, light, secondary seta nearby; trochantin broadly blackish brown basally, its seta short, thin.

Mesopleuron reddish brown, short, forming an almost equilateral triangle; pleural groove with narrow, dark, small stripe; dots in basal part of stripe indistinct, dark, 3-4 dots on episternum; a long, black, primary seta and 3-4 much smaller, thin secondary setae near distal margin; 3 setae on surface, in addition to minute setae; epimeron with a long, primary seta near distal margin, and 3-4 secondary setae on surface.

Number and arrangement of gills of *L. politus*

Segment	Dorsal	Pleural		Ventral
2	3	3		3
	3		3	3
3	3	3		3
	3		3	3
4	3	2		3
	3		2	3
5	3-2	1(0)		3-2
	2		1	3-2
6	3-2	1(0)		3-2
	2		1(0)	
7	2			2
	2-1			2-1
8	1(0)			1(0)

Metapleuron oblong, chestnut brown, with distinct punctation at base of pleural groove; 8-9 setae at distal margin of episternum, including a long, blackish, primary seta; surface with 2-3 setae and 4-5 light dots; 2 long setae, a primary and a secondary, near distal margin of epimeron; 9-10 thin, dark setae, most of them moderately long, further along distal margin of posterior process.

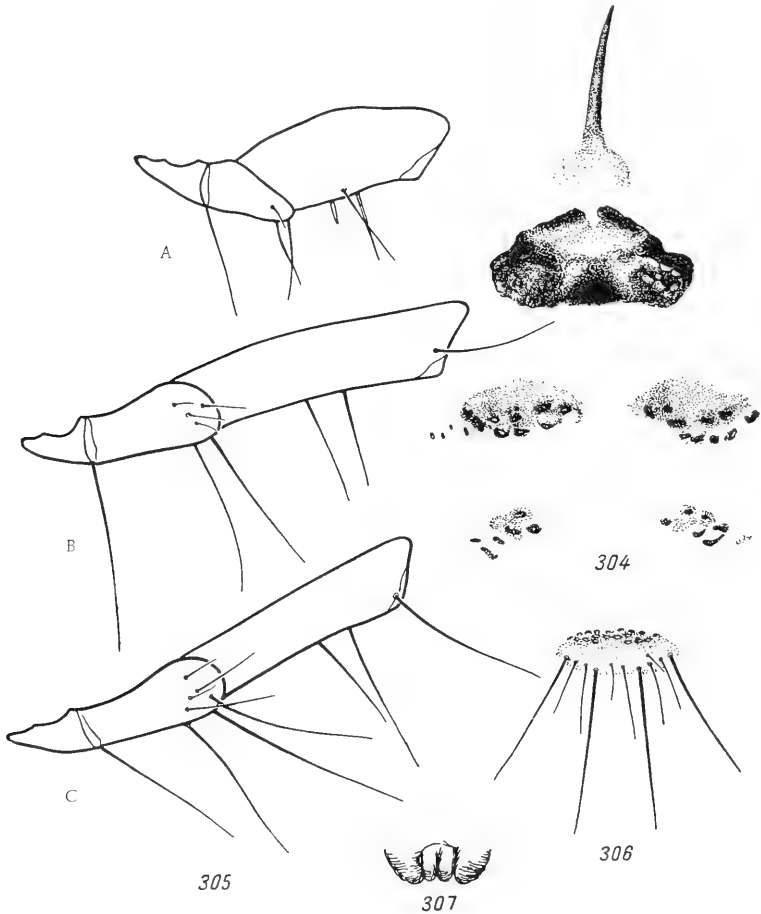
Prosternite (Figure 304) large, strongly sclerotized, its middle light brownish, posterior and lateral parts black or dark reddish brown, with several dark dots on a light background; brown lines laterally near anterior margin. Horn narrow, yellowish, light at base. Mesosternites (Figure 304) in form of 2 transverse, brown sclerites with 2 rows of large, reddish dark brown dots at posterior margin; light sclerotized dots lateral to sclerites. Metasternites with 8-9 dots situated on pale brownish, partly fused sclerites; median dots larger, reddish; lateral dots smaller, grayish.

Primary ventral setae of fore femur, as in *L. rhombicus*, in form of light thick spines, apical setae situated in about middle of femur and larger than basal setae; posterior, subventral seta short, black, not situated in middle between spines as in *L. rhombicus*, but closer to

distal seta and distinctly longer than this. Mid- and hind trochanter with 4 secondary setae near posterior primary seta, one of the 4 setae small, blunt, thick, brown (Figure 305).

Sclerite of segment 9 (Figure 306) light brown, with indistinct punctation near anterior margin; medioanal seta black, thick, long; anterior-angle seta slightly shorter and thinner; intermediate seta moderately long, thin; lateral seta short, light brown, thin; seta between medioanal setae situated asymmetrically to the right, longer and thinner than intermediate seta; 1-3 small, secondary setae on surface in middle near primary setae.

(184) .



FIGURES 304-307. *Limnophilus politus* McL.:

304 - thoracic horn and sternites; 305 - right trochanter and femur of foreleg (A), midleg (B) and hind leg (C), posterior; 306 - tergite of abdominal segment 9; 307 - sheath of genital appendages and penis of male pupa (307 - after Siltala).

Sclerite "b" of anal legs pinkish brown, with a group of light brownish dots laterally; median distal seta black, an almost equally large seta nearby at distal margin; a smaller and thinner, moderately long seta laterally;

a moderately long and a short seta at median margin, both thick, black; 2-3 moderately long, thin, and 5-6 smaller setae on surface; ventral seta thick, moderately long, black, or dark brown. Sclerite "c" yellowish brown, with broad, black, lateral margin; basal seta short, thick, reddish brown.

184 Claw mainly light brown, dark reddish brown apically, with a large, thick, dorsal denticle, 4 minute, light spinules near base of denticle. Dorsal setae brown; seta 1 situated subdorsally on median side of basal part, short, thick; seta 2 moderately brown, thin, situated near lateral margin; seta 3 situated on median side in distal part, longer, thin; seta 6 situated laterally in distal part near end of suture, much smaller than 1; ventral setae 7 and 8 straight, short, light; seta 5 small, situated laterally near 8; seta 4 situated near suture, brownish, small, thin.

Larval case, resembling that of *L. rhombicus*, made of small plant fragments arranged transversely or obliquely, usually with longer pieces which project laterally, sometimes with massive fragments of trees, or small shells, or fragments of large shells; anterior opening obliquely truncate; posterior end covered with a membrane with a large hole.

185 **Pupa.** Length 18-21 mm. Antennae reaching end of body. Labrum brownish, near setae lighter, with rounded sides anteriorly, as in *L. rhombicus*; seta 1 small, light, other setae brownish golden. Mandibles blackish brown, resembling those of *L. rhombicus* in form and chaetotaxy; lateral dorsal seta much larger than ventral. Wing sheaths reaching abdominal segment 5. Midlegs natatorial, with dense, relatively long setae on tarsal segments 1-4; segments 1-4 of hind tarsus sparsely setose.

Dorsal process of abdominal segment 1 dark brown, rugose; small distal lobes with small spinules lateral to median depression. Holding apparatus on segments 4-7; a small plate sometimes present also on segment 3; hooks relatively large, their numbers as follows: IV:2; V:2+10-16; VI:2; VII:2; number of hooks varies within range of  $\pm 1-3$ . Lateral line from end of segments 5 to 8; setae dense, dark brown. Gills on segments 2-8.

Anal rods with a small, black, basal seta, a larger light seta in middle, and 2 black, thick, relatively large setae subapically, one behind the other. Sheath of male genitalia as in *L. rhombicus* with large lateral lobes and deeply incised apex of penis sheath (Figure 307).

Case as in larva; anterior sievelike membrane with 30-34 holes, posterior membrane with 27-30 holes.

Mode of life and habitats. Usually in littoral vegetation of lakes, rarely on open shore, on a bottom of sand, sand with stones, silt or sand with detritus; species occurs mainly in vegetation, close to shore, especially among sedge; isolated specimens are found in upper sublittoral to a depth of 3-5 m; *L. politus* occurs also rarely in large clear ponds.

Distribution. European USSR, Western Siberia, Altai, Yakutia. In addition, Northern and Central Europe.

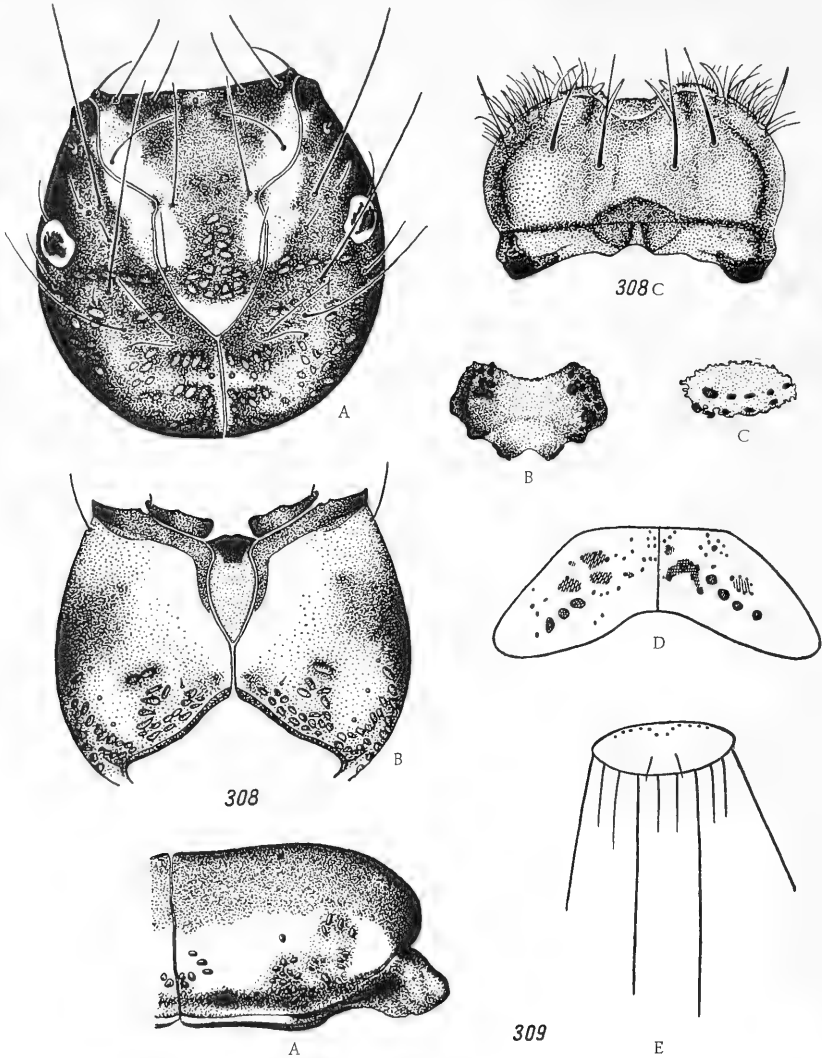
### 3. *Limnophilus abstrusus* McLachlan

Lepneva, 1949:170, Figures 21-22.

**Full-grown larva.** Length 16-19 mm. Main color of head (Figure 308, A) smoke brown; pattern dark, chestnut brown, blackish in some places; punctation

coarse, slightly lighter; dark pattern of frontoclypeus as in *L. rhombicus*, but without a light median indentation; dorsal stripes wide, dark, distinct; sides dark with rows of large dots; ventral surface light near gula and anterior margin, occipital margin also lighter than other surface, with large groups of large dots (Figure 308, B). Labrum as in Figure 308, C.

(186)



FIGURES 308 and 309. *Limnophilus abstrusus* McL.:

308 — head, dorsal (A) and ventral (B), labrum (C); 309 — pronotum (A), prosternite (B), left mesosternite (C), sternite of abdominal segment 1 (D), tergite of abdominal segment 9 (E).

Pronotum (Figure 309, A) broadly dark, chestnut brown in anterior third. Mesonotum lighter, with groups of large dark dots in each half. Metanotum with brown sclerites.



Prosternite in form of irregularly pentagonal plate (Figure 309, B); anterior part whitish in middle; lateral and posterior parts with large, brownish black dots; horn long, relatively thin. Mesosternites on each side in form of a thin, brownish plate, with 2 transverse rows of large dark sclerotized dots behind each plate (Figure 309, C). Metasternite formed by 2 lateral plates with 5-6 brown dots.

Primary ventral setae of fore femur forming 2 large, thick, light spines, posterior primary seta slightly longer, thin, dark; light, dense spinules between spines at ventral margin; basal part with thin, hairlike chaetoids between spinules, chaetoids as on trochanter but sparser. Both primary ventral setae of mid-femur dark, moderately long, very thin, situated in middle of segment. Primary ventral setae of hind femur also large and dark but slightly shorter, the basal situated in middle of femur, the 2nd more distally; spinules at ventral margin of mid- and hind legs slightly sparser and smaller than on the forelegs.

Abdominal segment 1 ventrally with thin, yellowish sternite of characteristic form, with dark punctation (Figure 309, D).

Gills on segments 2-7.

Tergite of abdominal segment 9 (Figure 309, E) light brown, slightly dark near anterior margin; medioanal seta and anterior-angle seta long, dark brown; intermediate and lateral setae thin, short, or moderately long; one or two secondary setae large, dark, situated between medioanal setae, other secondary setae short or small, situated on surface or near margin.

Sclerite "b" of anal legs blackish brown; setae as in *L. rhombicus*. Claw dark brown, blackish apically; dorsal denticle reddish.

Case straight, relatively wide, made of detritus, mainly small, transversely arranged particles, often with mollusk shells among the detritus.

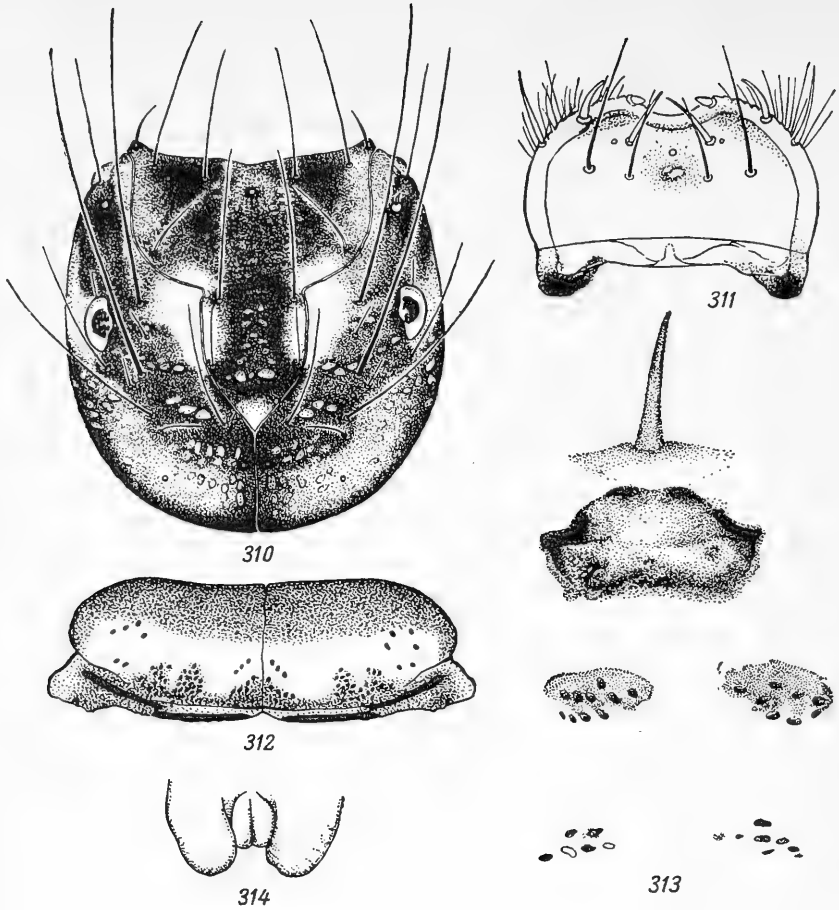
Mode of life and habitats. Near shore of lakes, including large lakes (Lake Teletskoe).

Distribution. USSR: Siberia, Altai, Kamchatka. In addition, Mongolia.

#### 186 4. *Limnophilus marmoratus* Curtis

Struck, 1899: Figure 16, a-c; 1900:16, 19-20, Figure 30a. - Ostwald, 1901:110-111. - Siltala, 1904c:40-45, Figure 9. - Ulmer, 1909:259. - Lestage, 1921:732-733, 748. - Hanna, 1956c:194-198.

187 **Full-grown larva.** Length 18-20 mm. Resembling *L. politus*, but darker and smaller. Pattern on frontoclypeus (Figure 310) wide, dark, black or blackish brown, reaching frontal sutures anteriorly, lighter near anterior margin; median indentation of pattern absent or indistinct, barely visible on dark background; longitudinal stripe wider posteriorly; punctation indistinct in dark specimens; posterior angle of sclerite and area near tentorial pit lighter; dorsal stripes wide, extending from anterior margin to coronal suture, joining at fork; narrow, dark stripes further along suture; punctation lateral to suture more distinct than on dark stripes. Lateral stripes wide, with numerous dots; space between stripes dark. Ventral surface uniformly dark, brownish, except a light stripe at anterior margin; posterior part with light and dark dots laterally. Gula dark. Setae as in Figure 310.



FIGURES 310-314. *Limnophilus marmoratus* Curt.:

310 - head, dorsal; 311 - labrum; 312 - pronotum; 313 - thoracic horn and sternites; 314 - sheath of penis and genital appendages of male pupa (314 - after Siltala).

Labrum (Figure 311) with 2-3 light dots on a dark, median spot.

Pronotum (Figure 312), as in *L. politus*, dark over more than anterior third; groove in anterior third without dark stripe in middle; a dark area at posterior margin; punctation as in *L. politus*; posterior margin with 2 dark stripes, fused in middle. Mesonotum uniformly dark brown, with black punctation, and coarse, reddish black streaks at posterior angle. Tergites of metathorax dark brown, distinct.

Prosternite (Figure 313) strongly sclerotized, large, reddish brown, blackish near lateral margin, with large dots at posterior angles. Horn brownish at end, narrow. Mesosternites in form of 2 transverse, brown plates with large dots. Metasternites represented by pale or brownish dots at sides of a brownish, membranous part.

188

Primary ventral setae of fore femur forming 2 light yellowish spines, the basal small, blunt, the apical situated in middle of femur, longer, sharp; posterior seta situated subventrally between spines as in *L. rhombicus*.

Gills on segments 2-7; segment 8 usually without gills, in contrast to *L. politus*.

Tergite of abdominal segment 9 pale, with large dots near anterior margin; medioanal setae long, black, or blackish brown; anterior-angle setae slightly shorter; seta between medioanal setae dark, moderately long, displaced slightly to the right; intermediate seta and lateral seta thin, brown, former slightly longer than latter; 3-4 short brown setae on surface in middle.

Number and arrangement of gills of *L. marmoratus*

Segment	Dorsal	Pleural		Ventral
2	3	3-2	3	3
	3			3
3	3	3	3-2	3
	3			3
4	3	2	2-1	3
	3-2			3
5	3-2	1-0	1(0)	3-2
	2			3-2
6	2	0	1(0)	3-2
	2			3-2
7	2			2
	1(0)			1(0)

Sclerite "b" of anal legs brown, with 3 black setae near distal margin, medioanal seta larger than others; 2 dark setae of different length at median margin; surface with 8-10 short to moderately long setae; ventral seta thin, moderately long. Sclerite "c" with wide, black, lateral margin; seta short, thin. Claw brown, dark reddish brown apically, with a large dorsal denticle; setae as in *L. politus*. Case 20-28 mm long, made of large fragments of detritus.

**Pupa.** Length 16-20 mm. Antennae reaching segments 7-8. Labrum and mandibles as in *L. rhombicus*.

Wing sheaths reaching abdominal segment 5. Midlegs natatorial, with setae on tarsal segments 1-4; hind tarsi with sparse setae on segment 1, sometimes on segments 1-4.

Gills on segments 2-7 or 2-8. Holding apparatus on segments 4-7; segment 3 sometimes with small plates; number of hooks: IV:2-3; V:2-3+7-9; VI:2-3; VII:2-3.

Anal rods 1.1-1.4 mm long; 1st of the 4 setae situated basally, the 2nd basal to middle, the 3rd and 4th subapically. Sheath of male genitalia forming 2 pairs of lobes of different size, lateral lobes longer and wider than small median lobes of penis sheath (Figure 314).

Ends of case covered with plant fragments, small pieces of stalks, rarely sand grains; anterior and posterior membrane with numerous holes.

Mode of life and habitats. Detritophagous, limnophilous, in littoral vegetation of lakes, ponds, swampy waters, and near coast of freshened parts of the Gulf of Finland. Full-grown larvae and pupae occur in late spring and early summer.

Distribution. European USSR (western, northwestern, and central regions). In addition, Europe.

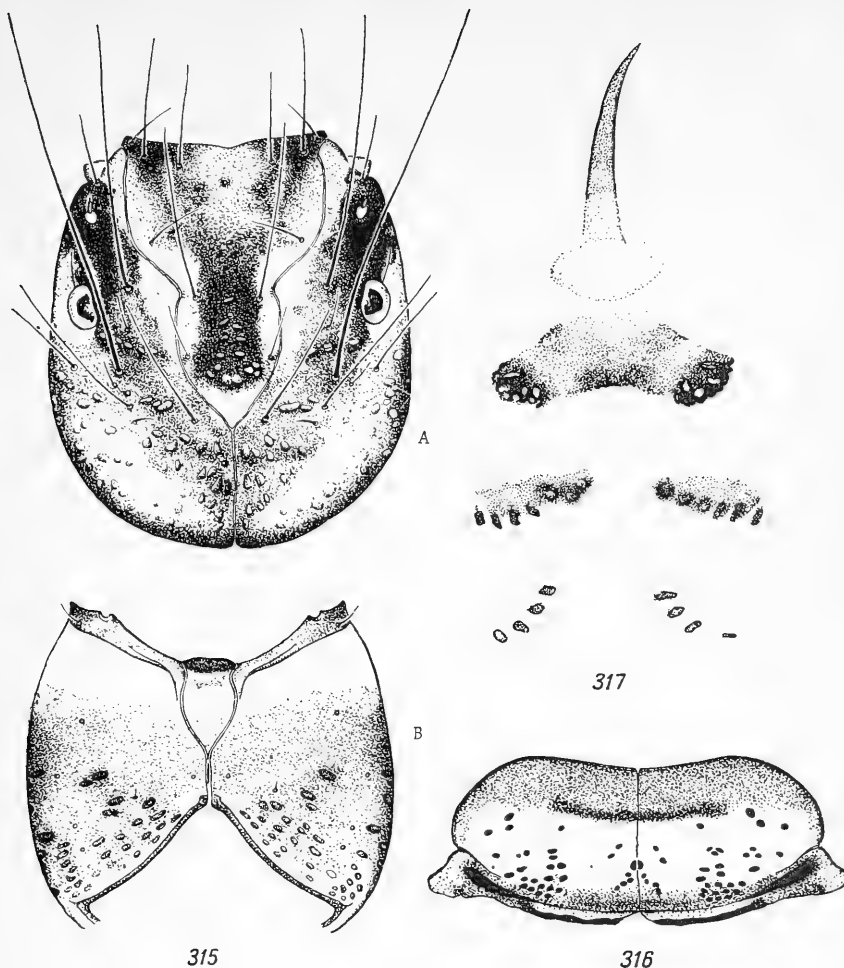
## 5. *Limnophilus flavicornis* Fabricius

Reaumur, 1737; Plate XII, Figures 6–10. — Degeer, 1778: Plate XI, Figure 14. — Pictet, 1834:152, Plate IX, Figure 20, q–c. — Rambur, 1842:484. — Kolenati, 1848:44–45. — Hagen, 1864:245–246. — Walser, 1864:58–60. — Meyer, 1867:161. — Packard, 1870:617, Figure 609. — Preudhomme de Borre, 1870–1871:67. — Wallengren, 1891:48. — Rudow, 1897:454. — Lampert, 1897:154, Figure 69. — Struck, 1900:20, Figure 32. — Ulmer, 1900, Figure 4. — Ostwald, 1901:112. — Siltala, 1902:50–54, Figure 10, a–o. — Ulmer, 1902b:231–234, Figures 1–12. — Struck, 1903:81, Plate II, Figure 1. — 189 Ulmer, 1903:56–58, Figure E, 49. — Siltala, 1904c:38–39. — Ulmer, 1909:259–260, Figure 390. — Lestage, 1921:729, 733, 742, 744, 747, Figure 255 b, 1, s. — Lepneva, 1940:215, Figures 159, 4. — Hickin, 1943:6–10, Figures 1–10. — Winkler, 1959:112–128, Figures 1–28.

**Full-grown larva.** Length 19–23 mm. Head (Figure 315, A) as in *L. rhombicus*, dark, nearly black or blackish brown; pattern on frontoclypeus reaching frontal sutures anteriorly; anterior area with deep, lighter, yellowish brown, median, sometimes indistinct indentation; 2 large black dots, which are poorly visible in dark specimens, lateral to indentation; longitudinal stripe wide, with large, light dots, usually reaching frontal sutures posteriorly; posterior angle and middle of lateral areas light. Dorsal stripes extending from anterior to posterior margin along frontal sutures, darker anteriorly than posteriorly; punctation distinct in posterior part. Lateral stripes wide, with longitudinal rows of dots, 190 space between stripes light, with a small, slightly dark area in middle. Ventral surface mainly chestnut brown, with groups of darker dots on each side posteriorly, with a light stripe near margin anteriorly; gula light (Figure 315, B).

Dorsal sclerite of labrum golden brown, median indentation deep, a small, dark reddish brown spot behind median pit; posterior-angle sclerites short, blackish brown. Seta 1 in form of a short, blunt, light spine; setae 2 and 4 forming small, light spines; seta 3 short, slightly longer and thinner; setae 5 and 6 larger than others, yellowish, thick, lateral to median pit, 5 larger than 6.

Mandibles black, oblong; left mandible with large median tooth, 2 smaller, wide teeth dorsal, and 2 narrow, sharp teeth ventral to median tooth, ventral blade smooth, slightly concave, dorsal blade with a small, rounded process distal to the brush; right mandible with 3 smaller teeth dorsal to distal tooth, with one tooth ventrally. Lateral setae of mandibles short, light, of about the same length, situated basally.



FIGURES 315-317. *Limnophilus flavicornis* Fabr.:

315 - head, dorsal (A) and ventral (B); 316 - pronotum; 317 - thoracic horn and sternites.

Anterior and lateral margin of pronotum (Figure 316) narrow, dark brown; posterior margin with 2 wide, black stripes; posterior-angle process with dark, lateral margin; surface chestnut brown in anterior third, groove in anterior third with dark stripe in middle, posterior submarginal zone dark, with groups of distinct, blackish brown dots; middle of sclerite light brown, with large dots near median suture and laterally.

Mesonotum chestnut brown, with short, dark stripe laterally near anterior margin, with narrow, blackish brown margin posteriorly; lateral margin broadly blackish brown at posterior angle. Punctuation distinct near median suture, forming a wedge-shaped pattern at anterior angle and near reddish brown streaks at posterior angle.

Tergites of metathorax chestnut brown, distinct. Chaetotaxy of thorax as in preceding species.

Prosternite (Figure 317) large, mainly light, with thickened, dark brown, median and lateral areas posteriorly, and with numerous, dense dots. Horn thin, long, dark. Mesosternites represented by large, oblique, brown plates with 5-6 large, dark dots. Metasternites brownish, with 4-5 pale dots (Figure 317).

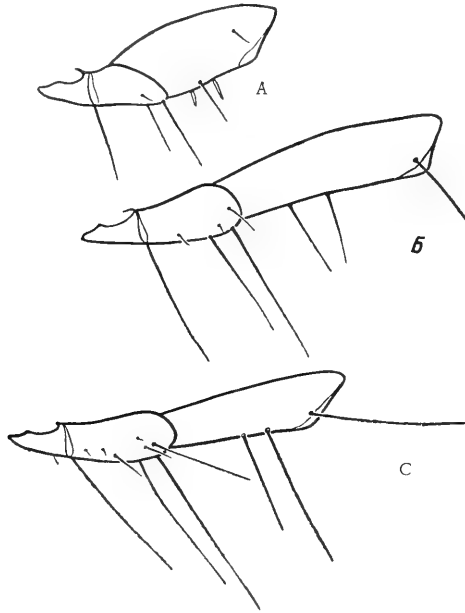


FIGURE 318. *Limnophilus flavicornis* Fabr.  
Right trochanter and femur of the foreleg (A), midleg  
(B) and hind leg (C), posterior

Posterior primary seta of fore femur situated subventrally, as in *L. rhombicus*, between 2 primary ventral setae; chaetotaxy of mid- and hind femora as in Figure 318. Hind trochanter with moderately long, posterior, primary seta and 4-5 small, secondary setae.

Lateral line on segments 3-8, with small, brown, hairlike spinules; segment 8 with very small hairlike spinules. Gills on segments 2-8.

Tergite of segment 9 light brown with indistinct punctation anteriorly, lighter, yellowish in other parts; medioanal setae long, dark brown; anterior-angle setae slightly shorter and thinner; intermediate seta, and lateral seta short, thin, of same length; seta between medioanal setae situated about in middle, thin, moderately long; several short, thin, and small setae situated subapically and on surface.

191

Sclerite "b" brown, with 3 large, black setae distally: a thick, long, median seta, a similar seta nearby, and a shorter, thinner, lateral seta; median margin with smaller setae, one large, moderately long, and 2 dark short

setae; surface with 5-7 setae of different size, most of them small, ventral seta thick, dark, moderately long.

Sclerite "c" yellow, with wide, reddish brown lateral margin; seta small, dark.

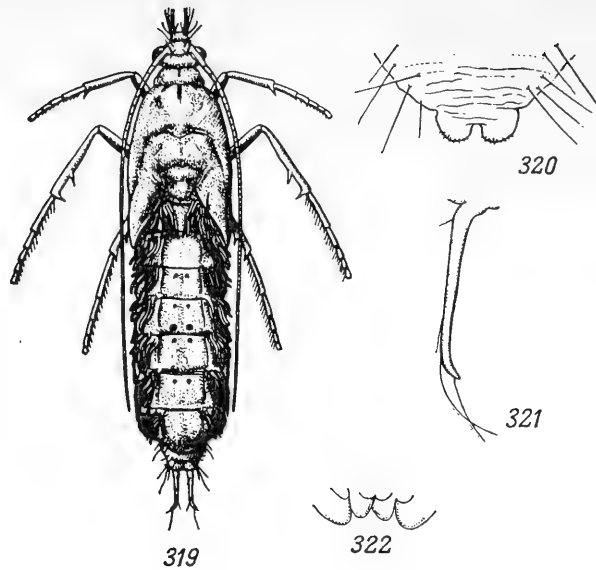
Number and arrangement of gills of *L. flavicornis*

Segment	Dorsal	Pleural		Ventral
2	3 3-2	3-2	3-2	3 3
3	3 3	2-3	3-2	3 3
4	3 3-2	2-1	2-1	3 3
5	3 3-2	1(0)	1(0)	3 3-2
6	2 2-1		1(0)	3-2 2
7	2-1 2-1			2-1 2-1
8	1-2			1(0)

Claw reddish brown, darker apically, with a large dorsal denticle and several, minute, light, basal spinules; seta 1 situated on median side of basal part, short; seta 2 situated dorsally near suture, moderately long, brown; seta 3 similar, situated dorsally in distal part; seta 6 short, dark, situated distal to suture; basoventral setae 7 and 8 light, reaching apex of claw; seta 5 small, light, situated nearby lateral to 8; seta 4 situated medially, slightly larger.

Case straight, 19-24 mm long, made of large particles, arranged transversely or obliquely (Vol. II, No.1, Figure 75); particles of about the same size in young larvae; case of older larvae made of smaller particles posteriorly, with large particles anteriorly, sometimes large fragments of detritus, arranged in different directions; some cases are made partly or entirely of mollusk shells, often rather large shells; anterior end of case truncate, posterior end narrow, closed by membrane with a broad, round hole, sometimes completely covered with small plant fragments (Vol. I, Figure 106, C, D).

**Pupa.** Length 17-19 mm (Figure 319). Antennae reaching segment 8. Labrum and mandibles as in *L. rhombicus*. Wing sheaths reaching segment 4. Mid-tarsi with dense setae; hind tarsi with setae only on segment 1, more sparse than in *L. rhombicus*. Dorsal process of abdominal segment 1 as in Figure 320. Dorsal plates of holding apparatus less developed than in *L. rhombicus*, segment 3 usually without plates, sometimes present on one side only; segment 5 with fewer postsegmental hooks; number of hooks: III:0-3; IV:2-5; V:2-3+9-15; VI:2-4; VII:2-5. Gills on segments 2-8, number and arrangement as in *L. rhombicus*.



FIGURES 319-322. *Limnophilus flavicornis* Fabr. Pupa:  
 319 - habitus; 320 - dorsal process of abdominal segment 1;  
 321 - anal rod; 322 - sheath of penis and ventral appendages  
 (319 - after Ulmer, the others after Siltala).

Anal rods with fewer fine spinules than in *L. rhombicus*; setae the same, both posterior setae, apical and subapical, black, relatively large (Figure 321).

Sheath of ventral appendages (Figure 322), as in *L. rhombicus*, longer than the bifid, rounded penis sheath.

Pupal case 19-22 mm, as in larva; posterior opening covered with an irregular membrane with one or a few holes; anterior membrane thin, with numerous holes.

Mode of life and habitats. Feeding on algae and detritus, in ponds, puddles, rarely in littoral zone of lakes; tolerating some pollution; recorded from polluted ponds.

Distribution. The European USSR, except northeast; some localities in Southern Siberia. In addition, Europe.

## 6. *Limnophilus stigma* Curtis

Meyer, 1867:163. - Struck, 1896:618, Figure 3; 1900:18-19, Figure 13 a-c. - Ulmer, 1900:849-850, Figure 3. - Ostwald, 1901:115-116. - Siltala, 1902:59-62, Figure 12. - Struck, 1903:106. - Ulmer, 1903:58; 1903 b:195. - Siltala, 1904 c:45. - Thienemann, A., 1905:570, Figure 21. - Ulmer, 1909:260, Figure 391. - Lestage, 1921:733-734, 742-745, 749, Figures 256, 258. - Lepneva, 1940:214-215, Figure 160, 7-8.



**Full-grown larva.** Length 19–24 mm. Wide anterior part of dark figure on frontoclypeus (Figure 323, A) truncate laterally in light specimens as in *L. rhombicus*, and does not reach frontal sutures; in more common, dark specimens, pattern covers whole width of sclerite, as in *L. politus* and *L. flavicornis*, but its lateral area, which reaches frontal sutures, is lighter than other part. Anterior margin with shallow, lighter, median area; longitudinal stripe wide, with nearly parallel sides, reaching frontal sutures in posterior angle; indistinct punctation anteriorly lateral to median pit; wedge-shaped figure in posterior part with coarse, distinct punctation. Dorsal stripes distinct, extending from anterior to posterior margin, with short, transverse rows of dots lateral to frontal and coronal sutures in posterior part; longitudinal rows of dots along lateral stripes. Area between dorsal and lateral stripes mainly light, slightly darker in middle, and near occipital foramen. Ventral surface mainly light, with slightly dark lateral areas; groups of dots near occipital foramen. Gula light, yellowish, or with slightly dark posterior part (Figure 323, B). Setae as in preceding descriptions of forms; anterior-margin setae thin, intermediate longer than median seta, lateral seta light, curved inward; seta 7 moderately long, strong; seta 14 dark, thick, long; seta 9 slightly smaller; seta 11 thin, short, situated behind 9; seta 10 light, short, situated lateral to eye; seta 12 thin, moderately long, situated behind eye; seta 13 short, thin, situated near 14; seta 15 thin, long; seta 17 moderately long; seta 8 small, strong; seta 18 small.

Labrum (Figure 324, A) with uniformly reddish brown dorsal sclerite; a small dark spot behind median pit; setae as in Figure 324, A.

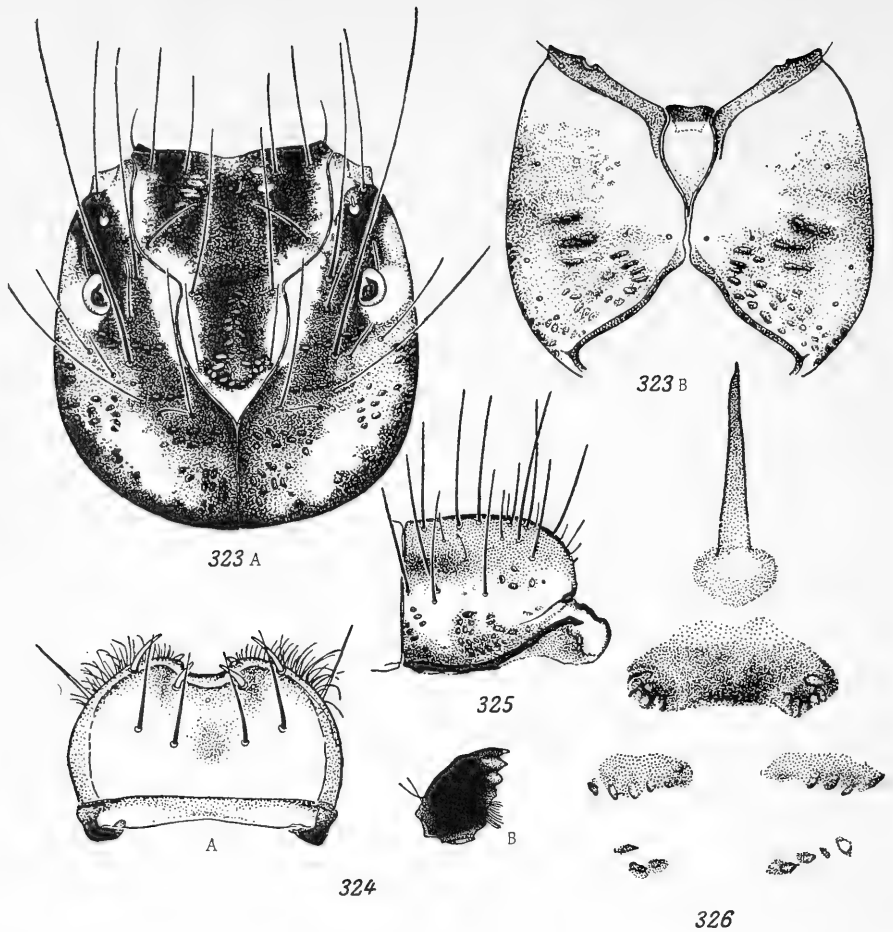
Mandibles (Figure 324, B) black; distal margin of left mandibles with 5 teeth, middle tooth larger than others; dorsal blade with a small, round process distal to brush; ventral blade slightly concave; distal margin of right mandible with 5 teeth, subventral tooth larger than others, 3 teeth further dorsally, marginal tooth broadly rounded, merging with slightly convex margin of dorsal blade, one tooth further ventrally; ventral blade slightly concave; lateral setae situated basally, light, strong, dorsal seta slightly larger than ventral.

Pronotum (Figure 325) with narrow, dark, anterior margin; lateral margin blackish near anterior angle; posterior margin with a broad, black stripe. Anterior part of pronotum chestnut brown, groove with blackish brown stripe in middle; posterior part dark near margin; punctation distinct, setae black.

Mesonotum chestnut brown; middle of anterior half darker laterally; posterior margin narrow, black, broadly black laterally.

Prosternite (Figure 326) less dark posteriorly than in *L. flavicornis*; median and lateral parts brown, with blackish brown punctation. Horn thin, yellowish at end. Mesosternites in form of pinkish plates with 6–7 large blackish brown dots. Metasternites in form of narrow, white plates with 4–5 small, pale dots.

Fore femur (Figure 327) with thick, black, posterior seta, situated subventrally in middle between primary ventral setae, usually closer to distal seta. Hind trochanter with 5–6 black, short and small, secondary setae. Gills on segments 2–8.



FIGURES 323-326. *Limnophilus stigma* Curt.:

323 - head, dorsal (A) and ventral (B); 324 - labrum (A), left mandible, dorsal (B); 325 - pronotum; 326 - thoracic horn and sternites.

194 Tergite of segment 9 yellowish, with brownish punctation near anterior margin. Medioanal setae long, black; anterior-angle setae slightly shorter and thinner; intermediate and lateral seta short, thin, dark brown; 2 setae between medioanal setae, a moderately long seta displaced slightly to the right and a short, thin seta to the left; 4-5 small setae on surface.

Sclerite "b" of anal legs brown, with several large dots at base; setae black; mediodistal seta long, thick; neighboring seta slightly smaller; lateral seta much thinner, shorter; ventral seta large, a moderately long, strong, thin seta and 2 short setae situated subapically near median margin. Sclerite "c" yellowish brown; seta small; lateral margin with broad black stripe.

Claw brown, reddish brown apically, with a large, dorsal denticle and several small, thick spinules near it. Seta 1 short, situated subdorsally on median side of basal part; seta 3 moderately long, situated distally;

setae 1 and 3 brown, 3 larger than others; setae 2 and 6 brown, seta 2 situated dorsally, moderately long, but smaller and thinner than 3; seta 6 situated subdorsally in distal part, short; ventral setae 7 and 8 straight, light, reaching apex of claw; seta 5 small, light, situated close to 8 near suture; seta 4 brownish, situated medially, slightly larger.

Number and arrangement of gills of *L. stigma*

Segment	Dorsal	Pleural		Ventral
2	3 3	3-2	3	3 3
3	3 3	3	3	3 3
4	3 3	3-2	2	3 3
5	3 3-2	2-1	2-1	3 3
6	2 2	2-1	2-1	2-3 2-3
7	2 2	1(0)	1	2 2-1
8	2-1			1-2

Case made of transversely arranged fragments of detritus or green plants (Figure 328); if particles are small, the case is straight, tubular, and more or less smooth, but ends of the fragments usually project above tube surface; in spring and early summer, a period of intensive feeding and growth, older larvae make the case from larger pieces, e. g., birch seeds or fragments of sedge leaves, attached by their edge so that case appears bulky; however, posterior end consists of smaller particles; the larvae sometimes use fragments of fresh stalks of moss; the case is then almost spherical.

**Pupa.** Length 15.1–16.9 mm. Antennae reaching segment 8. Anteclypeus light brown; median and intermediate seta thin, brown; lateral seta small, light. Labrum brown, with large, black, hooked setae on lighter background; median process wide, indistinct; seta 1 small, light, situated laterally.

Mandibles brown, dark brown distally; median blade slightly concave, finely serrated; lateral setae situated basally, short, black; ventral seta slightly smaller than dorsal. Wing sheaths reaching abdominal segment 5. Midlegs with 2 rows of setae on tarsal segments 1–4, setae of ventral margin longer and denser than on dorsal margin; hind tarsi with a few sparse setae on segments 1–3.

Dorsal process of abdominal segment 1 large, tapering and with a saddle-shaped indentation; surface folded basal to indentation.

Gills on segments 2–7. Holding apparatus little developed, present on segments 3–7 or 4–7; presegmental plates small, pinkish; number of hooks: III:0–1; IV:1–2; V:1–3+8–12; VI:1–3; VII:1–2.

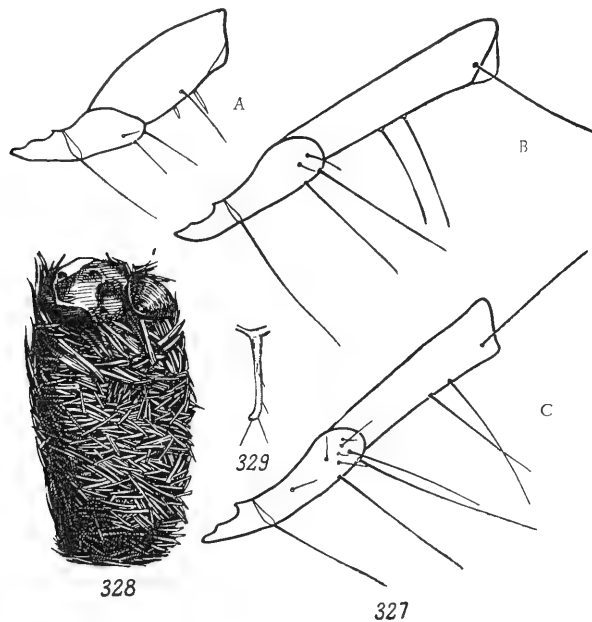
Anal rods (Figure 329) straight, slightly narrower distally, slightly curved laterally and dorsally; small spinules laterally on rods, which are denser at apex; setae black, a small seta in basal third, a slightly larger seta in middle third, and 2 larger setae subapically; basal part with 1–2 additional, small setae.

Anterior end of pupal case covered with a thin membrane with numerous holes; posterior membrane with fewer holes.

Mode of life and habitats. Phytophagous and detritophagous, living in small, stagnant water bodies, including swampy water; a spring species; large numbers of larvae are often found in large, spring puddles with rich vegetation.

195

Distribution. The European USSR, including Caucasus; Western and Eastern Siberia, Altai, the Maritime Territory. In addition, Central and Northern Europe.



FIGURES 327–329. *Limnophilus stigma* Curt.:

327 – right trochanter and femur of foreleg (A), midleg (B) and hind leg (C), posterior; 328 – larval case; 329 – anal rod of pupa (329 – after Siltala).

## 7. *Limnophilus nigriceps* Zetterstedt

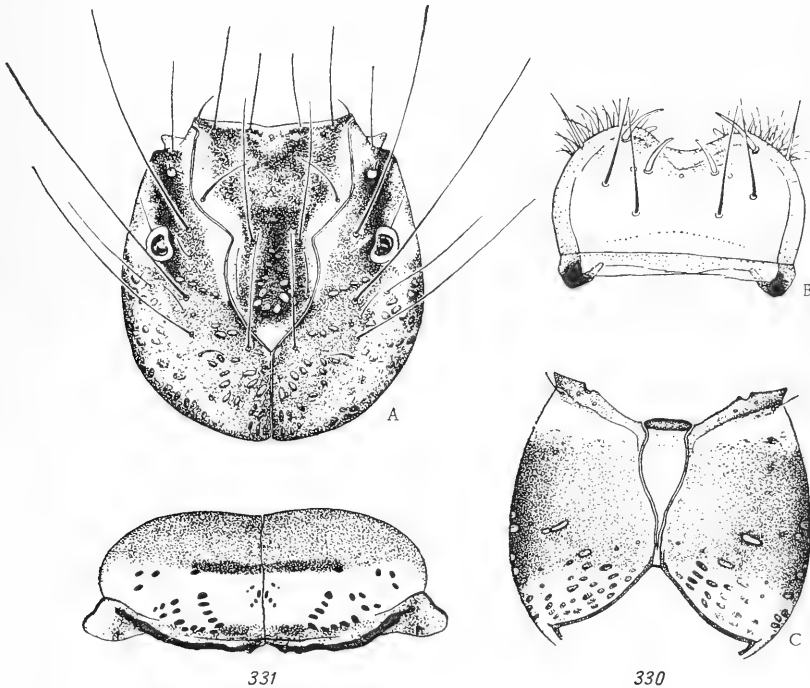
Hagen, 1864:247. – Meyer, 1867:161–162. – Struck, 1899:323–325, Figure 21; 1900:21–22; Figure 12. – Ostwald, 1901:113. – Struck, 1903:68–74. Figure 10. – Ulmer, 1903:58–59. – Siltala, 1904c:49. – Ulmer, 1909:258. – Lestage, 1921:731–732, 743, 744, 748. – Lepneva, 1940:215, Figure 159 (2).

**Full-grown larva.** Length 16–19 mm. Coloration very variable (Figure 330, A); in light larvae, in which the pattern is more typical, figure on frontoclypeus is narrower anteriorly, as in *L. rhombicus*; it is slightly dark laterally and reaches frontal sutures in dark specimens; a more or less light, anterior, median indentation always present; posterior end of stripe reaches margin.

Dorsal stripes uniformly wide, extending from anterior to posterior margin, transverse rows of dots lateral to coronal suture and posterior part of frontal sutures; longitudinal rows of dots on site of lateral stripes; a slightly dark, transverse stripe behind eye; ventral side mainly dark, with large groups of dots on light background near occipital foramen, and several, larger dots on dark background. Gula slightly brownish or lighter (Figure 330, B). Median anterior-margin seta relatively large, slightly shorter than intermediate seta; middle frontal seta longer than usual; seta 14, like other large setae, black, much longer than 9; seta 15 thin, almost as long as 9.

Labrum as in Figure 330, C; dorsal sclerite yellowish brown, with a dark spot near median pit.

(196)



FIGURES 330 and 331. *Limnophilus nigriceps* Zett.:

330 – head, dorsal (A) and ventral (B), labrum (C); 331 – pronotum.

Mandibles black, with yellowish brown apex; left mandible distally with 5 teeth, middle tooth the largest; ventral blade slightly concave, dorsal blade slightly convex; right mandible with 5 teeth distally, the subventral tooth larger than others, ventral tooth small, 3 dorsal teeth of same large size; lateral setae situated basally, short, light, dorsal larger than ventral.

196

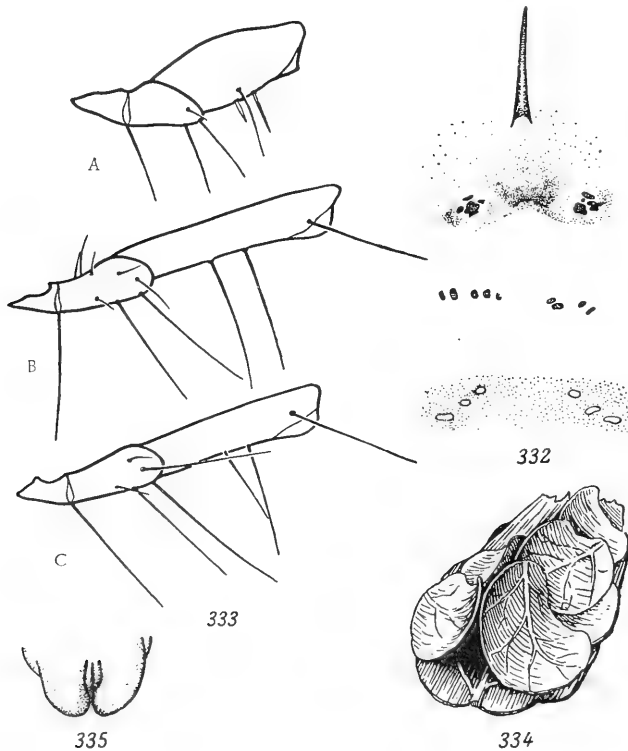
Pronotum (Figure 331) light, yellowish brown in middle, anterior third uniformly dark brown, with a darker, blackish brown stripe in middle of groove; posterior-margin area also dark; anterior and lateral margin narrow, dark reddish brown; posterior margin wide, with 2 separate, black stripes; posterior-angle process with 2 dots, and narrow, brownish, lateral margin; setae black and blackish brown.

Mesonotum brown, darker in middle of anterior part and at posterior angle, with a dark stripe laterally at anterior margin; posterior margin blackish brown, narrow; lateral margin with short, broad part posteriorly; striation of posterior angle narrow, reddish brown; medioanal seta black, thick, markedly longer than others.

Tergites of metathorax distinct, chestnut brown; anterior median tergites pale, primary seta long, 5-6 small, secondary setae; posterior median tergites with long medioanal seta, the other 4-5 setae of different size; lateral tergites with a transverse row of 3 large, dark reddish brown dots, primary seta long, situated in anterior part, 12-14 secondary setae of different size.

Prosternite with yellowish median area, with large dark dots posteriorly, several, pale sclerotized dots laterally. Mesosternites represented by a

(197)



FIGURES 332-335. *Limnophilus nigriceps* Zett.:

332 - thoracic horn and sternites; 333 - right trochanter and femur of foreleg (A), midleg (B), and hind leg (C), posterior; 334 - larval case; 335 - sheath of ventral appendages and penis of male pupa (335 - after Siltala).

row of 4-5 pale, pinkish brown dots. Metasternites represented by 3-4 whitish dots. Horn narrow, yellowish (Figure 332).

Posterior subventral seta of fore femur situated between primary ventral setae nearer to the basal seta. Hind trochanter basally with a long, posterior, primary seta, and 2 small, secondary setae. Other setae as in Figure 333.

Lateral line on segments 3-8. Gills on segments 2-8.

97

A special characteristic of this species is the absence of the pleural presegmental gill on abdominal segment 2; there are rarely, e. g., in Lake Teletskoe on the Altai, specimens with small, rudimentary, presegmental, pleural gills on one or both sides of segment 2.

Tergite of segment 9 light brown, with indistinct punctation near posterior angle. Setae black; medioanal seta thick, long; anterior-angle seta thinner and markedly shorter; intermediate and lateral seta thin, the former moderately long, the latter short, yellowish; seta between medioanal setae black, strong, moderately long; 2 small, dark setae on surface.

Sclerite "b" of anal legs brown, with indistinct punctation; setae black; mediodistal seta thicker and longer than other 2 distal setae; ventral seta moderately long; 3 setae, one moderately long, the other 2 short, at median margin; surface with 6-7 small, thin setae. Sclerite "c" yellowish, with broad, black, lateral margin. Claw with relatively long, basal part; mediodorsal setae 1 and 3 dark brown; dorsal seta 2 thin, moderately long; seta 6 short, brown; seta 8 situated closer to 7, both yellowish; setae 5 and 4 situated more distally, 5 small, situated laterally near 8; 4 situated medially, slightly larger.

Case straight, 20-25 mm long (Figure 334) made of plant particles, often trihedral; long plant particles are arranged longitudinally in cylindrical cases; 1-2 longer stalks sometimes project beyond end of case; sand grains are sometimes used (Lepneva, 1949:169-170).

198

**Pupa.** Length 11-15 mm. Antennae reaching abdominal segment 8 or end of body. Labrum with small median process. Mandibles with relatively broad distal part.

Midlegs natatorial with setae on tarsal segments 1-4; hind tarsi with sparse setae on segments 1-2.

Number and arrangement of gills of *L. nigriceps*

Segment	Dorsal	Pleural		Ventral
2	3-2 3-2		3-2	3-2 3-2
3	3-2 3	2	2-1	3-2 3-2
4	3-2 2-3	1	1(0)	3-2 2-1
5	2 2-1	1(0)	1(0)	2 2
6	2-1	1(0)	1(0)	2-1 2-1
7	2-1 2(0)			2-1 1(0)
8	1(0)			1(0)

Gills on segments 2–7; presegmental lateral gills absent, as in larva. Holding apparatus on segments 3–7, number of hooks: III:1–3; IV:2–3; V:2–4+6–16; VI:1–3; VII:2–3. Anal rods slightly curved at end, with one seta in basal third, another in middle, the other 2 longer than others, situated subapically one behind the other. Sheath of ventral appendages of male genitalia large, much longer and wider than the very short and narrow, bifid penis sheath (Figure 335).

Pupal case 15–22 mm long, its ends with sievelike membranes covered with small plant particles.

Mode of life and habitats. Shallow, overgrown parts of lakes and slow rivers, sometimes in open littoral, on a sandy or sandy-stony bottom rich in detritus; in calm places protected from wind. Broadly eurythermic; occurs not only in warm waters, but also in cold Lake Teletskoe, where the temperature does not rise above 10° before June; also in spring-fed ponds (the Ropshi area, Silurian Plateau). It occurs mainly in autumn; hatching of adults in August, September.

Distribution. The European USSR, Western and Eastern Siberia, Altai, Sayans, Kamchatka, Northern Kazakhstan, Middle Asia. In addition, Central and Northern Europe.

## 8. *Limnophilus decipiens* Kolenati

Struck, 1896:417, Figure 2; 1899:323–355; 1900:17, 21, Figures 7, 12. — Ostwald, 1901:108–109. — Siltala, 1902:55–58, Figure 11. — Struck, 1903:75–76, Plate II, Figure 3. — Ulmer, 1903:59–60. — Siltala, 1904c:40; 1907:496–497, 507–510. — Ulmer, 1909:258, Figure 388. — Lestage, 1921:731, 741, 742, 744–746, Figures 256, 259.

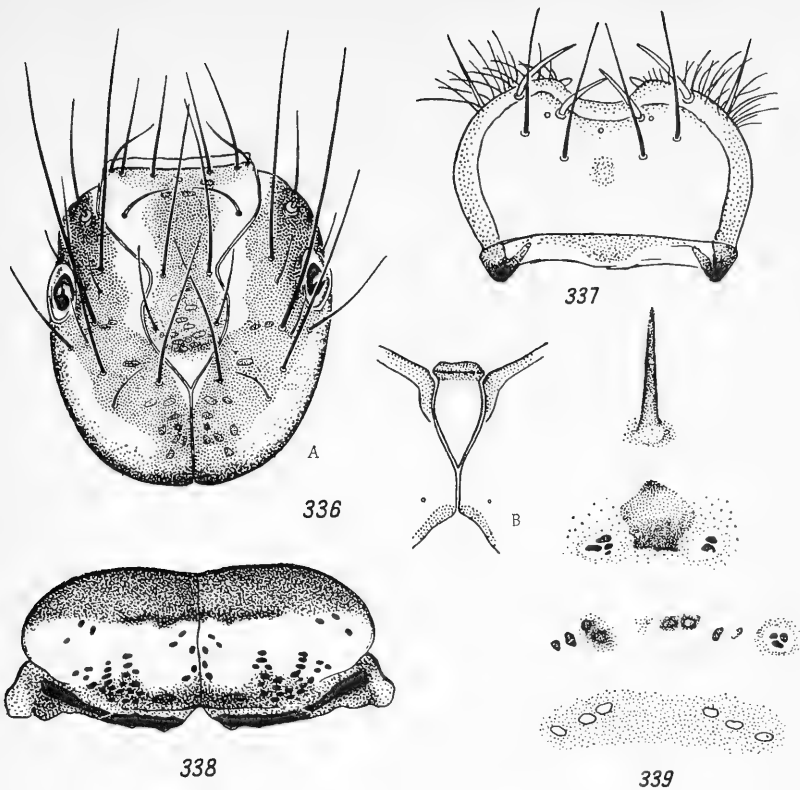
**Full-grown larva.** Length 16–21 mm. Head slightly oblong, light, yellowish; stripes dark brown (Figure 336, A). Pattern on frontoclypeus, as in *L. rhombicus*, slightly wider anteriorly, not reaching frontal sutures; light median indentation at anterior margin indistinct; a large and 3–4 small dots on each side behind median pit; dark longitudinal figure in posterior part relatively narrow; wedge-shaped figure formed by large dots. Dorsal stripes relatively narrow, distinct in middle and laterally with short, transverse rows of dots posteriorly; lateral stripes dark, with dense, longitudinal rows of dots; space between stripes light, with short, slightly dark bars behind eyes and near occipital foramen. Ventral side broadly dark laterally in middle, with large groups of dots on light background near occipital foramen. Gula yellowish brown (Figure 336, B).

Dorsal sclerite of labrum (Figure 337) golden brown. Mandibles black; left mandible with 5 teeth distally, middle tooth larger than others.

199 Pronotum yellowish in middle, brown near posterior margin (Figure 338); anterior part uniformly brown, groove dark brown in middle; posterior margin wide, with a black, transverse stripe without median interruption; posterior angle with 3 basal dots, with narrow dark stripe laterally; setae black or dark brown, medioanal seta long, larger than anterior-angle seta.

Mesonotum darker anteriorly in middle than in lateral and posterior areas; posterior angle and lateral margin lighter; anterior margin with dark, blackish brown stripe laterally; posterior margin narrow, black; lateral margin broadly black near posterior angle; anterior-angle seta long, larger than medioanal seta.





FIGURES 336-339. *Limnophilus decipiens* Kol.:

336 - head, dorsal (A) and ventral (B); 337 - labrum; 338 - pronotum; 339 - thoracic horn and sternites.

Prosternite pentagonal, yellowish or light brown, darker posteriorly; with 2-3 large pinkish to light brown dots on each side; horn thin, pale, grayish. Mesosternite represented by large, pinkish brown dots; metasternite by 2-3 large, whitish dots on each side (Figure 339).

Fore femur subventrally with black, strong, posterior seta situated in middle between primary ventral setae, slightly closer to distal seta. Mid- and hind trochanters with 3-4 secondary setae near posterior primary seta; setae of femur as in Figure 340.

Lateral line on segments 3-8; hairs dense, chestnut brown. Gills on segments 2-8.

Tergite of abdominal segment 9 yellowish brown; setae black; medioanal setae long, much larger than anterior-angle setae; seta between medioanal setae moderately long; intermediate and lateral seta short, thin; 5-6 small secondary setae usually present on surface.

Sclerite "b" of anal legs yellowish, with indistinct punctation; setae black; all 3 setae at distal margin, equally spaced, mediolateral seta long, black, larger than neighboring seta, lateral seta smaller; a moderately long and 2 short, black setae at median margin; ventral seta short, dark

brown, strong; 7-8 small setae on surface. Sclerite "c" light brown, with broad, reddish brown, lateral margin; seta small, brownish, strong. Claw and its setae as in *L. nigriceps*.

Case straight, slightly tapering posteriorly, 30-37 mm long, made of longitudinally arranged plant fragments, sometimes with 1-2 longer fragments, sedge leaves or a lamella of reed stalks projecting posteriorly, so that case is 50-60 mm long. Case sometimes trihedral, as in *L. nigriceps*, the ventral side formed by 3-4 large, overlapping leaf fragments, other walls converging dorsally; trihedral cases often consist of pieces of thin, fresh leaves (Figure 341).

Number and arrangement of gills of *L. decipiens*

Segment	Dorsal	Pleural		Ventral
2	3	3-2	3	3
	3			3
3	3	3-2	2	3
	3-2			3
4	3	2	2-1	3
	3-2			3-2
5	3-2	2-1	1	3-2
	2			3-2
6	2	1(0)	1(0)	2
	2-1			2-3
7	2-1	1(0)	1(0)	2-1
	2-1			2-1
8	2-1			2-1

**Pupa.** Length 15-18 mm. Antennae reaching end of segment 8. Labrum brownish dorsally; median seta 1 small, yellow; 5 dark brown, large, hooked setae. Mandibles with wide distal part; median blade straight, serrated. Wing sheaths reaching end of segment 4 or beginning of segment 5. Midlegs natatorial. Segments 1-3 of hind tarsi with sparse setae.

Dorsal process of abdominal segment 1 yellowish, its posterior saddle-shaped process brown posteriorly, with small, dark reddish brown spinules. Holding apparatus with pinkish plates, hooks small, dark brown; segment 3 usually without plates, sometimes with a small plate, on one side only, without hooks or with 1-2 small hooks; number of hooks: III:0-2; IV:2-3; V:3-4+11-15; VI:3-4; VII:2-4. Gills on abdominal segments 4-8.

Ventral appendages of male genitalia wide, rounded posteriorly (Figure 342), longer than penis sheath, which is narrow and bifid. Anal rods (Figure 343) thin, straight, slightly curved at end; both basal setae short, thin, situated one behind the other in middle, not quite symmetrical on right and left rod; subapical and apical seta thick, black, curved, moderately long, former larger than latter.

Pupal case 20-30 mm long, covered with plant fragments, its ends covered with thin, membranes; case attached by ventral part of anterior membrane to roots, stalks, or pieces of wood on the bottom.

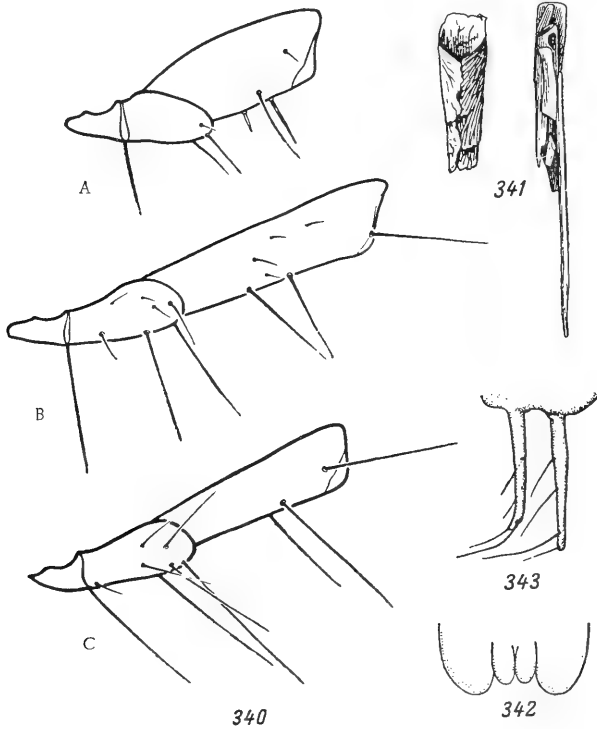
Mode of life and habitats. Shallow, overgrown waters of littoral of lakes, ditches, often swampy environment. Pupae occur in second half of summer. Feeding on detritus and algae.

Distribution. Northwestern, western, central, and southern parts of the European USSR, Crimea, Ciscaucasia, Western Siberia. In addition, Central and Northern Europe.

### 9. *Limnophilus borealis* Zetterstedt

Siltala, 1902:49-50, Figure 9; 1904c:34-38, Figure 8. — Lestage, 1921: 734-735, 246.

(201)



FIGURES 340-343. *Limnophilus decipiens* Kol.:

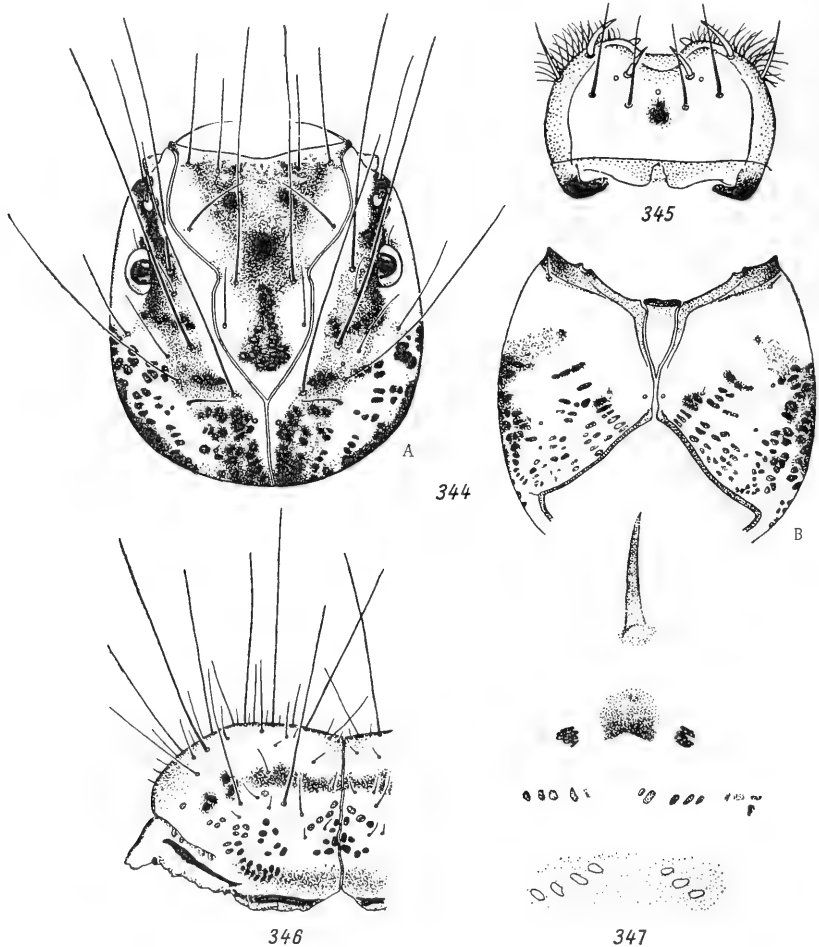
340 — right trochanter and femur of foreleg (A), midleg (B) and hind leg (C), posterior; 341 — larval case. Pupa: 342 — penis sheath and ventral appendages; 343 — anal rods (342, 343 — after Siltala).

**Full-grown larva.** Length 20-28 mm. Body light, with dark, pinkish brown dots; stripes and spots indistinct, sometimes absent. Main color of head (Figure 344, A) whitish yellow. Pattern on frontoclypeus narrow, not reaching frontal sutures, slightly wider anteriorly, darker anterior part not reaching intermediate seta; wedge-shaped pattern of posterior part distinct,

201 consisting of large dots. Dorsal stripes narrow, not reaching frontal sutures, reaching coronal suture near occipital foramen; dots on stripes not always distinct; lateral stripes dark only anteriorly; large dots on lateral stripes and in space between them. Ventral surface (Figure 344, B) whitish yellow, slightly laterally dark in anterior part, with large groups of dark, distinct dots, near occipital foramen, 2 anterior dots large, dark. Gula light, yellowish. Seta 14 longer than others; seta 9 also long, thick, both blackish brown; setae 15 and 17 thin, long, almost as long as seta 9.

Dorsal sclerite of labrum (Figure 345) golden brown, with a dark spot behind median pit. Mandibles black, reddish brown near distal margin; left mandible with 5 teeth, middle tooth situated separately and larger than the others, 2 small, basally fused teeth, dorsal to it, 2 teeth ventral to it; dorsal blade with large denticle distal to the brush; right mandible with 5 teeth, subventral tooth larger than others, 3 teeth dorsal to it.

(202)



FIGURES 344-347. *Limnophilus borealis* Zett.:

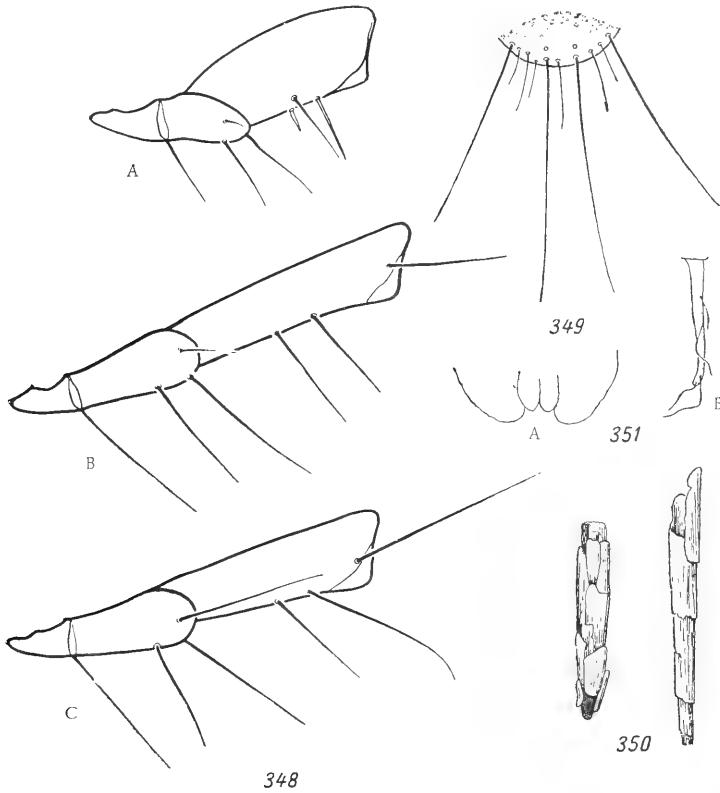
344 - head, dorsal (A) and ventral (B); 345 - labrum; 346 - pronotum; 347 - thoracic horn and sternites.

Pronotum whitish yellow; groove in anterior part golden brown in middle; anterior margin narrow, brown; posterior margin with 2 black, transverse stripes, divided by wide brown space; process at posterior angle with 2 dark dots, with a narrow brown stripe laterally (Figure 346).

Mesonotum also light, with brownish punctation; posterior margin slightly brownish, in contrast to preceding species; posterior angle broadly black.

Prosternite forming a small, yellowish, median sclerite with brownish posterior margin, with groups of 8–10 large, fused, reddish brown dots laterally; horn thin, light basally. Mesosternite represented by a row of reddish brown or lighter, large dots, metasternite by 4–5 white dots (Figure 347).

202  
(203)



FIGURES 348–351. *Limnophilus borealis* Zett.:

348 – right trochanter and femur of foreleg (A), midleg (B) and hind leg (C), posterior;  
 349 – tergite of segment 9; 350 – larval case; 351 – penis sheath and ventral appendages (A), anal rod (B) (351 – after Siltala).

Legs yellowish brown, with large, chestnut brown dots on coxae, trochanters, femora and tibiae. Posterior seta of fore femur (Figure 348, A) dark, moderately long, situated slightly distal to basoventral seta; both

ventral setae light, yellowish, represented by a short basal spine and a long apical spine, which is almost as long as posterior, primary seta. Mid-femur (Figure 348, B) and hind femur, rodlike, with straight, dorsal margin and slightly concave ventral margin, wider distally, slightly longer than hind femur; primary ventral setae situated in middle of femur, black, moderately long, thin, basal seta slightly longer and thinner. Ventral setae of hind femur (Figure 348, C) situated close together in distal half, strong, black, apical seta long, basal seta shorter. Gills on segments 2-7.

203 Tergite of segment 9 (Figure 349) pale, slightly pinkish near anterior margin, with coarse punctation; medioanal setae black, long, longer than twice the width of tergite, anterior-angle setae large, black, slightly shorter and thinner; intermediate seta dark brown, moderately long; lateral seta brown, thinner and shorter; seta between medioanal setae dark brown; almost as long as intermediate seta, displaced to the left; 20-23 small, thin, secondary setae on surface.

Sclerite "b" pale, slightly brownish, with large, light brown dots dorsally and laterally near anterior margin and on surface; setae black; medio-distal seta long, almost as long as medioanal seta of segment 9, but slightly thicker; neighboring seta almost as large; lateral seta thinner, of moderate length; a black, moderately long, subapical seta near median margin and a small, brown seta more basally; ventral seta short, black; surface with one short, brown, and 3-4 small setae.

Sclerite "c" yellowish, pale, with blackish brown lateral margin and a short, black seta. Claw pale yellow, reddish brown apically, with a large, thick denticle; a thick, small, light spinule laterally near the denticle. Setae 1 and 3 dark brown; setae 2 and 6 brown; ventral setae 7 and 8 light, straight, relatively short, seta 5 small, situated distally near seta 8; seta 4 slightly larger, situated on inner side.

204 Case (Figure 350) slightly or markedly longer than larva, 50-55 mm or longer, made of longitudinally arranged plant fragments, which sometimes form an irregular spiral, resembling in this respect the case of *Grammotaulius atomarius*. Fragments of sedge or leaves of grasses, stalks, long, fine particles of tree detritus, plant roots, etc., are used. Walls of case smooth, fragments arranged densely, attached at anterior end only, posterior end partly covering the following fragments.

Number and arrangement of gills of *L. borealis*

Segment	Dorsal	Pleural		Ventral
2	3 3	3	3-2	3-2 3
3	3 3	3	2	3 3-2
4	3-2 2	2	2-1	3-2 3-2
5	2 2-1	2-1	1(0)	2 2-1
6	2-1 1(0)	1(0)	1(0)	2-1 2-1
7	2(0)			2-1 1(0)

Anterior opening of case truncate, with a projecting dorsal fragment; posterior opening straight, exposed.

**Pupa.** Length 18–22 mm. Antennae of female pupae reaching abdominal segment 8, those of male pupae segment 9. Anterior margin of labrum sometimes with minute spinules. Mandibles with narrow distal part; lateral margin slightly convex; median margin almost straight, serrated; lateral setae situated basally, dorsal seta much larger than ventral.

Wing sheaths reaching end of abdominal segment 4. Midlegs natatorial. Hind legs with sparse setae on tarsal segments 1 or 1–4.

Gills on abdominal segments 2–7 or 2–8. Holding apparatus on segments 3–7; plates relatively large, hooks as follows: III:0–4; IV:2–5; V:3–5+10–21; VI:2–5; VII:2–6.

Anal rods (Figure 351, B) straight, slightly curved at apex. First 2 setae situated in basal half, the other 2 setae subapically and apically. Sheath of ventral male appendages wide, rounded posteriorly, projecting beyond narrow, bifid penis sheath (Figure 351, A).

Pupal case shorter than that of larva, 30–40 mm long; large, posteriorly projecting fragments are cut off before pupation; in cases which are longer than pupa, the anterior and posterior sievelike membranes are situated inside.

Mode of life and habitats. Usually in lakes, among vegetation, in calm water, among reeds, rushes and *Scolochloa festucacea* in open water.

Distribution. Northern, western, and central parts of the European USSR, Western and Eastern Siberia, Yakutia, Kamchatka. In addition, Northern and parts of Central Europe.

## 10. *Limnophilus bipunctatus* Curtis

Struck, 1899:264, 1900:Figure 18. — Ulmer, 1901:134. — Struck, 1903:88, Plate II, Figure 2. — Ulmer, 1903:52. — Siltala, 1908b:14, Figure 1. — Ulmer, 1909:262–263, Figure 394. — Lestage, 1921:729, 737, 746, Figure 255d.

**Full-grown larva.** Length 16–18 mm. Main color of head and thoracic sclerites yellowish white,\* punctation distinct, pinkish brown, stripes and spots indistinct. Head almost as long as wide. Frontoclypeus (Figure 352, A) with narrow, brownish stripe near anterior margin, with darker, golden brown areas between anterior and middle frontal setae laterally; wedge-shaped pattern of posterior area consisting of partly fused dots. Dorsal stripes indistinct, beginning behind palps as a narrow, dark stripe which widens near the eye and narrows again posteriorly without reaching fork of frontal sutures; a slightly dark area also in posterior part near coronal suture, where dorsal stripes meet; dorsal stripes separate from frontal sutures all along, leaving a lighter, narrow stripe lateral to frontal sutures; stripes with distinct punctation. Longitudinal rows of large dots on site of lateral stripes. Ventral surface light, yellowish anteriorly, brownish in middle, with a row of 3 dense, large, dark brown dots; large, chestnut brown dots near occipital foramen. Gula slightly dark,

\* The color is described from preparations; sclerites are not so light in whole specimens, faintly brownish, and stripes and dots are less distinct.

205 brownish (Figure 352, B). The largest setae, 14 and 9, blackish brown, 14 larger than 9; seta 17 and middle, frontal seta of moderate length, seta 17 dark brown, strong.

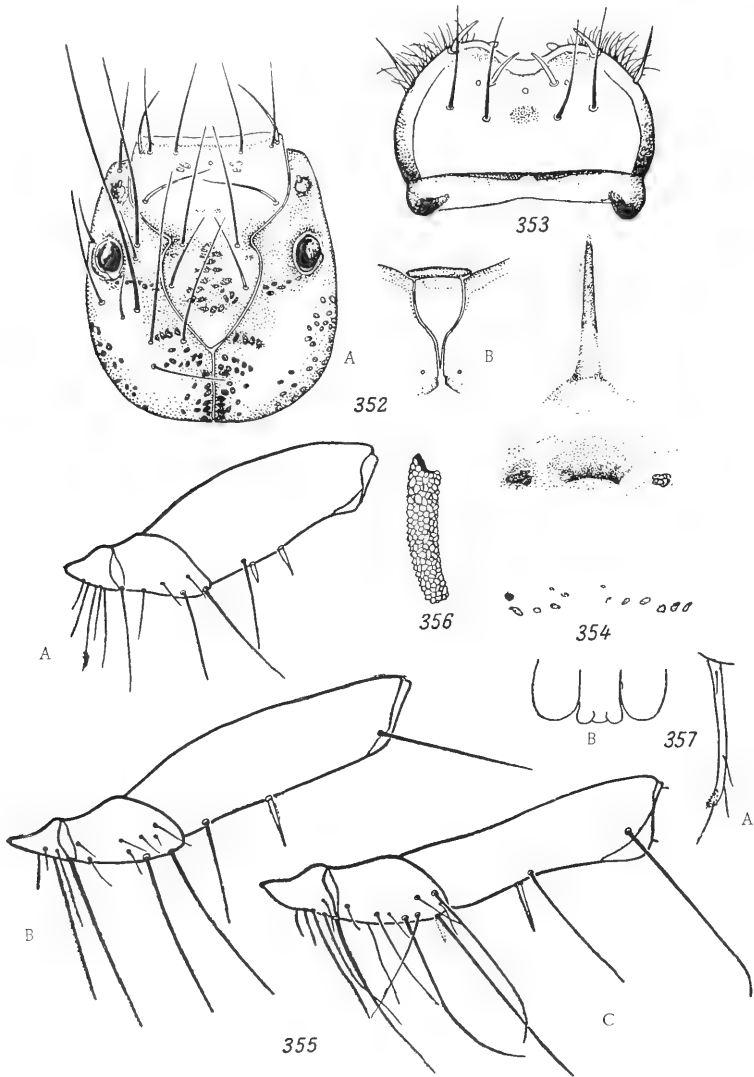


FIGURE 352-357. *Limnophilus bipunctatus* Curt.:

352 - head, dorsal (A), gula (B); 353 - labrum; 354 - thoracic horn and sternites; 355 - right trochanter and femur of foreleg (A), midleg (B), and hind leg (C), posterior; 356 - larval case; 357 - anal rod of pupa (A), penis sheath and ventral appendages of male pupa (B) (357, A - after Ulmer, B - after Siltala).

Labrum (Figure 353) with dark dot behind median pit. Mandibles blackish brown, reddish distally; distal margin of left mandible with 5 teeth, middle tooth larger than others, 2 teeth dorsally to it, 2 small, fused teeth ventrally



to it, last tooth indistinct; right mandible with 5 teeth, subventral tooth large, 3 small, blunt teeth dorsal to it, and one ventral to it; lateral setae thin, situated near base, dorsal seta darker and larger than short, light, ventral seta.

Pronotum yellowish; groove in anterior third of tergite brown in the middle, anterior margin brownish, lateral margin light; posterior margin wide, with clearly divided, transverse, black stripes.

Mesonotum brownish in middle and at posterior margin; posterior margin uniformly black; posterior angle large.

Tergites of metathorax indistinct; lateral tergite wide, pale, with a transverse row of several pinkish brown lines and dots; anterior-angle seta and 3-4 secondary setae black, long, other 7-8 setae thinner and smaller.

Prosternite (Figure 354) in form of a yellowish, posteriorly brownish, median sclerite and dense groups of pinkish brown dots lateral to it. Horn brownish, with light apex. Mesosternites represented by a row of pinkish dots; ventral side of metathorax with similar, but white dots.

Number and arrangement of gills of *L. bipunctatus*

Segment	Dorsal	Pleural		Ventral
2	3 3	3	3 3	3 3
3	3 3	3	2	3 3
4	3 3-2	2	1	3 3
5	2 2			2 2
6	2 2			2 2
7	2			2 1

Coxae and trochanters brown, femora and tibiae yellowish. Trochanters, femora, and tibiae with large, dots; basal segment of trochanter of all legs with several, secondary, ventral setae (Figure 355); distal part of mid- and hind trochanter with a few thin, secondary setae posteriorly. Primary ventral setae of fore femur in form of a short, light, basal spine and a slightly larger apical spine; posterior seta blackish brown, situated near basal spine, in contrast to *L. rhombicus*, sometimes slightly more basally; primary apical ventral seta of mid-femur represented by a large, light spine; basal seta black, moderately long; basal seta of hind femur spine-shaped, apical seta black, moderately long.

Gills on segments 2-7.

Tergite of abdominal segment 9 pale, light brownish, with sparse dots at anterior margin; setae blackish or dark brown; medioanal seta long, thick; anterior-angle seta shorter and thinner; intermediate seta moderately long,

lateral seta short, both thin; 2 thin setae, one moderately long, the other short, situated between medioanal setae; 2-3 small setae on surface.

Sclerite "b" of anal legs light brown; mediodistal, and neighboring seta black, thick, long; lateral seta situated on distal margin, much smaller, reddish brown; ventral seta smaller; 2 thin, moderately long, dark brown setae at median margin; 9-10 small setae on surface.

Claw brown, reddish brown apically, with a large, dorsal denticle and with a minute light spinule on each side of denticle.

Case 18-20 mm long, smooth, made of small sand grains, sometimes also with fine plant particles with projecting ends; anterior opening truncate, posterior opening straight, open (Figure 356).

**Pupa.** Length 13-15 mm. Antennae brushlike, reaching abdominal segments 8-9, with 4-5 small setae at distal margin.

Labrum with small median process anteriorly, small, light seta situated near it; other 5 setae hooked, black, situated on light background. Anteclypeus with 3 setae, 2 of which are short and thin; lateral seta smaller. Mandibles chestnut brown, distal part wide, apex dark brown, blade serrated; lateral setae dark, thin, of about same length. Wing sheaths reaching to abdominal segment 4. Midlegs natatorial; segments 1-4 of hind tarsi with sparse, thin setae.

Dorsal process of abdominal segment 1 yellowish, with slight, transverse striation; distal process saddle-shaped, reddish brown, lobes with dark brown setae.

207 Holding apparatus with reddish brown plates; each presegmental plate with a large hook on each side, other hooks small, not always distinct; number of hooks: III:3; IV:3-4; V:3+14-16; VI:3-4; VII:4-6. Lateral line on segments 5-8, with large, dense, blackish setae. Gills as in larva, on segments 2-7.

Anal rods as in Figure 357, A: 1st seta situated basally, 2nd seta in middle, 3rd and 4th seta moderately long, situated apically and subapically on end. Sheaths of ventral appendages of male pupae large, broadly rounded; penis sheath bifid (Figure 357, B).

Case as in larva, slightly shorter, attached at anterior end to large roots or branches; anterior and posterior opening with sievelike membrane.

Mode of life and habitats. Larvae live in ditches, puddles, often in running water, also in small ponds; detritophagous and phytophagous.

Distribution. Northwestern, western, and central parts of the European USSR. In addition, Central and Northern Europe.

## 11. *Limnophilus lunatus* Curtis

Reaumur, 1737: Plate XII, Figure 3. - Hagen, 1864:243-244. - Klapálek, 1888:14-17, Figure 5. - Ostwald, 1899:75. - Struck, 1900: Figure 5; 1903:74, Plate I, Figure 13. - Ulmer, 1903:60. - Sitala, 1904c:46, Figure 10. - Ulmer, 1909:260. - Lestage, 1921:734, 748. - Lepneva, 1940:215. - Hickin, 1943:66-68, Figures 1-9.

**Full-grown larva.** Length 15-17 mm (Figure 358). Main color of head brownish yellow. Pattern on frontoclypeus (Figure 359, A) reddish brown, more or less widened anteriorly; usual small anterior median indentation

replaced by a larger light area with 3 small dots on each side, 2 large and 1 small dot more posteriorly; dark longitudinal stripe wide posteriorly; wedge-shaped pattern with large punctation; tentorial pits dark; posterior angle and lateral stripes light. Dorsal stripes wide, reddish brown, reaching from anterior margin to coronal suture, usually some distance from frontal sutures, stripes with distinct punctation; rows of large dots on site of lateral stripes. Ventral side with groups of dots on light background. Gula light brownish (Figure 359, B).

Dorsal sclerite of labrum reddish brown; a large spot behind median pit; setae as in Figure 360.

Mandibles oblong, black, reddish distally; mediodistal tooth of left mandible projecting, both dorsal teeth distinct, both ventral teeth, especially last tooth, small, narrow; dorsal blade with basal brush; right mandible of characteristic form, slightly curved, with 5 distal teeth, subventral larger than the others, ventral tooth very small, 3 dorsal teeth wide, rounded apically; lateral setae situated basally, thin, dorsal seta brown, ventral seta shorter and lighter.

Number and arrangement of gills of *L. lunatus*

Segment	Dorsal	Pleural		Ventral
2	2 3		2	2 3
3	2-3 3	2	2-1	2 3
4	2-3 2	2-1	2-1	2 3-2
5	2 2-1		1(0)	2 2
6	1 2-1			2-1 2-1
7	1(0)			2-1 2-1

Pronotum yellowish brown; anterior third light, dark groove in middle; posterior margin with black transverse stripe, lateral process with narrow blackish lateral stripe (Figure 361).

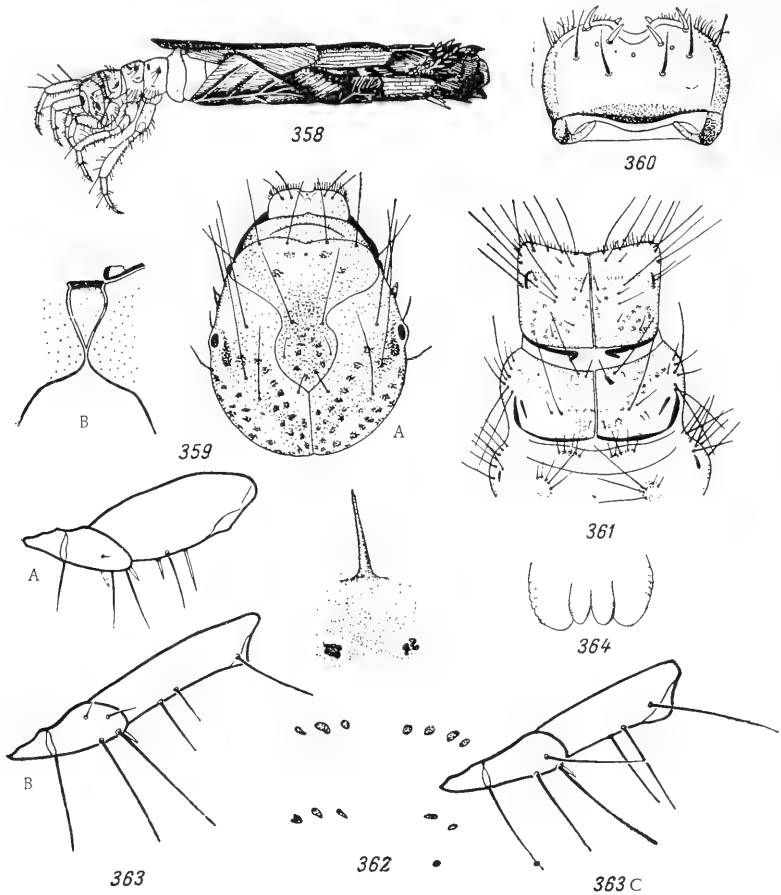
Mesonotum darker in middle of anterior part, grayish brown; anterior margin with golden brown stripes laterally; posterior margin reddish brown (Figure 361).

Prosternite slightly yellowish in middle near posterior margin, with dense groups of pinkish brown dots laterally; horn grayish, with light apex. Ventral side of meso- and metathorax laterally with short rows of large, pinkish brown dots which are lighter on metathorax (Figure 362).

Primary posterior seta of fore femur brown, short, strong, situated between 2 ventral setae, but closer to basal seta, which forms a small, light spine; apical seta thinner and larger, situated in middle of femur (Figure 363, A). Mid-femur slightly convex dorsally, slightly concave ventrally; apical primary, ventral seta situated in middle of femur,

208

large, spine-shaped, basal, primary ventral seta moderately long (Figure 363, B). Hind femur wider distally, almost straight ventrally and dorsally; basoventral primary seta situated in middle of femur, strong, second ventral seta situated more distally, moderately long, dark, much larger (Figure 363, C).



FIGURES 358-364. *Limnophilus lunatus* Curt.:

358 - larva in case; 359 - head, dorsal (A) and ventral (B); 360 - labrum; 361 - thorax, dorsal; 362 - thoracic horn and sternites; 363 - right trochanter and femur of foreleg (A), midleg (B), and hind leg (C), posterior; 364 - penis sheath and ventral appendages of male pupa (358, 359, 361 - after Hickin; 364 - after Siltala).

Gills fewer than in preceding forms; segment 2 without pleural presegmental gills.

Tergite of segment 9 light brown, with brownish punctation at anterior margin; medioanal setae black, long; anterior-angle setae also dark, markedly shorter; intermediate seta thin, moderately long, situated near

medioanal setae, lateral seta short; the relationships are sometimes reversed; seta between medioanal setae dark, long, displaced to the left; 2-3 small setae on surface.

Sclerite "b" of anal legs chestnut brown, with coarse, basal punctation; mediiodistal seta blackish brown; long, 2nd distal seta also large, lateral seta thin, situated closer to 2nd distal seta, much smaller; ventral seta short, thin; 2 setae at median margin, one of them resembling lateral seta, the other situated more basally, short, thin; surface with 9-10 small and short setae. Sclerite "c" reddish brown, with broad, blackish brown lateral margin; seta small, brownish.

Claw reddish brown, blackish brown distally, with a large dorsal denticle; setae 2 and 3 reddish brown, of same length; seta 6 light brown, thinner and smaller than short, thick seta 1; setae 7 and 8 light, seta 8 curved to apex of claw; seta 5 small, light, situated near 8; seta 4 situated medially, slightly larger.

Case straight, smooth, 15-25 mm long, made of small plant particles, often fragments of sedge or leaves of *Glyceria*, the fragments arranged longitudinally; posterior end of case, open or closed by a membrane with large, round hole; dorsal and ventral sides sometimes with narrow plant fragments which are longer than the case, and project at ends; sand grains or fragments of shells are rarely used (Figure 358).

**Pupa.** Length 14-21 mm. Distal part of mandibles narrower than in *L. rhombicus*; blade almost straight, serrated. Midlegs natatorial; hind tarsi with sparse setae on segments 1 or 1-4.

Gills as in larva, on abdominal segments 2-7. Hooks of plates of holding apparatus: III:0-1; IV:2-3; V:2-4+11-17; VI:2-4; VII:1-3.

Anal rods straight, thin; seta 1 situated basally, seta 2 slightly basal to the middle; setae 3 and 4 longer, situated subapically and apically. Appendages of male genitalia wide, rounded posteriorly; penis sheath (Figure 364) deeply divided, slightly shorter.

Pupal case attached at anterior end; anterior and posterior opening closed by sievelike membranes and covered by plants.

Mode of life and habitats. Clear, moderately sunlit ponds, near shore, on solid bottom; in calm parts of littoral of lakes; in slow, clear brooks; prefers water bodies which are moderately sunlit in summer.

Distribution. The European USSR, including the Crimea and Caucasus, in the north to Novaya Zemlya and littoral of bays of the White Sea. In addition, Europe, Iran.

## 12. *Limnophilus fuscicornis* Rambur

Struck, 1899:264, Figure 12; 1900:Figure 19; 1903:74, 77-99, Plate I, Figure 11, Plate VI, Figure 12. - Ulmer, 1903:56. - Siltala, 1904c:59-60. - Ulmer, 1909:260-261. - Lestage, 1921:735, 747.

**Full-grown larva.** Length 18-19 mm. Main color of head brownish yellow. Pattern on frontoclypeus chestnut brown, occupying almost the whole anterior part; wedge-shaped pattern at posterior margin with large dots. Dorsal stripes reddish brown, short, indistinct, not reaching

coronal suture. Lateral bands absent. Numerous large dots in dorsal and lateral areas of posterior part of head. Ventral surface mainly brownish, lighter posteriorly, with groups of large dots. Gula light.

Pronotum brownish yellow; anterior third light, with large, dark dots; groove in anterior third dark, chestnut brown in middle; anterior margin dark in each half; posterior margin wide, reddish brown in middle, with a black stripe laterally; posterior-angle process reddish brown, with narrow, dark, lateral margin. Mesonotum also brownish yellow, darker in some places, with large, dark dots; anterior margin with a small, dark stripe in each half; posterior margin narrowly dark brown, reddish in middle; posterior angle more broadly, blackish brown.

(210)

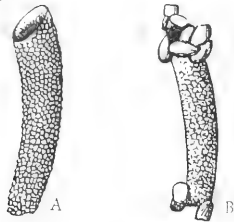


FIGURE 365. *Limnophilus fuscicornis* Ramb. Larval case (A), pupal case (B) (after Struck)

Posterior primary seta of fore femur dark brown, situated slightly more basal than basoventral seta, which forms a small, yellowish spine; distoventral seta situated in middle of femur, also spine-shaped but slightly larger. Primary ventral setae of mid-femur situated basally, short, blackish brown, basal seta slightly longer and thinner.

210

Primary ventral setae of hind femur situated in middle, dark brown; basal seta short, apical seta slightly longer and thinner. Setae on mid- and hind legs shorter than in species of *Limnophilus* described above.

Gills on segments 2-8.

Tergite of abdominal segment 9 brownish, with indistinct punctation; medioanal setae dark brown, long; posterior-angle setae also dark, thick, but shorter; intermediate seta thin, brown, long, as long as posterior-angle seta; lateral seta short, thin; seta between medioanal setae moderately long, thin, shorter than intermediate seta; 2-3 small, thin setae on surface. Case made of sand grains (Figure 365, A).

Sclerites "b" and "c" reddish brown. Claw reddish brown, with dorsal denticle.

Number and arrangement of gills of pupa of *L. fuscicornis*

Segment	Dorsal	Pleural		Ventral
2	3 3	2	2	3 3
3	3 3	2	1	3 3
4	3 2	1(0)	1(0)	2 2
5	2 1-2			2 2
6	2-1 1			2 1-2
7	2(0)			2-1 1(0)
8				1(0)

**Pupa.** Length 15–17 mm. Antennae reaching end of segment 8; scape thicker and longer than other segments. Wing sheaths reaching abdominal segments 4 or 5. Midlegs natatorial; sparse setae on tarsal segments 1–4.

Holding apparatus on segments 3–7; number of hooks: III:2–4; IV:2–5; V:2–4+8–11; VI:3–4; VII:2–4. Gills on segments 2–8.

Anal rods long, thin; 1st seta situated in basal quarter, 2nd seta about in middle, 3rd and 4th setae subapically and apically.

Case 17–19 mm long (Figure 365, B), straight, slightly tapering posteriorly, made of sand grains, as in larva; anterior end with sieve-like membrane covered with sand grains; posterior end covered with sand grains and with small holes. Case attached at anterior end.

Mode of life and habitats. Slow, small, water bodies. Full-grown larvae appear in spring.

Distribution. Northern, western, and central parts of the European USSR, Siberia. In addition, Central and Northern Europe.

### 13. *Limnophilus extricatus* McLachlan

Kolenati, 1858:57–58. — Hagen, 1864:251. — Walser, 1864:48. — Meyer, 1867:163–164. — Klapálek, 1893:9–12, Figure 2. — Struck, 1900:13, Figure 15. — Siltala, 1902:71–74, Figure 16; 1904c:56. — Ulmer, 1903:55. — Siltala, 1907:499, 507–510. — Ulmer, 1909:263, Figure 395. — Lestage, 1921:729, 737, 747. — Hickin, 1948:12–13, Figures 1–8.

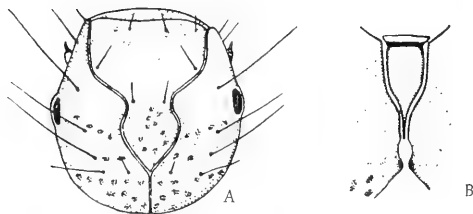
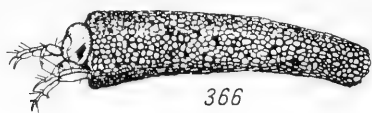
**Full-grown larva.** Length 11–14 mm (Figure 366). Head uniformly chestnut brown; posterior angle of frontoclypeus and a small adjacent area lateral to epicranial suture yellowish; large dots in posterior part of frontoclypeus and on site of dorsal and lateral stripes (Figure 367, A). Ventral side of head mainly brownish, lighter posteriorly, with groups of large dots near occipital foramen. Gula (Figure 367, B) yellowish. Setae dark reddish brown, except light setae; seta 14 markedly larger than others.

Dorsal sclerite of labrum golden brown, darker than head. Mandibles black, reddish at distal margin. Median distal tooth of left mandible projecting, 2 small, distal teeth ventrally, 2 larger teeth dorsal to it; right mandible with 5 teeth distally, subventral tooth projecting and larger than others; brush of dorsal blade narrow, tuft-shaped, with large chaetoids; lateral setae situated basally; dorsal seta short, dark; ventral light, smaller.

211 Pronotum (Figure 368, A) yellowish brown, including anterior third, groove chestnut brown; anterior margin brownish laterally, lateral margin light; posterior margin wide, narrower in middle, with 2 transverse, narrow, black stripes, median stripe some distance from posterior margin; large posterior-angle area reddish brown, with narrow, dark lateral margin, with 2 large dots posteriorly. Setae short, dark brown, strong.

Mesonotum yellowish brown, slightly darker anteriorly in middle; anterior margin light; posterior margin narrow, reddish brown, brownish in middle; margin of posterior angles slightly wider. Punctuation and setae as in Figure 368, B.

Prosternite (Figure 369) brownish in middle, with pinkish brown groups of dots laterally. Horn short, thin, grayish, with whitish apex. Mesothorax ventrally with 3-4 large pinkish sclerotized dots on each side near posterior margin; metathorax with 3 lighter dots on each side.



367

FIGURES 366 and 367. *Limnophilus extricatus* McL.:

366 - larva case; 367 - head, dorsal (A) and ventral (B).

Primary ventral setae of fore femur (Figure 370, A) forming yellowish spines, basal spine small, blunt, apical spine small, thin, situated in middle of femur; primary, posterior seta short, brown, situated basal to spines. Mid-femur (Figure 370, B) slightly convex dorsally, slightly concave ventrally; both primary, ventral setae situated in basal part; apical seta in form of large, thin spine; basal seta short, dark, strong. Primary ventral setae of hind femur (Figure 370, C) situated close together in middle of femur, dark, strong, apical seta longer than basal; posterior and distodorsal setae also long.

Lateral line on segments 3-8; hairlike spinules grayish brown. Gills on abdominal segments 2-7.

Tergite of abdominal segment 9 slightly brownish, without punctation; medioanal seta dark reddish brown, long; anterior-angle seta almost as large, shorter than medioanal seta; intermediate seta strong, dark, moderately long; lateral seta short, thin, light brown; between medioanal setae, slightly to the left, a moderately long seta resembling intermediate seta; to the right, a short, dark, strong seta; surface with 9-10 small setae.

Number and arrangement of gills of *L. extricatus*

Segment	Dorsal	Pleural		Ventral
2	3	2	2	3
	3			3
3	3	3-2	2-1	3
	3			3
4	3-2	1		2
				2
5	2			2
				2
6	2-1			2-1
				2
7	1(0)			2-1
				1(0)



Sclerite "b" of anal legs brown, large setae blackish brown; median distal seta long, thick, neighboring seta slightly shorter; lateral seta situated near former 2, strong, moderately long, much thinner; a large seta like the lateral seta at inner margin and a thin, moderately long, brown seta basally; distoventral seta strong, thin, moderately long; surface with 6-7 setae which are short to moderately long.

Sclerite "c" light brown, with wide, short, brownish black, lateral margin, with small, light seta at base. Claw brown, dark brown at end, with a large, blunt, dorsal denticle; seta 1 thick, reddish brown; seta 3 situated dorsally in basal part, thick, long, the longest on the claw; seta 2 much shorter, thin; seta 6 situated nearby close to end of suture, small, thin, yellowish; ventral setae 7 and 8 light yellow, thick, slightly curved; seta 5 small, light, situated laterally to 8; seta 4 larger, situated more inward.

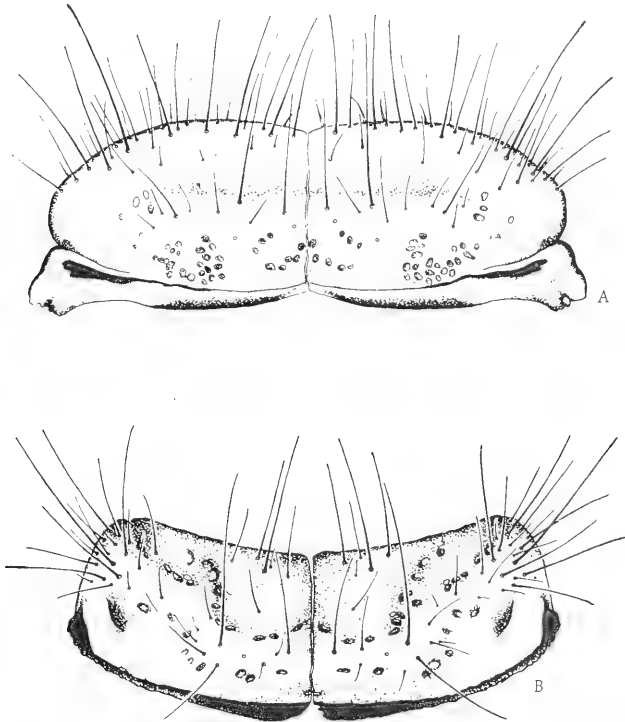


FIGURE 368. *Limnophilus extricatus* McL. Pronotum (A) and mesonotum (B)

Case made of sand grains, with smooth surface, almost cylindrical, slightly curved, rounded posteriorly; anterior opening truncate, posterior opening closed by a membrane with a large, round hole in middle; length 15-16 mm.

**Pupa.** Length 11 mm. Antennae reaching end of abdominal segment 8. Labrum light, with distinct anterior median process with minute dark spinules; seta 1 small, thin, situated laterally; large, hooked setae dark

reddish brown, thin and curved at end. Mandibles (Figure 371, A) chestnut brown; distal part relatively short, wide, slightly convex laterally, median blade serrated; lateral setae reddish brown, thin; dorsal seta slightly larger than ventral.

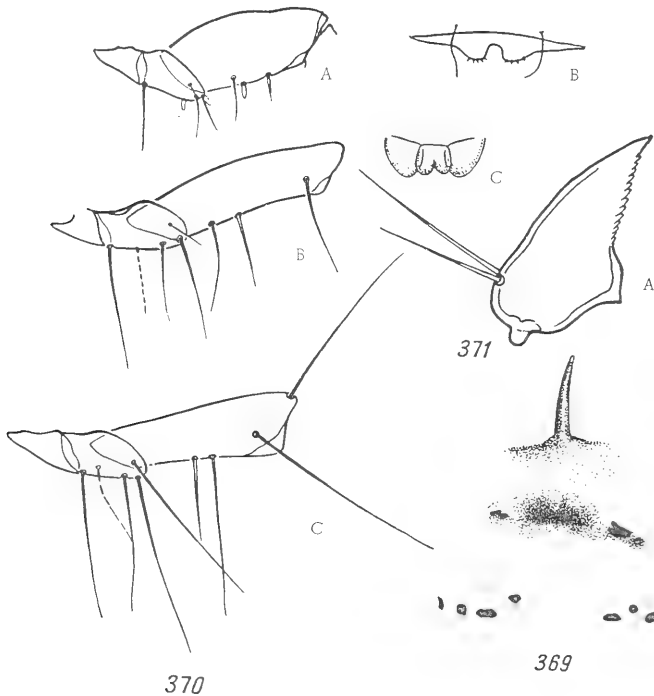
Wing sheaths reaching beginning of abdominal segment 5. Midlegs with sparse, thin, natatorial setae on tarsal segments 1-4; segments 1-4 of hind tarsi with sparse setae. Process of abdominal segment 1 (Figure 371, B) pale, yellowish, with fine, transverse striation, distal margin pinkish brown; lobes lateral to saddle-shaped process with small black spinules.

Holding apparatus on abdominal segments 3-7; number of hooks: III:2-3; IV:3; V:2-3+5-9; VI:3-6; VII:3-4. Gills on segments 2-7.

213

Anal rods almost straight, widely separated, thin, slightly club-shaped at end with minute spinules; 1st seta situated in basal third, 2nd in middle, 3rd and 4th subapically and apically.

Ventral appendages of male genitalia wide, rounded, longer than wide, divided penis sheath (Figure 371, C).



FIGURES 369-371. *Limnophilus extricatus* McL.:

369 - thoracic horn and sternites; 370 - right trochanter and femur of foreleg (A), midleg (B), and hind leg (C), posterior; 371 - pupa: right mandible, ventral (A), dorsal process of abdominal segment 1 (B), penis sheath and ventral appendages (C) (371, B, C - after Siltala).

Case 14–16 mm long, with smooth surface, like larval case, slightly curved, made of sand grains, sometimes with small pieces of detritus, rounded at end, closed with sand grains and with small holes; anterior and posterior ends attached to plants.

Mode of life and habitats. Open shore of lakes on a bottom of sand or sand with stones; clear brooks with slow current.

Distribution. Northern, central, and western parts of the European USSR. In addition, Central and Northern Europe.

#### 14. *Limnophilus affinis* Curtis

Meyer, 1867:160–161. — Siltala, 1904c:50–53, Figure 11. — Ulmer, 1909:261. — Lestage, 1921:735, 746.

**Full-grown larva.\*** Length 14–16 mm. Head mainly dark, orange-brown. Frontoclypeus (Figure 372, A) occupied almost entirely by large, dark pattern, leaving light areas as follows: posterior angle, a narrow stripe laterally in middle, before and behind tentorial pit, and a large spot in anterior part near median pit. Anterior margin dark reddish brown; anterior part with distinct punctation, posterior part with wedge-shaped punctate pattern. Dorsal stripes wide, with sharp outline laterally, close to epicranial suture; lateral and dorsal stripes slightly dark, with large dark dots; space between stripes lighter; a narrow, dark band behind eyes. Ventral surface mainly brown, yellowish posteriorly, with large, dark dots near occipital foramen, 2 larger dots at margin of dark area. Gula brownish, long (Figure 372, B); large setae black; seta 14 only slightly longer than seta 9; seta 15 thin; seta 17 strong, both of moderate length, smaller than in the species of *Limnophilus* described before this.

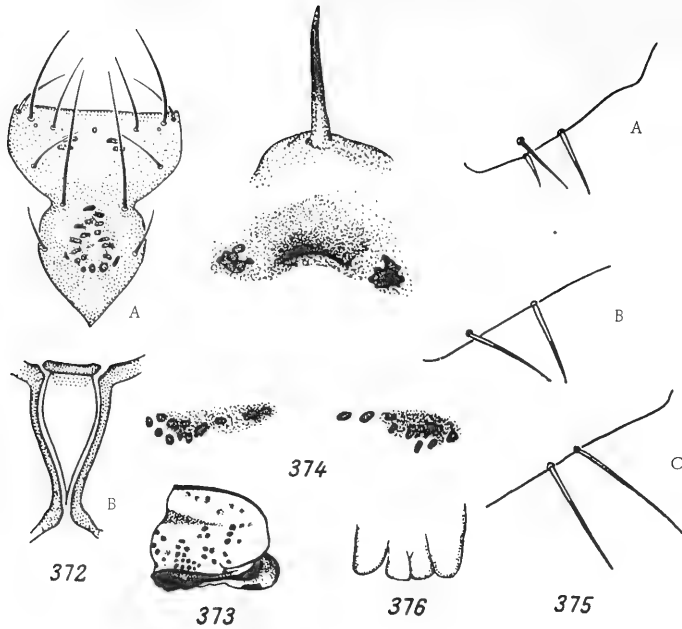
Labrum bright orange-brown; anterior margin with deep, curved, median depression; a large, dark spot behind median pit; posterior-angle sclerites short, black. Seta 1 in form of blunt, light, short spine; setae 2 and 4 represented by larger spines; seta 3 straight, light, short; setae 5 and 6 yellow, strong, larger than others, 5 slightly larger than 6.

Mandibles black, with pinkish distal margin; left mandible with large median tooth, ventral tooth distinct, 3 dorsal teeth indistinct, rounded; right mandible with 5 teeth distally, subventral tooth larger than others, 1 ventral and 3 dorsal teeth distinct, of equal size; median brushes of dorsal blade tuft-shaped, consisting of light, thick chaetoids; lateral setae situated basally, light dorsal seta slightly larger than ventral.

Pronotum (Figure 373) yellowish brown; anterior third light, with fine, sparse, dark punctation, middle of groove brownish; X-shaped median pattern consisting of large dots, lateral groups in posterior part also consisting of large dots; anterior margin with dark stripe laterally in middle of each half; posterior margin wide, light in middle, with transverse, black stripe laterally; posterior-angle process with dark lateral margin, with 2 large dark dots basally.

Large setae thin; anterior-angle seta brown, longer than others; medioanal surface seta almost the same, 2nd large surface seta slightly smaller; numerous, small setae in anterior third and other parts of sclerite.

\* Described from 4 specimens collected in the P'yavitsa River, Moscow Region, by Iordanskii in 1923. The description of Siltala (1904–1906) is made from larval exuviae from case of a male pupa. Meyer (1867:160–161) describes the case only; the earlier descriptions are unreliable.



FIGURES 372-376. *Limnophilus affinis* Curt.:

372 - frontoclypeus (A), gula (B); 373 - pronotum; 374 - thoracic horn and sternites; 375 - ventral margin of fore femur (A), mid-femur (B), and hind femur (C); 376 - penis sheath and ventral appendages of male pupa (373, 376 - after Siltala).

Mesonotum yellowish, grayish brown in anterior half; anterior margin with narrow, reddish brown stripe laterally; posterior margin narrow, reddish brown, brownish in middle; posterior angle broadly black, with an oblique, reddish brown line; setae thin, dots small. Anterior sclerites of metathorax situated close to median line, transverse, primary seta, anterior-margin seta, and one secondary seta large, other 10-11 setae small to minute. Posterior, median sclerites of metathorax indistinct, with 8-9 setae; primary medioanal surface seta longer than others. Lateral sclerites of metathorax with a narrow, reddish transverse line, with 8-10 setae anteriorly, primary anterior-angle seta and 2 secondary setae moderately long.

Propleuron light, yellowish; pleural groove black; epimeron with narrow, black outline at base, with a moderately long, brown, primary seta near suture; episternum blackish laterally; trochantin slightly longer than usual, with black median band, seta thin, moderately long, both setules situated more basally.

Prosternite (Figure 374) in form of pale, brownish sclerite, darker posteriorly, orange-brown, with groups of pinkish sclerotized dots laterally, dots less fused than in previously described forms. Horn relatively large, brownish in middle. Mesosternite represented by a row or irregular groups of large, pinkish dots; metasternite, by rows of large white dots.

Number and arrangement of gills of *L. affinis*

Segment	Dorsal	Pleural		Ventral
2	3	3	3	3-2
	3			3-2
3	3	3-2	2	3
	3			3
4	3	2	2	3
	3			3
5	2	1	0	2
	2			2
6	2			2
	2			2
7	2			2
	2			2
8	2			1

Legs reddish brown; basal segment of trochanter of all legs with 4-8 short, thin, secondary setae.

Primary ventral setae of fore femur (Figure 375, A) in form of yellowish spines, distal spines pointed, situated in middle of femur, basal spine smaller; posterior seta strong, dark, situated subventrally above basal spine or slightly more distally. Distal part of mid-trochanter with 4-5 thin, short, secondary setae. Primary ventral setae of mid-femur spine-shaped yellowish, moderately long, distal seta situated in middle of femur (Figure 375, B). Hind trochanter with 3-4 secondary setae distally. Primary ventral setae of hind femur strong, brownish, situated close together, thinner and longer than on mid-femur, the basal seta situated in middle of femur, the 2nd larger, situated in distal part (Figure 375, C).

Lateral line on segments 3-8; hairs small, brownish. Gills on segments 2-8.

Tergite of abdominal segment 9 yellowish white, with numerous, small, pinkish dots at anterior margin; medioanal setae thick, long; anterior-angle setae slightly smaller; intermediate and lateral seta thin, blackish, the former short, the latter moderately long, larger than intermediate seta, contrary to usual; 2 thin, black setae, one short, the other moderately long, between medioanal setae; 4-5 small setae on surface.

Sclerite "b" of anal legs yellowish or light brown; setae at distal margin reddish brown, mediolateral seta thick, moderately long, neighboring seta almost the same, lateral seta thinner, strong, moderately long; ventral seta dark brown; 2 similar setae at median margin; 4-5 short and small setae on surface. Sclerite "c" forming an equilateral triangle, with reddish brown lateral margin and a small, light brown seta.

Claw uniformly chestnut brown, with a dorsal denticle; dark setae reddish, light setae yellowish.

Case with smooth walls, made of fine sand grains.

**Pupa.** Length 13-15 mm. Antennae reaching middle of segment 8, scape with several, short setae. Labrum with broadly rounded, anterior margin.

Wing sheaths reaching abdominal segments 4–5; midlegs natatorial; segments 1–3 of fore tarsi, especially in female, usually with sparse, thin setae like the segments 1–3 or 1–4 of hind tarsi.

Process of abdominal segment 1 with small spinules on saddle-shaped process. Holding apparatus on abdominal segments 3–7; number of spinules: III:2–3; IV:2–3; V:2–5 + 8–12; VI:2–4; VII:2–4.

Gills on abdominal segments 2–7.

Anal rods 1.0–1.1 mm long, thin; all 4 setae dark, strong, first seta situated in basal half, 2nd seta at beginning of distal half, 3rd and 4th setae larger, situated apically and subapically. Sheath of ventral appendages and penis sheath of same length, the latter with large lobes (Figure 376).

Case as in larva; sand grains sometimes larger, forming a less smooth surface; ends of case rounded covered with sand grains, anterior and posterior membranes situated inside case, with numerous fine holes. Case attached to stones or other solid substrate.

Mode of life and habitats. Littoral of lakes, open or slightly overgrown, on solid bottom; brooks and rivulets with a moderately rapid current.

Distribution. Northwestern, western, central, and southern parts of the European USSR, including the Crimea and Caucasus. In addition, Central and Northern Europe, Iran, Japan.

Number and arrangement of gills of pupa of *L.affinis*  
(after Siltala)

Segment	Dorsal	Pleural	Pleural	Ventral
2	3 3	2	3	3 3
3	3 3	3–2	2–1	3 3
4	3 2	2–1	1	3 3–2
5	2–1 2	1 (0)	1 (0)	2 2
6	2 2–1			2 2
7	2–1			2–1 2–1

### 15. *Limnophilus centralis* Curtis

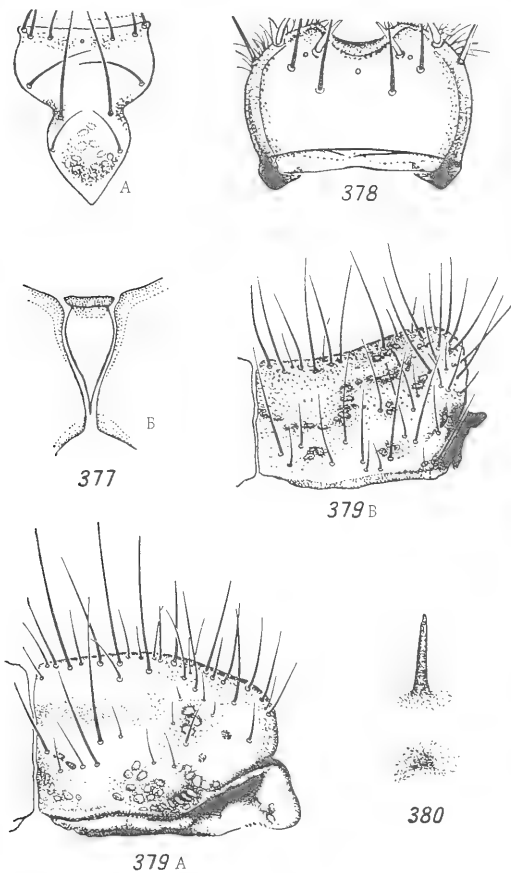
Pictet, 1834:156, Plate X, Figure 2. — Hagen, 1864:250. — Walser, 1864:70. — Meyer-Dür, 1875, 388. — Rudow, 1897:452. — Siltala, 1902:62–65, Figure 13. — Ulmer, 1903:54. — Siltala, 1904c:49. — Ulmer, 1909:264. — Döhler, 1914:32. — Lestage, 1921:738–739, 746. — Lepneva, 1940:215, 223. — Hickin, 1954:96–98, Figures 1–6.

**Full-grown larva.** Length 10.5–12.5 mm. Frontoclypeus (Figure 377, A) uniformly brown; posterior angle sometimes lighter; anterior part with

indistinct punctation; wedge-shaped pattern of posterior part formed by a few large dots. Dorsal stripes brown, sometimes indistinct laterally; head usually uniformly chestnut brown, including lateral stripes; dorsal stripes with longitudinal rows of a few large dots; lateral stripes with longitudinal rows of dots. Ventral side of head mainly chestnut brown, sometimes lighter in middle and at anterior margin; large groups of pale dots on light background near occipital foramen, a large, dark dot anterior to them. Gula brownish, slightly lighter than other surface (Figure 377, B).

The following setae are pinkish brown: 2 anterior margin setae, middle frontal 7, 9, 14, and 17; setae 9 and 14 thick, moderately long, 14 markedly larger than 9; seta 11 very thin, small; seta 12 short, pale yellow; seta 10 light, slightly smaller; seta 17 of moderate length, as large as middle frontal seta; seta 15 thin, slightly smaller.

217



FIGURES 377-380. *Limnophilus centralis* Curt.:

377 - frontoclypeus (A), gula (B); 378 - labrum; 379 - pronotum (A), mesonotum (B); 380 - prothoracic horn and sternite.

Labrum (Figure 378) orange-brown; posterior-angle sclerites blackish brown, situated at curvature.

Mandibles black, with reddish distal margin; middle tooth of left mandible largest of all 5 teeth; subventral tooth of right mandible larger than others, ventral tooth and 2 marginal dorsal teeth small, lateral dorsal seta yellowish, ventral seta light, smaller.

Pronotum (Figure 379, A) brownish yellow, with broad, pale golden median stripe in area of transverse groove; groups of large dots laterally and at posterior margin. Posterior margin with 2 small, black, transverse stripes with overlapping ends and a brown space between them; posterior-angle process with a narrow, lateral, dark stripe, with 2 large dots at base. Large setae pinkish brown.

Mesonotum (Figure 379, B) with broad, brown anterior part, slightly darker than pronotum, yellowish elsewhere; posterior margin narrow, pale brownish, posterior angles rust brown.

Sclerites of metathorax pale, indistinct. Anterior median sclerites transverse, situated close together; primary anterior-margin seta thin, moderately long; 11–12 other setae. Posterior median sclerites irregularly triangular; medioanal seta larger than 12–15 others, moderately long to small. Several median setae between sclerites. Lateral sclerites with grayish brown posterior third with a transverse row of reddish brown dots; setae present anteriorly to row of dots; greater part of sclerite white, 21–22 brownish setae, including a moderately long, primary, anterior-angle seta, and 2–3 similar secondary setae.

Prosternite in form of thin, pale, indistinct sclerite with a golden brown triangular spot at posterior margin; lateral dots small, pale, not always distinct. Horn short, thin, grayish brown (Figure 380). Ventral rows of sclerotized dots absent on mesothorax and metathorax.

Basal segment of fore and mid-trochanter with 2 secondary setae, of hind trochanter with 3 setae. Primary ventral setae of fore femur in form of light, short spines; posterior seta situated subventrally, dark, slightly more basal and almost twice as long as distal spine (Figure 381, A). Primary distoventral seta of mid-femur (Figure 381, B) represented by short, light, yellowish spine situated slightly basal to middle; second ventral seta situated basally, dark, strong, short. Ventral setae of hind femur situated close together in middle of femur, dorsal seta strong, dark, moderately long, basal seta in form of large, light, yellowish spine. Pleural rows with fewer gills.

218 Tergite of segment 9 (Figure 382) whitish, with indistinct punctuation at anterior margin; medioanal setae dark brown, of moderate length; anterior-angle seta shorter and thinner; intermediate seta large, slightly smaller than anterior-margin seta; lateral seta either large or short and thin on one or both sides; a dark seta like intermediate seta between medioanal setae; 2 large setae in middle near anterior margin; 3–4 small setae laterally.

Sclerite "b" brown; mediobasal seta long, dark reddish brown, neighboring seta almost the same, lateral seta shorter and thinner, ventral seta thin, short, light; a thick, dark brown, moderately long seta, and a shorter brown seta at median margin; surface with 6–7 small setae. Sclerite "c" light brown, with reddish brown, lateral margin; seta small, light. Claw chestnut brown, darker apically, with a large dorsal denticle; setae 1, 2, 3, and 6 dark; ventral setae 4, 5, 7, and 8 transparent, light.

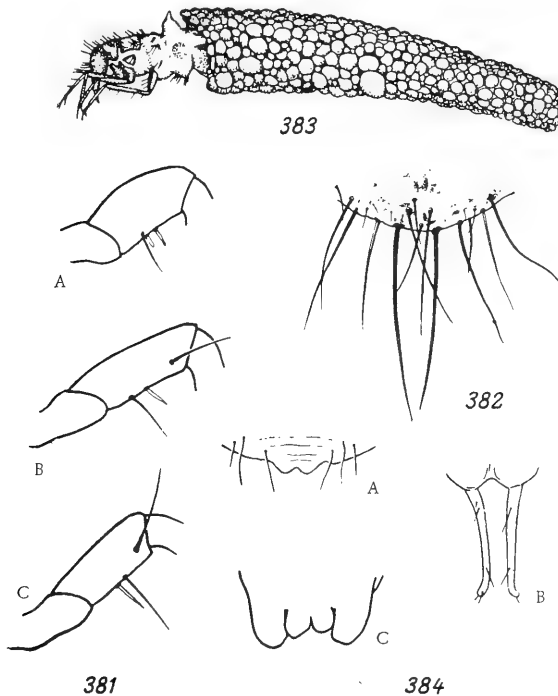


Number and arrangement of gills of *L. centralis*

Segment	Dorsal	Pleural		Ventral
2	3	2	2	3-2
	3			3
3	3	2	1	3-2
	3			3
4	3-2			2
	2			2
5	2			2-1
	2-1			2
6	1			2-1
	2-1			2-1
7	1 (0)			1(0)
				1(0)

Case made of fine sand grains, smooth, slightly curved, tapering posteriorly (Figure 383); anterior opening truncate, posterior opening closed by a membrane with a large, round hole.

(219)



FIGURES 381-384. *Limnophilus centralis* Curt.:

381 - right trochanter and femur of foreleg (A), midleg (B), and hind leg (C), posterior; 382 - tergite of segment 9; 383 - larva in case; 384 - pupa: dorsal process of abdominal segment 1 (A), anal rods (B), peris sheath and ventral appendages (C) (383 - after Hickin; 384 - after Siitla).

**Pupa.** Length 9–12 mm. Antennae reaching abdominal segment 8. Dorsal process of abdominal segment 1 pale, posterior saddle-shaped process with shallow median depression and small spinules lateral to it (Figure 384, A). Gills as in larva. Hooks of holding apparatus: III:2–4; IV:2–4; V:2–4+8–12; VI:3–4; VII:2–4. Anal rods thin, slightly thicker at end, with small spinules; 1st seta situated at basal margin, 2nd seta in distal third, 3rd and 4th setae situated apically and subapically (Figure 384, B). Penis sheath and ventral appendages in Figure 384, C.

Pupal case covered at both ends by convex covers of sand grains with fine holes between them.

Mode of life and habitats. Spring species. Forest brooks, brooks and ditches with a slow current and clean water.

Distribution. The European USSR. In addition, Europe.

## 16. *Limnophilus vittatus* Fabricius

Pictet, 1834:158, Plate X, Figures 3, a, b, 4a. — Kolenati, 1848:50. — Hagen, 1864:250–251. — Walser, 1864:69. — Meyer, 1867:162. — Meyer-Dür, 1875:387. — Ostwald, 1901:102–105. — Siltala, 1903a:24–27, Figure 7. — Struck, 1903:86–88, Plate I, Figure 9. — Ulmer, 1903:51, Figure 25. — Siltala, 1904c:49. — Ulmer, 1909:264, Figure 397. — Döhler, 1914:39. — Lestage, 1921:738, 744, 749. — Lepneva, 1940:215. — Hickin, 1943:72–74, Figures 1–6.

**Full-grown larva.** Length 12–13 mm. Head slightly oblong. Frontoclypeus mainly uniformly chestnut brown; posterior angle and stripe at posterior end of frontal sutures usually yellowish; wedge-shaped pattern indistinct, formed by large dots; surface lateral to frontal sutures, chestnut brown; periocular area large, yellowish; dorsal stripes indistinct, only slightly darker than other surface, with a few large, sometimes indistinct, dots situated either singly or in short transverse rows of 2–3; longitudinal rows of small dots on area of lateral stripes, dots more distinct between stripes. Ventral side of head mainly brown, lighter at anterior margin and along gular suture, with groups of dots on light background near occipital foramen. The described pattern is visible in preparations; head of whole specimens usually uniformly chestnut brown, with whitish light periocular area.

219

Setae characteristic; seta 14 very long, thick; large setae chestnut brown. Median and intermediate of the 3 anterior-margin setae short, lateral seta light, almost as long as median seta; anterior frontal seta longer, procumbent; middle frontal seta short, brown, posterior frontal seta small, thin; seta 7 short; seta 10 slightly smaller, light; seta 9 long, thick, shorter and thinner than 14; setae 11 and 13 small, thin; seta 12 moderately long; seta 14 slightly longer than width of head, longer and thicker than all others; seta 15 thin, of moderate length, as long as 9; seta 16 short, procumbent; seta 17 strong, thin, moderately long. Ventral seta 8 thin, strong, seta 18 small.

Labrum dark golden brown, with shallow median indentation.

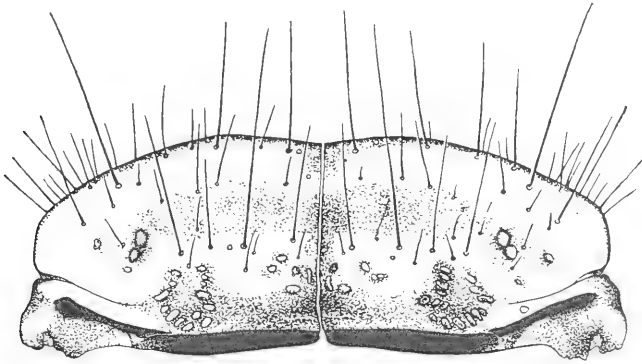
Mandibles slightly oblong; middle tooth of left mandible largest of the 5 teeth; both dorsal teeth wide, rounded, ventral teeth slightly smaller; brush situated on both mandibles in middle of dorsal blade; subventral

tooth largest on right mandible, ventral tooth pointed, narrow, large, 2 small, rounded teeth dorsally; lateral setae situated basally, dorsal seta thicker and slightly longer than ventral.

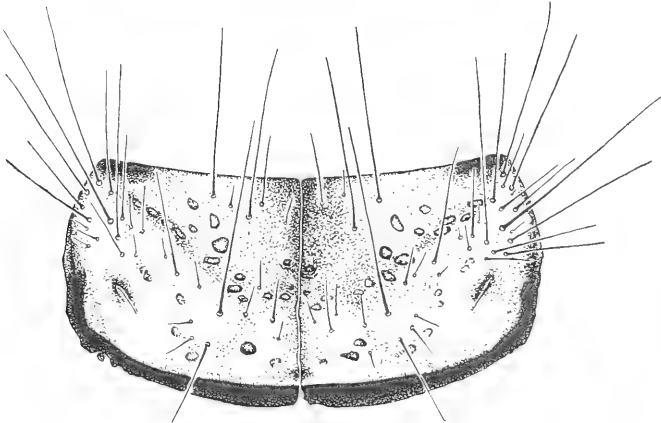
220

Pronotum (Figure 385) brown, with wide, golden brown stripe in groove in anterior third; sclerite also darker in middle of posterior margin; lateral and posterior submarginal punctation indistinct; anterior margin narrow, brownish; posterior margin with 2 wide, transverse, black stripes which almost fuse in middle; posterior-angle process with dark, lateral outline, with 2 dark, basal dots. Setae thin, pinkish brown; anterior-angle seta slightly larger than usual, long; 3 posterior surface setae almost the same.

Mesonotum (Figure 386) darker than pronotum, reddish brown, with large, sparse, distinct dots; posterior lateral area yellowish brown, with short, wide, oblique, dark streaks. Anterior margin with short, wide, blackish brown stripe laterally; posterior margin and part of lateral margin blackish brown, posterior part of margin no wider; setae as in Figure 386.



385



386

FIGURES 385 and 386. *Limnophilus vittatus* Fabr.:

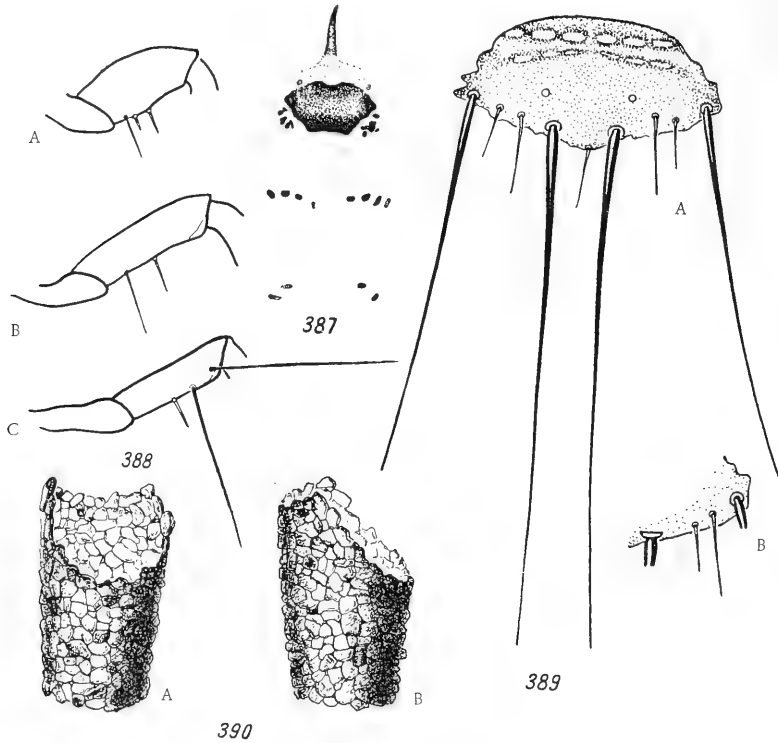
385 - pronotum; 386 - mesonotum.

Median sclerites of metanotum pale, anterior sclerites smaller than posterior sclerites; elliptical, with 6–7 setae; posterior median sclerites triangular, with 7–8 setae, medioanal, primary seta larger than others. Lateral sclerites dark, reddish brown, contrary to the norm, except in whitish yellow, anterior, and posterior areas; anterior part with 10–11 setae, including 3 long setae; posterior part with a moderately long seta.

Prosternite represented by a large, chestnut brown median sclerite with a small anterior median indentation; a black stripe behind the sclerite; anterior angles blackish; groups of dark sclerotized dots lateral to sclerite. Horn brown or brownish yellow, relatively large (Figure 387).

Ventral side of mesothorax on each side with 4 large reddish black sclerotized dots in the middle; 1 or 2 similar dots laterally near the base of the legs. Ventral side of metathorax with 2–3 light dots on each side.

221



FIGURES 387–390. *Limnophilus vittatus* Fabr.:

387 – thoracic horn and sternites; 388 – right trochanter and femur of foreleg (A), midleg (B), and hind leg (C), posterior; 389 – tergite of abdominal segment 9 (A), margin of right side (B); 390 – anterior end of case, ventral (A) and lateral (B).

Legs brown, without punctation; coxae slightly darker than other segments. Primary ventral setae of fore femur (Figure 388, A) represented by 2 yellow spines, basal spine blunt, short, apical longer and thinner; posterior seta yellow, thin, situated between basal spine and base of femur,

longer than apical spine. Distoventral seta of mid-femur (Figure 388, B) in form of sharp, yellow spine as on forelegs; basoventral seta brownish, thin, strong, spine-shaped, almost twice as long. Hind femur (Figure 388, C), as in *L. griseus*, with 3 very long, thin, blackish brown, primary setae (longer than femur), a primary, distodorsal seta, a posterior surface seta and a distoventral seta; primary basoventral seta in form of a pointed, yellow spine; primary posterior seta of trochanter also very long.

Lateral line on abdominal segments 3-7; gills on segments 2-7.

Tergite of segment 9 (Figure 389) brown, with large, light dots at anterior margin; medioanal seta thick, long, black, or dark reddish brown, longer than width of tergite; anterior-angle seta also large, dark, thinner, and smaller; intermediate and lateral seta brown, short, thin; a short, light seta between medioanal setae, displaced to the right.

Sclerite "b" of anal legs chestnut brown; 3 posterior, distal setae black or dark reddish brown; median seta large, thick, longer than others, lateral seta moderately long, thinner; ventral seta short, brown; a thick, brown, moderately long seta, and a short, thin seta at inner margin; surface with 5 short, and 3-4, small setae. Sclerite "c" brown, with wide, reddish black margin and a small, light seta. Claw reddish brown, with a large, dorsal denticle, 1 or 2 small, thick spinules lateral to it; seta 3 thick, darker than others.

222

Number and arrangement of gills of *L. vittatus*

Segment	Dorsal	Pleural		Ventral
2	3	3-1	2	3-2
	3			3
3	3	3-2	2-1	3-2
	3			3
4	3-2	2 (0)	1	2
	3-2			3-2
5	2		1 (0)	2
	2-1			2
6	2-1			2-1
	1 (0)			2-1
7	1 (0)			2 (0)
				1 (0)

Case made of fine sand grains, conical, narrow, markedly curved; anterior opening with deep ventral indentation and a small, dorsal indentation (Figure 390); cases made entirely of shells of the rhizopod *Diffugia* have been found in puddles (O. L. Kachalova).

**Pupa.** Length 10-11 mm. Antennae reaching abdominal segments 7-8. Mandibles with slightly convex median blade. Wing sheaths reaching segments 4-5.

Dorsal process of abdominal segment 1 not as large as in *L. rhombicus*, with small, light spinules on saddle-shaped process at posterior margin. Number of hooks of holding apparatus: III:1-2; IV:1-3; V:1-2+4-7; VI:1-2; VII:1-2.

Anal rods strongly curved, with few spinules; 1st seta situated at basal margin, 2nd seta in middle, 3rd and 4th setae apically and subapically. Sheath of ventral appendages of male pupae wide, slightly longer than narrow, bifid penis sheath.

Anterior and posterior end of case covered with convex covers of sand grains; case attached at anterior and posterior end to stalks or leaves of plants, usually sedge leaves.

Mode of life and habitats. Small, overgrown, stagnant water bodies, small ponds, and spring puddles.

Distribution. The European USSR, including the Crimea and Caucasus; Western and Eastern Siberia, Yakutsk Region. In addition, Europe, Asia Minor.

### 17. *Limnophilus elegans* Curtis

Döhler, 1914:30-35, Figures 1-4. — Lestage, 1921:738, 747.

**Full-grown larva.** Length 17-18 mm. Head (Figure 391) relatively wide; frontoclypeus reddish brown, with a small, light spot in posterior angle; wedge-shaped pattern formed by large dots; area lateral to frontal sutures also dark, with large light pericocular spot; dots on area of dorsal and lateral stripes large, on dark background, not very distinct. Ventral side of head dark, lighter near occipital foramen, with groups of pale dots.

Number and arrangement of gills of *L. elegans*

Segment	Dorsal	Pleural		Ventral
2	3	3	2-3	3
	3			3
3	3	2-3	2	3
	3			3
4	3	1-2		3
	2-3			3
5	2			2
	2			3
6	1			2
	1-2			2
7	1			2
	1			2

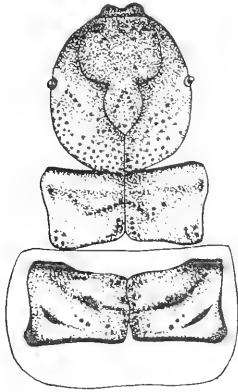
Pronotum reddish brown; groove in anterior third of sclerite darker in middle; punctation more or less distinct. Mesonotum brown, anterior

margin with wide, dark stripes laterally as in *L. vittatus*; posterior and part of lateral margin narrowly black, wider at posterior angle; punctation as in Figure 391.

Anterior median sclerites of metanotum small, oval, widely separated. Posterior median sclerites triangular. Lateral sclerites with dark, transverse, blackish spot.

Prosternite small, yellowish; horn grayish white, relatively large; ventral side of mesothorax with 2 large, sclerotized dots on each side.

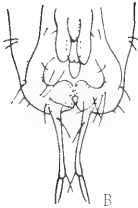
(223)



391



392 A



B



C

392



393



394

FIGURES 391 and 392. *Limnophilus elegans* Curt. (after Döhler):

391 - head, pro- and mesothorax; 392 - larval case (A), anal rods of pupa (B), pupal case (C).

FIGURES 393 and 394. *Limnophilus xanthodes* McL.:

393 - head and thorax, dorsal; 394 - larval case (393 - after Struck; 394 - after Ulmer).

Legs brown. Primary ventral setae of foreleg in form of 2 thick, light spines, apical spine thinner and almost twice as long as basal spine; posterior seta situated subventrally between spines.

223

Lateral line on segments 3-7. Gills on segments 3-7.  
Gills on segments 3-7.

Tergite of segment 9 brown; medioanal, and anterior-angle seta thick, long, latter smaller than former; intermediate and lateral seta short, thin, sometimes accompanied by a secondary seta; a large, moderately long seta situated submarginally between medioanal setae.

Claw with a dorsal denticle.

Case 20–34 mm long, made of overlapping plant fragments imbricated so that one particle covers part of the posterior particle; posterior end narrower and covered by a membrane with a large round hole (Figure 392, A).

**Pupa.** Length 15–17 mm. Antennae to segment 8 of abdomen.

Labrum with a small, light, anterior-margin seta and 5 large setae with slightly curved end. Mandibles brownish, brownish black at end, lateral setae of about the same length.

Natatorial setae on mid-tarsi not very dense, sparse on hind tarsi. Dorsal process of abdominal segment 1 as in *L. extricatus*. Holding apparatus on abdominal segments 3–7, hooks: III:2; IV:3–4; V:3–6+12–20; VI:3–6; VII:3–5. Lateral line from beginning of segment 5–8.

Anal rods slightly curved, slightly wider at end; 4 usual setae black (Figure 392, B).

Case as in larva, its ends covered by stalks of moss and other plants (Figure 392, C).

Mode of life and habitats. Small, swampy water bodies, Sphagnum swamps, occurring together with larvae of *L. sparsus*.

**Distribution.** Northern, northwestern, and western parts of the European USSR; Western Siberia, Altai, Sayans. In addition, Northern Europe.

## 18. *Limnophilis xanthodes* McLachlan

Struck, 1903:84–85, Plate II, Figure 4; Plate IV, Figure 9. — Ulmer, 1903:55. — Ulmer, 1909:262, Figure 393. — Lestage, 1921:736, 749.

224 **Full-grown larva.** Length 18 mm. Frontoclypeus entirely chestnut brown. Dorsal stripes and punctation indistinct; distinct large dots on area of lateral stripes and in space between them (Figure 393). Ventral surface of head brownish, lighter posteriorly, with groups of dots.

Pronotum brown, groove in anterior third darker in middle; punctation distinct. Mesonotum mainly brownish, lighter at posterior angles; posterior margin narrow, black, interrupted in middle, wider in posterior angle area.

Case straight, narrower posteriorly, made of plant particles, which are sometimes large, each particle overlapping the next one; anterior margin obliquely truncate, posterior end slightly narrower, closed by a membrane with a large, round, central hole (Figure 394).



**Pupa.** Length 17–18 mm. Antennae reaching end of abdominal segment 8, wing sheaths to segment 5. Plates of holding apparatus with hooks: IV:3; V:2–4+18; VI:3; VII:3. Anal rods as in *L. politus*.

Case as in larva but slightly shorter.

Mode of life and habitats. Spring species. Larvae inhabit small, stagnant water bodies, including swampy waters.

Distribution. Northwestern, central, and part of southern regions of the European USSR. In addition, Central and Southern Europe.

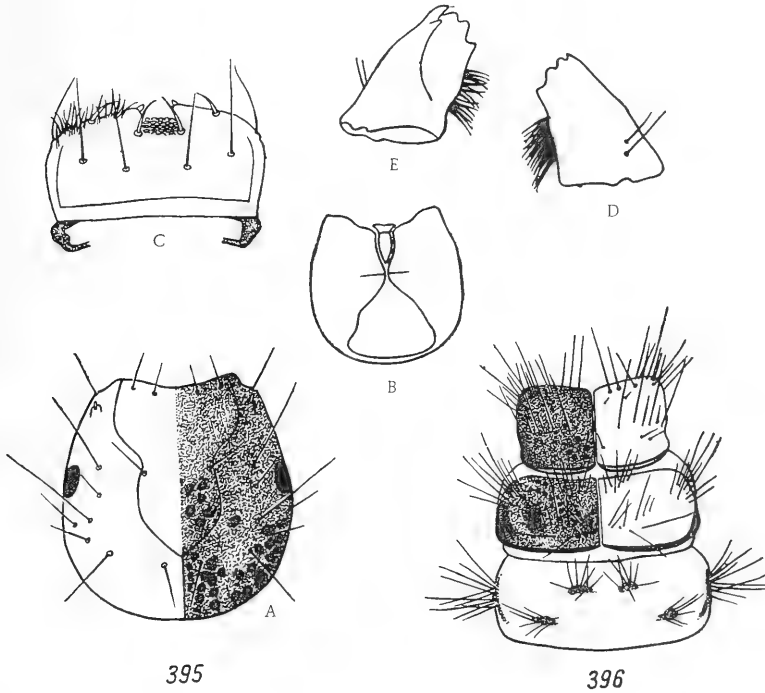
**19. *Limnophilus sparsus* Curtis**

Struck, 1900:34, Figure 34; 1903:49, Plate I, Figure 12; Plate IV, Figure 11; Plate VI, Figure 14. — Ulmer, 1900:52. — Siltala, 1908b:15–16, Figure 2. — Ulmer, 1909:263, Figure 396. — Lestage, 1921:737, 749. — Zerechnaya, 1961:24–27, Figures 1–9.

225

**Full-grown larva.** Length 15–19 mm. Frontoclypeus (Figure 395, A) light brown; dots in anterior part and wedge-shaped pattern not always distinct; area lateral to frontoclypeus also brownish; dorsal or lateral stripes absent, short transverse rows of dots in area of dorsal stripes, longitudinal rows of dots on area of lateral stripes; rows of pale dots lateral to coronal suture; groups of dots laterally on ventral surface near occipital foramen. Gula as in Figure 395, B.

(224)



FIGURES 395 and 396. *Limnophilus sparsus* Curt. (after Zarechnaya):  
 395 – head, dorsal (A) and ventral (B), labrum (C), right mandible, dorsal (D) and ventral (E); 396 – tergites of thorax.

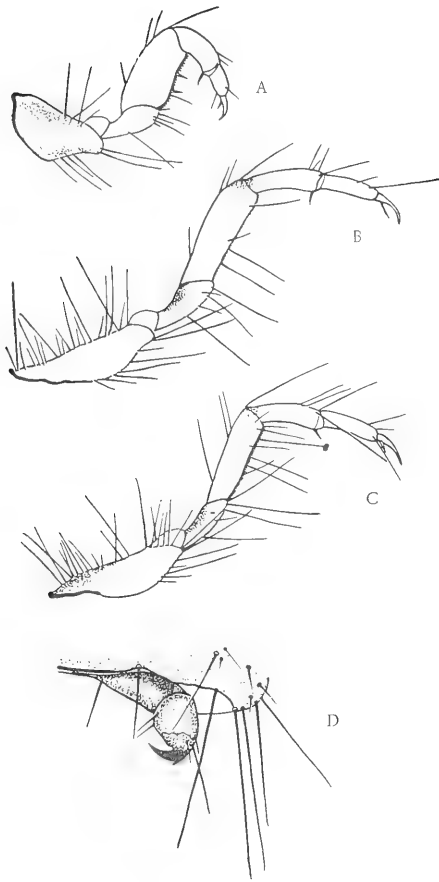


FIGURE 397. *Limnophilus sparsus* Curt. Right foreleg (A), midleg (B), and hind leg (C), posterior; left anal leg, lateral (D) (after Zarechnaya)

penis sheath bifid, slightly longer than lateral appendages. Anal rods slightly curved at end; seta situated in basal quarter, 2nd in middle, 3rd and 4th setae apically and subapically.

Pupal case 14–16 mm long; ends rounded, covered with small plant fragments as is other surface, small sand grains sometimes present at ends instead of plant particles; whole case rarely made of sand grains.

Mode of life and habitats. Spring species, in ditches, sometimes in slow current, in swampy areas.

Distribution. Northern, western, and central parts of the European USSR, Middle Asia, North [of USSR], Sаяns. In addition, Europe.

Dorsal sclerite of labrum brownish; setae as in Figure 395, C. Mandibles blackish brown (Figure 395, D, E).

Pronotum brown; groove in anterior third not dark in middle; X-shaped median pattern formed by distinct dots. Lateral dots small, not always distinct; posterior margin with wide, black stripe; setae as in Figure 396. Mesonotum dark brown anteriorly in middle; posterior angle with oblique black stripe; dots as in Figure 396; posterior margin black, wider at posterior angle. Legs as in Figure 397, A, B, C.

Gills on segments 2–7.

Claw of anal legs with a dorsal denticle (Figure 397, D).

Case 16–19 mm long, smooth, slightly curved, made of small, transversely arranged, regular particles of detritus.

**Pupa.** Length 12–14 mm. Antennae reaching beginning of segment 9. Mandibles with straight or slightly curved median blade. Mid-tarsi with natatorial setae; sparse setae on segments 1–4 of hind tarsi, sometimes only on segment 1.

Holding apparatus on abdominal segments 3–7; number of hooks variable: III:1–6; IV:2–6; V:3–6+8–19; VI:3–6; VII:3–7. Sheath of genitalia rounded posteriorly;

(225)

Number and arrangement of gills of *L. sparsus*

Segment	Dorsal	Pleural		Ventral
2	3	3	3-2	3
	3			3
3	3	3-2	2-1	3
	3			3-2
4	3	2 1 (0)		3-2
	2			2
5	2			2
	2-1			2
6	2-1			2
	1			2
7	1			2-1
	1 (0)			1

(225)

Number and arrangement of gills of pupa of *L. sparsus*

Segment	Dorsal	Pleural		Ventral
2	3	2 (0)	2	3-2
	3			3
3	3-2	2-1	2-1	3-2
	3			3
4	2	2-1		2
	2			3-2
5	2			2
	2-1			2
6	2 (0)			2-1
	2-1			2
7				1
				2-1

## 20. *Limnophilus auricula* Curtis

Pictet, 1834:158, Plate X, Figure 5. — Kolenati, 1848:66. — Hagen, 1864:252. — Meyer-Dür, 1875:387. — McLachlan, 1875:85. — Struck, 1903:93-94, Plate I, Figure 14; Plate IV, Figure 10, Plate VI, Figure 17. — Ulmer, 1903:53. — Siltala, 1903a:21-23. — Ulmer, 1909:265. — Lestage, 1921:739-740, 746.

**Full-grown larva.** Length 11-12 mm. Head (Figure 398) short, rounded in dorsal view; dorsal surface, including frontoclypeus, uniformly dark reddish brown, usually with a small light spot in angle of frontoclypeus; wedge-shaped pattern on frontoclypeus invisible in whole specimens;

punctuation indistinct on area of dorsal stripes, more distinct on area of lateral stripes. Ventral surface of head less dark; darker and with groups of dots near occipital foramen. Mandibles with blunt teeth.

Number and arrangement of gills of *L. auricula* (after Siltala)

Segment	Dorsal	Pleural		Ventral
2	3	3 (0)	3 (0)	3-2
	3			3
3	3	3-2	2-1	3-2
	3			3
4	3-2	2 (0)	1 (0)	3-2
	2			3-2
5	3	1 (0)		2
	2-1			2-1
6	2-1			2-1
	2-1			2-1
7	2-1			2-1
	2 (0)			2-1
8	2 (0)			1 (0)

Pronotum light brown; groove in anterior third, dark in middle. Mesonotum darker than pronotum anteriorly and in middle, lighter laterally and at posterior angles (Figure 398); posterior margin black, interrupted in middle; lateral margin wider, with well marked posterior-angle areas.

Primary ventral setae of fore femur in form of 2 light spines; posterior seta short, situated between spines. Ventral setae of mid- and hind femora strong, dark, of different lengths.

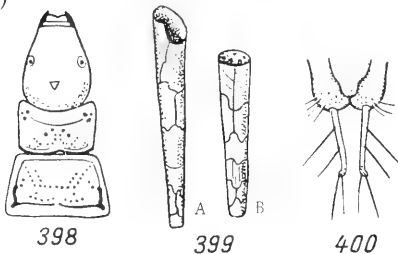
Tergite of segment 9 yellowish, indistinct, without punctuation, with 8 primary setae at posterior margin and 5-6 setae between the former and on surface. Claw with a dorsal denticle and small blunt spinules lateral to it.

Case 11-15 mm long, usually smooth, slightly narrower posteriorly, made of longitudinally arranged small plant

particles, each overlapping the next; anterior end truncate; posterior end open or closed by a membrane with a large round hole (Figure 399).

**Pupa.** Length 10.5-11.7 mm. Antennae reaching segment 7 or 8. Distal part of mandibles relatively wide, with slightly convex outer and inner sides.

(227)



FIGURES 398-400. *Limnophilus auricula* Curt. (after Struck):

398 - head, pronotum, and mesonotum; 399 - case of larva (A) and pupa (B); 400 - anal rods of pupa.

Wing sheaths reaching abdominal segment 4. Mid-tarsi with poorly developed natatorial setae; hind tarsi with sparse setae.

Gills on abdominal segments 2-8, as in larva. Holding apparatus with following number of hooks: III:1-4; IV:2-3; V:2-3+10-11; VI:2-3; VII:3. First seta of anal rods situated in basal quarter, 2nd about middle or more distally; 3rd and 4th setae situated apically and subapically (Figure 400).

Penis sheath very large, wide, with deep median indentation and 2 large, round lobes; ventral appendages with shorter sheaths.

Case straight, as in larva; anterior and posterior end attached among moss.

Mode of life and habitats. Swamps.

Distribution. Northwestern, western, and central parts of the European USSR, Caucasus. In addition, Europe.

## 21. *Limnophilus sericeus* Say (*Limnophilus despectus* Walker)

Siltala, 1902:68-71, Figure 15; 1903a:23. — Ulmer, 1903:54; 1909:262. — Lestage, 1921:736, 746.

**Full-grown larva.** Length 11-13 mm. Head dark brown but less dark than foregoing described species, with light, yellowish spots in angle of frontoclypeus and near tentorial pits; punctation bright. Ventral surface brown, light near occipital margin, with groups of dark dots.

Pronotum chestnut brown; middle of groove in anterior third and posterior submarginal area darker than other surface; posterior margin with 2 wide, transverse stripes. Mesonotum less dark, with narrow, black, posterior margin.

Legs brown, with indistinct punctation.

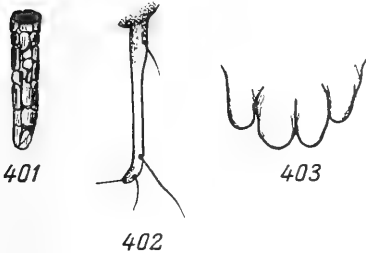
Lateral line on segments 3-7. Gills on segments 2-8. Tergite of abdominal segment 9 pale, indistinct, with 8-9 secondary setae situated between

medioanal setae and on surface, in addition to primary setae.

Claw of anal legs with a large dorsal denticle, several, small, light spinules near it.

Larval case (Figure 401) 14-17 mm long, straight, slightly narrower posteriorly, smooth, made of small and large plant fragments arranged longitudinally.

**Pupa.** Length 10-12 mm. Antennae reaching middle of segment 8 or slightly longer. Mandibles with relatively wide distal part; median blade almost straight, dorsal lateral seta slightly longer than ventral.



FIGURES 401-403. *Limnophilus sericeus* Say (after Siltala):

401 - larval case; 402 - left anal rod of pupa; 403 - penis sheath and ventral appendages of pupa.

Wing sheaths reaching end of segment 4 or beginning of segment 5. Mid-tarsi with poorly developed natatorial setae; hind tarsi with sparse setae on first 4 segments. Gills on segments 2-8.

Holding apparatus on segments 3-7; number of hooks: III:2-3; IV:2-4; V:3-4+8-15; VI:3-4; VII:3-5. Anal rods straight, thin (Figure 402), slightly curved at end; 1st seta situated in basal quarter, 2nd in apical quarter, 3rd and 4th setae subapically and apically. Sheaths of ventral appendages narrow; penis sheath large, long, bifid (Figure 403).

228 Pupal case 12-13 mm long, nearly cylindrical, with anterior and posterior membranes; anterior end of case attached to moss or other plants.

Mode of life and habitats. Among vegetation, in small, swampy water bodies.

Distribution. European USSR, mainly northern and central regions, Western and Eastern Siberia, Far East, Kamchatka, Sakhalin. In addition, Europe, Japan, North America.

## 22. *Limnophilus ignavus* McLachlan

Ulmer, 1904:55, Figures 1-2; 1909:265. - Lestage, 1921:740, 747.

**Full-grown larva.** Length 15-16 mm. Dorsal side of head uniformly dark brown, including frontoclypeus; posterior angle of latter usually with a light yellowish spot; indistinct dots on site of dorsal stripes, more or less distinct dots on site of lateral stripes. Ventral side of head brown, lighter near occipital foramen, with groups of large, indistinct dots.

Pronotum dark brown; groove in anterior third blackish brown in middle; posterior submarginal zone also slightly darker; X-shaped, punctate pattern indistinct. Mesonotum as dark as pronotum, with indistinct punctation; posterior-angle with blackish oblique stripe; posterior margin narrow, black.

Legs brown. Primary ventral setae of fore femur represented by 2 light, long, spines of different length; posterior seta short, situated slightly further basally. Primary ventral setae of mid-femur strong, moderately long, situated in basal part close together, distal spine in about the middle. Ventral setae of hind legs also dark and strong, slightly longer, situated close together in middle of femur.

Tergite of abdominal segment 9 yellowish brown, with several secondary setae in addition to primary setae. Claw with a dorsal denticle.

Case 16.0-16.5 mm long, straight, smooth, made of dark, longitudinally arranged fragments of leaves; posterior end covered by a membrane with large, central, round hole.

**Pupa.** Antennae reaching end of body. Mandibles serrated in middle. Midlegs with dense, natatorial setae; hind tarsi with sparse setae. Hooks of holding apparatus: III:2; IV:3; V:3+8; VI:3; VII:3. Sheaths of ventral appendages rounded, no longer than penis sheath.

Pupal case as in larva.

Mode of life and habitats. Small, overgrown water bodies.

Distribution. Northwestern and western parts of the European USSR. In addition, Central and Northern Europe.

### 23. *Limnophilus griseus* Linné

Degeer, 1778: Plate XIV, Figure 15. — Kolenati, 1848:54–55. — Hagen, 1864:248. — Walser, 1864:50. — Preudhomme de Borre, 1870–1872:68. — Ostwald, 1899:50–64. — Ulmer, 1902b:117. — Siltala, 1902:65–68, Figure 14. — Struck, 1903:94–95, Plate IV, Figure 7. — Ulmer, 1903:53–54. — Siltala, 1904c:53–56, Figure 12. — Ulmer, 1909:264, Figure 398. — Lestage, 1921:729, 739, 747, Figure 255, k, r. — Lepneva, 1940:215.

**Full-grown larva.** Length 15–18 mm. Head (Figure 404, A) wide, mainly dark dorsally. Frontoclypeus chestnut brown, with yellowish, posterior angle; area lateral to frontoclypeus also dark; eyes on a small, light area. Dorsal stripes not differentiated, adjacent to frontal sutures and coronal suture; posterior part of head with a well defined, light brownish space between dorsal and lateral stripes; transverse rows of large dots on site of dorsal stripes; longitudinal rows of large dots on site of lateral stripes, and in space between stripes. Ventral surface brown, including gula, lighter, and with groups of large dots near occipital foramen (Figure 404, B).

Median anterior-margin seta short, brown, strong; intermediate anterior-margin seta slightly larger; lateral anterior-margin seta light, short, curved; anterior frontal seta light, procumbent, middle seta dark brown, strong, moderately long, posterior seta small, thin. Seta 7 brown, strong, as long as intermediate seta; seta 9 thick, dark brown, long; seta 11, small, thin; seta 12 situated behind eye, dark, strong, moderately long; seta 14 longer and thicker than 9; seta 13 small, thin; seta 15 thin, moderately long, much shorter than 14; seta 16 light, procumbent; seta 17 strong, dark brown, moderately long, shorter than 15. Ventral seta 8 small, dark, seta 18 minute.

Labrum dark brown, with deep median indentation; seta 1 in form of a small, blunt, light spine; seta 2 slightly larger; seta 4 also in form of a blunt, small spine; seta 3 short, thin, light; setae 5 and 6 large, brown.

Mandibles black, without a pinkish distal area; left mandible with 5 teeth, middle tooth larger than others; the subventral of the 5 teeth on right mandible larger than others, ventral tooth narrow, 3 dorsal teeth of equal size, wide, rounded; setae situated basally, dorsal larger than ventral.

Pronotum brown, groove in anterior third dark brown in middle; posterior median part darker; anterior margin brownish; posterior margin with 2 narrow, black, separate stripes; posterior-angle process with a large dot. Punctuation distinct; major setae of moderate length.

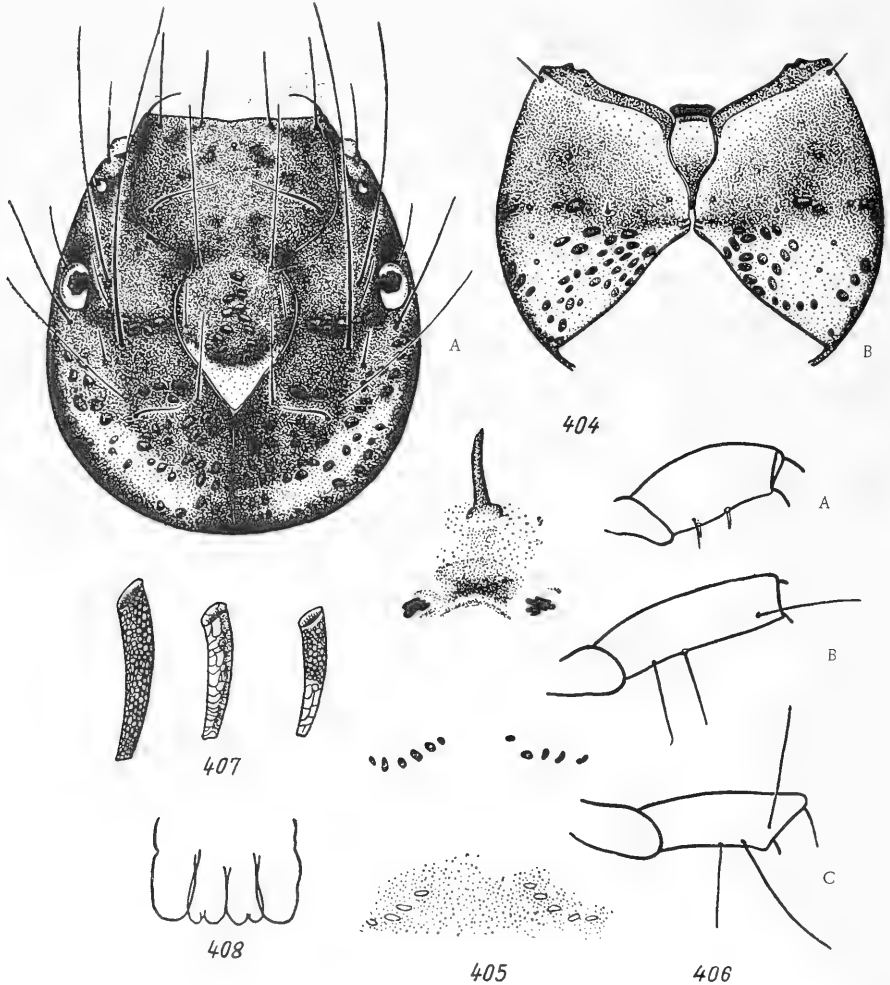
Mesonotum chestnut brown anteriorly except laterally; other surface lighter, brownish; posterior margin black, narrow; lateral margin wider, posterior angle projecting.

Prosternite pale, whitish (Figure 405), golden brown posteriorly, with groups of pinkish dots laterally; horn short, grayish. Mesosternite represented by a row of 6 large, pinkish dots on each side. Metathorax ventrally with 3–4 whitish dots on each side.

Legs brown, without punctuation; coxa slightly darker than other segments. Primary ventral setae of fore femur in form of 2 brownish spines, basal spine blunt, almost half as long as apical spine; posterior seta short, dark,

situated above or near basal spine, slightly basally or apically (Figure 406, A). Primary ventral setae of mid-femur (Figure 406, B) dark, strong, moderately long. Basoventral seta of hind legs (Figure 406, C) similar, situated in middle; apical ventral seta very long, almost reaching margin of tarsus; distodorsal seta similar; posterior surface seta of tibia, posterior surface seta of trochanter, and posterior distoventral seta of trochanter also very long.

(229)



FIGURES 404-408. *Limnophilus griseus* L.:

404 - head, dorsal (A) and ventral (B); 405 - thoracic horn and sternites; 406 - right femur of foreleg (A), midleg (B), and hind leg (C), posterior; 407 - larval case; 408 - penis sheath and ventral appendages of male pupa (407 - after Struck; 408 - after Siltala).

Lateral line on segments 3-8. Gills on segments 2-8.

Tergite of segment 9 light brown or yellowish, with indistinct punctuation at anterior margin; medioanal setae black, long, longer and thicker than



anterior-angle setae; intermediate seta thin, brown, very long; lateral seta small, light; 2 thin, strong, moderately long setae between medioanal setae; surface with 8-9 short, and small, secondary setae.

Sclerite "b" of anal legs brown; lateral dots large, not very distinct; large setae black; mediodistal seta long; neighboring seta slightly shorter; lateral seta thinner, of moderate length, separated from other 2; a similar and a short, thin seta at median margin; ventral seta strong, short; surface with 9-10 small, thin setae.

Sclerite "c" brown, with broad, black, lateral margin; basal seta small, thin.

Claw brownish yellow, dark brown apically, with a large dorsal denticle; setae 1 and 3 darker and thicker than others.

Case 12-21 mm long, with smooth surface, curved greatly narrowed posteriorly, made of small sand grains, often including plant fragments (Figure 407).

**Pupa.** Length 10-14 mm. Antennae reaching abdominal segment 7-8. Labrum with rounded anterior margin. Distal part of mandible relatively wide, convex laterally; median blade straight, serrated.

Wing sheaths reaching abdominal segments 4-5. Mid tarsi with natatorial setae; hind tarsi with sparse setae on segments 1-3.

Dorsal process of abdominal segment 1 slightly dark, posterior spinules small, few. Gills on segments 2-8. Holding apparatus on segments 3-7; number of hooks: III:1-2; IV:2-3; V:2-4+7-15; VI:2-4; VII:2-4.

Anal rods 0.7-1.0 mm; 1st seta situated in basal quarter, 2nd seta in middle or more apically, 3rd and 4th seta subapically and apically. Sheaths of ventral appendages of male wide, large; lobes of penis sheath of same length incised posteriorly (Figure 408).

Case 12-17 mm long, made of sand grains or sand grains and plant particles; anterior and posterior membranes with numerous holes; case covered with moss or other plants; anterior and posterior end of case attached to plants.

Mode of life and habitats. Usually small, stagnant water bodies, calm, overgrown littoral of lakes.

Distribution. The European USSR, including the Crimea, Altai, Sayans. In addition, Europe, Asia Minor.

Number and arrangement of gills of *L. griseus*

Segment	Dorsal	Pleural		Ventral
2	3	2	3-2	3-2
	3			3
3	3	3	2-1	3
	1			3
4	3	2-1	1 (0)	3
	2			2
5	2			2
	2-1			2
6	2-1			2-1
	2			2
7	2-1			1
	2-1			1
8	1 (0)			

24. *Limnophilus incisus* Curtis (*Colpotaulius incisus* McL.)

Struck, 1899: 117,\* 198; 1900, Figure 4. — Ostwald, 1901: 107. — Struck, 1903: 81—84, Plate I, Figure 6. — Siltala, 1904c: 29—31, Figure 6. — Ulmer, 1909: 262. — Lestage, 1921: 707—712, Figures 243, 245.

232 **Full-grown larva.** Length 15—17 mm. Frontoclypeus (Figure 409) brown; wedge-shaped pattern and anterior part of sclerite with indistinct punctation. Dorsal stripes as dark as in larvae of *L. fuscicornis*, following frontal sutures but not always in contact with suture; posterior part with short, transverse, rows of dots on stripes; lateral stripes brown, with longitudinal rows of dots; space between stripes light brown. Ventral surface light brownish, with rows of dots near the occipital foramen.

Pronotum mainly yellow; dark areas brownish; transverse groove in anterior third brown; posterior margin dark brown laterally; X-shaped, median, punctate pattern and lateral groups of dots distinct. Mesonotum usually darker in middle than laterally. Sclerites of metathorax brownish.

Legs yellow, yellowish brown in some places, with dark punctation.

Case 20—25 mm long, straight, slightly narrower posteriorly, made of small, thin plant fragments of irregular form, sometimes with a few sand grains.

**Pupa.** Length 10—11 mm. Antennae filiform, reaching end of abdominal segment 8; scape longer and thicker than other segments. Labrum yellowish brown; setae as in forms described in preceding paragraphs.

Wing sheaths rounded at end, reaching anterior margin of segment 5. Midlegs natatorial; hind tarsi with sparse setae.

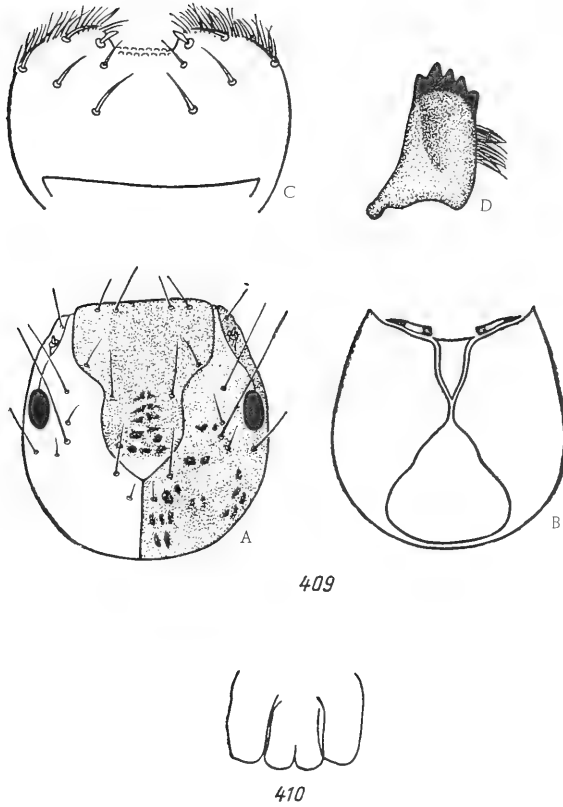
Holding apparatus on segments 3—7; number of hooks: III:1; IV:2; V:2 + 7—8; VI:2; III:2. Gills as in larva.

Anal rods thin, with slightly thicker end, curved dorsally, distal part with small spinules laterally; all 4 setae black, small, 1st situated in basal third, 2nd slightly more distally, 3rd and 4th subapically and apically. Penis sheath broadly bipid, slightly longer than ventral appendages (Figure 410). Cases as in larva.

**Mode of life and habitats.** Spring species, in stagnant water and slow rivers in plains.

**Distribution.** The European USSR, Middle Asia, Siberia, Maritime Territory, Kamchatka, Shantar Islands. In addition, Central and Northern Europe, Pakistan.

\* Struck (1899: 117) states in his description of the larva of *Colpotaulius incisus*: "... Obwohl dieselbe nicht zur Gattung *Limnophilus* gehört, so erscheint sie doch den eigentlichen *Limnophiliden*larven so konform organisiert, dass eine detaillierte Beschreibung derselben überflüssig erscheint." (Although this species does not belong to the genus *Limnophilus*, its larva resembles the true larvae of *Limnophilidae* so closely that a detailed description seems unnecessary.) The morphology of the larva and pupa of this species does not show a single character that differs from the rather slight differences between the larvae of the species of *Limnophilus* described above. Following American authors, Schmid (1955: 130) made *Colpotaulius* Kolen. a synonym of the genus *Limnophilus* Leach. The larva of *L. incisus* belongs to the group of dark-headed larvae of this genus.



FIGURES 409 and 410. *Limnophilus incisus* Curt.:  
 409 — head, dorsal (A) and ventral (B), labrum (C), right mandible,  
 inner side (D); 410 — penis sheath and ventral appendages of male  
 pupa (409 — after Zarechnaya; 410 — after Siltala).

5. Genus *Phacopteryx* Kolenati

**Full-grown larva.** Medium-sized, 12 — 14 mm long. Greater part of head uniformly dark. Apical ventral seta of fore and hind femur moderately long, dark, relatively thin, and much longer than basal seta. Case made of small fragments of thin leaves, usually trihedral.

Two species occur in the USSR; the larva of only one species is known.

**Mode of life and habitats.** Detritophagous, small, stagnant water bodies, often in swampy environment.

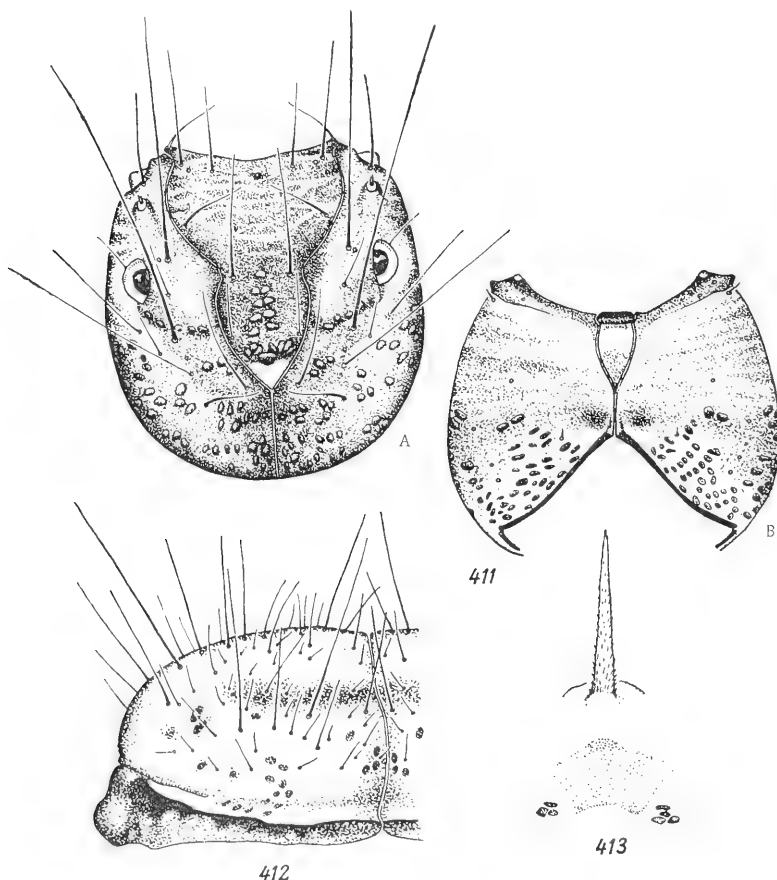
**Distribution.** Western, northern, and central parts of the European USSR, Urals, Western and Eastern Siberia, the Far East. In addition, Northern and Central Europe.

# 1. *Phacopteryx brevipennis* Curtis

Struck, 1899:324, Figures 20, 21; 1900:21, 22, 31, Plate II, Figure 10. — Ostwald, 1901:114—115. — McLachlan, 1902:185. — Struck, 1903:90—92, Plate II, Figure 6; Plate VI, Figure 18a, b. — Ulmer, 1903:63; 1909:263. — Lestage, 1921:756—758. — Lepneva, 1940:213—216, Figure 160, 6.

**Full-grown larva.** Length 12—14 mm. Head (Figure 411, A) short, wide; dorsal surface and sides mainly uniformly chestnut brown; punctuation indistinct in whole larvae, relatively light in preparations. Posterior angle of frontoclypeus lighter than other surface; tentorial pits not dark, anterior part of frontoclypeus with indistinct punctuation; long wedge-shaped pattern, consisting of large, distinct, sparse, light brownish dots. Dorsal and lateral stripes absent; dots on their sites sparse, light brown. Ventral side of head, including gula, mainly chestnut brown, lighter and with large brownish dots near occipital foramen (Figure 411, B).

233



FIGURES 411—413. *Phacopteryx brevipennis* Curt.:

411 — head, dorsal (A) and ventral (B); 412 — pronotum; 413 — prothoracic horn and sternite.

Setae reddish brown, with few exceptions. Anterior-margin setae, median and intermediate, moderately long, latter longer than former; lateral anterior-margin seta short, transparent, curved inward; anterior frontal seta the same, middle frontal seta moderately long, longest on sclerite, posterior frontal seta small, thin; seta 9 thick, long; seta 7 much shorter and thinner; setae 10, 11, and 13 small, light; seta 14 thick, larger than 9, largest on head; seta 12 moderately long; seta 15 thin, light brown, of moderate length; seta 16 light, small, procumbent; seta 17 large, strong, slightly shorter than middle frontal seta. Setae 8 and 18 as in Figure 411, B.

Dorsal sclerite of labrum uniformly chestnut brown; posterior-angle sclerites no darker; median depression shallow; seta 1 in form of small, light, thick, pointed spine; seta 2 and 4 small, light, seta 2 curved; seta 3 straight, short, light; setae 5 and 6 situated on surface, reddish brown, thick, larger than others.

Mandibles reddish brown distally, elsewhere black; middle tooth of left mandible sharp, projecting, 2 large and a small tooth dorsal to it on dorsal

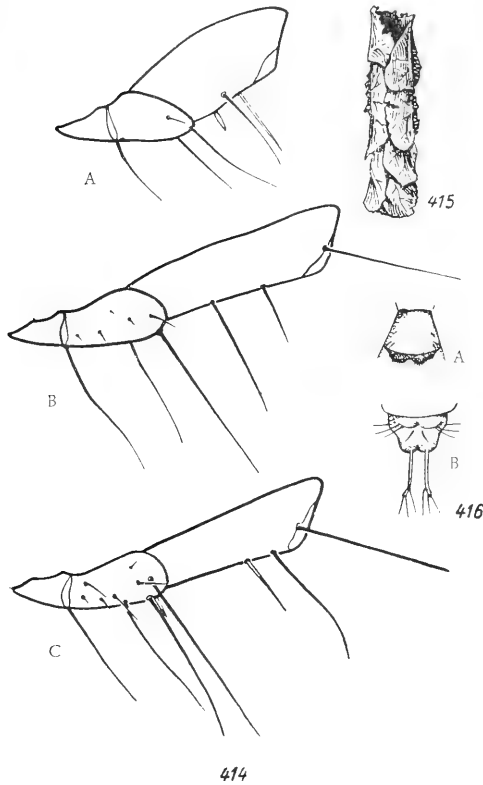
blade; 2 large teeth ventral to it on ventral blade; brushes of chaetoids situated in basal part on dorsal blade in both mandibles; lateral setae situated basally, dorsal seta short, dark, thin, ventral smaller, light.

Sclerites of cardo brown in middle; median margin wide, dark reddish brown; lateral part dark reddish brown, except for a small, narrow, brown stripe at anterior margin. Submentum brown; setae thin, moderately long, and situated on large sclerotized dots. Stripes brown; median margin dark brown posteriorly; lateral seta moderately long, distal seta small, both thin, light brown. Palpifer reddish brown; apical seta short, brown; basal median seta small, light; segments of maxillary palp about the same length, sclerites reddish brown; galea wide, short, conical. Mentum in form of wide, dark reddish brown semicircle. Ventral sclerites rodlike, brownish, seta small, light. Palpiger horseshoe-shaped, brown. Labial palps distinct, light; labium with rounded apex.

Pronotum (Figure 412) mainly light brown; anterior third brown, groove chestnut brown in middle; anterior margin narrow, brownish;

(234)

234



FIGURES 414-416. *Phacopteryx brevipennis* Curt.:

414 - right trochanter and femur of fore leg (A), mid-leg (B), and hind leg (C), posterior; 415 - larval case; 416 - pupa: dorsal process of abdominal segment 1 (A), anal rods (B) (416 - after Struck).

lateral margin narrow, brown; posterior margin wide, smoke brown, with dark, brownish stripes, divided by a wide space in middle of each half; posterior-angle process with brownish margin and a large dark spot. Mesonotum brownish in middle of anterior half; other surface yellowish brown; posterior margin narrow, brownish, slightly wider laterally. Sclerites with pale, pinkish brown, sparse punctation; setae thin.

Sclerites of metathorax indistinct, whitish; setae pinkish brown; anterior-margin sclerites situated close together with 3–4 secondary setae in addition to moderately long anterior-margin seta; posterior median tergites the same, with a moderately long medioanal seta and 5–6 additional setae; lateral sclerites large, with transverse band of reddish brown lines and dots, anterior part of sclerite setose, posterior part much smaller, without setae; each lateral sclerite with 16–17 setae, primary anterior-angle seta and 3–4 secondary setae moderately long, larger than others.

Propleuron, as in species of *Limnophilus*, with broad, brownish, pleural suture; base of trochantin of similar color; seta of trochantin short, light; seta of epimeron slightly larger. Meso- and metapleurites with narrow pleural suture and pale dots; setae as in species of *Limnophilus*.

Prosternite (Figure 413) trapezoidal, indistinct, grayish, wider anteriorly, with 2–3 dense grayish dots at posterior margin laterally; horn grayish, lighter basally. Mesosternites represented by a row of 5 large, pinkish dots and 2 additional dots more laterally.

235 Legs uniformly brown, without punctation, with narrow, brownish articulations; setae pinkish brown. Large setae of forelegs moderately long, lighter and thinner on tibiae and tarsi; primary ventral seta of fore femur (Figure 414, A) in form of strong, light spines, apical spine more than twice as large as basal; posterior seta dark, strong, situated near apical spine. Mid-trochanter (Figure 414, B) with short, posterior, primary seta and long, posterior, distoventral seta; both setae on hind trochanter long. Primary ventral setae of mid-femur moderately long, pinkish brown, basal seta longer, as long as strong, posterior, primary seta. Basoventral seta of hind femur (Figure 414, C) light brown, short, spine-shaped; apical ventral seta strong, moderately long, dark; primary, posterior seta long.

Gills on segments 2–8.

Tergite of segment 9 grayish, with indistinct punctation at anterior margin; medioanal setae close together, long, reddish brown; anterior-angle setae similar, thinner and smaller; intermediate and lateral seta short, thin; a short, strong seta and 2–3 small, thin setae between medioanal setae displaced slightly to the left; surface with 3–6 small to minute secondary setae.

Sclerite "b" of anal legs light brown; posterior margin with 3 distodorsal setae, a large, thick, median, and 2 smaller setae; ventral seta thin, moderately long; a moderately long seta, and 2 small, thin setae at median margin; surface with 6–7 small, secondary setae. Sclerite "c" yellowish brown; lateral margin wide, dark reddish brown; seta short, pinkish.

Claw yellowish brown, with reddish brown apex and a dorsal denticle, 1–2 light spinules near denticle. Setae as in *Limnophilus*; seta 1 short, situated in basal part; seta 3 situated subdorsally in distal part, moderately long; setae 1 and 3 thick; seta 6 short, 2 moderately long, both thin and situated subdorsally on side; setae 1, 2, 3, and 6 pinkish; basoventral setae 7 and 8 straight, short, light; setae 4 and 5 small, transparent, situated lateral to seta 8.

Number and arrangement of gills of *Ph. brevipennis*

Segment	Dorsal	Pleural	Ventral
2	3	3	3
	3	3	3
3	3	3	3
	3	2	3
4	3	2	3
	3	1	3
5	3	2	3
	2	1	3
6	2	0	2
	2	1	3
7	2		2
	2		2
8	2		

Case trihedral, made of green or dark, overlapping fragments of leaves; inner tube cylindrical (Figure 415).

**Pupa.** Length 11–12 mm. Wing sheaths reaching abdominal segment 4. Midlegs natatorial. Dorsal process of abdominal segment 1 less projecting than in *Limnophilus*; saddle-shaped process with shallow depression, with wide, lateral, rounded lobes with numerous, small spinules (Figure 416, A).

Plates of holding apparatus small, brown; number of denticles: III: 2; IV: 1–2; V: 2 + 8–12; VI: 2; VII: 2–3. Lateral line from end of segment 5 to 8. Gills on segments 2–8, as in larva.

Anal rods shorter than in *Limnophilus*; according to Struck (1903: 92, Plate VI, Figure 18a), small spinules are restricted to distal part; setae, except basal seta, situated apically and subapically (Figure 416, B).

Case trihedral, as in larva.

Mode of life and habitats. Small, stagnant, often swampy water bodies.

Distribution. Western, northern, and central parts of the European USSR; Urals, Western and Eastern Siberia to Irkutsk. In addition, Northern and Central Europe.

## 6. Genus *Anabolia* Stephens

**Full-grown larva.** Length 16–24 mm. Dorsal side of head with characteristic, pattern of bands, spots, and large dots. Pronotum and mesonotum light, with a distinct pattern.

Case made of sand grains and small pieces of detritus, or entirely of sand; case covered with fragments of reed stalks or other detritus, which sometimes project far beyond anterior and posterior ends.

Mode of life and habitats. Detritophagous, in littoral zone of lakes, in slow, clear brooks, and near river mouths.

Distribution. European USSR, Altai, Sayan foothills. In addition, Central and Northern Europe, China, North America.

### Key to Species

#### Full-grown larva

- 1 (2). Anterior part of frontoclypeus with 2 large dots which are narrower posteriorly; ventral surface light; labrum yellowish, darker posteriorly in middle; western part of European USSR . . . . . 2. *A. nervosa* Curt. (p. 303)
- 2 (1). Frontoclypeus with different pattern; ventral surface, including gula, largely dark; labrum brown.
- 3 (4). Frontoclypeus usually light anteriorly in middle; posterior seta of fore femur situated basal to primary ventral setae; case in form of wide, straight tube with loosely attached sand grains; rods on sides of case straight, thick, firmly attached, not or only slightly projecting beyond the case . . . . . 3. *A. furcata* Br. (p. 305)
- 4 (3). Anterior median part of frontoclypeus partly or broadly dark; posterior seta of fore femur situated near basoventral seta; case made of loosely attached sand grains, usually with pieces of detritus among them; rods in dorsal side or sides often thin (conifer needles), loosely attached, usually much longer than case . . . . . 1. *A. soror* McL. (p. 296)

#### 1. *Anabolia soror* McLachlan\* (*Anabolia sororcule* auctorum)

Siltala, 1902: 74–94, Figure 17. — Ulmer, 1903: 62. — Siltala, 1904c: 60–61. — Siltala, 1907: 500–501, 507–510. — Ulmer, 1909: 257. — Lestage, 1921: 751–756, Figure 262. — Lepneva, 1940: 215, Figure 159, 6.

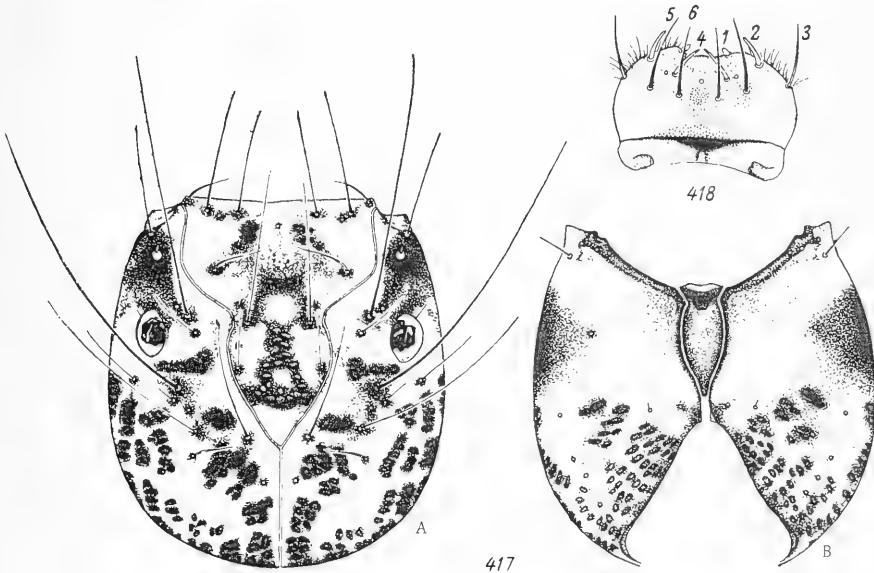
**Full-grown larva.** Length 18–22 mm. Main color of head yellow; pattern distinct, variegated, variable, described here from moderately dark specimens (Figure 417, A). Anterior margin of frontoclypeus grayish brown, with 2 large dark dots laterally, an oblique row of 3 large dots behind dots in anterior part, median dot sometimes consisting of 2–3 small, fused dots; a large, median, dark area with a group of dots in middle of anterior part; a large, dark dot behind tentorial pit; wedge-shaped pattern

\* The synonymy established by Schmid (1950: 310–311) is confirmed by the absence of data on the larva of *A. soror*. The description of the larva of *A. sororcule* McL. by Siltala (1902: 74–94) refers therefore to *A. soror* McL. Martynov (1924: 39) found among Petrograd specimens of *A. sororcule* a number of larvae the "upper appendages" of which resembled those of *A. soror*.



in posterior part of frontoclypeus dark, consisting of large, dense dots; area posterior and lateral to posterior transverse row of dots dark, reaching frontal sutures, forming a characteristic anchorlike pattern; posterior angle of frontoclypeus and area lateral to longitudinal row of dots light. Dorsal stripes indistinct, narrow, dark, reaching coronal suture and posterior end of frontal sutures\*; dots large and forming several short, dark, transverse rows and groups. Lateral stripes replaced by longitudinal rows of dots; a brownish area anterior to stripes. Ventral surface of head light at anterior margin, lighter near occipital foramen than in middle, and with large groups of dots; a small, narrow, dark stripe extending laterally from gula and along gular suture. Gula dark, dirty brown (Figure 417, B).

237



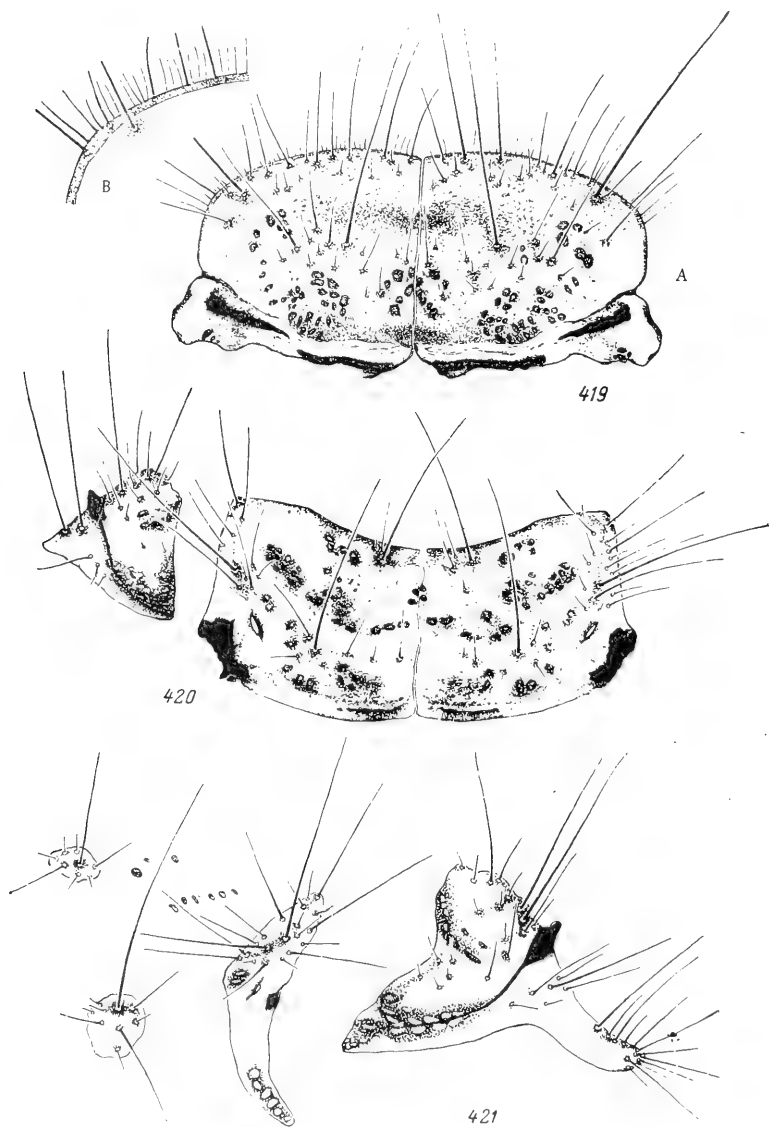
FIGURES 417 and 418. *Anabolia soror* McL.:  
417 — head, dorsal (A) and ventral (B); 418 — labrum

Setae, with a few exceptions, pinkish brown, situated on dark spots. Median anterior-margin seta and intermediate anterior-margin seta moderately long, the latter slightly larger; lateral anterior-margin seta light, curved inward; anterior frontal seta the same, situated on a large dot; middle frontal seta long, larger than other setae, situated on a dark dot; posterior frontal seta thin, short, light brown. Seta 7 resembling anterior-margin setae but slightly thinner; seta 9 thick, long; seta 11 short, thin, light brown; seta 14 larger than 9, largest on head; seta 13 small, brownish; seta 12 short, thin, slightly larger than 11; seta 15 thin, brown, much shorter than 9; seta 16 small, thin, light, directed inward; seta 17 firm, dark, longer than 7.

\* This dark part is sometimes absent, and only dots are present on site of dorsal bands.

Labrum (Figure 418) reddish brown anteriorly and posteriorly in middle, yellowish brown laterally; posterior-angle sclerites reddish brown at end; middle of sclerite with a large, round, dark reddish brown spot and 2 smaller spots near setae 5 and 6 on each side; a small, brownish, transverse, median stripe near posterior margin. Seta 1 in form of short, blunt, light spine; setae 2 and 4 forming thick, pointed, curved, light spines; seta 3 short, light; setae 5 and 6 brownish, strong, situated on dark dots, of about the same length.

238)



FIGURES 419-421. *Anabolia soror* McL.:

419 - pronotum (A), anterior corner (B); 420 - mesonotum and mesopleuron; 421 - tergites and pleuron of metathorax.

Mandibles black, reddish brown at distal margin; middle tooth of left mandible larger than others, 2 sharp teeth and a pointed process dorsal to it on dorsal blade, 2 teeth ventral to it; subventral tooth of right mandible prominent, wider than others, 3 teeth dorsal to it, one ventral; brush of mandible situated in middle, lateral setae situated basally, dorsal seta darker, ventral smaller, light.

Sclerites of cardo with wide, black, longitudinal median margin; lateral half almost entirely reddish black, other surface light brown; setae small, one strong brown seta and one light, lateral seta. Submentum brown; large, median, sclerotized dots slightly darker; setae reddish brown, moderately long. Stipes yellowish brown, with a small, brownish stripe basally; lateral seta large, reddish brown, slightly lighter than median seta. Palpifer brown, brownish basally; distal seta dark reddish brown; median seta small, light. Galea reaching base of segment 4 of palp. Mentum blackish brown; ventral sclerites reddish brown, with a small, light seta; horseshoe-shaped sclerite of palpiger reddish brown; sclerites of palps yellowish; labium with rounded apex.

238 Pronotum (Figure 419) yellow, with distinct, dark pattern of dots; groove in anterior third brown or dark brown in middle; anterior margin narrow, brownish laterally; lateral margin brownish; posterior margin grayish yellow, with brownish to dark brown, transverse stripes, divided by a broad light space; posterior-angle process with small, narrow, dark brown, lateral, marginal band, with 4–6 small, densely fused, reddish brown dots at base; pattern of dots and setae as in Figure 419; anterior-angle and medioanal seta larger than others.

240 Mesonotum (Figure 420) light, with distinct, reddish brown punctation; a brownish area near anterior margin in each half and in middle of posterior margin; posterior margin narrow, brownish yellow, with a short, wide, black area at posterior angle; setae and punctation as in Figure 420.

Tergites of metathorax brownish, with lighter margin (Figure 421); anterior median tergites small, situated close together, transverse, with 6–8 setae, primary anterior-margin seta larger than others; posterior median tergites larger, with 7–9 setae, medioanal tergite larger than others; lateral tergites light posteriorly; whitish, with a transverse band consisting of a large, dark dot, thin, reddish lines, and 2 brown dots; anterior part brownish, with 18–19 setae, anterior-angle setae longer than others.

Propleuron with wide, blackish brown, pleural suture; epimeron yellowish, with small, narrow, reddish brown stripe and a similar large dot at lateral margin; seta near suture dark, strong, moderately long; episternum darker, brown; trochantin broadly blackish brown at base, with a similar dot distally, seta short, brown, and with 2 small, light setules medial to it.

Pleurites of meso- and metathorax yellowish; metepimeron with brown, posterior, distal part; pleural suture thin, dark reddish brown, dots along suture and in transverse row on episternum. Mesopleuron with 12–14 setae on episternum, 4–5 setae on epimeron; metapleuron with 13–17 setae on episternum, 14–17 on epimeron.

Prosternite brownish, trapezoidal, with dark, posterior, marginal stripe, with groups of several small, dark dots laterally. Horn grayish brown. Mesosternites in form of an irregular row of 8–10 pinkish dots, lateral dot situated on a brownish sclerite. Metasternites represented by an anterior, and a posterior row of 3–5 dots (Figure 422).



FIGURES 422 and 423. *Anobolia soror* Mcl.:

422 — thoracic horn and sternites; 423 — right foreleg (A), midleg (B), and hind leg (C), posterior

Number and arrangement of gills of *H. infumatus* (after Siltala)

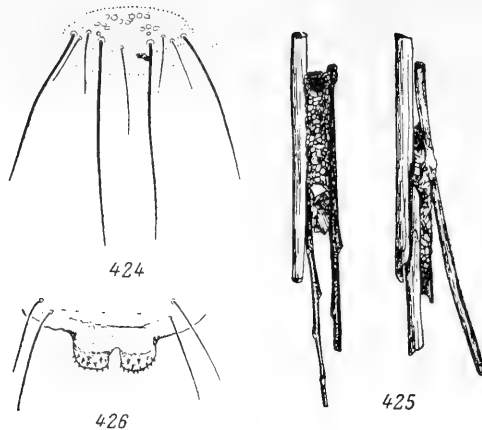
Segment	Dorsal	Pleural		Ventral
2	3	2		2
	3		2	3
3	3	3		3
	3		2	3
4	3	2		3
	3		1	3
5	2	1		3
	2		1	3
6	2	1(0)		2
	2			3
7	2-1			2
	1			2-1
8	1(0)			1(0)

Coxae brownish yellow, other segments of legs yellow, punctuation sharp, reddish brown; ratio of length of legs 62:100:97. Primary ventral setae of fore femur (Figure 423, A) in form of 2 small, light spines, a blunt, basal spine and a thin, pointed, apical spine. Distoventral seta of mid-femur (Figure 423, B) in form of a large, brownish spine in middle of segment, a strong, moderately long, dark seta further basally; mid-trochanter posteriorly with 2 small, secondary setae in addition to primary ones. Primary, basoventral seta of hind femur (Figure 423, C) spine-shaped, black, large, situated in middle of femur, second ventral seta much longer, situated more distally; hind trochanter with 4 small, secondary setae posteriorly.

Lateral line from middle of segment 3 to end of segment 8, consisting of small, light hairs.

Tergite of abdominal segment 9 (Figure 424) light yellow, with indistinct punctuation at anterior margin; medioanal setae black or blackish brown, thick, moderately long; anterior-angle setae also large, dark; intermediate and lateral seta thin, brown, short; a thin, dark, moderately long, and a small, brown seta situated between medioanal setae.

Sclerite "b" of anal legs reddish brown, large, distal setae black or blackish brown; medioanal seta thick, black; intermediate seta slightly smaller; lateral seta moderately long; a dark, moderately long seta situated apically at median margin; surface with 4-5 small setae. Sclerite "c" light brown; basal seta small, dark. Claw with a dorsal denticle; setae brown, except ventral setae; seta 1 situated dorsally, thicker than others, situated laterally in basal part; seta 2 situated subdorsally; seta 6 short, situated laterally near end of suture; seta 3 situated subdorsally in distal part; setae 4 and 5 small, thin, situated near light, ventral seta 8; seta 7 brownish, situated near base of claw.



FIGURES 424-426. *Anabolia soror* McL.:

424 - tergite of segment 9; 425 - larval case; 426 - dorsal process of abdominal segment 1 of pupa. (426 - after Siltala).

Case of full-grown larva (Figure 425) made of sand grains, sometimes also with detritus, forming a straight tube with a slightly narrower posterior end; case covered with rods which are longer than case (50-60 mm), and which project markedly posteriorly and anteriorly; anterior opening usually covered dorsally with a rod which is placed slightly obliquely and reaches side of case at posterior end.

**Pupa.** Length 15-17 mm. Antennae reaching abdominal segment 8. Labrum with small median process, as in *Limnophilus*. Mandibles with broad distal part; blade slightly convex, coarsely serrated; lateral setae situated basally, short and about equal in size.

Wing sheaths reaching abdominal segment 4. Midlegs natatorial; hind tarsi with sparse setae.

Posterior process of abdominal segment 1 large; lobes wide, with numerous black spinules (Figure 426). Holding apparatus on segments 4-7, segment 3 sometimes with a small plate with 1-2 small hooks; number of hooks: III: 0-2; IV: 2-3; V: 2-3 + 9-15; VI: 2-3; VII: 2-3.

Anal rods with numerous small spinules in middle and distally; 1st dark seta situated in basal part, 2nd in about middle, 3rd and 4th apically and subapically. Sheaths of ventral appendages of male pupa short, narrow, not longer than wide, bifid penis sheath.

Rods on case are shorter before pupation. Anterior end of case attached to branches or large pieces of trees. Posterior membrane entirely sievelike, anterior partly; both ends covered by plant or mineral particles.

**Mode of life and habitats.** Feeding on algae and detritus, in lakes, on bottom in open, sandy-stony, or sandy littoral zone, on solid or silty bottom in areas with open vegetation, also in brooks and rivulets with slow current. This species is represented in lakes in Karelia in June by young hibernating larvae, by full-grown larvae, pupae, and adults in August.

Distribution. Northern, northwestern, central, and western parts of the European USSR. In addition, Finland, Poland, Northern and Eastern parts of Western Europe.

## 2. *Anabolia nervosa* Curtis

Réaumur, 1737:160, Plate 12, Figure 14; — Degeer, 1778:418, Plate XV, Figures 11—14. — Pictet, 1834: 153—155, Plate X, Figure 1. — Hagen, 1864:252—253. — Parfitt, 1864: 8975. — Walser, 1864: 51—52. — McLachlan, 1865:54—55. — Meyer-Dür, 1874: 389—390. — Westwood J., 1877: 431—433, Plate X, Figures B1—3. — Struck, 1900:24. — Ulmer, 1901:116. — Struck, 1903:102, Plate II, Figure 5. — Ulmer, 1903:61—62, Figure 9; 1909:256, Figure 384a. — Lestage, 1921:750, 753—756, Figures 260c—263. — Nielsen, 1942: 482—489, Figure 117. — Hickin, 1943: 11—14, Figures 1—11.

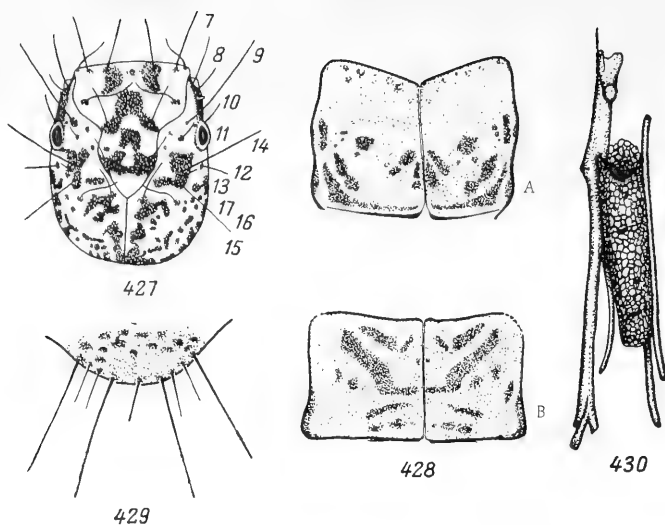
Full-grown larva. Length 21—23 mm. Lighter than *A. soror*. Main color of head yellow (Figure 427). Anterior-margin area of frontoclypeus with a large, brown, piriform spot, which is narrower posteriorly lateral to median pit on each side and curved laterally; dark area in middle smaller than in *A. soror*; dots of wedge-shaped pattern sharp, slightly dark at base.

242 Dorsal stripes replaced by short rows and groups of dots on slightly dark background; smaller dots on site of lateral stripes; brown area between eye and anterior margin of head, darker near antenna. Ventral surface with a large, grayish brown spot in middle; punctation on light background near occipital foramen; gula brown, small, reddish brown stripes lateral to it. Setae as in *A. soror*.

Labrum yellow, brownish in middle, with a dark spot near median pit. Mandibles black, with rounded apex; teeth small, blunt.

Number and arrangement of gills of *A. nervosa* (after Nielsen)

Segment	Dorsal	Pleural	Ventral
2	1-2 3		1-2 3
3	3 3	2 1-2	2-3 3
4	3 2	2-1 1(0)	2 3-2
5	2 2(0)		2 2
6	2-1 2(0)		2 2
7	2-1 1(0)		2-1 2
8	1(0)		1(0)



FIGURES 427-430. *Anabolia nervosa* Curt.:

427 - head, dorsal; 428 - pronotum (A), mesonotum (B); 429 - tergite of abdominal segment 9; 430 - larval case (427 - after Nielsen; 428-430 - after Hickin).

Pronotum and mesonotum (Figure 428) light yellow, with reddish brown punctation; dark areas absent, except for a golden brown stripe in middle of groove in anterior third; posterior margin of pronotum with dark reddish brown stripes. Posterior margin of mesonotum reddish brown in middle, yellowish laterally, broadly black at posterior angle; setae as in *A. soror*.

Prosternite pentagonal, brown, with a dark spot in middle; horn grayish brown. Mesosternites represented by a row of 4 reddish brown dots and 2 further dots behind row; metasternites similar but whitish.

Legs yellow; coxae and femora with dark punctation, tibiae with less distinct punctation; ratio of length of legs 61:100:99. Primary ventral setae of fore femur in form of 2 short, light spines; posterior seta short, darker than basal seta.

Lateral line on segments 3-8.

Tergite of segment 9 (Figure 429) brownish, with coarse punctation at anterior margin; medioanal and anterior-angle setae long; intermediate and lateral seta short, thin; a short, dark seta between medioanal setae.

Sclerites "b" and "c" yellowish; setae as in *A. soror*.

Claw of anal legs with a dorsal denticle; setae as in *A. soror*.

Case tubular, 22-26 mm long, made of sand grains, slightly narrower posteriorly, with slightly flattened ventral side; walls covered with longitudinally arranged rods which are sometimes 40-50 mm long (Figure 430).

Mode of life and habitats. Feeding on diatoms, filamentous, and other algae in vegetation on stones and tree remnants, some detritus may be present in the food; species occurs in slow, clear water with a current speed of 0.05-0.2 m/sec, rarely 0.5 m/sec, often in spring-fed brooks and canals, or in more sunlit streams with a summer temperature of 18-20°; usually on a bottom of stone or sand with detritus.



Distribution. Western part of the European USSR. In addition, Central Europe.

3. *Anabolia furcata* Brauer (*Anabolia laevis* auctorum) \*

Lucas, 1853:289-300, Plate X, Figure 2. — Klapálek, 1893: 12-16, Figure 3. — Lampert, 1900: 203, Figure 70. — Struck, 1903: 62. — Ulmer, 1903:62, Figure H; 1909:257, Figure 384b. — Lestage, 1921:750-751, 755-756. — Mayer, 1937: 16-24. — Lepneva, 1940:215.

Full-grown larva. Length 16-20 mm. Main color of head brownish yellow; punctation dark brown. Frontoclypeus smoke brown in punctate area on each side near anterior margin and between tentorial pits; wedge-shaped pattern light; dots of posterior transverse row on dark background.

243

Dorsal stripes replaced by rows and groups of large dots; a small, narrow, slightly dark stripe sometimes along frontal sutures and coronal suture; smaller dots on site of the lateral stripes; area between eye and anterior margin dark, almost fused laterally with a large dark brownish area on ventral side; large groups of dots on light background near occipital foramen. Gula brownish.

Labrum, as in *A. soror*, slightly dark not only in middle, but also laterally. Mandibles black, with strongly reduced distal teeth; each mandible with 4 small, short teeth.

Number and arrangement of gills of *A. furcata* (after Klapálek)

Segment	Dorsal	Pleural	Ventral
2	3 3	2-3 2-3	2-3 3
3	3 3	3-2 2	3 3
4	3 3-2	2 1	3 3
5	2 2	1-2 1	3-2 3
6	2 2-1	1(0) 1(0)	2 2-3
7	2 1-2		2 2
8	1(0)		1(0)

Pronotum yellowish brown; groove in anterior third with a slightly dark, golden brown stripe in middle; anterior margin reddish brown; posterior margin brownish, with long, dark stripes overlapping but not fused,

\* Synonymy, see Schmid, 1950:313.

posterior-angle process with narrow lateral margin with several small dots at base. Mesonotum lighter with narrow posterior margin. Tergites of metathorax with dark brown setae and dots.

Prosternite pentagonal, reddish brown, with lateral groups of small, reddish dots at posterior margin; horn brownish. Mesosternites represented by a row of several pinkish dots. Sternites of metathorax with whitish sclerotized dots.

244 Legs brownish yellow, with indistinct punctuation. Primary ventral setae of fore femur in form of 2 pointed, light spines, basal spine shorter than apical; posterior seta short, dark. Ventral setae of mid-femur situated in middle, apical seta spine-shaped, lighter and shorter than basal, which is moderately long; trochanter with 2 small, secondary setae. Primary ventral setae of hind femur situated distally, basal seta lighter, more apical seta spine-shaped, moderately long, dark brown; hind trochanter with 2-3 small, secondary, posterior setae.

Gills on segments 2-7 or 2-8.

Tergite of abdominal segment 9 light brownish, with several dots at anterior margin; medioanal and posterior-angle seta long, blackish brown; intermediate and lateral seta short, thin; a short, dark seta between medioanal setae.

Sclerite "b" of anal legs reddish brown; 3 distodorsal setae, a long, median distal, a similarly neighboring seta, and a much smaller, lateral seta, blackish brown; median margin with a thinner, moderately long seta; ventral seta thin, short. Sclerite "c" light brown, with reddish brown lateral margin; seta small, dark. Claw brown, dark brown apically, with a dorsal denticle.

Case forming a straight, wide tube; rods on sides thick, firmly attached, no longer, or only slightly longer, than tube.

**Pupa.** Length 17-21 mm. Antennae reaching segment 8 in male pupae, end of segment 7 in female. Labrum brown basally and anteriorly in middle; anterior margin rounded, with a slight, median projection; setae as in other species of *Anabolia*. Mandibles with wide distal part; blade slightly convex, serrated; lateral setae situated basally, dorsal seta almost reaching apex, ventral about half as long, both thin.

Wing sheaths rounded at end, reaching abdominal segment 4. Midlegs natatorial.

Saddle-shaped process of abdominal segment I' with wide lobes and numerous black marginal spinules.

Number of hooks of holding apparatus as follows: III: 0-2; IV: 3(2)-4; V: 3-4 + 10-17; VI: 3-4(5); VII: 2-1.

Lateral line on abdominal segments 5-8.

Gills as in larva, but less numerous.

Setae of anal rods situated basally, in middle, apically, and subapically; spinules numerous, especially laterally. Ventral appendages of male genitalia small, narrow, slightly shorter than lobes of bifid penis sheath.

Pupal case attached to a stone or piece of wood, its ends covered with sand grains and with sievelike membranes. Pupa bites through wall when it hatches.

Mode of life and habitats. Small brooks and rivulets with a slow current, rarely in stagnant water.

Distribution. The European USSR, Western Siberia. In addition, Central and Northern Europe.

7. Genus *Asynarchus* McLachlan

**Full-grown larva.** Length 15–23 mm. Body light. Main color yellow, dark areas poorly differentiated; large setae black or dark brown. Dorsal pattern of head resembling that of larvae of *Anabolia* but lighter. Legs light brown, with distinct dark punctation. Tergite of abdominal segment 9 pale, without secondary surface setae; 1–2 setae sometimes between medioanal setae. Claw of anal legs with 2 dorsal denticles.

Case made of detritus, straight, slightly narrower posteriorly, sometimes with long rods projecting at ends.

Mode of life and habitats. Usually in stagnant water, in slow parts of brooks and rivulets, in lakes and puddles of river floodplains, in littoral of lakes.

Distribution. Northern part of the European USSR, Siberia, Maritime Territory, Amur Region. In addition, Northern Europe, Mongolia, Japan, North America.

Key to Species

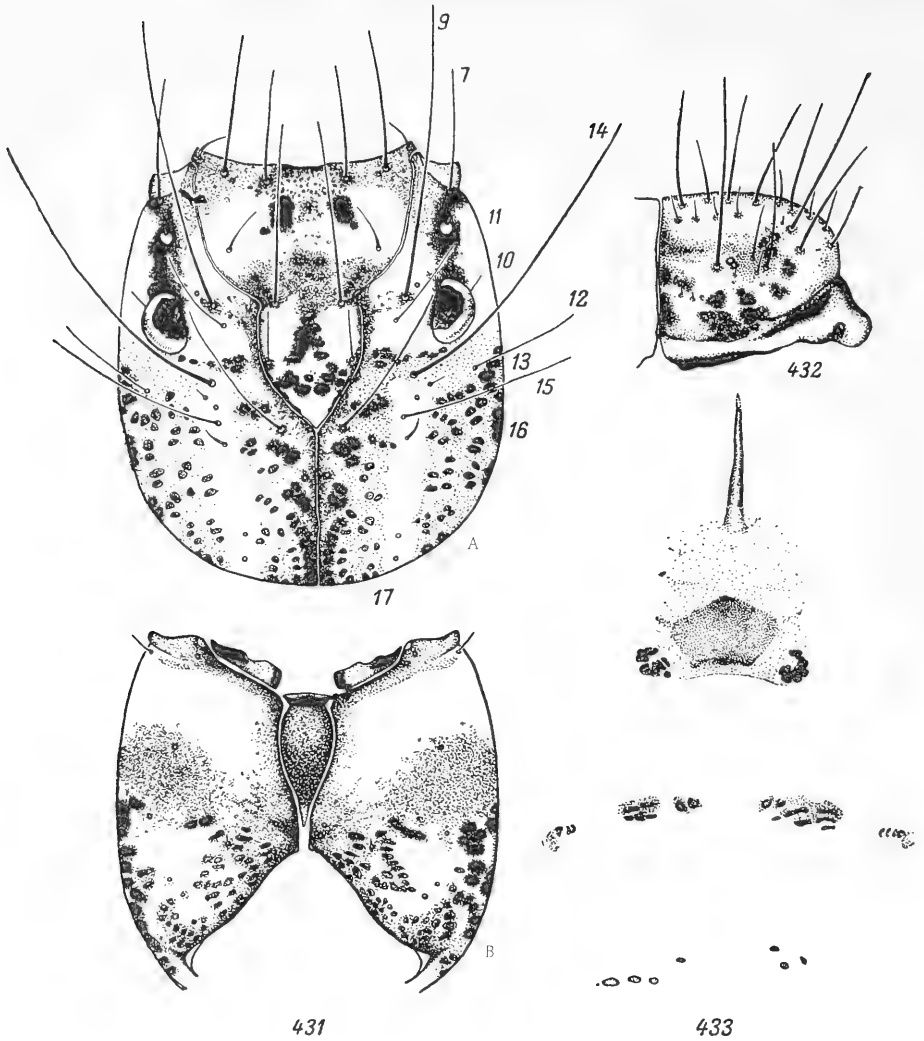
Full-grown larva

- 245 1 (2). Body light; anterior part of frontoclypeus slightly dark only in middle; a dark, very narrow stripe lateral to frontal sutures and coronal suture; tergite segment 9 without secondary seta between medioanal setae; claw of anal legs with 2 large dorsal denticles; case usually with long rods projecting at ends . . . . . 1. *A. amurensis* Ulm. (p. 307)
- 2 (1). Body less light; dark area in anterior part of frontoclypeus wider than in *A. amurensis*, sometimes entire anterior part grayish brown; stripes lateral to epicranial suture darker and broader; claw of anal legs with dorsal denticles of different size; case without long, projecting rods . . . 2. *A. lapponicus* Zett. (p. 311)

1. *Asynarchus amurensis* Ulmer, larva nova

**Full-grown larva.** Length 22–23 mm. Dorsal pattern on head resembling that of larvae of *Anabolia* but lighter. Frontoclypeus (Figure 431, A) slightly dark at anterior margin; median pit with large, reddish brown, laterally concave spots on each side as in *A. nervosa*; median space between spots slightly dark; brown spots near tentorial pits, margin of sclerite with a narrow, brownish stripe near suture posteriorly; wedge-shaped pattern distinct, light in middle, area between pattern and stripes always light, which is characteristic for larvae of *Asynarchus*. Sclerite narrowly brown on area of dorsal stripes, from tentorial pit along frontal sutures and beginning of coronal suture; short transverse rows and groups of dots lateral to stripes; space between dorsal and lateral stripes light; rows of dots on area of lateral stripes; area anterior to eye dark, as in *Anabolia*. Ventral surface with large, dark spots in middle, and a group of dots behind spot near occipital foramen; a narrow, dark brown stripe along gular suture. Gula brown, long (Figure 431, B).

(246)



FIGURES 431-433. *Asynarchus amurensis* Ulm.:

431 - head, dorsal (A) and ventral (B); 432 - pronotum; 433 - thoracic horn and sternites.

Large setae blackish brown; median anterior-margin setae moderately long; intermediate seta longer than median seta; lateral seta short, light, curved inward; anterior frontal seta the same; middle frontal seta dark brown, moderately long, thin, larger than anterior-margin setae; posterior frontal seta brown, thin, short; seta 7 thin, strong; seta 9 thick, long; seta 11 thin, unusually long, almost as long as short, thin seta 12; seta 14 longest on sclerite; seta 13 small, light; seta 15 thin, brown, rather long (longer than in *Anabolia*); seta 16 light, smaller than usual; seta 17 strong, dark.

Dorsal sclerite of labrum reddish brown, with a large, darker, median dot behind pit and a small dark median area near posterior margin; seta 1 in form of a small, thick, blunt, light spine; seta 2 represented by a small, thick, blunt, curved spine; seta 4 similar but slightly larger; seta 3 light, short; setae 5 and 6 dark brown, situated lateral to large dot.

Mandibles black; distal margin blackish brown; left mandible with large, projecting, middle tooth, and with 2 smaller teeth on dorsal and ventral blade; subventral tooth of right mandible larger than others, 3 smaller teeth dorsal to it on dorsal blade, a small tooth ventral to it on ventral blade; lateral setae situated basally, dorsal seta darker and larger than light ventral seta.

Sclerites of cardo brown; median margin and lateral stripes reddish brown; setae small, thin. Submentum reddish brown; sclerotized dots at base of setae slightly darker. Stipes brown; lateral seta moderately long, much longer than median seta. Palpifer dark brown, distal seta strong, dark, median seta in form of small light spine. Mentum blackish brown.

Pronotum (Figure 432) yellow, whitish yellow in some places; middle of groove in anterior third golden brown; sclerites slightly brownish along median suture before and behind stripe; dots of median pattern and groups of dots on sides distinct, large, reddish brown; anterior margin narrow, brown; posterior margin broad, yellowish brown; posterior-angle process with wide blackish margin, with groups of small pinkish dots at base; transverse stripes of posterior margin short, dark, divided by a large, light space.

Mesonotum lighter than pronotum; anterior margin with small, narrow, dark stripe in each half, a small dark area and several dots near margin; posterior margin present only at posterior angle, narrow, reddish brown.

246

Tergites of metathorax distinct, brown or chestnut brown; anterior tergites small, situated close to median line, with 4–5 secondary setae in addition to dark, moderately long, primary seta; posterior median sclerites large, medioanal seta long, intermediate and lateral seta smaller, 2–3 small secondary setae; lateral sclerites pale yellowish, with slightly dark, transverse band of fine oblique striation and 2 large dots, posterior part with a longitudinal row of 5–6 large dots, primary anterior-angle seta thick, dark, of moderate length, 11–12 remaining seta of different size.

Prosternite (Figure 433) brown, pentagonal, with short, narrow, dark stripes at anterior and posterior margin, with lateral groups of pinkish dots basally. Mesosternites represented by groups of large dots, in some places by thin sclerites, and several small dots lateral to large dots. Metasternites in form of several large sclerotized dots. Horn grayish brown.

247

Legs yellowish brown, with coarse, distinct, reddish brown punctation. Primary ventral setae of fore femur (Figure 434, A, B) in form of 2 light spines, a small, blunt, basal spine and a pointed, apical spine; posterior seta larger, short, strong, situated above basal spine, slightly basal or apical to it. Ventral setae of mid-femur (Figure 434, C) strong, black, moderately long, widely separated. Primary ventral setae of hind femur (Figure 434, D) situated in distal part, black, strong, apical seta moderately long, basal seta shorter; trochanter with 5–7 small, secondary setae posteriorly.

Gills on segments 2–8.

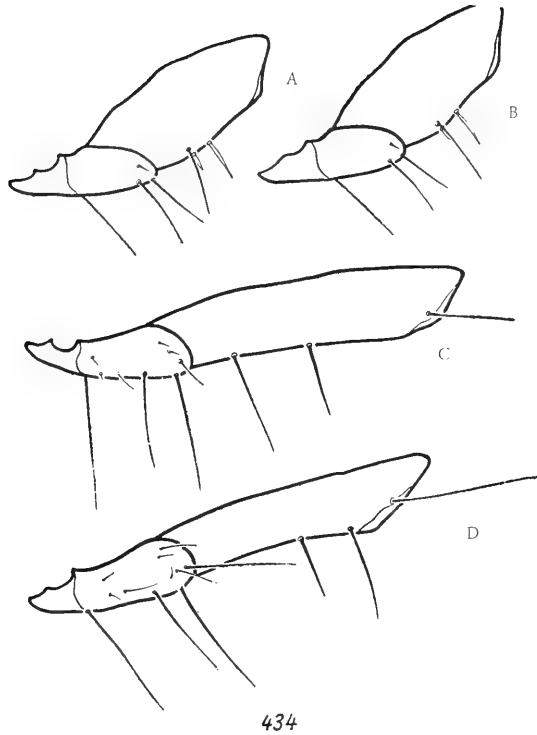


FIGURE 434. *Asynarchus amurensis* Ulm. Right trochanter and femur of foreleg (A, B), midleg (C), and hind leg (D), posterior

Tergite of segment 9 pale, light brownish, with numerous, grayish dots at anterior margin; medioanal and anterior-angle setae brownish black, about the same length; intermediate seta and lateral seta short, thin; secondary seta between medioanal setae usually absent.

Sclerite "b" of anal legs reddish brown, with black setae; median distal and neighboring seta thick, long; lateral seta situated at some distance, thinner, moderately long; ventral seta short, thin; a strong, moderately long, and a short, thin seta at median margin; surface with 7-9 thin, short, and small setae.

Sclerite "c" light brown, with black lateral margin; basal seta small, dark.

Claw brown, with 2 dorsal denticles of similar color and size; apex chestnut brown; median setae 1 and 3 dark brown, 3 longer than other setae; seta 2 moderately long, light; seta 6 short, situated near end of suture; basoventral seta 7 yellowish, darker than light seta 8; seta 5 in form of small, transparent spinule near seta 8; seta 4 situated basally, thin, brownish (Figure 435).

248

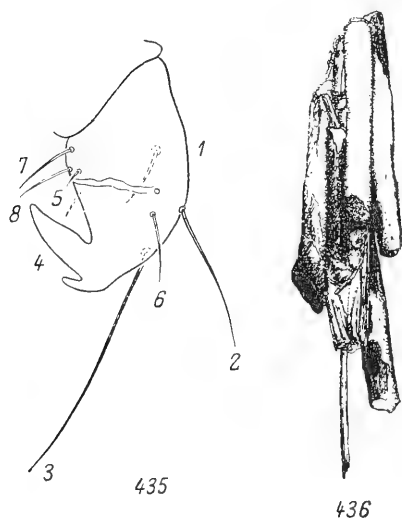
Case made of densely arranged, large pieces of detritus including rods 40-50 mm long, sometimes projecting anteriorly, and especially posteriorly (Figure 436).

Number and arrangement of gills of *A. amurensis*

Segment	Dorsal	Pleural	Ventral
2	2-3 3	1 2	2 3
3	3 3	2 2	3 3
4	3 2	2 2-1	3 3
5	2 2	1 1	2 2
6	2 2	0 1	2 2
7	2 2		2 2
8	1(0)		2-1

Mode of life and habitats. Brooks and rivulets with clean water, in parts with a slow current; puddles and lakes in river floodplains.

Distribution. USSR: Amur Region, Eastern and Western Siberia.



FIGURES 435 and 436. *Asynarchus amurensis* Ulm.:

435 - claw of left anal leg, lateral; 436 - larval case.

2. *Asynarchus lapponicus* Zetterstedt (*Anabolia modesta* Hagen; *Asynarchus fusorius* McLachlan; *Limnephilus modestus* Ross)\*

Lepneva, 1949: 172-173, Figures 23-25.

Full-grown larva. Length 15 mm. Main color yellow. Frontoclypeus (Figure 437) slightly dark in part of or whole anterior part; posterior part with a short, narrow, dark stripe near sutures; a broad, dark area near tentorial pits; anterior region with 3-4 dots on darker background lateral to median pit, 3 dots further posteriorly; wedge-shaped pattern in posterior part with large dots, darker in middle, with yellowish white lateral areas. A narrow, dark stripe on site of dorsal stripes along frontal sutures and epicranial suture, beginning from eye; transverse rows and groups of dots on dorsal stripes, also sometimes situated on dark background. Lateral stripes represented by longitudinal

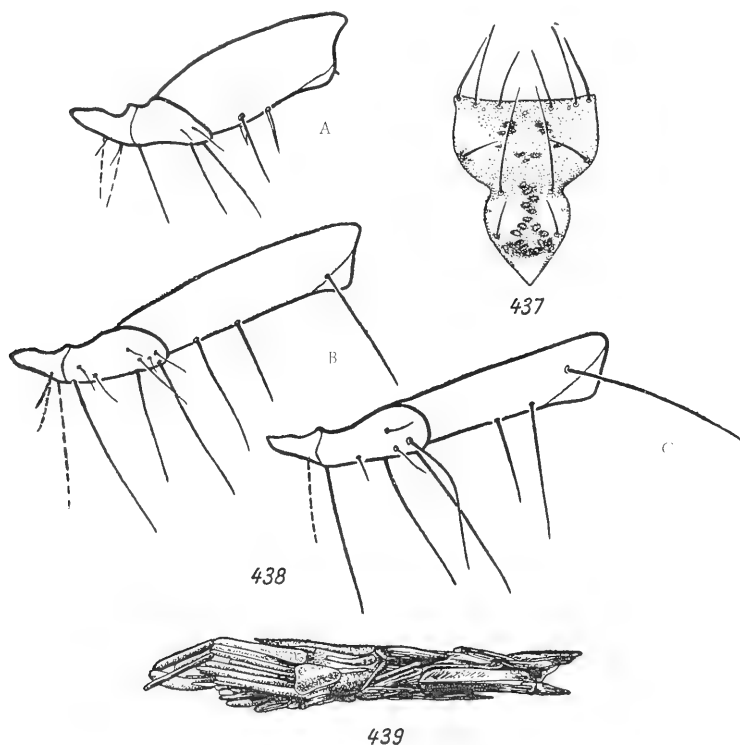
\* Synonymy, see Schmid, 1954: 78; 1955: 154.

rows of distinct dots, those near occipital foramen smaller; space between dorsal and lateral stripes yellowish, less light than areas lateral to wedge-shaped pattern. Ventral side with a large, slightly dark spot in each half; punctation near occipital foramen less dense than in *A. amurensis*; a short, dark stripe along gular suture. Gula brown. Seta 15 brown, thin, moderately long, as in *A. amurensis*.

Pronotum yellowish to light brown; groove in anterior third grayish in middle; anterior margin narrow, brownish; posterior margin grayish brown, black transverse stripes of different length, separated; posterior-angle area with black, lateral margin and 2 basal dots; posterior groups of dots situated on a slightly dark background.

Mesonotum lighter than pronotum, yellowish brown, middle surrounded by punctation, and slightly darker than other surface; anterior margin with a narrow reddish brown stripe near angles; posterior margin dark brown; posterior angles black, triangular.

249



FIGURES 437-439. *Asynarchus lapponicus* Zett.:

437 - frontoclypeus; 438 - right trochanter and femur of foreleg (A), midleg (B), and hind leg (C), posterior; 439 - larval case.

Legs light brown; punctation absent or indistinct (Figure 438). Ventral setae of fore femur (Figure 438, A) in form of light spines, widely separated;



basal spine blunt, much smaller than apical; posterior seta situated slightly distal to basal spine. Ventral setae of mid-femur (Figure 438, B) situated basally, strong, black, basal seta longer than apical; trochanter posteriorly with 5 secondary setae in apical and 3 in basal part. Ventral setae of hind femur (Figure 438, C) situated in distal part, strong and black as on the midlegs, apical seta moderately long, basal seta shorter; trochanter with a secondary seta in distal and basal part.

Gills on segments 2-7.

Number and arrangement of gills of *A. lapponicus*

Segment	Dorsal	Pleural	Ventral
2	2 3	2 2	2 2
3	3-2 3	2 2	2 3
4	2 2	1	2 2
5	2-1 1		2 2
6	1(0) 1(0)		2 1
7			2-1 1(0)

Tergite of abdominal segment 9 grayish brown, with indistinct punctuation at anterior margin; setae black; medioanal seta longer than anterior-angle seta; intermediate and lateral seta thin, the former moderately long; one thin, moderately long seta between medioanal setae; one secondary seta on surface.

250 Sclerite "b" of anal legs brownish; distal and median setae as in *A. amurensis*, surface with 4-5 secondary setae. Sclerite "c" with blackish margin. Claw with 2 dorsal denticles of different length. Larval case as in Figure 439.

Mode of life and habitats. On stones among vegetation, in littoral zone of lakes (Lake Teletskoe), near banks of rivers and in parts with a slow current (Abakan, Biya, Lena).

Distribution. Northern and northeastern parts of the European USSR, Western and Eastern Siberia.

## 2. Tribe Stenophylacini Schmid

Full-grown larva. Length 20-32 mm.

Pattern on head and thoracic sclerites mainly punctate, without stripes or spots; when present, spots are pale and indistinct.

Gills single on segments 2-7, usually absent from segment 8.

Case straight, slightly tapering posteriorly, sometimes slightly curved, and with slightly flattened ventral surface made of sand, small stones, sand and detritus, or detritus only, usually coarse particles of detritus, sometimes with long rods.

Mode of life and habitats. In rapid and slow streams; some species inhabit surf zone of lakes; the small larvae of *Enoicyla* live outside water.

Distribution. Throughout the USSR. In addition, Europe, Africa (northern coast), Iran, Pakistan, China, Japan, North America.

## Key to Genera

### Full-grown larva

- 1 (4). Case made entirely of sand grains or small stones, sometimes with particles of detritus at posterior end.
- 2 (3). Case smooth, made of sand grains, slightly flattened dorso-ventrally . . . . . 1. *Potamophylax* Wall. (p. 314)
- 3 (2). Case walls not very smooth, made of sand grains, anterior part often with small stones . . . . . 6. *Micropterna* Stein (p. 367)
- 4 (1). Case made of detritus or detritus and sand.
- 5 (10). Dorsal side of head and thoracic tergites with continuous punctate pattern; case straight.
- 6 (9). Abdominal segment 2 with presegmental gills.
- 7 (8). Case smooth; detritus particles of varying size, sometimes including long, rodlike pieces projecting posteriorly . . . . . 4. *Halesus* Steph. (p. 352)
- 8 (7). Case smooth; detritus particles in form of thin plates with closely fitting margins . . . . . 3. *Stenophylax* Kol. (p. 350)
- 9 (6). Abdominal segment 2 without presegmental gills . . . . . 2. *Hydatophylax* Wall. (p. 337)
- 10 (5). Pattern on dorsal side of head and thoracic tergites with light, longitudinal, median stripe; case slightly curved . . . . . 5. *Anisogamodes* Mart. (p. 362)

### 1. Genus *Potamophylax* Wallengren

**Full-grown larva.** Length 17–25 mm. Head uniformly dark, reddish brown or yellowish, rarely with stripes and spots on light background; groove in anterior third usually dark. Anterior-median tergites of metathorax transverse, contiguous, but not fused. Abdominal segment 1 without dorsal process. Abdominal segment 2 with dorsal and ventral presegmental gills but sometimes without pleural presegmental gills. Abdominal segment 9 with numerous, secondary setae.

Case made of sand grains, rarely sand grains and detritus or only detritus.

Mode of life and habitats. Brooks and rivulets with clear water; springs and overflows of springs; on bottom of stone or coarse detritus in open littoral zone of lakes.

Distribution. The European USSR, Caucasus, Siberia. In addition, Europe.

251 Key to the Species

Full-grown larva

- 1 (6). Head, pronotum; and mesonotum mainly dark reddish brown.
- 2 (5). Dorsal side of head uniformly, or almost uniformly, reddish brown.
- 3 (4). Anterior third of pronotum with numerous, small setae; dark, lateral margin of mesonotum extending anteriorly, at most to middle; case made of sand grains and detritus, rarely of detritus only . . . . . 2. *P. nigricornis* Pict. (p. 321)
- 4 (3). Anterior third of pronotum with only a few surface setae; dark lateral margin of mesonotum extending to most of the anterior half; case made of sand grains . . . 1. *P. stellatus* Curt. (p. 315)
- 5 (2). Frontoclypeus with light spots in anterior part, on sides of posterior part, and at posterior angle . . . . . 3. *P. latipennis* Curt. (p. 328)
- 6 (1). Head, pronotum, and mesonotum mainly yellowish or whitish yellow.
- 7 (8). A short, dark stripe between eye and anterior margin of head; posterior part of head light around occipital foramen; case made of small sand grains, or of sand grains and silt, with smooth surface . . . . . 4. *P. rotundipennis* Br. (p. 330)
- 8 (7). Head light between eye and anterior margin; area around occipital foramen dark; dorsal side and sides with wide, dark stripes; case made of coarse sand grains . . . . . 5. *P. excisus* Mart. (p. 334)

1. *Potamophylax stellatus* Curtis (*Stenophylax stellatus* auctorum)

Pictet, 1834: 137–138, Plate VII, Figure 1. — Kolenati, 1848: 67–68. — Hagen, 1864: 257. — Walser, 1864: 47–48. — Meyer, 1867: 165. — Klapálek, 1893: 23–25, Figure 6. — Struck, 1900, Figure 20. — Siltala, 1902: 83–87, Figure 19. — Struck, 1903: 99. — Ulmer, 1903: 63–64. — Siltala, 1904c: 66–67; 1907: 502. — Ulmer, 1909: 267. — Lestage, 1921: 765–774, Figures 270, 271c, f, j, l, 275 A. — Lepneva, 1940: 216, Figure 160, 17. — Hickin, 1942: 9–11, Figures 1–10. — Nielsen, 1942: 534–541, Figures 133–135. — Philipson, 1961: 321–326. — Jacquemart et Coineau, 1963: 155–168.

**Full-grown larva.** Length 21–25 mm (Figure 440). Head chestnut brown, with a narrow, yellowish white periocular area; punctation dark brown, not always distinct. Frontoclypeus (Figure 441, A) with following light areas: anterior median, posterior in region of wedge-shaped pattern and at posterior angle; anterior part of frontoclypeus with 3 median pairs of indistinct dots; wedge-shaped pattern wide, consisting of small, distinct dots.

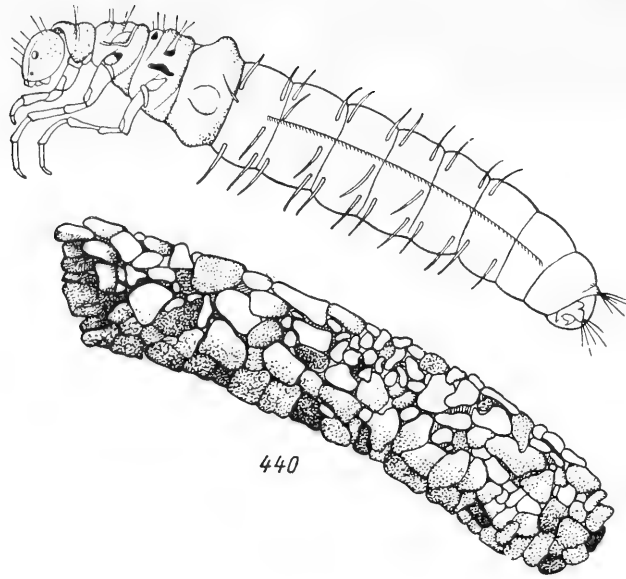


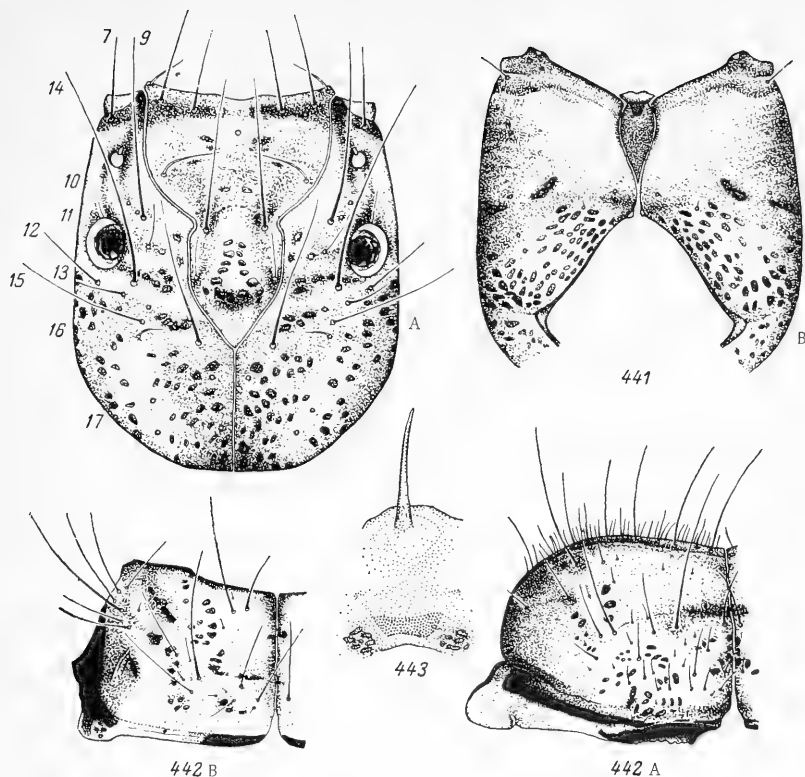
FIGURE 440. *Potamophylax stellatus* Curt. Larva and case

Dorsal and lateral stripes absent, replaced by rows and groups of dots; a dark stripe between eye and anterior margin. Ventral side with large groups of dots on lighter background near occipital foramen; 3 dots in each half, one of them dark and large. Gula dark brown (Figure 441, B).

Large setae dark reddish brown, less differing in thickness and length than those in *Limnophilus*; small setae thinner and shorter. Median anterior-margin setae moderately long, intermediate anterior-margin seta markedly longer than median seta, lateral anterior-margin seta short, light, curved inward; anterior frontal seta the same, middle, frontal seta large, slightly shorter and thinner than seta 9, posterior frontal seta small, thin. Seta 7 thin, strong; seta 9 thick, long; seta 11 minute, thin, light; seta 10 the same; seta 12 short, thin; seta 13 shorter, but thicker than 12; seta 14 not thicker, and only slightly longer than 9; seta 15 brown, thin; seta 16 short, procumbent; seta 17 dark, strong, almost as long as middle frontal seta. Ventral seta 8 small, strong; seta 18 very small.

Labrum differing in form from that of *Limnophilus*, less wide, with a shallow, rounded, median indentation; dorsal sclerite reddish brown, median dot large, brown; posterior part slightly dark in middle; posterior-angle sclerites blackish brown at end. Seta 1 in form of small, blunt, light spine; seta 2 represented by small thick, blunt, curved spine; seta 4 by a similar but straight, pointed spine; seta 3 short, light; setae 5 and 6 large, dark.

252 Mandibles black; left mandible with 2 teeth and a pointed process on dorsal blade in addition to distal tooth, and a large tooth on ventral blade; right mandible with 3 teeth dorsal to large, subventral tooth, and one tooth ventral to it; chaetoids of brush longer basally; lateral setae brown, ventral setae lighter and smaller.



FIGURES 441—443. *Potamophylax stellatus* Curt.:

441 — head, dorsal (A) and ventral (B); 442 — pronotum (A), mesonotum (B); 443 — prothoracic horn and sternite.

Sclerites of cardo transverse, slightly narrower laterally; median margin and transverse stripe black, the latter situated at anterior margin; both setae thin, small. Lateral sclerites of mentum triangular; median sclerites small, not dot-shaped as in *Limnophilus*, but transverse and almost fused with lateral sclerites; seta dark brown, large, situated near distal margin. Stipes brown, with reddish brown median margin posteriorly; lateral seta brown, large; distal seta small, thin, short. Palpifer blackish laterally; apical seta thin, dark; basal median seta small, light; galea cylindrical, rounded apically; palp very short, its 3 proximal segments about the same length, last segment smaller. Mentum in form of a narrow, dark semicircle with a blackish, transverse stripe in middle; ventral sclerites with a minute, light seta; palpifer in form of wide horseshoe-shaped palps slightly longer than wide rounded end of labium.

Pronotum (Figure 442, A) yellowish in middle, brownish laterally in anterior part and at posterior margin; groove in anterior third golden brown in middle; anterior margin brownish; posterior margin brown; transverse stripes black, separated; lateral margin wide; a group of pinkish dots near base of posterior-angle process; large setae brownish black.

Mesonotum (Figure 442, B) lighter than pronotum; anterior part with narrow, dark, median area, posterior part with a wider, dark, median area; anterior angle with a darker area in punctate region; posterior angle light with reddish brown streaks; anterior margin with a short, dark band in middle; posterior margin light brown in middle, lighter elsewhere, posterior angle and greater part of lateral margin broad, black, narrower anteriorly.

253 Tergites of metathorax slightly brownish; anterior pair situated close together; setae short and small, anterior and posterior tergites with 7-8 and 6-7 secondary setae in addition to primary setae; lateral tergites large, with reddish brown striation and a large dot in middle, posterior part with pale punctation, anterior part with 10-11 secondary setae, in addition to a moderately long, anterior-angle, primary seta. Metanotum with small setae between sclerites, especially posteriorly.

Prosternite (Figure 443) trapezoidal, light brownish, with a small, narrow, reddish stripe posteriorly, with groups of indistinct dots laterally. Mesosternites represented by 2 rows of pinkish dots forming a wedge-shaped pattern. Metasternites with similarly arranged white dots.

Legs (Figure 444) brown, darker than thoracic tergites; coxae and femora with dark dots, trochanters and tibiae less distinctly punctate. Secondary setae present only on coxae and femora; femora with only a few secondary setae on dorsal side. Primary ventral setae of fore femur in form of 2 light spines, both pointed, apical seta as long as posterior seta, the latter short, dark, situated in middle between basal spine and margin. Primary ventral setae of mid-femur brown, spine-shaped, basal spine slightly smaller; posterior distoventral setae of mid-trochanter almost the same but slightly larger and lighter. Ventral seta of hind femur represented by similar spines situated close together in middle, basal spine smaller; posterior seta situated in distal part; posterior distoventral seta of hind trochanter long.

Abdominal segment 1 without dorsal process; lateral processes normally developed; dorsum of segment strongly convex, with numerous small, black, secondary setae situated, as are primary setae, on small sclerotized dots; ventral surface also convex, with 2 small, dark sclerites, and with setae on entire surface on sclerites and sclerotized dots.

Lateral line on segments 2-8; hairs small, brownish.

Gills single, on segments 2-7.

Ventral side of segments 2-7 with elliptical, transverse, smooth areas of thin integument.

254 Tergite of segment 9 (Figure 445) brown, with 2 rows of dots at anterior margin; setae black; medioanal and anterior-margin setae thick, of almost equal length, the former slightly larger; intermediate seta thin, very long, lateral seta short; 2 large, moderately long, secondary setae between medioanal setae; other secondary setae, margin and surface setae numbering 17-19,\* in contrast to *Limnophilus*, and differing in size from small to long.

Sclerite "b" of anal legs brownish; distodorsal setae about equally spaced, long, lateral seta smaller than other 2, median seta larger, ventral seta short, dark; a long, black seta resembling median distal seta, and a short, thin seta at ventral margin; surface with 7-8 setae. Sclerite "c" yellowish

\* They are more numerous according to Siltala (1907; 510).

255 brown; margin broad, black; seta small, dark. Claw light brown, dark brown apically, with a dorsal denticle; setae as in *P. nigricornis* (Figure 455).

(254)

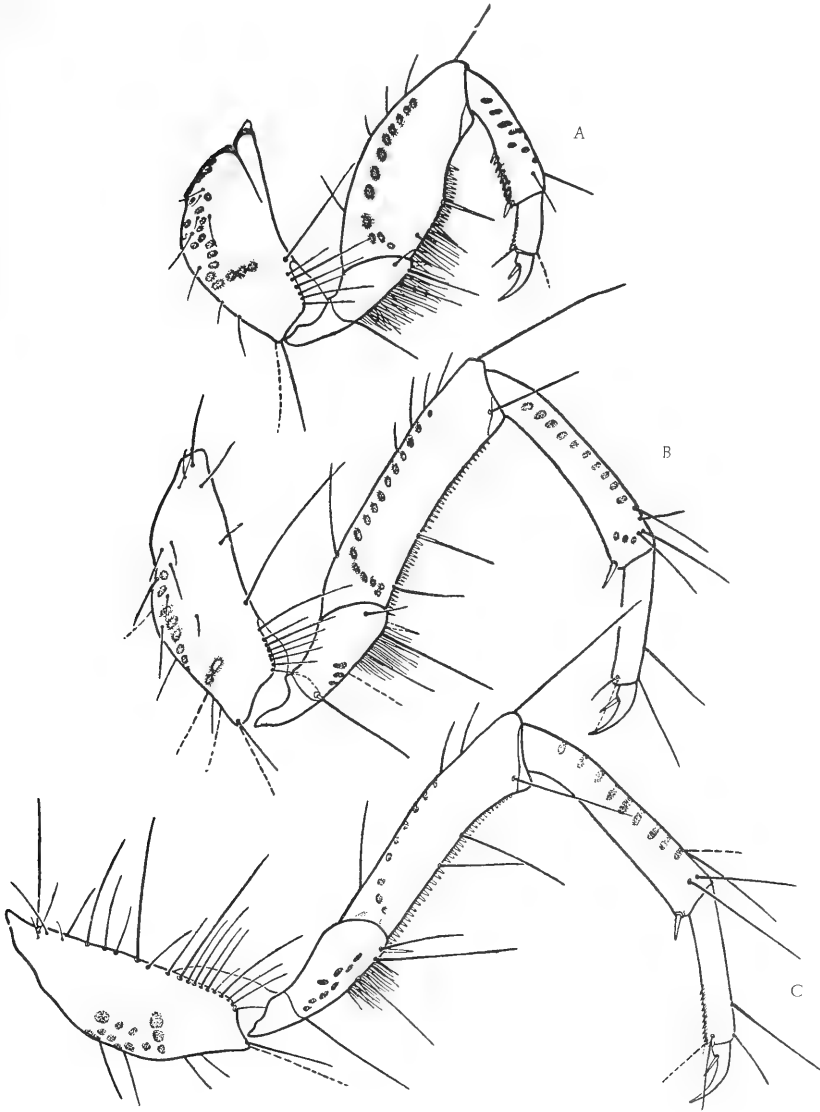
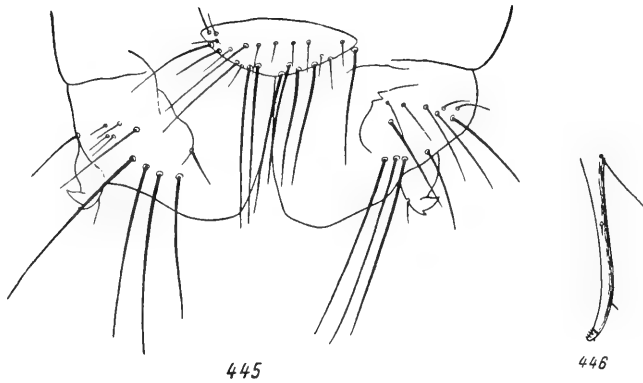


FIGURE 444. *Potamophylax stellatus* Curt. Right foreleg (A), midleg (B), and hind leg (C), posterior

Case made of coarse sand grains,\* slightly curved, slightly flattened ventrally, rounded posteriorly, with obliquely truncate anterior margin.

\* Nielsen (1942; 540) found particles of plants and detritus on cases of larvae of medium and older stages. There are no such cases in the collection of the Zoological Institute.



FIGURES 445 and 446. *Potamophylax stellatus* Curt.:  
 445 — tergite of abdominal segment 9 and anal legs; 446 —  
 left anal rod of pupa, dorsal (445 — after Jacquemart;  
 446 — after Nielsen).

**Pupa.** Length 17–21 mm. Antennae reaching to end of abdominal segment 8 or almost end of body.

Labrum brownish dorsally, slightly longer than wide, with straight sides; anterior margin with distinct median process with small setae 1 near it; the 5 other setae large, black, hooked, situated on a light area. Mandibles brown basally, dark brown apically; blade straight, serrated; lateral setae dark brown, dorsal seta short, strong, ventral seta thin, smaller.

Number and arrangement of gills of *P. stellatus*

Segment	Dorsal	Pleural	Ventral
2	1 1	1 1	1 1
3	1 1	1 1	1 1
4	1 1	1 1	1 1
5	1 1	1(0)	1 1
6	1 1	1(0)	1 1
7	1		1 1

Wing sheaths reaching end of abdominal segment 4. Mid-tarsi with dense, golden brown setae on segments 1–4; hind tarsi with sparse setae on 3 proximal segments. Abdominal segment 1 convex dorsally, brown, slightly sclerotized, with transverse streaks; saddle-shaped process at



posterior margin with wide, median depression and short lobes; spinules reddish, small, few.

Lateral line on segments 5–8, open ventrally, with dense, blackish setae. Gills, as in larva, same number and on segments 2–7. Holding apparatus on segments 3–7; number of hooks: III: 2–4; IV: 3–4; V: 4–5 + 12–16; VI: 3–5; VII: 2–4.

256 Anal lobes (Figure 446) long, straight in their greater part, slightly tapering posteriorly, curved laterally and dorsally at end, reddish brown; setae dark; basal seta larger than others, in contrast to *Limnophilus*; 2nd seta similar, situated between 1st and 2nd third of rod; 3rd seta minute, situated at end of 2nd third; 4th seta slightly larger, situated subapically.

Pupal case 20–22 mm long, resembling larval case; anterior and posterior ends rounded, covered with small stones; a coarse, almost black, membrane around an almost circular hole at anterior end, and an irregular hole at posterior end laterally among the stones; a second, inner membrane with a hole which may be almost in form of a cross slightly deeper at anterior end, a hole of irregular form at posterior end, with lobes projecting from periphery to center; the opposing lobes usually not reaching each other. Anterior end of case attached to substrate. Cases are sometimes found in large aggregations.

Mode of life and habitats. On stones, on open shore of lakes, in brooks and rivulets, often spring-fed, in a moderately rapid current.

Distribution. The European USSR, Caucasus, Siberia. In addition, mainly Central and Northern Europe.

## 2. *Potamophylax nigricornis* Pictet

Pictet, 1834: 136–137, Plate VI, Figure 4. — Klapálek, 1893: 20–23, Figure 5<sub>1-9</sub>. — Struck, 1900: 14–15, Figure 23. — Ostwald, 1901: 106. — Siltala, 1902: 79–83, Figure 18. — Struck, 1903: 101. — Ulmer, 1903: 65. — Siltala, 1904c: 66; 1907: 502. — Ulmer, 1909: 266, Figure 401. — Lestage, 1921: 766–773, Figure 271 d, k, m. — Nielsen, 1942: 497–539, Figures I, 3–8, 120–132.

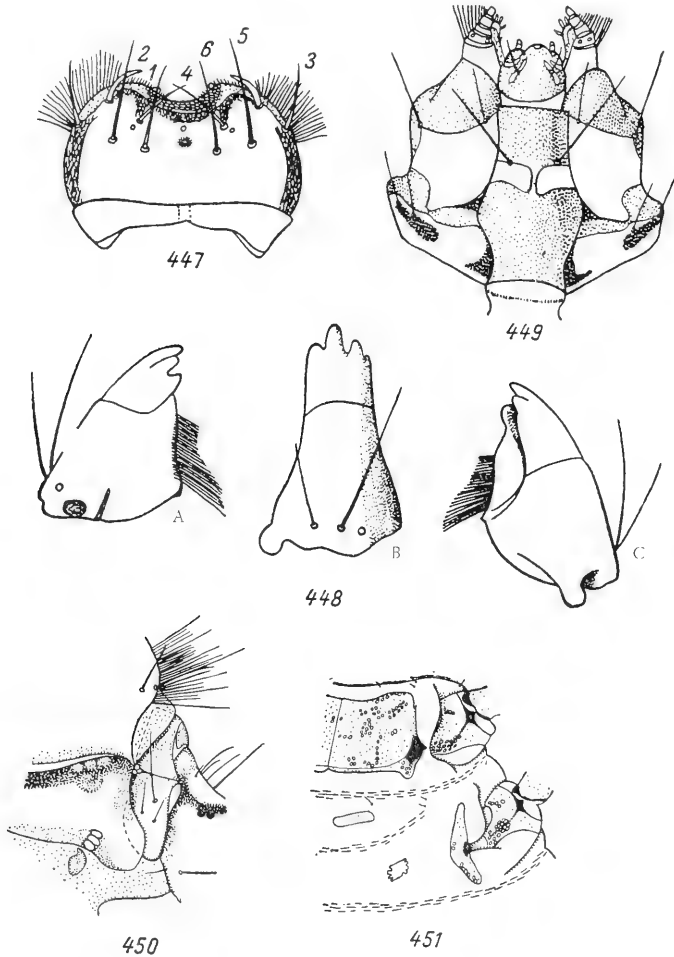
Full-grown larva. Length 18–20 mm. Head 1.8–2.0 mm, mainly yellowish brown, eyes on light background; dark areas reddish brown; dots with dark outline. Anterior part of frontoclypeus with indistinct punctation; middle slightly dark; posterior part with distinct, wedge-shaped pattern of large dots, those in posterior row partly fused; dorsal surface slightly dark laterally from frontal sutures, except for a light spot behind eye; rows and groups of large dots instead of dorsal and lateral stripes. Ventral side with similar punctation on pale background near occipital foramen, middle with 2–3 more distinct and darker dots on a slightly dark area. Gula light, long.

Intermediate, anterior-margin seta longer than median seta, which is thinner, lateral seta light, short, procumbent; anterior frontal seta the same, middle frontal seta moderately long, posterior frontal seta small, thin. Seta 9 long, thick, blackish brown; seta 11 small, thin; seta 7 straight, strong, relatively large; seta 10 light, situated near eye; seta 14 slightly larger than 9 (4/5 as long as width of head); seta 13 small, thin; seta 12

short, relatively thin; seta 15 moderately long, thin; seta 16 light, procumbent; seta 17 slightly larger than 7. Ventral seta 8 small, thin; seta 18 small.

Labrum (Figure 447) with deep anterior median depression; dorsal sclerite brown, with a brown spot behind median pit; posterior-angle sclerites dark, curved at a right angle. Setae as in Figure 447; seta 1 in form of short, thick, blunt spine thicker in middle, situated slightly ventrally.

(257)



FIGURES 447-451. *Potamophylax nigricornis* Pict. (after Nielsen):  
 447 - labrum; 448 - left mandible, dorsal (A), lateral (B), and ventral (C);  
 449 - maxillolabium; 450 - part of pronotum, propleuron, and base of fore  
 coxa, lateral; 451 - mesonotum, metanotum, mesopleuron, and metapleuron.

Mandibles (Figure 448) black, short, with a distinct groove between distal and basal part; teeth blunt; dorsal blade of left mandible with 2 teeth in

addition to projecting, middle tooth; ventral blade with one tooth and a process; right mandible, in addition to middle tooth, with 2 distinct teeth and one less distinct tooth dorsally, and one tooth ventrally; lateral setae situated basally, large, dorsal seta thicker and longer than ventral; chaetoids of dorsal brush forming 3-4 rows, those near basal margin longer than apical chaetoids.

257 Base of maxillolabium (Figure 449) with brown pregula, divided by dark groove from gula. Sclerites of cardo with a median stripe and broad, black, transverse stripes; both setae small, thin. Middle of submentum with yellowish brown, transverse sclerites with a dark, moderately long seta at anterior margin. Sclerite of stipes large, extending laterally partly to dorsal side; lateral seta large, thick; median seta thin. Palpifer large, about as long as palp; distal seta small, thin, dark; median basal seta light, small. Palp short, tapering apically; sclerite of segment 1 semicircular, of segment 2 open on median side. Galea short, conical, partly sclerotized. Mentum dark brown, in form of a narrow curved plate with concave anterior margin; ventral sclerites rodlike, with a small, thin, light seta. Labial palpiger horseshoe-shaped; palps markedly longer than distal process of labium.

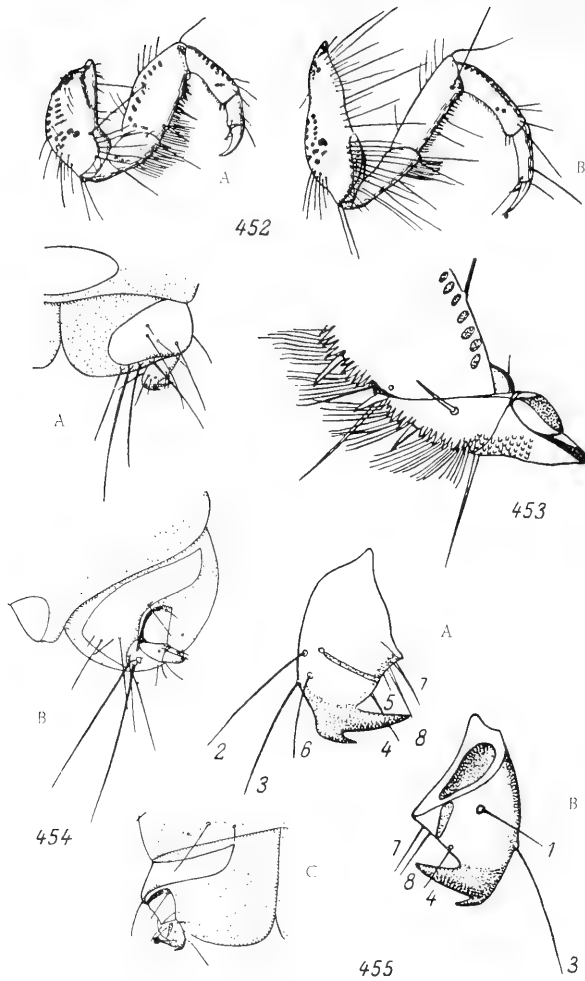
Pronotum (Figure 450) yellowish brown; groove in anterior third dark brown in middle; posterior margin light brown dorsally, yellowish laterally, wide black stripes sometimes fused; dots small, not always distinct. Anterior, submarginal area with 4 large, dark setae; primary anterior-angle seta larger; secondary anterior-margin setae arranged in 2 rows: short, strong, black setae directed upward, and thin yellow setae directed anteriorly; secondary surface setae numerous (120-140), in contrast to other species of *Potamophylax*, and of different size; these setae include short, strong, black setae characteristic for the species.

258 Mesonotum (Figure 451) light brown, slightly darker than pronotum anteriorly and in mid-posterior; anterior margin with a narrow, dark brown stripe laterally; posterior margin dark brown; posterior angle broadly black; punctation fine; setae numerous (65-85).

259 Anterior median tergite of metathorax transverse, grayish brown; posterior median tergite smaller, of similar color, rhomboidal, with rough margin; lateral tergite oblong, yellow, with a black spot at articulation with pleuron, also with a transverse band of dark streaks and several dots, and with rows of dots at median margin in posterior part (Figure 451). Anterior median tergite with a primary anterior-margin seta; posterior median tergite with 3 surface setae, including a larger medioanal seta; primary anterior-angle seta situated near anterior margin of lateral tergite; secondary setae numerous, in 3 groups: anterior surface setae (10-17), posterior surface setae (13-15), and anterior-angle setae (15-20), the latter situated in anterior part of lateral sclerite.

Propleuron (Figure 450) yellowish brown, with broad, black, pleural suture; greater part of episternum also dark, trochantin rounded apically, black basally and anteriorly, apical seta relatively large, situated near a small setule, second setule situated more basally; primary seta of epimeron situated near suture; 2-3 secondary setae small, strong.

Pleural sclerites of meso- and metathorax (Figure 451) with black, pleural suture; epimeron surrounding coxa, slightly produced ventrally on mesothorax, more so on metathorax; secondary setae: 25-31 on mesepisternum, 23-26 on mesepimeron, 29-33 on metepisternum, 23-29 on metepimeron.



FIGURES 452-455. *Potamophylax nigricornis* Pict. (after Nielsen);

452 - right foreleg (A) and midleg (B), posterior; 453 - trochanter and base of femur of right foreleg, anterior; 454 - posterior part of segment 9 and right anal leg, dorsal (A), lateral (B) and ventral (C); 455 - claw of right anal leg, lateral (A), inner side (B).

Prosternite represented by a small, slightly sclerotized, median sclerite, and a row of dark dots at posterior margin. Mesosternites in form of dots, lateral dots fused, forming a small dark sclerite.

Legs (Figure 452) brownish yellow; ratio of length of legs 70 : 100 : 99; coxae, trochanters, femora, and tibiae with longitudinal rows and groups of distinct, reddish brown dots. Apical part of fore trochanter and basal part of fore femur with whitish, hairlike chaetoids accompanied by small spinues on ventral side (Figure 453); mid- and hind legs with similar chaetoids,

those on distal part of trochanter shorter. Primary ventral setae of fore femur in form of 2 strong, almost equally large spines; primary posterior seta thin, slightly longer, situated basal to spines. Posterior seta of mid- and hind femora situated distally, moderately long; one ventral seta of midlegs situated in middle of segment, the other slightly shorter and situated more basally; ventral setae of hind legs situated close together in middle of segment, apical seta longer than basal.

Number and arrangement of gills of *P. nigricornis*

Segment	Dorsal	Pleural	Ventral
2	1 1	1(0) 1	1 1
3	1 1	1 1	1 1
4	1 1	1 1	1 1
5	1 1		1 1
6	1 1(0)		1 1
7	1(0)		1(0) 1(0)

Dorsal process of abdominal segment 1 absent; lateral processes well developed, with a small, oval, pale yellow basal sclerite posteriorly. Primary anterior-margin seta relatively long, black; medioanal seta also large (about half as long as width of head), both on brown sclerotized dots; intermediate and lateral seta smaller; secondary dorsal setae numerous (about 100), many of them on sclerotized dots; about 125 small, secondary setae ventrally in a median group together with 3 primary setae.

Abdominal segments 2-7 with ventral elliptical areas, that of segment 2 smaller than others. Gills on segments 2-7.

Anal sclerite of segment 9 light yellow, with brownish punctation at anterior margin; medioanal and anterior-angle setae black, long (about 2/3 as long as width of head); intermediate and lateral seta also dark; 32-35 secondary, posterior-margin and surface setae, including several dark, moderately long ones; smallest setae light.

Sclerite "b" of anal legs (Figure 454) yellowish, light brown laterally in distal part; distodorsal setae situated on membrane around sclerite, median distal seta thicker and longer than others (2/3 as long as width of head), ventral seta short, thin; surface with several secondary, including 1-2 moderately long, setae.

Sclerite "c" light yellow, with wide, black lateral margin and a small, basal seta.

Claw brown, darker basally, dark brown apically, with a dorsal denticle; setae as in Figure 455.

Case 20—22 mm long, usually made of sand grains (Figure 457, C, D, E), slightly curved, rounded posteriorly, with smoother, slightly flattened, ventral side; some cases consist of plant particles, as in *Nemotaulius punctatolineatus*; dorsal wall made of large, overlapping leaf fragments with laterally projecting ends; ventral wall made of similar fragments, fresh or decayed, but in smaller numbers; lateral walls made of fine pieces of detritus. Anterior end sometimes made like the first type; posterior end like the second type.

Young larvae (Stages 1—4).

**Stage 1** (Figure 456). Length 2.8—3.7 mm. Head 0.4 mm wide, yellowish brown, without punctation; other sclerites lighter. Seta 1 of labrum normal, pointed, not blunt and spine-shaped as in full-grown larva.

Posterior corners of mesonotum without dark, oblique streaks. Ventral elliptical areas on abdominal segments 2—7 absent. Gills and lateral line absent. Setae of head, thorax, legs, and abdomen relatively long; some setae of abdominal segments 2—7 are 1.5 times as long as width of head. Case 3.4—4.5 mm long (Figure 457, A), made of coarse sand grains with larger grains laterally; posterior end slightly narrower than anterior end; case delicate, fragile, with a colorless, thin base of tissue.

**Stage 2.** Length 4.4—6.9 mm. Head 0.5—0.6 mm wide, with indistinct punctation. Seta 1 of labrum blunt but not spine-shaped. Dorsum of thorax and legs with a few, secondary setae. Gills absent; abdominal segments 2—7 with ventral elliptical areas. Case made of sand grains, 4.5—4.8 mm long; walls delicate and fragile; anterior and posterior openings similar; plant fragments sometimes present at anterior opening.

**Stage 3.** Length 5.3—10.2 mm. Head 0.8—0.9 mm wide, dark. Mesonotum lighter than pronotum; punctation present but indistinct.

Secondary setae on thoracic segments of *P. nigricornis*

	Stage			
	1st	2nd	3rd	4th
<b>Pronotum</b>				
Anterior margin . . .	0	13—17	33—35	54—59
Others . . . . .	5	12—13	34—36	64—66
<b>Mesonotum</b>				
Anterior angle . . . .	1	4—5	8—10	15—18
Anterior surface . . .	1	1	4—5	9—13
Posterior surface . . .	3	4	7—9	16—17
<b>Metanotum</b>				
Anterior angle . . . .	1	5	11—12	16—17
Anterior surface . . .	1	1	4—5	15—21
Posterior surface . . .	3	3	7—9	20—23

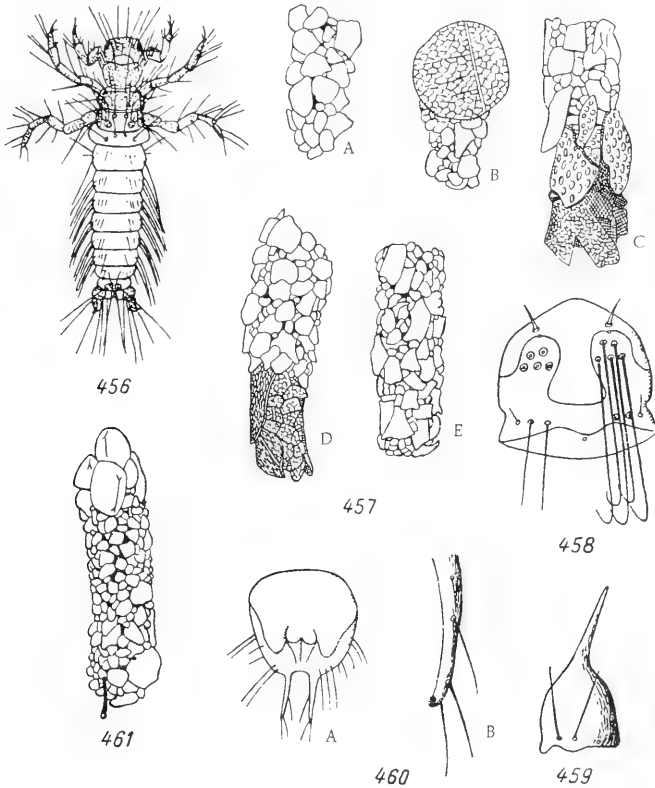
Gills on segments 2—7, ventral gills only on segment 7.

Case 6.0—10.0 mm long, more solidly and intricately made (Figure 457, B); some cases contain, in addition to sand grains, circular or oval plant

fragments attached at anterior end; lateral walls of such cases are made of small sand grains.

**Stage 4.** Length 8.8–15.0 mm. Width of head 1.3–1.4 mm. Punctuation more distinct. A median prothoracic sternite present. Secondary setae more numerous. Gills on segments 2–6; lateral line present. Case made of sand grains or plant fragments, sometimes anterior end with sand grains, posterior end with plant fragments.

(261)



FIGURES 456–461. *Potamophylax nigricornis* Pict. (after Nielsen):

456 – 1st stage larva, dorsal; 457 – case of 1st stage larva (A), 3rd stage (B), and 5th stage (C, D, E). Pupa: 458 – anteclypeus and labrum; 459 – left mandible, lateral; 460 – posterior end of male pupa, ventral (A), left anal rod, dorsal (B); 461 – case.

**Pupa.** Length 16–17 mm; male pupae slightly smaller than female. Antennae of male pupa reaching abdominal segment 9; scape with one seta, pedicel with 4–9 small setae. Anteclypeus short, separated from labrum by a deep groove; lateral seta of anteclypeus small, 2 other setae dark, strong. Labrum (Figure 458) relatively long, brownish in middle, anteriorly, and on part of sides; sides almost straight, median process rounded; seta 1

light, strong, 5 hook-shaped setae on light background, thick, dark, much longer than setae of anteclypeus.

Mandibles (Figure 459) relatively short; distal part with serrated median side; basal setae short, dark, strong, about same length.

261 Wing sheaths reaching middle of segment 4. Mid- and hind legs with dark natatorial setae dorsally on segments 1–5 and ventrally on segments 1–3 of mid-tarsi, and dorsally and ventrally on segments 1–4 of hind tarsi.

Distal saddle-shaped dorsal process of abdominal segment 1 with 10–17 small, dark brown setae laterally.

Holding apparatus on abdominal segments 3–7; plates dark brown; number of spinules: III: 3–6; IV: 3–7; V: 3–7 + 6–10; VI: 3–8; VII: 4–9. Lateral line on segments 5–8, with thick, dark brown setae. Gills on segments 2–7, as in larva. Male genitalia in form of wide, rounded, ventral appendages and a much shorter, bifid penis sheath.

Anal rods (Figure 460) shorter than in other species, tapering posteriorly, slightly curved at end, with small, apical spinules. First seta small, thin, situated at basal part, 3 remaining setae dark, large, one of them near middle, the other 2 situated subapically and apically.

262 Pupal case (Figure 461) usually made of sand grains, sometimes also with detritus particles. Anterior and posterior end covered with a convex brown membrane, with sand grains in some places and holes between the sand grains; posterior end with larger holes than anterior end. Case attached to substrate at posterior end by a ligament which is 0.1–0.3 mm thick, originating on a sand grain and forming an adhesive disk about 1 mm wide on the substrate. Posterior end of case often covered with sand.

Mode of life and habitats. Small water bodies, close to shore; in ditches with running water, often in springs and overflows, among decaying leaves, in very shallow water, under almost amphibian conditions.

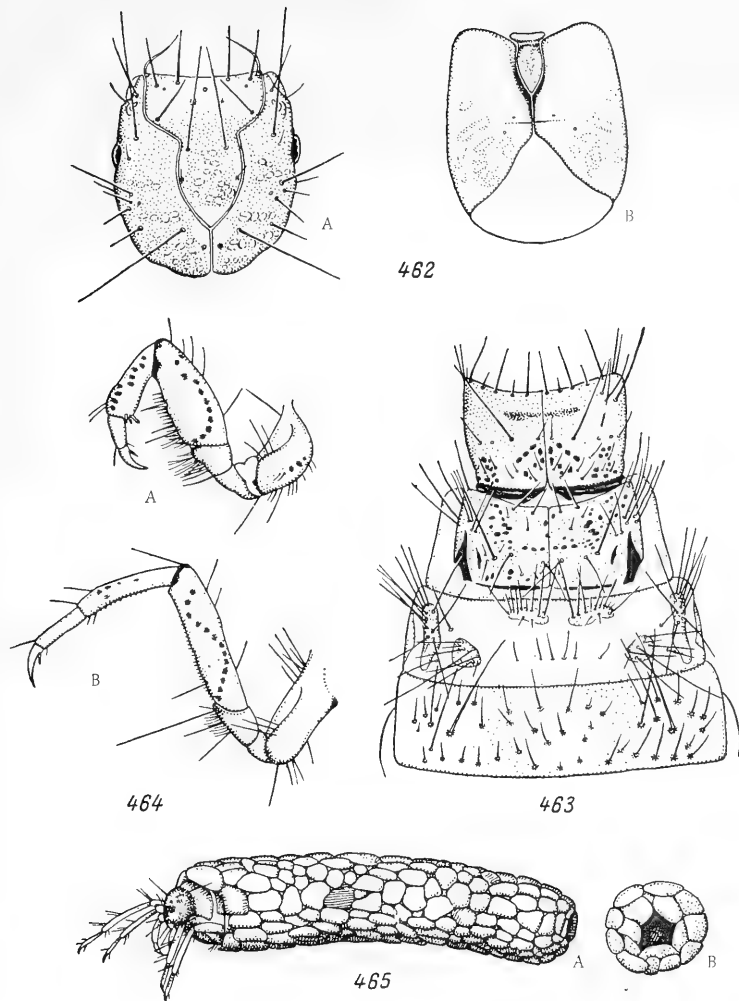
Distribution. Northern and western parts of the European USSR, Southern Urals. In addition, Central and Southern Europe.

### 3. *Potamophylax latipennis* Curtis

Struck, 1903:99, Plate II, Figure 9. — Ulmer, 1903:63; 1903b:199–202, Plate V, Figures 31–32; 1909:267, Figure 402. — Döhler, 1914:91, Figure 33. — Lestage, 1921:766–767, 772–773, Figure 271 a, i. — Hickin, 1954:55–58, Figures 1–6.

263 **Full-grown larva.** Length 18–20 mm. Head (Figure 462, A) mainly brown, but lighter than in *P. stellatus*. Frontoclypeus dark at anterior margin and anterior angles, with a dark dot on each side of median pit; posterior part broadly black, with distinct wedge-shaped pattern; stripes on sides and posterior angle of frontoclypeus, together with adjacent areas of lateral sclerites, forming 3 distinct light spots. A short, narrow, light stripe along coronal suture; short, transverse rows of dots on area of dorsal stripes; lateral part with longitudinal punctation. Ventral side of head lighter than dorsal side; gular suture short, closed; a group of dots near occipital foramen; middle of each half with 2–3 distinct, dark dots fused into a row. Setae as in species described before this. Gula (Figure 462, B) long, dark.





FIGURES 462-465. *Potamophylax latipennis* Curt. (after Hickin):

462 — head, dorsal (A) and ventral (B); 463 — thorax and abdominal segment 1, dorsal;  
464 — foreleg (A), midleg (B); 465 — larva in case (A), case, posterior (B).

Pronotum mainly dark, chestnut brown; punctation in posterior part on darker background; groove in anterior third slightly dark in middle; anterior margin blackish brown; posterior margin with wide, black stripes. Mesonotum darker than pronotum, chestnut brown, with yellowish posterior angles; lateral margin broadly black in posterior half. Tergites of metathorax dark, distinct (Figure 463).

Legs brown. Primary ventral setae of fore femur in form of 2 light spines; posterior seta short, situated more basally (Figure 464).

Abdominal segment 1 with numerous, short setae on small sclerotized dots (Figure 463).

Case 19—22 mm long (Figure 465), straight or slightly curved, made of large sand grains, tapering posteriorly, with flat ventral surface; dorsal wall projecting in form of a hood; posterior end rounded, with fine sand grains around opening. Posterior end of case of young larvae usually consisting of longitudinally or obliquely arranged plant particles.

Mode of life and habitats. Small, cool, clear brooks with a stony or sandy-stony bottom and a moderate current. Pupae occur often in large numbers, in rows.

Distribution. Western and southwestern parts of the European USSR. In addition, Northern and Central Europe.

#### 4. *Potamophylax rotundipennis* Brauer

Walser, 1864: 68—69. — Klapálek, 1893: 16—20, Figure 4<sub>1-9</sub>. — Struck, 1900: 13 (separ.), Figures 16, 17; 1903: 98—99, Plate II, Figure 8. — Siltala, 1903a: 27—30, Figure 8. — Ulmer, 1903: 65—66, Figure J. — Siltala, 1904c: 66. — Ulmer, 1909: 266, Figure 395. — Lestage, 1921: 766, 770—772, 774, Figures 274, 275.

**Full-grown larva.** Length 17—19 mm. Head (Figure 466) broadly oval, pale yellowish brown, with dark, chestnut brown punctation; anterior margin of frontoclypeus narrowly golden brown; slightly brownish spots at margin near tentorial pits, a narrow golden stripe lateral to frontal sutures further posteriorly; punctation of wedge-shaped pattern on brownish background; posterior angle and greater part of surface light. A reddish brown stripe between eye and anterior margin, including base of antennae; short, transverse rows of dots lateral to epicranial suture; sides of head with longitudinal rows of dots behind eye. Ventral surface smoky yellow in middle, whitish yellow anteriorly, with groups of dots laterally near occipital foramen posteriorly; middle with streaks from 2 darker dots. Gula light, with brownish stripes laterally (Figure 467).

Large setae reddish brown, thinner than in *P. stellatus*; median and intermediate anterior-margin setae of about same length, lateral seta short, curved, light; anterior frontal seta thinner and procumbent; middle frontal setae larger than usual, longer and thicker than anterior margin setae; posterior frontal setae thin, moderately long, yellow; setae 9 and 14 long, thick, 14 markedly larger; setae 10, 11, and 13 small, thin, 11 light, curved anteriorly; seta 12 short, thin, yellow, slightly larger than 13; seta 15 brown, thin, long, shorter than 9; seta 16 thin, small, procumbent; seta 17 firm, moderately long, shorter than middle frontal seta.

Labrum darker than head, reddish brown, with a dark spot behind median pit, slightly displaced to the right. Left mandible with a large tooth and 2 oval tooth-shaped processes dorsal to middle tooth, a large tooth ventral to it; right mandible with 3 large teeth in a row dorsal to middle tooth, a small tooth ventral to it.

265 Sclerites of cardo in form of narrow, transverse rods, yellowish brown in middle, black laterally, with wide black inner margin. Submentum and stipes brown, darker than head; mentum dark reddish brown.

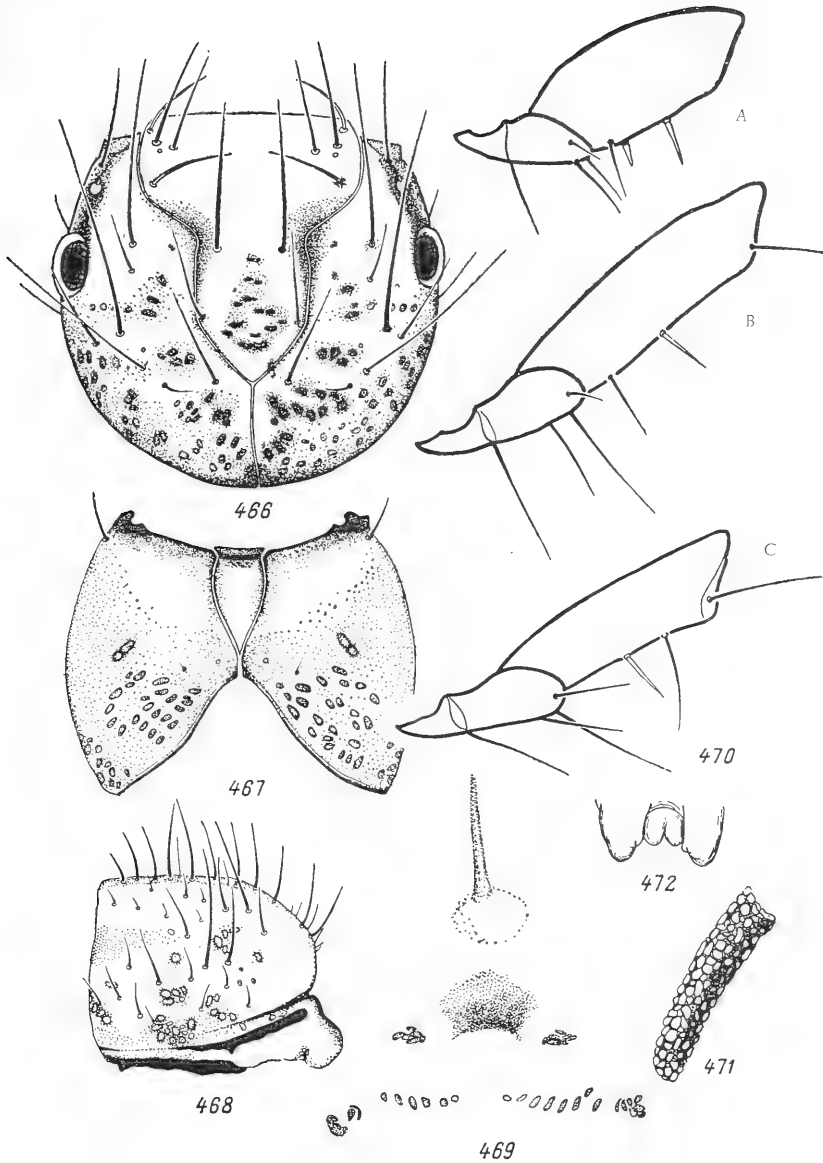


FIGURE 466-472. *Potamophylax rotundipennis* Br.:

466 - head, dorsal; 467 - head, ventral; 468 - pronotum; 469 - thoracic horn and sternites; 470 - trochanter and femur of foreleg (A), midleg (B), and hind leg (C), posterior; 471 - larval case; 472 - ventral appendages and penis sheath of male pupa. (471 - after Ulmer; 472 - after Siltala).

Pronotum (Figure 468) light yellow; transverse groove in anterior third usually pale golden brown in middle, rarely without dark stripe; anterior margin brick brown; posterior margin grayish yellow, with distinct black stripes; posterior-angle process with narrow, brownish lateral margin, punctuation at the base fine, brown. Setae mainly black; secondary surface setae numerous, most of them small.

Mesonotum uniformly yellow, whitish yellow in posterior lateral and posterior-angle areas; anterior margin with a narrow, brownish stripe laterally; posterior margin with a small, dark area, posterior angle process broadly brown.

Number and arrangement of gills of *P. rotundipennis*

Segment	Dorsal	Pleural	Ventral
2	1 1	1	1 1
3	1 1	1 1	1 1
4	1 1	1 1(0)	1 1
5	1 1	1(0)	1 1
6	1 1		1 1
7	1		1 1(0)

Propleuron with distinct reddish black, pleural suture; epimeron whitish yellow, with narrow dark lateral margin; seta short, brown; trochantin mainly dark, seta situated distally, small, light, accompanied by small setules. Pleurites of meso- and metathorax with blackish brown, pleural suture which is wider at base; episternum wide, much larger than epimeron, with groups of brown dots; setae black.

Prosternite (Figure 469) pale yellow, with a narrow, golden brown stripe posteriorly, small, brownish dots laterally. Horn narrow, long, golden brown. Mesosternite represented by a row of dark, distinct, sclerotized dots. Metasternite with similar, but whitish, often indistinct, dots.

Legs brown, with indistinct punctuation; ratio of length of legs 67 : 100 : 99; coxae and femora with a few secondary setae. Primary ventral setae of fore femur (Figure 470) in form of 2 strong, brown spines, basal spine half as large as apical; posterior seta situated basal to spines, short, dark. Primary ventral setae of mid-femur (Figure 470, B) of equal length, distal seta in form of a short, strong, brown spine in middle of femur, second seta dark brown, situated near basal margin, strong, spine-shaped. Primary ventral setae of hind femur (Figure 470, C) situated in middle of segment, basal seta in form of a short, brown spine, apical dark, strong, much longer.

Dorsal process of abdominal segment 1 barely visible, represented by an elevation without setae. Primary and secondary dorsal setae of segment 9 situated on reddish sclerotized dots.

Lateral line on segments 3-8. Gills on segments 2-7; abdominal segment 2 without lateral, presegmental gills.

Sclerite of segment 9 pale yellow, with 2 rows of dots on each side at anterior margin; setae black; primary anterior-angle seta longer than medioanal seta; intermediate seta thin, moderately long; lateral seta shorter, not always visible among secondary setae; a dark, thin, moderately long seta situated between medioanal setae, displaced slightly to the left; 11-17 additional secondary setae.

Sclerite "b" of anal legs yellowish; setae black; median and neighboring dorsal seta long, thick, lateral seta and seta at median margin shorter and thinner; surface with 4-5 thin setae.

Sclerite "c" yellowish white, with broad, black lateral margin; basal seta small, thin, reddish.

Claw brown, dark brown apically, with a dorsal denticle; setae reddish.

Case (Figure 471) of characteristic structure, different from that of other species of *Potamophylax* described, narrow, made of fine, densely arranged sand grains, sometimes mixed with silt, which gives it a brown color; some cases show boundaries of parts built at different seasons; case slightly curved, narrower anteriorly, and especially posteriorly, with slightly flattened ventral surface; anterior opening with dorsal hood; posterior opening with a membrane with a large round hole.

266

**Pupa.** Length 16-18 mm. Antennae reaching anal rods in male pupae, abdominal segment 7 in female. Labrum and mandibles as in *P. nigricornis*.

Wing sheaths reaching to abdominal segment 4. Midlegs natatorial; hind tarsi with sparse setae.

Gills on segments 2-7, as in larva; segment 2 without lateral, presegmental gills.

Hooks of holding apparatus: III: 1-2; IV: 2-3; V: 2-3 + 8-12; VI: 2-4; VII: 2-3.

Anal rods with small light setae, as in *P. stellatus*. Ventral appendages of male genitalia (Figure 472) wide, rounded posteriorly, with a distinct, median basal indentation; penis sheath bifid, shorter than ventral appendages.

Pupal case attached at anterior end by ligaments of a rough adhesive membrane; sievelike part of lid with a few, large holes; posterior end covered with a membrane with small, flat, sand grains, 2-3 large, central holes or one hole with lobate margin.

**Mode of life and habitats.** Small, clear brooks with a slow current. Summer species, hatching in late July and August.

**Distribution.** Northern, western, and central parts of the European USSR, Eastern Siberia. In addition, Central Europe.

## 5. *Potamophylax excisus* Martynov, larva nova \*

Martynov, 1926: 46—47.

**Full-grown larva.** Frontoclypeus light brownish; dots small, not always distinct (Figure 473, A); 3 dots near median pit, 2 dots behind it and medially; area of tentorial pit brown; dots wedge-shaped pattern and distinct. A wide, brown stripe along epicranial suture, lateral to sclerite, beginning at anterior margin; occipital foramen surrounded dorsally and laterally by a dark, chestnut brown band (Figure 473, C); other part of dorsal surface, entire lateral, and most of ventral surface light; transverse rows of dark dots on area of dorsal stripes; longitudinal rows of dots, some of them light, replacing lateral stripes; ventral side (Figure 473, B) with a group of indistinct dots near occipital foramen, a row of 3 dark, oblong dots which form characteristic, narrow, median striation anterior to this group. Dark dorsolateral "collar" around occipital foramen is a specific character.

Labrum (Figure 474) reddish brown, darker than frontoclypeus; posterior-angle sclerites short, blackish.

Mandibles black, with blunt, short teeth; dorsal blade of left mandible with a median tooth, a large tooth, 2 small pointed processes, and a small, barely distinguishable, tooth; ventral blade of left mandible with one tooth; right mandible with 2 distal teeth of about the same size, 2 small teeth further dorsally; lateral setae light brown, ventral seta lighter and shorter than dorsal.

Sclerites of cardo reddish brown, with narrow, black stripes. Submentum and stipes brown.

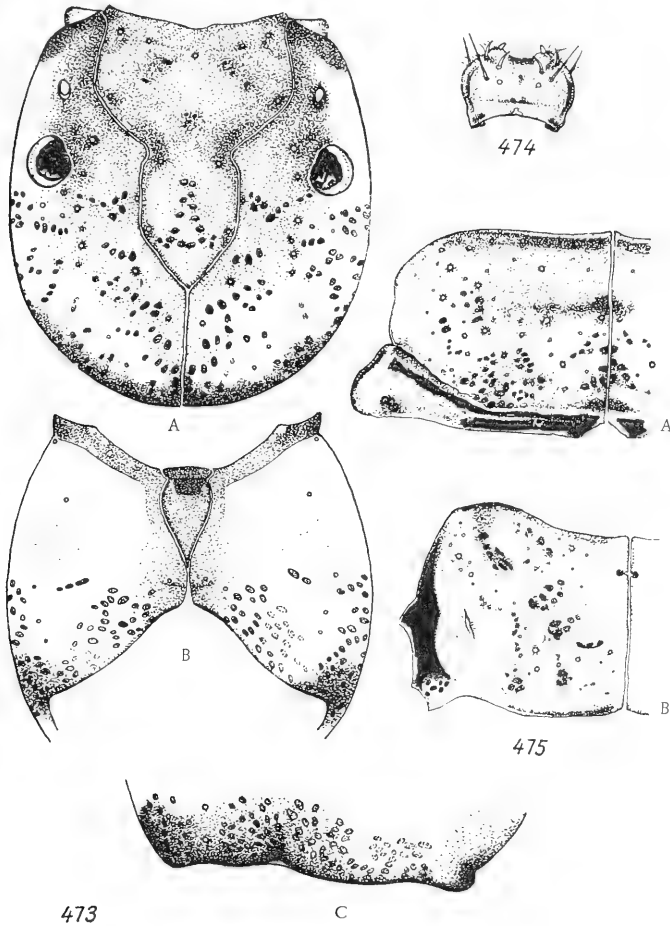
Pronotum (Figure 475, A) light yellow, brownish at posterior margin; anterior margin wide, brick brown; lateral margin pale yellow; groove in anterior third dark brown in middle; punctation as in Figure 475, A; posterior margin brownish, with large, posterior-angle processes, with narrow, reddish brown lateral margin; black transverse stripes wide, lateral stripe sometimes extending almost to suture in form of a narrow process before median stripe, fused with it in some places.

Mesonotum (Figure 475, B) whitish yellow, lighter than pronotum; posterior angles whitish; oblique striation fine, reddish brown; anterior margin light brown, slightly reddish laterally; posterior margin reddish brown in middle, whitish yellow laterally; lateral margin broadly black almost from anterior angle and including posterior angle.

Propleuron with reddish black pleural suture; epimeron brownish yellow, with narrow, reddish brown margin. Pleurites of meso- and

\* The material from which A. V. Martynov described the species *Stenophylax excisus* sp.n., labeled "Sukhumi Military Road, near Lake Kara-Kel", 3 August 1925, 2 pupae, collection of D. A. Tarnogradskii" contains a male and a female pupa. Almost complete larval exuviae were present in the male pupa case, and the genitalia were well preserved. Such exuviae, characterized by the presence of a wide, dark band around the occipital foramen, are also known from other localities, e. g., Station 259, Collection 366, Teberda, 13 August 1954, Mukhu River near the mouth, 3 pupae, collected by E. A. Tetyueva. Similar exuviae were also found in pupal cases labeled "Station 198, Collection 294, Teberda, 5 July 1954, a brook joining Amanauza River, depth 0.09—0.20 m, stones, 7°, 2 pupae, male and female, collected by E. A. Tetyueva." The male pupa of this sample contained well developed genitalia. Some information on the pupa is found in Martynov (1926: 46—47).

metathorax light yellow; pleural suture narrow, reddish black, with dense rows of chestnut brown dots at base; episternum with reddish brown distal margin and 4 large dots on surface; margin of epimeron restricted to suture.



FIGURES 473-475. *Potamophylax excisus* Mart.:

473 - head, dorsal (A) and ventral (B), dark stripe at occipital foramen, lateral (C); 474 - labrum; 475 - pronotum (A), mesonotum (B).

Legs reddish brown. Fore femur (Figure 476) with 2 primary setae in form of strong, yellow spines ventrally; posterior seta situated more basally, short, dark, slightly longer.

268 Sclerite of segment 9 (Figure 477) mat yellow, with dots in 2 rows which converge in middle at anterior margin. Median setae longer than others, anterior-angle setae slightly shorter; intermediate seta and both secondary setae between medioanal setae, moderately long, thin; 18-20 other setae.

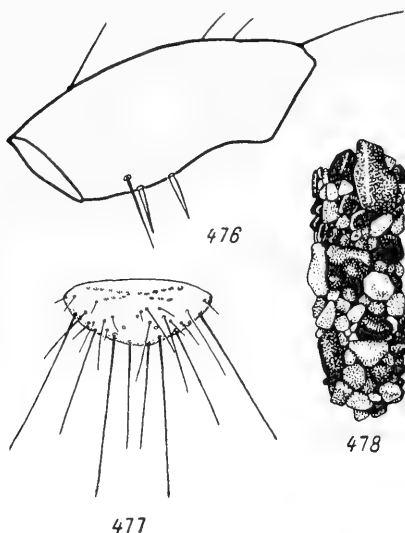
Sclerite "b" of anal legs brown, with black setae; median distal dorsal seta thick, long; neighboring seta slightly shorter, lateral seta thin, moderately long; median margin with a similar, subapical seta and a small, thin, light, submarginal seta further basally; ventrodorsal seta brown, thin; surface with 4-5 setae of different size.

Sclerite "c" brown, with wide, black, lateral margin; seta small, brownish.

Claw reddish brown, dark brown apically, with a small, blunt, dorsal denticle.

Case made of coarse sand grains, almost straight, slightly curved, with rough, irregular surface; ventral surface more or less smooth, with smaller sand grains; posterior end rounded (Figure 478).

**Pupa.** Length 16 mm, including anal rods, 17 mm. Antennae of male pupae almost reaching end of anal rods. Labrum brownish dorsally; anterior margin with a slight median process, small, light seta 1 situated near it; long, sometimes 3 instead of 5, hooked setae brown, on light background. Both large setae of anteclypeus brown, much shorter



FIGURES 476-478. *Potamophylax excisus* Mart.;

476 - fore femur, posterior; 477 - tergite of abdominal segment 9; 478 - larval case.

than hooked setae; lateral seta small, light, thin. Mandibles reddish brown; distal part with serrated blade; lateral setae dark brown, large, about the same length, dorsal seta slightly longer.

Wing sheaths reaching end of abdominal segment 4. Midlegs natatorial, with golden brown setae on the tarsal segments 1-4 (only dorsally on segment 4). Hind legs with sparse setae on tarsal segments 1-3.

Dorsal process of abdominal segment 1 yellowish, with fine, transverse striation; lobes of saddle-shaped, posterior margin with a few, reddish brown spinules.

Holding apparatus on segments 3-6; number of hooks: III: 2-3; IV: 3-2; V: 3-2 + 12-14; VI: 2-3; VII: 3-4.

Gills on segments 2-7.

Anal rods as in *P. stellatus*; basal seta of moderate length, other setae small; apex with small, reddish spinules.

Anterior and posterior end of case closed by membranes covered with sand grains; holes between sand grains small or slitlike at anterior end, holes at posterior end larger, usually fused into a single cross-shaped or irregular opening.

**Mode of life and habitats.** Small mountain brooks and rivulets; Lake Kara-Kel' (Teberda); on stones.

**Distribution.** USSR: Central Caucasus. Not recorded outside USSR.



## 2. Genus *Hydatophylax* Wallengren

**Full-grown larva.** Large, 19–32 mm, or medium-sized. Resembling *Potamophylax* in coloration of head, pronotum and mesonotum, and in form and chaetotaxy of legs. Anterior median tergites of metathorax fused. Dorsal process of abdominal segment 1 present. Dorsal, lateral, or ventral presegmental gills on abdominal segment 2 absent. Tergite of abdominal segment 9 usually with only 2–3 secondary setae.

Case made of detritus, usually large pieces, with longitudinally arranged rods projecting anteriorly and posteriorly; sand grains rarely present in anterior part. Case 30–65 mm long, including rods.

Mode of life and habitats. Clear brooks and rivulets with cool water.

Distribution. Northwestern part of the European USSR, Siberia, Far East, Kamchatka, Sakhalin. In addition, Europe, North China, Japan, North America.

### Key to Species

#### Full-grown larva

- 1 (4). Siberia, Far East.
- 2 (3). Length 22–26 mm; head with distinct, large dots; mesonotum with contrasting pattern including a light, wide, median stripe which continues in whitish, median area of anterior median tergite of metathorax; legs of variegated color, with black distal cross-stripes on tibiae and tarsi, and less distinct, but also dark cross-stripes on trochanters and femora; case made of detritus, sometimes bulky, 30–40 mm long, sometimes with sand grains among detritus, rarely a large part made of sand grains; Siberia, Far East, Kamchatka . . . . . 2. *H. nigrovittatus* McL. (p. 343)
- 3 (2). Larger, 30–32 mm long; head with large and small dots; light, median stripe of mesonotum less marked, dark dots in anterior third near suture; anterior tergite of metathorax brownish yellow; legs not variegated, brown cross-stripes only on tarsi; case made entirely of detritus, bulky, usually of large particles of wood, 40–50 mm long; Maritime Territory. . . . . 1. *H. magnus* Mart. (p. 338)
- 4 (1). Northwestern and part of western territory of the European USSR; mesonotum with broad, light median area; legs without distinct cross-stripes; case made of coarse detritus, bulky, with rough surface, 30–50 mm long . . . . . 3. *H. infumatus* McL. (p. 348)

1. *Hydatophylax magnus* Martynov (*Stenophylax magnus* Martynov), larva nova

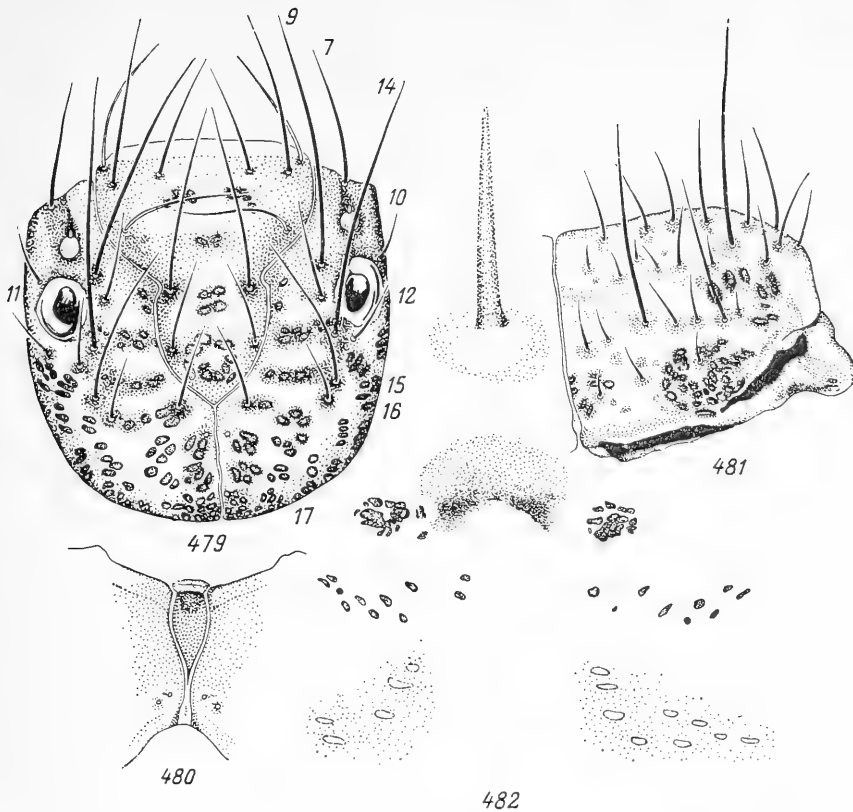
Full-grown larva.\* Length 28—32 mm. Main color of head and thorax yellow; dots distinct, dark, on brown background, forming dense, short rows and groups, resembling variegated pattern of larvae of *Stenopsycha*. Frontoclypeus (Figure 479) reddish brown at anterior margin, brownish around and between tentorial pits, posteriorly with a narrow, golden brown stripe along frontal sutures; anterior part with an oblique, brown spot with several fine dots lateral to median pit; 2 median spots with fine punctation close together further posteriorly; wedge-shaped pattern in posterior part situated on light yellow background, consisting of large, distinct, dark brown dots. A narrow, reddish brown stripe along posterior part of frontal sutures and near end of coronal suture; anterior area blackish brown from margin to eye; short transverse and oblique rows of dots on dark background along epicranial suture; sides with similar longitudinal and oblique rows and groups of dots. Ventral surface light brownish in anterior half, whitish yellow posteriorly, with large group of large and small dots, including 3 dark, transverse, median dots. Gula slightly darker, brownish, extending in a fine point into open gular suture (Figure 480).

270 Large setae relatively thin. Median and intermediate anterior-margin setae blackish brown, widely separated, the latter closer to lateral than to median seta; middle frontal seta relatively long, posterior frontal seta short, thin. Seta 7 strong, dark; seta 10 small, light, slightly thickened; setae 9 and 14 of about the same length; seta 11 short, thin; seta 13 lighter and smaller; seta 12 brown, moderately long; seta 15 light brown, thin, long; seta 16 situated slightly posteriorly, light yellowish, small, directed inward; seta 17 strong, dark, large, shorter than middle frontal seta. Ventral seta 8 small, strong; seta 18 minute.

Labrum reddish brown, darker than head; setae 5 and 6 dark brown, other setae light; seta 3 situated further posteriorly, almost at level of setae 5 and 6.

Mandibles black; right mandible, in addition to middle tooth with 3 small teeth on dorsal blade and an indistinct tooth more basally; ventral blade with one tooth; left mandible with 2 teeth on dorsal and ventral blade, in addition to middle tooth; lateral setae situated basally, small, ventral seta yellowish, almost half as large as dorsal; median brush forming a tuft of large, golden chaetoids; brush on left mandible larger than on right.

\* The large larvae described below were collected in 1927 by I. I. Sokolov, P. D. Rezvoi, and A. V. Martynov, and by I. M. Levanidova in 1949 in the Maritime Territory, in brooks and rivulets of the system of the rivers Suchan (Sitsa River and tributaries) and Ussuri (Khor, Ugodinza, a tributary of the Daubikhe); I. D. Cherskii, A. I. Kurentsov, A. M. D'yakonov, N. N. Filip'ev repeatedly found in the same area males and females of *Hydatophylax magnus* Mart., the largest species of the tribe Stenophylacini in the Far East. The largest larvae of this genus found there may be considered to be those of *H. magnus*. Larvae, pupae, and cases have been found in the following rivers and rivulets: 1) Sitsa River, a tributary of Suchan, 11 June 1927, one pupa, A. V. Martynov; 2) brooks and rivulets of the Sitsa system near Tigrovaya Station, 11 and 13 June 1927, 6 larvae, 4 pupae, 6 cases, I. I. Sokolov, A. V. Martynov; 3) rivulet Ugodinza, a tributary of the Daubikhe, a source of the Ussuri, 2 specimens, I. I. Sokolov, P. D. Rezvoi; 4) Khor River, Pavlenkovskaya [channel], 6 July 1949, 6 larvae, I. M. Levanidova. I. M. Levanidova, who has additional specimens of *Hydatophylax*, thinks that the larvae found in the canals of the Khor River are those of *H. magnus*.



FIGURES 479-482. *Hydatophylax magnus* Mart.:

479 - head, dorsal; 480 - gula; 481 - pronotum; 482 - thoracic horn and sternites.

Sclerites of cardo reddish brown; median margin black; posterior margin mainly dark brown; a large, oblong, black spot laterally.

271 Main color of pronotum (Figure 481) yellow; groove in anterior third golden brown in middle; similar brownish areas laterally at posterior margin; anterior margin wide, reddish brown; lateral margin yellowish; posterior margin wide, light brownish; posterior-angle process yellow, with narrow, reddish brown, lateral margin; small sclerotized dots in indentation at base of process; black stripes wide, distinctly separated. Dots on surface large, chestnut brown, situated singly, in rows or in groups on reddish brown stripes or spots; similar, small, dark dots at base of setae. Setae as in Figure 481; anterior-angle, and medioanal seta longer than others; secondary setae few, 4 of them at anterior margin and one at anterior angle, all short, strong, brown.

Mesonotum mainly pale yellow, broadly whitish yellow at posterior angles; anterior margin with blunt lateral angle, middle with a reddish brown stripe or a dark brown dot; lateral margin mainly light, with a wide, black stripe posteriorly, fused with posterior angle; posterior margin yellowish brown laterally, with a reddish brown stripe in middle; posterior

margin light near median suture. Surface with reddish brown, longitudinal streaks at posterior angle; 2 small, dark dots in anterior third near median suture; groups and rows of dots on brown background, brown dots and spots fused in some places; chaetotaxy scarce, as on pronotum.



FIGURE 483. *Hydatophylax magnus* Mart.: Right foreleg (A), midleg (B) and hind leg (C), posterior

272 Anterior sclerite of metathorax single, formed by 2 fused sclerites, light brownish in middle, with dark dots at base of setae laterally; setae dark reddish brown; primary, anterior-margin, and one secondary seta moderately long, 8-10 other setae. Posterior median sclerites irregularly triangular, with dark and light punctation; 7-9 setae, medioanal seta larger than others. Lateral sclerites oblong, large, light, pale yellowish, with a transverse band of reddish brown striation, and 2-3 brownish spots; posterior part with a median row of 9-10 dots; anterior part with 11-12 setae, large and small, with dark, partly fused dots at their base.

Propleuron yellowish brown, with broad, black, pleural suture; epimeron oblong, with a small, black spot laterally; seta situated near suture, strong, reddish brown; trochantin mainly black, seta situated distally, both setules transparent, situated at anterior margin.

Mesopleuron light, metapleuron lighter, whitish yellow, with dense, dark dots on dark background along pleural suture; episternum with 3–4 large dots; setae chestnut brown, with dark dots at base.

Prosternite yellowish, with indistinct, brown stripe at posterior margin, with small, chestnut brown, sclerotized dots laterally. Horn large, chestnut brown. Mesosternite represented by a number of dark, sclerotized dots, and a small sclerite on each side. Metasternite in form of pale pinkish dots (Figure 482).

Number and arrangement of gills of *H. magnus*

Segment	Dorsal	Pleural	Ventral
2	1	1	1
3	1 1	1 1	1
4	1 1	1 1	1 1
5	1 1	1	1 1
6	1 1	1	1 1
7	1 1(0)		1(0)

Legs (Figure 483) reddish brown. Fore coxae, femora, and tibiae with large distinct dots; mid- and hind legs with indistinct dots; large setae moderately long; a row of small, light spinules at ventral margin of all tibiae and femora, but not on tarsi; fore femur with a tuft of light, hairlike chaetoids similar to those on trochanter ventrally near base; such chaetoids absent near basal margin of mid- and hind femora. Primary ventral setae of fore femur represented by 2 large, light yellow spines of almost the same length situated close together; posterior seta dark, thin, situated slightly distally above spine resembling posterior distal seta of trochanter. Primary ventral setae of mid-femur in form of 2 large, strong, brown spines of equal size, situated in middle of femur, basal spine slightly thinner than apical; primary ventral setae of hind femur in form of a similar spine in middle of segment, and a dark, strong, moderately long seta situated more distally.

Dorsal process of abdominal segment 1 small, conical, retracted in fixed specimens, apex represented by a dark brown spot; lateral processes normally developed; 6–7 small dark setae on dark, sclerotized dots between dorsal and lateral processes; each half of segment with 2 small, ventral sclerites with several small setae.

Lateral line from posterior margin of segment 2 to end of segment 8; segment 8 with a row of 8 pairs of thin, long setae dorsal to small, sparse hairs, each pair of setae situated on a small sclerotized dot.

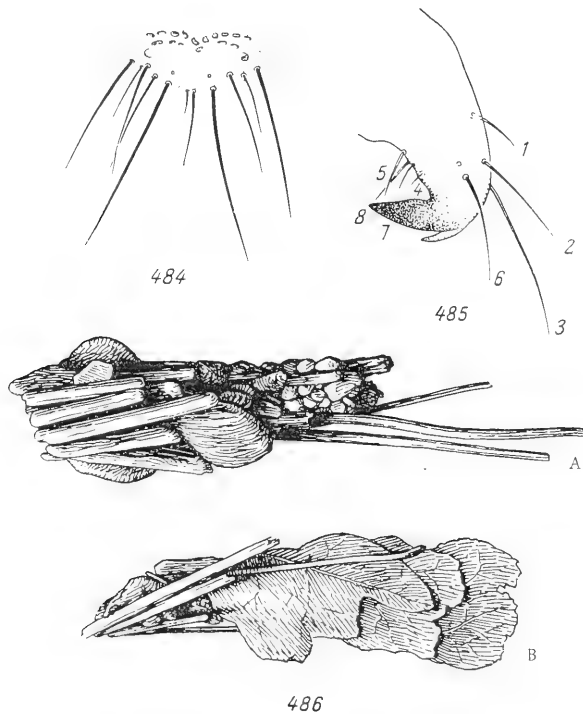
Presegmental gills on abdominal segment 2 absent.

Tergite of abdominal segment 9 (Figure 484) brown, with 2 curved rows of dark, reddish brown dots near anterior margin; medioanal setae thick, long, dark brown; angle setae shorter; intermediate seta thin, long, but shorter than angle seta; a primary and a secondary lateral seta short, thin, situated close together; a moderately long and a small seta between medioanal setae; secondary setae on surface absent.

Sclerite "b" chestnut brown, with a group of large, dark dots; median and neighboring seta in distodorsal part of sclerite black, long, thick; lateral seta thinner, moderately long; a similar seta subapically at median margin; a short, thin seta further basally; distoventral seta strong, brown, moderately long; surface with 2 - 3 small, thin setae.

273

Sclerite "c" brownish yellow; lateral margin black, narrow; basal seta short, dark brown.



FIGURES 484-486. *Hydatophylax magnus* Mart.:

484 - tergite of abdominal segment 9; 485 - claw of anal leg;  
486 - larval case, normal type (A), and flat type (B).

Claw (Figure 485) reddish brown basally, blackish brown apically, with a lighter reddish dorsal denticle; transverse suture narrow laterally.

Seta 1 situated subdorsally on median side of basal part, strong, moderately long, dark brown; seta 2 thin, slightly longer, brown, situated at end of suture; seta 6 situated nearby distal to suture, thin, shorter; seta 3 black, situated dorsally on median side of dorsal part, thicker than others, long, almost as long as claw; short, ventral, setae 7 and 8 thick, pale yellow; seta 5 thin, dark, situated laterally near seta 8; seta 4 same, situated near seta 8.

Case (Figure 486, A) made of detritus, usually fragments of wood arranged densely and obliquely; surface rough; fragments sometimes large; a long rod sometimes projects posterior; ventral surface usually smoother. Another type of case also occurs as in *Potamophylax nigricornis* (Figure 486, B); it is flat as in *Nemotaulius punctatolineatus*, made of oval fragments of leaves which overlap dorsally and ventrally; dorsal and ventral walls meet with the dorsal usually projecting above the ventral.

Mode of life and habitats. Brooks and rivulets with a varying current (Maritime Territory, Sitsa River from source to the lower reaches; Odarka River, Ugodinza River, channel of the Khor River); at a temperature to 24° in summer (channel of the Khor).

Distribution. USSR: Maritime Territory. In addition, North China.

f

274 2. *Hydatophylax nigrovittatus* McLachlan (*Platyphylax nigrovittatus* McLachlan), larva nova

**Full-grown larva.\*** Length 22—28 mm. Main color yellow, in some places orange-yellow; punctate pattern, variegated as in *H. magnus*, consisting of rows and groups of large, dark dots on orange-brown background, and similar dots at base of setae (Figure 487). Frontoclypeus brownish near tentorial pit, with a narrow, golden brown stripe on posterior part of frontal suture. Large setae relatively thin; setae 9 and 14 of about the same length, slightly thicker than anterior-margin and middle frontal setae; seta 10 small, light; setae 11 and 13 thin, brown, relatively large; seta 12 dark, strong, moderately long; seta 15 thin, brown, long; seta 16 small, light, situated immediately behind 15; seta 17 strong, dark, moderately long, shorter than middle frontal seta.

Dorsal sclerite of labrum mainly brown, with darker, chestnut brown areas in each half; a small, dark dot behind median pit.

Mandibles black, with narrow, reddish brown apex; middle and subventral tooth of left mandible large, projecting, larger than others, 2 teeth and a pointed process dorsal to them, a small tooth ventral to them; subventral tooth of right mandible larger than others, 2 large teeth and one smaller,

\* The species of the larva was determined in Khabarovsk by I. M. Levanidova from full-grown larvae, pupae, and adults of both sexes, collected in the Pavlenkovskaya Protoka of the Khor River and in the channel from Lake Teploe to the Biru River. Full-grown larvae were found in the following localities: Pavlenkovskaya Protoka, 23 December 1948, 3 specimens, 13 November 1949, 12 specimens; Pavlenkovskie Springs, 23 January 1950, 2 specimens; pupae and adults: Pavlenkovskaya Protoka, 2 June 1949, adults of both sexes; in the channel from Lake Teploe and at the shore, 25 May 1952, 3 pupae, 1 male; 5 June 1953, 5 adults of both sexes. The exuviae from the pupal cases from the channels of Lake Teploe (25 May 1952) were identical with those of larvae from the Pavlenkovskii channels (18 November 1949) and full-grown larvae from the aforementioned collections.

rounded tooth dorsal to it, a small tooth ventral to it; lateral setae situated basally, ventral seta small, light; dorsal short, dark, twice as large.

Sclerites of cardo transverse; median margin short, wide, black; sclerite entirely black laterally, reddish brown elsewhere. Submentum with whitish membranous part; lateral and median sclerites in form of small, reddish brown, triangular plates, median sclerites with a large, brown seta at anterior margin. Stipes reddish brown, with a narrow, dark brown stripe at posterior margin; lateral seta moderately long, light brown; distal seta small, darker. Palpifer relatively large, reddish brown; apical seta small, dark brown; basal seta small, light.

Mentum dark reddish brown; posterior margin blackish; ventral rods with small light seta. Palpiger narrow, horseshoe-shaped, reddish brown. Labial palps with reddish brown sclerite.

Pronotum (Figure 488, A) yellow, with variegated punctate pattern; light stripe along median suture; anterior margin narrow, dark brown; lateral margin yellowish; groove in anterior third with golden brown stripe in middle; posterior margin brown, light brown in middle; posterior-angle process with narrow, black, lateral stripe and small sclerotized dots; black, transverse stripes wide, clearly separated.

Mesonotum (Figure 488, B) pale yellow, with brownish pattern. Anterior margin curved, brown, with a narrow blackish stripe laterally; posterior margin black in middle and laterally, anterior and posterior margin with light, median space near suture; lateral margin broadly black in posterior half connected with posterior lateral area. Surface without punctation near suture (except 2 small, indistinct dots); light median areas of anterior and posterior margin form a light, longitudinal, median band; lateral areas darker; groups of median dots in anterior and posterior part situated on brown background, as in oblique row of dots at anterior corner; sclerite pale yellow laterally, whitish posteriorly laterally, with broad, short, black striation; examination of dark specimens under low magnification shows 5 longitudinal stripes on surface; a median, 2 light lateral, and 2 dark intermediate stripes.

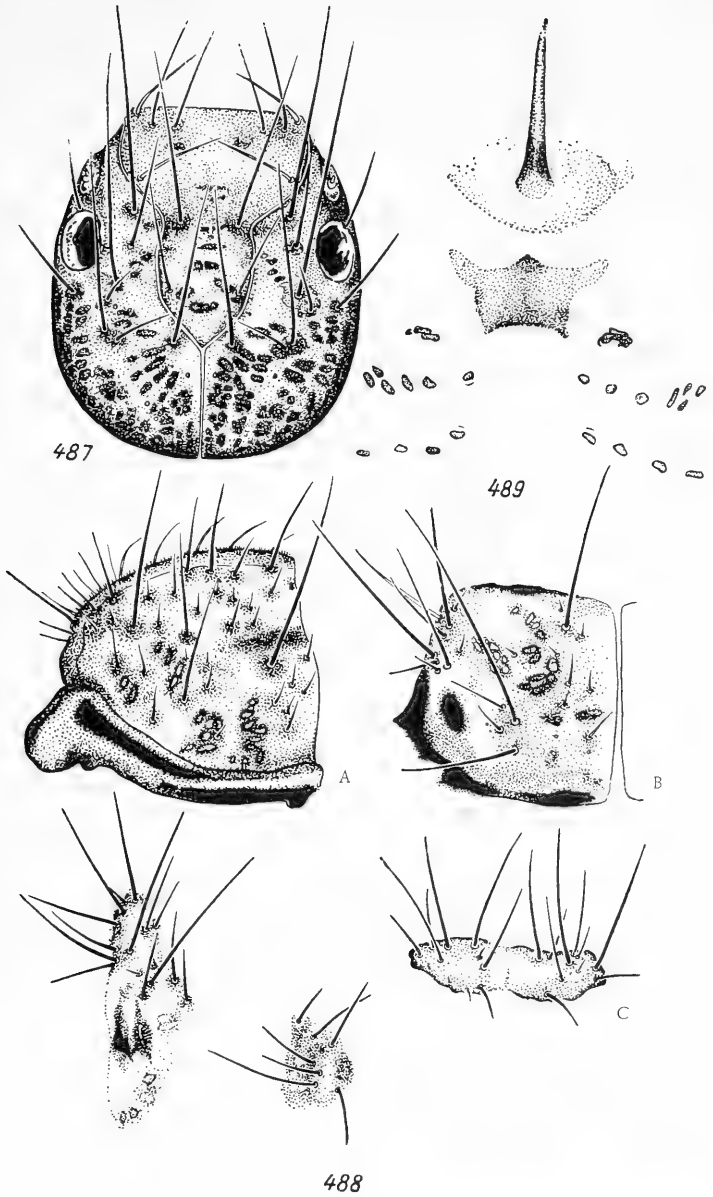
276

Anterior sclerite of metanotum (Figure 488, C) consisting of 2 fused sclerites, light in middle, forming a continuation of the light band on mesonotum; posterior median sclerites irregularly triangular, chestnut brown; lateral sclerite pale yellow, with a transverse band of a pale dot and 2 reddish brown lines, lateral line with black dot in middle, anterior part of sclerite with indistinct dots at base of setae, posterior part with pale punctation at margin.

Propleuron with wide, reddish black, pleural suture; epimeron yellowish brown, angular posteriorly, with narrow, blackish margin on median side and partly laterally; seta near suture short, strong, dark; trochantin mainly black, seta situated distally, brownish, both setules situated more basally at anterior margin, and distinct. Pleurites of meso- and meta-thorax chestnut brown, darker than in *H. magnus*; punctation in anterior part of episternum indistinct, coarse; fine, and dense along suture. Horn and thoracic sternites as in Figure 489.

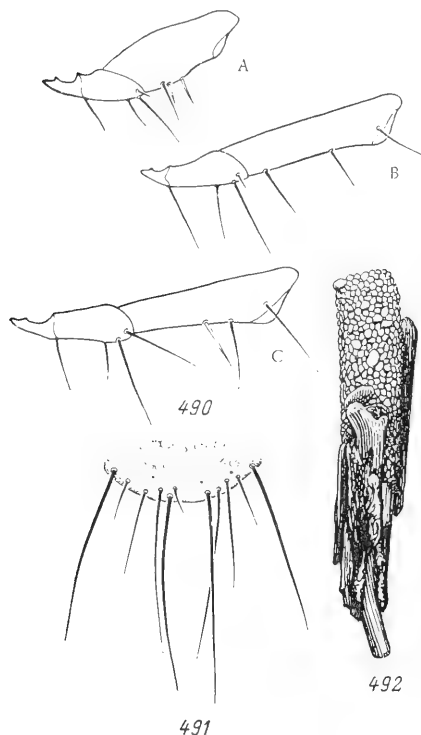
Legs reddish brown; tibiae and tarsi distally with wide, distinct, black cross-stripes; apical part of trochanter and subapical part of femur dark;





FIGURES 487-489. *Hydatophylax nigrovittatus* McL.:  
487 - head, dorsal; 488 - pronotum (A), mesonotum (B), metanotum (C); 489 -  
thoracic horn and sternites.

ratio of length of legs 66 : 100 : 103; punctuation distinct on coxae, indistinct on femora. Primary ventral setae of fore femur (Figure 490, A) in form



FIGURES 490-492. *Hydatophylax nigrovittatus* McL.:

490—right trochanter and femur of foreleg (A), midleg (B), and hind leg (C), posterior; 491—tergite of abdominal segment 9; 492—larval case.

of 2 large, pointed, light yellow spines, basal spine slightly thicker, apical longer; posterior seta large, brown, situated above and much longer than basal spine, almost as long as posterior distoventral seta of trochanter. Primary ventral setae of mid-femur (Figure 490, B) represented by 2 thin, moderately long, brown spines of about the same size, one situated in middle of femur, the other on its basal part. Primary ventral setae of hind femur (Figure 490, C) in form of a thin, brown spine in middle of femur, similar to that on midlegs, and a moderately long, strong, dark brown seta situated more distally, slightly smaller than distoventral, posterior seta of trochanter. Secondary setae numerous only on coxae; femora with only dorsal subapical setae, 3 light thin setae on foreleg and 4 on mid- and hind legs.

Dorsal process of abdominal segment 1 small, retracted in fixed specimens; lateral processes normally developed; dorsal process flanked by 10—12 large and small setae situated on dark dots, and 5—6 minute setules; each side of segment with 2 small, setose ventral sclerites. Lateral line on segments 3—8, with brownish hairs. Gills in form of thick, long filaments, except pleural gills of posterior segments, which are small, almost rudimentary; segment 2 without presegmental gills.

Tergite of segment 9 brown, reddish brown at anterior and posterior margin; large, indistinct dots at anterior margin; medioanal and anterior-angle setae blackish, thick, the former much longer; intermediate seta thin, moderately long, almost as long as anterior-angle seta; lateral setae, a primary and secondary, short, thin; a small thin seta sometimes present between medioanal setae; surface apparently without setae (Figure 491).

Sclerite "b" of anal legs dark brown, with large, indistinct dots at anterior margin; distodorsal setae black, situated close together; both setae situated further medially, thick, long, lateral seta thinner, moderately long; subapical seta of median margin the same, a small, thin seta near margin further basally; distoventral seta moderately long, strong, brown; surface with a short and 2—3 small, thin setae.

Sclerite "c" yellowish, brownish laterally, with brownish lateral margin; basal seta short, dark.

Claw yellowish brown basally, dark, brownish apically, with a dorsal denticle flanked, usually, by 2 thick spinules on each side; setae as in *H. magnus*.

Number and arrangement of gills of *H. nigrovittatus*

Segment	Dorsal	Pleural	Ventral
2	1	1	1
3	1 1	1 1	1 1
4	1 1	1 1	1 1
5	1 1	1 1	1 1
6	1 1	1(0)	1 1
7	1 1(0)		1 1
8			1(0)

Case 30—42 mm long, made of detritus, smooth if made of small particles; cases made of large fragments are bulky, as in *H. magnus*, with a rough surface, often with long rods projecting beyond posterior end; anterior end often with a number of smoothly arranged sand grains ventrally or all around; whole anterior part or most of case sometimes consists of sand grains (Figure 492).

**Pupa.** Length 21—22 mm. Antennae reaching end of segment 6 or beginning of abdominal segment 7. Labrum brownish, with a small, light spot with 5 reddish brown hooked setae; seta 1 small, situated lateral to median process at anterior margin, light, relatively large.

Mandibles dark brown; blade of distal part serrated; lateral setae brown, dorsal seta larger than ventral.

Wing sheaths reaching abdominal segment 4. Natatorial setae light, dense, grayish, on segments 1—4 of mid-tarsi; hind tarsi with sparse light setae, those of segments 1 and 2 larger and denser, those on following segments slightly smaller.

Process of abdominal segment 1 wide, light, with fine transverse striation; saddle-shaped distal margin with reddish margin with relatively large, dark brown setae. Holding apparatus on segments 3—7, number of hooks: III: 6—7; IV: 7—8; V: 8—10 + 16—20; VI: 6—8; VII: 5—6.

Anal rods thicker in basal part, club-shaped apically; setae dark, basal, subapical, and apical setae slightly larger than in *Potamophylax*; seta in middle small.

Case shorter than in larva and attached at anterior end; posterior, sievelike membrane situated inside tube some distance from posterior end, which is narrow and rounded, covered with flat sand grains laterally.

Mode of life and habitats. Brooks, rivulets, river channels.

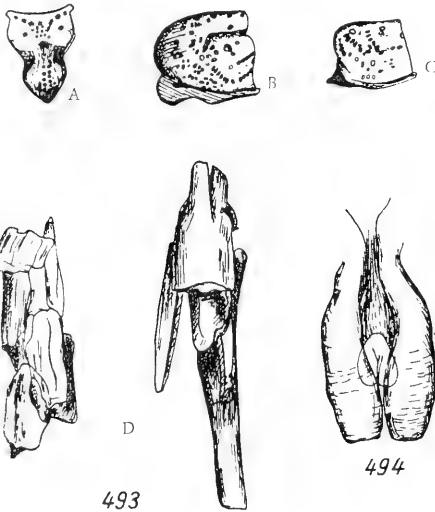
Distribution. USSR: Altai, Sayans, Eastern Siberia, Yakutia, Maritime Territory, Amur Region, Kamchatka. In addition, North China, Mongolia, Japan.

### 3. *Hydatophylax infumatus* McLachlan

Siltala, 1904c: 63–66, Figure 15. — Ulmer, 1909: 265, 268, Figure 400a. — Hanna, 1957: 218–222, Figures 1–14. — Lestage, 1921: 766–768, 771–773, Figure 271 b, h.

Full-grown larva. Length 19–25 mm. Head short, yellowish, brownish before eye and anteriorly on ventral side; pattern as in previously described

(278)



species, variegated, with numerous distinct dots. Frontoclypeus (Figure 493, A) brown near tentorial pits, lighter in middle and posteriorly near frontal sutures; wedge-shaped pattern distinct, consisting of dark dots. Numerous, dense dots dorsally along sutures behind eye and on sides.

Labrum with dark spots near median pit, and near setae 5 and 6. Both mandibles with 5 distal teeth. Maxillary palps very short.

Pronotum (Figure 493, B) light yellow, lighter than head, brownish in some places; groove in anterior third dark in middle; posterior margin with wide, rounded, posterior-angle process, black transverse stripes of margin clearly separated; dots numerous and distinct, as on mesonotum; setae situated on brown dots. Mesonotum (Figure 493, C) yellowish brown; posterior angle yellowish; posterior margin light brown, with a narrow black stripe in middle; posterior angle of margin

broadly black. Tergites of metathorax; anterior median tergites fused.

Prosternite indistinct, yellowish; posterior margin pale. Ventral side of mesothorax with a row of dark sclerotized dots. Metathorax ventrally with several light dots.

FIGURES 493 and 494. *Hydatophylax infumatus* McL. (after Siltala);

493 — larva; frontoclypeus (A), pronotum (B), mesonotum (C), larval case (D); 494 — penis sheath and genital appendages of male pupa.

Ratio of length of legs 65:100:96; punctation distinct in some places.

Dorsal process of abdominal segment 1 small, low. Lateral line beginning at end of abdominal segment 2 with several dark hairs. Gills on segments 2-7; segment 2 without presegmental gills.

Number and arrangement of gills of *H. infumatus* (after Siltala)

Segment	Dorsal	Pleural	Ventral
2	1	1	1
3	1 1	1 1	1 1
4	1 1	1 1	1 1
5	1 1	1(0) 1(0)	1 1
6	1(0) 1(0)		1 1
7			1(0) 1(0)

Tergite of abdominal segment 9 yellowish; 3 thin, secondary setae between long, dark, medioanal setae. A short, thin, secondary seta near lateral seta.

Sclerite "b" of anal legs with 6-7 small thin setae.

Case (Figure 493, D) bulky, 30-50 mm long, covered with coarse fragments of wood usually including a long fragment which projects posteriorly, so that case is 60-65 mm long; fragments arranged longitudinally or obliquely; posterior opening with a membrane with a large round hole.

**Pupa.** Length 16-21 mm. Antennae reaching to abdominal segments 6-7, wing sheaths to segments 3-4. Dorsal process of abdominal segment 1 wide, with small spinules at posterior margin. Holding apparatus on segments 3-7; number of hooks: III: 3-6; IV: 3-7; V: 4-7 + 21-23; VI: 4-9; VII: 3-8. Anal rods 1.0-1.1 mm long, with slightly curved end; basal seta larger than others. Lateral lobes of male genitalia (Figure 494) very long, with almost straight posterior margin, much longer than small, bifid penis sheath.

Pupal case short, attached at anterior end; anterior and posterior opening with thin sievelike membranes with numerous holes.

Mode of life and habitats. Clear brooks, in parts with slow current; pupae occur from mid-July in Karelia.

Distribution. Northwestern part of the European USSR. In addition, Central Europe.

279 3. Genus *Stenophylax* Kolenati

**Full-grown larva.** Brownish, lighter than in other genera of the tribe. Pattern consisting of dark, large dots; large setae black. Gills on segments 2–8. Case straight, smooth, made of detritus.

Mode of life and habitats. Brooks with moderately rapid current.

Distribution. Southern part of the European USSR. In addition, Europe, except northern countries; North Africa, Iran.

1. *Stenophylax permistus* McLachlan

Frochot, 1962:1–16, Figures 1–13.

**Full-grown larva.** Length 18–20 mm. Head (Figure 495) relatively wide, pale reddish brown; punctation distinct, brown; only primary setae present; setae 9 and 14 larger than others, black, thick. Gula slightly dark.

Thoracic tergites as in Figure 496. Pronotum yellowish brown; groove in anterior third slightly darker; posterior margin blackish; punctation dark, distinct; setae brown or reddish brown, strong. Mesonotum yellowish brown, yellowish at posterior angle. Lateral tergites of metathorax pale posteriorly.

Legs brown; form and chaetotaxy of legs as in *Potamophylax stellatus*.

Abdominal segment 1 darker than other segments; median ventral process wide, with 30–50 small, dark setae. Lateral line on segments 3–8. Gills on segments 2–8.

Tergite of segment 9 brown, with a row of blackish brown dots at anterior margin; medioanal setae longer than others, black; anterior-angle setae, intermediate setae, and secondary seta between medioanal setae dark, strong but shorter; surface with 8–9 small setules.

Number and arrangement of gills of *S. permistus*

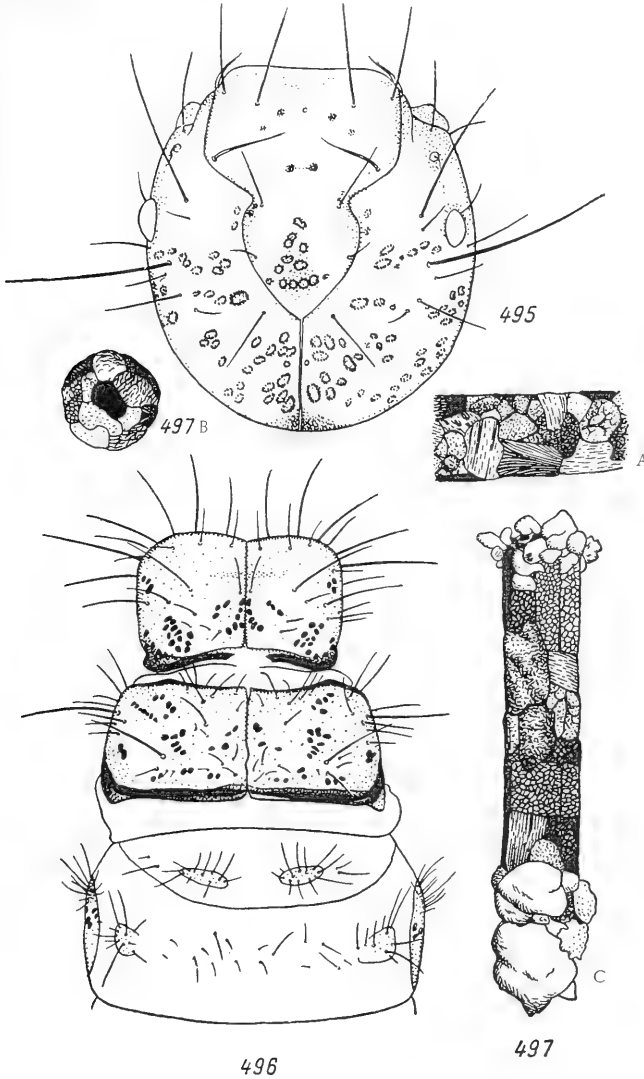
Segment	Dorsal	Pleural		Ventral
2	1 1	1	1	1 1
3	1 1	1	1	1 1
4	1 1	1	1	1 1
5	1 1	1 (0)	1 (0)	1 1
6	1 1	1 (0)		1 1
7	1 1			1 1 (0)
8				1 1 (0)

Sclerite "b" of anal legs, brownish, with large, darker dots; 2 long, thick setae, 2-3 moderately long, black setae and 10-12 short and small setae at posterior margin. Claw with large dorsal denticle and a small denticle at its base; seta 3 larger than others.

Case (Figure 497) 17-18 mm long, straight, cylindrical, with large dorsal anterior-margin process, consisting of flat fragments of detritus with accurately cemented margins; posterior end rounded, with a central opening surrounded by small, regular fragments of detritus (Figure 497, B).

Pupal case with a sievelike membrane at each end, and covered with loosely attached sand grains and small stones (Figure 497, C).

(280)



FIGURES 495-497. *Stenophylax permistus* McL. (after Frochet):

495 - head, dorsal; 496 - thoracic tergites; 497 - part of larval case, lateral (A), posterior end of larval case (B), pupal case (C).

Mode of life and habitats. Slow brooks with abundant fallen leaves on bottom.

Distribution. Western part of the European USSR, Caucasus, Crimea. In addition, Europe.

#### 4. Genus *Halesus* Stephens

**Full-grown larva.** Length 17–26 mm. Head brownish, with large, distinct, chestnut brown dots; light areas of head little differentiated. Groove in anterior third of pronotum dark in middle. Mesonotum lighter than pronotum. Anterior median tergites of metathorax, long, triangular, 280 not fused. Fore trochanters with a row of hairlike chaetoids curved distally on entire distal part from suture; mid- and hind tibiae and tarsi with ventral rows of spinules.

Dorsal process of abdominal segment 1 wide, blunt. Presegmental gills present on abdominal segment 2.

Case made of detritus, 22–35 mm long, with smooth surface except if particles of trees are used; long rods sometimes present at ends, increasing 281 length to 40–45 mm.

Mode of life and habitats. Brooks and rivulets with abundant detritus; open shore of lakes.

Distribution. Northern, northwestern, and central parts of the European USSR, Caucasus, Siberia (rare), Sakhalin. In addition, Europe, Iran, Japan.

#### Key to Species

##### Full-grown larva

- 1 (2). Medium sized, 17.5–21.0 mm long; groove in anterior third of pronotum dark, dark brown in middle; abdominal segment 2 usually without lateral presegmental gills; case smooth, made of small pieces of detritus, sometimes with a small rod projecting posteriorly. Rare; isolated records from western border of the USSR and northern Caucasus . . . . . 3. *H. digitatus* Schrk. (p. 360)
- 2 (1). Larger, 20–26 mm; groove in anterior third of pronotum slightly dark in middle; abdominal segment 2 with lateral presegmental gills; case often smooth, sometimes made of coarse tree detritus, with rough surface and rods projecting beyond ends. Common in large areas of European USSR.
- 3 (4). Darker than *H. interpunctatus*; posterior margin of pronotum with short, black median stripe and a long lateral stripe extending in a thin end before median stripe almost to suture; anterior median sclerites of metathorax brown, distinct . . . . . 2. *H. tessellatus* Ramb. (p. 358)
- 4 (3). Lighter; black lateral stripe at posterior margin of pronotum extending above median stripe only to middle of half of sclerite; anterior median sclerites of metathorax pale, indistinct . . . . . 1. *H. interpunctatus* Zett. (p. 353)



## 1. *Halesus interpunctatus* Zetterstedt

Klapálek, 1888:20–22, Figure 7. — Siltala, 1903a:31–34, Figure 9. — Ulmer, 1909:68–69. — Siltala, 1904:69; 1907:503–504, 507–510. — Ulmer, 1909:268–269, Figure 400a. — Döhler, 1914:50. — Lestage, 1921:785–795, Figure 281e. — Lepneva, 1928:80; 1940:216, Figure 160, 3.

**Full-grown larva.** Length 20–26 mm. Head mainly brown, lighter in some places; punctate pattern on brown background, distinct; dots large, chestnut brown, with narrow, dark margin (Figure 498, A). Frontoclypeus almost uniformly brown, slightly lighter anteriorly, in middle, laterally, and behind wedge-shaped pattern;\* margin darker at tentorial pit and further posteriorly; anterior part with 2 indistinct dots laterally and behind median pit; wedge-shaped pattern distinct posteriorly, with less distinct dots anteriorly. Eye surrounded by a narrow, light stripe; a dark reddish brown area anteriorly; palp with brown sensilla; light specimens have indistinct dorsal stripes along frontal sutures, and transverse rows of 3–4 indistinct dots; numerous dots lateral to coronal suture; space between dorsal stripes and lateral surface of head lighter; sides with longitudinal rows of numerous large dots behind eye. Ventral surface mainly brown, lighter at anterior margin, with large, pale, brownish areas with numerous, sometimes indistinct dots near occipital foramen. Gula long (Figure 498, B).

Large setae brown or dark brown, largest setae relatively thin. Median and intermediate anterior-margin setae brown, moderately long, lateral anterior-margin seta light, curved inward; anterior-frontal seta the same, middle frontal seta large, moderately long, posterior frontal seta small, thin; seta 7 strong; setae 9 and 14 long, dark brown, but only slightly thicker than middle frontal setae, second longer than first, almost as long as width of head; seta 10 small, transparent; seta 11 slightly larger, thin, brownish; seta 13 similar; seta 12 thin, moderately long; seta 15 thin, light brown, moderately long, only slightly longer than middle frontal seta; seta 16 short, light, procumbent; seta 17 strong, large, as long as middle frontal seta.

282 Labrum with reddish brown dorsal sclerite and narrow, membranous anterior margin; posterior angle sclerites dark brown; a small, brown dot behind median pit; seta 1 situated on membrane, in form of a thick, light spine with thin pointed apex, in contrast to usual blunt end; setae 2 and 3 situated submarginally, light, seta 2 thick, blunt, curved inward, seta 3 straight, short, with thin end.

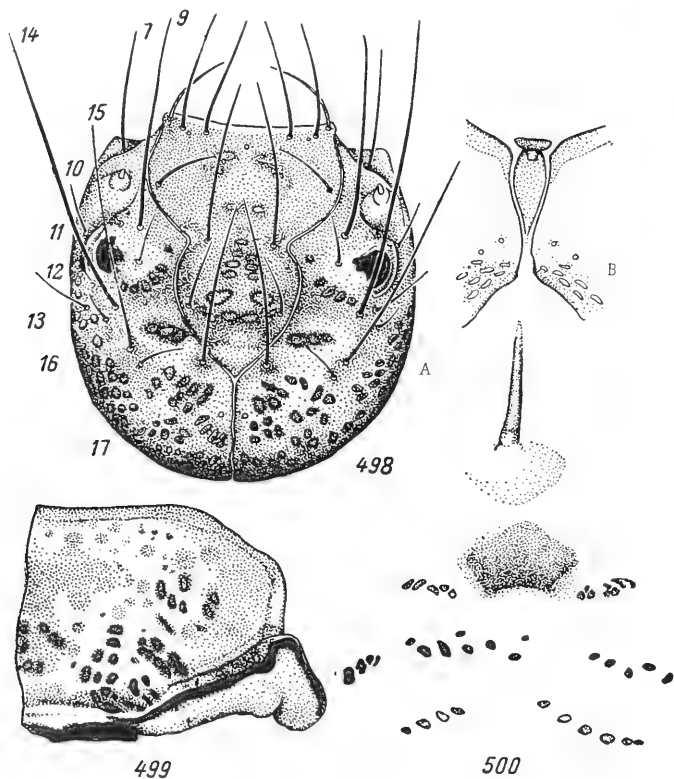
Mandibles black, with small, blunt teeth. Left mandible with 2 teeth and a wide tooth-shaped process on dorsal blade dorsal to middle tooth, ventral blade with one tooth in addition to distal tooth. Right mandible with a large distal tooth, and 4 teeth on dorsal blade, last tooth in form of a rounded, sometimes indistinct, process; ventral blade distally with an indistinct tooth-shaped process. Setae situated at basal margin; dorsal seta short, brown, ventral seta small, light.

Sclerites of cardo light brown, with slightly projecting anterior margin; posterior margin reddish brown; median margin in form of black, slightly oblong spot; lateral margin reddish black anteriorly; lateral seta small, light, second seta dark brown, slightly larger. Submentum with light, whitish membranous part; lateral sclerite triangular, reddish brown; median sclerite in form of a dark, narrow, oblique plate; space between sclerites

\* Described from preparations.

yellowish, weakly sclerotized; median sclerite distally with a brown, strong, moderately long seta. Stipes yellow, with a reddish brown basal stripe; lateral seta light brown, median seta thinner, darker, almost half as long as lateral. Distal seta of palpifer large, slightly thinner and smaller than distal seta of stipes, and also dark; median seta small, light, situated closer to basal margin. Maxillary palp short, segments 2-3 narrow, slightly longer than segment 1. Galea large, short, cylindrical, with brown sclerite. Mentum in form of wide, dark brown semicircle, shorter in middle; ventral sclerites brownish yellow, with a small light seta. Palpiger in form of a broad horseshoe; labial palp with reddish sclerite; labial lobe with a short process.

(283)



FIGURES 498-500. *Halesus interpunctatus* Zett.:

498 - head, dorsal (A) and ventral (B); 499 - pronotum; 500 - thoracic horn and sternites.

Pronotum (Figure 499) light yellowish; anterior margin narrow, dark brown; lateral margin yellowish brown; middle of groove in anterior third broadly golden brown; similar brownish areas laterally and at posterior margin; dots large, chestnut brown, each on a small brown or brownish spot;

setae dark brown or blackish brown, with round brownish dots at base; punctate pattern pale in contrast to variegated pattern of *Hydatophylax*, mainly of soft brown tone. Posterior margin yellowish brown; black lateral stripe slightly longer than median stripes, the 2 stripes almost meeting in middle of sclerite; posterior-angle process light yellow, with narrow, reddish, lateral margin; a group of small, brown, and light dots posteriorly on a dark area at base of process.

Anterior margin of mesonotum with a brownish or reddish stripe laterally; posterior angle dark, with blackish brown margin; posterior margin brownish in middle, grayish laterally. Mesonotum lighter than pronotum, light brownish in anterior half and in part of posterior half; posterior angles broadly whitish; oblique streaks narrow, pinkish; dots and setae reddish brown.

Tergites of metathorax pale, indistinct; anterior and posterior median tergites light brownish, anterior with 10–11, posterior with 7–8 setae; anterior-margin, and medioanal, primary setae longer than others; lateral tergites large, brownish anteriorly, white posteriorly, with 3–4 indistinct dots, transverse band consisting of lines and dots, setae situated anteriorly, including long, primary, anterior-angular seta.

Propleuron with broad, black, pleural suture; episternum reddish brown; trochantin black basally, epimeron light yellow, with wide, blackish brown margin; seta situated near suture, short, dark, thin.

Mesopleuron brown; pleural suture apically in form of thin, blackish brown stripe, basal part with brownish groove and small, dense dots lateral to it; episternum with 3–4 large brownish dots; setae dark reddish brown, primary setae of episternum and epimeron, and one secondary seta of epimeron longer than others. Metapleuron paler, light brownish; pleural suture and dots on episternum the same, setae similar.

Prosternite pentagonal, light brown, with indistinct reddish brown stripe posteriorly, with dense groups of pinkish, sclerotized dots situated on thin yellowish plate laterally. Mesosternite represented by a row of large, pinkish dots and dense groups of smaller, lateral dots. Metasternite in form of brownish and pale dots. Horn brownish, darker basally (Figure 500).

283 Legs brown, with large dots on coxae, femora, and tibiae; dots distinct on forelegs, indistinct on mid- and hind legs; ratio of length of legs 65:100:93.

Fore trochanter (Figure 501, A) with small, light, anterior seta; posterior seta strong, small, dark; anterior-apical primary, ventral seta in form of a short, thick, yellow spine; subapical seta similar, but longer and thinner; posterior ventral setae brown, apical seta long, subapical shorter; anterior basal seta the same; dense curved light chaetoids at ventral margin, from suture to end of trochanter, usually only in distal setose area. Apical dorsal seta of femur brown, moderately long, strong; basodorsal seta thinner and smaller; apical and basal parts of dorsal margin with 4 small secondary setae; anterior seta of femur blackish brown, strong, both primary ventral setae in form of pointed, yellow spines of equal size, posterior seta dark, short, strong, situated basal to spines; small light spinules at ventral margin. Ventral side of tibia with similar spinules; tarsus without spinules.

Primary dorsal setae of mid-femur (Figure 501, B) slightly larger than on fore femur; 6 small secondary setae apically and 3–4 basally; anterior and posterior setae situated apically and subapically, dark, former longer;

primary ventral setae moderately long, blackish, spiniform; small, light spinules ventrally along entire segment. Similar but smaller spinules at ventral margin of tibia and tarsus.

(284)

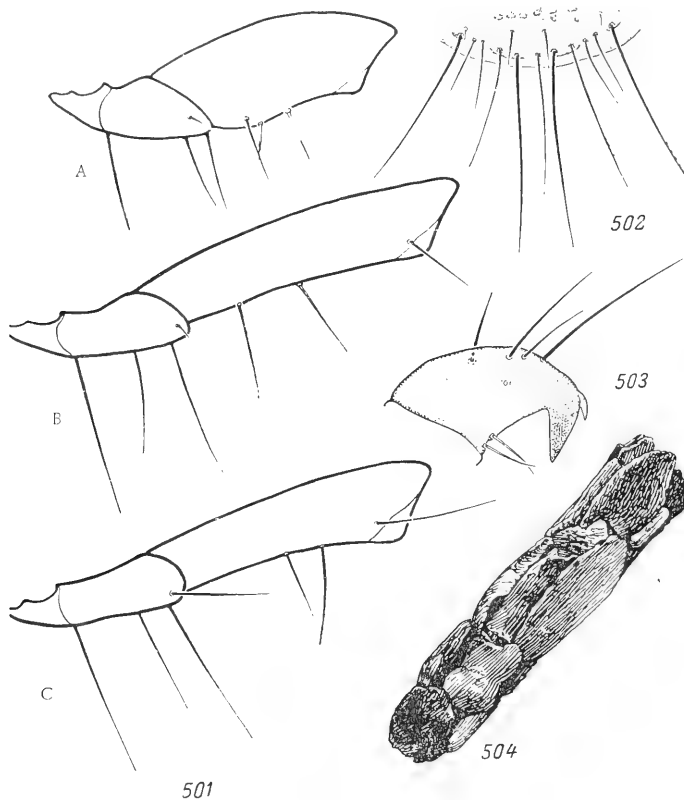


FIGURE 501-504. *Halesus interpunctatus* Zett.:

501 - hind trochanter and femur of the foreleg (A), midleg (B) and hind leg (C), posteriorly; 502 - tergite of abdominal segment 9; 503 - claw of anal leg; 504 - larval case.

Primary, apical-dorsal seta and primary posterior seta of hind femur (Figure 501, C) long, dark; anterior and basodorsal setae thin, moderately long; apical and basal parts with 3-4 secondary dorsal setae; primary ventral setae in form of a strong, black, spiniform, moderately long seta in middle of femur and a longer, dark, strong, distal seta; small spinules at ventral margin of hind femur, tibia, and tarsus absent.

Dorsal process of abdominal segment 1 blunt, wide; lateral processes large. Lateral line from middle of segment 2 to end of segment 8; segment 2 with presegmental gills.

Tergite of abdominal segment 9 brownish, its anterior margin laterally with 2 rows of pinkish dots converging in middle; setae dark reddish brown; medioanal setae long, thicker than others; anterior-angle setae slightly

shorter; intermediate seta thin, long; lateral primary and secondary setae short, thin; one, rarely 2 setae, between medioanal setae; surface with 4–5 small setae (Figure 502).

Sclerite "b" of anal legs brown; both large distodorsal setae, a median and a neighboring seta, long, black; lateral seta moderately long, thinner, apical-ventral seta short, brown; subapical seta of median margin the same; 2 thin setae basally near margin; surface with 3–5 small, thin, additional setae, rarely 9–10.

Sclerite "c" brown, with black lateral margin, seta small, brown.

Claw reddish brown, brownish apically, with a light brownish dorsal denticle; seta 3 larger and thicker than others (Figure 503).

Case made of detritus (Figure 504), with small, flat, approximately equal and regularly arranged pieces, with smooth surface in more or less rapidly flowing water; tube slightly curved; cases in calm water more bulky and covered with coarse tree detritus, some rods projecting beyond ends of case.

Number and arrangement of gills of *H. interpunctatus*

Segment	Dorsal	Pleural		Ventral
2	1 1	1	1	1 1
3	1 1	1	1	1 1
4	1 1	1	0	1 1
5	1 1			1 1
6	1 1			1 1
7	0			1 0

**Pupa.** Length 16–20 mm. Antennae reaching abdominal segment 8 or apex of rods.

Labrum light brown dorsally; seta 1 small, dark; all 5 hooked setae black, situated on a light spot. Mandibles brown, with dark brown apex and serrated blade; lateral setae short, black, about the same length.

Wing sheaths reaching middle of abdominal segment 4. Mid-tarsi with rust-colored natatorial setae on first 4 segments; hind tarsi with sparse setae on both sides of first 3 segments, only dorsally on segment 4.

Dorsal process of abdominal segment 1 whitish yellow, streaked transversely with dark brown posterior margin; lobes of saddle-shaped process with dark spinules including 3–4 larger spinules. Holding apparatus on segments 3–7; number of hooks: III:2–3; IV:2–4; V:2–4 + 12–14; VI:3–4; VII:4.

Anal rods relatively short, straight, slightly curved upward, with a longitudinal row of minute spinules dorsally, terminal spines larger; setae small, dark; basal seta thinner than others; middle, subapical and apical setae large, dark brown, of similar length.

Pupal case attached at anterior end; anterior and posterior openings closed by a sievelike lid with large, irregularly distributed holes; both ends covered above by pieces of plants or large sand grains and small stones.

Mode of life and habitats. Running water, usually in parts with a slow current; open shore of lakes, on a bottom with abundant detritus; pupae occur in later summer.

Distribution. Western, central, and northern parts of the European USSR, including Northern Urals. In addition, Northern and Central Europe.

## 2. *Halesus tessellatus* Rambur

Siltala, 1902:87-91, Figure 20. — Struck, 1903:61, Plate II, Figure 12. — Ulmer, 1903:67-68; 1903b:202-204, Figures 33-38. — Siltala, 1907:504-505. — Ulmer, 1909:269. — Döhler, 1914:50. — Lestage, 1921:785-795, Figures 282-284. — Lepneva, 1928:79-80; 1904:216.

**Full-grown larva.** Length 17-20 mm. Slightly darker than *H. interpunctatus*. Head pattern similar, more distinct ventrally; spots near tentorial pits darker.

Pronotum with light brown posterior margin; posterior angle process with blackish margin; black lateral anterior stripe of margin extending in a narrow process before posterior median stripe almost to suture. Lateral margin broadly black posteriorly. Most setae of thoracic tergites black.

Mesonotum light brown anteriorly and in middle of posterior part, brown in punctate area; posterior angle light, except area near lateral margin; oblique streaks as in *H. interpunctatus*, pinkish; anterior margin with black or dark brown stripe laterally; lateral margin with wide black posterior half joining wide and black posterior angle margin; posterior margin brownish in middle.

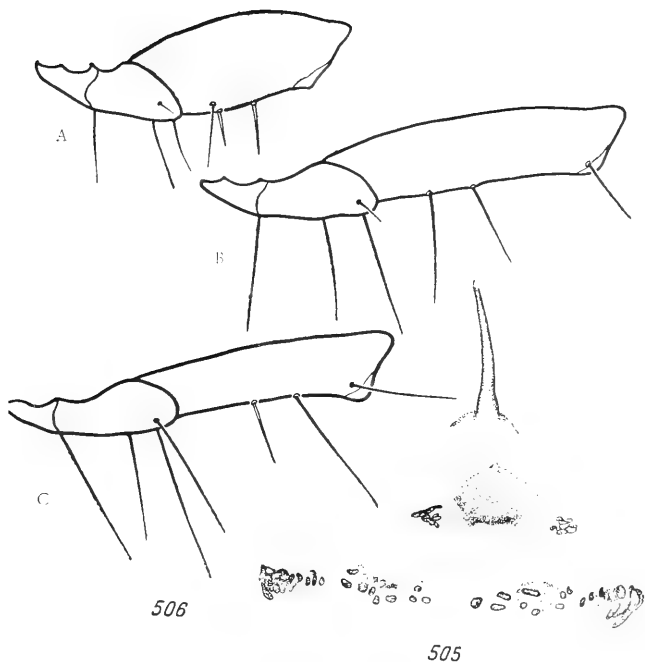
Tergites of metathorax brown, distinct; anterior median tergites in form of oblong triangles; posterior median tergites larger, irregularly triangular, with whitish lateral area; lateral tergites large, with a transverse band composed of a large reddish brown dot, longitudinal lines, and a small dot.

286 Prosternite (Figure 505) yellowish, not dark posteriorly or with a narrow stripe, with dense group of 16-18 small, pinkish, dots laterally. Mesothorax ventrally with a row of pinkish dots. Ventral side of metathorax with pale dots.

Legs (Figure 506, A-C) brown. Primary ventral setae of fore femur in form of 2 light yellow, large pointed spines, apical spine longer than basal; posterior seta dark, thin, as long as subapical seta of trochanter, situated above basal spine or slightly more basally, rarely apically. Primary ventral setae of mid- and hind legs as in *H. interpunctatus*.

Lateral line from end of segment 3 to beginning of segment 8, formed by small, dark, hairlike spinules. Gills on segments 2-7.

Tergite of segment 9 light brown, with indistinct punctation at anterior margin; medioanal seta black, long, sometimes situated near a smaller seta; anterior-angle seta similar, thick, dark, slightly smaller; intermediate seta thin, moderately long, brown; lateral setae, a primary and a secondary, short, thin; tergite with isolated, small, surface setae.



FIGURES 505 and 506. *Halesus tessellatus* Ramb.:

505 - thoracic horn and sternites; 506 - right trochanter and femur of foreleg (A), midleg (B), and hind leg (C), posterior.

Number and arrangement of gills of *H. tessellatus*

Segment	Dorsal	Pleural		Ventral
		1	2	
2	1	1		1
	1		1	1
3	1	1		1
	1		1	1
4	1	1	1	1
	1		1	1
5	1	0		1
	1		0	1
6	1			1
				1
7				1

Sclerite "b" reddish brown. Sclerite "c" lighter, with black lateral margin. Claw with a dorsal denticle. Setae as in *H. interpunctatus*. Case also as in *H. interpunctatus*.

287 **Pupa.** Length 16-20 mm. Resembling pupa of *H. interpunctatus*. Hooks of holding apparatus: III:3-4; IV:3-4; V:3+9-11; VI:2-3; VII:32. Anal rods with small, dorsal spinules.

Case 22–26 mm long, resembling that of larva; posterior, sievelike membrane as in *H. interpunctatus*, situated some distance from end; both ends covered with plant particles, sometimes sand grains or small stones.

Mode of life and habitats. Brooks with a moderately rapid current; open shore of lakes.

Distribution. Northwestern, western, and northern parts of the European USSR; isolated records from Siberia (Minusinsk area). In addition, Europe.

### 3. *Halesus digitatus* Schrank

Pictet, 1834:139, Plate VII, Figure 2. — Meyer, 1867:165–166. — Struck, 1903:101, 107. — Ulmer, 1903:68; 1903b:205–207, Plate V, Figures 39–41; 1909:269, Figure 404. — Döhler, 1914:50. — Lestage, 1921:785, 788–790, 793–794. — Martynov, 1926:50. — Moretti, 1934:134–137, Figure 10. — Nielsen, 1942:489–497, Figures 118–119. — Hickin, 1949:56–59, Figures 1–12.

**Full-grown larva.** Length 17.0–20.1 mm. Head light brown, less wide than in *Potamophylax*; ratio of width to length 0.86; punctation distinct in some places, darkish brown (Figure 507, A). Frontoclypeus slightly dark laterally in anterior part; a narrow, reddish brown stripe in area of tentorial pits and along part of sutures; anterior part with indistinct dots; dots of wedge-shaped pattern large, distinct. Head slightly dark from lateral to epicranial suture to before eye; distinct dots further posteriorly lateral to frontal sutures and along coronal suture; similar dots on sides; ventral surface with groups of indistinct dots near occipital foramen. Gula light (Figure 507, B).

Labrum brown, with a dark spot behind median pit. Mandibles black; dorsal blade of left mandible with 2 teeth in addition to middle tooth; ventral blade with a large and a small tooth; dorsal blade of right mandible with 3 teeth in addition to middle tooth; ventral blade with a much smaller, blunt tooth; each mandible, therefore, with 5 teeth.\*

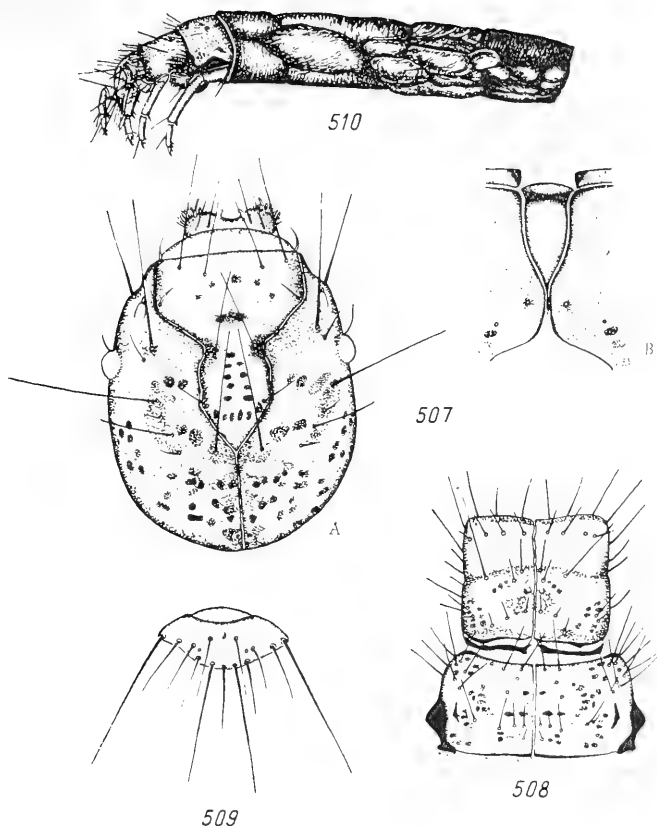
Pronotum (Figure 508) yellowish; transverse groove in anterior third distinctly dark in middle; posterior submarginal area and part of lateral area also slightly dark. Mesonotum darker than pronotum, brown anteriorly and in middle of posterior part; posterior angles lighter, with dark lines; anterior margin with dark stripe laterally; posterior margin with dark, wide, median part; posterior angles with black margin, lateral margin partly black; punctation as in Figure 508.

Median sclerites of metathorax grayish brown; lateral sclerites large, lighter, with 1–2 dots anteriorly, with a longitudinal row of dots posteriorly, transverse band formed by dark lines.

Legs yellowish brown; ratio of length of legs 71:100:93; coxae, femora, and tibiae with dark, distinct punctation. Primary ventral setae of foreleg in form of 2 strong, pointed, light spines of almost the same size; posterior seta thin, dark, situated basal to spines. Ventral setae of mid- and hind legs as in species of *Halesus* described in preceding paragraphs.

\* Not 4 as was stated in earlier descriptions.





FIGURES 507-510. *Halesus digitatus* Schrk. (after Hickin):

507 - head, dorsal (A) and ventral (B); 508 - pronotum and mesonotum; 509 - tergite of abdominal segment 9; 510 - larva in case.

Number and arrangement of gills of *H. digitatus*

Segment	Dorsal	Pleural	Ventral
2	1	1 (0)	1 (0)
	1	1	1
3	1	1	1
	1	1	1
4	1	1 (0)	1
	1		1
5	1 (0)		1
	1 (0)		1
6	1 (0)		1
			1
7			1

Dorsal process of abdominal segment 1 well developed; lateral processes with small, pale sclerites. Ventral elliptical area on segments 2–7, those on segment 2 smaller than others. Lateral line formed by small, grayish hairs, extending from beginning of segment 3 to end of segment 8. Gills on segments 2–7.

Lateral presegmental gill of segment 2 usually absent or very small.

Tergite of abdominal segment 9 (Figure 509) light brown, with brownish punctation; medioanal and anterior-angle setae about the same length; intermediate seta and lateral seta short, thin; a large, moderately long seta situated between medioanal setae; surface with 3–4 relatively large, and several small setae.

Sclerite "b" of anal legs yellowish brown, with brown punctation, with 3 large distodorsal setae, a ventral, and 2–5 other setae. Sclerite "c" yellow, with a dark seta.

Claw yellow, with a dorsal denticle.

Case (Figure 510) 20–50 mm long, made of coarse pieces of detritus, usually tree detritus, arranged obliquely or longitudinally; sand grains sometimes present among detritus; large rods not always present posteriorly.

**Pupa.\*** Length 17 mm. Spinules of holding apparatus: III:3; IV:4; V:5+14–18; VI:4; VII:4. Anal rods short.

Sheaths of lateral appendages of male pupae much longer than penis sheath. Case (according to Döhler) usually made of tree detritus. Nielsen (1942:497) described a pupal case of *H. digitatus* made of sand, rounded posteriorly with openings between sand grains, with a membrane anteriorly, with several sand grains among numerous holes. Case attached at posterior end to lower surface of stones by several short ligaments.

289 Mode of life and habitats. Clear brooks and small rivulets with moderately rapid current; among vegetation on stones, on large branches or pieces of wood, on sandy or silty bottom.

Distribution. Northern and northwestern parts of the European USSR, rare; Northern Caucasus. In addition, Europe, Iran.

## 5. Genus *Anisogamodes* Martynov

**Full-grown larva.** Medium sized, 17–21 mm long. Head slightly oblong, brown, with indistinct shaded pattern; punctation distinct. Pronotum and mesonotum with a broad, light, longitudinal stripe along median suture. Presegmental gills on abdominal segment 2 absent.

Case made of detritus, with rough surface, with long rods projecting at the end.

Mode of life and habitats. On stony or sandy bottom; open shore of mountain lakes; near banks of mountain rivers.

Distribution. USSR: Altai. In addition, Mongolia.

### 1. *Anisogamodes flavipunctatus* Martynov

Lepneva, 1949:171, 173–174, Figure 28.

**Full-grown larva.** Length 17–21 mm. Head (Figure 511, A) slightly oblong, ratio of width to length 0.67; sclerites with small, blunt spinules

\* See Döhler, 1914:48–50.

(Figure 511, B). Frontoclypeus mainly uniformly brown; anterior margin golden brown; 2 brown dots on each side behind median pit, 2 pairs of dots, one behind the other further posteriorly; tentorial pits dark brown; margin slightly dark at base of posterior frontal seta; wedge-shaped pattern with large dots posteriorly; posterior angle broadly light. A light stripe along coronal suture; eyes on a light area, situated behind a brownish area; antenna with dark sensilla. Dark specimens have indistinct dorsal stripes some distance from epicranial suture and with 2 transverse rows of dots in middle; a straight row of 5-6 small dots before seta 14; 2 large reddish brown dots before setae 15 and 17; large, distinct dots lateral to light stripe at coronal suture; sides with short longitudinal rows of large, dense dots behind eye. Ventral surface darker than dorsal, chestnut brown; yellowish brown, with large dots near occipital foramen. Gula narrow, chestnut brown, pointed posteriorly, with a narrow, dark stripe at gular margin of sclerites. Anterior-margin setae, median and intermediate, dark brown, moderately long, lateral anterior-margin seta short, light; anterior frontal seta the same, procumbent, middle frontal seta brown, long, slightly thinner and longer than anterior-margin setae; posterior frontal seta short, very thin. Seta 7 strong, moderately long, situated before antenna; setae 9 and 14 long, dark brown, about the same length; seta 10 small, light; seta 11 thin, moderately long; seta 12 the same, thicker; seta 13 small; seta 15 thin, very long, almost as long as 14; seta 16 short, light, procumbent; seta 17 thin, like 15, as long as middle frontal seta; ventral seta 8 small, thin, seta 18 very small.

Dorsal sclerite of labrum with deep median indentation, anterior margin broadly membranous, convex inside indentation, in form of lobes laterally, with numerous light hairs; posterior-angle sclerites thin, curved, reddish brown at end; dorsal sclerite brown, with a dark dot behind median pit, near posterior margin and in each half with dark chestnut brown spots with dark, large setae 5 and 6, seta 5 slightly larger than 6; seta 1 situated lateral to indentation in form of a light, thick spine; seta 2 situated on membrane near margin, thick, spiniform, light; seta 3 also light, larger, situated at anterior angle; seta 4 situated on sclerite some distance from indentation, light, smaller than 3.

Mandibles oblong, black, reddish at apex; left mandible with 3 large teeth of almost equal size distally, middle tooth slightly wider, dorsal blade with 2 rounded, indistinct tooth-shaped processes further dorsally; ventral blade with a small, distal tooth; subventral tooth of right mandible larger than others; dorsal blade with 3 small teeth and a tooth-shaped process; ventral blade with an indistinct process; brush situated near dorsal margin consisting of thin, grayish chaetoids; lateral setae situated basally, thin, small, dorsal seta dark; ventral light, shorter.

290 Maxillolabium with light, whitish membranous part. Sclerites of cardo reddish brown; median margin and lateral stripe black; lateral seta light, thin, second seta brownish, thick, both small. Lateral sclerites of submentum reddish brown, triangular; median sclerites in form of small oblique brownish plates with strong, moderately long seta laterally at anterior margin. Stipes yellowish brown, with reddish brown margin posteriorly; lateral seta light brown, distal seta brown, half as long. Palpifer brown, blackish laterally; median apical seta large, brown; basal seta small, light. Maxillary palps short, slightly longer than palpifer; galea short,

reaching base of segment 3 of palp. Mentum dark reddish brown, lighter at anterior and posterior margin; ventral sclerites in form of a brown oblong plate; seta small, light. Palpiger broad, bracketlike, brown. Palp with brownish sclerite, longer than distal process of labium.

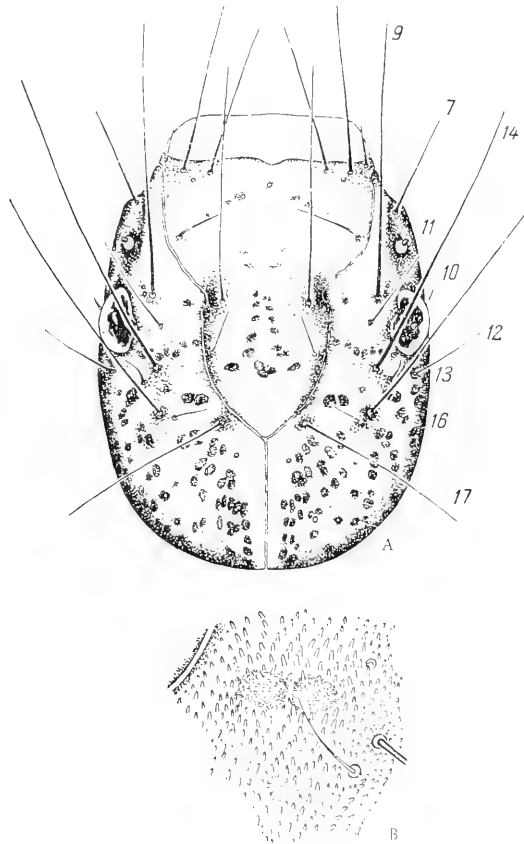
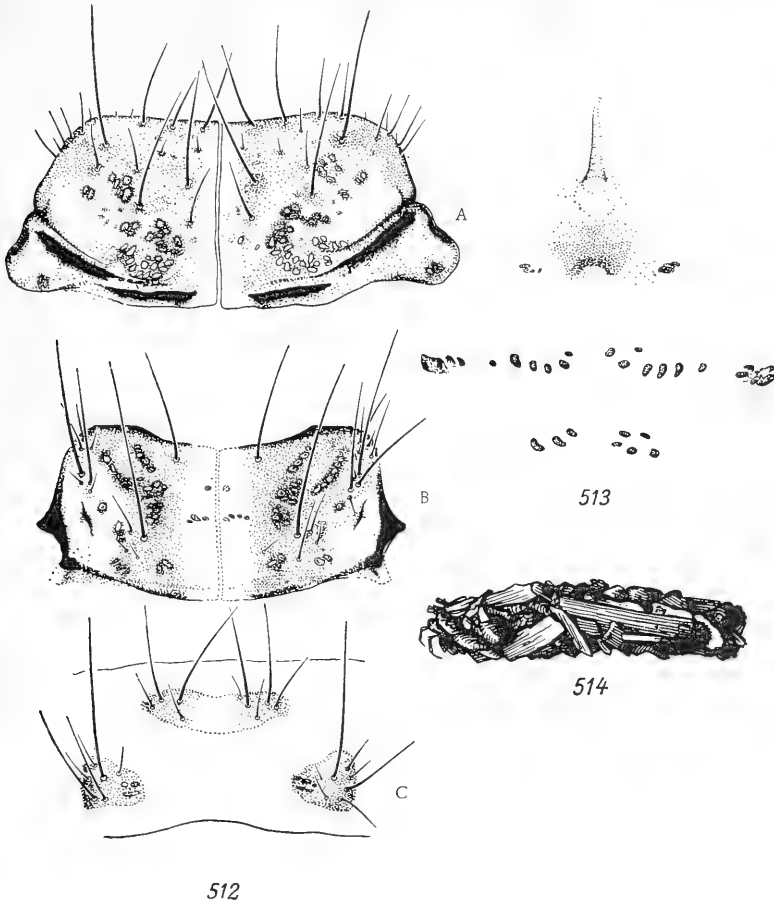


FIGURE 511. *Anisogamodes flavipunctatus* Mart. Head, dorsal (A), spines near setae 15 and 16 of head (B)

Pronotum (Figure 512, A) light yellow; anterior and lateral margin very narrow, brownish; setae black, as on following thoracic segments; surface broadly light in middle along median suture, with pale, X-shaped, punctate pattern posteriorly; middle of groove in anterior third slightly dark in a small area lateral to light, median stripe; surface chestnut brown near lateral margin, including base of long anterior-angle seta; anterior submarginal area with similar dark brown, partly fused spots at base of setae; other surface, including median area, yellow; posterior angles whitish yellow; middle of each half with groups of large, chestnut brown dots on a reddish brown background; large and small setae with small, chestnut brown

rings at base. Posterior margin brown; posterior-angle process lighter, with narrow reddish brown margin laterally, with 3-4 sclerotized dots basally, transverse stripes of margin wide, blackish brown, separated, lateral stripe extending in a thin line before posterior stripe.

(291)



FIGURES 512-514. *Anisogamodes flavipunctatus* Mart.:

512 - pronotum (A), mesonotum (B), and metanotum (C); 513 - thoracic horn and sternites; 514 - larval case.

Mesonotum (Figure 512 , B) with broad, light yellowish, median stripe, as on pronotum; anterior part on each side with 2 small, pale, pinkish dots near median suture, with 3-4 more distinct dots further posteriorly; posterior angle broadly whitish yellow, with narrow, oblique, reddish black striation; other surface brown; dots large, chestnut brown, situated, as the setae, on darker reddish brown or smoky brown background; anterior margin brown, with wider reddish brown stripe laterally; lateral margin

291 brown in anterior half, posterior half black, fused with wide posterior-angle process; posterior margin light in middle, yellowish laterally, reddish brown in middle of each half.

Tergites of metathorax distinct, with black setae; anterior sclerites fused into an elliptical, transverse, median sclerite with a light, milk white, longitudinal stripe, and with blackish brown, lateral setose parts; posterior median sclerites large, triangular, blackish brown (Figure 512, C); lateral sclerites mainly yellowish, the anterior, setose parts blackish brown, with 2–3 dark dots; median side with a row of 6–7 dots on dark background; transverse band consisting of oblique, blackish lines, and a reddish dot.

A distinct character of this species is the presence of a light stripe lateral to coronal suture, which continues in a light median stripe on pronotum, mesonotum, and anterior tergite of metathorax; forming a distinct dorsal stripe on head and thorax.

Prosternite in form of a small, yellowish, irregular sclerite, with small, dense, pinkish dots near its base; horn relatively short, wide at base, dark brown; light apically and slightly bifid. Mesosternite represented by a row of large, dark brown, sclerotized dots, and small, brown sclerites with dots laterally. Ventral side of metathorax with 4–6 large, pinkish, or lighter, dots laterally (Figure 513).

292 Legs chestnut brown, with broad, blackish, distal bands on all tibiae and tarsi; coxae and femora with indistinct punctation; ratio of length of legs 62:100:96.

Number and arrangement of gills of *A. flavipunctatus*

Segment	Dorsal	Pleural		Ventral
2	1		1	1
3	1 1	1	1 1	1 1
4	1 1	1	1	1 1
5	1 1	1 (0)	1 (0)	1 1
6				1 1
7				1 (0) 1 (0)

Fore femur long, with slightly convex dorsal and almost straight ventral side. Primary ventral setae of fore femur in form of 2 pointed, light yellow, large spines, basal spine slightly smaller than apical; posterior seta thin, dark, short, slightly shorter than distal ventral seta of trochanter, and situated nearby or dorsal to basal spine. Primary ventral setae of mid-leg brown, moderately long, strong, about the same size, situated in middle of segment and further basally. Primary ventral setae of hind leg represented by a similar strong, moderately long seta in middle of segment, and a longer seta further basally.

Dorsal process of abdominal segment 1 large, pointed; lateral processes blunt; ventral side with 2 small, brown sclerites close to middle.

Lateral line on segments 3-8; hairs fine, brownish.

Gills on anterior segments in form of thick, relatively long filaments; dorsal and pleural gills absent from segment 6; ventral gills become smaller; segment 2 without presegmental gills.

Tergite of abdominal segment 9 chestnut brown, with pinkish punctation at anterior margin; posterior margin darker than anterior. Setae dark brown; medioanal setae long, thicker than others, anterior-angle setae thinner and shorter; intermediate seta thin, moderately long, lateral seta short; a similar short seta slightly basal to it; a moderately long and a short, thin seta between medioanal setae; surface with 2-3 small, secondary setae.

Sclerite "b" of anal legs chestnut brown, with indistinct punctation at anterior margin; setae dark brown; the median of 3 distodorsal setae long, thick; neighboring seta almost the same, lateral seta thinner and much shorter; subapical seta at median margin similar; 2 thin, short, and a small seta situated nearby or more basally; distoventral seta short, thin, dark; surface with a brown, moderately long seta, and 5-6 small setae.

Sclerite "c" light brown, with a short, strong, dark, basal seta, and reddish brown, relatively narrow, lateral margin.

Claw light brown, reddish brown apically, with a large, lighter, dorsal denticle. Seta 1 situated subdorsally on inner side of basal part, strong, dark; seta 3 moderately long, situated distally; seta 2 thin, brown, situated dorsally above suture; seta 6 short, situated laterally near seta 2 and distal to suture; ventral setae 7 and 8 light, lateral seta 5 shorter, thin, situated near seta 8, basal to suture; seta 4 larger, situated distal to suture.

Case (Figure 514) made of detritus, forming straight, cylindrical tube with rough surface, sometimes slightly narrower posteriorly; surface covered with small particles of detritus, and also with larger pieces, such as stalks, large debris of trees or sticks, arranged along entire case and projecting posteriorly.

Mode of life and habitats. Open shore of lakes, sometimes rivers (Lakes Teletskoe, Kochurlinskoe, Mul'tinskoe; Biya River); on bottoms of stone, sand and stone, and sand and detritus.

Distribution. USSR: Altai. In addition, Mongolia.

## 6. Genus *Micropterna* Stein

**Full-grown larva.** Length 16-19 mm. Head almost uniformly brown; pattern absent or indistinct; pronotum lighter than head. Secondary setae present ventrally and on anterior and posterior sides of femora. Dorsal and ventral gills present on segments 2-7.

293 Case made of sand grains and small stones of detritus, straight, slightly narrower posteriorly, with rounded posterior end.

Mode of life and habitats. Stony and sandy-stony bottom in running water, small brooks, and rivulets.

Distribution. The European USSR, including the Crimea and Caucasus, Middle Asia. In addition, Europe, Algeria, Iran, Pakistan, India, China.

Key to Species

Full-grown larva

- 1 (4). Case made of sand grains.
- 2 (3). Coloration more or less light; head and thoracic sclerites yellow or light brown; punctation distinct . . . . . 3. *M. sequax* McL. (p. 371)
- 3 (2). Body dark; punctation not distinct everywhere . . . . . 1. *M. nycterobia* McL. (p. 368)
- 4 (1). Case made of detritus; larva relatively light, with distinct punctation . . . . . 2. *M. lateralis* Steph. (p. 370)

1. *Micropterna nycterobia* McLachlan

Pictet, 1834:134–135, Plate VI, Figure 2. — Hagen, 1864:255–256. — Klapálek, 1893:27–31, Figure 8. — Struck, 1903:98. — Ulmer, 1903:67; 1909:268, Figure 403. — Lestage, 1921:779–785, Figures 277, 278b, c, d, e, g, h, i, j, k.

**Full-grown larva.** Length 16–19 mm. Head brown or dark brown; posterior angle of frontoclypeus lighter. Eyes on a narrow, light area; ventral surface light brown at anterior margin. Gula dark brown, tapering posteriorly. Dots large, dark brown; wedge-shaped pattern of frontoclypeus distinct; groups of dots lateral to frontal sutures, coronal suture, and on sides; similar dots ventrally near occipital foramen.

Number and arrangement of gills of *M. nycterobia*

Segment	Dorsal	Pleural		Ventral
2	1 1	1	1	1 1
3	1 1	1	1	1 1
4	1 1	1	1	1 1
5	1 1	1	1	1 1
6	1 1		1 (0)	1 1
7	1 1 (0)			1 1

Labrum wide; setae 5 and 6 blackish brown. Mandibles black; teeth situated distally, small, 4 on each mandible; brush with golden yellow chaetoids; lateral setae dark, situated basally (Figure 515).

Pronotum yellowish brown; dots large, brown; X-shaped, median, punctate pattern distinct; setae black, with round brown dots at base. Mesonotum with shining black posterior margin and part of lateral margin; setae black. Tergites of metathorax slightly sclerotized.



Legs brown, with dark brown punctation on coxae, femora, and tibiae; trochanters ventrally with light, curved, hairlike spines, as in previously described genera.

Dorsal process of abdominal segment 1 distinct, lateral processes larger. Lateral line from end of segment 3 to end of segment 8 formed by short, dark brown, hairlike spinules. Gills of anterior segments thick, long.

Tergite of abdominal segment 9 yellowish brown, with black setae. Sclerite "b" with longer, black setae. Claw with a dorsal denticle.

Case (Figure 516) 20–25 mm long, made of sand grains and small stones, narrower posteriorly, slightly curved, with rough surface; fragments of plant detritus often among mineral particles; anterior opening oblique, wide, posterior opening closed by a membrane with large, round, central hole.

**Pupa.** Length 16–18 mm. Antennae filiform, reaching end of abdominal segment 7. Labrum with rounded process at anterior margin (Figure 517, A), with a small, golden yellow seta laterally; 5 other setae long, hooked, dark. Mandibles relatively short, with straight distal part with a sharp point and serrated median side; lateral setae short, firm, about the same length (Figure 517, B).

Wing sheaths reaching middle of abdominal segment 4.

Dorsal process of abdominal segment 1 large; lobes of saddle-shaped indentation with small spinules. Holding apparatus on segments 3–7, number of hooks: III:4–5; IV:7–10; V:7–10+10–20; VI:6–9; VII:8–10.

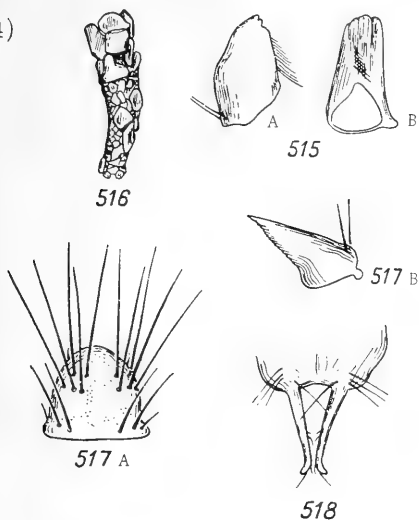
Lateral line from end of segment 5 to segment 8; setae long, dense, blackish brown. Gills, as in larva, on segments 2–7. Anal rods straight, slightly curved at end, with 4 small, dark setae situated at base, in middle, apically, and subapically (Figure 518). Lateral appendages of male genitalia blunt, wide, longer than penis sheath.

Pupal case 20–30 mm long, made of small stones and sand grains; anterior and posterior openings closed with small stones and membranous areas with large holes between them. Case attached almost vertically to a stone.

Mode of life and habitats. Brooks with stony bottom and rapid current.

Distribution. Western and southern (rarely) parts of the European USSR; Middle Asia. In addition, Central and Southern Europe.

(294)



FIGURES 515–518. *Micropterna nycterobia* McL. (after Klapálek):

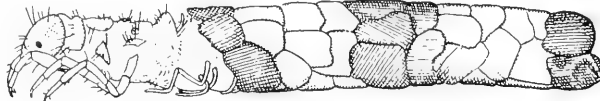
294 515 – left mandible, dorsal (A) inner side (B); 516 – larval case. Pupa: 517 – anteclypeus and labrum (A), left mandible, ventral (B); 518 – anal rods.

## 2. *Micropterna lateralis* Stephens

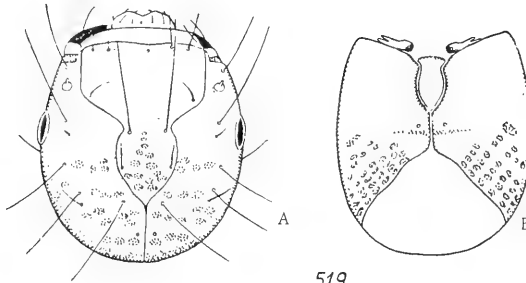
Siltala, 1904c:67-69, Figure 16; 1908b:16-17, Figure 3. — Ulmer, 1909:268. — Lestage, 1921:778. — Hickin, 1954:145-146, Figures 1-5.

**Full-grown, larva.** Length 16-18 mm. Head (Figure 519, A) chestnut brown dorsally, including frontoclypeus; anterior part of frontoclypeus with indistinct punctation, posterior angle lighter, wedge-shaped pattern distinct. Dorsal stripes replaced by transverse rows of large, sparse dots; sides with longitudinal rows of dots, ventral surface with large groups of dots on lighter background near occipital foramen (Figure 519, B).

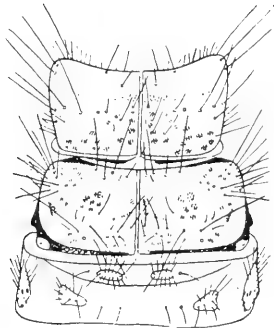
(295)



521



519



520

FIGURES 519-521. *Micropterna lateralis* Steph. (after Hickin):

519 - head, dorsal (A) and ventral (B); 520 - thoracic tergites; 521 - larva in case.

Pronotum (Figure 520) yellowish brown; groove in anterior third slightly dark in middle; X-shaped punctate pattern and dots in posterior part large, distinct; dark dots at base of setae. Mesonotum darker than pronotum anteriorly and in middle of posterior part; posterior angles broadly light, with oblique, dark striation (Figure 520).

Larval case 16–19 mm long, straight or slightly curved, made of plant particles, fragments of plants or decayed leaves of more or less uniform size and form but contrasting color; light yellow fragments alternating with dark brown fragments; case surface smooth, particles firmly cemented; anterior opening with projecting dorsal margin, posterior end rounded, narrow, closed at margins by plant fragments, but leaving a round or irregular opening in middle (Figure 521).

**Pupa.** Length of male pupae 16–17 mm, of female 17–18 mm. Antennae reaching beginning of abdominal segment 8. Labrum and mandibles as in *M. nycterobia*. Wing sheaths rounded posteriorly, reaching end of abdominal segment 4. Midlegs natatorial; hind legs with sparse setae on the 4 proximal segments.

Dorsal process of abdominal segment 1 with deep, saddle-shaped indentation. Holding apparatus on segments 3–7, number of hooks: III:3–4; IV:7–8; V:7–9+14–23; VI:7–11; VII:7–11. Gills on segments 2–7 (see p. 372).

Anal rods 0.6 mm long, straight, with numerous spinules at end, slightly curved; 1st seta situated in basal third; 2nd seta about the middle, 3rd and 4th setae subapically and apically.

295 Ventral appendages of male genitalia wide, long; penis sheath much shorter, bifid.

Pupal case 16–20 mm long, made of densely arranged plant pieces of about the same size; sand grains often present at posterior end; anterior and posterior sievelike membranes thin, with numerous small holes, membranes covered with plant fragments, larger ones at anterior end; small sand grains sometimes present among detritus. Pupal cases are often covered with a thin layer of silt, which imparts to them a reddish brown color.

Mode of life and habitats. Brooks with slow current, including cold, spring-fed brooks; pupae appear in late spring and early summer.

Distribution. Northern (Solovetskie Islands), northwestern, and central parts of the European USSR. In addition, Northern (Finland), Central and Western Europe (Britain).

### 3. *Micropterna sequax* McLachlan

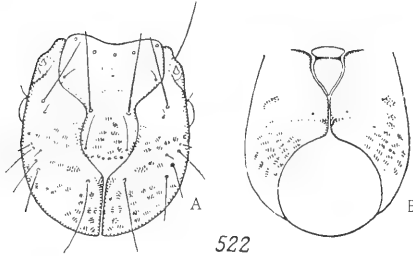
Pictet, 1834:132, Plate VI, Figure 1. — Struck, 1900:14, Figure 21; 1903:95–99, Plate II, Figure 11; Plate VI, Figure 19, a, b. — Ulmer, 1903: 66–67; 1909:268. — Lestage, 1921:782–785, Figure 280. — Hickin, 1953: 163–165.

296 **Full-grown larva.** Length 18–19 mm. Frontoclypeus (Figure 522, A) brown anteriorly, punctation not always distinct, yellowish or yellowish brown posteriorly, with distinct wedge-shaped pattern of large dots. Head brown anteriorly lateral to frontal sutures, with a dark brown stripe before eye, yellowish brown posteriorly; a narrow, brownish stripe reaching frontal sutures and with transverse punctate rows lateral to them on area of dorsal stripes; large dots along coronal suture; sides of head with longitudinal rows of dots. Ventral surface brown, yellowish brown in some places (Figure 522, B).

Pronotum mainly brownish yellow, brownish at posterior margin, lighter than head and mesonotum; groove in anterior third brownish in middle; punctation distinct. Mesonotum brown anteriorly and in middle of posterior part; posterior angles broadly light, with short, dark lines; lateral margin mainly light; posterior angles with broad black margin.



523



522

FIGURES 522 and 523. *Micropterna sequax* McL. (after Hickin):

522 — head, dorsal (A) and ventral (B); 523 — larva in case.

Legs yellowish brown; tibiae and tarsi with a dark band distally; femora and tibiae with dark dots; fore tarsi without ventral row of spinules, mid- and hind tarsi with very small spinules.

Dorsal process of abdominal segment 1 blunt; lateral processes flat apically. Lateral line on segments 3–8, with fine, dark hairs.

Tergite of abdominal segment 9 brownish. Claw of anal legs with a dorsal denticle.

Case 18–19 mm long, made of sand grains, cylindrical, slightly curved, rounded posteriorly, sometimes with small stones at anterior end (Figure 523).

**Pupa.** Length 18 mm. Antennae reaching abdominal segment 7. Labrum and mandibles as in *M. nycterobia*. Wing sheaths reaching to abdominal segment 4. Mid-tarsi with numerous natatorial setae, hind tarsi with a few sparse setae.

Process of abdominal segment 1 moderately rounded; posterior margin with a median indentation, lobes with numerous spinules.

Holding apparatus on segments 3–7; number of hooks: III:5–7; IV:9; V:10+16; VI:10–13; VII:13. Anal rods straight, slightly thicker apically, with small spinules.

Number and arrangement of gills of the pupa of *M. lateralis*

Segment	Dorsal	Pleural		Ventral
2	1 1	1	1	1 1
3	1 1	1	1	1 1
4	1 1	1	1	1 1
5	1 1	1	1 (0)	1 1
6	1 1			1 1
7	1 1 (0)			1 1

Case, made of sand grains, with small stones at anterior end, as in larva, attachment at posterior end.

Mode of life and habitats. Small, clear brooks with cool water.

Distribution. Northern, northwestern, and central parts of the European USSR. In addition, Europe, except the South.

### 3. Tribe Chaetopterygini Stein

**Full-grown larva.** Medium sized, 12–16 mm long, rarely 20 mm. Head of uniform color; pattern of shades absent or little marked. Head and thoracic sclerites with large, distinct dots.

297 Anterior third of pronotum with dark stripe in groove. Mesonotum lighter than pronotum, of uniform color, posterior angles not lighter or only slightly lighter than other surface. Anterior sclerites of metathorax large, in form of long triangles situated close together but not fused; posterior part of lateral sclerites pale, slightly sclerotized, with indistinct punctation.

Gills single, less numerous than in Stenophylacini; dorsal gills on segments 5–6 and pleural gills on segments 4–5 usually absent, or thin, small, sometimes present on only one side.

Case made of sand and detritus or detritus only, rarely of sand only or of fragments of live plants, sometimes of small leaves of moss.

The larvae of this tribe are very similar and are little known; the preceding characters and the following key are provisional.

Mode of life and habitats. Running water and open shore of lake.

Distribution. The European USSR, including the Caucasus, Altai, Sayans. In addition, Europe, Iran.

### Key to Genera

#### Full-grown larva

- 1 (4). Head brown or dark brown; pleural gills to abdominal segments 4–5, dorsal gills to segment 6; ventral gills to segment 7; case made of sand grains, sand grains and detritus, or detritus only, with a rod or conifer needle projecting posteriorly.
- 2 (3). Length 14–17 mm; pleural gills to abdominal segment 4; tergite of segment 9 light brown, with large dots at anterior margin; case often made of detritus only . . . . . 2. *Annitella* Klap. (p. 383)
- 3 (2). Length 13–15 mm; pleural gills to abdominal segment 5; tergite of segment 9 chestnut brown or brownish, with indistinct dots; case usually made mainly of sand grains, often entirely, rarely only of detritus . . . . . 1. *Chaetopteryx* Steph. (p. 374)
- 4 (1). Body lighter; head yellow or yellowish brown; pleural gills to abdominal segment 3, dorsal gills to segment 5, ventral gills to segment 6; case made of detritus or fresh plant fragments . . . . . 3. *Chaetopterygopsis* Stein (p. 387)

1. Genus **Chaetopteryx** Stephens

Mode of life and habitats. Small brooks and rivulets, including spring-fed brooks; limnocene springs; open shore of lakes, usually near river mouths.

Distribution. Northern, western, and central parts of the European USSR. In addition, Europe.

Key to Species

Full-grown larva

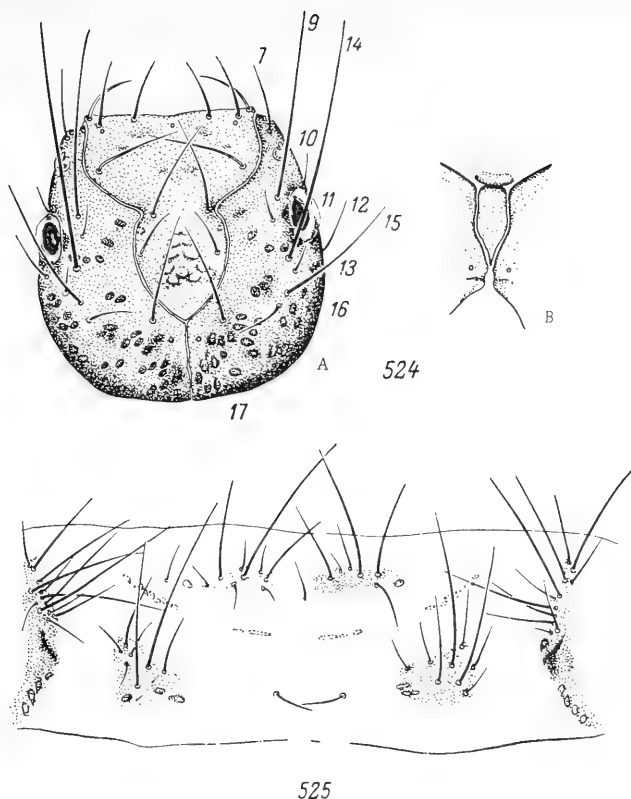
- 1 (2). Head light brown or brown; frontoclypeus darker anteriorly and in middle than posteriorly; dorsal stripes of head little differentiated, with large dark dots; pronotum yellowish brown, middle of groove in anterior third of pronotum markedly dark; tergite of segment 9 with sharp dots at anterior margin . . . . 2. **Ch. villosa** Fabr. (p. 379)
- 2 (1). Greater part of head uniformly brown; frontoclypeus darker in middle; large, dark dots on area of dorsal stripes; pronotum brown, groove in anterior third slightly darker in middle; tergite of segment 9 with indistinct dots at anterior margin . . . . .  
. . . . . 1. **Ch. sahlbergi** McL. (p. 374)

298 1. **Chaetopteryx sahlbergi** McLachlan

Lepneva, 1928:77-79; 1940:216.

**Full-grown larva.** Length 13-15 mm. Head (Figure 524, A) uniformly brown; frontoclypeus slightly darker near tentorial pits; anterior part with an oblique row of 3 dots lateral to median pit, last dot some distance from first 2; another 2 dots further posteriorly; wedge-shaped pattern distinct, its posterior row with larger dots. Two pale dots, one behind the other, on area of dorsal bands; 2 transverse rows of 2 and 3 blackish brown, large dots posterior to curvature of frontal sutures; rows and groups of large dots lateral to coronal suture; a longitudinal, dense pattern of dots behind eye. Ventral surface brown in middle, lighter at anterior margin, with groups of dots, which are sometimes indistinct, near occipital foramen, on lighter background; middle with 2 narrow, dark dots close together laterally. Gula (Figure 524, B) dark, narrow, with long, sometimes blunt, posterior end.

Setae brown, dark brown, or light. Median anterior margin seta brown, moderately long, intermediate seta longer, slightly thicker, dark brown, lateral seta light, curved inward; anterior-frontal seta the same, thinner; middle frontal seta brown, thinner and slightly longer than intermediate seta; posterior frontal seta short, light, very thin. Seta 7 resembling middle frontal seta; seta 9 dark brown, long, a little thicker than intermediate anterior-margin seta; seta 14 the same, longer; setae 10, 11, 13, and 16 short, thin; seta 10 smaller than others; seta 16 procumbent; seta 12 moderately long, thin; seta 15 long, thin, markedly shorter than 9; seta 17 slightly larger than middle frontal seta.



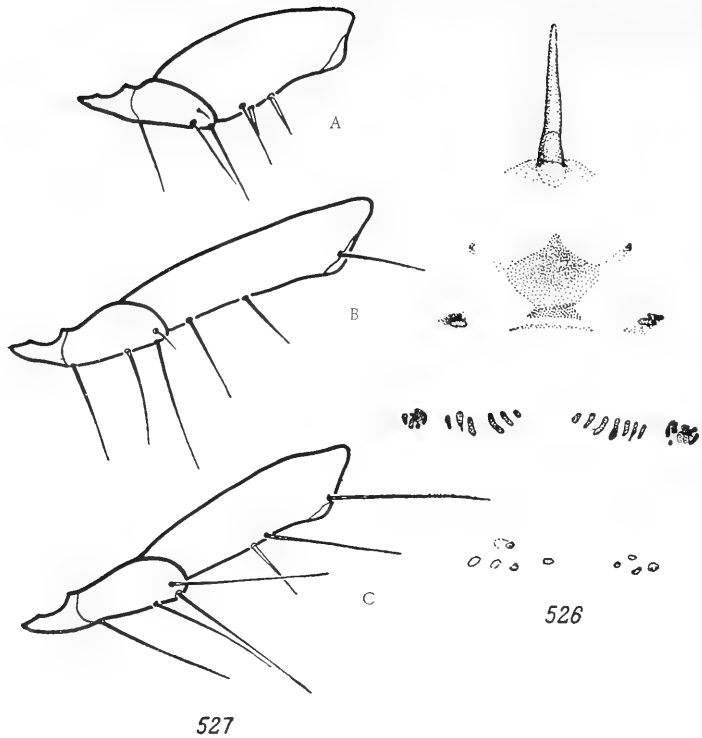
FIGURES 524 and 525. *Chaetopteryx sahlbergi* McL.:

524 - head, dorsal (A) and ventral (B); 525 - tergites of metathorax.

Labrum with shallow median indentation; dorsal sclerite uniformly reddish brown; dark median spot absent; posterior angle sclerites blackish brown at end; seta 1 in form of small, blunt, light spine; setae 2 and 4 represented by thick, blunt spines, 4 larger; seta 3 light, short, pointed; setae 5 and 6 brown, about the same length.

Mandibles slightly oblong, with a transverse ridge in middle; basal part blackish brown, apical part reddish at margin of blade; left mandible with 2 large teeth and 1 small tooth in addition to middle tooth on dorsal blade, and 2 small teeth subapically on ventral blade; right mandible with 4 distal teeth on dorsal blade; lateral setae situated basally; thin, dorsal seta brownish, almost twice as long as small, thin, ventral seta.

Sclerites of cardo yellowish, with dark brown posterior margin; median margin and dark lateral stripe black; lateral seta light, 2nd seta dark, both thin, small. Submentum mainly membranous, whitish yellow, with small, grayish brown, median sclerites fused with lateral sclerites; setae brown, moderately long. Stipes yellowish, with reddish posterior margin; lateral seta light brown, moderately long, median seta short, brown.



FIGURES 526 and 527. *Chaetopteryx sahlbergi* McL.:

526 - thoracic horn and sternites; 527 - right trochanter and femur of foreleg (A), midleg (B), and hind leg (C), posterior.

Palpifer yellowish brown; distal seta small, brown; median seta small, light. Palp short, 2nd and 3rd segments of equal length. Galea short, reaching middle of 3rd segment. Mentum in form of broad, reddish brown semicircle, pinkish at anterior and posterior margin. Ventral sclerites and palpifer grayish brown, the former with small light seta. Labial palps small, with brown sclerites.

300 Pronotum brown, with large, chestnut brown dots; anterior margin distinct, narrow, reddish brown; lateral margin yellowish; middle of groove in anterior third slightly dark, with 2 large dots on each side; dots of X-shaped pattern large, distinct; group of small dots near posterior margin in each half; posterior margin with large, brownish posterior-angle process, lateral stripe of process narrow, chestnut brown, basal, sclerotized dots dark; black, transverse stripes clearly separated, lateral stripe longer than posterior, extending before posterior in a thin process, which sometimes almost reaches median suture.

Mesonotum light brown or yellowish, lighter than pronotum, brownish at anterior margin; posterior angle as light as, or slightly lighter than, other surface; posterior-angle margin in form of a large, black, or reddish brown spot.



Tergites of metathorax brown, distinct, anterior sclerites in form of long triangles, situated close together but not fused, with 8–9 setae, posterior sclerites triangular, larger, with 10–11 setae; lateral tergites narrow, pale, with 4–5 grayish dots, a transverse band of coarse, reddish streaks and 2–3 dots posteriorly near median margin; anterior part with 13–14 setae including longer primary seta (Figure 525).

Proepimeron oblong, light yellow; lateral stripe narrow, reddish brown, seta near suture thin, strong, dark; episternum chestnut brown, trochantin blackish basally, seta thin, dark, setules transparent.

Number and arrangement of gills of *Ch. sahlbergi*

Segment	Dorsal	Pleural		Ventral
2	1	1		1
	1		1	1
3	1	1		1
	1		1	1
4	1	1		1
	1		1 (0)	1
5	1	1 (0)		1
	1 (0)			1
6	1 (0)			1
	1 (0)			1
7				1

Prosternite (Figure 526) small, light yellow, slightly sclerotized, with 2–3 pinkish dots on each side; horn narrow. Mesothorax with a row of large, oblong, reddish dots on ventral side; metathorax with 3–4 such dots.

Legs brown, with indistinct punctation on coxae, femora, and tibiae; tibiae and tarsi with blackish distal bands; ratio of length of legs 67:100:92.

Primary ventral setae of fore femur (Figure 527, A) in form of 2 large, yellow spines, basal spine slightly thicker and shorter than apical, both pointed; posterior seta dark, thin, situated more basally, as long as the posterior subapical seta of trochanter; distal part with 2 short, brown, secondary setae, and a small, light seta dorsally. Primary ventral setae of midlegs (Figure 527, B) represented by a large, strong, brown spine in middle of segment, and a similar short, brown, spiniform seta, which is longer and thinner, situated at basal margin; distal part dorsally with 4 secondary setae, 2 short brown and 2 small light setae. Primary baso-ventral seta of hind femur (Figure 527, C) in form of large, strong, brown spine in middle of segment; apical seta situated nearby, brown, moderately long; 4 secondary, dorsal setae in distal part, 3 short, brown setae and a small light seta more basally.

Dorsal process of abdominal segment 1 blunt, high. Lateral line on segments 3–8. Ventral gills on segments 2–9, dorsal gills on segments 2–5, pleural gills on segments 2–4 (presegmental on segment 4), gills small or rudimentary, if present further posteriorly.

Tergite of abdominal segment 9 brown, with indistinct punctation at anterior margin; setae dark brown; medioanal setae long, thick, more than twice as long as width of tergite; anterior-angle setae slightly shorter, thinner; intermediate seta large, strong, only slightly smaller than anterior-angle seta; lateral seta short, thin; surface with 6 setae near posterior margin.

Sclerites "b" and "c" brown; distodorsal setae of sclerite "b" dark brown; medioanal seta thick, long, markedly longer than neighboring seta; lateral seta much smaller, strong, moderately long; median subapical seta the same; distoventral seta moderately long, strong, brown; surface with 2 brown, moderately long setae, 3 short, and 2-3 small, thin setae.

301 Sclerite "c" with blackish brown, wide, lateral margin; seta small, dark, strong.

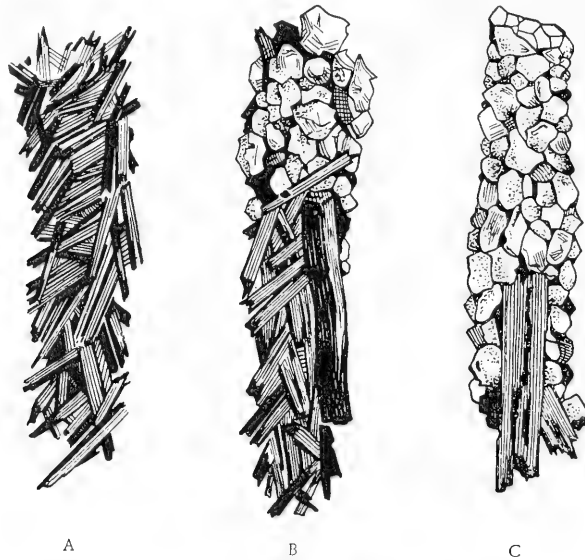


FIGURE 528. *Chaetopteryx sahlbergi* McL. Larval case made of detritus (A), detritus and sand (B), and mainly sand (C)

Claw mainly pale brown, dark reddish brown apically, pointed with a large, dorsal denticle; seta 1 short, brown, thick, situated subdorsally in basal part on median side; seta 3 situated in the apical part, strong, dark brown, longest, thickest, and darkest seta of the claw; seta 2 thin, moderately long, situated in lateral part of dorsal side near end of suture; seta 6 situated slightly more distally and closer to end of suture, short, thin; setae 2 and 6 brown; ventral setae 7 and 8 situated ventrally, one behind the other, close together, short, light, some distance from suture and nearer basal margin of claw; seta 5 situated near 8, small, transparent; median seta 4 small, light, situated subventrally near suture.

Case 14-18 mm long, made mainly of detritus or detritus and sand grains (Figure 528, A), rarely of sand only (Figure 528, C), almost straight or

slightly curved, cylindrical or slightly narrower posteriorly; most cases are made entirely or mainly of detritus; anterior end or entire anterior part of case often consists of sand in full-grown larvae, posterior part of detritus; in other cases, a narrow, anterior ring and entire ventral surface consist of sand, but dorsal part is made of detritus; sand grains are firmly cemented, pieces of detritus less smoothly, with some thin fragments, e. g., conifer needles, projecting at posterior end; larva makes its case rarely of fresh plant fragments, e. g., leaves of *Hippuris vulgaris*.

Mode of life and habitats. In various types of running water, often in small brooks and rivulets, close to bank, rarely in deep current of large rivers, on open or slightly overgrown shores of lakes, on solid bottom with abundant detritus, in a current or surf of moderate speed; the larvae live on a stony, sandy-stony, sandy, or detritus-rich bottom in lakes and running water, usually at a depth of 0.2–1.0 m; they avoid silt bottom and thick, vegetation in littoral zone.

Distribution. Northwestern and northern parts of the European USSR, including Northern Urals. In addition, Northern Europe, including Finland, the Carpathians.

## 2. *Chaetopteryx villosa* Fabricius

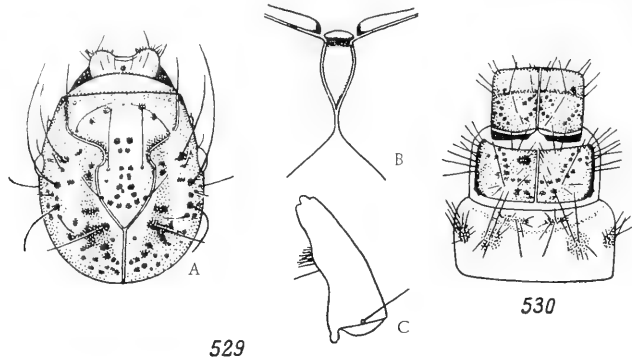
Pictet, 1834:140–141, Plate VII, Figure 4. — Kolenati, 1848:72–72. — Walser, 1864:61. — Wallengren, 1891:84. — Struck, 1899:325, Figure 24, a–d; 302 1900:15, Figure 22, a–d. — Ulmer, 1901:166–168, Figures 1–14. — Siltala, 1902:91–94, Figure 21. — Struck, 1903:100, Plate II, Figure 13. — Ulmer, 1903:70. — Siltala, 1904c:70; 1907:505. — Ulmer, 1909:265, 266–267, Figure 399. — Döhler, 1914:49–51. — Lestage, 1921:796, 798–802, Figures 285–289. — Hickin, 1948:59–61, Figures 1–10.

**Full-grown larva.** Length 14–16 mm. Head (Figure 529, A) brownish or brown dorsally and laterally. Frontoclypeus darker, reddish brown anteriorly laterally and at tentorial pit; 2 large, indistinct dots on each side of median pit, 2 median pairs of dots, one pair behind the other further posteriorly; wedge-shaped pattern on posterior part formed by large, distinct, black dots. Dorsal stripes little differentiated, narrow, slightly dark, brownish, absent in light specimens; a dark, reddish brown stripe before eyes from base of antenna to anterior margin; large, sparse dots situated on area of dorsal stripes lateral to posterior part of frontal sutures and coronal suture; a short, transverse row of 3–4 large dots medially to eye; sides of head with longitudinal rows of larger dots behind eye; ventral surface dark brown, lighter at anterior margin; punctation near occipital foramen on lighter background. Gula dark brown (Figure 529, B). Setae black, arrangement and form as in *Ch. sahlbergi*.

Dorsal sclerite of labrum reddish brown; posterior-angle sclerites blackish at end; setae as in Figure 529. Mandibles black, spadelike, with teeth at distal margin; lateral setae situated basally; dorsal seta short, brown; ventral seta small, light (Figure 529, C). Maxillolabium as in *Ch. sahlbergi*.

Pronotum (Figure 530) yellowish brown; anterior margin narrow, reddish brown; lateral margin brownish; groove in anterior third distinctly dark in

middle; 3 large dark dots on each side of stripe; X-shaped pattern with distinct dots; groups of dots on sides the same; setae black; posterior margin brownish yellow; posterior-angle process with narrow, brownish, lateral stripe, dark basally, with several, small, dark sclerotized dots; black, transverse stripes of margin clearly separated, lateral stripe slightly longer than posterior median stripe.



FIGURES 529 and 530. *Chaetopteryx villosa* Fabr. (after Hickin):  
529 - head, dorsal (A) and ventral (B), left mandible, ventral (C); 530 -  
thoracic segments, dorsal.

Mesonotum (Figure 530) yellowish or light yellowish; anterior and lateral margin light; posterior angle with broad, black margin; posterior margin yellowish, with a reddish stripe in middle; anterior third of surface with 2 large, chestnut brown dots lateral to coronal suture; punctation at anterior angle and in posterior part distinct, chestnut brown; narrow, reddish streaks at posterior angle near dark stripe; setae black, strong, as in Figure 530.

Tergites of metathorax (Figure 530) brown to smoky brown, distinct, with black setae; anterior-median tergites transverse with 8-9 setae, including a moderately long, primary, anterior-margin seta; posterior-median tergites irregularly triangular, with 7-8 setae, including a larger medioanal seta; lateral tergites lighter, smoky brown, with a median row of 3-4 pale dots, a transverse band of reddish striation and 2 large, brownish dots posteriorly, with 12 setae anteriorly, including several larger setae: a primary anterior-angle seta and 2-3 secondary setae.

Propleuron mainly yellowish brown; pleural suture blackish brown; epimeron with dark, median margin; seta near suture short, brown, thin; trochantin blackish brown basally and apically, with a short, light seta and small setule.

Legs brown; ratio of length of legs 65:100:92. Punctation distinct on fore femora, less distinct on mid- and hind legs; mid- and hind tibiae and tarsi with indistinct brownish bands. Primary ventral setae of fore femur (Figure 531, A) represented by 2 large, yellow spines; posterior primary seta short, dark, thin, usually situated above basal spine. Primary ventral setae of mid-femur (Figure 531, B) situated basally in form of 2 widely

spaced, thin, brown, large spines, basal spine slightly thinner and longer than apical spine. Primary ventral setae of hind femur (Figure 531, C) situated close together in middle of segment, basal seta in form of a large, thin, brown spine; apical seta black, moderately long. Secondary dorsal setae present only in distal part of legs.

Dorsal and lateral processes of abdominal segment 1 large, well developed; 12-14 small, black setae on small, pale, sclerotized dots anteriorly, and lateral to dorsal process; ventral side of segment with 2 small, median, brown sclerites.

Lateral line on segments 3-8 with small, light hairs. Gills on segments 2-7.

Postsegmental gills of segment 2 and gills of segment 3 well developed, larger than the others; dorsal and ventral rows of segments 6 and 7, and lateral row of segment 4 and (if present) of segment 5, always with short, thin, sometimes small and rudimentary, gills.

Number and arrangement of gills of *Ch. villosa*

Segment	Dorsal	Pleural		Ventral
2	1	1		1
	1		1	1
3	1	1		1
	1		1	1
4	1	1 (0)		1
	1		1 (0)	1
5	1	1 (0)		1
	1			1
6	1 (0)			1
	1 (0)			1
7				1
				1 (0)

Tergite of abdominal segment 9 chestnut brown, with distinct punctation at anterior margin; setae black; medioanal setae thick, long; anterior-angle setae similar but shorter; intermediate seta moderately long; lateral seta short, thin; a long seta between medioanal setae; 5-6 setae on and around tergite (Figure 532).

Sclerite "b" of anal legs brown, with dark punctation at basal margin; large setae black; medioanal seta long, thick; neighboring seta slightly shorter; lateral seta thinner and shorter; median subapical seta the same; apical ventral seta strong, thin, moderately long; surface with 3-4 short, thin, and 2-3 small setae (Figure 532).

Sclerite "c" brown, with broad, black, lateral margin; seta small, strong, black.

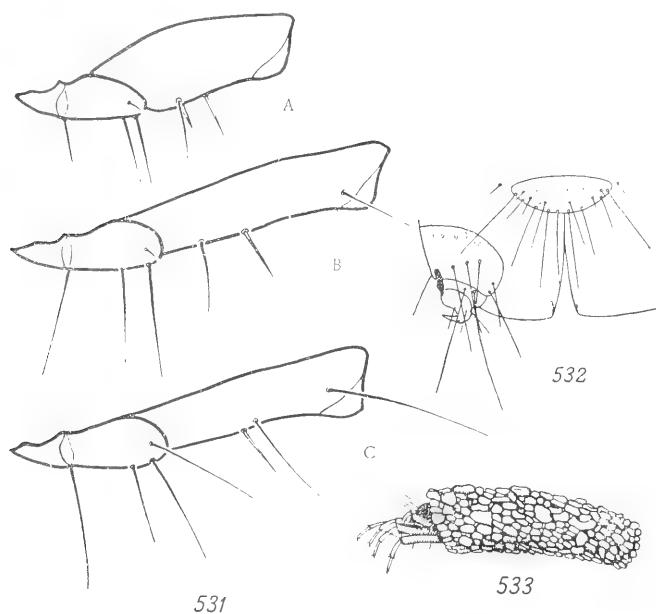
Claw yellowish brown basally, pointed, reddish brown at apex, setae as in *Ch. sahlbergi*.

Case 14-18 mm long, including an additional rod, 26-27 mm, made of sand grains or together with detritus, with smooth surface if made only of

sand, slightly curved, slightly narrower posteriorly, with flat ventral surface; cases made entirely or partly of detritus usually with a thin long rod, a stalk or a conifer needle which projects posteriorly (Figure 533).

**Pupa.** Length 11–14 mm, rarely 15–16 mm. Antennae filiform, thin, reaching abdominal segment 7–8, proximal segment slightly thicker than the others. Labrum brownish, its anterior margin forming a broad, rounded process flanked by small, thin seta 1; five long, black, hooked setae on light background. Anteclypeus with 3 setae, 2 of them black, moderately long, lateral seta yellowish, short, slightly curved. Median blade of mandible straight, serrated, with a tubercle basally; dorsal lateral seta larger than ventral.

Wing sheaths rounded posteriorly, reaching end of segment 3 or beginning of segment 4. Mid-tarsi with dense natatorial setae on segments 1–4; setae 304 on segments 1–2 of mid-tarsi sparse; short, and few on segment 3; segment 4 with a few setae on one side only.



FIGURES 531–533. *Chaetopteryx villosa* Fabr.:

531 – right trochanter and femur of foreleg (A), midleg (B), and hind leg (C), posterior; 532 – tergite of segment 9 and left anal leg, dorsal; 533 – larva in case (532 and 533 – after Hickin).

Dorsal process of abdominal segment 1 small; lobes of saddle-shaped indentation of posterior margin with small spinules directed posteriorly. Holding apparatus on segments 3–7; number of hooks: III:3–4; IV:4–5; V:3–5 + 10–14; VI:3–4; VII:2–3. Lateral line on segments 5–8, with dense, grayish black setae. Gills as in larva: pleural row present only in anterior half of abdomen, dorsal row mainly anteriorly; segments 5–6 with small,

thin gills, if present. Anal rods straight, tapering, with sparse spinules; setae relatively large, situated basally, in middle, subapically and apically. Ventral appendages of male genitalia wide, short, rounded, not longer than bifid penis sheath.

Case 14–20 mm long, made, as in larva, usually of sand only or together with detritus, or of detritus only; small stones sometimes present at ends; both openings with sievelike membranes; case attached to stones or tree remains.

Mode of life and habitats. Usually in running water, but also in lakes, on a bottom of stone or sand and stone; late-hatching species, pupae appear in September; adults, in late October.

Distribution. Northern, western, and central parts of European USSR. In addition, Europe, except the South.

## 2. Genus *Annitella* Klapálek

Mode of life and habitats. Running water, open shore of lakes with a moderate surf.

Distribution. Northern and western parts of the European USSR, Altai, Sayans. In addition, Europe.

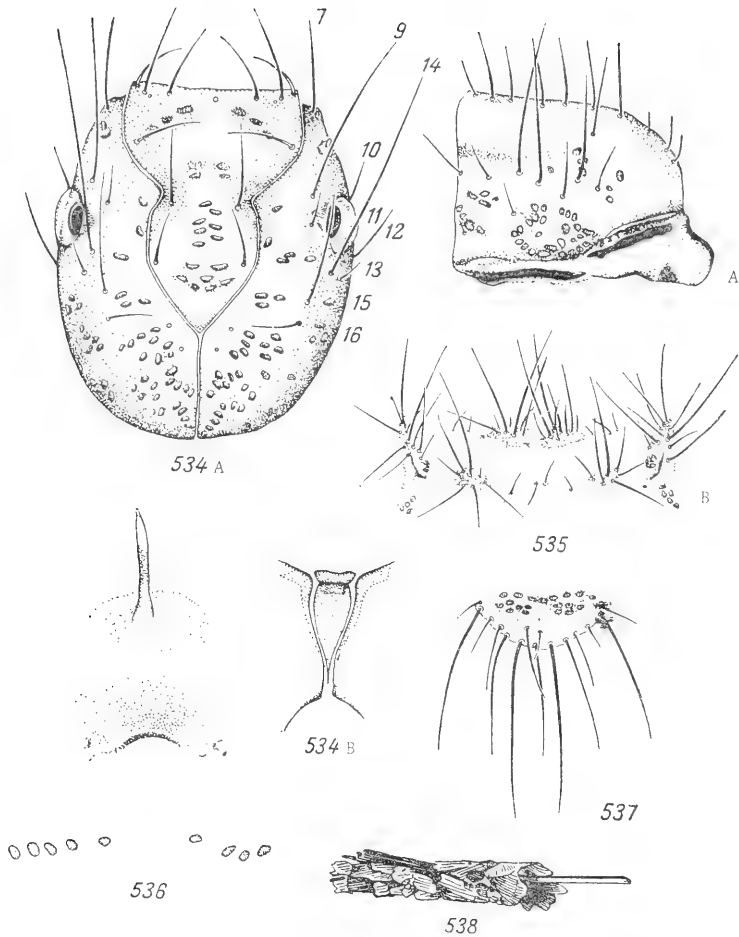
### 305 1. *Annitella obscurata* McLachlan (*Chaetopteryx obscurata* McLachlan)\*

Lepneva, 1949:174, 176.

**Full-grown larva.** Length 14–17 mm. Head (Figure 534, A) slightly oblong. Frontoclypeus slightly narrower than in *Chaetopteryx*. Dorsal side of head brownish, frontoclypeus slightly darker anteriorly; tentorial pits reddish brown. Rows of 2 or 3 dots on area of dorsal stripes lateral to frontal sutures; 3 large dots near fork; rows and groups of smaller dots lateral to coronal suture. Sides of head with large dots from eye to occipital foramen. Ventral side of head mainly smoky brown, lighter anteriorly, with a large, distinct, light median spot in middle of posterior part; dots near occipital foramen large, on less light background. Gula brown. Setae as in *Chaetopteryx* (Figure 534, B).

Labrum reddish brown, as in *Chaetopteryx*, darker than head; setae the same; a dark spot behind median pit. Mandibles black; subventral tooth largest on left mandible, 2 distal teeth and a small tooth-shaped process on dorsal blade dorsal to it, ventral blade of left mandible with a large, distal tooth; right mandible distally with 2 almost equal teeth, one tooth on ventral blade, 2 small teeth on dorsal blade; brush as in *Chaetopteryx*; lateral dorsal seta short, light brown; ventral seta light, half as large. Sclerites of cardo yellowish brown, black, lateral stripe at anterior margin relatively narrow, spot at median margin small, black. Median sclerites of submentum small, fused with lateral sclerites; seta thin, moderately long, pinkish brown, situated near anterior margin of median sclerites.

\* Synonymy, see Schmid, 1955:211.



FIGURES 534-538. *Annitella obscurata* McL.:

534 - head, dorsal (A) and ventral (B); 535 - tergites of pronotum (A) and meta-notum (B); 536 - thoracic horn and sternites; 537 - tergite of abdominal segment 9; 538 - larval case.

Pronotum (Figure 535, A) yellowish brown; anterior margin narrow, reddish brown, dark brown in anterior angles; groove in anterior third with dark stripe in middle, 3 large dots lateral to stripe, further laterally 2 large and 2 small dots; a distinct, X-shaped pattern near median suture, its anterior branches formed by small, dark brown dots; posterior part with groups of large dots in each half; posterior margin yellowish brown; posterior-angle process with a narrow, dark, lateral stripe; base of process with 3-4 small, dark brown, sclerotized dots; black, transverse stripes wide, clearly separated. Chaetotaxy as in Figure 535, A.

Mesonotum yellowish, lighter than pronotum, with whitish yellow posterior angles; anterior margin laterally with a dark reddish brown



stripe; lateral margin light; anterior angle with oblique row of dots on darker background; posterior angle with narrow, oblique streaks; posterior margin with a dark reddish brown stripe in middle, light in middle of each half, broadly black laterally, connected with posterior-angle margin; surface with 4 small, dark reddish brown dots in anterior third lateral to median suture.

Anterior median tergites of metathorax yellowish brown, in form of long triangles, situated close together in middle, as in *Chaetopteryx*, divided by a membranous space, surface with 7-8 thin setae of varying size together with primary anterior-margin seta, and a number of small, setuliform setae. Posterior median tergites lighter, triangular; medioanal seta larger than others, moderately long, reddish brown, 8-9 other setae, including small setae. Lateral tergites whitish posteriorly with a longitudinal row of 5 large, pinkish gray dots, a transverse band of oblique, reddish brown streaks and 2-3 indistinct dots near median margin; anterior part pale yellow, with 3 large, indistinct dots basally; 13-14 setae, primary anterior-angle seta larger than others (Figure 535, B).

Propleuron with wide, black, pleural suture; epimeron slightly oblong; seta near suture short, dark brown, strong; episternum dark brown; trochantin black basally, seta small, thin, both setules distinct. Pleurites of meso- and metathorax with thin, pleural suture, mesepisternum dark brown, metepisternum lighter, 3-4 pale dots on surface, setae black.

Prosternite in form of a slightly sclerotized, yellowish sclerite, with 2-3 small, pinkish dots laterally; horn dark chestnut brown, with light apex. Mesosternite represented by a number of large, pinkish dots, 2 large dots on each side. Ventral side of metathorax with 3-4 pale dots on each side (Figure 536).

306 Legs brown, punctation of femora and tibiae usually indistinct; fore femur dorsally with a small, secondary seta near primary basodorsal seta, in addition to apical secondary setae; secondary dorsal setae of mid- and hind femora restricted to distal part. Primary ventral setae of fore femur represented by 2 strong, pointed, pale yellow spines; posterior primary seta short, thin, brown, situated basal to spines. Primary ventral setae of mid-femur in form of 2 strong, moderately long, brown spines, one in middle of femur, other situated more basally. Primary ventral setae of hind femur in form of a similar spine in about middle of segment, and a more distal, thinner, moderately long seta.

Dorsal process of abdominal segment 1 large with 6 short, or moderately long, reddish brown setae on brown sclerotized dots, and 11-12 small, thin setae anteriorly and laterally.

Lateral line from beginning of segment 3 to end of segment 7. Gills on segments 2-7; segment 2 without presegmental pleural gills; ventral gills on segment 3 and anteriorly on segment 4 especially long, almost reaching base of opposite gill.

307 Tergite of segment 9 (Figure 537) yellowish brown, with 2 rows of large, light brown dots at anterior margin; setae reddish brown; medioanal setae thick, long; anterior-angle setae slightly thinner and much shorter, intermediate seta moderately long, strong; seta between medioanal setae the same; lateral setae short, thin; surface with 7-8 small, thin, secondary setae.

Number and arrangement of gills of *A. obscurata*

Segment	Dorsal	Pleural		Ventral
2	1 1	0	1	1 1
3	1 1	1	1	1 1
4	1 1	1	1 (0)	1 1
5	1 1			1 1
6	0 1			1 1
-				1

Sclerite "b" brown, basally with large dots, dark margin, with a dark reddish stripe ventrally; setae dark brown; medioanal and neighboring seta thick, long, the former slightly larger; lateral seta strong, moderately long; subapical seta at median margin the same; apical ventral seta short, strong, thin; surface with 6-7 short, small, thin setae.

Sclerite "c" yellowish brown, with reddish black lateral margin and a small, light seta.

Claw mainly yellowish brown, blunt, chestnut brown apically, with a large dorsal denticle; seta 1 short, strong, situated subdorsally on median side in basal part; seta 3 situated dorsally, moderately long, but longest on the claw; both setae dark brown, darker and thicker than the 2 setae following; seta 2 situated dorsally near end of suture; seta 6 situated near seta 2, short, strong, both setae brown; ventral setae 7 and 8 pale yellowish; seta 5, situated laterally near 8, transparent, small; seta 4 situated subventrally, small, thin, brownish, medial to seta 5 at some distance on membrane of suture.

Case 14-16 mm long, sometimes 18-19 mm, straight, slightly narrower posteriorly, made of various kinds of detritus, usually pieces of soft, light, debris of trees, with sticks or conifer needles at posterior end, rarely anteriorly; small, flat, particles of mica sometimes among detritus (Figure 538).

Mode of life and habitats. Clear mountain brooks and rivulets, oligotrophic lakes, especially near river mouths, on solid bottom, usually among sparse vegetation. The species is known from Lake Teletskoe and its tributaries (Samysh, Kamga, Chechenek); and from lakes Taimen'e and Multinskoe in central Altai.

Distribution. Northern part of the European USSR, Altai, Sayans. In addition, Northern and parts of Central Europe (mainly highlands).

### 3. Genus *Chaetopterygopsis* Stein

Mode of life and habitats. Small, running, clear water bodies, on stones.

Distribution. Northern part of the European USSR, Northern Urals. Also Europe.

#### 1. *Chaetopterygopsis maclachlani* Stein

Felber, 1908a:473-476, Figures 1-3; 1908b:248-253, Figures 1-5. — Ulmer, 1909:267. — Döhler, 1914:50-51. — Lestage, 1921:802-809, Figure 290.

**Full-grown larva.** Length 15-18 mm. Head yellowish brown. Frontoclypeus with 3 dark dots on each side of median pit, 2 median dots further posteriorly; wedge-shaped pattern formed by large dots (Figure 539).

Short rows of large dots on site of dorsal stripes and lateral to coronal suture; longitudinal, lateral rows of dots behind eye; groups of dots ventrally near occipital foramen.

Labrum yellowish, with deep median indentation; setae 5 and 6 dark and relatively large. Mandibles short, black, each with 4 distinct teeth.

308 Pronotum yellow (Figure 539); groove in anterior third with a narrow, dark stripe in middle; dots of X-shaped pattern large, distinct; anterior-angle and medioanal seta longer than others; anterior margin with 4 short, or moderately long, strong setae.

Mesonotum (Figure 539) lighter and narrower than pronotum, with large dots; posterior-angle margin in form of a large, dark spot; posterior margin with small, dark stripe in middle.

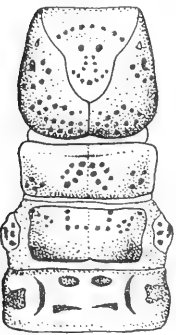
Tergites of metathorax (Figure 539) slightly sclerotized, yellowish, with thin setae; anterior-median tergites relatively large, clearly separated.

Legs light brownish; femora with distinct dots; primary ventral setae of fore femur in form of strong, yellow spines, posterior primary seta short, thin, situated above basal spine.

Dorsal and lateral processes of abdominal segment 1 blunt, wide. Lateral line on segments 3-7 with small, thin hairs. Gills more strongly reduced than in *Chaetopteryx*, absent from segment 6 onward dorsally, and sometimes also in ventral row; pleural gills present only to posterior margin of abdominal segment 3.

Tergite of abdominal segment 9 brownish; medioanal setae long; anterior-angle seta markedly smaller; intermediate setae long; both lateral setae short, thin; 2 setae between medioanal setae, one moderately long, the other short. Claw large, pointed, with a dorsal denticle.

Case 20-25 mm long, straight or slightly curved, slightly narrower posteriorly, made of plant particles, especially leaves of moss (*Fontinalis antipyretica*).



539

FIGURE 539. *Chaetopterygopsis maclachlani* Stein. Head and thorax, dorsal (after Felber, with modifications)

Number and arrangement of gills of *Ch. maclachlani*

Segment	Dorsal	Pleural		Ventral
2	1	1	1	1
	1			1
3	1	1	1	1
	1			1
4	1			1
	1			1
5	1 (0)			1
	1			1
6				1 (0)

**Pupa.** Length 12–15 mm. Antennae filiform, reaching end of abdominal segment 7, scape slightly larger than following segments. Anterior 2 of 5 large, hooked setae of labrum shorter than posterior 3. Wing sheaths reaching end of abdominal segment 3. Mid-tarsi natatorial, with dense setae; hind tarsi with sparse setae.

Presegmental plates of holding apparatus with 3–4 hooks, postsegmental plates of segment 5 with 10–12 hooks. Presegmental gills on segment 2 absent.

Anal rods thin, slightly curved at end; basal seta longer than others, 2nd seta situated at beginning of apical third of rod, other 2 setae subapically and apically.

Case as in larva.

Mode of life and habitats. Mountain and spring-fed brooks, on stones among moss.

Distribution. Northern part of the European USSR, northern Urals. In addition, Central Europe mountains.

##### 5. Subfamily DRUSINAE Banks (Eclisopteryginae Nielsen, Drusinae Schmid)

**Full-grown larva.** Length 10–14 mm. Sclerites of head and pronotum and some other parts of body rugose, shagreened with stripes of small tubercles in reticulation; membranous parts of integument also rugose, with dark tubercles or minute spinules. Head short, wide in middle, narrower anteriorly; dorsal surface flat anteriorly. Eyes situated in broad middle of head, antennae between eye and anterior margin. Anterior margin of labrum membranous, trilobed, with median and lateral processes. Mandibles scraping, with chisel-like distal part; teeth small or absent.

309 Pronotum flat or concave anteriorly, convex in other parts; stripe between concave and convex parts forming a hump or blunt angle, best visible in lateral view. Mesonotum wider than pronotum, with distinct, black margin posteriorly and laterally. Anterior tergites of metathorax

large, much larger than posterior. Thorax, legs, and abdominal segment 1 with numerous, secondary setae. Lateral line on segments 3-7. Gills single.

Case conical, curved, narrower posteriorly, made of sand grains, with smooth surface.

**Pupa.** Head with tubercle or spine-shaped process on clypeus. Antennae long, reaching end of body. Mandibles with short distal part; median blade concave distally, serrated. Midlegs natatorial. Holding apparatus on segments 3-7; lateral line on segments 5-8. Anal rods thin, straight, with narrower, slightly curved end. Case with anterior and posterior membranes covered with sand grains, with small holes between them.

See Fischer on authorship of the subfamily (Trichopteroorum Catalogus Vol. VIII, 1966), who notes the priority of Banks (1916:117).

Mode of life and habitats. On stones, in small, running water bodies, springs; feeding on algae.

Distribution. Western part of the European USSR, Caucasus. In addition, Europe, Iran.

## Key to Genera

### Full-grown larva

- 1 (2). Length 10-12 mm. Head blackish dorsally; secondary setae forming a dense crown or absent; pronotum flat anteriorly; anterior median tergites of metathorax dark brown or blackish . . . . . 1. **Drusus** Steph. (p. 389)
- 2 (1). Length 13-14 mm. Head reddish brown; small secondary setae present near the ridge; pronotum concave anteriorly; anterior median tergites of metathorax large, lighter, brownish . . . . . 2. **Ecclisopteryx** Kol. (p. 401)

### 1. Genus **Drusus** Stephens

**Full-grown larva.** Length 10-12 mm; head and pronotum black or blackish brown. Secondary dorsal setae of head forming a corona or absent. Pronotum flat anteriorly. Anterior-median tergites of metathorax dark brown or blackish. Case smooth, made of fine sand grains.

**Pupa.** Clypeus with large dark process.

Mode of life and habitats. On stones, in brooks and rivulets with cold water; springs.

Distribution. Western part of the European USSR, Caucasus. In addition, Europe, Iran.

Key to Species

Full-grown larva

- 1 (2). Dorsal side of head with a crown of secondary setae . . . . . 3. *D. discolor* Ramb. (p. 399)  
2 (1). Crown of secondary setae on dorsal side of head absent.  
3 (4). Setae 15 and 16 about the same length. Posterior median of tergites of metathorax oblong. Presegmental gills of abdominal segment 2 and gills on segment 8 present; Caucasus . . . . . 1. *D. caucasicus* Ulm. (p. 390)  
4 (3). Seta 16 much shorter than 15. Posterior median tergites of metathorax triangular. Presegmental gills on segment 2 absent; segment 8 without gills; southeastern part of the European USSR near the Carpathians . . . . . 2. *D. trifidus* McL. (p. 396)

310 1. *Drusus caucasicus* Ulmer

Martynov, 1926:45.

**Full-grown larva.** Length 10–12 mm. Head (Figure 540, A) wide, dark brown dorsally, yellowish brown near occipital foramen and ventrally. Integument reticulate, with small spinules (Figure 540, B). Eyes on light pericocular area; antennae situated far from eyes near ridge. Frontoclypeus large, wide anteriorly; ends of frontal sutures slightly curved; anterior part punctate,\* posterior part with triangular pattern of large dots situated behind 2 pairs of smaller dots. Area of dorsal stripes occupied by rows of 3–5 small dots, and groups of dots lateral to coronal suture; short rows of dots on area of lateral stripes. Ventral surface with groups of light brown dots on light background posteriorly (Figure 540, C).

Anterior-margin setae of head large; median and intermediate seta dark, lateral seta light, curved inward; anterior frontal seta the same; middle frontal seta dark, large; posterior frontal seta thinner, light, small; seta 7 dark, short, situated near ridge before antenna; seta 9 black, situated medially to eye, moderately long; seta 11 small, light; seta 10 light, situated near margin of pericocular area; setae 12, 13, and 14 forming a transverse row behind pericocular area, 14 black, longest on the head; 13 small, light; 12 thin, short, brownish; setae 15 and 16 situated close together, 15 thin, moderately long, 16 similar, lighter, projecting; seta 17 situated near fork of frontal sutures, large, dark; ventral seta 8 small, situated near anterior margin, seta 18 very small, situated on light background.

Dorsal sclerite of labrum (Figure 540, D) dark brown, tuberculate, with broad median indentation; posterior-angle sclerites with dark basal spot; anterior margin membranous, with large median process; seta 1 situated on each side of process, in form of small, thick, blunt transparent spine; seta 2 represented by a much larger, light spine near anterior margin, curved, blunt, thick; seta 4 the same; seta 3 short, light, situated near margin; setae 5 and 6 yellowish, larger than others, situated lateral to median pit.

Mandibles (Figure 540, E) mainly black, reddish brown distally, spadelike, without teeth, except for a small, blunt, distal process on dorsal margin; median brush situated at dorsal margin formed by dense, yellow chaetoids; lateral setae situated basally, light, yellowish brown, dorsal seta larger than ventral.

\* Described from preparations; the dots are indistinct in the whole larva.

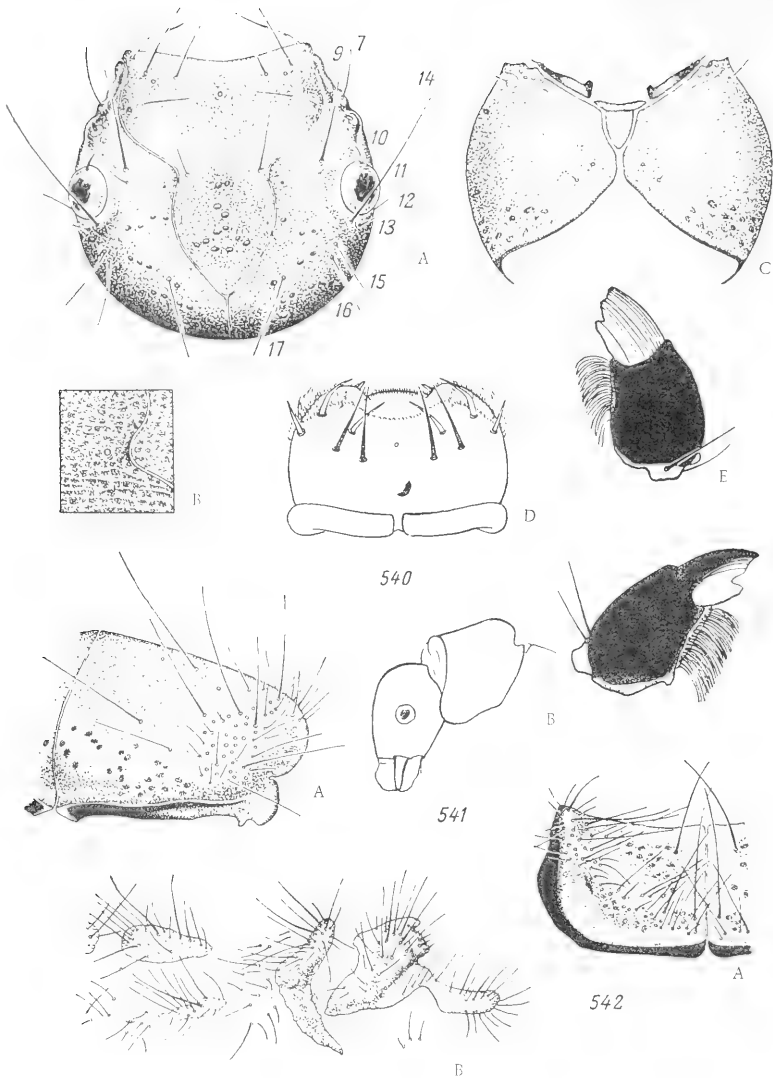
Sclerites of maxillo-labium yellowish, reddish brown in some places. Sclerites of cardo large, brown, with black median spot, and a broad, black stripe and 2 small, light setae laterally at anterior margin. Median sclerites of submentum yellowish, with light brown, lateral process with thick, light seta anteriorly. Stipes large, yellowish, with reddish yellow, posterior margin; setae light, basal seta larger than apical. Palpifer light brown; distal seta small, thick, brown; median seta small, light. Galea short, reaching base of segment 4 of palp; segment 1 of palp shorter than following 2 segments; segment 4 smaller than others, with large sensillae. Mentum with reddish brown transverse stripe. Ventral sclerites represented by brown stripes with a light, thick, subapical seta. Palpiger horseshoe-shaped, yellowish brown. Labial palp relatively large, with yellowish sclerite and 2 large sensillae.

Pronotum (Figure 541, A) dark brown; posterior margin yellowish, with wide, black stripe; posterior-angle processes light brown, with reddish brown lateral margin; anterior part of sclerite flat in middle; posterior part strongly convex, humped in lateral view (Figure 541, B). Punctate pattern and setae situated mainly in posterior and lateral parts; X-shaped, median dot and 2 groups of dots situated in middle and laterally in each half of sclerite. Flat part with long, black, anterior-margin seta some distance from median suture; 2 brown, moderately long setae, and a long, black anterior-angle seta further along margin; behind the latter, a similar, thick, black, secondary seta at margin of flat area and some distance from each other; a long, black, medioanal seta near median suture; other setae situated outside flat area; lateral parts of sclerite with thick, strong, black setae, most of them short or moderately long.

Mesonotum (Figure 542, A) light brown, with yellowish posterior angles; anterior angle, lateral, and posterior margin with black margin forming a  
311 large process; an oblique stripe with a large, oblong, black, or dark brown spot on surface. Surface with numerous dots, lateral dots in anterior part forming a large wedge-shaped pattern; middle of sclerite with 3 large dots, one behind the other, and 2 smaller dots laterally; posterior part with a group of dots and a dot near posterior margin. Setae dark brown or black; anterior-margin seta strong, situated some distance from margin and median suture; anterior-angle seta long, situated some distance from angle; numerous thick, strong setae, short and moderately long, all directed  
312 anteriorly, situated between anterior angle and base of median suture; thus, middle of mesonotum with few setae, but surrounded by a dense crown of strong setae.

Anterior-median tergites of metathorax (Figure 542, B) large, chestnut brown, in form of long triangles; setae dark brown, most of them moderately long, primary seta longer and thicker. Posterior median tergites smaller than anterior tergites, oblong, grayish brown; dark brown or blackish setae of varying size, most of them thick and strong, situated on, between, and lateral to the sclerites. Lateral tergites yellowish brown; transverse stripe reddish brown, with 3 large dots; setae only in anterior part, dense, short to moderately long; primary, anterior-angle seta slightly longer than others.

Propleuron: epimeron relatively large, lobed, yellowish, seta small, black; pleural groove black; episternum brown, trochantin small, blackish, seta small, reddish brown.



FIGURES 540-542. *Drusus caucasicus* Ulm.:

540 - head, dorsal (A), membranous area in region of left tentorial pit (B), head, ventral (C), labrum (D), mandibles, dorsal (E); 541 - pronotum (A), head and prothorax, lateral (B); 542 - mesonotum (A), tergites and pleuron of metathorax (B).

Mesopleuron triangular, brown; episternum much larger than epimeron, with 3 large dots at anterior margin; pleural groove with narrow black stripe; a large, black, oval spot at distal margin; primary seta of episternum situated nearby; seta of epimeron situated distally at margin, some distance from suture, both setae black, moderately long; secondary setae dark, distributed on entire sclerite, several of them moderately long, others small.



Metapleuron slightly oblong, light brown; pleural groove with dark stripe and a dark brown, triangular, distal spot; epimeron yellowish, including its distal process surrounding the coxa; primary seta of episternum long, black, situated subapically at suture; primary seta of epimeron the same, slightly shorter, situated some distance from suture; secondary setae brown and dark brown, on whole sclerite, denser and thicker on distal, lateral process.

Prosternite trapezoidal posteriorly, pale brown with a dark, narrow stripe anteriorly; horn small, pale yellowish, slightly curved (Figure 543). Ventral side of mesothorax and metathorax with 8–9 pale, brownish, sclerotized dots laterally at posterior margin.

Legs reddish brown; punctation dark, not always distinct; ratio of length of legs 68:100:98.

Fore coxa (Figure 544, A) massive, shorter than femur; basodorsal seta moderately long, situated together with several, smaller, secondary setae; anterior distodorsal seta short, posterior seta long, situated in a row of similar large, secondary setae which are sparser at basal margin; both primary anterior setae shorter, light yellowish, branched at end; secondary surface setae small, not numerous; primary distoventral setae light brown, short, posterior seta slightly larger than anterior; 10–11 short to moderately long secondary setae.

Setae of trochanter yellowish brown; anterior seta short, with 5–6 short branches at the end (Figure 544, A); posterior seta short, spine-shaped; anterior-ventral setae, apical and intermediate, in form of short, thick, yellow spines; basal seta strong, moderately long; basal segment with 2 secondary setae; posterior ventral setae situated apically and subapically, resembling basal seta, yellowish, moderately long; a row of 20–25 white, chaetoids on ventral side.

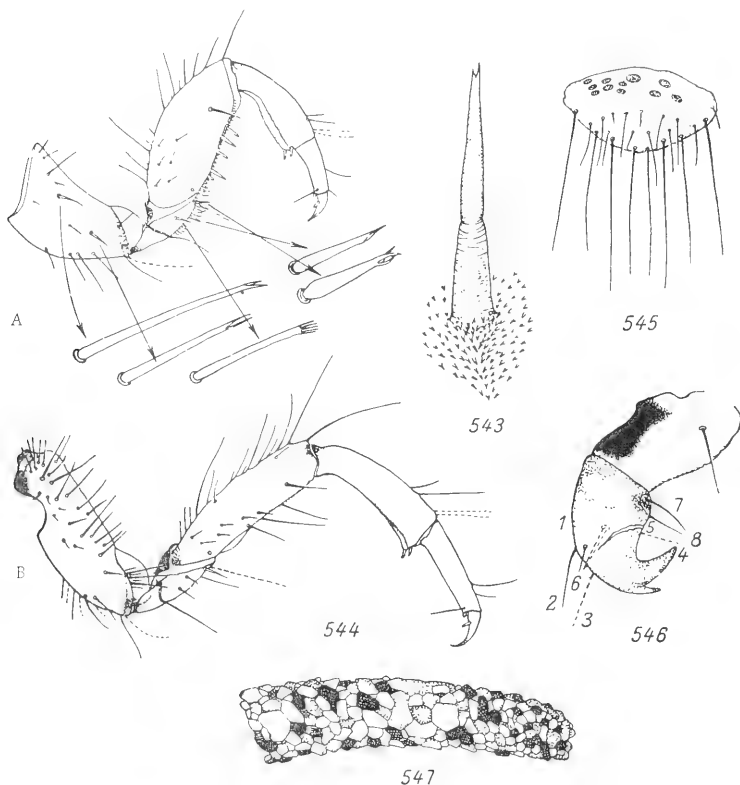
Femur narrower distally, with convex dorsal and slightly concave ventral margin; basodorsal seta thin, moderately long; apical dorsal seta similar but stronger; both setae situated in a dense row of thin, moderately long, secondary setae; anterior-primary seta situated subapically, short, dark; posterior-primary seta larger, strong, situated basally at ventral margin, brown; anterior surface with 5–6 short, thin, dark, secondary setae, and several small setae; posterior surface with 3–4 darker, thin, and several, small setae; primary ventral setae situated basally near posterior primary seta, represented by 2 large, strong, yellow spines; 3 almost as large, secondary setae further distally; 11–12 minute, blunt, light spinules in basal half; 4–5 white, thin, ventral chaetoids near basal margin, like those on trochanter.

Tibia uniformly wide in distal half, with a longitudinal row of small, light spinules ventrally; primary distoventral setae represented by 2 short, blunt, yellowish spines, and a small, blunt, light spinule near each spine; primary dorsal setae thin, light, arranged in 2 pairs, subapical and almost apical; one apical seta moderately long, longer than others.

Tarsus slightly narrower distally; distoventral setae light, thin, 2 light spinules between them; 2 dorsal setae situated one behind the other, apically and subapically; apical seta larger, moderately long. Claw thin, curved, with a blunt, strong, yellowish spine at base.

313 Mid-coxa long, narrow, slightly wider than femur; basodorsal seta thin, moderately long; 5–6 smaller, secondary setae further basally; anterior

distodorsal seta dark, slightly longer, a row of 4–5 secondary setae more basally; posterior distodorsal seta very long, situated in a dense row of long, secondary setae which become sparser and smaller toward base; both primary, anterior setae short, dark brown, situated in distal part; distoventral setae larger, of equal length; secondary, surface setae small, sparse; ventral side with 8–9 larger setae.



FIGURES 543–547. *Drusus caucasicus* Ulm.:

543 – prothoracic horn; 544 – left legs: foreleg with its branched setae (A), hind leg (B), anterior; 545 – tergite of abdominal segment 9; 546 – right anal leg, lateral; 547 – larval case.

Anterior seta of trochanter thick, spine-shaped, light; posterior seta dark, both short; anterior distoventral seta in form of a large, yellow spine; intermediate distoventral seta short, spine-shaped; basal distoventral seta strong, moderately long; posterior apical ventral seta long; subapical seta slightly smaller, both thick, brownish; basal segment usually with a short, thin, secondary seta.

Mid-femur slightly narrower distally, with slightly convex dorsal side and almost straight ventral surface; apical dorsal seta strong, basodorsal seta thin, situated in a dense, marginal row of long, secondary setae; anterior

seta situated subapically, dark brown, short, strong, posterior seta situated ventrally, longer; anterior surface with 4–5 small, dark, secondary setae in basal part, posterior surface with 6–7 larger setae; 4 short, strong, reddish brown setae and 2 smaller setae, both primary setae among the former, ventrally at margin.

314 Tibia long, slightly wider distally. Tarsus almost straight, slightly narrower distally. Dorsal setae of tibia in 2 pairs, longer than on forelegs; distoventral setae in form of 2 light spines, smaller than on forelegs. Dorsal setae or tarsus more widely spaced than on forelegs, thin, light, of equal length; distoventral setae longer and thinner than on forelegs, thin spinules near them. Claw thinner, curved, with yellow, basal seta.

Number and arrangement of gills of *D. caucasicus*

Segment	Dorsal	Pleural		Ventral
2	1 1	1	1	1 1
3	1 1	1	1	1 1
4	1 1	1	1	1 1
5	1 1			1 1
6	1 1			1 1
7	1 1			1 1
8	1 1			1 1

Hind coxa (Figure 544, B) shorter than mid-coxa, with similar chaetotaxy. Posterior seta of trochanter thin, moderately long, dark brown, intermediate ventral seta small, light. Hind femur narrower and slightly shorter than mid-femur, with slightly wider distal end; primary ventral setae in form of thin, strong spines in middle of femur; a similar secondary seta further distally.

Hind tibia similar to mid-tibia. Subapical dorsal seta of hind tarsus longer than apical seta.

Dorsal process of abdominal segment 1 small, pointed; lateral processes large, blunt; anterior dorsal part of segment with small, strong, black setae on sclerotized dots; ventral convexity of segment brownish, with similar setae and a reddish brown stripe at posterior margin.

Lateral line from middle of segment 3 to beginning of segment 7, with small, golden brown hairs. Gills on segments 2–8, single, long, ventral gills longer than dorsal gills.

Tergite of segment 9 (Figure 545) yellowish brown, with indistinct punctuation at anterior margin; medioanal and anterior-angle seta black,

thick, relatively long; intermediate seta situated near medioanal seta, thin, black, moderately long; lateral seta short, thin; a group of setae between the medioanal setae usually consisting of 2 black, moderately long, 2 short, thin setae and a dark median seta, but number and form of these setae vary considerably; surface with several secondary setae.

Sclerite "b" of anal legs reddish brown, with large, dots laterally and anteriorly; the median of the 3 distodorsal setae black, thick, long, the 2nd the same, but shorter, the lateral thinner, black, moderately long; 2 black, moderately long setae at median margin; surface with 5-6 short, brown, and several larger and smaller setae; ventral seta small, brown. Sclerite "c" yellowish brown, with broad, black lateral margin; seta small, brownish.

Claw yellowish brown, apex reddish brown; dorsal denticle also dark; seta 1 situated in basal part, small, thick; seta 2 brownish, large, situated at end of suture; seta 3 the same, situated dorsally in distal part; seta 6 situated subdorsally and laterally; seta 4 straight, light, transparent, relatively large, situated near suture, medial to seta 8; seta 5 small, situated laterally near seta 8; ventral setae 7 and 8 transparent, pale yellowish, seta 7 larger and curved distally (Figure 546).

Case 12-15 mm long, tubular, slightly curved, slightly flattened ventrally, made of smoothly arranged sand grains, those at anterior end sometimes slightly larger; posterior end rounded, with a large, irregularly round, central hole (Figure 547).

Mode of life and habitats. Feeding on algae; pure, mountain brooks and rivulets.

Distribution. USSR: Caucasus, common.

## 2. *Drusus trifidus* McLachlan

Klapálek, 1888:22-25, Figure 8. — Ulmer, 1903:73-74, Figure 52; 1909:73-74. — Döhler, 1914:42-52, Figure 21. — Lestage, 1921:814-822, Figure 295, b, e, f, i, j, k. — Fotius-Jaboulet, 1961:1-19, Figures I-XII.

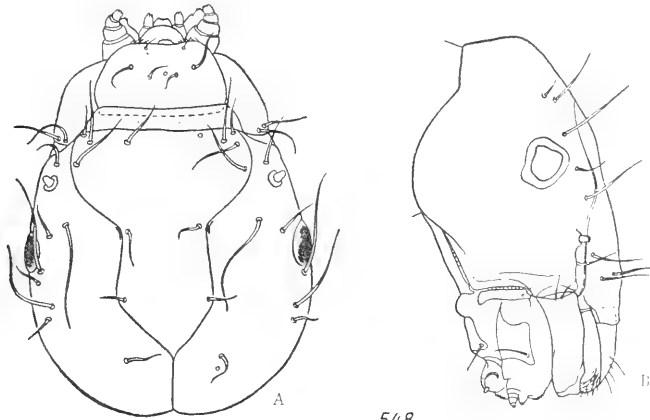
315 **Full-grown larva.** Length 10-11 mm, width 2.0-2.3 mm. Head sloping sharply downward, convex dorsally in posterior part (Figure 548), slightly flattened anteriorly; eyes situated in middle; antennae situated slightly nearer to anterior margin than to eye. Dorsal side of head dark, especially in transverse middle; anterior part lighter laterally and on ventral side; posterior part of frontoclypeus with indistinct punctation. Gula dark. Dorsal setae of head resembling those of *Drusus caucasicus*; setae 16 and 17 smaller than in *D. caucasicus*; seta 8 very small; seta 18 small.

Labrum as in *D. caucasicus*. Mandibles short, massive, black; distal margin without teeth; brush situated at dorsal margin; lateral setae short, black, of equal length, situated basally.

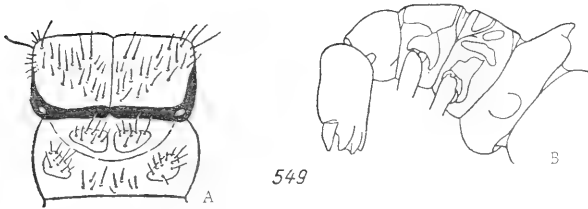
316 Sclerites of cardo dark in middle, with a black spot, a black stripe and 2 small setae laterally. Submentum with 2 transverse sclerites, divided by a narrow, median stripe; primary setae short, one in middle of anterior margin of each sclerite. Stipes wide, with projecting lateral margin; both setae about the same length, situated anteriorly; apical seta at anterior margin; basal seta at lateral margin. Apical and basal setae of palpifer small, and of similar size. Maxillary palps with short segments, segment 2

slightly larger than others. Mentum in form of a narrow semicircle. Ventral sclerites with a small distal seta. Sclerites of palpiger forming narrow, sclerotized bands. Labial palps small, with a single segment.

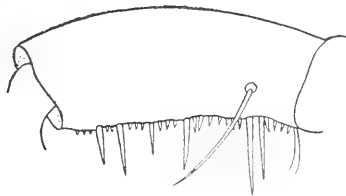
(315)



548



549



550

FIGURES 548-550. *Drusus trifidus* McL. (after Fotius-Jaboulet):

548 - head, dorsal (A) and lateral (B); 549 - mesonotum and metanotum (A), head, thorax and abdominal segment 1, lateral (B); 550 - left fore femur, posterior.

Pronotum dark, with black lateral and posterior margin, surface with numerous, small, yellow spinules and black setae, including several moderately long setae. Mesonotum brownish at posterior angles and in anterior part, darker elsewhere, with broad, black, lateral and posterior margin; a light spot at posterior angle; lighter area of posterior angles without setae; setae sparse in middle of anterior part, numerous on other parts, black, strong, of different size. Anterior-median tergites of meta-thorax situated close together, transverse; setae short, strong, situated in

anterior part. Posterior median tergites smaller, triangular, with short setae; lateral tergites oblong, pale posteriorly, dark anteriorly, with black, short to moderately long setae. Groups of setae between tergites (Figure 549, A).

Prosternite in form of small, median sclerite. Horn thin.

Legs like those of *D. caucasicus*. Forelegs much shorter and more massive than others; midlegs longer than hind legs. Fore femur with a row of small spinules at ventral margin; primary ventral setae in form of 2 large, light spines; similar 2-5 secondary setae situated among small spinules; posterior primary seta black, short, strong, situated basally (Figure 550).

Number and arrangement of gills of *D. trifidus* (after Klapálek)

Segment	Dorsal	Pleural		Ventral
2	1 1		1	1 1
3	1 1	1	1	1 1
4	1 1	1	1	1 1
5	1 1			1 1
6	1 1			1 1
7				1 1

Abdominal segment 1 wider than other segments; dorsal and lateral processes large, setae between them short, strong; ventral side of segment with median convexity, with short, black setae, and 2 small sclerites close together on median side; a small sclerite and a group of setae, one of them on sclerite at base of lateral process.

Lateral line from beginning of segment 3 to beginning of segment 8 with thin, very small hairs. Gills on segments 2-7.

Tergite of segment 9 brown; median setae, intermediate setae, anterior-angle setae, and secondary seta between medioanal setae long, thick, black; anterior-angle setae slightly larger than others.

Sclerite "b" of anal legs dark, 3 long, thick, black setae on membrane dorsally near posterior margin; several thick, moderately long setae at median margin; surface with a group of shorter and smaller setae. Sclerite "c" in form of a short, wide triangle with a black marginal stripe; seta small, strong, dark.

Claw dark, short, black or blackish brown apically, with a large, dorsal denticle; dorsal seta 2 moderately long, larger than others.

Mode of life and habitats. Clear brooks and sources.

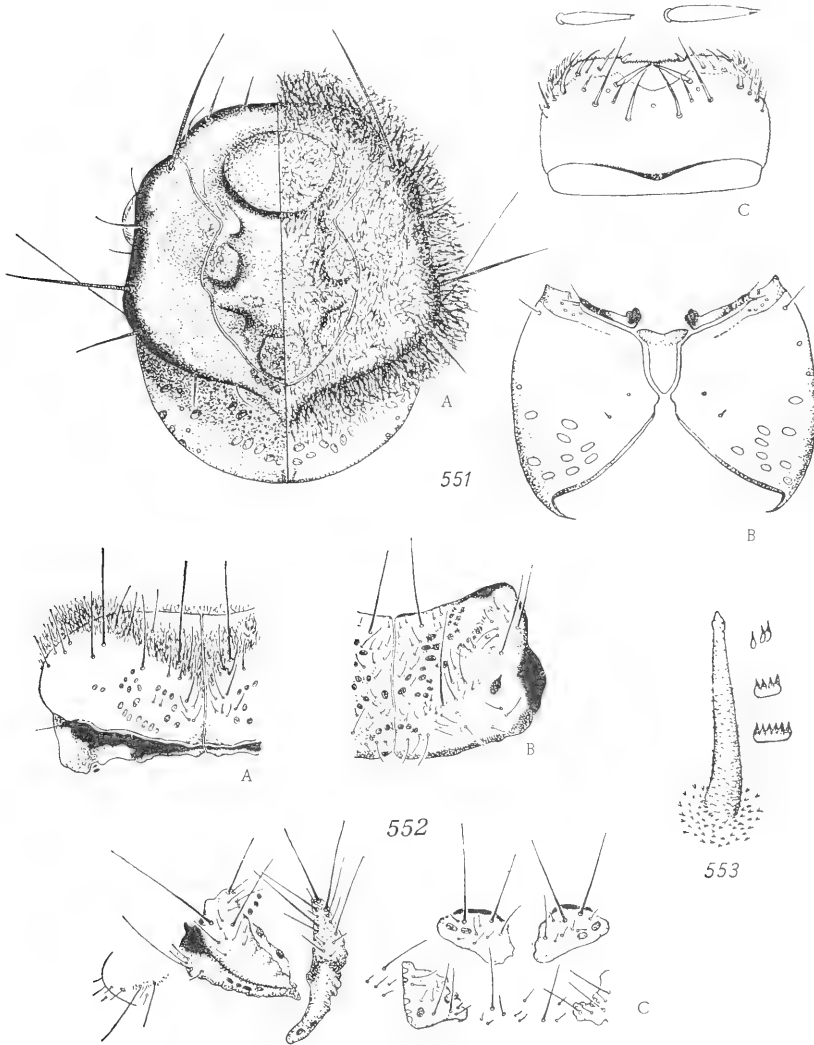
Distribution. Western and southwestern parts of the European USSR, especially in the Carpathians. In addition, Central and Southern Europe.

3. *Drusus discolor* Rambur

Ulmer, 1903:71-73, Figures 3, 51; 1903a:90-93, Figures 1-5. - Thiene-  
mann, 1905:Plate 17, Figure 25. - Steinmann, 1907-1908:89. - Ulmer,  
1909:269, Figure 407, a, b, c, d, e. - Döhler, 1914:46, 51, Figure 21. - Lestage,  
1921:814-822, Figure 295, a, c, g, h.

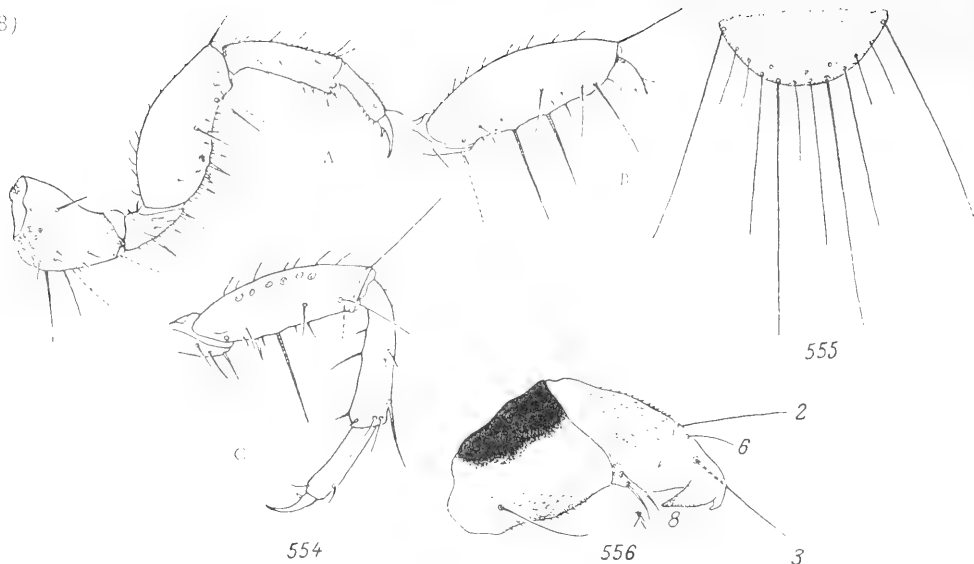
Full-grown larva. Length 10-12 mm. Head and thoracic sclerites  
shining brown. Frontoclypeus with large, dark dots posteriorly, arranged

(317)



FIGURES 551-553. *Drusus discolor* Ramb.:

551 - head, dorsal (A) and ventral (B), labrum and its branched setae (C); 552 - pronotum (A), mesonotum (B), tergites and metapleuron of metathorax (C); 553 - prothoracic horn and chaetoids near it.



FIGURES 554—556. *Drusus discolor* Ramb :

554 — left legs, anterior: foreleg (A), mid-femur (B), and hind femur, tibia, tarsus, and claw (C); 555 — tergite of abdominal segment 9; 556 — left anal leg, lateral.

in a characteristic pattern at margins (Figure 551, A). Flattened dorsal part of head surrounded by a ridge, especially near eyes. A crown of numerous, thin, dense, light, secondary setae along and behind ridge; setae 9 and 14 dark, thick, moderately long, distinct among secondary setae; seta 15 thin, moderately long, situated behind 14; other primary setae little visible among secondary setae. Ventral surface lighter, without pattern; seta 8 light, relatively large, situated near ventral articulation of mandibles; seta 18 small (Figure 551, B).

Labrum with dark brown dorsal sclerite; median indentation shallow; seta 1 small, light, situated on each side in indentation; seta 2 situated laterally, curved, light; seta 3 on lateral margin; seta 4 situated near anterior margin; setae 5 and 6 situated slightly posteriorly lateral to median indentation (Figure 551, C).

Mandibles black, chisel-shaped, with 3 small, blunt teeth; chaetoids of median brush light, larger basally; lateral setae short, of about equal length.

Sclerites of cardo yellowish, with brown median and lateral dots; both setae small, dark. Submentum with 2 sclerites, brown, relatively large, separated by a membranous stripe; a short seta at anterior margin of each sclerite. Stipes wide, brown; basal seta short, light, apical seta smaller. Palpifer and sclerites of palp brown; distal seta of palpifer situated at anterior margin. Galea shorter than palp, with large sensillae; segments of palps of similar length; segment 4 slightly shorter than the others; segment 3 larger. Mentum in form of a short, reddish brown semicircle with a darker transverse stripe. Ventral sclerites brown, with a small, light seta. Palpiger sickle-shaped, light brown. Labial palps relatively large, reaching end of labial lobe.

Pronotum (Figure 552, A) brown, with a transverse, humplike process in middle, more visible in lateral view, and densely covered with secondary, light setae similar in color and density to those on head. Primary setae



anterior-angle and medioanal, black, strong; other primary setae less visible among secondary setae.

Mesonotum (Figure 552, B) with reddish brown, anterior margin. Lateral and posterior margin black, wider laterally and posteriorly; surface with a large, reddish brown dot at posterior angle; 3 primary setae, anterior-margin, anterior-angle, and medioanal, larger than others.

Median tergites of metathorax large, anterior tergites triangular, with dark anterior and median margin; posterior tergites lighter and smaller; primary anterior-margin and medioanal setae moderately long, thick, dark brown; a few thick, shorter, secondary setae. Lateral tergites situated in middle with a large, dark reddish brown spot, 7 dark brown, large, thick setae and several smaller light setae anteriorly (Figure 552, C).

Horn thin, its chaetoids serrated (Figure 553). Forelegs (Figure 554, A) slightly shorter than mid- and hind legs; fore femur wider basally, narrower apically; legs and their chaetotaxy as in Figure 554, A. Fore femur ventrally with 2 long, dark setae, one of them a primary anterior seta; primary ventral setae of fore femur situated basally in form of 2 large, light spines; primary ventral setae of mid-femur very long, thick, dark, spine-shaped (Figure 554, B).

Abdominal segment 1 with large, atypically located, lateral processes; a row of black setae situated on large brown sclerotized dots between them ventrally. Lateral line on segments 3–8, with small, dark hairs. Gills single, on segments 2–7.

Tergite of abdominal segment 9 brown (Figure 555); medioanal setae and anterior-angle setae moderately long, black; intermediate seta also dark, large; a similar, large, dark seta and a shorter, light one between medioanal setae; lateral seta light, shorter; several secondary setae of different size near primary setae.

Sclerite "b" of anal legs (Figure 556) short, chestnut brown, with 3 thick, black, moderately long setae dorsally; ventral seta short, brown; other setae of different size, situated apically and subapically. Sclerite "c" relatively large, yellowish, with broad, black, lateral margin; basal seta like ventral seta of sclerite "b."

Claw brown, apex reddish brown, with a dorsal denticle; surface rugose, with microscopic spinules basally; seta 3 dark, larger than the others.

Case made of sand grains, slightly curved, narrower posteriorly.

Mode of life and habitats. Rheophile, feeding on algae. Small, rapid, cold brooks.

Distribution. USSR: Carpathians and surrounding territory. In addition, Europe.

## 2. Genus *Ecclisopteryx* Kolenati

**Full-grown larva.** Length 11–14 mm. Head yellowish brown; secondary setae present in area of dorsal ridge. Pronotum concave anteriorly. Anterior-median tergite of metathorax light brown. Case consisting anteriorly of coarse sand grains, not smooth.

**Pupa.** Length 9–14 mm; clypeus with large, tuberculate, dark brown process.

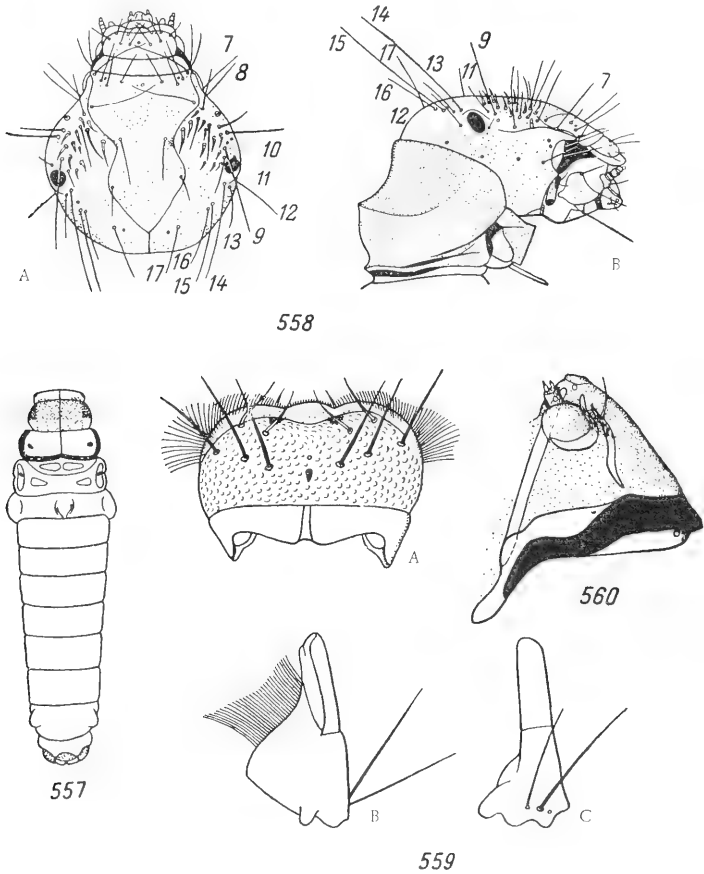
Mode of life and habitats. Cool, small, brooks and springs.

Distribution. Southwestern part of the European USSR. In addition, Europe.

1. *Ecclisopteryx guttulata* Pictet

Nielsen, 1942:550, Figures 138–146; 1943–1944:106–116.

**Full-grown larva.\*** Length 11–14 mm (Figure 557); sclerites tuberculate, shagreened. Head (Figure 558, A) reddish yellow; darker, grayish brown anteriorly; middle of head 1.3–1.6 mm wide; ridge higher anteriorly, more distinct; eyes situated behind ridge; base of antennae dome-shaped, fused with ridge; sensilla situated on dorsal side of ridge. Setae as in 320 Figure 558, A and B; seta 14 longest, about half as long as width of head; seta 16 light, procumbent in 1st stage larvae, projecting and brown in 4th and 5th stage larvae; 11–17 secondary setae, most of them small, situated between ridge and anterior branch of frontal sutures.



FIGURES 557–560. *Ecclisopteryx guttulata* Pict. (after Nielsen):

557 – full-grown larva, dorsal; 558 – head, dorsal (A), head and prothorax, lateral (B); 559 – labrum (A), left mandible, ventral (B) and lateral (C); 560 – mentum and labium laterally.

\* Described after Nielsen; the collection of the Zoological Institute has no larvae of this species.

Mandibles (Figure 559, B, C) black basally, reddish brown apically, without teeth, except for a small, blunt, tooth-shaped process at dorsal margin; median brush forming a row of golden yellow chaetoids; lateral setae brown, dorsal seta longer and thicker than ventral.

Maxillolabium, lateral as in Figure 560; mentum with wide, black, transverse stripe; other sclerites yellow or yellowish brown; setae of submentum relatively large.

321

Pronotum blackish brown in concave, anterior part surrounded by ridge; lateral and posterior parts light brown, with groups of small dots; posterior margin with a narrow, black stripe; posterior-angle process wide, light, with dark brown, lateral margin; small, thin spinules at anterior margin; both primary and secondary setae present, the latter numerous, mainly laterally.

Mesonotum reddish yellow, brownish at anterior margin, with a narrow, black margin laterally and posteriorly; lateral margin with a large black process. Secondary setae situated mainly at anterior angles and posteriorly.

Anterior-median tergites of metathorax brownish, larger than posterior tergites; lateral tergites with a blackish, transverse stripe; secondary setae numerous.

Propleuron with a black groove on pleural suture; episternum light brown, epimeron yellow, with black dorsal margin; trochantin mainly black, with a small seta and one setule. Pleurites of meso- and metathorax light brown, the latter with broad posterior process; secondary setae numerous.

Number and arrangement of gills of *E. guttulata* (after Nielsen)

Segment	Dorsal	Pleural		Ventral
2	1 1	1	1	1 1
3	1 1	1	1	1 1
4	1 1	1	1	1 1
5	1 1	1		1 1
6	1 1			1 1
7	1 1			1 1

Ventral side of prothorax with a small, pale, weakly sclerotized sternite with brown diverging lines at anterior angles near posterior margin.

Mesosternite represented by several yellow or brownish dots, metasternite by a smaller number of such dots.

Legs yellowish brown, some articulation with black margin; ratio of length of legs 80:100:99. Forelegs relatively longer in young larva; ratio of length of legs in 1st-stage larvae 87:100:98. Form of legs and their chaetotaxy in 1st-stage and full-grown larvae as in Figure 561. Anterior setae of coxa and anterior seta of trochanter branched at apex.

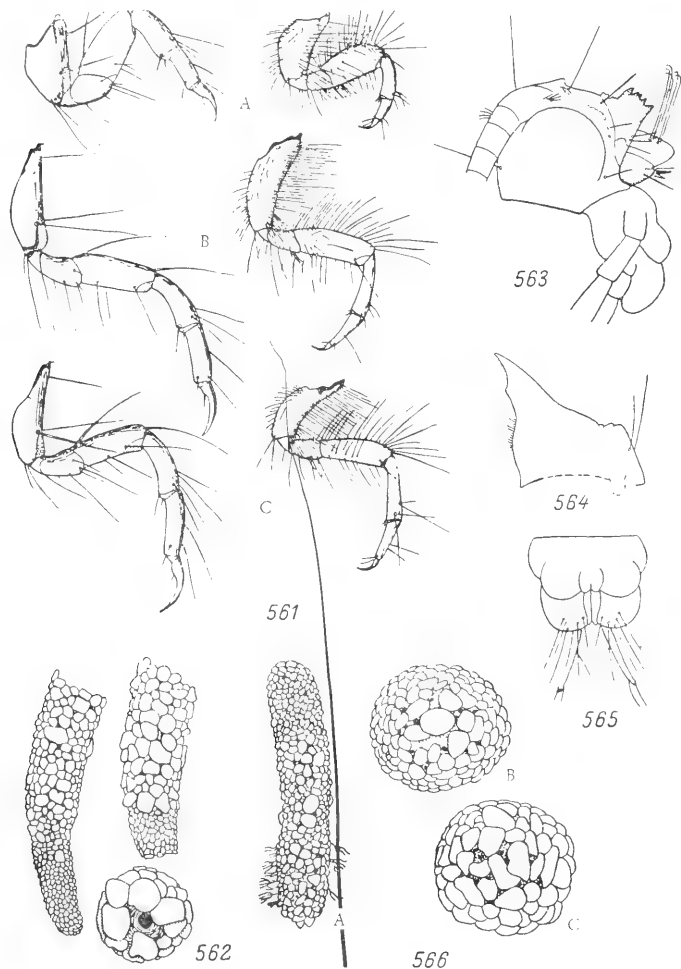
Dorsal process of abdominal segment 1 small, pointed; lateral processes large, without sclerite. Ventral elliptical areas on segments 2-7. Gills on segments 2-7, those of pleural row shorter than those of dorsal and ventral rows; gills appear in 3rd-stage larva.

Tergite of segment 9 yellowish brown, with indistinct punctation; 17-20 secondary setae in addition to primary setae.

Sclerite "b" of anal legs brownish; 12-19 large and small setae. Sclerite "c" yellow, with broad, black, lateral margin. Claw yellowish.

Case (Figure 562) slightly curved, tapering posteriorly, made of sand grains, which are small and smoothly arranged in posterior part, larger anteriorly; posterior end covered with a membrane with a round hole; membrane covered with sand grains.

(322)



FIGURES 561-566. *Ecclisopteryx guttulata* Pict. (after Nielsen):

561 - right legs, posterior (on left) of 1st-stage larva; (on right) of full-grown larva; foreleg (A), midleg (B), hind leg (C); 562 - larval case, lateral (a long and a shorter case), and posterior. Pupa: 563 - head, lateral; 564 - left mandible, ventral; 565 - posterior end of male pupa, ventral; 566 - pupal case lateral (A), anterior (B), and posterior (C).

**Pupa.** Length 9–11 mm in male pupae, 11.8–13.4 mm in female pupae. Dorsal side of head near anterior margin with a brown, sclerotized process (Figure 563) on clypeus, and divided into several tubercles; frontoclypeus with a much smaller tubercle. Antennae of male pupae reaching middle of anal rods, those of female pupae segment 7. Antennal segments 1 and 2 with 3–6 small setae. Labrum, with a small anterior-margin seta, and 5 large, dark, setae which are curved, the end projecting upward. Mandibles (Figure 564) relatively broad, with a lateral tubercle with 2 short setae at base, dorsal seta larger than ventral; distal part wide, short; median blade slightly concave, serrated, a row of small spinules further basally.

Midlegs natatorial, with setae on segments 1–4. Lateral line on segments 5–8. Holding apparatus on segments 3–7, number of spinules: III:2–5; IV:2–5; V:2–5+6–12; VI:2–4; VII:2–5.

Anal rods thin, setae as in Figure 565.

Case 13.8–17.6 mm long (Figure 566); anterior and posterior end dome-shaped; anterior end covered with fine sand grains, posterior end by larger grains; holes in posterior membrane more numerous than in anterior membrane; case attached at posterior end by numerous, thin ligaments.

Mode of life and habitats. On stones, in running water, brooks, rheocrene springs and ditches, often swampy; larva avoids areas with a rapid current; feeding on algae and moving rapidly, hiding its head in case; larva clings to stones with claws of its longest legs, the midlegs.

Distribution. Southwestern part of the European USSR. In addition, Europe, mainly Central.

### III. Family GOERIDAE Ulmer

**Full-grown larva.** Medium-sized, 8–15 mm. Head short, narrower anteriorly; dorsal surface curved, forming a distinct hump; eyes situated in middle of head, antennae between eye and seta 7. Gula triangular, usually with curved sides. Most of primary setae markedly reduced; secondary setae small, light, procumbent. Labrum with broadly membranous anterior part. Submentum with 2 large, oblong, median sclerites.

Pronotum with large, pointed, anterior-angle processes; a similar process on mesopleuron. Each half of mesonotum with 2 sclerites, median and lateral, latter divided transversely into 2 parts, or 2 separate sclerites. Metanotum with 3 or 4 sclerites.

Abdomen, in contrast to Apataniinae, almost uniformly wide from segment 2 to segment 7, sharply tapering posteriorly. Gills on segments 2–7, with 3, rarely 2 or 4, filaments. Tergite of segment 9 absent, setae at posterior margin, including several secondary setae. Claw short, usually with a small, dorsal denticle.

Case made of sand grains, tubular, almost straight, slightly curved and tapering posteriorly, with larger sand grains or small stones laterally, sometimes attached at margin.

Mode of life and habitats. Small running water bodies, brooks, and rivulets with a slow current; open shore of lakes with moderate surf.

Distribution. Throughout the USSR. In addition, Europe, Africa, Asia, North America.

## Key to Genera

### Full-grown larva

- 1 (2). Dorsal side of head black or brownish black in middle; mesonotum with 3 pairs of sclerites, metanotum with 4 pairs; case with coarse sand grains laterally, as in *Apatania*. Western part of the European USSR, the Caucasus . . . . . 3. *Lithax* McL. (p. 433)
- 2 (1). Dorsal side of head brown or reddish brown; number of tergites on mesonotum and metanotum similar or smaller; case with small stones laterally, attached at margin. Widely distributed.
- 3 (4). Frontoclypeus large, anterior and posterior parts well developed, posterior part narrower; mesonotum with 2 pairs of sclerites; metanotum with 3 pairs of small sclerites as in *Limnophilinae* . . . . . 1. *Goera* Steph. (p. 406)
- 4 (3). Anterior part of frontoclypeus large, broad; posterior part much narrower and shorter; mesonotum with 3 pairs of sclerites, metanotum with 4 pairs . . . . . 2. *Silo* Curt. (p. 416)

### 1. Genus *Goera* Stephens

**Full-grown larva.** Medium-sized, 12–14 mm long. Head light brown or reddish brown dorsally, flat in middle, without tubercles, in some places, surrounded by a ridge. Mesonotum with 2 pairs of sclerites, metanotum with 3 pairs. Case with several small stones laterally, attached at margin and with winglike lobes.

Mode of life and habitats. Slow brooks and rivulets, open shore of lakes with moderate surf, on solid bottom.

Distribution. Parts of the European and Asian USSR. In addition, Europe, Asia, North America.

## Key to Species

### Full-grown larva

- 1 (2). Dorsal side of head brownish, its median, flat area lighter, surrounding ridge distinct only anteriorly; ventral surface whitish, with a broad chestnut brown stripe posteriorly and near gular suture; gula triangular, relatively wide. Tergites of mesonotum light brown, with indistinct punctation . . . . . 1. *G. pilosa* Fabr. (p. 407)
- 2 (1). Dorsal side of head reddish brown, including flat, median area; surrounding ridge distinct laterally, formed by dense, blunt tubercles; ventral surface reddish brown; gula oblong, narrow, with blunt, truncate posterior end. Tergites of mesonotum reddish brown, with distinct, dark dots . . . . . 2. *G. sajanensis* Mart. (p. 412)

## 1. *Goera pilosa* Fabrizzius

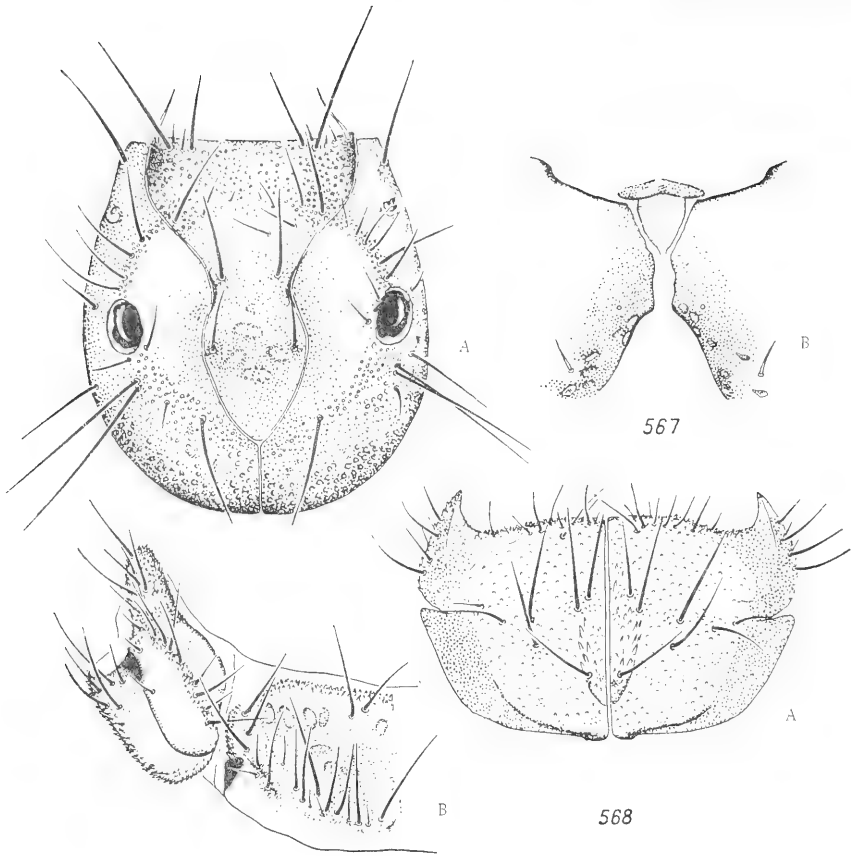
Pictet, 1834:173, Plate XIII, Figure 8. — Kolenati, 1848:95–96. — Hagen, — 1864:235. — McLachlan, 1865:81, p. 11, Figures 3, 30. — Meyer-Dür, 1875:402. — Klapálek, 1893:48–52, Figure 13. — Struck, 1899:324–325, Figure 22c; 1900:23, Figure 26. — Ulmer, 1903:83, Figure 56. — Thienemann, 1905b:522. — Siltala, 1905:19–21, Figure 5; 1907:535–539. — Ulmer, 1909:271–273, 315–316, Figure 410a. — Lestage, 1921:838–844, Figures 299–302. — Lepneva, 1940:214, 216. — Hickin, 1943:75–77, Figures 1–10. — Baker, 1963:172–173, Figure 2. — Brindle, 1964:197, Figure 6.

**Full-grown larva.** Length 12–13 mm. Head (Figure 567, A) light brown dorsally, lighter in flat, median area. Frontoclypeus anteriorly with small, dense, blunt, or pointed tubercles, lateral parts of sclerite darker, angle chestnut brown; posterior part with large, dark brown dots, tubercles present only at base of setae and in middle of posterior part. A whitish area without tubercles lateral to frontal sutures, ending anteriorly in a ridge, covered with dense brownish tubercles and with a row of sparse, secondary setae; a dense row of similar tubercles with large, brown dots laterally from posterior margin of eye to coronal suture. Ventral surface mainly light yellowish, with small, flat, scale-shaped tubercles, area near gular suture brownish, posterior part near occipital foramen smooth, chestnut brown, with large, indistinct dots. Gula triangular, light brownish, slightly longer than wide, with rounded posterior end; pregula reddish brown, transverse, almost twice as wide as gula (Figure 567, B).

Intermediate anterior-margin seta thick, dark reddish brown, moderately long; median anterior-margin seta short, dark; lateral seta light, slightly curved; anterior frontal seta short, brownish, posterior frontal seta smaller, intermediate frontal seta longer, last 2 setae light brown. Seta 7 reddish brown, thin; seta 9 much smaller than usual, light brown, situated at ridge before the eye among short secondary setae; seta 10 light, thin, short, situated laterally before eye; seta 11 slightly larger, brown, situated behind 9, medially to eye; seta 12 thin, light brown, moderately long; setae 14 and 15 situated close together, one behind the other, behind the eye, equally long, chestnut brown, 15 slightly darker and thicker than 14, contrary to usual; seta 16 situated behind 15, short, brownish; seta 17 large, strong, moderately long; ventral seta 8 brown, thin, almost as large as 7; seta 18 small, light, situated between light and dark area. Secondary dorsal setae as in Figure 567, A, situated in anterior part of frontoclypeus and laterally at margin of light flat part of head; 3–4 short setae lateral to antenna.

Labrum with broadly membranous anterior margin as in *Apatania*; anterior lateral lobes large, with dense, light hairs; median lobe slightly convex, with tufts of small hairs. Dorsal sclerite brown, slightly narrower anteriorly; short, blunt processes lateral to median indentation; surface with small, blunt, or pointed tubercles, some of them with small spinules at end; area behind median pit chestnut brown, with a round, light spot; posterior groove brownish; posterior-angle sclerites narrow, curved ventrally. Seta 1 situated on membrane, small, light; setae 2 and 4 light, equally thick; seta 2 larger; seta 3 situated submarginally, forming a row with setae 5 and 6, all 3 setae thick, brown.

(325)



FIGURES 567 and 568. *Goera pilosa* Fabr.:

567 — head, dorsal (A) and ventral (B); 568 — pronotum (A), mesonotum and mesopleurite (B).

Mandibles slightly curved, black at base, pinkish apically, divided by a sharp ridge; distal part spatulate, slightly concave, with smooth or irregularly serrated apex; brush at dorsal margin with light, yellowish chaetoids, those near base longer.

Sclerites of cardo transverse, yellowish in middle and reddish brown laterally; a large dark reddish brown spot between the 2 parts; median margin broadly black, both setae small, light, lateral seta smaller, situated near margin among small spinules. Submentum large, brownish, rhomboidal, with reddish brown setae. Stipes yellowish, with a large, dark brown, lateral spot; lateral seta moderately long, median seta smaller. Palpifer reddish brown, darker in middle; distal seta thin, brown; median seta small, light. Galea wide, short. Maxillary palp small, 2nd segment smaller than 1st; 4th segment slightly smaller than 3rd, with large sensillae. Mentum 325 reddish brown, black laterally; ventral rods narrow, seta small, situated subapically. Palpiger with long, longitudinal and short transverse part. Labial lobe wide; palps small, with a brown sclerite, one sensilla large, and together with seta, longer than segment.



Pronotum (Figure 568, A) yellowish, posterior margin projecting posteriorly, as characteristic for the family; pale, brownish, anterior margin slightly projecting; lateral margin yellowish brown; lateral part of anterior

margin forming a wide, pointed process directed anteriorly; a similar smaller lobe laterally, continuing into curved posterior margin; a deep incision between anterior and posterior lobes; both lobes cover lateral margin, lateral part of posterior margin, articulation with pleurite, and the pleurite, which is visible dorsally only at apex of epimeron. Middle of pronotum with a raised, elliptical area with numerous light tubercles, some of them pointed; other surface with sparse, small tubercles; 3 pairs of pale, brownish dots along suture on elliptical area; a large group of dots posteriorly and several dots anteriorly, laterally in each half. Pronotum with primary, and a few secondary setae, most of them small, pale, yellowish, or light brown (Figure 568, A).

(327) Number and arrangement of gills of *G. pilosa*

Segment	Dorsal	Pleural	Ventral
2	2-3 3	2-3	2-3 3
3	3 3		3 3
4	3 2-3		3 3
5	3 3		3 3
6	3 3		3 3
7	3 3		3 3

326

Mesonotum (Figure 568, B) pale, whitish brown; lateral sclerite divided transversely into an anterior and a posterior part; median sclerite and anterior lateral sclerite with small, light tubercles, those near membranous part larger, conical; anterior part of large sclerite with a brownish dot near suture, 4 similar, larger dots parallel to margin further laterally; posterior part with a median group of 5 small dots, and 2 slightly larger dots, a longitudinal row of 3 large brownish dots laterally; posterior angle strongly sclerotized, light, yellowish, with black, triangular, lateral spot, oblique lines, and a reddish stripe with dark margin. Setae light brown or yellowish in posterior part of median sclerite and anterior part of lateral sclerite; primary medioanal and anterior-angle seta projecting among secondary setae.

Median tergites of metanotum pale, thin, brownish, indistinct, densely covered with small tubercles; anterior median tergites situated close together, transverse; 7 brown, or light brown setae; primary anterior-margin seta moderately long, darker, and larger than others; posterior median tergites large, with 2 white, lateral dots and 9-10 setae; primary medioanal seta dark brown, moderately long. Lateral tergite large, whitish, tuberculate only in anterior part; a lateral, light brown, strongly sclerotized band, wider in transverse area, forming a reddish spot; median margin convex, with an oblique, dark area, light in some places; anterior part with a large, white dot and 17-18 setae; primary anterior-angle seta long, dark brown; secondary seta smaller, brown, and lighter.

Proepimeron light, seta situated distally, short, thin, reddish brown; trochantin reddish brown, with a large, black, basal spot; seta apical, small, brown.

Mesopleuron yellowish brown, with narrow pleural groove and a black spot at distal margin; mesepisternum large with 2 brownish spots at base, anterior-angle process darker, brownish, near basal part; episternum convex, with a comblike ridge from base of suture to subapical dot at lateral margin of anterior-angle process; ridge densely covered with large, teat-shaped tubercles which are larger and more numerous than in other parts of sclerite; secondary setae along ridge, basal and intermediate setae small, light; apical setae long, brown, together with a primary seta.

Metapleuron also with a narrow, blackish brown stripe on pleural suture, widening distally into a dark spot; episternum slightly sclerotized, yellowish near suture, whitish elsewhere, with several brownish dots at base of groove, and a similar dot in anterior angle; large setae, a primary and several secondary setae, reddish brown, moderately long, concentrated in anterior angle; ventral posterior-angle process of epimeron slightly sclerotized, in form of a yellowish, sometimes interrupted, setose plate, separated by a membranous area from distal margin.

Prosternite represented by a small, slightly sclerotized area; horn light, whitish basally, relatively large.

(326)

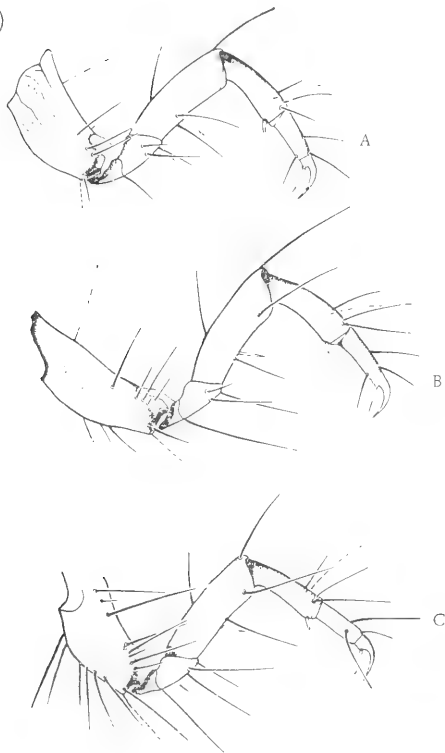
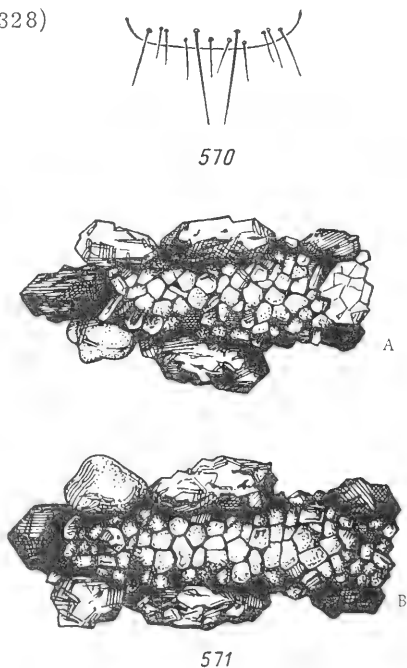


FIGURE 569. *Goera pilosa* Fabr. Right legs, posterior: foreleg (A), midleg (B), and hind leg (C)

(328)



FIGURES 570 and 571. *Goera pilosa* Fabr.: 570 - dorsal setae of posterior margin of abdominal segment 9; 571 - larval case, ventral (A) and dorsal (B) (570 - after Hickin).

Legs (Figure 569) light brown, slightly reddish in some places; articulations between coxa and trochanter, and between tibia and femur, black and dark brown; ratio of length of legs 83:100:99.

Fore coxa less massive than in Limnophilidae, relatively longer, resembling long mid- and hind coxae; distodorsal indentation of all coxae shallow. Femora long, slightly curved; mid-femur thinner and longer than others; dorsal margin convex, ventral margin of fore and mid-femora concave, almost straight on hind femur; tibiae and tarsi straight, reddish at apex, slightly shorter and more massive on forelegs than on other legs; tibia not wider distally; tarsus slightly narrower.

Setae as in Figure 569; secondary setae, in contrast to *Apatania* and *Silo*, restricted to coxae, few on forelegs, more numerous on hind legs than on fore- and midlegs. Primary anterior setae of coxa and trochanter of foreleg short, as in *Apatania*, with slightly bifid apex. Hind trochanter with long posterior seta as in *Apatania*; posterior subapical, ventral seta, in contrast to *Apatania*, long, thin, and dark as posterior apical ventral seta. Primary dorsal setae of fore and mid-femora of equal length; apical seta larger than basal on hind femora; primary ventral setae of fore femur situated close together, slightly proximal to middle, (anterior) apical ventral seta represented by a large, thin, yellow spine; basoventral (posterior) seta not spine-shaped as in *Apatania*, but dark, large, strong, slightly shorter and thicker than posterior surface seta; the latter situated sub-ventrally, dark brown, moderately long, near primary setae, not basal, but slightly apical to them. Primary ventral setae of midleg situated close together, in about middle of segment, resembling those on forelegs, apical (anterior) seta in form of a large, pointed, yellow spine; basal (posterior) seta dark, moderately long; posterior surface seta long, situated distally at ventral margin. Apical ventral (posterior) seta of hind femur moderately long; basoventral (anterior) seta represented by large, yellowish spine; posterior surface seta shorter than distoventral seta; position, coloration and form of setae as on the mid-femur. Brown setae of mid-tibia, tarsus, and claw as in Figure 569, B; those of hind legs (Figure 569, C) slightly longer, those of forelegs shorter, thinner, and lighter.

Abdomen uniformly wide from segments 2-8; segment 1 wider, with large dorsal and lateral processes. Lateral line from middle of segment 3 to end of segment 8. Gills with 2-3 filaments, in dorsal and ventral rows on segments 2-7, in a pleural row on segment 2.

Tergite of segment 9 (Figure 570) represented by an indistinct white, hardened, membranous area; medioanal seta moderately long; anterior-angle seta reddish brown, smaller; 2 setae between medioanal setae; 2 moderately long, primary setae, intermediate and lateral, and usually a small, secondary seta situated between medioanal and anterior-angle setae.

Sclerite "b" of anal legs thin, whitish, dorsally, brownish laterally, brown at apex, reddish brown ventrally; distodorsal seta large, black; neighboring seta also long, black; subapical seta at median margin similar, slightly smaller; ventral seta brown, moderately long, situated slightly more lateral than usual. Sclerite "c" yellowish brown, with broad, blackish brown, lateral margin and a small, brown seta.

328 Claw brown, reddish brown apically, with a large, dorsal denticle, in contrast to *Apatania*; basal part and some apical areas with small

spinules; setae as in *Apatania*; median seta 1 situated basally, short, relatively thick, brown; seta 3 situated subdorsally in distal part, moderately long; seta 2 situated dorsally above suture, brown, thin, moderately long; seta 6 situated lateral and distal to suture, thin, shorter; ventral setae 7 and 8 light; seta 7 situated on membrane, seta 8 on sclerite as in *Apatania*; seta 5 situated slightly lateral to seta 8, small; seta 4 moderately long, situated medially.

Case 12–15 mm long, made of sand grains, smooth, slightly curved, narrower posteriorly, with flat ventral side, with 4–5 large, flat, sand grains or small stones attached at margin, giving a winged appearance; anterior opening directed obliquely downward, posterior opening closed by a membrane with a single, round hole (Figure 571).

Mode of life and habitats. Brooks and small rivulets with a slow current; littoral of lakes with moderate surf, on solid bottom, rarely with some silt.

Distribution. Western, northwestern, and central parts of the European USSR, the Central Urals. In addition, Central, Western, and Northern Europe.

## 2. *Goera sajanensis* Martynov, larva nova

**Full-grown larva.** Length 10–11 mm. Head (Figure 572, A), widest at level of eyes, narrower anteriorly, dorsal surface darker than in *G. pilosa*, mainly chestnut brown, darker in some places, lighter posteriorly; flat dorsal area smaller than in *G. pilosa* but more distinct. Middle and posterior part of frontoclypeus smooth, except for a small median group of blunt tubercles; anterior part longer than in *G. pilosa*, with small pointed tubercles; tentorial pits dark brown; light dots on site of wedge-shaped pattern. Flat area with smooth stripes, without tubercles, situated lateral to frontal sutures and bordered anteriorly by ridge with pointed tubercles and extending from anterior frontal seta to eye; bordered laterally by a dense row of large, dark, blunt tubercles, appearing as a continuous dark band under low magnification; area lateral to this stripe (to eye) with similar, but less dark, tubercles; tubercles smaller before and behind eye, pointed and small on ridge; area near occipital foramen smooth; a light yellowish area behind fork; posterior part with several, large, brown dots laterally. Ventral surface (Figure 572, B) lighter, brown, reticulate, smooth near occipital foramen, with several dark dots. Gula brown, narrow, in form of long triangle, with irregular margin; margins of gular suture separated. Setae as in Figure 572; intermediate anterior-margin seta larger than in *G. pilosa*, thicker than others, one of longest on head; median seta short, dark; lateral seta slightly larger, light; anterior frontal seta short, dark, situated more posteriorly than usual, closer to tentorial pit; intermediate frontal seta similar, situated close to anterior seta and resembling it in form and color; posterior-frontal seta small, thin; seta 7 straight, strong, brown, moderately long; seta 9 slightly shorter, light brown; seta 10 small, 329 thin, situated before eye; seta 11 situated medially to eye, small; seta 12 situated laterally behind eye, short, yellowish; seta 13 situated medially to 12, small, light; setae 14 and 15 about the same length, situated near 13

behind eye, both setae longer than intermediate anterior-margin seta;  
seta 15 slightly thicker and longer than 14, contrary to usual; seta 16 small,  
situated behind 15; seta 17 situated slightly anterior to fork outside flat area,  
330 short, yellowish. Secondary setae small, light, most of them situated in  
anterior part and near periocular ridge; several setae lateral to eye.

(329)

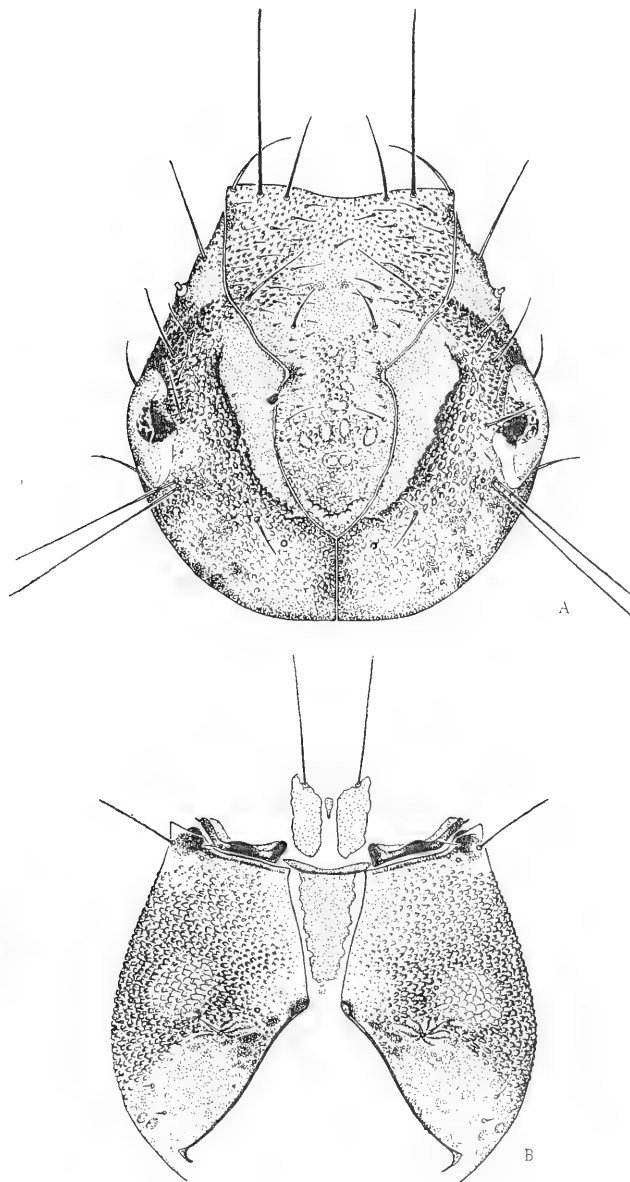


FIGURE 572. *Goera sajanensis* Mart. Head, dorsal (A) and ventral (B)

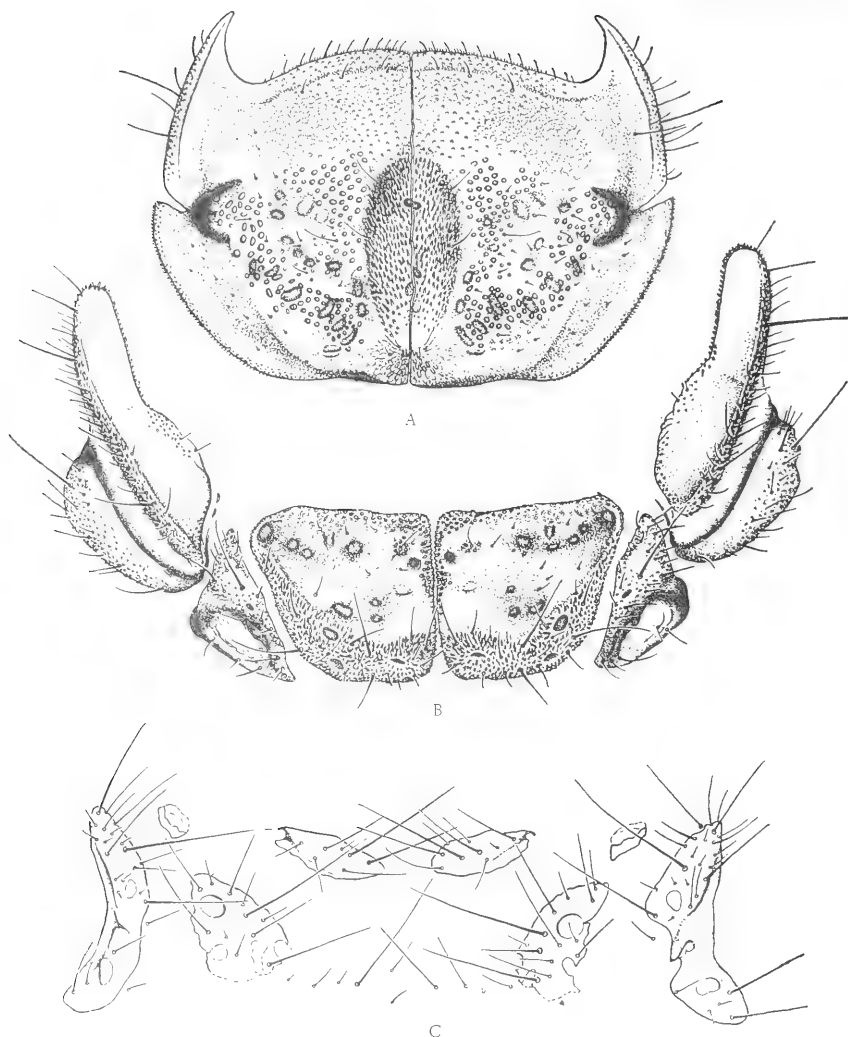


FIGURE 573. *Goera sajanensis* Mart. Pronotum (A), mesonotum and mesopleuron (B), metanotum and metapleuron (C)

Dorsal sclerite of labrum chestnut brown, posterior stripe black; seta 1 small, light; situated among hairs near anterior margin; seta 2 relatively large, light, situated on membrane near anterior margin of process; seta 4 also situated on process, slightly darker, grayish; setae 6 and 5 large, thick, dark brown or reddish brown; seta 3 in same row, lighter, brown, smaller.

Basal part of mandible black, blackish brown in some places, sometimes in its greater part; divided by a sharp ridge from spade-shaped, long, pinkish brown apical part; brush near dorsal margin long, with golden yellow chaetoids, those in middle of brush shorter than the others; lateral seta situated basally, dorsal seta brownish, moderately long; ventral light, small.

331 Sclerites and setae of cardo as in *G. pilosa*. Sclerites of submentum (Figure 572, B) also similar, in form of long, brownish rectangles, but more widely separated, with a small, intermediate, triangular sclerite at anterior margin. Stipes brownish, without dark, lateral spot, in contrast to *G. pilosa*; setae of stipes and submentum as in *G. pilosa*.

Number and arrangement of gills of *G. sajanaensis*

Segment	Dorsal	Pleural	Ventral
2	3	2	3
3	2 3		2 3
4	2 3		2 3
5	2 3		2 3
6	2 3		2 3
7	2 3		2 3

Pronotum (Figure 573, A) as in *G. pilosa* but darker, reddish brown, yellowish brown in anterior third and on median hump; surface of hump with long, conical tubercles, 2 pairs of dark brown dots, a 3rd pair paler.

Mesonotum (Figure 573, B) darker than in *G. pilosa*, dark chestnut brown; lateral tergite slightly larger, with more distinct transverse ridge; strongly sclerotized middle of median tergite smooth, in contrast to *G. pilosa*, without small tubercles except at anterior margin and along median suture. Mesopleuron, like tergites, chestnut brown, its form as

in *G. pilosa*. Tergites of metanotum darker and more distinct than in *G. pilosa*, chestnut brown; in contrast to *G. pilosa* and as in the genus *Silo*, there is a small 4th sclerite at anterior margin between median and lateral sclerites (Figure 573, C).

Prosternite: represented by a narrow, transverse, dark brown stripe; horn short, brownish.

Legs darker than in *G. pilosa*, brown, similar in size and form; fore coxa slightly less long, in contrast to *G. pilosa*; femora and tibiae slightly dark dorsally, tibiae dark dorsally in distal part; femora with indistinct, light dots. Chaetotaxy as in *G. pilosa* (Figure 574).

Lateral line from beginning of segment 3 to end of segment 8; hairs longer at posterior margins of segments 7-8 than elsewhere. Gills with 2 or 3 filaments, on segments 2-7.

Tergite of segment 9 indistinct, whitish, thin, with minute spinules at margin; setae pinkish brown, medioanal setae slightly darker, moderately long, anterior-angle setae longer but thinner; 2 setae between medioanal setae; 3-4 primary and secondary setae, including a moderately long, intermediate seta, situated between medioanal and anterior-angle setae.

332 Area "b" of anal legs pale, weakly sclerotized, mainly white on dorsal side, golden brown distally, light brown laterally and ventrally, with narrow, blackish brown, distal margin; median distal seta and neighboring seta black, thick, of equal length; lateral seta dark, thinner, much shorter; median subapical seta brownish, thin, moderately long, ventral seta similar but darker. Sclerite "c" yellow, with sparse, small spinules, with straight, black lateral margin; seta yellow, relatively large.

Claw light brown in basal half, covered with small spinules; apex reddish brown, with a yellow dorsal denticle. Seta 1 situated near base, short, light

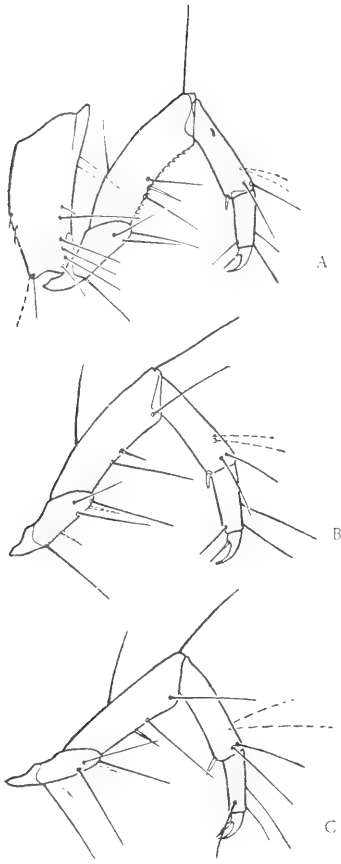


FIGURE 574. *Goera sajanensis* Mart.  
Right legs, posterior: foreleg (A), midleg (B), and hind leg (C)

yellow, thick; seta 3 situated subdorsally in distal part, brown, moderately long; seta 2 lighter, yellowish, shorter, situated dorsally at suture; seta 6 brown, thin, moderately long, situated laterally at end of suture; setae 7 and 8 situated basally, close together, short, thick, light, seta 7 situated ventrally; seta 8 more lateral and distal; seta 5 small, light, situated near 8; seta 4 small, strong, light, situated medial to seta 8.

Case as in *G. pilosa*.

Mode of life and habitats. Lakes and rivers, close to the bank, on firm bottom.

Distribution. USSR: Altai, Sayans, Eastern Siberia, north to the Upper Tunguzka. Not known outside USSR.

2. Genus *Silo* Curtis

Full-grown larva. Length 7–9 mm.

Posterior part of frontoclypeus, in contrast to *Goera*, narrow, short, much smaller than anterior part. Tubercles of head and thoracic sclerites larger, most of them flat. Lateral tergite of mesonotum larger than in *Goera* and divided by a transverse suture into 2 sclerites. Metanotum with 4 sclerites. Gills of pleural row absent. Case usually with 3 small stones laterally; these are rounded and less laterally projecting than in *Goera*.

Mode of life and habitats. Brooks with a bottom of stone or gravel, including mountain brooks with a rapid current.

Distribution. The European USSR, including the Crimea and Caucasus. In addition, Europe, Southeast Asia, North America.

Key to Species

Full-grown larva

- 1 (4). Head dark, brown or blackish; pronotum with 3 large, light, yellowish spots.
- 2 (3). Dorsal side of head with dark brown, large, flat tubercles; spots of pronotum yellowish, oblong, distinct, lateral spots larger than median spot . . . . . 1. *S. pallipes* Fabr. (p. 417)



- 3 (2). Dorsal side of head with larger, blackish, flattened tubercles; spots of pronotum of irregular form, lateral spots smaller than median spot; the Caucasus . . . . . 2. *S. proximus* Mart. (p. 425)
- 4 (1). Head lighter, yellowish gray or brownish; pronotum without large, light spots; European species, possibly occurring on western border of the USSR . . . . . 3. *S. nigricornis* Pict. (p. 428)

1. *Silo pallipes* Fabricius\*

McLachlan, 1865:82-83. — Thienemann, 1905b:522, Figures 35-37. — Siltala, 1905:15-19, Figure 4; 1907:533-565. — Lestage, 1921:849-856, Figures 305, b, h, 306, 307. — Hickin, 1942:123-126, Figures 1-9. — Nielsen, 1942:588, 607, 615. — Baker, 1963:171-174, Figure 3. — Brindle, 1964:197.

333 Full-grown larva. Length 7-8 mm. Head mainly dark, with a large, dark, reddish spot from one eye to the other, including flat median area (Figure 575). Frontoclypeus with small, light tubercles anteriorly in the middle, with larger, brownish tubercles laterally; median area short between anterior frontal seta and tentorial pit, forming a dark, transverse stripe with a dense cover of large, flattened, reddish brown tubercles, and raised ridgelike above flat area of anterior part and entire posterior part; posterior part of frontoclypeus reddish brown, with large, flat tubercles anteriorly, wedge-shaped pattern replaced by light dots. Area lateral to frontal suture dark, covered with large, flattened tubercles, and with smooth, light chestnut brown parts without tubercles; periorcular ridge narrow, comblike, dark, densely covered with small, rounded tubercles. Ventral surface light, reticulate, slightly grayish in middle, with a large, smooth area with vague whitish dots near occipital foramen. Gula long, triangular, brownish, with light, indistinct posterior part; pregula brown, divided from gula by a dark stripe, its anterior margin with a deep median indentation.

334 Intermediate anterior-margin seta dark brown, thick, moderately long; median anterior-margin seta shorter, dark, thick; lateral anterior-margin seta short, light, curved inward; anterior frontal seta small, brown, contrary to usual, much smaller than lateral anterior-margin seta; intermediate frontal seta similar, situated slightly anterior to tentorial pit; posterior frontal seta very small. Seta 7 strong, dark brown, moderately long, shorter and thinner than median anterior-margin seta; seta 9 short, thick, brown, anterior and lateral to ridge; seta 10 light, situated before eye; seta 11 medial to eye; both small, thin; seta 12 situated laterally behind eye, small, light; setae 14 and 15 situated one behind the other, close together, brown, thin, of equal length, shorter than median anterior-margin seta; seta 17 small, brown, thick basally, situated behind fork some distance from suture. Ventral seta 8 short, thin, brown; seta 18 small, light.

Dorsal sclerite of labrum dark chestnut brown; anterior margin with rounded anterior angle; surface with blunt tubercles, lateral tubercles larger; groove at posterior margin not darker than other surface. Posterior-angle sclerites of labrum thin, curved inward; membranous anterior and anterior lateral parts large, as in Goera, lobes similar. Light setae 1, 2, and 4 as in Goera; setae 5 and 6 large, dark; seta 6

\* The literature is not quoted completely as some data are not reliable (see Nielsen, 1942:588).

situated at level of median pit, seta 5 slightly anterior to pit; seta 3 situated near margin, smaller and lighter than other 2.

(333)

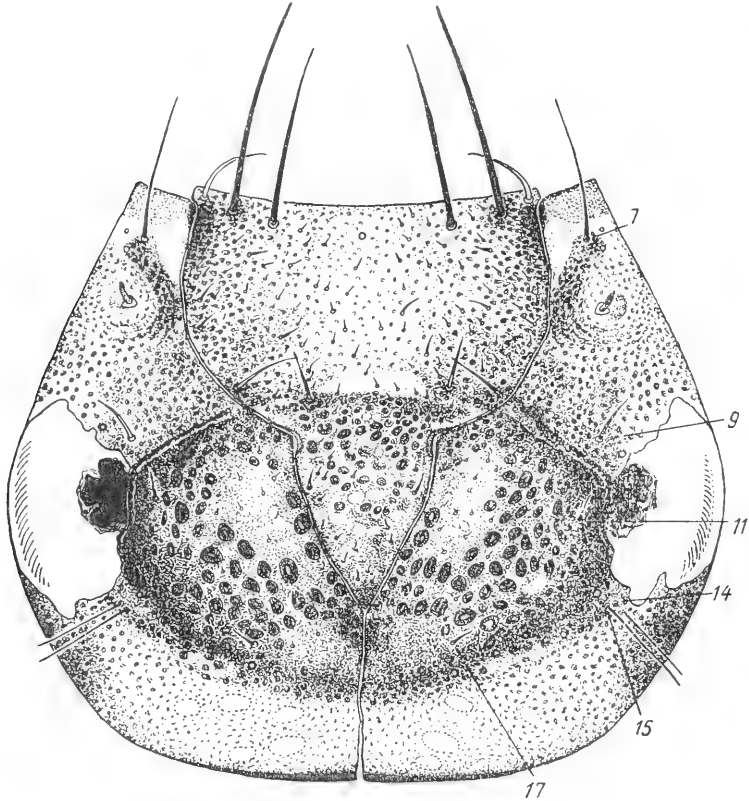


FIGURE 575. *Silo pallipes* Fabr. Head, dorsal

Mandibles black basally; lateral seta situated basally, dorsal seta small, brown, ventral seta smaller, light.

Submentum with 3 sclerites, paired sclerites oblong, light brown, slightly divergent posteriorly; single sclerite thin, yellowish, indistinct, situated before pregula; setae moderately long, chestnut brown, twice as long as sclerite. Stipes light yellow in middle, brown along median line, with wide, reddish brown margin, with a large, black spot laterally; lateral seta moderately long; median seta short, both dark brown.

Pronotum (Figure 576, A) mainly dark reddish brown; anterior margin brown; a narrow, yellow stripe behind margin; dark surface with large, oblong, yellow spots, median spot smaller, spots in each half larger; large, dark reddish brown, flat tubercles on dark background, those at anterior margin brownish, those on yellow spots light, some tubercles small; stripe near median suture smooth, with 2 pairs of light dots; large tubercles (high magnification) concave in middle and with a ridgelike outline

335 which is sometimes open, its outer side with minute spinules or club-shaped processes as in Figure 576, B; setae short to moderately long, thin, a few secondary setae present.

(334)

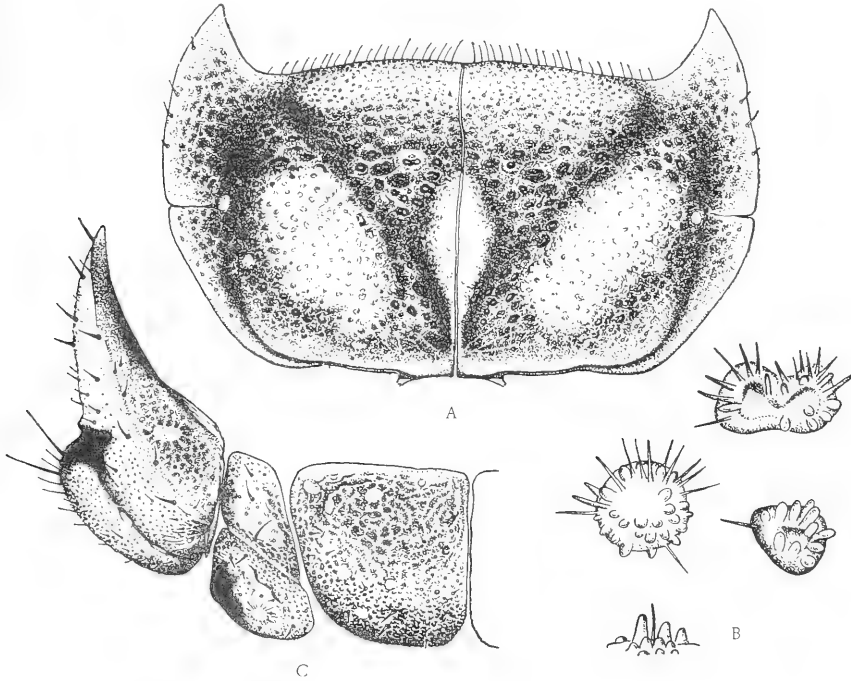


FIGURE 576. *Silo pallipes* Fabr.: Pronotum (A), spinules of light part (B), mesonotum and mesopleuron (C)

Tergites of mesonotum (Figure 576, C) chestnut brown; median tergites darker than lateral tergites; lateral tergites larger than in *Goera*, these and median tergites reaching anterior margin; anterior margin of lateral tergite straight. Median tergite with several flat tubercles; 3 large, light dots near anterior margin; 2 similar dots and a small dot posteriorly; small, dense, flat, blackish tubercles near posterior margin. Chaetotaxy sparse; a short, thick, spine-shaped, brownish seta situated lateral to small, light dot in posterior part; a similar seta between and lateral to 2 light dots in middle. Anterior part of lateral tergite with large, dark, flat tubercles at posterior and lateral margin; tubercles smaller, light at anterior margin and part of median margin; seta near suture short, dark brown, thick; 3-4 small, light setae anteriorly. Median and lateral tergites, as on pronotum, with numerous minute, light setae in distinct alveoles. Posterior lateral tergite anteriorly with a small, tuberculate, reddish brown stripe; most of its surface forms a strongly sclerotized area, smooth, light yellowish, with wide, black, posterior-angle margin, oblique reddish brown streaks, and a large white spot near slightly dark posterior margin; a small, seta anteriorly, lateral to oblique reddish streaks; several such setae posteriorly.

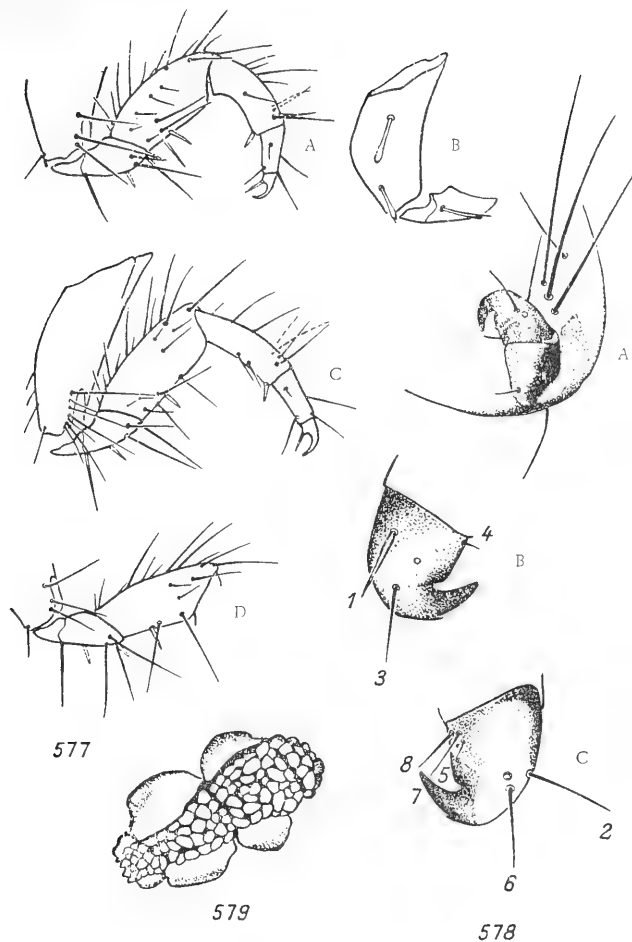
Tergites of metanotum brown, grayish in some places, distinct, smooth; setae gray or blackish gray, shorter than in *Goera*; anterior median tergite with 8–9 setae, and minute, light, setules, which are also present on posterior median and lateral tergites. Posterior median tergites larger than anterior tergites, irregularly triangular, with large, whitish gray spot posteriorly, densely covered with minute, dark tubercles; 10–11 setae, except minute setae. Lateral tergites grayish, their anterior part larger, covered with minute tubercles and with a large white dot; posterior part smooth, with a brownish dot; a smooth, brownish, longitudinal stripe, wider near transverse belt, and with 2 red spots laterally; anterior part with 15–16 setae, one of them moderately long, dark brown, and small setae; posterior part with a short, brown and a smaller, light seta.

Mesopleurite larger than median tergite; anterior angle of episternum pointed, keel-shaped, keel less sharp than in *Goera*, setae less numerous; surface before keel smooth, reddish brown, with a large, light, yellow dot, covered with small tubercles behind keel; epimeron grayish, with similar tubercles; 2 small, brown setae and several, smaller, light setae at lateral margin of anterior-angle process; 2 short, grayish brown setae near distal margin of epimeron; other setae few, small, light.

Horn short, pointed, yellowish.

Legs (Figure 577) brown, without punctate pattern; articulation between coxa and trochanter with black margin on both segments; a similar margin on tibia at articulation with femur; small, flat tubercles dorsally and subapically on fore and mid-coxae; few such tubercles on hind coxae dorsally and subdorsally, together with small spinules. Ratio of length of legs 80:100:97. Setae relatively short.

Fore coxa massive, much shorter than mid- and hind coxae; primary basodorsal seta moderately long, black; apical dorsal seta similar; 2 similar secondary setae, further distally, a 3rd seta lighter and shorter; primary anterior setae, as in *Goera* and *Apatania*, light, branched at apex, apical seta shorter than basal; secondary coxal setae situated ventrally and subventrally, several dorsally. Anterior primary seta of trochanter short, branched at apex, posterior seta strong, short, dark brown; apical and subapical of 3 anterior ventral setae form light spines, basoventral spine light, grayish, moderately long; posterior ventral setae, one apical and one subapical, slightly larger. Femur slightly convex dorsally, ventral margin almost straight; primary dorsal setae, one basal and one dorsal, of equal size, moderately long; 2 secondary, dorsal setae similar, other 8–9 smaller; anterior primary seta of fore femur dark brown, moderately long, posterior primary seta the same, situated subventrally in basal part; anterior surface with 2–3 short, secondary setae, posterior surface with 7–8 secondary setae of different size; primary ventral setae forming 2 short, light spines in basal part, apical spine shorter than basal; posterior primary seta situated between spines. Tibia short, with small tubercles dorsally; setae as in Figure 577, A; 2 brown, moderately long, secondary setae anteriorly. Tarsus narrower distally, slightly dark, with light yellowish, moderately long, primary setae, and further basally, 2 small secondary setae dorsally; anterior and posterior surface with a short, dark, secondary seta; primary distoventral setae thin, light, short. Claw strongly curved, with light basal seta.



FIGURES 577-579. *Silo pallipes* Fabr.:

577 - right legs: foreleg, posterior (A), coxa and trochanter anterior (B), midleg, posterior (C), hind trochanter and femur, posterior (D); 578 - right anal leg, lateral (A); claw, lateral (B) and inner side (C); 579 - larval case (579 - after Nielsen).

Mid- and hind coxa much longer than femur, with shallow, distodorsal indentation; anterior distodorsal seta situated at end of indentation; setae absent at anterior margin of indentation; posterior distodorsal seta slightly 337 thinner and longer; 6 secondary setae, including 2 moderately long, and a small, thin seta further distally at margin; primary anterior setae short, strong, apical seta dark brown, seta situated in middle yellowish; distal half ventrally and subventrally with 9-10 short, strong, light brown setae and 2-3 small, light setae. Anterior seta of trochanter yellowish, divided, shorter than on forelegs, situated submarginally; posterior seta situated subapically, short, dark brown; apical and subapical posterior ventral setae

brownish gray, moderately long, basoventral seta of equal length, lighter, grayish; anterior distoventral seta forming a light spine, 2nd distoventral seta the same, situated more basally, closer to suture.

Distodorsal seta of femur short, strong, black; 12–13 secondary, dorsal setae along femur, 3–4 of them similar to basodorsal seta, others smaller, including 4–5 small, light setae; anterior-primary seta of femur situated subapically, similar to distodorsal seta, black, moderately long; posterior seta slightly shorter, brownish black, dark, strong, situated subventrally in middle of segment; distoventral seta in form of short, yellow spine in middle of femur; primary basoventral seta the same, situated in basal part; ventral surface with minute, blunt tubercles instead of usual light spinules; anterior surface with 5 short, grayish, secondary setae, and 2–3 small, light setae; posterior surface with 4 short, dark, strong, secondary setae, and 4 small, thin, light setae.

Mid-tibia longer and narrower than fore tibia, not wider distally; dorsal of 2 primary posterior setae thin, transparent, short; subdorsal blackish brown, moderately long; the relationship is reversed on fore tibia – dorsal seta strong, dark, moderately long, subdorsal seta smaller, yellowish; primary distoventral setae in form of 2 spines, a light, posterior and a slightly brownish, anterior spine; basal part dorsally with 2 strong, blackish, secondary setae, which are longer than primary setae, and 3–4 small, light setae; anterior and posterior surface with 2 secondary setae. Tarsus longer and narrower than on forelegs, less narrow distally, slightly dark at end; primary dorsal setae light grayish, strong, moderately long, situated one behind the other; distoventral setae smaller, thin, posterior seta larger than anterior; dorsal surface with 2–3 small, light, secondary setae, anterior surface with 2 brown setae, posterior surface with a moderately long, blackish brown seta at base.

Basodorsal seta of hind coxa black, moderately long; anterior distodorsal seta thinner, slightly shorter, posterior distodorsal seta strong, moderately long; 2–3 thick short secondary setae further distally at margin; 5–6 large, moderately long, secondary setae and a basal group of 10–11 small setae dorsally and subdorsally; primary anterior setae short, strong; 10 short, secondary setae and 6–7 small, light setae ventrally and subventrally; both distoventral setae short, thin, anterior seta brown, posterior darker. Anterior seta of trochanter short, yellow; posterior setae, a surface seta and 2 distoventral setae, blackish, long; basoventral seta slightly shorter and thinner, yellowish; both anterior ventral setae in form of short, light spines. Femur much shorter than coxa, wider distally; primary dorsal setae, as on mid-femur, strong, moderately long, apical seta blackish, basal seta brown; 11–12 secondary, dorsal setae shorter, including 4–5 small, light setae; anterior primary seta situated subapically, moderately long, black; posterior primary seta long, situated subventrally at distal margin; distoventral seta similar, situated in middle of femur; basoventral seta situated slightly more basally, in form of a large, pointed, light spine; tubercles on ventral surface smaller than on mid-femur; secondary surface setae short, thin, brown, 2 on anterior and 3 on posterior surface. Tibia slightly more massive than on midlegs, its ventral surface smooth, without spinules; primary setae larger than on midlegs, 2 moderately long, black, secondary, dorsal setae and 2 short, light setae; anterior surface with a

moderately long, secondary seta; posterior surface with a similar seta and a small, thin seta. Tarsus narrower distally, slightly dark; primary, dorsal subapical seta longer than on midlegs, blackish; distal seta short, light; dorsal surface with 2 small, thin, transparent, secondary setae; posterior surface with a large, moderately long, blackish brown, secondary seta, longer than primary setae, at base; anterior surface with a short, thin, brown seta; primary distoventral setae of equal length. Claw brown, strongly curved; seta light.

339) Number and arrangement of gills of larva of *S. pallipes* (after Siltala)

Segment	Dorsal	Ventral
2	1-2	1-2
3	2-4	2-5 3-4
4	2-3 3-4	2-3 2-3
5	3 3-4	2-3 3
6	3 3-5	2-3 2-3
7	3-4 3-4	2-3 3-4

Number and arrangement of gills of pupa of *S. pallipes* (after Siltala)

Segment	Dorsal	Ventral
2	1	1
3	3-4	3 3-4
4	1-3	2-3 2-3
5		2-3 2-3
6		2-3 2-3
7		2-3

Dorsal process of abdominal segment 1 low; lateral processes more ventral than usual. Lateral line from beginning of segment 4 to beginning of segment 8. Gills dorsally and ventrally on segments 2-7, with 1-2 filaments on segment 2, 2-5 filaments on other segments; presegmental and post-segmental, except on segment 2 and dorsal side of segment 3, which lack presegmental gills.

338 Tergite of segment 9 absent or weakly sclerotized, whitish; anterior-angle and medioanal setae moderately long; 6 setae between the medioanal setae, including a moderately long, 2 short, and 3 small, thin, light setae; 6 setae between medioanal and anterior-angle setae, including 3 small, thin, light, and 3 larger setae, among them a moderately long seta, almost as long as anterior-angle seta; 4-5 small setae on surface near posterior margin.

Area "b" of anal legs whitish dorsally, not sclerotized; lateral part with a thin, light brown sclerite; ventral part brown, with a narrow, reddish brown, distal stripe; in contrast to *Goera* and *Limnophilidae*, median distal seta lighter and thinner than others, but slightly longer, brown; neighboring and lateral seta black, thick, long, latter slightly smaller than former; subapical seta at median margin thin, grayish, moderately long; ventral seta dark brown, firm, moderately long, situated lateral to base of sclerite "c." Sclerite "c" with wide, dark reddish brown, lateral margin, its surface with minute, pointed tubercles, area near margin brown, brownish near ventral margin; seta thin, short, dark brown (Figure 578, A).

Claw dark reddish brown basally, chestnut brown apically, with strongly curved, reddish brown apex; seta 1 thick, brown, relatively large, situated on median side of basal part; seta 3 situated in distal part, thin, brown; seta 2 dorsal, light, moderately long; seta 6 situated near distal end of suture; ventral seta 8 situated laterally at margin; seta 7 situated ventrally on 339 membrane, both setae thick, light, reaching apex of claw; seta 5 small, light, close to seta 8 and near suture margin; seta 4 very thin, small, light, situated medial to seta 7 (Figure 578, B, C).

Case (Figure 579) 8–10 mm long, as in *Goera*, forming a short, wide tube made of medium-sized sand grains with larger grains laterally; lateral sand grains usually smaller than in *Goera*, although there are also cases with small stones on sides; anterior opening truncate, posterior opening with a membrane with a round hole.

(338)

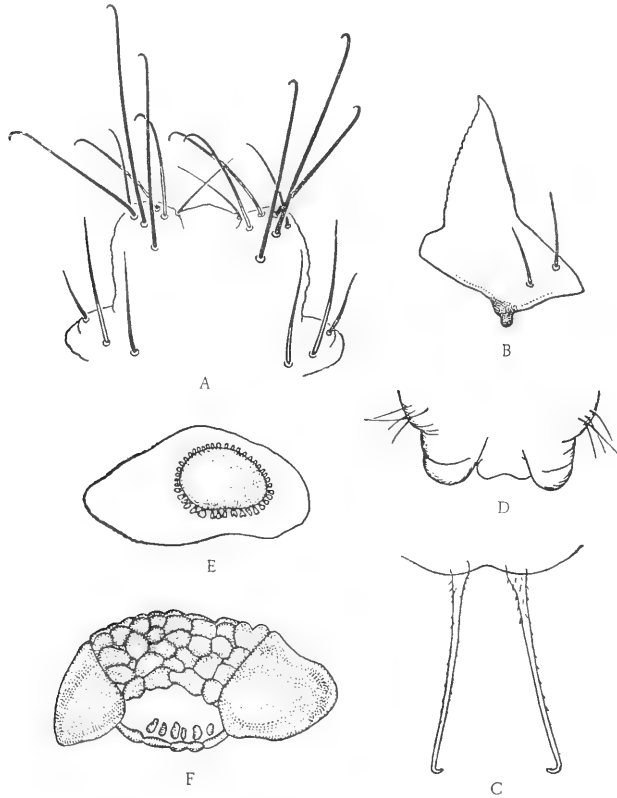


FIGURE 580. *Silo pallipes* Fabr. Pupa: anteclypeus and labrum (A), left mandible, ventral (B), anal rods, dorsal (C), sheath of ventral appendages and penis (D), inner view of small stone closing anterior opening of case (E), case, posterior (F) (D – after Siltala, E, F – after Thienemann)

**Pupa.** Length 5.7–7.2 mm. Antennae of male pupae reaching end of segment 8 or abdominal segment 9, those of female pupae segment 7–8; antennal



segments 1–2 larger than following segments, each with several setules. Of 3 brown setae on anteclypeus, intermediate seta longer than others, lateral seta shorter (Figure 580, A); 2–3 additional setules sometimes present (Nielsen, 1942:615); 5 other setae situated in anterior angle, thick, hooked at end, including 3 moderately long, black, lateral setae and 2 brown, much shorter, median setae. Median blade of mandibles almost straight, with minute, light denticles (Figure 580, B); lateral setae situated basally, brown, ventral seta shorter than dorsal.

Sheaths of fore wings reaching segment 6 or middle of segment 7, sheaths of hind wings shorter.

Holding processes of abdominal segment 1 blackish brown, widely separated. Presegmental plates brown, with large denticles, postsegmental plates of segment 5 with small denticles; number of denticles: III:1–4; IV:1–4; V:2–4+10–18; VI:2–4; VII:2–4. Lateral line on segments 5–8 is a row of setae with a gap in middle on ventral side of segment 8.

Anal rods (Figure 580, C) very thin, slightly wider basally, with hook-shaped, inward-curved apex. Sheath of genital appendages of male pupae broadly rounded; penis sheath concave at apex, shorter (Figure 580, D).

Case 7.5–9.0 mm long, with 3 small stones on each side; anterior end covered by a small stone attached to case by a sievelike, membranous band with numerous small openings (Figure 580, E); posterior end closed by a dark membrane with 4–9 irregular holes at ventral margin (Figure 580, F). Case attached to lower side of a stone by disks at both ends.

Mode of life and habitats. On stony bottom, in brooks and rivulets with a more or less rapid current; often in springs and spring-fed brooks.

Distribution. Central, western, and northern parts of the European USSR. In addition, Europe.

## 340 2. *Silo proximus* Martynov

Martynov, 1926:40.

**Full-grown larva.** Length 7.0–7.5 mm. Head (Figure 581) mainly dark reddish brown, with large, dorsal, median flat area, as in *G. sajanensis*. Frontoclypeus brown anteriorly, its entire surface covered with flat tubercles which may resemble a mushroom with a short light stalk and a dark disk concave in middle and with wide margin; sclerite surface raised into a narrow, dark, tuberculate, transverse keel, which divides anterior from middle part; middle with large, flat tubercles; posterior part relatively smooth, with minute, dot-shaped tubercles, its anterior and lateral borders formed by a sharp, blackish brown, keel-shaped fold along sutures; a relatively smooth, punctate area bordered by 3–4 blackish brown folds which merge laterally with rows of large, flat tubercles lateral to frontal sutures. Ventral surface yellowish, with reticulate striation in its greater part, middle with a light brown spot, median submarginal area also slightly dark; a large, smooth area with large, pale dots near occipital foramen. Gula triangular, yellowish brown, with indistinct posterior margin; pregula brown, divided by a reddish stripe from gula, its anterior margin with a shallow, median indentation. Chaetotaxy as in *S. pallipes*; median and intermediate anterior-margin

setae reddish brown, thick, latter moderately long, almost twice as long as former; setae 14 and 15 shorter and thinner than in *S. pallipes*.

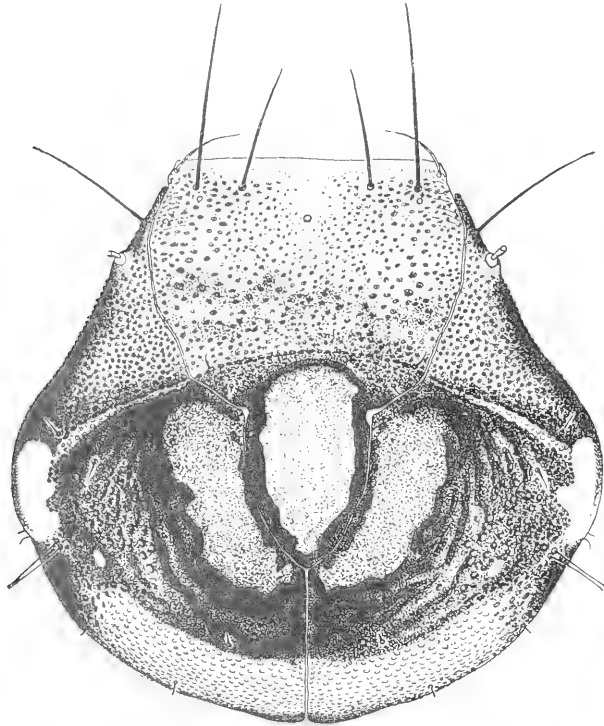


FIGURE 581. *Silo proximus* Mart. Head, dorsal

341 Labrum lighter than head; dorsal sclerite light brownish, with a deep, median indentation at anterior margin; membranous anterior-angle lobes large; groove at posterior margin with a small, dark reddish brown stripe. Setae 1, 2, and 4 as in *S. pallipes*; setae 5 and 6 reddish brown, situated before median pit, closer to anterior margin; seta 3 yellowish, situated near margin at anterior angle. Mandibles as in *S. pallipes*. Longitudinal, paired sclerites of submentum light brown, setae moderately long, brown; single posterior sclerite thin, indistinct, yellowish white. Dark lateral spot of stipes dark reddish brown, smaller than in *S. pallipes*.

Pronotum (Figure 582, A) mainly dark reddish brown, darker than in *S. pallipes*, blackish laterally; yellow spots less numerous; median spot in form of a longitudinal stripe; wider anteriorly, with 2 pairs of reddish brown dots at suture; lateral spots in posterior part smaller than median spot; anterior-angle processes as in *S. pallipes*; anterior margin extending to end of process, brown; yellow stripe behind margin absent; anterior part rough between processes, with fused tubercles, each with a

minute setule on a light alveole;\* a black ridge in middle at base of  
 342 chestnut brown dots around yellow lateral spots, which is a specific character of  
*S. proximus*; yellow spots with small light tubercles. Chaetotaxy sparse;  
 setae small, thin, as in *S. pallipes*.

(341)

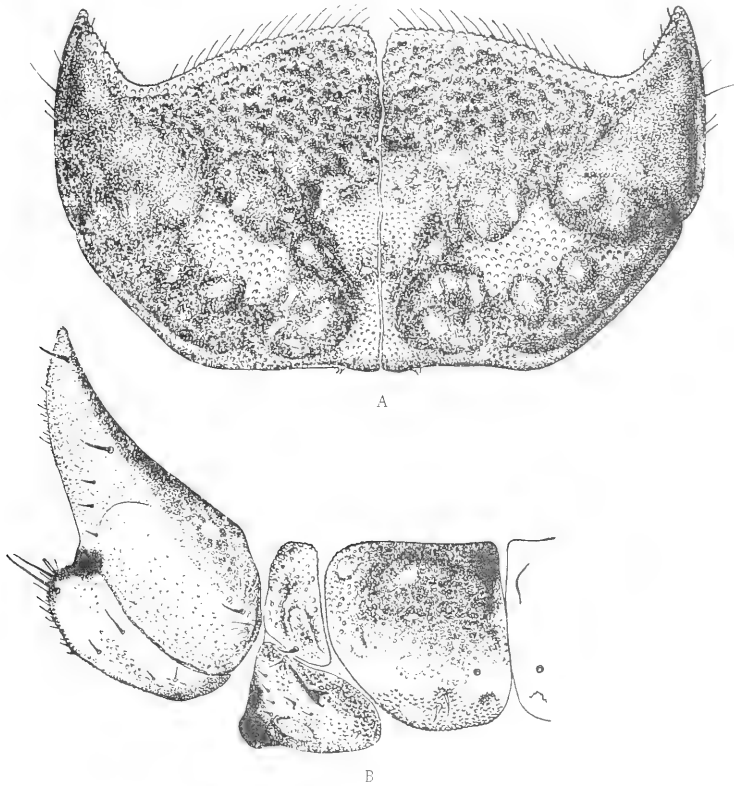


FIGURE 582. *Silo proximus* Mart. Pronotum (A), mesonotum and mesopleuron (B)

Tergites of mesonotum (Figure 582, B) different from those of *S. pallipes*: median tergite with convex, lateral margin, lateral tergite with slightly concave, median margin; anterior half of median tergite mainly dark brown, with large tubercle bordered anteriorly by a black, curved ridge; lateral margin and wide stripe behind dark area yellowish, stripe with 3 large, light dots surrounded by flat tubercles; similar tubercles near anterior margin; posterior submarginal area with small, dark, flat tubercles with a large, chestnut brown dot; posterior part with 4 small, spine-shaped

\* This and other areas show the microstructure of dots which is present also on other thoracic and cephalic sclerites of this species. The dots are not depressions but minute tubercles on a smooth surface. A similar, but less distinct picture is present in *S. pallipes*.

setae. Anterior lateral tergite mainly chestnut brown, lighter laterally and at anterior margin, with flat tubercles, its surface with a small, dark, spine-shaped seta, and 2–3 thin, small setae. Posterior lateral tergite with broad,

Number and arrangement of gills of *S. proximus*

Segment	Dorsal	Ventral
2	—	—
3	1 3	2 3
4	1 3	2 3
5	2 4	2 3
6	3 3	3 3
7	3 3	3 3

black margin at posterior angle, its surface yellowish, covered with small, light tubercles and oblique dark reddish brown streaks; anterior and median margin with dense, dark tubercles. Tergites of metanotum grayish brown, anterior-margin tergites larger than in *S. pallipes*, situated close together in middle, tapering laterally.

Horn short, light brown.

Legs yellowish brown, without punctuation; chaetotaxy as in *S. pallipes*.

Dorsal and lateral processes of abdominal segment 1 as in *S. pallipes*; lateral line from end of segment 3 to end of segment 7. Gills with 1–4 filaments, on segments 3–7; ventral gills longer than dorsal gills.

Segment 9 without tergite; setae at posterior margin as in *S. pallipes*; medioanal and anterior-angle setae thin, blackish, moderately long; 3 setae between medioanal setae, one of them small; 4 setae between medioanal and anterior-angle setae, intermediate seta moderately long; 4 setae on surface, 2 setae lateral to anterior-angle seta.

Area "b" of anal legs not sclerotized dorsally; ventral and lateral sides with a narrow, pale brownish sclerite at distal margin; median distal seta blackish brown, as in *S. pallipes*, lighter and thinner than adjacent black, thick, long seta; lateral seta black, shorter, and thinner; subapical median seta thin, moderately long; 2 small, light setae on surface; ventral seta short, dark brown, situated lateral to base of sclerite "c." Sclerite "c" whitish yellow, light brownish at distal and lateral margin; lateral margin dark reddish brown, with small, pointed tubercles.

Claw brown, reddish brown apically, with a dorsal denticle; setae as in *S. pallipes*.

Case 8–9 mm long, rarely 10.0–11.1 mm, in form of a wide tube made of small sand grains, coarser grains laterally, usually 2–3 on each side; ventral surface smooth, anterior opening truncate, posterior end covered with a membrane with a single dorsal elliptical hole.

Mode of life and habitats. Mountain brooks and rivulets with stony bottom.

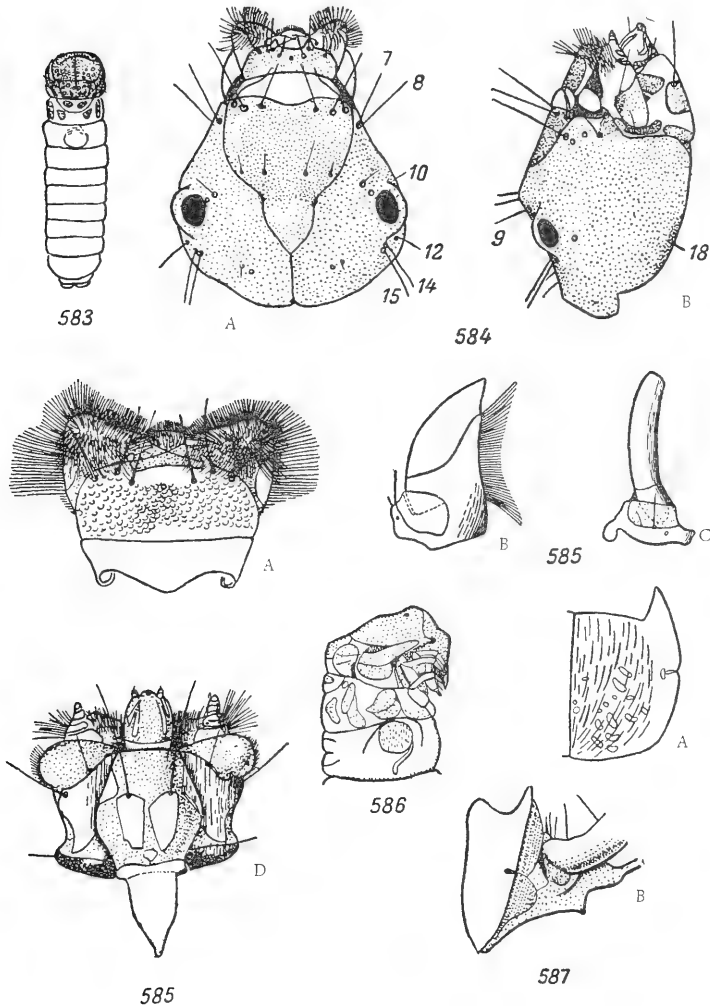
Distribution. USSR: the Caucasus. In addition, Iran.

### 3. *Silo nigricornis* Pictet\*

Nielsen, 1942:588–615, Figures 160–175. — Baker, 1963:171–174, Figures 1, 4. — Brindle, 1964:197.

\* Described after Nielsen (1942:588–615); we have not seen the larva. Data in the literature are not reliable (see Nielsen, loc cit).

**Full-grown larva.** Length 5.7–10.0 mm. Head, thorax, and abdominal segments 1–8 more or less uniformly wide, in contrast to *Apataniinae* (Figure 583); ventral inclination of head especially marked when anterior 3/4 part of larva is retracted in case (Figure 586). Head yellowish gray, with a blackish tone; frontoclypeus with dark anterior margin; tentorial pits with dark spot. Dorsal surface with large, dense tubercles.



FIGURES 583–587. *Silo nigricornis* Pict. (after Nielsen):

583 – larva, dorsal; 584 – head, dorsal (A) and lateral (B); 585 – labrum (A), left mandible, dorsal (B) and lateral (C), maxillolabium and gula (D); 586 – head, thorax and abdominal segment 1, lateral; 587 – pronotum (A); same, lateral, pleuron, base of coxa, and base of horn (B).

Primary setae of head partly reduced (Figure 584). Anterior-margin setae of frontoclypeus normally developed, intermediate seta longer than others, lateral seta light, curved inward; all 3 frontal setae small; anterior seta situated close to intermediate seta; posterior seta smaller than others; seta 7 normal, moderately long, the largest seta on the head; seta 8 short; setae 9, 12, and 18 small, thin; setae 14 and 15 situated close together, short, slightly smaller than seta 7; setae 10, 11, and 16 small, setuliform.

344 Secondary setae of head, small, light, almost procumbent.

Number and arrangement of gills of *S. nigricornis*

Segment	2nd stage		5th stage	
	dorsal	ventral	dorsal	ventral
2	0-1		2-3	0-2 2-3
3	1	1	2-3 4	3 4
4	1	1	1-3 4	2-3 4
5	1	1	1-3 4	2-3 4
6	1	1 (0)	1-3 4	2-3 3-4
7	1 (0)	1 (0)	1-3 4	2-3 3-4

Labrum as in Figure 585, A; dorsal sclerite yellowish gray, sometimes darker, median indentation slightly convex, not concave as in *Apatania*; anterior margin broadly membranous, forming 2 large, lateral lobes; hair-like spinules of median lobe small, situated on a tubercle in small, straight tufts; hairs of lateral lobes different in size and form, some of them thin, moderately long; ventral surface with feathered hairs.

Mandibles long, almost black basally, light elsewhere; a groove divides mandible into 2 parts (Figure 585, B, C); mandibles flat and slightly curved (more strongly curved than in *Apatania*); ventral blade reduced, visible ventrally as an edge at lateral margin; dorsal margin with large brush; chaetoids longer at margin than in middle; lateral dorsal seta moderately long; ventral seta small, thin.

Sclerites of maxillolabium (Figure 585, D) mainly yellowish brown. Sclerites of cardo markedly curved, with black margin; lateral margin with small setae. Setae of submentum short, situated at anterior margin of median sclerite; lateral sclerites triangular, darker than median sclerites. Stipes relatively wide; a large, strongly convex membranous lateral area further distally; basal lateral seta short, apical seta thinner and smaller. Distal seta of palpifer and median seta strong, both situated on membrane. Maxillary palp short, 1st segment much larger than following segments, sclerotized only ventrally and laterally; sclerite of 2nd segment also open;

sclerite of 3rd segment long dorsally, with a narrow membranous stripe ventrally. Mentum dark brown, in form of a narrow, curved plate like a horseshoe; ventral rods straight, with a small, light seta. Palpiger with a longitudinal branch parallel to rod. Labial palps small.

Pronotum (Figure 587, A) wide, yellowish brown, with sharp lateral edge and wide anterior-angle process; narrow, lateral stripe curved ventrally and with an indentation in middle for articulation with pleuron (Figure 587, B); surface with large tubercles. Setae short, dark, and light; primary anterior-angle seta larger than others.

Median sclerites of mesonotum (Figure 586) brownish, with darkly outlined dots, which do not reach posterior margin; sclerites form an angular prominence, in about middle of segment, which divides anterior part of thorax from posterior part (Figure 586). A narrow, membranous suture between anterior and posterior lateral sclerites; sclerites covered with large and small tubercles. Primary medioanal seta situated on angular prominence, larger than others; anterior-angle seta situated on lateral sclerite, near several secondary setae; most secondary surface setae small, light, procumbent.

Median tergites of metanotum brown, blackish; lateral tergites light, yellowish, distinct, a small, intermediate sclerite between anterior median and lateral sclerites; lateral sclerite with transverse groove between anterior and posterior part; tubercles smaller and sparser than on mesonotum; primary setae larger, secondary setae less numerous.

345 Propleuron with short, black, pleural suture; epimeron lobed, with dark, dorsal margin; episternum small, light brown; trochantin relatively large, dark dorsally, with a small seta. Mesopleuron, forming a large, pointed process, which reaches anterior margin of pronotum; pleural suture black, narrow; epimeron rounded posteriorly. Metapleuron much smaller (Figure 586).

Ventral side of pro- and mesothorax short, that of metathorax normal; ventral horn of prothorax large, situated on a membranous tubercle. Small, lateral sternites with a dark stripe behind horn; mesosternites slightly larger, situated near posterior margin of segment; metasternite single.

Legs (Figure 588) yellowish brown; ratio of length of legs in 5th stage, 87:100:96, in 2nd stage, 94:100:101. Coxae without dorsal groove; distal dorsal depression shallow; tubercles flattened, with small apical spinules (Figure 588, B). Primary anterior setae of fore coxa spine-shaped, distal seta branched at apex (Figure 588, C). Setae of hind leg longer than on the other legs.

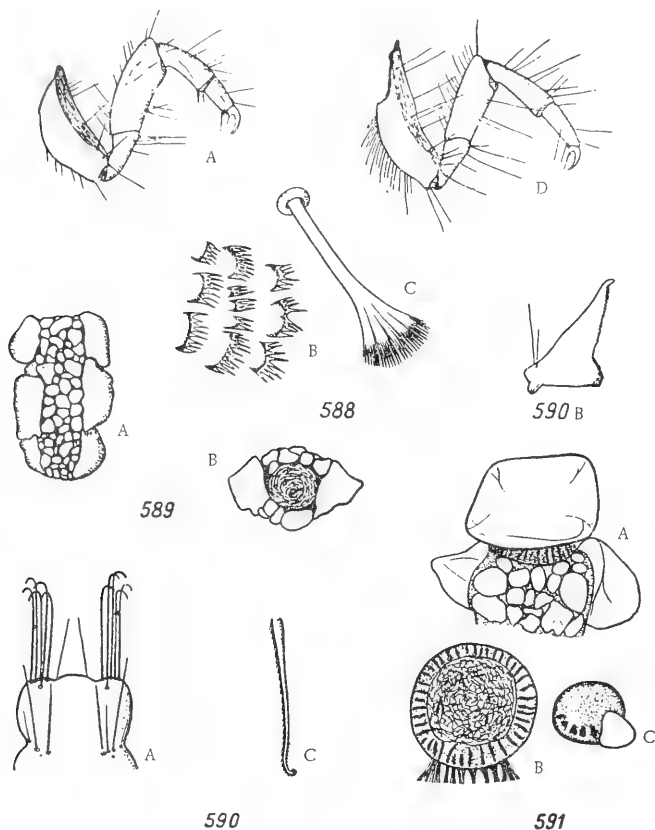
346 Dorsal process of abdominal segment 1 well developed; lateral processes wide, flat, with lobed process directed upward; ventral surface convex, with a small sclerite resembling metasternite. Ventral elliptical areas on segments 3-8; segment 8 overlapping segment 9 dorsally. Tergite of segment 9 absent; primary and secondary setae at posterior margin of segment. Gills on segments 2-7.

Area "b" of anal legs not sclerotized dorsally; median distal seta short, neighboring seta the largest on anal legs. Sclerite "b" with small dark seta.

Claw with a small dorsal denticle. Setae 1 and 3 situated close to dorsal margin; ventral setae 7 and 8 normally developed; seta 4 situated more basally.

Case (Figure 589) 7.9–10.4 mm long, cylindrical, covered with sand grains and small stones; stones in lateral walls much larger than the others, so that case appears broad with a slightly flattened ventral surface made of fine sand grains; anterior opening exposed, posterior opening with a membrane with a small, round, central hole.

(345)



FIGURES 588–591. *Silo nigricornis* Pict. (after Nielsen):

588 – legs, posterior: foreleg (A), spinules of fore coxa (B), anterior-distal seta of fore coxa (C), hind leg (D); 589 – larval case, dorsal (A), posterior (B). Pupa: 590 – anteclypeus and labrum (A), right mandible, ventral (B), right anal rod, ventral (C); 591 – pupal case (details): anterior and ventral (A), anterior membrane and covering stone (B), posterior membrane (C).

**Pupa.** Length 7–8 mm. Dorsal side of head with small, pale, transverse tubercles anteriorly. Antennae of male pupae reaching end of body, to segment 8, in female pupae; wing sheaths reaching abdominal segment 6.

Anteclypeus laterally with 2 moderately long, and one short setae. Labrum (Figure 590, A) of characteristic form, with a short seta lateral to median process anteriorly; 5 other setae also at anterior margin, moderately long, hooked at end, one seta smaller and some distance from margin.



Mandibles (Figure 590, B) resembling those of Limnophilinae, but with slightly shorter basal part; median blade serrated, with small, basal spinules; ventral of 2 lateral setae smaller than dorsal. Fore and mid-tarsi with natatorial setae, fore tarsi dorsally on segments 1-4 and ventrally on segments 1-3; mid-tarsi dorsally and ventrally on segments 1-4.

Number and arrangements of gills of pupa of *S. nigricornis*

Segment	Dorsal	Ventral
2	2-3	2
3	1-2 4	3 4
4	2	2 4
5		2 4
6		2-3 4
7		1-2

Abdominal segment 1 with strongly sclerotized tubercles, covered with spinules at posterior margin; plates of holding apparatus on segments 3-7 with hooks as follows: III:2; IV:2-3; V:2-3 + 15-17; VI:2-3; VII:2-3.

Gills on segments 2-7, gills in dorsal row fewer than in larva.

Anal rods (Figure 590, C) yellow, brown basally, thin, long, curved at end, with minute spinules, without setae.

Genital appendages of male pupae very short, with rounded apex; penis sheath small.

Case attached to a stone at anterior end by numerous ligaments with widened end; anterior opening with a membrane and covered with a small stone, membrane with small, slitlike, radial holes between stone and ventral margin of case (Figure 591, B); posterior membrane with several holes near ventral margin (Figure 591, C).

Mode of life and habitats. Phytophagous, feeding on algae, living on stones or on plants among stones; in brooks and rivulets with a current of 40-70 cm/sec; avoids rapid currents. Pupa emerges from case by gnawing through anterior membrane and removing small stone; empty case remains attached to stone for a long time.

Distribution. Not recorded in the USSR, but possibly occurs at western border. In addition, Europe.

### 3. Genus *Lithax* McLachlan

**Full-grown larva.** Length 8-12 mm. Body slightly tapering posteriorly. Coloration mainly dark; dorsal side of head black or brownish black in middle; posterior part of frontoclypeus much smaller than anterior part, as in *Silo*.

Pronotum largely blackish. Mesonotum with 3 pairs of sclerites, metanotum with 4 pairs. Case made of sand grains, slightly curved, sometimes almost straight, slightly narrower posteriorly, flattened ventrally, with large sand grains laterally, as in *Apatania*.

347 Mode of life and habitats. Rapid mountain brooks and rivulets.

Distribution. The European USSR, including the Caucasus. In addition, Europe.

Key to Species

Full-grown larva

- 1 (2). Gills on abdominal segments 2-7; segment 2 without ventral pre-segmental gills; western part of European USSR . . . . . 1. *L. obscurus* Hag. (p. 434)
- 2 (1). Gills on abdominal segments 2-8; segment 2 with ventral pre-segmental gills; Caucasus . . . . . 2. *L. incanus* Hag. (p. 435)

1. *Lithax obscurus* Hagen

Ulmer, 1901:309-311, Figures 1-12; 1903:84; 1909:272, 316. - Lestage, 1921:845-848, Figure 303.

**Full-grown larva.** Length 7-8 mm (Figure 592). Dorsal side of head mainly blackish, lighter near occipital foramen. Labrum, with projecting, broadly membranous, anterior margin; setae 3, 4, 5, and 6 short, situated on sclerotized part of sclerite, setae 3 and 4 at anterior margin, 5 and 6 in middle of sclerite. Mandibles without teeth, with a median brush forming a row of small chaetoids, and situated at dorsal margin.

Thoracic tergites (Figure 593) blackish brown, brown, or reddish brown in some places.

Legs brown, large setae black; claws strongly curved; basal seta strong, situated on a tubercle, reaching apex of claw (Figure 594).

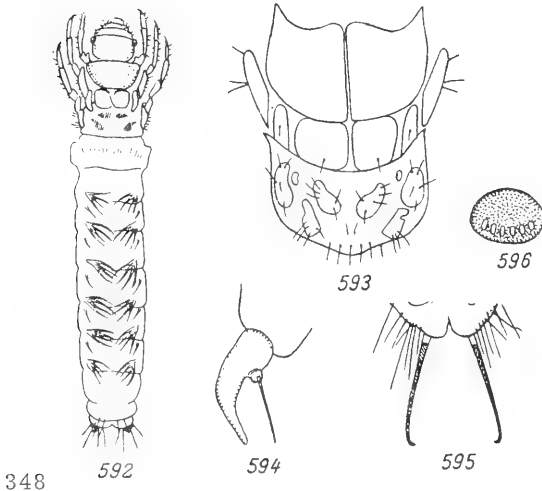
Abdomen not wider than thorax, slightly tapering posteriorly. Lateral line little differentiated, formed by fine hairs, from segments 3-7. Gills short, filiform, with 2-4 filaments.

Claw of anal legs strongly curved, with a dorsal denticle.

Case to 9 mm long, made of sand grains, slightly curved, with flattened ventral side, with large sand grains and small stones laterally, as in *Apatania*, so that case appears wider, but less wide than in *Silo*; posterior end closed by a membrane with a round central hole.

**Pupa.** Length 6-7 mm.

Antennae filiform, reaching end of body, proximal segment oblong, larger than others, with a tuft of setules. Labrum with rounded anterior angle. Mandibles small with blunt apex; median margin serrated.



348

FIGURES 592-596. *Lithax obscurus* Hag.:

592 - larva, dorsal; 593 - thoracic tergites; 594 - end of tarsus and claw of midleg. Pupa: 595 - anal rods of male pupa; 596 - posterior membrane of case (592 - after Lestage, others after Ulmer).

Wing sheaths pointed, reaching end of abdominal segment 5. Natatorial setae on mid-tarsi and proximal segment of hind tarsi.

Number and arrangement of gills of *L. obscurus*

Segment	Dorsal	Ventral
2	3	3
3	3 4	3 3
4	2 4	3 4
5	2 4	2 4
6	2 4	2 4
7	2 4	2 4

Mode of life and habitats. Brooks; feeding on detritus.

Distribution. Western part of European USSR. In addition, Europe.

## 2. *Lithax incanus* Hagen

Sykora, 1960:217–224, Figures 1–8.

Number and arrangement of gills of pupa of *L. incanus*

Segment	Dorsal	Ventral
2	2	1 2
3	2 4	3 4
4	2 4	2 3
5	2–3 4	3 3
6	3 4	3 3
7	3 4	3 3
8	1	

Abdominal segment 1 with 2 dark, blunt tubercles with small denticles. Holding apparatus on segments 3–7 presegmental in form of small, rounded sclerites with denticles directed posteriorly; numbers as follows: III:1; IV:2; V:2–3; VI:2; VII:2; segment 5 with an elliptical plate with numerous spinules directed anteriorly. Lateral line from end of segment 5 to segment 8, formed by dense, strong, moderately long, grayish brown setae.

Gills dorsally on segments 2–4, ventrally on segments 2–7. Anal appendages in form of thin rods curved inward at end (Figure 595).

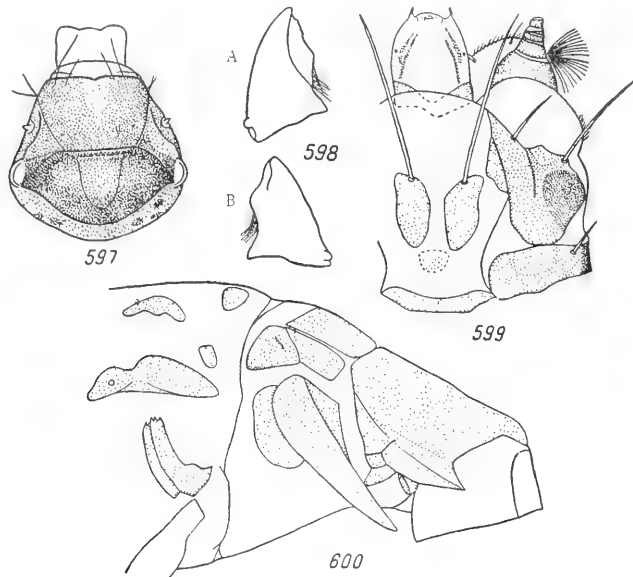
Posterior opening of case, as in Goera and Silo, with a membrane with small, oblong, radial, marginal slits (Figure 596).

**Full-grown larva.** Length 9–10 mm. Body less tapering posteriorly than *Silo*. Head as in Figure 597. Transverse ridge in middle of head distinct, covered with wart-shaped tubercles, of which the lateral are larger; surface anterior to ridge brownish; posterior blackish brown; occipital area yellowish, with large, dark dots; entire surface of head with large or small tubercles. Secondary setae present (Sykora, 1960:233).

Labrum, with broadly membranous anterior and lateral parts; sclerite brown, yellowish brown at the anterior margin. Mandibles (Figure 598) black, with rounded apex; dorsal blade projecting, with tubercles in some places; brush small, situated submarginally on dorsal side and formed by fine chaetoids.

349 Maxillolabium as in Figure 599. Paired sclerites of submentum brown, with a moderately long, thick, distal seta; median sclerite small, lighter.

(348)



FIGURES 597-600. *Lithax incanus* Hag. (after Sykora):

597 - head, dorsal; 598 - mandibles, ventral: right (A) and left (B) mandible; 599 - maxillolabium; 600 - thoracic segments, lateral.

Pronotum (Figure 600) yellowish brown; anterior-angle process and stripe near anterior margin slightly darker; posterior part with distinct spots laterally near median margin; surface with large, flat tubercles; 6 primary and secondary setae at anterior angle, 13-22 on surface, 18 at anterior margin. Tergites of mesonotum yellowish brown; median tergite with large and small tubercles, and 5 dark spots laterally; anterior lateral tergite with large tubercles at anterior margin; posterior lateral tergite with black posterior and lateral margin; number of setae, including primary setae, about 80. Four tergites on metanotum (Figure 600) brownish; large lateral tergite with spinules in anterior part; smooth posterior part with a light spot surrounded by spinules; 120-130 setae on, and about 30 setae between sclerites.

Legs as in *S. nigricornis*, with fewer secondary setae.

Lateral line little marked.

Case slightly curved, made of sand grains, with 3 small stones on each side, anterior stone the largest, posterior the smallest.

**Pupa.** Resembling pupae of *Silo*. Labrum with black setae. Plates of holding apparatus, lighter than in *L. obscurus*; number of spinules: III:2-3; IV:2; V:2-3+8-11; VI:2-3; VII:1-2.

Anterior stones of case larger than in *Silo*.

Mode of life and habitats. Mountain brooks and rivulets.

Distribution. USSR: The Caucasus. Not recorded outside the USSR.

IV. Family LEPIDOSTOMATIDAE Ulmer

**Full-grown larva.** Length 7–11 mm. Head wide (as long as wide or slightly longer), brown or dark brown, with large, light, more or less oblong dots; eyes situated in middle of head; antennae at anterior margin of pericocular spot; frontoclypeus, as in Limnophilidae, with equally large anterior and posterior part; gula slightly oblong, triangular oval. Mandibles black, short, chisellike; teeth distinct, situated at apex; brush situated near dorsal margin on both mandibles. Pronotum wide, with slightly projecting anterior margin; anterior angles rounded; posterior margin broad. Mesonotum lighter posteriorly, weakly sclerotized in some species; dots somewhat oblong, light, large. Mesonotum, as in Limnophilinae, with or without 3 small sclerites. Forelegs much shorter and more massive than the thin, long, mid- and hind legs. Gills single, in dorsal and ventral rows. Tergite of abdominal segment 9 weakly sclerotized or absent. Claw of anal legs with 1 or 2 dorsal denticles.

Case made of sand grains, conical, straight, or slightly curved; those made of detritus are tetrahedral, with small, regularly arranged particles.

Mode of life and habitats. Running water, including spring-fed brooks; mountain brooks, and rivulets, rarely near banks of large rivers; open littoral of lakes.

Distribution. Throughout the USSR. In addition, Europe, Africa, Asia, North and Central America, Madagascar.

Key to Genera

- 1 (4). Mesonotum well differentiated, sclerotized posteriorly, ending before posterior margin of segment in some species. Metanotum, as in Limnophilinae, with 3 pairs of small tergites.
- 350 2 (3). Head and pronotum brown or light brown, light dots of head mainly oblong; mesonotum lighter than pronotum; setae brown or light brown; case made of detritus, tetrahedral or conical; case made of sand grains, straight; widely distributed in European and Asiatic parts of the USSR . . . . . 1. **Lepidostoma** Ramb. (p. 438)
- 3 (2). Head and pronotum reddish brown, dots mainly round; mesonotum much lighter than pronotum; setae mainly dark brown or black; case made of sand grains; Caucasus, Asiatic part of the USSR . . . . . 2. **Dinarthrum** McL. (p. 445)
- 4 (1). Mesonotum indistinctly sclerotized posteriorly, merging gradually with membranous part; small tergites of metanotum indistinct; western part of the European USSR.
- 5 (6). Head dark, chestnut brown; light dots mainly in form of streaks, round dots less numerous; case conical, made of sand grains, slightly curved . . . . . 4. **Lasiocephala** Costa (p. 460)
- 6 (5). Head lighter dorsally, dark reddish brown, with oblong dots ventrally; case tetrahedral, made of large pieces of detritus . . . . . 3. **Crunoecia** McL. (p. 454)

## 1. Genus *Lepidostoma* Rambur

**Full-grown larva.** Length 9–11 mm. Head and pronotum light brown or brown, with distinct, rounded, or oblong, light dots. Mesonotum light posteriorly. Metanotum with 3 pairs of small tergites. Setae of medium length, brown or dark brown; very large setae absent; secondary setae absent on head, a few present on dorsum of thorax. Forelegs short, massive; mid- and hind legs thin, moderately long; secondary setae only on coxae.

Gills on the segments 2–7.

Claw of anal legs with one large, dorsal, and one small denticle.

Case made of detritus, tetrahedral; rarely of sand grains, conical, straight.

Mode of life and habitats. Small, running, water bodies, clear brooks and rivulets in mountains and plains; near banks of large rivers.

Distribution. European and Asiatic parts of the USSR. In addition, Europe, North America, and parts of South America.

### 1. *Lepidostoma hirtum* Fabricius

Kolenati, 1848:99. — Klapálek, 1893:75–79, Figure 20. — Struck, 1900:23, Figure 29; 1903:108, Plate II, Figure 15. — Ulmer, 1903:90–91, Figure 55. — Siltala, 1905:29–32, Figure 8; 1907:544–549. — Ulmer, 1909:274–275, 315, 317–318, Figures 411–412, 462. — Lestage, 1921:897–904, Figures 319–322. — Lepneva, 1940:216–217, Figures 160/20. — Hickin, 1943:15–17, Figures 1–10. — Brindle, 1964:197, 198.

**Full-grown larva.** Length 9–11 mm. Head (Figure 601) slightly longer than wide; antenna situated near anterior margin of light periocular spot; dorsal surface uniformly brown, bright, with large, distinct, transverse or rounded, light spots; brown surface with dense, brownish, microscopic spinules; light spots smooth. Frontoclypeus with wide, reddish brown, anterior margin; anterior part with 2 pairs of small, light dots; 1 or 2 dots between tentorial pits; posterior part with a transverse row of 4 light dots, 2 large dots in middle, a small dot on each side; a small, distinct, and 2 smaller, indistinct dots at anterior end in middle. A number of light, transverse streaks or 2 oblong dots, one rounded, the other elongate, lateral to epicranial suture, from seta 14; similar but smaller dots lateral to coronal suture; light, rounded, smaller dots behind eye on sides. Ventral surface with reticulate striation, its posterior part with groups of large, light, oblong dots in each half. Gula triangular, with curved sides, slightly narrower anteriorly; pregula in form of a reddish brown, transverse plate, not wider than gula (Figure 601, C).

Median and intermediate anterior-margin setae brown, relatively thick, latter moderately long, former smaller; lateral anterior-margin seta light, large, longer than median, procumbent; anterior frontal seta large, moderately long, similar to lateral seta, light, curved inward, opposite setae crossing; intermediate frontal seta situated near tentorial pit, short, thin; posterior frontal seta, slightly larger, situated close to posterior margin  
351 behind transverse row of dots. Seta 7 brown, moderately long, larger than median seta, situated near margin; seta 9 situated medial to antenna, long,

relatively thick, like seta 7, with long, thin, transparent end; seta 11 distant from 9, situated medial to eye, small, very thin; seta 10 situated lateral to antenna near anterior margin of periocular spot, short, brown; seta 12 short, thin, dark, situated behind eye; seta 14 situated medially, brown, long, thick, slightly shorter than 9; seta 15 situated some distance behind 14, thin, long, brown; seta 13 situated laterally nearby, short, light; seta 17 situated lateral to fork, slightly behind fork among light dots, brown, moderately long, thick, similar to 14 but shorter, adjacent pit close to coronal suture; seta 16 situated lateral to 17, short, thick, brown. Ventral seta 8 brown, thin, dark, short; seta 18 small, very thin, light.

Labrum (Figure 601, D) wide, with narrow membranous margin; dorsal sclerite brown, median indentation shallow, median pit near anterior margin situated at level of seta 4; posterior angle sclerites wide, curved inward; seta 1, as in Limnophilinae, in form of small, light, thick, blunt spine, situated on membrane; seta 4 situated at anterior margin, larger than 2, light, curved inward; seta 3 situated at anterior angle, straight, light, larger than 4; setae 5 and 6 situated behind median pit, darker brown, widely separated.

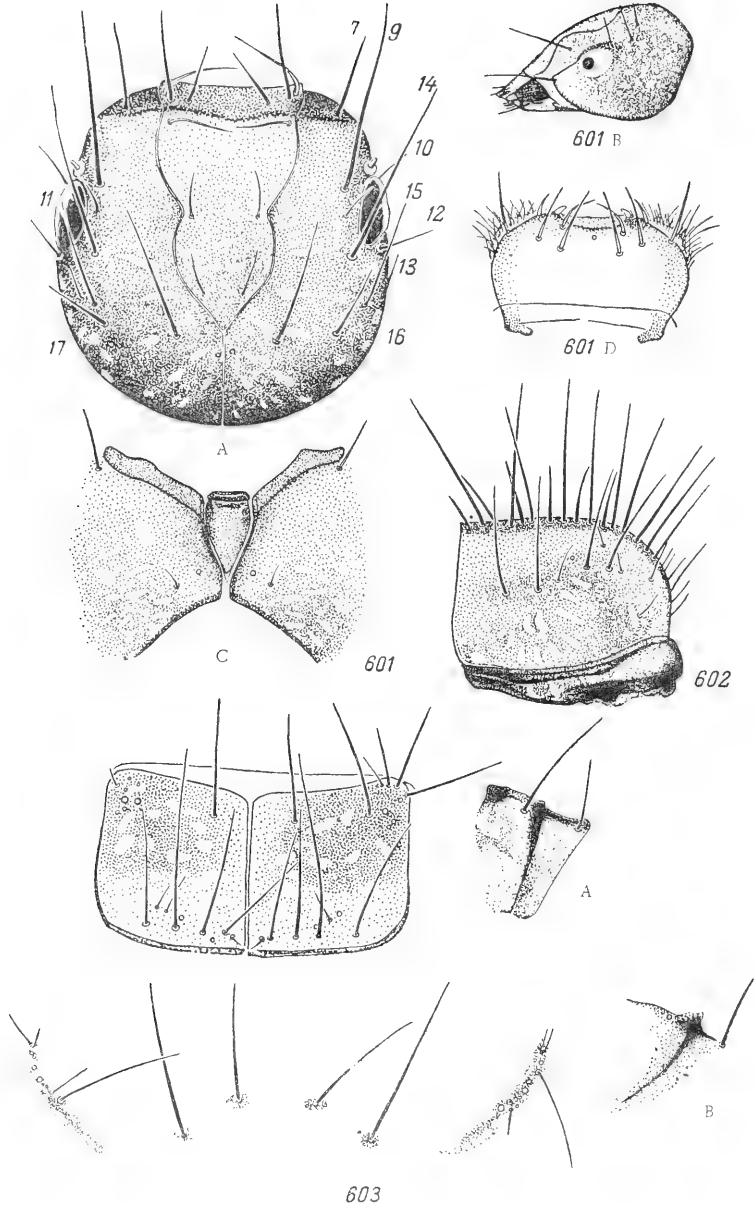
Mandibles short; basal part black, massive; apical part pinkish brown; median tooth of both mandibles large; dorsal blade of left mandible with 2 teeth, ventral blade with one distinct and one small, indistinct tooth; right mandible with 2 teeth on dorsal and ventral blade, in addition to median tooth; brush short, tuftlike, situated at dorsal margin, basal chaetoids longer than apical chaetoids; lateral setae situated basally, dorsal setae short, yellowish; ventral very small, thin, light.

Sclerites of cardo mainly black, with a narrow, reddish brown stripe at posterior margin and in middle of anterior margin; seta relatively large, thin, yellowish, second (lateral) seta very thin, small.

Sclerites of submentum small, yellowish, indistinct; seta at distal margin brown, moderately long. Stipes yellowish, with small, reddish brown, median stripe; setae brown, lateral seta moderately long, median seta short, thin. Palpifer brown; distal seta situated on membrane, reddish brown, relatively large, reaching apex of palp; median seta small, blunt, light, relatively thick; galea short, wide, domelike. Maxillary palps short; segments 1 and 4 slightly larger than 2 and 3; sclerites of first 3 segments brown, of last segment yellowish. Mentum represented by a uniformly narrow, reddish brown semicircle; ventral sclerite small, with light seta; sclerite of palpiger in form of a broad horseshoe.

Pronotum (Figure 602) uniformly chestnut brown, with large, light spots in middle of posterior margin and in each half; 1-2 smaller spots laterally; anterior margin narrow, brown; lateral margin darker, reddish brown; posterior margin wide, mainly chestnut brown, with a distinct, brownish stripe anteriorly; lateral margin broad, black, posterior margin blackish brown in middle and with a large, black spot connected by a narrow, dark brown stripe with black lateral margin. Setae brown and dark brown, as in Figure 602.

Mesonotum (Figure 603, A) wide, mainly chestnut brown, lighter at median suture, whitish brown at posterior margin; each half slightly longer than wide, with large, light dots. Primary setae thin, strong, grayish brown, moderately long; secondary setae light, few, most of them small.



FIGURES 601-603. *Lepidostoma hirtum* Fabr.:  
601 - head, dorsal (A), lateral (B), and ventral (C), labrum (D); 602 - pronotum; 603 -  
dorsal and pleural sclerites of mesothorax (A) and metathorax (B) (601, B - after Hickin).



Tergites of metanotum (Figure 603, B) pale, weakly sclerotized, with indistinct outline. Anterior median tergites in form of small, yellowish semicircles with a strong, moderately long, blackish brown, primary, anterior-margin seta. Posterior median tergites slightly larger; medio-anal primary seta large, blackish; intermediate and lateral seta situated basally, small, thin, setuliform; secondary median setae absent, in contrast to Goeridae and Limnophilidae. Lateral tergites in form of narrow, oblique, brownish plates, slightly concave on median side and convex laterally, in contrast to Limnophilinae; border between anterior and posterior parts little marked; striation in form of thin, grayish lines; posterior part without seta, anterior part with 9-10 setae, including 5 small to moderately long, 353 very thin setae, and 3 large, long, blackish brown setae; primary anterior-angle seta among them.

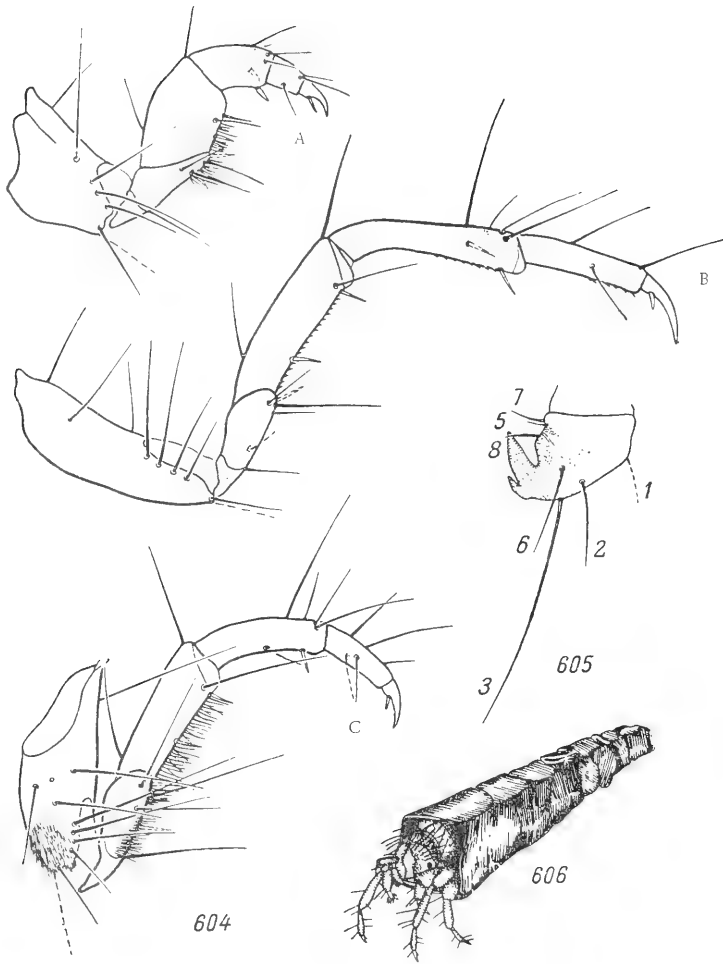
Propleuron with black pleural suture; epimeron reddish brown, median and lateral sides with blackish brown, partly reddish brown, margin; median submarginal seta brown, moderately long; trochantin mainly black, apical seta moderately long, brown, resembling seta of epimeron; basal setule light, relatively large. Mesopleuron (Figure 603, A) chestnut brown; pleural groove in form of a broad, reddish brown stripe with a black rhomboidal, distal spot; distal margin of epimeron brownish, narrow, that of episternum dark reddish brown, wide, with a reddish black spot at anterior corner; all setae primary; seta of episternum situated near suture, dark brown, moderately long; seta of epimeron smaller, brown, situated near posterior margin. Metapleuron (Figure 603, B) poorly differentiated, in form of reddish brown, pleural groove with a black distal spot; distal margin of episternum with a short, wide, reddish brown area; margin of epimeron narrow, longer; pleural suture with a narrow, brownish, weakly sclerotized stripe; seta of episternum blackish brown, long, situated at reddish part of margin; 2-3 small, light, secondary setae anteriorly; seta of epimeron situated near posterior margin, blackish brown, moderately long.

Prothoracic horn large, grayish.

Legs (Figure 604) uniformly rust brown, without dots; black spots at articulation between coxa and trochanter, and between femur and tibia. Setae brown or reddish brown, some setae dark.

Fore coxa (Figure 604, A) short, massive, with shallow distodorsal indentation; basodorsal seta moderately long, strong, dark brown as are other setae; anterior apical dorsal seta displaced to basal part, short, strong; posterior, distodorsal seta situated basal to indentation, long; 2 similar secondary setae and a thin, moderately long seta further distally at margin; both anterior surface setae situated in middle of coxa; subdorsal seta short, strong; seta situated more ventrally larger and thicker; both distoventral setae moderately long, thin; minute, light spinules on ventral and most of posterior surface.

Trochanter large, nearly as long as femur; anterior seta light brown, short, branched apically; posterior seta reddish brown, longer and thinner, strong; basoventral primary seta moderately long; anterior ventral setae in form of 2 light spines with long, thin apex; posterior ventral setae situated apically and subapically, long, larger and thicker than basoventral seta; setose area of distal part, as in Limnophilidae, with a row of thin, light, slightly curved, hairlike chaetoids, like those on ventral margin of femur.



FIGURES 604-606. *Lepidostoma hirtum* Fabr.:

604 - right legs, posterior: foreleg (A), midleg (B), and hind leg (C); 605 - claw of anal leg; 606 - larva case (606 - after Hickin).

Femur short, with convex dorsal and straight ventral side; basodorsal seta moderately long; apical dorsal seta slightly thicker; anterior surface seta short, strong, situated some distance from distal margin; posterior surface seta dark brown, long, situated subventrally at distal margin; primary ventral setae in form of light large spines, apical ventral spine moderately long, with slightly curved apex, basoventral spine in middle of femur; both large, thick.

Tibia short, curved; setae of dorsal group thin, light, smaller than dorsal setae of femur; distodorsal seta of apical pair light, thin, moderately long; subdorsal shorter and slightly thicker; dorsal seta of subapical pair moderately long, subdorsal seta short, strong; distoventral setae in form

of 2 spines, a posterior spine at distal margin and an anterior spine situated subventrally some distance from margin; several light, pointed, small, spinules, which are thicker at base on ventral surface. Tarsus short, massive, slightly narrower distally, with slightly convex dorsal, and straight ventral margins; primary distodorsal seta brown, moderately long, longer and thicker than dorsal setae of tibia, second seta situated slightly more basally, light, grayish. Claw short, blunt; basal seta in form of light, thick spine with thin apex.

Mid-coxa (Figure 604, B) long; distodorsal indentation deeper than on forelegs; primary basodorsal seta moderately long, dark brown, strong; anterior distodorsal seta thinner, slightly longer, brown, situated a short distance basal to indentation; posterior distodorsal seta long, slightly shorter than coxa; 3 secondary setae, one of them long, the other 2 shorter, further distally at margin of indentation; basal part with a large, secondary seta at dorsal margin, as long as primary distodorsal seta; anterior setae situated in distal part, one of them short, brown, situated near dorsal margin, the other moderately long, dark brown, subventral; both distoventral  
354 setae strong, situated close together, brown, anterior seta short, strong; posterior longer, slightly subventral. Trochanter oblong, anterior primary seta short, strong; posterior primary seta moderately long; basoventral seta moderately long; posterior ventral setae dark, situated apically and subapically; anterior distoventral seta in form of light, thin, pointed spine, 2nd distoventral seta thinner and closer to suture; ventral side without hairlike spinules. Femur, tibia and tarsus rodlike, narrow, long. Femur slightly wider distally; ventral side slightly concave, dorsal side slightly convex in basal half, straight apically; apical dorsal seta thin, moderately long, basodorsal seta smaller; anterior surface seta short, dark brown, strong, situated some distance from distal margin; posterior surface seta situated subventrally, dark brown, strong, moderately long, situated in distal part; a light, slightly curved, large spine (apical ventral seta) nearby ventrally; basoventral seta situated in middle of segment, forming light, straight, but thinner spine. Tibia slightly curved, wider distally; apical  
355 pair of dorsal setae consisting of a thin, light, moderately long, distodorsal seta and a brown, longer and thicker, subdorsal seta situated more posteriorly; setae of subapical pair situated some distance from each other, dorsal seta reddish brown, long, second seta situated subdorsally at anterior margin, light, moderately long; 2 unusually situated ventral setae, apical ventral (posterior) in form of a short, light spine; the 2nd (anterior) formed by a similar spine, but situated much more basally, in middle of tibia. Tarsus straight, thin, much narrower than tibia; setae of dorsal pair thin, about equally long, situated subapically and in basal part; other 2 setae situated in middle of tarsus; posterior seta moderately long; anterior shorter; both thin, brown; light spinules at ventral margin small but more distinct than those on femur and tibia. Claw long, slightly curved, its seta in form of short, blunt spine.

Hind coxa (Figure 604, C) slightly shorter than mid-coxa, with similar dorsal indentation; basodorsal seta long, strong, dark brown; anterior disto-dorsal seta the same, situated basal to apex of depression; 3 setae situated distally at margin of depression, 1st like primary seta, long, dark brown; 2nd shorter; 3rd smaller; posterior distodorsal seta situated at apex of

depression, long, dark brown; nearby distally, 2 similar, large, secondary, and a 3rd shorter, light seta; apical of 2 primary anterior setae dark, reddish brown, moderately long; the other short, brown, situated subdorsally in basal part; posterior surface with 2 thin, moderately long, secondary setae and 3-4 smaller setae; anterior distoventral seta moderately long, thin, dark brown, posterior distoventral seta situated subventrally, short, brown; posterior side subventrally in distal part with dense, thin, light, hairlike, adpressed spinules, which form a continuous, furlike cover.

Number and arrangement of gills of *L. hirtum*

Segment	Dorsal	Ventral
2	1	1
3	1 1	1 1
4	1 1	1 1
5	1 1	1 1
6	1 1	1 1
7	1	1

Trochanter oblong, with straight ventral side distal to suture; anterior seta in form of large, light spine like ventral spines; posterior seta thin, dark brown, long; anterior distoventral seta represented by a long, thin, light spine, 2nd ventral seta the same, situated closer to basal suture, slightly posterior apical ventral seta similar;

subapical seta shorter and thinner; ventral side with slightly curved, hair-like chaetoids in distal part. Femur slightly shorter than coxa, markedly wider distally, with almost straight dorsal and ventral side; distodorsal seta moderately long; basodorsal seta shorter, both setae brown; anterior seta dark brown, situated subapically; posterior seta situated subventrally near distal margin, long, dark brown; primary ventral setae in form of large, light spines, slightly yellowish, pointed, situated subapically and in middle of femur; thin, light, hairlike, slightly curved spinules on whole ventral margin as on trochanter. Tibia shorter than femur, slightly curved; dorsal group of setae consisting of an apical and a subapical pair; setae of ventral pair represented by 2 light, pointed, large spines, posterior spine situated ventrally some distance from margin, anterior slightly longer and thinner, situated much more basally in middle of tibia; ventral margin, in contrast to midlegs, with dense, light spinules, those near basal margin smaller. Tarsus shorter than tibia, almost uniformly narrow; dorsal setae situated in middle, one behind the other, moderately long, light, much shorter than distodorsal setae of tibia; 2 other primary setae situated in middle of segment; posterior seta subdorsally, large, brown, reaching apex of claw, longest and thickest seta on tarsus; anterior seta in middle, brownish, moderately long. Claw, as on midlegs, long, slightly curved, its seta in form of short, blunt, light spine.

Abdominal segment 1 without dorsal process; lateral processes small, situated more ventral than usual. Lateral line on segments 3-7. Gills in form of long, single filaments dorsal and ventral on segments 2-7.

Segment 9 without tergite; setae situated on a slightly thicker membranous area; medioanal and anterior-angle setae long, brown, thin; 1-2 small, thin setae between medioanal setae; 3 setae between medioanal and anterior-angle setae, one of the 3 longer and thicker than others.

356 Sclerite "b" of anal legs rust brown; median seta and distodorsal seta grayish brown, long; lateral seta shorter and slightly thinner, moderately long; median subapical seta similar, slightly smaller; ventral seta moderately long, situated more lateral than usual, thin, brown. Sclerite "c" yellowish brown, with reddish brown, lateral margin; seta short, thin, dark brown.

Claw (Figure 605) light brown, chestnut brown at base and apex, with a dorsal denticle and 2-3 light spinules. Setae 1 and 3 situated subdorsally on median side, light and thin in contrast to Goeridae and Apatania; seta 3 longer than claw, thick, chestnut brown; seta 2 thin, moderately long, situated dorsally above suture; seta 6 situated in distal part some distance from suture, thin and moderately long, in contrast to Limnophilidae and Goeridae, longer than seta 2; setae 7 and 8 situated ventrally in basal part one behind the other, both light and reaching apex of claw; seta 5 thin, small, larger than in *Goera* (more than half as long as seta 8); seta 4 situated medial to 8, smaller than 4. Larval case as in Figure 606.

Mode of life and habitats. Running water; solid bottom of clear, small brooks and rivulets; near banks of large rivers; open littoral of lakes, in moderate surf.

Distribution. USSR: from the western border to the Maritime Territory, from Kola Peninsula and Lower Tunguzka to the Caucasus and Middle Asia. In addition, Europe.

## 2. Genus *Dinarthrum* McLachlan

**Full-grown larva.** Length 7-9 mm. Head not as short as in *Lepidostoma hirtum*; frontoclypeus narrow, oblong, with distinct punctuation only in posterior part; some light dots lateral to epicranial suture and on ventral side transversely oblong, sometimes like a streak; setae 9, 14, and 17 longer and thicker than others. Middle of posterior margin of pronotum with 2 large, oblong, longitudinal, light dots; posterior part of mesonotum usually much lighter than anterior part; sclerites with dark, sometimes black, setae.

Case made of sand grains or sand and detritus, rarely of detritus only, as in *L. hirtum*.

Mode of life and habitats. Small, mountain brooks and rivulets.

Distribution. USSR: The Caucasus, Middle Asia. In addition, Iran, Pakistan.

### Key to Species

#### Full-grown larva

- 1 (4). Dorsal side of head shining, rust brown; light dots lateral to epicranial suture indistinct.
- 2 (3). Pronotum dark chestnut brown; mesonotum grayish brown, brownish posteriorly; coxae blackish brown; Caucasus . . . . .  
. . . . . 3. *D. tchaldyrense* Mart. (p.451)

- 3 (2). Pronotum shining, rust brown, darker posteriorly; mesonotum chestnut brown, grayish brown posteriorly; coxae and legs brown; Middle Asia . . . . . 1. *D. pugnax* McL. (p. 446)
- 4 (1). Dorsal side of head grayish brown; light dots lateral to epicranial suture distinct, with dark outline; Middle Asia . . . . . 2. *D. reductum* Mart. (p. 450)

1. *Dinarthrum pugnax* McLachlan

Martynov, 1927:465-466, Figure 1, Plate XXI, 1-4.

**Full-grown larva.** Length 7-9 mm. Head (Figure 607, A) shining, golden brown; dots yellowish, large, indistinct; frontoclypeus narrow, mainly of uniform color, with wide, brownish, anterior margin with a transverse row of 6 light dots posteriorly, 2 large, median dots and 2 smaller dots laterally; a small, light, median dot before the row. Yellowish dots similar to those on frontoclypeus lateral to epicranial suture, including 2 oblong, anterior dots, others round or slightly oblong transversely; numerous, small, yellowish dots behind eye; ventral surface mainly brownish, lighter in middle; dots yellowish, coarse, transverse, distinct. Gula oval, with long, curved sides, and blunt, rounded, posterior end; anterior margin narrower. Pregula in 357 form of narrow, transverse, reddish brown plate with a straight, or slightly concave, anterior margin (Figure 607, B).

Intermediate anterior-margin seta situated near lateral seta, brown, moderately long, thick; median seta shorter; lateral seta situated in anterior angle, large, light, curved inward, longer than median seta, thick, opposite setae crossed at end; anterior frontal seta large, procumbent, similar in form to lateral seta, but slightly smaller and thinner; intermediate frontal seta short, thin, situated near tentorial pit; posterior frontal seta, as in *Lepidostoma*, situated in posterior part behind row of light dots. Seta 7 brown, moderately long, strong, like intermediate anterior-margin seta, but slightly larger; seta 10 brown, situated near eye, immediately behind antenna; seta 9 long, dark reddish brown, situated medially near anterior margin of eye; nearby laterally a small, brushlike secondary seta; seta 11 moderately long, light, situated behind 9; seta 14 similar to 9, slightly shorter; seta 12 situated lateral to 14, short, thin, light brown; seta 15 situated some distance behind 12 and 14, thin, long, brown, shorter than 14; seta 13 situated nearby laterally, light, moderately long, procumbent anteriorly; seta 16 situated behind 15, slightly medially, thick, dark reddish brown, moderately long; seta 17 situated lateral to fork, large, long, similar to, and as thick at base as 14; then, thinner; ventral seta 8 short, strong, brown; seta 18 small, light.

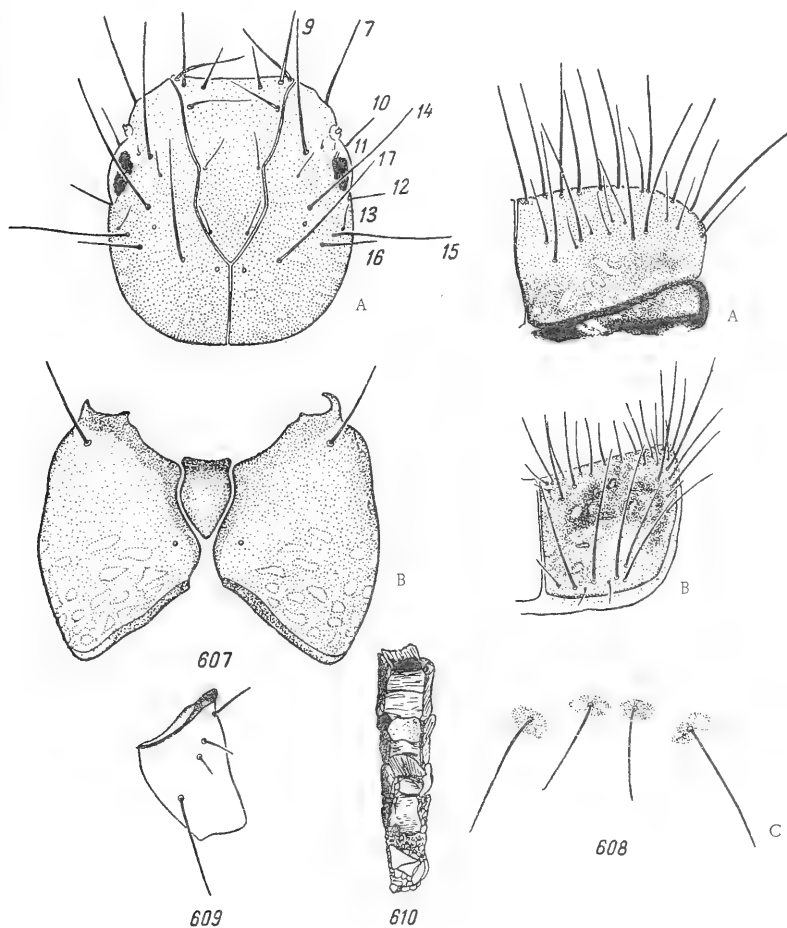
Labrum, as in *Lepidostoma*, relatively small, with broad, hairy, membranous, anterior margin; posterior-angle sclerites wide, short, reddish; seta 1 in form of light, thick spine lateral to depression; seta 2 situated on membrane near process, light, pointed, spine-shaped; seta 3 short, light, situated laterally near margin; seta 4 thick, light brown, blunt, curved to margin; setae 5 and 6 brown, short, thick, pointed.

Mandibles massive, mainly black, reddish distally; left mandible with a large tooth, and a small, round, tooth-shaped process on dorsal blade, in

addition to distal tooth; right mandible, with 2 blunt teeth on dorsal and ventral blade in addition to distal tooth; median brush situated near dorsal margin, in form of a tuft of large, light chaetoids; lateral setae situated basally, short, brown, ventral smaller than dorsal.

Sclerites of cardo mainly brown, with reddish brown, median margin; lateral stripe dark reddish brown; seta at margin small, brownish; 2nd seta small, light. Submentum yellowish, pale, indistinct, wider at anterior margin, concave; setae moderately long, brown. Stipes yellowish brown, inner margin with a narrow, reddish brown stripe; lateral seta thick at base, moderately long; median distal seta short, thin. Palpifer light brown; distal seta situated on membrane, dark brown; median seta small, light, spine-shaped. Galea and maxillary palp as in *L. hirtum*. Mentum in form of a wide, reddish brown semicircle.

(358)



FIGURES 607-610. *Dinarthrum pugnax* McL.:

607 - head, dorsal (A) and ventral (B); 608 - pronotum (A), mesonotum (B), tergites of metanotum (C); 609 - fore coxa, anterior; 610 - larval case.

Pronotum (Figure 608, A) shining, rust brown, darker posteriorly, with large, oblong, light dots, including 2 dots of characteristic form posteriorly at suture, one situated near margin and forming a narrow, light stripe parallel to the suture, the other oblique in angle at margin; anterior margin, including anterior angle, wide, brown; lateral margin indistinct; posterior margin wide, blackish brown, with 2 large, light spots, and 2 small spots; posterior margin divided from other surface by a sharp ridge with black median, and reddish brown lateral parts; lateral edge of posterior margin black, posterior edge interrupted, with a large, black spot in each half, and with a short, reddish stripe in middle. A row of 12–13 blackish brown, thick, long setae, and shorter setae at anterior margin; 2–3 light, thin setae at lateral margin, and a dark, moderately long seta situated some distance from margin; surface with 4 median and 2 lateral, dark, thick, moderately long setae, 2 smaller, dark setae and 18–20 light, thin, moderately long to short setae laterally.

Mesonotum (Figure 608, B) chestnut brown anteriorly, light brown posteriorly, whitish in some places, with indistinct punctation, in contrast to *Lepidostoma*; setae more numerous than in *Lepidostoma* and concentrated in median, anterior-margin, anterior-angle, and posterior-margin areas, the latter with 3 setae, median and anterior-angle areas with 2 thick, blackish brown setae longer than others.

Median tergites of metanotum (Figure 608, C) rounded, brownish, small, larger than in *L. hirtum*; lateral tergite brownish, in form of a narrow, oblong plate; median tergites with only primary setae, anterior-margin surface seta and medioanal seta moderately long, thick, blackish brown, 358 intermediate and lateral setae situated submarginally, and small, light, setuliform; anterior part of lateral tergite with 16–17 setae of different size, including 2 long, blackish brown setae, one primary anterior-angle, and one secondary seta.

Propleuron as in *L. hirtum*; seta of epimeron brown, situated at distal margin; trochanter black basally, yellowish apically, seta thin, light brown, setule light. Mesopleuron as in *Lepidostoma*, triangular, mainly brownish; pleural groove reddish brown, with black, distal spot; anterior angle of episternum with a large, blackish brown spot; distal margin of epimeron reddish brown; a dark stripe at base of lateral margin; setae situated distally blackish brown; seta of episternum moderately long, situated near suture; seta of epimeron shorter, situated near posterior margin of stripe. Metapleuron as in *L. hirtum*, weakly sclerotized, pleural groove and setae as on mesothorax.

Legs rust brown, without spots, segments as in *L. hirtum*; ratio of length of legs 59:100:104.

Chaetotaxy of legs as in *L. hirtum*, with some differences; large setae brown or dark brown. Basodorsal seta of fore coxa (Figure 609) moderately 359 long, strong; anterior distodorsal seta short, strong; posterior distodorsal seta situated some distance from apex of indentation, thick, long; 7–8 long, and moderately long, secondary setae further distally at and near margin; one anterior primary seta in basal part short, strong, situated near anterior distodorsal seta; 2nd seta situated in middle of segment, thick, long, longer than in *L. hirtum*; distoventral setae moderately long, anterior seta darker and thicker than subventral, posterior seta. Anterior seta of trochanter



branched, posterior seta strong, pointed, both setae short, light brown; basoventral seta moderately long, strong, grayish brown; both posterior ventral setae the same, anterior ventral setae forming large, pointed, yellowish spines; large, light chaetoids situated ventrally in setose area,

Number and arrangement of gills of *D. pugna* x

Segment	Dorsal	Ventral
2	1	1
3	1	1
4	1	1
5	1	1
6	1	1
7	1	1

and on entire ventral margin of femur, as in *L. hirtum*. Basodorsal seta and apical dorsal seta of femur strong, brown, moderately long, anterior seta situated subapically, short, strong, reddish brown; both ventral setae represented by yellowish spines, apical spine larger than basal; primary posterior seta dark brown, moderately long, situated subventrally between spines. Dorsal setae of tibia in 2 pairs, light, thin, like those of *L. hirtum*; distoventral setae in form of 2 short, light spines, anterior spine yellowish, situated subventrally; posterior smaller, blunt, ventral; small spinules at ventral margin. Primary distoventral setae of tarsus thin, moderately long; anterior seta only

slightly shorter than posterior, in contrast to *L. hirtum*.

Dorsal process of abdominal segment 1 little differentiated; lateral processes large. Gills on segments 2-7, dorsal gills postsegmental only, in contrast to *L. hirtum*.

Tergite of abdominal segment 9 small, brownish, with indistinct anterior margin; medioanal and anterior-angle setae relatively thin, moderately long, blackish brown; intermediate and lateral seta short, light, very thin.

Sclerite "b" of anal legs, as in *L. hirtum*, with little differentiated dorsal side, forming a narrow, brownish, distal stripe; outside normally developed, brown; ventral side reddish brown; mediobasal and neighboring seta black, very long, and thick, largest setae on entire body; lateral seta thinner, shorter, blackish brown; subapical seta at median margin slightly smaller, dark reddish brown; ventral seta brown, moderately long. Sclerite "c" brownish, with reddish brown lateral margin; seta situated basally, dark brown, short, thin. Claw mainly light brown, brown basally, reddish brown apically, with a large, dorsal denticle; several minute spinules at base of denticle; both median setae 1 and 3 situated subdorsally, seta 1 short, light, basal; seta 3 apical, dark brown, very long, almost twice as long as claw; seta 2 situated dorsally at end of suture, moderately long; seta 6 situated laterally in distal part near suture, brown, almost twice as long as seta 2; ventral setae as in *L. hirtum*; setae 7 and 8 short, thick, light, situated one behind the other; seta 5 situated laterally, small, thin; seta 4 situated medially, slightly larger.

Case (Figure 610) 7-9 mm long, straight, round in cross section, slightly narrower posteriorly, made mainly of sand grains; anteriorly with 2-3 rows of regularly arranged, large pieces of detritus, as in *L. hirtum*; 4 in a row, but rounded; some cases before pupation consist almost entirely of

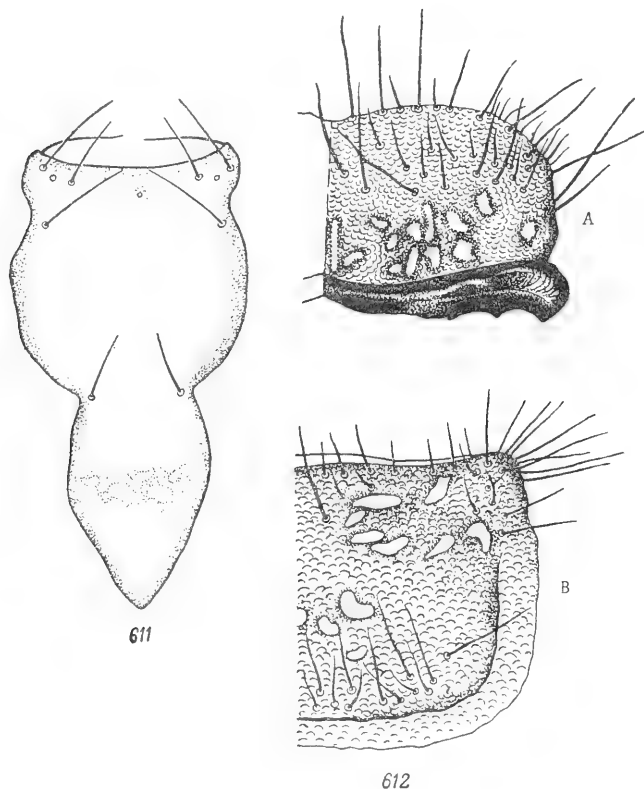
detritus, except for a small posterior part and a few streaks of sand grains; posterior end covered with a brown membrane with a wide, round hole.

Mode of life and habitats. Rapid mountain brooks and rivulets.

Distribution. USSR: Middle Asia.

## 2. *Dinarthrum reductum* Martynov, larva nova\*

**Full-grown larva.** Length 9–10 mm. Head (Figure 611) grayish brown dorsally, darker, rust brown laterally and posteriorly; frontoclypeus with a transverse row of 4 large dots posteriorly; a small brown dot before the row; 360 epicranial suture flanked by distinct, light, small, rounded dots. Pronotum (Figure 612) mainly grayish brown; darker, chestnut brown posteriorly in middle, with large, light dots; one longitudinal and one oblique dot posteriorly at median suture; posterior margin black or blackish brown, sometimes with 2 light dots in middle.



FIGURES 611 and 612. *Dinarthrum reductum* Mart.:

611 — frontoclypeus; 612 — pronotum (A), mesonotum (B).

\* Described from a larva from the Chirchika River, collected by L. Sibirtseva in 1954 (Sibirtseva, 1958:177).

Mesonotum much lighter, grayish brown anteriorly, whitish gray posteriorly with indistinct, light dots.

Legs brown, without dots; chaetotaxy as in *D. pugnax*.

Gills on segments 2-6; dorsally on segments 3-5, presegmental and postsegmental.

Case made of sand grains, slightly curved, with round cross section; posterior opening with a membrane with a large, round, central hole.

Mode of life and habitats. Mountain brooks and rivulets.

Distribution. USSR: Middle Asia, highlands.

### 3. *Dinarthrum tchaldyrense* Martynov, larva nova\*

**Full-grown larva.** Length 7-8 mm. Head dark, chestnut brown (Figure 613, A). Frontoclypeus with 2 pairs of small, indistinct dots anteriorly; 2 large, light dots close together on site of transverse row posteriorly; 3-4 large, light, oblong dots on each side of posterior part of frontal sutures, as in *L. hirtum*; pairs of round dots lateral to coronal suture; numerous, dense, light dots behind eye; ventral side with 6-7 large, transverse, oblong, light dots posteriorly, less distinct than on dorsal side. Gula ovoid (Figure 613, B).

Number and arrangement of gills of *D. tchaldyrense*

Number and arrangement of gills of *D. reductum*

Segment	Dorsal	Ventral
2	1	1
3	1 1	1 1
4	1 1	1 1
5	1 1	1 1
6	1	1 1

Segment	Dorsal	Ventral
2	1	1
3	1	1 1
4	1	1 1
5	1	1 1
6	1	1 1
7		1

Large setae 9, 14, and 17 slightly shorter than in preceding species; dark brown; seta 14 slightly smaller than 9; seta 15 thin, light brown, as long as seta 14.

Dorsal sclerite of labrum chestnut brown; posterior-angle sclerites reddish brown; setae 1 and 2 as in *D. pugnax*, light, represented by a blunt spine and a short, spine-shaped seta among the hairs; setae 4 and 3 light, equally large; setae 5 and 6 brown, equally long, larger than the others.

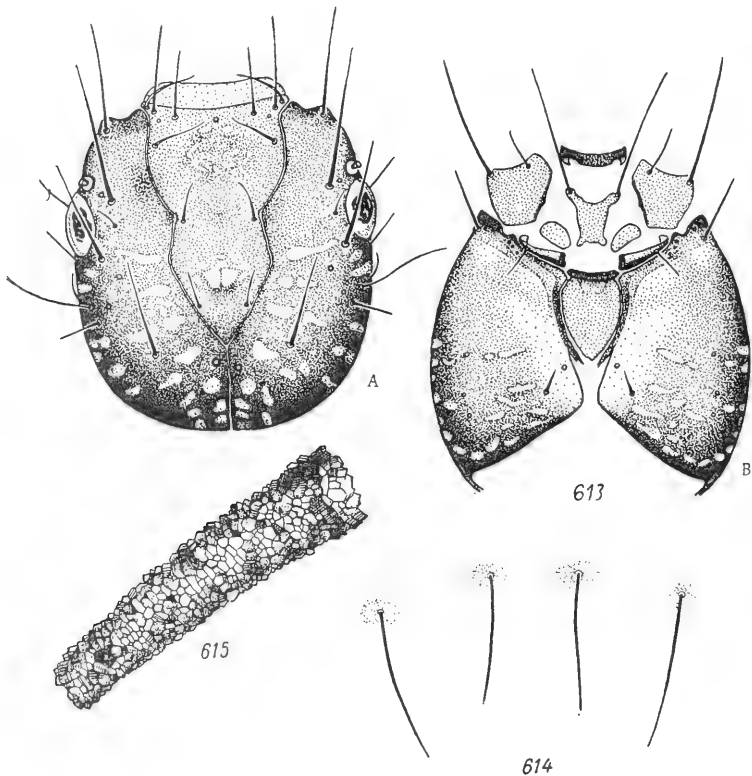
\* Described from a larva from the Tsakkara River in the Sevan Basin, 31 July 1960; collected by A.M. Meshkova.

Mandibles short, black, as in *D. pugnax*, with blunt, distinct, distal teeth. Sclerite of submentum, in contrast to *D. pugnax*, distinct, yellowish, wider anteriorly, with deep median indentation; setae chestnut brown.

Pronotum dark chestnut brown; posterior margin black; light dots at posterior margin in each half indistinct; a narrow, longitudinal, oblong, light dot situated posteriorly along median suture; a large, round dot near posterior margin; anterior and anterior angles with a row of 12–13 strong, dark setae, including 4 long, thick setae; 2 short, light setae near lateral margin, a long, thin, blackish seta some distance from margin; surface with median and lateral pairs of thick, black setae; other surface setae consisting of 2 dark, moderately long, and 11 brown to light brown setae, most of them thin, small.

Mesonotum, in contrast to the preceding forms, usually uniformly light chestnut brown at anterior margin, lighter, grayish posteriorly; anterior angle with a group of 18–20 setae, including 2–3 thick, black, moderately long setae; median anterior-margin group with 6–7 setae, including 2 black, strong setae near suture; posterior-margin group consisting of 10–11 setae, 5–6 of them black, moderately long.

(362)



FIGURES 613–615. *Dinarthrum tchaldyrense* Mart.:

613 – head, dorsal (A) and ventral (B); 614 – tergites of metanotum; 615 – larval case.

Median tergites of metanotum (Figure 614) yellowish, rounded, more distinct than in preceding forms; lateral tergite narrow, chestnut brown, with 11–12 setae anteriorly, including 2 thick, black, moderately long setae, longer than others.

Trochantin of prothorax as in *D. pugnax*, black basally, yellowish brown apically, with a short, thin, brown seta. Mesopleuron with large, black, anterior-angle spot.

Legs reddish brown, without spots; coxae darker, blackish in some places; articulation between femur and tibia with a large, black spot; chaetotaxy as in preceding forms; large setae black.

362 Basodorsal seta of fore coxa strong, black, moderately long; anterior apical dorsal seta situated in basal part, short; posterior distodorsal seta long; 2 similar, long, secondary setae and a 3rd slightly shorter and thinner seta further distally at margin; basal of the 2 primary anterior setae situated near apical dorsal setae, short, black, strong; the 2nd on surface in middle of coxa, black, long; distoventral setae black, strong, slightly shorter. Light, feathered chaetoids dense and large in distal part of ventral margin of trochanter, sparse at ventral margin of femur. Primary ventral setae of femur represented by thick, yellowish spines, basal spine blunt, apical larger, pointed; posterior primary seta black, moderately long, situated basal to spines. Basodorsal seta of mid-coxa thick, moderately long; anterior distodorsal seta moderately long, black, situated some distance from apex of depression; posterior distodorsal seta long; 2 long, secondary setae and one shorter seta distally at margin of depression; 2 secondary setae, close together basally at margin one of them long, the other thin, shorter; primary anterior setae of coxa situated in middle, one of them short, strong, subdorsal; the other long, black, subventral; distoventral setae black, equally long. Basodorsal seta of hind coxa long, black like other setae; anterior distodorsal seta long, situated some distance from apex of depression; 2 long, black, secondary setae and one brown, shorter seta distally at anterior margin; one primary distodorsal seta, 3 long, black setae, and one brown, moderately long seta at posterior margin of depression; 3 long, black, secondary setae basally; posterior surface with 2 secondary setae in middle, one of them short, brown, the other black, moderately long; primary anterior setae long, black, situated subdorsally in basal half and 363 subventrally in apical half; both distoventral setae black, moderately long; chaetoids in ventral distal part of trochanter and at ventral margin of femur, sparse.

Gills on segments 2–7, postsegmental, only on dorsal side.

Tergite of segment 9 small, indistinct, pale chestnut brown; medioanal and anterior-angle setae black, long, the latter larger; intermediate and lateral setae light, thin, short.

Sclerite "b" light brown, chestnut brown dorsally at distal margin and laterally, reddish brown ventrally; represented dorsally by a narrow, distal stripe as in preceding forms; dorsal, median, distal, and neighboring setae black, thick, long, largest setae of the body; subapical and lateral seta similar, black, thinner, shorter; ventral seta brown, thin, moderately long. Sclerite "c" light brown, with reddish brown, lateral margin; seta short, dark brown.

Claw as in *D. pugnax*, light brown, reddish brown apically with a large dorsal denticle; setae as in *D. pugnax*: seta 1 situated almost subdorsally in basal part, short, light brown, thin; seta 3 situated in distal part, long, reddish brown, largest on the claw, much longer than claw; seta 2 situated dorsally near end of suture, much smaller than seta 6, which is situated near distal end of suture, and is moderately long, reddish brown; ventral setae 7 and 8 thick, light, projecting slightly beyond apex of claw; setae 4 and 5 small, thin, 4 situated medially near 8, which is lateral to 7; seta 5 slightly larger than seta 4.

Case 8.0–8.5 mm long, made of sand, slightly curved, narrower posteriorly, with round cross section; posterior end closed by a membrane with a wide, round hole (Figure 615).

Mode of life and habitats. Small mountain brooks and rivulets. Distribution. USSR: The Caucasus.

### 3. Genus *Crunoecia* McLachlan

**Full-grown larva.** Length 6–7.5 mm. Head yellowish brown, with groups of lighter dots; pronotum brownish anteriorly, yellowish white posteriorly.

Case 7–9 mm long, made of detritus, tetrahedral, sometimes (in young larvae) with sand grains posteriorly and detritus anteriorly.

Mode of life and habitats. Springs and spring-fed brooks, an element of the "fauna hygropetrica" near banks of clear brooks and rivulets, among humid moss, kept wet by splashes from current.

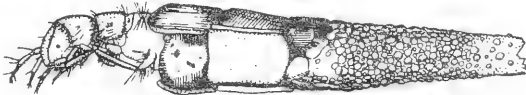
Distribution. Western part of the European USSR. In addition, Europe.

### 1. *Crunoecia irrorata* Curtis

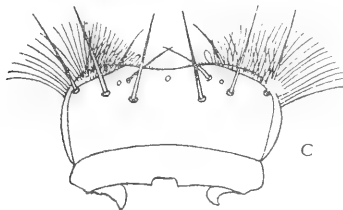
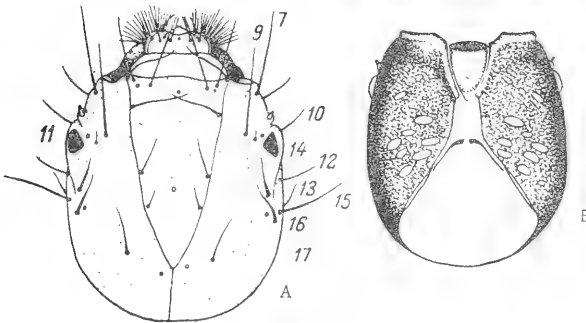
Morton, 1885–1886:43. — Klapálek, 1893:71–75, Figure 19. — Lampert, 1900:204, Figure 78. — Ulmer, 1903:91. — Thienemann, 1905b:528–529, 553, 555–557, Figures 9, 10, 49, 50, 118. — Siltala, 1906:58–60, Figure 5. — Ulmer, 1909:274–275, 317. — Lestage, 1921:904–910, Figures 323–325. — Thienemann, 1925:50–52, Figure 20. — Lepneva, 1940:217. — Nielsen, 1942:465–482, Figures 105–116. — Hickin, 1954:172–173, Figures 1–7. — Brindle, 1964:198, Figure 11.

**Full-grown larva.** Length 5.5–7.2 mm. Metathorax and abdominal segments 1–8 wider than head and 2 anterior, thoracic segments (Figure 616). Head slightly oblong (Figure 617, A) with curved sides; maximal width 0.61–0.74 mm, length/width ratio 1:0.88; dorsal surface reddish brown, periocular area convex, light; antennae situated directly before eye. Frontoclypeus relatively narrow; frontal sutures curved; indentation near tentorial pit barely visible (sclerite of normal form in stage 3 with a deep, lateral indentation, which is still visible in stage 4). Dorsal surface without dots; ventral surface lighter anteriorly than dorsal surface, blackish brown posteriorly, with large, light streaks. Gula small, broadly triangular; area behind suture whitish, without suture (Figure 617, B).

Setae on head (Figure 617, A) relatively short; largest setae, 7 and 9, no longer than  $\frac{2}{5}$  of width of head; median and intermediate anterior-margin setae also large, about the same length, brown, lateral anterior-margin seta light, procumbent; anterior frontal seta the same; intermediate and posterior frontal setae small, thin; seta 7 situated near anterior margin, dark brown, moderately long; seta 9 similar, situated medially at level of anterior margin of eye; seta 11 situated posteriorly near seta 9, small; seta 10 light, situated laterally before eye, seta 12 behind eye, both short, thin; seta 13 similar, slightly thicker, curved, directed anteriorly; seta 14 short, thick, smaller than 9, light brown; seta 15 moderately long, thin; seta 16 short, thick, curved medially; seta 17 strong, moderately long.



616



617

FIGURES 616 and 617. *Crunoecia irrorata* Curt.:

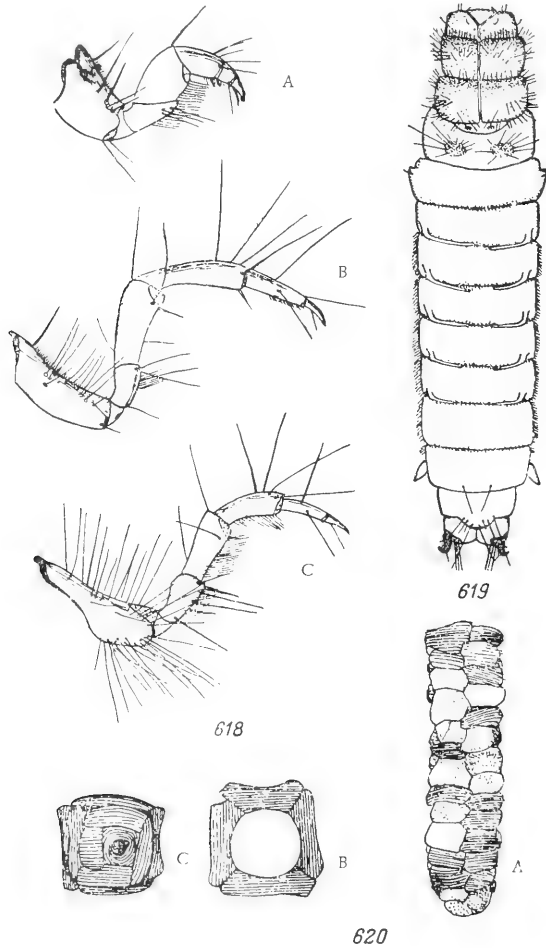
616 - larva in case, lateral; 617 - head, dorsal (A) and ventral (B), labrum (C) (616 and 617, B - after Hickin; others after Nielsen).

Labrum (Figure 617, C) short, wide, as in *Lepidostoma* (length/width ratio 1:2.89); anterior margin membranous laterally, with long, thin hairs; lateral margin also with wide, membranous stripe; dorsal sclerite light reddish brown, with a shallow, median indentation; posterior-angle sclerites wide basally, curved, narrow apically. Seta 1 situated lateral to median indentation, in form of a small, blunt, light spine; seta 2 situated on membrane

near margin, pointed, thin; seta 4 situated on sclerite at anterior margin, similar to seta 2, light; anterior-angle seta 3 light, situated near margin; surface setae 5 and 6 short, strong, brown.

Mandibles massive, without transverse ridge; teeth blunt; left mandible, in addition to distal tooth, with 2 large teeth on dorsal blade and 2 smaller teeth on ventral blade; right mandible similar; chaetoids of brush situated in median depression near dorsal margin; lateral setae relatively large, strong, close together, yellowish brown.

365)



FIGURES 618-620. *Crunoecia irrorata* Curt.:

618 - right legs, posterior: foreleg (A), midleg (B), and hind leg (C); 619 - thorax and abdomen of larva, dorsal; 620 - larval case, lateral (A), cross section (B), posterior (C) (619 - after Hickin, others after Nielsen).



Sclerites of cardo light brown, with black median margin; lateral seta very small, median seta relatively large. Submentum wider anteriorly; lateral setae thin, moderately long. Stipes yellowish; lateral seta shorter but thicker than setae of submentum. Palpifer narrower at median margin; 365 distal seta situated on membrane, relatively large, brownish; median seta light, spine-shaped, very small, situated on sclerite. Maxillary palps blunt, short, 1st segment slightly larger than following segments, with a semi-circular sclerite; other segments with circular sclerites. Galea short, wide, its 2 basal setae larger than others. Mentum in form of uniformly wide semicircle; ventral rods narrow, with a small seta. Palpiger relatively large. Labial palps small, labial lobe short, wide, covered with hairs.

Pronotum (Figure 619) brown or dark brown anteriorly, light brown posteriorly, with indistinct, light, oblong dots; posterior margin wide, mainly reddish brown, separated by a groove, which is black in middle; posterior margin with 2 black spots; numerous black setae (84–90, according to Nielsen) near anterior margin and in anterior half, including anterior angles, those at anterior margin  $\frac{2}{3}$  as long as width of head; small, thin spinules at anterior margin and angle.

Mesonotum (Figure 619) light brown anteriorly, with lighter dots at lateral margin; posterior part yellowish, with dark dots; anterior part and anterior angle with 56–57 setae, including primary setae, posterior part with 18–23 setae (after Nielsen).

Tergites of metanotum (Figure 619) pale yellow; anterior median tergites in form of small sclerotized dots, as in *Lepidostoma*, with a dark primary seta; posterior median tergites larger, in contrast to *Lepidostoma*, each with 15–17 setae; lateral tergites oblong, narrow, concave on median side, with 16–18 setae anteriorly.

Propleuron mainly light reddish brown with slightly dark pleural groove; episternum much larger than epimeron; trochantin large, broadly black at base, anteriorly with a short, hornlike process with sclerotized dorsal and lateral parts; a dark, relatively large seta ( $\frac{1}{3}$  of width of head) near membranous apex; one setule situated subapically, 2nd setule absent.

Pleurites of meso- and metathorax yellowish brown; pleural groove dark brown, black distally at articulation, setae black; mesepisternum with one primary seta, mesepimeron with 11–15 setae, one of them primary; 366 metepimeron with wide, long, anal process, separated from lateral part by a narrow sclerotized area; episternum with 13–15 setae, epimeron with 9–12.

Legs (Figure 618) reddish yellow; forelegs massive and short, as in *Lepidostoma*; midlegs longer than other legs; ratio of length of legs 67:100:88. Form and chaetotaxy of leg segments as in *L. hirtum*; light, hairlike chaetoids in distal part of trochanter and at ventral margin of femur of forelegs, in form of a small tuft on mid-trochanter (in contrast to *Lepidostoma*), in distal part of hind trochanter and at ventral margin of hind femur.

Abdomen almost uniformly wide (Figure 619); segment 1 slightly wider than segments following it, segment 9 narrower. Abdominal segment 1 without dorsal process; lateral processes with a horseshoe-shaped ridge with small, pointed spinules in anterior half. Dorsal medioanal seta of segment 1 slightly shorter than long thoracic setae; intermediate and lateral setae small; anterior-angle seta large, situated dorsal to lateral process; lateral

setae situated more ventrally, anterior seta larger than posterior. Lateral line from beginning of segment 3 to beginning of segment 8, thin; segment 8 with small, soft, lobed processes directed laterally and posteriorly.

Gills single, dorsal and ventral, gills of segments 2-6 only post-segmental, in contrast to *Lepidostoma* and *Lasiocephala*.

Tergite of segment 9 indistinct, whitish; medioanal and anterior-angle seta moderately long, dark; intermediate seta small, thin; lateral seta short, thin.

Area "b" of anal legs mainly membranous dorsally, with a narrow, light brown, sclerotized stripe distally; lateral and distal parts yellowish brown; distodorsal setae black, long, the largest about 1.3 times width of head. Sclerite "c" yellowish, with brown lateral margin and a small, black seta.

Claw with a dorsal denticle; seta 1 situated on median side of basal part, short, strong; seta 3 largest on the claw, almost half as long as width of head; setae 2 and 6 moderately long; setae 7 and 8 yellow, thick; setae 5 and 4 light, thin, small, situated laterally in basal part.

Case 7-9 mm long, 2 mm wide, made of plant particles in full-grown larva, tetrahedral as in *L. hirtum* (Figure 620), usually of particles of roots or pieces of fallen leaves arranged in a regular, circular pattern

on the cylindrical tube; detritus fragments less uniform and less closely attached than in *L. hirtum*. Case uniformly wide, but tapering posteriorly; dorsal margin of anterior opening with an additional or large plant fragment; thus, cases made of sand or detritus have an oblique anterior opening, which is directed downward; posterior end with a membrane with a small round hole. Case of some full-grown larvae resembles that of 4th stage larva in being tetrahedral, anterior part made of detritus, and posterior part of sand grains (Figure 616); rarely does entire case consist of sand grains, usually consists entirely of detritus before pupation.

**Young larva.\* Stage 3.** Length 1.7-2.4 mm; width of head 0.31-0.34 mm. Head and pronotum without dots; tergites of meso- and metanotum pale, indistinct. Legs pale yellowish. Abdomen tapering posteriorly; segment 6 without ventral gills; segment 8 without lateral processes. Case straight, narrower posteriorly, round in cross section, made of sand grains, rarely with irregularly arranged pieces of detritus.

**Stage 4.** Length 2.7-4.3 mm. Sclerites lighter than in full-grown larva; head light ventrally, with sparse dots, as on pronotum; tergites of meso- and metanotum pale yellow. Fore trochanter, as in stage 3, without hairlike, ventral chaetoids. Abdomen tapering posteriorly. Case straight, made of sand grains, with obliquely truncate anterior end; posterior end closed by a

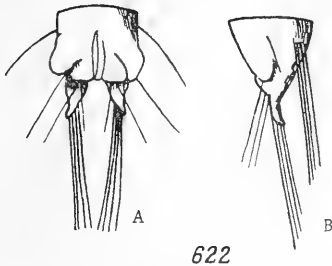
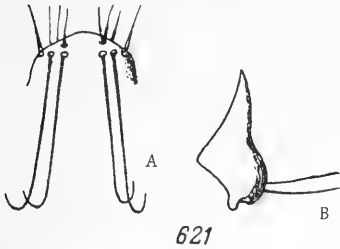
Number and arrangement of gills of *G.irrorata*

Segment	Dorsal	Ventral
2	1	1
3	1	1
4	1	1
5	1	1
6	1	1

\* After Nielsen (1942:405-479).

367 membrane with a small, round hole; some cases consist of sand in posterior half and detritus in anterior half (Figure 616), and are tetrahedral; fragments usually of different size, attached less regularly than in full-grown larvae; some cases are made entirely of detritus.

**Pupa.** Cylindrical, 5.7–6.9 mm long. Antennae of male pupae longer by almost  $\frac{1}{4}$  than body, those of female slightly shorter; scape large, wide in male pupae, with 4–6 setules. Labrum (Figure 621) short, curved downward; anterior margin with a median process and a small, thin, light seta lateral to it; only 2 of the 5 surface setae thick, long, hooked at end, black, the other 3 thin, close to anterior margin. Mandibles (Figure 621, B) short, conical; distal part with median serration; lateral margin slightly concave near wide basal part; basal setae strong, dark, relatively large, equally long.



Wing sheaths pointed, reaching middle of abdominal segment 5 in female pupae, end of segment 5 in male. Pupa, which lives in moist biotopes or in very shallow water, little adapted for swimming; natatorial setae present only on 1st segment of mid-tarsi, 28–30 dorsally, 5–7 ventrally; legs with very small claws.

Holding apparatus of abdominal segment 1 in form of a narrow, transverse, dorsal ridge at posterior margin, with 2 rounded, sclerotized lateral processes directed posteriorly and with 6–7 small spinules directed posteriorly on median sides; presegmental plates of segments 3–7 rounded, yellow; postsegmental plates on segment 5; hooks brown, numbers as follows:

III:4–6; IV:5–7; V:5–7+4–8; VI:5–7; VII:5–7. Lateral line on segments 3–8; setae pale yellowish brown on posterior segments, forming a semicircle on segment 8. Gills very small, postsegmental, dorsally on segments 2–5, ventrally on segments 2–6.\* Segment 9 of male pupae longer and wider than in female; genital appendages forming large, rounded processes, penis sheath indistinct. Anal lobes (Figure 622) short, flat, pointed, with 4 long, thick, black setae.

Case 7–8 mm long, tetrahedral as in larva, usually made of detritus only, rarely with sand grains at posterior end. Larva continues to build anterior vertical part of the case before pupation, so that the anterior opening becomes vertical, directed anteriorly; case is attached to substrate at both ends by several short, brown ligaments with terminal disks; anterior end with a sievelike membrane with numerous small holes; posterior end with similar, but smaller membrane.

\* The statements of Klapalek (1893:74) and Ulmer (1903:90) that the pupa of *C. irrorata* lacks gills are erroneous (Nielsen, 1942:475).

Mode of life and habitats. An element of the "fauna hygropetrica," usually in forests near springs, among humid moss, in shallow water between fallen leaves, or in humid detritus; Even careful search did not reveal a specimen in springs in the water; found occasionally in small overflows of springs, between roots or decaying leaves in forest brooks.

Distribution. Western part of the European USSR. In addition, Europe.

#### 368 4. Genus *Lasiocephala* Costa

**Full-grown larva.** Length 7.1–8.0 mm. Head dark, with numerous, dark, oblong dots. Pronotum uniformly dark, with light oblong dots; mesonotum dark anteriorly, lighter posteriorly; tergites of metanotum indistinct, marked by setae.

Gills single, on segments 2–6, presegmental and postsegmental on segments 3–6.

Case conical, curved, made of sand grains.

Mode of life and habitats. Brooks with cool water and moderately rapid current.

Distribution. Western part of the European USSR. In addition, Europe.

##### 1. *Lasiocephala basalis* Kolenati

Pictet, 1834:Plate XIV, Figure 3.—Hagen, 1864:238.—Mayer, 1867:168.—Klapálek, 1888:31–34, Figure 11.—Ulmer, 1903:91.—Thienemann, 1905b: 528–529, Figures 51, 121.—Ulmer, 1909:275, 317, Figure 462.—Lestage, 1921:890–896, Figures 316–318.—Brindle, 1964:198, Figure 12.

**Full-grown larva.** Length 7–9 mm; greater part of body uniformly wide. Head reddish brown, with numerous, light, oblong dots. Mandibles short, massive, blackish brown; teeth blunt, short, dorsal and ventral blades with one tooth in addition to distal tooth; brush in form of a narrow tuft of hairs near dorsal margin (Figure 623).

Number and arrangement of gills of *L. basalis*

Segment	Dorsal	Ventral
2	1	1
3	1 1	1 1
4	1 1	1 1
5	1 1	1 1
6	1 1	1 1

Pronotum reddish brown; setae, as in *Lepidostoma*, moderately long, black, situated at anterior margin and in a transverse row in middle of sclerite. Mesonotum as in *Lepidostoma*, formed by a square plate in each half, brown anteriorly, lighter posteriorly; setae at anterior and posterior margin, dark, strong, few.

Forelegs massive, as in preceding forms, much shorter than other legs.

Abdominal segment 1 without dorsal process; lateral processes blunt, low. Gills single, on segments 2–6.

Sclerite "b" of anal legs with long, black setae dorsally.

Case (Figure 624) 10–11 mm long, made of sand grains, curved, markedly narrower posteriorly, rounded in cross section.

**Pupa.** Length 7.0–7.2 mm. Antennae longer than body; basal segment of antenna of male pupae long, wide, almost twice as long as head, with black hairs and scales visible through sheath; basal segment of antenna of female pupae thinner. Labrum as in *Crunoecia*, short, wide; only 2 of the 5 surface setae long, thick, hooked, black. Mandibles short, with wide basal segment, distal part with median serration.

Wing sheaths pointed, reaching to segment 7. Spurs of forelegs shorter and thicker, those of mid- and hind legs longer and narrower, their number: 2, 4, 4. Mid-tibia and tarsus slightly thickened, with dense, long setae.

Abdominal segment 1 with a ridge at posterior margin, as in *Crunoecia*, with 2 round, hard, spinulose, lateral processes directed posteriorly. Presegmental plates of holding apparatus on segments 3–7, each with 3 hooks; postsegmental plates of

segment 5 larger, with 6 hooks. Lateral line thin, setae grayish, distinct on segments 4–8, forming an open circle on segment 8. Gills single, moderately long on segments 2–6, arrangement as in larva.

Anal appendages triangular-lobe-shaped, flat, with numerous black setae laterally and at end, 4 distal seta longer and thicker than others. Genital appendages of male pupae long, lobe-shaped, narrower distally, curved inward; penis sheath short, bilobed.

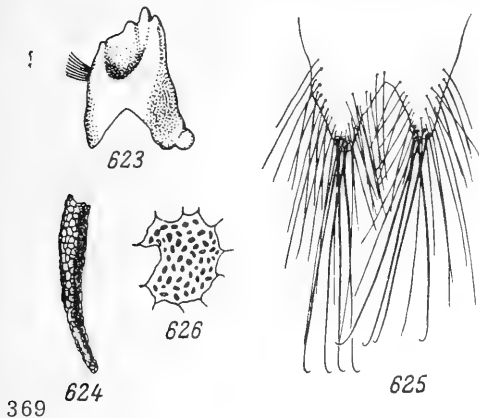
Pupal case 10–11 mm long, made of sand grains, conical, curved, with anterior and posterior sievelike membranes (Figure 626); anterior end covered by a small stone; case attached to a stone, a plant, or another case by short ligaments with terminal disks; pupal cases sometimes in clusters.

Mode of life and habitats. Brooks and small rivulets.

Distribution. Western part of the European USSR. In addition, Europe.

## V. Family BRACHYCENTRIDAE Ulmer

**Full-grown larva.** Length 6–14 mm. Body slightly narrower posteriorly; head slightly wider than long; dorsal surface flat, bordered in some species by a horseshoe-shaped ridge; frontoclypeus long, wider anteriorly; antennae situated about in middle between eye and anterior margin. Gula wide, gular suture absent.



FIGURES 623–626. *Lasiocephala basalis* Kol.:

623 – right mandible, median side; 624 – larval case. Pupa: 625 – anal lobes; 626 – membrane at posterior end of case (625 – after Thienemann, the others after Klapálek).

Pronotum with characteristic, curved, transverse ridge. Mesonotum of most species consisting of 2 sclerites in each half, divided by a light suture. Metanotum with 2 tergites near anterior margin: a medioanal sclerite close to anterior margin, and a lateral tergite.

Forelegs short, coxa massive, femur high, tibia and tarsus short; claw large, thick. Mid- and hind legs long, much longer than forelegs; femur with a regular row of small spinules at ventral margin; tibia and tarsus with distoventral process, only on tibia in some species; claw very long.

Lateral line on segments 3-7. Gills on segments 2-6 and 2-7, single or intersegmental with 2-7 filaments; gills sometimes absent. Anal legs short, with wide area "b"; claw small, with large dorsal denticle.

Case straight, smooth, narrower posteriorly, made only of secretion or covered with small sand grains, or with regular, transversely arranged, thin pieces of detritus, tetrahedral in latter case.

**Pupa.** Length 6-8 mm. Body almost uniformly wide, sharply narrowing posteriorly. Antennae shorter than body. Labrum rounded or narrower anteriorly, anteclypeus wider. Mandibles in some species with long, thin, distal part; serration fine, indistinct; distal part sometimes short. Mid-tarsi with dense natatorial setae.

Lateral line on segments 5-8. Gills as in larva. Anal rods thin, slightly curved, pointed.

Case as in larva; anterior end closed with a solid membrane with sieve-like, central part with small holes; posterior membrane similar or with a single central hole.

Mode of life and habitats. Running water bodies of various types.

Distribution. The European and Asiatic USSR. In addition, Europe, Asia, North America, China, Japan.

## Key to Genera

### Full-grown larva

- 1 (2). Small, 6-10 mm. Mesonotum with 1 or 2 sclerites in each half; tibiae and tarsi without distoventral tubercle or process, or tubercles present only on tarsi; gills absent, rarely small and single; case smooth, conical, made of fine sand grains, rarely of secretion . . . . . 4. **Micrasema** McL. (p. 492)
- 370 2 (1). Length 10-14 mm; mesonotum with 2 sclerites in each half; mid-tibia with large, distoventral process.
- 3 (6). Length 10-12 mm; basal part of coxae with 1 or 2 dorsal rows of large, hooked, dark processes; femur ventrally with a row of light spinules and small light setae; gills in form of small tufts; the European and Asiatic USSR.
- 4 (5). Head light, with dark pattern, or brownish; tarsi without distoventral process; case made of detritus, tetrahedral, or made of secretion, brown to dark brown, with irregular tetrahedral, rarely round cross section . . . . . 1. **Brachycentrus** Curt. (p. 463)
- 5 (4). Head dark brown; tarsi with distoventral process; case made of sand grains . . . . . 3. **Oligoplectrum** McL. (p. 485)

- 6 (3). Length 12–14 mm; ventral side of femur with spinules only; gills single; case tetrahedral, made of large, coarse pieces of detritus, rarely of secretion, blackish brown; the Asiatic USSR . . . . . 2. *Oligoplectrodes* Mart. (p. 478)

Pupa

- 1 (4). Case made of sand grains, conical, narrower posteriorly, smooth.
- 2 (3). Length 6–10 mm; gills absent or present only on dorsal side, small, single . . . . . 4. *Micrasema* McL. (p. 492)
- 3 (2). Length 10–12 mm; gills with 2–3 filaments, in dorsal, pleural (segment 2), and ventral rows . . . . 3. *Oligoplectrum* McL. (p. 485)
- 4 (1). Case tetrahedral, made of detritus, rarely of secretion.
- 5 (6). Gills forming tufts; case 11–14 mm long, made of regularly arranged, straight, thin pieces of detritus; case yellowish or brown when made of secretion; the European USSR, Siberia . . . . . 1. *Brachycentrus* Curt. (p. 463)
- 6 (5). Gills single; case 13–16 mm long, made of detritus, tetrahedral, detritus particles coarse, not always smooth, or made of secretion, blackish brown; the Asiatic USSR . . . . . 2. *Oligoplectrodes* Mart. (p. 478)

1. Genus *Brachycentrus* Curtis

**Full-grown larva.** Length 8–12 mm. Dorsal side of head light yellow, with distinct, dark pattern, or entirely dark, chestnut brown. Mesonotum sclerotized, with 2 sclerites on each side; metanotum membranous, with a transverse, curved row of 4 small, dark sclerites. Mid- and hind tibiae with large distoventral process; claw thin, very long. Gills short, with 1–7 filaments. Case tetrahedral, made of transversely arranged, small pieces of detritus, rarely of mineral particles, sometimes of secretion.

**Pupa.** Length of male pupae, 8 mm, of female 10 mm. Antennae reaching segments 6–8 or end of body. Number of spurs 2, 3, 3. Gills on segments 2–6. Case as in larva, anterior and posterior membranous covers with several small holes; case attached at anterior and posterior end.

**Mode of life and habitats.** Running water of various types.

**Distribution.** The European USSR, including the Caucasus; Middle Asia, Siberia, the Amur region. In addition, Iran, Pakistan, China, Japan, North America.

Key to Species

Full-grown larva

- 1 (4). Case made of detritus or secretion.
- 2 (3). Head yellowish dorsally, with distinct, dark pattern in middle; widely distributed . . . . . 1. *B. subnubilus* Curt. (p. 464)

- 3 (2). Dorsal side of head entirely dark chestnut brown; southwestern border region of the European USSR . . . . . 2. *B. montanus* Klap. (p. 472)
- 4 (1). Case made of mineral or of plant and mineral particles; head blackish brown dorsally; mesonotum and metanotum with brownish sclerites . . . . . 3. *B. caucasicus* Mart. (p. 474)

371 1. *Brachycentrus subnubilus* Curtis

Pictet, 1834:180, Plate XIV, Figure 4. — Eaton, 1867:399, Figures 7, 8. — McLachlan, 1872:166; 1874:257–259. — Ulmer, 1903:87, Figures 6, 17, 28, 57, 97, 113; 1903c:346–347. — Siltala, 1905:21–26, Figure 6. — Ulmer, 1909: 275–278, Figures 412, a, f, h, g, i. — Lestage, 1921:862–872, Figures 309, f–i, 310, A, 311, 312, A. — Lepneva, 1940:217–218, Figure 161. — Hickin, 1943:81–83, Figures 1–10. — Brindle, 1964:197, Figure 8.

**Full-grown larva.** Head slightly oblong, ground color light yellow; pattern distinct, chestnut brown (Figure 627, A). Frontoclypeus large, long, narrower posteriorly; anterior part with indistinct, longitudinal, median stripe with 2 large, light dots and 2 less distinct dots; posterior part mainly chestnut brown, with a wedge-shaped pattern of 8–10 light yellow dots, 2 similar dots lateral to pattern; posterior angle light. Frontal sutures laterally with dorsal stripes, which are indistinct, pale brownish anteriorly, wider posteriorly from eye to seta 17, distinct, chestnut brown, with 3 pairs of transversely fused, large, light dots; a lighter area near fork of frontal sutures; area near occipital foramen dark brown dorsally and laterally, with small, round, light dots; ventral side chestnut brown, lateral to gular suture and posteriorly with numerous indistinct dots; broad, blackish brown stripes, tapering posteriorly, along the gular suture. Gula oblong-trapezoidal, dark chestnut brown, narrower posteriorly; pregula in form of a narrow, yellowish brown, transverse stripe (Figure 627, B).

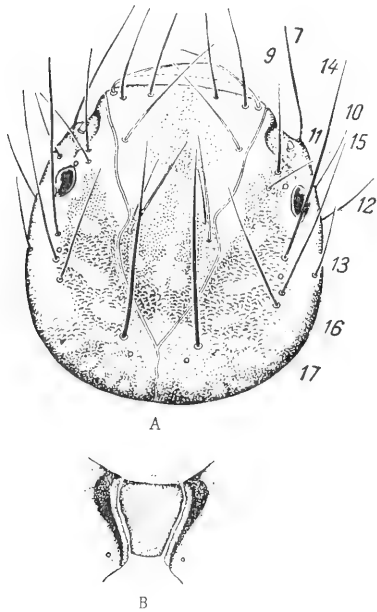


FIGURE 627. *Brachycentrus subnubilus* Curt. Head, dorsal (A), gula (B)

Median and intermediate, anterior-margin setae light brown, moderately long, latter slightly larger than former, lateral anterior-margin seta large, almost as large as median, curved inward; anterior frontal seta similar, procumbent; intermediate frontal seta small, light, thin; posterior frontal seta larger, light brown, situated near intermediate seta. Seta 7 moderately long, light brown, thinner than anterior-margin setae, situated ventral to antenna and at its level; seta 9 moderately long, dark



brown, situated medial to anterior margin of eye; seta 10 small, light, situated ventral to eye; seta 11 brownish, thin, small, situated behind 9; seta 14 large, dark brown, situated behind eye; seta 12 thin, light, short, situated lateral to eye; seta 13 small, light, situated between 12 and 14; seta 15 thin, light brown, long, slightly longer than 14; seta 16 situated immediately behind 15, brown, moderately long, shorter and thicker than 15; seta 17 thick, dark brown, very long, longest on the head; ventral seta 8 small, light, thin; seta 18 minute.

Labrum wide, short, chestnut brown, with slightly concave posterior margin; posterior-angle sclerites with blackish brown basal spots; seta 1 situated at margin of median depression in form of a small, thin, light spine; seta 2 situated nearby in form of a large, thick spine directed inward; seta 4 similar, situated posteriorly and lateral to depression; seta 3 situated at anterior angle, short, light; setae 5 and 6 slightly larger, brown, former slightly longer than latter.

Mandibles short, spatulate, with shallow median indentation, blackish brown in middle, brown basally, reddish brown apically; teeth situated distally, a large and a small tooth dorsal to large median tooth on left mandible; 2 small teeth dorsal to median tooth on right mandible; one tooth on both mandibles ventral to medium tooth; brush in form of a small tuft of chaetoids near dorsal margin of median indentation; lateral setae situated basally, light, relatively large, of equal length.

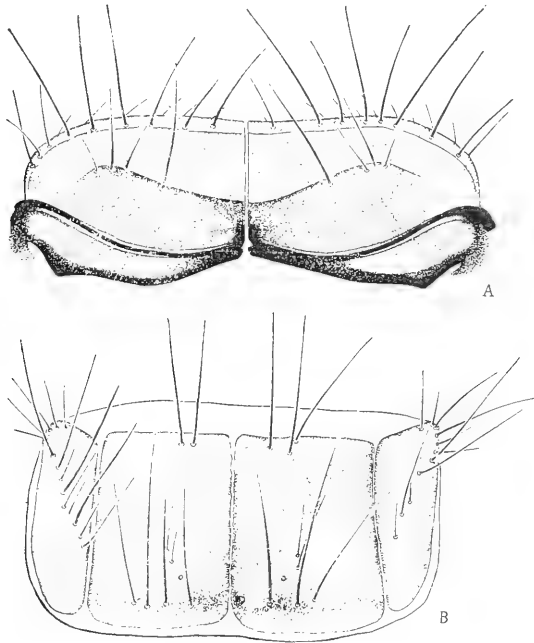


FIGURE 628. *Brachycentrus subnubilus* Curt. Pronotum (A) and mesonotum (B)

Sclerites of cardo transverse, blackish brown, with narrow lateral parts; lateral seta light, small, 2nd seta situated medially; brownish, relatively large. Sclerites of submentum represented by 2 pale, yellowish, oblique, wide plates; seta moderately long, light yellowish. Stipes brownish; setae yellowish, as on submentum, about the same length. Palpifer brownish, membranous part with numerous, thin hairs; primary distal seta situated among hairs on membrane, strong, large, brown; median basal seta small, light. Segments of maxillary palps about the same length, tapering distally. Mentum relatively narrow, reddish brown. Ventral sclerites represented by relatively large, brown rods; seta situated subapically, small, light. Labial palps small.

Pronotum (Figure 628, A) with a thin, curved, transverse ridge; area behind ridge chestnut brown with large light spots; anterior and lateral area light yellowish; anterior margin grayish brown, narrow; posterior margin wide, brownish, separated by a reddish brown groove from other surface, posterior margin wide, blackish brown, reaching anterior groove in middle. Setae brownish; anterior margin with 4 thick, moderately long, and 4-5 short, thinner setae; a row of small, light setae along entire anterior margin; a moderately long, medioanal seta on ridge, one short and 2 small, thin setae near lateral end of ridge; 2 short, thin setae near lateral margin. Tergites of mesonotum (Figure 628, B) oblong, light chestnut brown, median tergites almost twice as wide as lateral, with light dots; median tergites with 2 moderately long setae anteriorly near suture, 4 large setae posteriorly, one of them (primary medioanal) long, 2 others slightly smaller, 4th thinner, moderately long; lateral tergite with a group of 3-5 short to moderately long, thin setae near anterior angle, an oblique row of 3 large, long, brown setae further posteriorly (the anterior seta is the primary anterior-angle seta), and 5-6 moderate-sized to short, light, thin setae.

Tergites of metanotum chestnut brown, median pair indistinct, with 5 long, brown setae, including a large medioanal seta and 2-3 small, light setae; anterior-margin seta situated before sclerites, thin, small, light; lateral tergites in form of oblongate triangles, their anterior angle projecting anteriorly, margin with a row of 4-5 large, thick, brown setae, including primary anterior-angle seta, and with 3-4 smaller, and 2-3 small, light setae.

373 Propleuron oblong, brown, with a large, blackish brown spot on site of pleural suture; process of trochantin and anterior margin of episternum reddish; seta of epimeron situated on surface near spot, brown; seta of trochantin similar, situated near process, setule light, large, situated distally. Mesopleuron triangular, brown, pleural suture in form of a reddish brown stripe; epimeron larger than episternum, with a brownish, distal seta; episternum with reddish distal margin and 3 setae, including a larger primary seta. Metapleuron with a pale yellowish process of epimeron; setae brown; 3 large setae at distal margin of episternum, one of them primary; also one short and 2 small, light setae; epimeron with a row of similar setae distally, including a longer primary seta.

Legs yellowish brown, without dots; ratio of length of legs 47:100:106; large setae brown or chestnut brown.

Forelegs short, massive (Figure 629, A, B). Coxa with shallow, distodorsal indentation; basodorsal seta moderately long, chestnut brown, situated near dark basal margin; anterior apical dorsal seta short, strong, chestnut brown; posterior apical dorsal seta long, brown, situated some distance from apex of depression; 2 long, brown, secondary setae, longer and slightly thicker than primary setae further distally at posterior margin of depression; anterior primary setae short, strong, reddish brown, branched at apex, 1st subdorsally in basal part, 2nd distally, about in middle of coxa, shorter and lighter than 1st; posterior surface with 1-3 thin, moderately long, secondary setae; distoventral setae moderately long, thin, strong, posterior seta slightly longer and thinner than anterior.

Anterior primary seta of trochanter situated distally, small, light, strong; posterior primary seta subventral, some distance from distal margin, slightly longer and thinner; basoventral seta thin, strong, moderately long; the distal of 2 anterior ventral setae in form of a small, pointed, brownish spine situated on a small tubercle, the other also a light, but slightly longer and thinner, spine; both posterior ventral setae light, moderately long; distal part ventrally with a dense row of fine, light, hairlike chaetoids.

Femur short, high; apical dorsal seta short, basodorsal seta similar, but slightly thinner, each accompanied by a small secondary seta; anterior seta situated subapically, short, branched at apex; posterior seta situated subventrally at distal margin, short, light; primary ventral setae light, thick, spine-shaped, apical ventral seta moderately long, basoventral seta short, situated in middle of femur; a row of small, light, dense spinules at margin, fine, whitish, hairlike chaetoids, similar to those on trochanter, along entire femur posterior to them; a row of shorter, thin, straight spinules posteriorly at distal margin.

Tibia and tarsus short, shorter together than femur; primary setae of tibia situated in distal part; 2 subapical, posterior setae: a light, moderately long, dorsal, and a slightly longer and thinner, brown, subdorsal seta; anterior setae, a dorsal and a subdorsal, situated more basally, the former straight, thin, light; the latter short, brown, thick, spine-shaped; posterior distoventral seta represented by large, light spine; anterior distoventral seta situated subventrally some distance from margin, much smaller, brown; a group of spinules near posterior distoventral seta; posterior surface of tibia subdorsally in middle with a group of very thin, setiform spinules, a dense row of similar spinules subventrally.

Tarsus short, with 2 primary, light, moderately long setae, one anterior and one posterior dorsally, the latter slightly longer; the anterior of the 2 primary, subventral setae short, the posterior longer, both brown; a group of thin, straight spinules on posterior surface, a row of similar spinules at distal margin; ventral side with 2 rows of spinules, one anterior and one posterior. Claw large, longer than tarsus, thick at base, slightly curved; basal seta in form of large, blunt, light spine and with several, small spinules.

Mid-coxa (Figure 629, C) moderately long, with small, distodorsal indentation; basal part with 2 large, wide, hook-shaped processes, 2-3 smaller processes, and a group of small, scale-shaped chaetoids dorsally; 2-3 large, hook-shaped processes and 3-5 small processes near anterior margin. Basodorsal seta brown, thick, moderately long; anterior apical dorsal seta short, light, strong, situated basal to margin of indentation;

a row of short, secondary setae, some of them branched at apex between setae and further distally; both primary anterior setae situated distally, reddish brown, uniformly thick, branched at apex; subdorsal seta short, 2nd seta moderately long, situated in middle of coxa; posterior primary distodorsal seta light brown, moderately long, situated basal to apex of depression; 5-6 posterior, secondary setae basally, and 1-2 subventrally in distal part; distoventral setae light brown, moderately long, anterior thicker than posterior.

374



FIGURE 629. *Brachycentrus subnubilus* Curt. Legs, posterior, except B; foreleg (A), fore coxa and trochanter, anterior (B), midleg (C), and hind leg (D)

Anterior seta of trochanter small, brown; posterior seta lighter, thinner, slightly larger, both situated distally; basoventral seta light, moderately long,

situated on suture; several small spinules further basally; anterior apical ventral seta represented by large, light spine, subapical seta in form of a similar but larger spine; several small spinules basal to former spine;

(375) Number and arrangement of gills of *B. subnubilus* (after Siltala, with modifications)

Segment	Dorsal	Ventral
2	5-6	1 (0)
3	4-6	1
4	4-6	1
5	3-6	1
6	3-6	1
7	2-3 (0)	

posterior ventral setae, apical and subapical, situated near anterior setae, light, small, slightly longer and thinner.

Femur long, with slightly convex dorsal and ventral margin; apical dorsal seta and basodorsal seta short, light, thin; 4-5 short, secondary setae between them, 3-4 smaller setae further basally; one posterior and 1-2 short, thicker, anterior, subdorsal setae nearby in distal half; 1st of 2 primary ventral setae situated subapically, the 2nd closer to middle of segment, both short, light, the 2nd slightly longer and thicker; small, light, spine-shaped, secondary setae about the same size, situated at intervals along ventral margin; between them, 9-12 groups of small spinules (Figure 629, C), 3-5 at basal margin.

375 Tibia short, narrow basally, strongly curved, wide distally, with large distoventral process, slightly more than  $\frac{1}{3}$  as long as femur; dorsal setae forming a subapical pair, dorsal seta thin, moderately long, light, directed upward, subdorsal seta thicker, situated slightly posteriorly and directed distally; setae of 2nd dorsal pair situated about in the middle of the tibia, dorsal seta thin, subdorsal (situated anteriorly and slightly basally) larger and thicker; posterior distoventral seta in form of large, thick, moderately long spine on the process; anterior distoventral seta situated basally, short, in form of a light spine; a dense row of light spinules between setae, at the margin, those near basal margin smaller; distal spine (near the process) larger than others, another similar spine near distoventral seta; 5 small spinules situated basal to primary basal seta at dorsal margin of the process.

Tarsus thinner than tibia; dorsal setae light, distal seta short, the 2nd slightly larger, situated in basal part; distoventral setae represented by spines, posterior thin, yellowish, anterior light, shorter, and thicker, with 3-4 small spinules basally; a regular row of small spinules at ventral margin, a small, light, spine-shaped seta further basally.

Claw reddish brown, long, thin, slightly longer than tarsus, basal seta in form of thin, pointed, light spine.

Hind legs (Figure 629, D) resembling midlegs. Coxa slightly longer, its basal part with 2-3 large, tooth-shaped processes, and 5-7 smaller processes subdorsally. Basodorsal seta reddish brown, strong, moderately long; anterior apical dorsal seta brown, shorter; 5-6 short, light brown, secondary setae situated at margin among the preceding two; posterior apical dorsal seta brown, moderately long, thin; 4 light brown, secondary setae, 2 long, 2 shorter, further distally at margin; basal part with 4 large, thin, brown, secondary setae near processes; 2 similar subventral setae

submarginally; one of the 2 primary anterior setae long, situated in middle, longer than on midlegs and the longest on the coxa, with thin (not branched) apex; 2nd seta much smaller, subdorsal; 4-5 short, light setae ventrally

on coxa, basal one larger than others; primary distoventral setae light, moderately long, the posterior one slightly thinner and longer.

Trochanter slightly thinner and longer than on midlegs; anterior seta large, brownish, branched at apex; posterior seta situated more dorsally, longer, light, thin; basoventral seta light, longer than on mid-trochanter, and reaching end of segment; anterior ventral setae, apical and subapical, in form of small, light spines; posterior ventral setae situated near anterior setae, very thin, pale, subapical one short, apical one smaller; a group of minute spinules near apical setae.

Femur slightly narrower than that of midlegs, also long, with black dorsal stripe; chaetotaxy similar; one (sometimes 2) short setae situated subdorsally near secondary dorsal setae, as on mid-femur, anteriorly and posteriorly, anterior seta with slightly branched apex; As only anterior primary setae of the coxa and

trochanter are branched, it may be assumed that the short, subdorsal setae of mid- and hind femora are anterior and posterior primary setae.

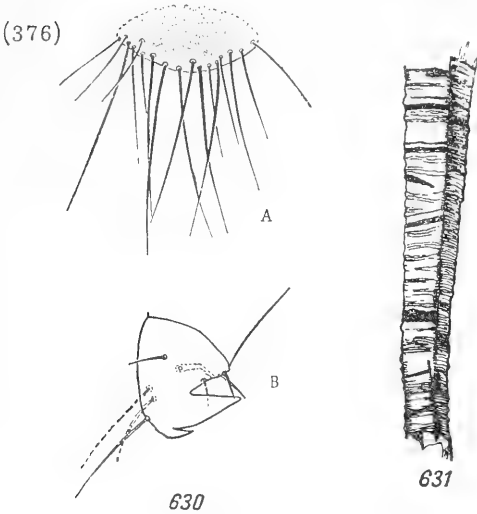
Tibia and tarsus as on midlegs; tibia slightly wider distally; chaetotaxy the same. Claw similar, long, reddish brown; basal spine large, thin, with 5 small, basal spinules.

Abdominal segment 1 with an indistinct elevation of dorsal side instead of a dorsal process; elevations replacing lateral processes more distinct, situated slightly more ventrally than usual. Lateral line thin, with small, grayish hairs on segments 3-7; sclerotized dots dorsal to lateral line, dots on segment 7 more numerous.

Gills small, dorsal gills postsegmental (almost intersegmental) on segments 2-7 in form of 2-6 short, thick filaments; pleural gills with a single filament on segments 2-7 immediately below lateral line; ventral gills with a single filament on segments 2-7. Siltala (1905:23) considered these gills as pleural, apparently having overlooked the small gills near the lateral line.

376 Tergite of segment 9 pale, whitish yellow, indistinct; setae situated apically and subapically, a median group of 8 long, brown setae, and 5-6 thin, light brown, short to moderately long, setae on each side (Figure 630, A).

Anal legs short, thick; area "b" incompletely sclerotized, median margin indistinct; sclerite brown, with long ventral process; a row of 10-12 brown



FIGURES 630 and 631. *Brachycentrus subnubilus* Curt.:

630 - tergite of segment 9 (A), claw of anal leg, inner side (B); 631 - larval case.

setae dorsally at distal margin, median distal and neighboring seta long, thicker, and darker than others; only one seta of moderate length near median margin subapically close to median distal seta; ventral seta short, thin, light. Sclerite "c" brown, wide, narrower basally, with a small, light, basal seta.

Claw (Figure 630, B) of characteristic form, strongly convex basally, with pointed, reddish apex with 2 large, dorsal denticles; 2 parts divided by narrow suture; seta 1 situated in basal part, short, brown; seta 2 thin, light, moderately long, situated dorsally above suture; seta 3 similar, situated dorsally in distal part; seta 6 situated laterally near end of suture, shorter than 2; setae 7 and 8 situated ventrally in basal part, short, light, spine-shaped; seta 5 minute, situated lateral to seta 8; seta 4 situated medially, slightly larger, both light, very thin.

Case 10–12 mm long (Figure 631), in form of straight tube, slightly narrower posteriorly, usually tetrahedral, made of secretion and covered with regular, narrow, transversely arranged, pieces of detritus; edges sometimes smooth or case with round cross section, and made in part or entirely of secretion; case attached at anterior end, lies against the current (see Vol. II, No. 1, p. 121). Sometimes a large number of cases in one place.

**Pupa.** Length of male pupae 8 mm; female, 9.0–10.5 mm; antennae of male pupae reaching middle of segment 8, those of female, segment 6; scape with short, light setae.

Labrum narrower anteriorly, with slightly projecting median part; seta 1 situated at anterior margin, short, thin, light, other 5 setae strong, yellowish, large, forming 2 rows on a light area; anteclypeus with 2 strong, large setae and a smaller, light, lateral seta. Mandibles with wide base and a narrow, long, slightly curved, distal part with serrated median side; lateral setae strong, yellowish brown, dorsal seta slightly larger than ventral.

(377)

Number and arrangement of gills of the pupa of *B. subnubilus* (after Siltala)

Segment	Dorsal	Pleural	Ventral
2	5-6		1
3	6	1	1
4	3-6	1	1
5		1	1
6		0-1	1

Sheaths of fore wings reaching beginning of segments 5–6, those of hind wings shorter. Fore and mid-tibiae and tarsi with natatorial setae, dense on midlegs, sparser on forelegs.

Abdominal segment 1 brown dorsally near posterior margin, saddle-shaped, with 2 darker, lateral elevations with small, black spinules; holding apparatus of segments 3–7 represented by small elliptical, presegmental

plates, and a row of hooks at posterior margin of segment 5; number of spinules: III:5-9; IV:5-8; V:3-9+19-27; VI:2-10; VII:4-11.

Lateral line on segments 5-8.

Gills as in larva, dorsal, pleural, and ventral; dorsal postsegmental (intersegmental) gills of segments 2-4 small, with 3-6 filaments; pleural and ventral gills with a single filament on segments 2-6.

Anal segment narrower posteriorly; anal rods small, thin, curved upward.

377 Pupal case dark brown, tetrahedral, 9-12 mm long, sometimes made in part or entirely of secretion; edges rounded, sometimes absent, so that cross section is round. Anterior and posterior openings with a brown membrane with several holes in middle; number of holes very variable, 8-25 anteriorly, 5-17 in posterior membrane. Case attached at both ends, anteriorly by 2 large disks on thick stalks and several small ligaments, posterior disks smaller, both at ventral side.

Mode of life and habitats. Calm rivers and rivulets, large rivers (Dnepr, Don, Volga, Oka, Kama, Ob', Yenisei), close to the bank in the Yenisei, in parts with slow current, mainly in upper and middle reaches, often among vegetation. Larvae feed on microorganisms and detritus carried by the current, which they capture with spinules and setae of the legs held before the mouth.

Distribution. The European USSR. Siberia, the Amur Region. In addition, Europe, Iran.

## 2. *Brachycentrus montanus* Klapálek

Klapálek, 1893:55-59, Figures 1-11. — Ulmer, 1903:87. — Lestage, 1921:862-871, Figures 309, b, e, k, 310, b, 312, b.

**Full-grown larva.** Length 10-11 mm. Dorsal side of head mainly chestnut brown, in contrast to *B. subnubilus*; posterior part of frontoclypeus with 5-6 small, light dots; similar larger dots lateral to frontal sutures and in posterior part. Gula narrow, dark, trapezoidal. Mouth parts as in *B. subnubilus*; mandibles as in Figure 632.

Number and arrangement of gills of *B. montanus* (after Klapálek)

Segment	Dorsal	Ventral
2	6	1
3	6	1
4	6	1
6	6	1
7	6	1
8	3	

Pronotum with curved transverse ridge, as in *B. subnubilus*, brown, slightly darker in middle and at anterior margin.

Tergites of mesonotum dark brown, median tergites larger, with indistinct, light dots; chaetotaxy as in *B. subnubilus*. Tergites of metanotum with a transverse row of 6 dark setae; lateral tergites with a row of setae of different length anteriorly.

Legs yellowish brown; femora brown at dorsal margin; chaetotaxy, form, and size of segments as in *B. subnubilus*.



Abdominal segment 1 as in *B. subnubilus*, without dorsal tubercle; lateral tubercles indistinct. Lateral line thin, on segments 3-7, with sparse, brown hairs; several sclerotized dots in anterior part of each segment dorsal to lateral line. Gills postsegmental (almost intersegmental), on segments 2-7.

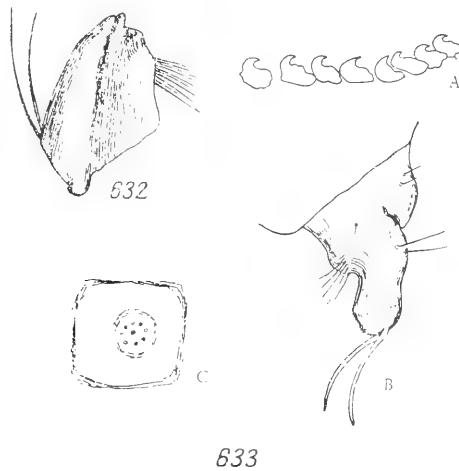
Tergite of abdominal segment 9 short, transverse, rounded posteriorly, with numerous setae.

Sclerite "b" of anal legs with black, distal setae, including 3 dorsal setae larger than others. Claw with 2 large, dorsal denticles.

Case tetrahedral, 12-13 mm long, made of small, transversely arranged pieces of detritus; posterior opening with a thin membrane bulging outside, and with a large round hole.

**Pupa.** Length of male pupae 7.2-7.5 mm, of female 8.0-8.5 mm. Antennae of male pupae reaching end of body, those of female, segment 8; scape of antenna slightly longer and thicker than following segments.

378



FIGURES 632 and 633. *Brachycentrus montanus* Klap.:

632 - right mandible, ventral; pupa: 633 - postsegmental row of hooks on segment 5 (A); posterior end of male lateral (B); membrane at anterior end of case (C) (633, A - after Thienemann; others after Klapálek).

Labrum as in *B. subnubilus*. Mandibles shorter and wider distally than in *B. subnubilus*, with serrated median side; lateral setae situated basally, yellowish brown, about equal in size.

Wing sheaths wide, pointed, anterior sheaths reaching end of segment 6, posterior sheaths shorter. Mid-tibia and tarsus with dense natatorial setae; forelegs with sparse natatorial setae.

Abdominal segment 1 with blackish brown elevations covered with spinules laterally at posterior margin; holding apparatus on segments 3-7; presegmental plates with hooks as follows: III:5-8; IV:6-10; V:5-10; VI:7-10;

VII:6-12; segment 5 of male pupae with a continuous, transverse row of hooks directed anteriorly at posterior margin (Figure 633, A); female pupae with a similar row but with a gap in its middle.

Gills on segments 2-6.

Lateral line distinct, on segments 5-8; setae thin, brown.

Anal rods short, curved; genital appendages of male pupae wide, rounded posteriorly; penis sheath in form of small tubercle (Figure 633, B).

Pupal case 9-12 mm long, tetrahedral, covered with small, transversely arranged pieces of detritus. Anterior end closed by a pale, brownish membrane with 6-11 small holes in middle (Figure 633, C); posterior membrane with 5-6 small holes; case attached at both ends to a stone or another object; both ends, especially anterior end, protected by fragments of conifer needles or other plants.

Mode of life and habitats. Mountain brooks and rivulets, often in large numbers.

Distribution. USSR: the western part of the Ukraine. In addition, Europe.

### 3. *Brachycentrus caucasicus* Martynov

Martynov, 1926:38-40.

**Full-grown larva.** Length 11.0-11.5 mm. Head (Figure 634, A) slightly oblong, mainly reddish chestnut brown on dorsal side, lighter near tentorial pits, at angle and laterally; posterior part of frontoclypeus with 3 small, light spots; 3 larger spots on site of dorsal stripes, and several smaller spots in posterior part lateral to coronal suture; dorsal side, as in other species of *Brachycentrus*, with a large, flat, median area; small, flat, tubercles behind eye and in posterior part of frontoclypeus. Ventral side of head, including gula, dark reddish brown, less dark posteriorly, with large, light dots. Gula reddish brown, trapezoidal, slightly oblong, wider anteriorly, with rounded posterior angles (Figure 634, B).

Number and arrangement of gills of pupa of *B. montanus*  
(after Klapálek)

Segment	Dorsal	Pleural	Ventral
2	7	1	1
3	6-7	1	1
4	6	1	1
5		1	1 (0)
6		1 (0)	

379 Median and intermediate anterior-margin setae reddish brown, strong, moderately long, the former slightly longer; lateral anterior-margin seta

large, light, directed inward. Seta 7 situated ventral to antenna, slightly larger than the lateral seta, light; seta 9 situated slightly anterior and medial to eye, reddish brown, strong, moderately long; seta 11 situated behind 9, small, thin; seta 10 lateral to anterior margin of eye, light; seta 14 situated behind eye, strong, moderately long, dark brown; seta 12 lateral to eye, thin, moderately long, brown; seta 13 almost as long as 12, procumbent, directed anteriorly, situated slightly behind and lateral to seta 14; seta 15 long, thin, yellowish brown, longer than 14; seta 16 situated slightly posteriorly, strong, reddish brown, moderately long, directed inward; seta 17 lateral to fork of frontal sutures, long, strong, reddish brown, larger than the other setae; setae behind eye situated at margin of flat area between tuberculate and smooth parts of head. Ventral seta 8 short, light; seta 18 small.

Labrum short, uniformly reddish brown; posterior-angle sclerites darker; seta 1 in form of large, blunt, light spine; seta 2 thinner, slightly longer, light; seta 4 thin, light, spine-shaped, situated laterally at posterior margin of median depression; seta 3 short, light, situated near anterior-angle sclerite; setae 5 and 6 thicker, large, reddish brown.

Mandibles short, brown; teeth situated distally, small, except larger median tooth; dorsal blade of left mandible with 2 small, widely spaced teeth; ventral blade with one tooth; dorsal blade of right mandible with 2 teeth in addition to distal tooth; ventral blade with one tooth; lateral setae light, relatively large, reaching end of mandible; dorsal seta slightly larger than ventral.

Sclerites of cardo dark reddish brown; seta short, strong, brown; 2nd (lateral) seta small, light. Sclerites of submentum in form of 2 wide, oblique, brown plates; seta strong, brown, moderately long. Stipes yellowish brown, setae strong, moderately long, of equal length. Palpifer reddish brown; both setae on membrane, distal seta short, strong; median seta small, light. Palp short, basal segment larger than 3 following segments, which are of almost equal length. Mentum reddish brown, forming a wide semicircle; ventral rods large, brown, seta small, thin, light. Labial palps situated on an elevation, with a brown sclerite; sensillae large.

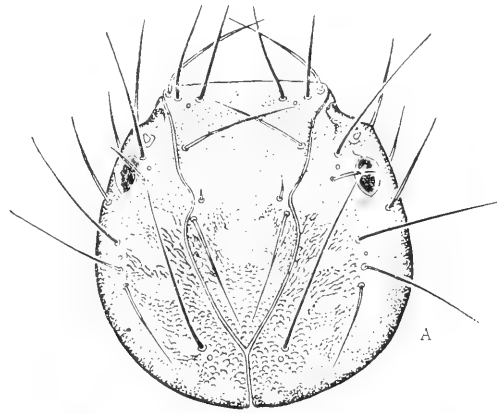
Pronotum (Figure 635, A) mainly light chestnut brown; anterior and posterior parts differing only slightly in color, in contrast to *B. subnubilus*; transverse ridge in form of a dark reddish brown stripe; surface behind it only slightly darker than anterior surface; light dots in posterior part less distinct than in *B. subnubilus*. Anterior margin in form of narrow, smooth stripe, no darker than surface; posterior margin wide, separated anteriorly by a blackish brown groove, posterior margin blackish brown in middle, dark brown laterally; margin with light dots. Anterior margin with 6 regularly spaced, moderately long, strong, brown setae; 5-6 shorter, thinner setae between and lateral to them; margin also with 7-9 small, thin, light, sparse setae, and a row of minute, pale spinules; in middle on the ridge a long, brown medioanal seta; 3 light setae laterally, 2 of them short, and a thicker, moderately long, 3rd seta between them.

Tergites of mesonotum brown; light dots on median tergites less distinct than in *B. subnubilus*; tergites with 3-4 brown, moderately long setae near anterior margin, one (primary) larger than others; 4 long, including 3 primary, setae near posterior margin; lateral tergites with an anterior-angle group of 5 setae and an oblique row of 8 setae, 5 of them long, reddish brown.

Tergites of metanotum brownish, median tergites indistinct, with 4 long, strong setae, lateral tergites with an oblique row of 6-8 long, and 5-9 thin, short setae.

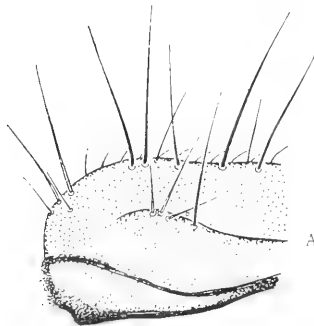
Pleurites brown. Propleuron in form of an oblong plate, with short, dark reddish brown, pleural suture, epimeron lobed, lighter, and smaller than episternum, seta near suture thin, moderately long; episternum fused with trochantin, reddish brown near anterior margin, tuberculate; trochantin in form of a lobed, lateral process; basal seta short, brown; subapical setule light, relatively large.

(380) Mesopleuron long, triangular, brown; pleural suture brownish to dark brown, setae brown; epimeron larger than episternum, posterior distal seta



634

B



635



B

FIGURES 634 and 635. *Brachycentrus caucasicus* Mart.:

634 - head, dorsal (A) and ventral (B); 635 - pronotum (A), larval case (B).

380 thin, moderately long; distal margin of episternum indistinct, reddish brown, 3 setae near margin, 2 of them long, the 3rd (at suture) thinner and shorter; a light setule anteriorly on membrane.

Metapleuron broadly triangular; epimeron much larger than on metathorax, ventral process whitish, pale, indistinct, brownish only at base; episternum with 4 moderately long setae at distal margin, fifth seta situated on membrane, thinner and smaller than others; a light setule at margin.

Form, size, and chaetotaxy of legs as in *B. subnubilus*; legs darker, reddish brown, dark brown in some places.

Basodorsal seta of fore coxa strong, dark reddish brown, moderately long; anterior apical dorsal seta also situated in basal part, short, brown; one primary anterior seta situated basally at dorsal margin; 2nd primary anterior seta situated in middle of coxa, both branched apically; posterior distodorsal seta situated at apex of depression, moderately long; 2 thin, long, secondary setae situated at margin of depression; subdorsal surface with 2 thin, moderately long, secondary setae; primary distoventral setae thin, moderately long, posterior seta situated subventrally.

Anterior seta of trochanter short, branched apically; posterior seta very thin, slightly smaller; basoventral seta thin, strong, brownish, moderately long; anterior distoventral seta in form of small, yellowish spine; basal tubercle distinct, larger than in *B. subnubilus*; anterior ventral subapical seta represented by a slightly thinner and larger light spine; both posterior ventral setae thin, moderately long, situated apically and subapically, larger than in *B. subnubilus*; distal part of ventral margin with dense, light, feathered chaetoids.

Primary dorsal setae of femur apical and basal, short, yellowish, accompanied by a secondary seta; anterior seta situated subapically, short, brown, branched apically; posterior seta situated subventrally at distal margin, short, spine-shaped, yellowish; primary distoventral seta represented by moderately long, light spine near margin; 2nd ventral seta in form of much smaller spine in middle; ventral margin with row of strong, dense, small spinules situated behind feathered chaetoids anteriorly; distal margin with a group of small, thin spinules posteriorly. Tibia and tarsus dark brown, setae and spinules as in *B. subnubilus*. Claw and its seta as in *B. subnubilus*.

381 Mid- and hind femora with indistinct dorsal stripe.

Gills only on dorsal side on segments 2-7.

Tergite of segment 9 brownish, with indistinct margin; setae situated on membrane behind tergite, 11 on each side; median and adjacent (intermediate?) seta long, reddish brown, larger than others; anterior-angle seta brown or grayish brown, thin.

Sclerite "b" of anal legs brownish, whitish at median margin, with a ventral process in form of a narrow stripe; 13-15 reddish brown setae at distal margin; median distal, and neighboring seta long, thicker than others; 4-5 lateral setae shorter and thinner; ventral seta short, light, very thin. Sclerite "c" brownish, with a small, light seta.

Claw with large, reddish brown apex; 3 large, dorsal denticles; seta 1 situated in basal part, short, reddish brown; seta 6 short, situated near end of suture; seta 2 moderately long, situated dorsal to 6; seta 3 similar, situated near denticles; setae 7 and 8 straight, light, short; seta 5 light, thin, situated laterally near 8, and slightly longer than 8, seta 4 small, light, situated medially.

Case of young and full-grown larva tetrahedral, made of narrow, transversely arranged pieces of detritus (Figure 635, B).

Mode of life and habitats. Large, rapid, mountain rivers (Terek, Teberda).

Distribution. USSR: Northern and Central Caucasus.

## 2. Genus *Oligoplectrodes* Martynov

**Full-grown larva.** Length 12–14 mm. Head dark, with indistinct pattern or with a pattern of light dots; seta 17 moderately long, thick, strong, dark brown (Figure 636, A). Transverse ridge of pronotum less developed than in *Brachycentrus*. Anterior surface seta of mid- and hind femora moderately long, thick, strong, dark brown, in form of a large pointed spine; primary distoventral seta of mid- and hind femora also unusual, in form of a large, thick, blunt spine.

Case tetrahedral, slightly narrower posteriorly, made of detritus, sometimes of secretion, without edges, dark, with round cross section.

Mode of life and habitats. Mountain brooks and rivulets.

Distribution. USSR: Northern Kazakhstan, Siberia, Altai, Sayans, Kamchatka, Sakhalin. In addition, Mongolia.

### 1. *Oligoplectrodes potanini* Martynov

Lepneva, 1949:184–186.

**Full-grown larva.** Length 12–14 mm. Head slightly oblong, mainly reddish brown or brown, sometimes dark brown, with indistinct punctation; periocular spot brownish yellow (Figure 636, B); frontoclypeus with 2 pairs of dots anteriorly, a transverse row of 4–6 dots posteriorly, including 2 large, median, and small, lateral dots; posterior corner of frontoclypeus light brown, yellowish in light specimens. Four large, transverse dots lateral to posterior part of frontal sutures; similar dots lateral to 2 posterior dots and near coronal suture; ventral surface of head chestnut brown in middle, light brown near occipital foramen, with large, light, and brownish dots; some specimens with a distinct whitish yellow area at posterior margin of gular suture. Gula wide, irregularly trapezoidal, with slightly convex sides; posterior corner narrower, straight, or with a shallow indentation; boundary with pregula with a narrow, reddish stripe (Figure 636, C).

Anterior-margin setae reddish brown, short, very thick, lateral seta moderately long, lighter, and thinner; anterior frontal seta also large, intermediate frontal seta smaller, situated at curvature of frontal sutures, posterior frontal seta large, light; seta 7 situated lateral to antenna, light brown, moderately long; seta 9 situated before eye, reddish brown, similar to anterior-margin setae; seta 11 small, situated behind 9 near eye; seta 14 large, moderately long, dark reddish brown, situated behind eye; seta 12 situated laterally, light, moderately long; seta 13 short, situated between 12 and 14 and slightly posteriorly; setae 15 and 16 situated on a light spot, both reddish brown, 15 moderately long, longer and thinner than 14,

seta 16 short, curved; seta 17, as characteristic for the genus, thick, long, blackish brown, longer and thicker than all other setae of the head; ventral seta 8 small, brown, strong; seta 18 minute, reddish.

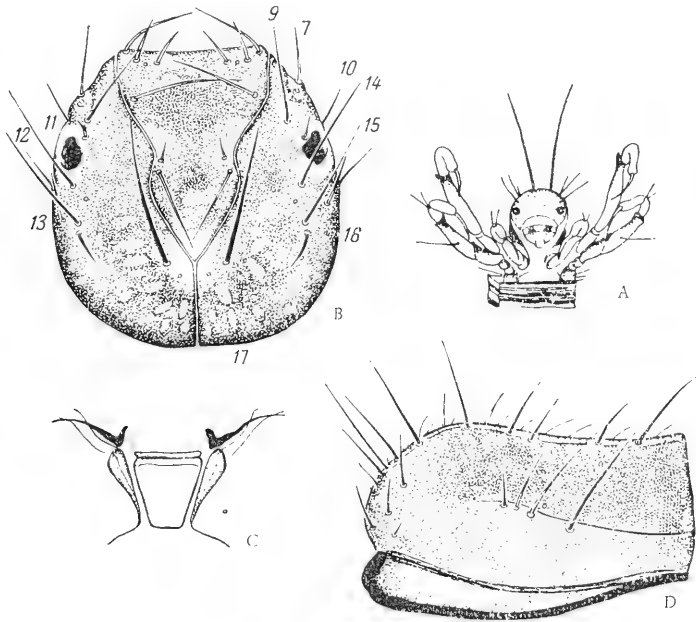


FIGURE 636. *Oligoplectrodes potanini* Mart. Larva in case, anterior (A), head, dorsal (B) and ventral (C), pronotum (D)

Labrum of characteristic form, small, short, narrower than anterior margin of frontoclypeus; dorsal sclerite reddish brown, anterior margin dark, with shallow median indentation; posterior-angle sclerites blunt, short, with blackish brown basal spots. Seta 1 situated lateral to median indentation in form of a small, pointed, light, thick spine; seta 2 among hairs at lateral margin, pointed, light; seta 4 similar, larger; seta 3 situated at anterior angle, short, brownish; setae 5 and 6 situated on surface, larger, reddish brown.

Distal part of mandibles short, dentate, separated by a deep suture; basal part reddish brown proximally, black at border with distal part; dorsal blade of left mandible with 2 teeth in addition to median tooth; ventral blade with a large and a small tooth; right mandible with 2 similar teeth on ventral, and one on dorsal blade; lateral setae situated basally, large, close together, reddish brown.

Sclerites of cardo mainly black, with black median process at anterior margin; seta small, reddish brown, strong. Sclerites of submentum in form of 2 large, transverse plates, brown in middle, reddish brown laterally; setae dark brown, strong, moderately long; stipes mainly yellowish, with a reddish brown median stripe; basal seta as on submentum; median distal

seta slightly thinner. Palpifer chestnut brown; distal seta small, strong, reddish brown, situated on membrane; basal seta small, light. Palp short, segments with chestnut brown sclerites; distal segment slightly smaller and lighter than the preceding segments. Mentum dark reddish brown in middle, black laterally, with a median process at posterior margin; ventral sclerites large, in form of brown plates; seta very small, light; palpiger brown, horseshoe-shaped; labial palps small, with yellowish brown sclerite.

Pronotum (Figure 636, D) mainly light chestnut brown, yellowish laterally; transverse ridge, characteristic for the family, represented by a thin, dark brown stripe; posterior part with 5–6 large light dots, and 2–3 indistinct dots, behind ridge; anterior margin narrow, brown; posterior margin mainly yellowish, narrow in middle, markedly wider laterally, separated anteriorly by a narrow, reddish stripe and posteriorly by a brownish margin, indistinct laterally; lateral margin short, with a dark reddish brown stripe. Anterior and anterior part of lateral margin with a row of 9–10 brown setae, median setae short, setae at anterior angle longer, strong, 2 shorter and thinner setae laterally. Medioanal seta situated in middle of ridge, reddish brown, strong, moderately long; 3 setae situated laterally at end of ridge, one short, other 2 longer, all 3 light; further laterally a number of reddish brown setae, one moderately long, other 3 short, closer to posterior margin.

Mesonotum (Figure 637, A) chestnut brown, lighter laterally; median tergites anteriorly with 4–6 large, lateral dots, with several smaller dots; posteriorly at median suture and in each half; lateral tergites with flat median part and lighter lateral part divided by a longitudinal, oblique, narrow, reddish stripe. Setae dark chestnut brown; anterior margin of

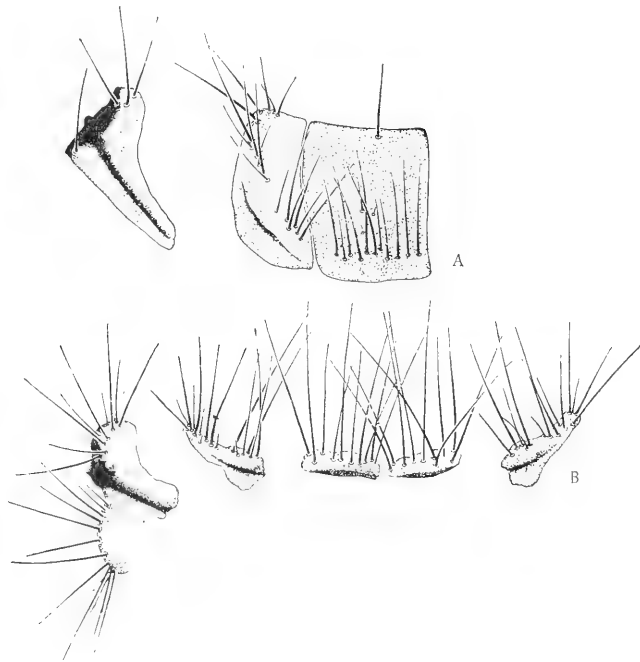


FIGURE 637. *Oligoplectrodes potanini* Mart. Dorsal and pleural sclerites of mesothorax (A) and metathorax (B)



median tergite with a strong, moderately long, primary, anterior-margin seta; primary surface and secondary setae, consisting of 10–11 moderately long setae about the same size, forming a transverse row near posterior margin; lateral tergites with a longitudinal oblique row of 12–16 setae with a small gap in middle; large setae light, smaller setae brown; anterior angle with a group of 7–11 setae, 2–3 of them longer, but smaller than those of oblique row.

Tergites of metanotum (Figure 637, B) in 2 pairs, chestnut brown, the median tergites lighter than the lateral, and with a transverse row of 10 setae, including 4–6 strong, long, and 1–3 small, light brownish, thin, setae; lateral tergites as in *Brachycentrus*, developed more transverse than longitudinal and with an oblique ridge forming a thin, reddish brown stripe as on lateral tergites of mesonotum; anterior part with a large dot; setae reddish brown, 4–6 in an anterior-angle group, and a row of 10–14 setae parallel to ridge near anterior margin, 3–5 of these thick, long, darker.

384 Propleuron reddish brown, with black pleural suture; episternum large, black at anterior margin; epimeron lobed, much smaller, rounded posteriorly, with a strong, dark brown, moderately long seta; trochantin dark basally, fused with episternum, and resembling a process of anterior angle; seta short, dark, subapical, setule light.

Mesopleuron oblong; pleural suture in form of narrow, reddish stripe, wide at end, blackish at distal margin; episternum and epimeron as in Figure 637, A; episternum with 3 setae, epimeron with one primary seta. Metapleuron as in Figure 637, B; pleural suture shorter; episternum with a deep indentation on median margin, epimeron with large, yellowish, ventral lateral process; setae blackish brown, strong, 14 setae at distal margin of episternum, 3–4 of them long, thick; epimeron with 16 setae on process situated close together posteriorly, 4–5 setae thicker and long.

Legs mainly chestnut brown, without dots; ratio of length of legs 50:100:96; setae large, dark, brown or dark reddish brown.

Forelegs (Figure 638, A) much shorter than other legs, with short segments, except for trochanter. Coxa with shallow, distodorsal indentation; primary anterior basodorsal seta strong, moderately long, blackish brown; anterior apical dorsal seta short, situated nearby in basal part; posterior distodorsal seta situated near apex of depression, long, thin, strong; further basally and apically, 2 secondary setae, one long, the other moderately long; both anterior setae strong, moderately long, blackish brown, situated basally and in middle of coxa; primary distoventral setae thin, moderately long, posterior seta situated subventrally, lighter, brown.

Trochanter long, yellowish; anterior seta small, tapering, posterior seta short, thinner, both yellowish; anterior ventral setae, an apical and a subapical, in form of short, pointed, yellowish spines on tubercles, 1st spine shorter and thicker than 2nd; basoventral seta moderately long, strong, brown; posterior distoventral seta the same, somewhat smaller; subapical seta short, thin, light; light, hairlike chaetoids dense, feathered, situated ventrally in distal part of segment.

Femur chestnut brown dorsally, yellowish brown ventrally; all setae primary, as on segments which follow; apical dorsal seta short, brown; basodorsal seta similar but thinner; anterior seta reddish brown, situated subapically in dorsal part, thick, slightly branched at apex; posterior seta situated subventrally at distal margin, short, brown, strong; distoventral seta situated at margin in form of a large, light yellowish spine as long as posterior primary seta; basoventral seta represented by smaller spine in

middle of femur; a dense row of thick, light spinules anteriorly on ventral margin, a row of thin, hairlike feathered chaetoids behind them.

Tibia less than half as long as femur, with slightly dark dorsal side, as on femur; dorsal setae in 2 pairs, apical pair with a light, moderately long seta directed upward, and a brown seta curved distally; subapical pair with a thin seta directed upward, and slightly larger than apical seta; 2nd seta situated nearby anteriorly, strong, brown, moderately long; distoventral seta in form of short, thick, yellowish spine; subventral seta situated more basally, slightly longer and thinner; light spinules at ventral margin, a distal row of thinner spinules posteriorly.

(385)

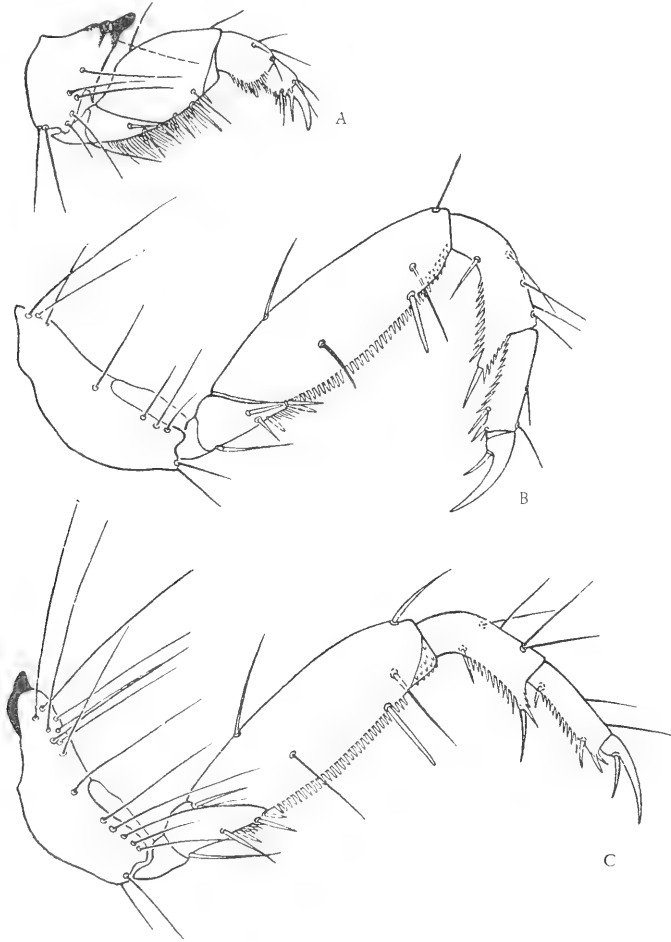


FIGURE 638. *Oligoplectrodes potanini* Mart. Right legs: foreleg (A), midleg (B), and hind leg (C) posterior

Tarsus shorter than tibia, with 2 strong, moderately long, brownish setae dorsally, anterior slightly shorter than posterior; 2 other primary setae

situated subventrally near distal margin, both short, light brown, one anterior, the other posterior; a row of small spinules ventrally. Claw large, longer than tarsus, slightly curved, reddish apically pointed, its basal seta in form of large, yellow spine.

Mid-coxa (Figure 638, B) moderately long; anterior basodorsal seta long, thin, longer than coxa, accompanied by 2 short setae; anterior apical dorsal seta also long; 2 thin setae further distally; posterior apical dorsal seta situated near apex of depression, strong, moderately long; 2 similar setae further distally near margin; 3 large, thin, secondary setae dorsally; anterior primary setae situated in middle, thin, strong, one subdorsal, moderately long, other subventral, short; distoventral setae short, in contrast to forelegs, strong, posterior seta lighter and smaller.

Trochanter slightly darker than on forelegs; anterior and posterior seta small, light; basoventral seta moderately long, light brown, thicker than on forelegs; anterior apical and subapical setae in form of thick, light spines, subapical spine larger and thinner; both posterior setae short, spine-shaped, light; several light chaetoids, and a row of small spinules between the distal setae.

Femur yellowish ventrally and subventrally, chestnut brown elsewhere, brownish dorsally; apical dorsal seta short, strong, chestnut brown; basodorsal seta thin, lighter, slightly larger; anterior seta dark brown, moderately long, in form of a very large, thick, long spine; posterior seta 385 situated in basal part, dark brown, spine-shaped; primary distoventral seta in form of a large, yellow, subapical spine, second ventral seta absent; ventral margin with very thin, small, light spinules of equal size, in contrast to *Brachycentrus*.

(386)

Number and arrangement of gills of *O. potanini*

Segment	Dorsal	Pleural	Ventral
2	1 (0) 1		1 (0) 1
3	1 1 (0)	1	1 1
4	1 (0)	1	1 1
5			1 1
6			1 1

Tibia with large distoventral process, yellowish ventrally, chestnut brown dorsally; distodorsal seta moderately long, light, directed upward, 2nd dorsal seta situated nearby posteriorly, shorter, brown, curved distally; dorsal seta of subapical pair light, subdorsal seta situated anteriorly, brown, thicker, procumbent; posterior ventral seta situated distally on process; anterior ventral seta situated subventrally at basal margin; a row of small, pointed, light spinules between setae ventrally; similar but smaller spinules on

dorsal side of process. Tarsus long, in contrast to forelegs, narrower than tibia and slightly longer; both dorsal setae yellowish, apical seta moderately long, larger than subapical; posterior ventral seta in form of light spine; anterior ventral seta situated at ventral margin at end of row of spinules, in form of a small, thin spine. Claw strong, curved, longer than on forelegs, basal seta in form of blunt, curved, brown spine.

386 Hind legs (Figure 638, C) similar to midlegs; hind tibia slightly different distally. Anterior basodorsal seta of coxa very long, longer than on midlegs; both distodorsal setae thin, long; 2 setae at margin of depression, 5 moderately long setae distal to posterior seta; basal part with more numerous secondary setae than midlegs, some nearly as long as basal seta; anterior setae dark brown, long, larger than on midlegs; primary distoventral setae light brown, moderately long. Trochanter and femur as on midlegs, chaetotaxy similar, anterior and posterior surface setae larger. Tibial and tarsal setae as on midlegs; claw and its seta the same.

Abdominal segment 1 without dorsal process; lateral processes in form of small elevations; ventral surface broadly convex in middle, with 2 short, blackish brown, median setae anteriorly. Lateral line on segments 3-8, with small, light hairs. Gills single, on segments 2-6.

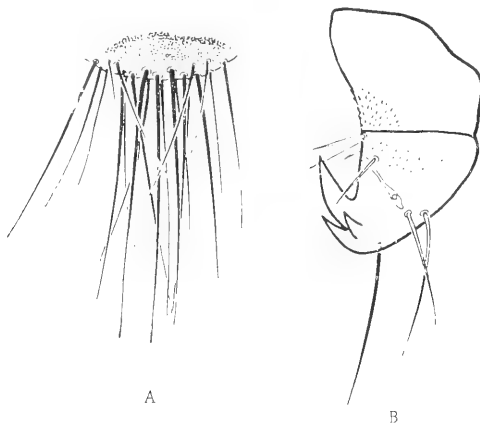


FIGURE 639. *Oligoplectrodes potanini* Mart.  
Dorsal sclerite of abdominal segment 9 (A), claw of  
left anal leg, lateral (B)

Tergite of segment 9 (Figure 639, A) brownish, indistinct; about 20-21 setae, including 8 long, thick, blackish brown setae in middle; primary medioanal setae slightly larger than the others; anterior-angle setae long, brown, shorter, and thinner than medioanal setae; 5-6 of other setae thin, light brownish.

Sclerite "b" of anal legs chestnut brown, lighter in lateral and ventral parts; setae situated on membrane, a median group of 6 long, thick, blackish brown setae distally, 8 smaller, brown setae laterally, 3 of them thin, moderately long; median margin with 3 thin, moderately long, dark brown setae; ventral seta short, strong, brown.

387 Sclerite "c" light brownish, with indistinct, reddish brown, lateral margin; seta small, light.

(386) Claw (Figure 639, B) brown, reddish brown apically, with 2 dorsal denticles and 4-5 small spinules. Seta 1 situated in basal part, short; seta 2 dorsal, moderately long, thin, light brown; seta 3 brown, relatively long, situated in distal part; seta 6 situated laterally, dorsal to suture, thick, smaller; ventral setae 7 and 8 short, thick, light; seta 5 situated near 8, longer but thinner; seta 4 situated medial to 8, small, thin; setae 5 and 4 light.

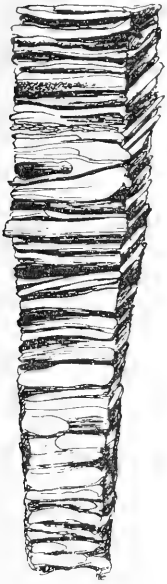


FIGURE 640. *Oligoplectrodes potanini* Mart. Larval case

Case tetrahedral, made of detritus, straight, slightly tapering posteriorly, rarely consisting entirely of secretion before pupation, edges little marked or absent, cross section round (Figure 640).

Mode of life and habitats. Clear mountain rivulets and rivers.

Distribution. USSR: Northern Kazakhstan, Siberia, Altai, Sayans, Sakhalin. In addition, Mongolia.

### 3. Genus *Oligoplectrum* McLachlan

Full-grown larva. Length 9-11 mm. Head mainly dark, lighter ventrally, with indistinct dots; ridge bordering flat middle of dorsal surface, extending from margin of frontoclypeus to eye, from seta 14 to coronal suture posteriorly, where ridges of both sides meet in a thin, horseshoe-shaped line in posterior part of head. Gula large, trapezoidal, shorter and wider than in *Oligoplectrodes*.

Mesonotum narrower posteriorly in area of lateral tergite; median tergite with fewer and smaller setae at posterior margin than in *Oligoplectrodes*.

Mid- and hind coxae dorsally with large, hooked processes at base, in contrast to *Oligoplectrodes*; mid- and hind femora similar to those of *Brachycentrus*, with similar ventral spinules and small, light setae dividing spinules into groups. Tarsus with small, distoventral process, in contrast to *Oligoplectrodes*; process of tibia large, as in *Oligoplectrodes*.

Case made of sand grains, 10-16 mm long, straight, smooth, narrower posteriorly, attached at anterior end.

Mode of life and habitats. Running water; microphagous, living on food carried by water; cases often occurring in large numbers, attached to stones and other objects.

Distribution. Western border region of the USSR. In addition, Europe, North America.

1. *Oligoplectrum maculatum* Fourcroy

Pictet, 1834:180, Plate XIV, Figure 4. — Brauer, 1857:XIX. — Klapálek, 1893:59–63. — Ulmer, 1903:88; 1909:277, Figures 415, 319, 466, a. — Lestage, 1921:873–878, Figure 313. — Nielsen, 1936:255–266, Figures 1–6; 1943:1–87, Figures 1–21, Plate I–III.

**Full-grown larva.** Length 9.0–11.6 mm. Head (Figure 641) mainly chestnut brown, lighter in preparations; eyes on a yellowish brown spot; antenna situated in middle between eye and margin; sensilla dark, with a small, thin seta. Dorsal surface of head mainly flat, flat area bordered by dark ridge, less distinct in posterior part, in form of a horseshoe-shaped stripe. Frontoclypeus with several large, light dots in posterior part. Surface lateral to frontal sutures, chestnut brown, light dots at posterior branch only slightly visible, even in preparations; lateral and ventral sides of head, lighter, brownish. Gula (Figure 641, B) trapezoidal, large, chestnut brown, wider anteriorly, length and width almost equal, in contrast to *Oligoplectrodes*.

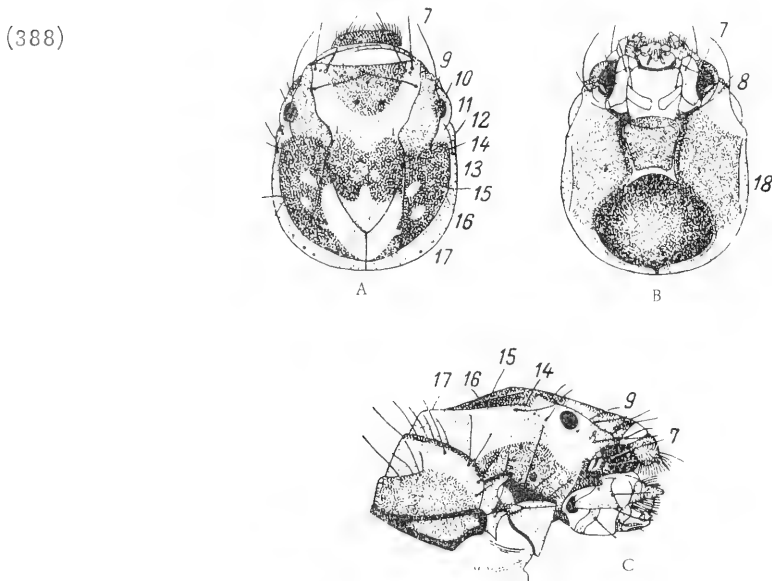


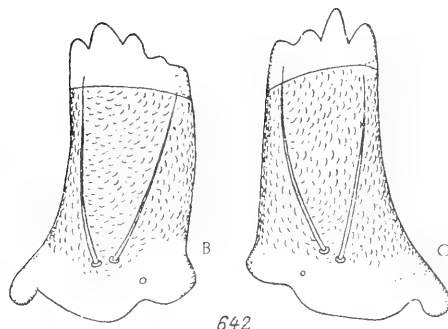
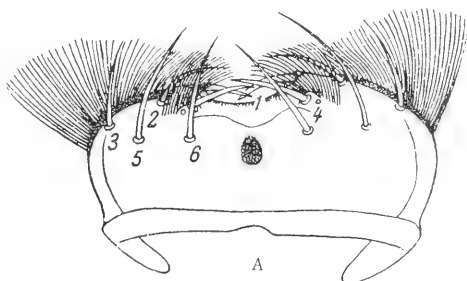
FIGURE 641. *Oligoplectrum maculatum* Fourc. Head, dorsal (A) and ventral (B), head and prothorax, lateral (C) (after Nielsen)

Anterior-margin setae light brown, moderately long, median seta larger than intermediate, lateral seta light, large, curved inward. Anterior frontal seta thinner and smaller, light; intermediate frontal seta very small, posterior frontal seta thin, brown, moderately long. Seta 7 situated ventral to ridge, laterally near antenna, light, moderately long; seta 10 small, light,

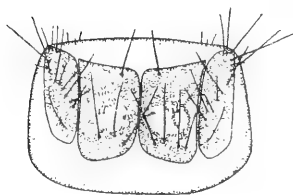
situated before eye; seta 9 situated dorsal to eye near ridge, shorter than 7, dark, thick; seta 11 small, light, situated behind 9; seta 14 slightly larger than 9, dark; seta 13 thin, short, light; seta 12 similar; seta 15 situated some  
 388 distance behind 14, thin, moderately long; seta 16 situated near 15, smaller; seta 17 situated slightly before fork, strong, brown. Ventral seta 8 small, light; seta 18 minute.

Labrum (Figure 642, A) wide, short, with deep median indentation; dorsal sclerite brown, dark brown laterally; posterior-angle sclerites blunt, short, with dark reddish brown, basal spot. Seta 1 in form of large, blunt, light spine; seta 2 thinner; seta 4 similar to 1 but slightly longer and thinner; seta 3 short, light, situated near anterior margin; setae 5 and 6 widely separated, brown, situated lateral to median spot.

(389)



642



643

FIGURES 642 and 643. *Oligoplectrum maculatum* Fourc. (after Nielsen):

642 - labrum (A), left mandible (B), right mandible, lateral (C); 643 - mesonotum.

Mandibles (Figure 642, B, C) short, massive, dark brown; teeth situated distally; on left mandible, subventral tooth projecting, larger than others, between 2 similar large teeth, 2 small, round, tooth-shaped processes dorsal to margin; 4 teeth on right mandible, subventral tooth larger than others, 2 dorsal teeth smaller than ventral tooth; brush with relatively large, grayish chaetoids; lateral setae short, strong, dorsal larger than ventral.

(390) Number and arrangement of gills of *O. maculatum*

Segment	Dorsal
2	4-6
3	4-7
4	3-5
5	3-5
6	2-3
7	2-3

Sclerites of cardo black, with a thin seta. Sclerites of submentum in form of transverse, widely separated plates, with moderately long setae laterally at anterior margin.

Pronotum with curved, transverse, dark ridge; anterior margin narrow, wider in middle, reddish brown; lateral margin narrow, brownish; posterior margin wide, separated by a dark reddish brown stripe, with a wide dark reddish brown ridge; ridge and stripe fused near suture into a wide, dark reddish brown, median, posterior margin; brown part of margin with large light spots; chaetotaxy as in *Oligo-*

*plectrodes*, with minor differences.

Mesonotum (Figure 643) incompletely sclerotized with membranous posterior and lateral parts; a straight suture divides each half in 2 parts, median and lateral, both oblong, as in *Oligoplectrodes*; median sclerite with light dots posteriorly; lateral sclerite slightly wider anteriorly, without oblique streaks or seta posteriorly; median sclerite posteriorly with a row of 3 setae instead of 11 large setae, 2 of the 3 setae large, brown; 3rd short, yellowish; a small seta closer to lateral margin.

Metanotum without curved transverse groove; 2 pairs of sclerites: posterior median and lateral; anterior median sclerites absent; median sclerite with 4-5 large brown setae, lateral sclerite with 6 strong, moderately long setae and 5-7 thin setae of different size.

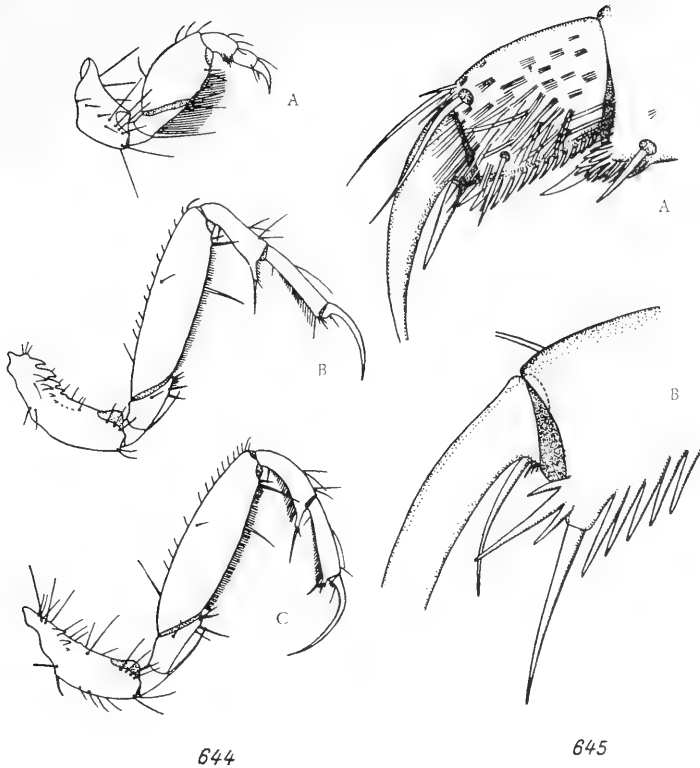
Number of setae in natatorial combs of *O. maculatum* (after Nielsen)

		Tibia	Tarsus			
			segment 1	segment 2	segment 3	segment 4
Foreleg	dorsal	14-15	7-13	8	3	2-3
	ventral	9-16	7-11	2	-	-
Midleg	dorsal	53-71	52-68	26-27	16-19	9-12
	ventral	43-53	47	18-23	9-12	6-7

Legs mainly yellowish brown, similar to those of *O. potanini* in size, form, and chaetotaxy; ratio of length of legs 48:100:102.

Fore coxa (Figure 644, A) dark, blackish on dorsal side at base and at margin; tibia wider distally; tarsus shorter than tibia; claw much longer than tarsus; chaetotaxy as in Figures 644, A and 645, A.





FIGURES 644 and 645. *Oligoplectrum maculatum* Fourc. (after Nielsen):  
 644 — right legs, posterior: foreleg (A), midleg (B), and hind leg (C); 645 — distal  
 part of tibia, tarsus, and claw of right foreleg, anterior (A), distal part of tarsus and  
 basal part of claw of right midleg, anterior (B).

Mid-coxa (Figure 644, B) with 2 rows of dark reddish brown, hook-shaped processes basally at anterior and posterior margin of dorsal surface, anterior row with 3 large and a much smaller (distal) processes; baso-dorsal primary seta situated laterally near first process, black, strong, moderately long, near a short, light, secondary seta; posterior row with 389 2 larger hooks, 2 smaller hooks dorsal and ventral to them.

Anterior and posterior setae of trochanter short, strong; basoventral seta moderately long, strong, 2 small spinules on basal segment; anterior ventral setae represented by 2 light spines; 2 posterior ventral setae short, dark, the apical smaller than subapical; row of light, feathered chaetoids which is characteristic for the fore trochanter absent on mid-trochanter.

Mid-femur similar to that of *Brachycentrus subnubilus*, including chaetotaxy. Primary apical dorsal seta short, strong; basodorsal seta smaller; several, small, secondary setae between these two setae; primary ventrodorsal seta represented by a thin light spine at beginning of row of ventral spinules; primary basoventral seta situated in middle, similar but

larger and slightly curved; a row of blunt, light grayish spines arranged in groups of 4–7, sometimes 9–10, at ventral margin; space between groups occupied, as in *B. subnubilus*, by small, thin, light, secondary setae.

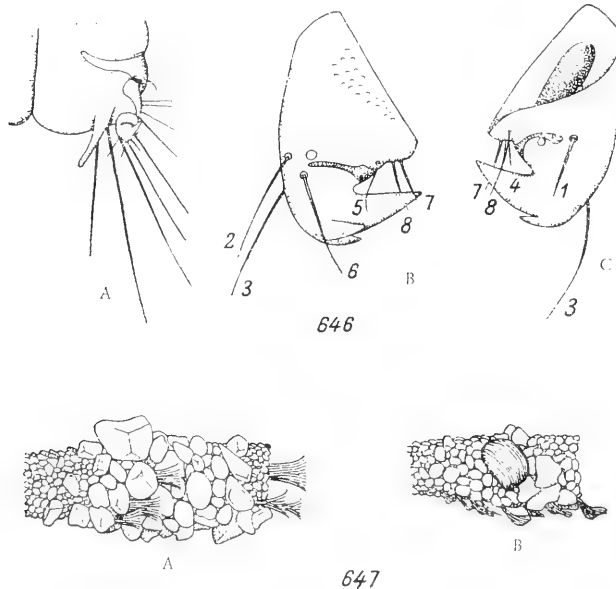
Tibia dorsally with 2 pairs of primary setae; primary distoventral seta situated on process, in form of a large, thick, yellowish spine; 2nd ventral seta shorter, straight, light, situated basally; a row of spinules between setae. Tarsus with small, distinct distoventral process, in contrast to *Oligoplectrodes*; primary dorsal setae situated one behind the other, short; posterior distoventral seta in form of light spine on process, anterior distoventral seta similar, slightly smaller, situated basal to row of spinules. Claw long, as long as tarsus, basal seta in form of a small, light spine (Figure 645, B).

Hind coxa basally with a posterior row of 2 large, hook-shaped spines and one small spine; anterior dorsal processes absent; chaetotaxy of trochanter, femur, tibia, and tarsus as in Figure 644, C.

Abdominal segment 1 without dorsal or lateral processes; lateral line poorly marked; from segments 3–7 hairs irregularly distributed, mainly in posterior part of segments. Gills only on dorsal side, postsegmental (almost intersegmental) from posterior margin of segment 2 to posterior margin of segment 7, with 2–7 short filaments (according to Nielsen).

Tergite of abdominal segment 9 small, brownish, with 1–3 secondary setae at posterior margin on each side, in addition to 4 primary setae; medioanal setae and anterior-angle setae longer than others.

(392)



FIGURES 646 and 647. *Oligoplectrum maculatum* Fourc. (after Nielsen):

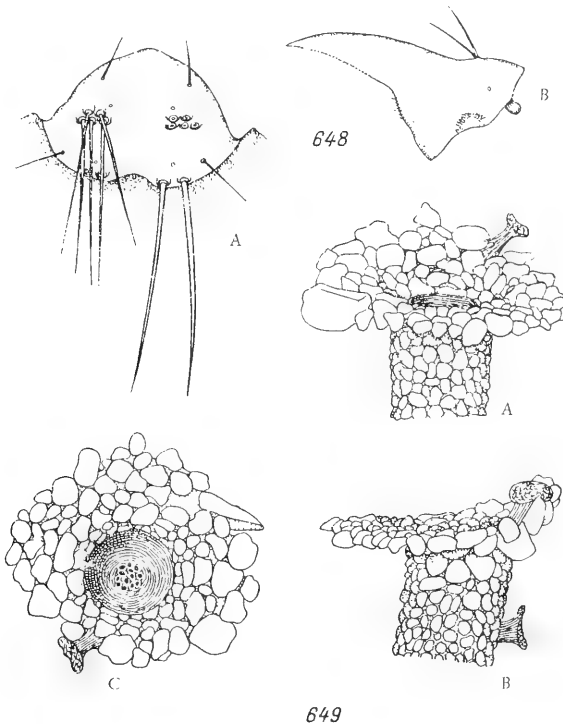
646 – left anal leg and adjacent part of segment 9, ventral (A), claw of right anal leg, lateral (B), and inner side (C); 647 – anterior part of larval case, ventral (A) and lateral (B).

Area "b" of anal legs mainly membranous on dorsal side, slightly sclerotized laterally and ventrally, yellowish, with brownish distoventral margin. Dorsal setae situated on membrane near margin; median distal and neighboring seta long, dark reddish brown, lateral seta thinner, moderately long; subapical seta of median margin similar; 5-6 thin brown  
 390 setae further laterally along margin; ventral seta short, thin, yellowish. Sclerite "c" relatively large, larger than claw, yellowish in median and basal parts, with darker, brownish lateral margin; lateral margin visible only basally as an indistinct, reddish brown spot; seta small, light (Figure 646, A).

Claw (Figure 646, B, C) brown, with 2 large dorsal denticles; seta 1 situated in basal part, short, strong; seta 2 large, situated above end of suture, seta 3 slightly larger, situated dorsally in distal part; seta 6 situated distal to suture, large; setae 7 and 8 situated ventrally, straight, light; seta 5 relatively large, very thin, situated laterally near seta 8; seta 4 situated medially, small, light.

Case (Figure 647) as long as, or longer than larva, 14-18 mm, made of sand grains, straight, slightly tapering posteriorly, attached by 2 or 3 ligaments to a hard substrate or to case of another larva, often forming large clusters; posterior end with a membrane with a large, central hole.

(392)



FIGURES 648 and 649. *Oligoplectrum maculatum* Fourc.  
 Pupa (after Nielsen):

648 - anteclypeus and labrum (A), right mandible, dorsal (B);  
 649 - anterior end of case, dorsal (A), lateral (B), anterior (C).

**Pupa.** Length 5.0–8.6 mm in male pupae, 6.9–10.6 mm in female pupae. Antennae filiform, reaching end of body in male pupae, abdominal segment 5 in female. Labrum (Figure 648, A) curved anteriorly and laterally, with a small median process; seta 1 small, other 5 setae situated close together at base, strong, of equal length, anterior row with 2 setae, posterior row with 3 slightly larger setae, all 5 without hooked end; median and intermediate setae of anteclypeus longer and thicker, lateral seta small, thin. Mandibles (Figure 648, B) brown, slightly curved, pointed; distal part short, wide at base, with median serration; basal part with a median row of small, thin spinules; lateral setae situated close together, light, of equal length, short.

Wing sheaths of male pupae reaching middle of segment 6, those of female, end of segment 5.

Midlegs with natatorial rows on tibiae and first 4 tarsal segments; setae sparser on fore tibiae and tarsi.

Posterior margin of abdominal segment 1 with narrow, posterior sclerotized stripe, with blackish brown processes laterally, each with 3–8 large spines directed posteriorly and several smaller spines, and with tubercles with spinules laterally. Holding apparatus on segments 3–7, number of hooks: III:2–7; IV:2–8; V:2–8 + about 60 (last number for both sides); VI:3–8; VII:3–7. Lateral line from end of segment 5 to segment 8, with thin, golden brown setae. Gills as in full-grown larva. Anal appendages short, forming 2 thin, slightly curved, yellowish brown rods without setae.

Pupal case (Figure 649) 16–18 mm long, usually much longer than pupa, pupal chamber anteriorly and posteriorly with a sievelike membrane; larvae before pupation adds a collarlike structure at anterior end which forms a broad funnel of larger sand grains and small stones directed to  
391 substrate; it is attached by a ligament with a disklike end; anterior and posterior membranes forming a brown, outer circle and a rounded, sievelike, central area with 10–21 holes at anterior end, 14–30 at posterior end where the membrane is larger. Case attached to moss or stones; they are often found in large numbers.

Mode of life and habitats. Microphagous; sessile, attached to substrate with anterior end directed against the current, as in *Brachycentrus*; feeding on detritus and microscopic organisms, mainly diatoms, carried by the current.

Distribution. Western border region of the European USSR. In addition, Europe.

#### 4. Genus *Micrasema* McLachlan

**Full-grown larva.** Small, 5.5–9.0 mm long. Head short, rounded dorsally; frontoclypeus of some species with dark anterior, and a wide, dark stripe in posterior part. Pronotum relatively wide, transverse ridge indistinct, in form of dark, curved stripe. Mesonotum entire in some species, in contrast to *Brachycentrus*. Median tergites of metanotum small, pale, reduced; lateral tergites also poorly developed, with indistinct boundaries. Mid- and hind tibiae without distoventral process.

393 Case made of sand grains, smooth, conical, slightly curved.  
 Mode of life and habitats. Clear brooks and rivulets.  
 Distribution. The European USSR, Siberia, Far East. In addition,  
 Europe, North America.

Key to Species

Full-grown larva

- 1 (2). Frontoclypeus not of uniform color, darker anteriorly; wedge-shaped pattern of posterior part consisting of dark dots. Each half of mesonotum divided into 2 sclerites. Western and north-western parts of the European USSR . . . . . 2. **M. setiferum** Pict. (p. 498)
- 2 (1). Frontoclypeus of uniform color, mat brown, wedge-shaped pattern replaced by indistinct light dots. Each half of mesonotum entire. The Caucasus . . . . . 1. **Micrasema** sp. (p. 493)

1. **Micrasema** sp., larva nova\*

**Full-grown larva.** Length 3–4 mm. Head (Figure 650, A) slightly oblong, almost round dorsally, brown; frontoclypeus wider in area of anterior frontal seta than at anterior margin; frontal sutures curved inward anteriorly; dorsal ridge more distinct anteriorly; frontoclypeus with numerous flat, dark brown tubercles covering most of anterior part and middle between tentorial pits; similar tubercles lateral to epicranial suture in anterior part and near fork of frontal sutures; posterior part of frontoclypeus with several large dots; periocular area large, whitish; ventral surface mainly brown, scaly, rough, smooth near occipital foramen, pale yellowish, with large light dots. Gula large, nearly square, chestnut brown, lighter and narrower anteriorly; surface of gula slightly rugose (Figure 650, B).

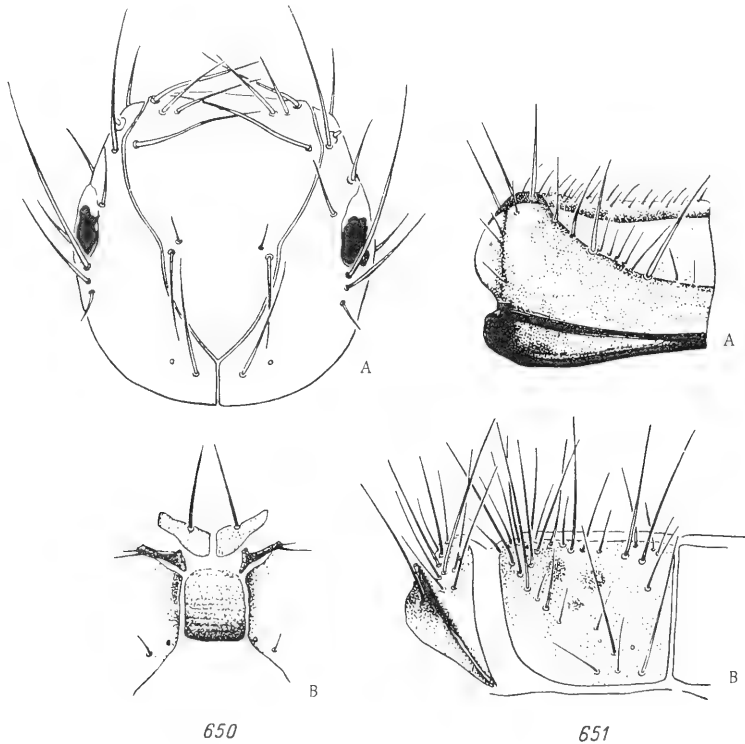
Anterior-margin setae thick, reddish brown, moderately long, intermediate seta moderately long, lateral seta light, curved inward also moderately long; anterior frontal seta procumbent, longer than lateral; intermediate frontal seta situated near tentorial pit, small, thin; posterior frontal seta near intermediate seta, short, thin; seta 7 situated ventral to antenna, brownish, shorter than intermediate seta; seta 9 situated on ridge, moderately long, reddish brown, larger than anterior-margin setae; seta 11 situated further posteriorly, short, thin, near inner margin of periocular area; seta 10 similar, situated near anterior margin of periocular area; seta 14 at posterior angle of periocular area, long, reddish brown, larger than 9; seta 13 short, light, situated laterally at posterior margin of periocular area; setae 15 and 16 situated close together behind seta 14, seta 15 light, moderately long, 16 short, curved, brownish; seta 12 light, curved inward, situated laterally behind 2 last-mentioned setae; seta 17 light brown, moderately long. Ventral seta 8 small, strong, brownish; seta 18 smaller, light, situated behind gula.

\* Described from specimens from the Zangi River (Georgia); this may be the larva of *Micrasema bifoliatum* Mart.

Labrum narrower than anterior margin of frontoclypeus, with broad, membranous, anterior margin; median indentation small; dorsal sclerite brown; posterior-angle sclerites reddish brown; seta 1 small; dorsal sclerite brown; posterior-angle sclerites reddish brown; seta 1 small, light, situated on membrane near margin; seta 2 situated lateral to 1; seta 4 small, slightly thicker, situated on sclerite near posterior margin of median depression; seta 3 straight, short, light, situated near margin in anterior angle; setae 5 and 6 situated on surface, brownish, with thin, long end, seta 5 larger than 6.

Mandibles short, with brownish distal and ventral parts, blackish brown elsewhere; left mandible distally with 2 teeth, its dorsal blade in form of a thin, projecting plate with a brush of light, relatively short chaetoids submarginally in middle; ventral margin slightly curved, blade little differentiated; one of 2 distal teeth of right mandible larger than other; dorsal blade less prominent, brush similar; lateral setae situated basally, relatively large, reaching end of mandible, of equal length, pale yellowish.

394



FIGURES 650 and 651. *Micrasema* sp.:

650 - head, dorsal (A) and ventral (B); 651 - pronotum (A), mesonotum and mesopleuron (B).

Sclerites of cardo reddish brown; median margin with sharp anterior process. Sclerites of submentum represented by 2 large, transverse, yellowish plates divided by a narrow membranous stripe; seta moderately

long, whitish yellow, setae situated distally almost at same level, relatively large, light brownish, moderately long, median seta slightly larger, contrary to usual. Palpifer and sclerites of maxillary palps yellowish brown; distal seta short, pale; median seta minute, situated basally; segment of palp of about same length. Galea short, wide. Mentum short, reddish brown.

Pronotum (Figure 651, A) dark chestnut brown, relatively short, wide, transverse curved ridge in form of thin, dark brown stripe; anterior margin wide, reddish, bordered by dark stripe; posterior margin as in *Oligo-plectrodes*, narrow in middle, wider laterally, chestnut brown, with narrow, blackish brown border; anterior angles with 2-3 strong, submarginal, moderately long, brown setae; anterior margin with sparse, small, thin, light setae; similar setae on surface along ridge, including 3 large setae: a primary medioanal seta in middle, a seta at end of ridge, and one between them, all setae strong, brown, moderately long; middle seta accompanied by a slightly shorter, light seta; 2 similarly thin setae and a group of small light setae laterally.

Mesonotum (Figure 651, B) chestnut brown, with 3 large, dark dots, and several brownish dots anteriorly; light brown setae lateral to suture near posterior margin; 4 strong, and several, thin, small setae at anterior margin; anterior-angle group consisting of 6 strong, moderately long, and  
395 5-6 shorter, smaller, light setae; anterior part laterally with an oblique row of 6-7 setae, posterior part with a median group of 5-6 similar setae.

Metanotum mainly membranous; median tergites little differentiated, pale yellowish, with 2 setae, a moderately long primary, and a short secondary seta; lateral tergites brownish, narrow at anterior angle, with a longitudinal row of 9-10 setae including 2 strong, moderately long, brown setae.

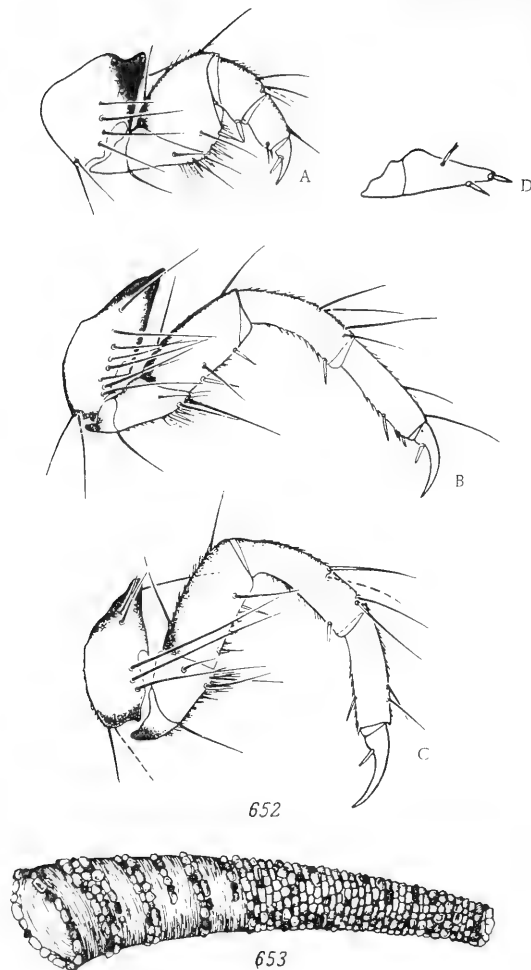
Propleuron chestnut brown, like pronotum; pleural suture black; epimeron in form of a process, pointed posteriorly; trochantin fused with episternum, blackish as in anterior margin of episternum; seta short, strong, brown; setules small, light.

Mesepisternum with an anterior group of 9 large and small brown setae; primary seta at distal margin, long, larger than others; epimeron rounded laterally, long seta at suture.

Metapleuron irregularly triangular, light brown; pleural suture black; episternum with an anterior group of 5-6 light brown setae, primary seta moderately long, others smaller and thinner; seta of epimeron situated in posterior part, moderately long, light brown.

Legs brown, without dots; coxae, femora, tibiae, and tarsi with dark dorsal margin; ratio of length of legs 50:100:106.

Fore coxa (Figure 652, A) short, massive, oblong in lateral view; basodorsal seta brown, moderately long, strong; anterior apical, dorsal, short brown seta with branched apex nearby distally and anteriorly; posterior apical dorsal seta brown, moderately long, situated at apex of indentation; 2 thin, long, brownish setae, one longer than primary seta, the other as long, further distally near margin; primary anterior seta situated subdorsally in basal part, moderately long, 2nd seta in middle of coxa, short; both brown, strong, with slightly branched apex; posterior surface with a short, thin, secondary seta; distoventral setae light brown, moderately long, posterior of them situated subventrally and distoventral seta shorter.



FIGURES 652 and 653. *Micrasema* sp.:

652 - right legs, posterior: foreleg (A), midleg (B), and hind leg (C), fore trochanter, anteriorly (D); 653 - larval case.

Trochanter (Figure 652, A, D) light brown; anterior seta small, light, strong, branched apically; posterior seta short, thin, brown; basoventral seta situated near suture, grayish, strong, moderately long; anterior apical ventral seta represented by small, thick, blunt, grayish spine; subapical seta also in form of a spine, pointed, light, slightly larger and thinner; posterior ventral setae situated apically and subapically, brown, moderately long, 396 shorter than basal seta; light curved chaetoids on trochanter near distal margin.

Femur (Figure 652, A) very short ventrally, with strongly convex dorsal side, and a black, basal spot; apical dorsal seta moderately long, brown;



basodorsal seta similar but shorter; small light setae along femur between primary setae; anterior primary seta situated subapically on surface, short, brown, branched apically; posterior primary seta situated subventrally in middle of femur, short, pointed, dark brown; both ventral setae in form of light, large spines with thin end; ventral margin with small blunt spinules and large, curved, light chaetoids like those on trochanter.

Tibia short, thick, with short, slightly concave, ventral margin; dorsal side convex, almost twice as long as ventral side; primary dorsal setae arranged in 2 pairs: apically (slightly posterior) and subapically (slightly anterior), shorter than dorsal setae of femur, both dorsal setae thin, anterior subdorsal seta thicker than posterior; several small, thin setae basally at margin; posterior distoventral seta in form of large, thick, blunt, light spine; anterior distoventral seta represented by a much smaller, pointed, light spine; 5-6 small spinules at ventral margin.

Tarsus straight, wide, shorter and narrower than tibia; primary apical dorsal seta situated slightly posteriorly, thin, light, moderately long; subapical seta situated anteriorly, shorter and thicker; 2 other primary setae situated subventrally near distal margin, both short, thin, posterior larger than anterior; ventral margin with 5-6 thin, small, light spinules, and 2 large, distal spinules, the 1st blunt, the 2nd pointed. Claw blunt, slightly curved, brown, with thick, blunt, light, basal seta.

Mid-coxa (Figure 652, B) long, primary basodorsal seta long, thin, light brownish; 5-6 secondary setae at anterior margin, the primary anterior distodorsal seta among them; posterior distodorsal seta very long, light brown, situated at apex of depression, 2 almost equally long secondary setae basal to it, 4-5 thin, moderately long setae apical to it; both primary anterior setae brown, strong, moderately long, branched apically, situated subdorsally in basal part and subventrally in apical part; 4-5 thin, long and shorter setae further distally; primary distoventral setae strong, brownish, moderately long.

Anterior seta of trochanter small, strong, light brown; posterior seta thinner and slightly larger; basoventral seta grayish, strong, smaller than that on forelegs; anterior distoventral seta in form of small, light spine; second distoventral seta similar but slightly larger; light chaetoids between setae; posterior apical ventral seta moderately long, brownish, strong, subapical seta similar but about half as long.

Femur slightly convex dorsally, and slightly concave ventrally, both sides nearly parallel; primary dorsal setae, apical and basal, thin, strong, of equal length, moderately long; anterior seta situated in middle of femur, short, branched apically; posterior seta situated subventrally in middle of femur; both ventral setae in form of short, pointed, light spines.

Tibia moderately long, slightly shorter than femur, slightly wider distally; primary distodorsal seta thin, moderately long, longer than apical dorsal seta of femur; subapical seta light, shorter, and thinner; anterior subdorsal seta of 2nd pair thicker than the others, moderately long; posterior subapical seta of 1st pair shorter; posterior distoventral in form of short light spine; anterior ventral seta situated subventrally and slightly more basally, in form of small, thin, pointed, light spine; dense small spinules ventrally at margin.

Tarsus almost straight, narrower at end; apical dorsal seta thin and light as on tibia, but slightly smaller; subapical seta short, thinner; posterior

ventral seta situated subapically, as on tibia, in form of a thin, pointed, light spine; anterior ventral seta subventral, slightly more distal, thin, spine-shaped, brownish; distoventral spinule blunt, thick, others small, thin, situated ventrally in distal half, subventrally in basal part and in middle. Claw longer and thinner than on forelegs, more curved; basal seta similar, small, light.

Hind coxa (Figure 652, C) shorter than mid-coxa; femur thicker; tibia, tarsus, and claw slightly longer; chaetotaxy the same.

Abdomen green in live specimens, nearly cylindrical anteriorly; segment 1 shorter than following segments, without dorsal or lateral processes; segments 2-4 of equal size, segments 5-8 tapering; segment 9 much smaller; anal legs thick, projecting laterally. Hairs of lateral line and gills absent.

Tergite of segment 9 small, grayish brown, little differentiated; medio-anal setae long, brown; anterior-angle setae the same; intermediate and 397 lateral seta moderately long, latter seta darker, thicker, and longer than former; one seta between medioanal setae.

Sclerite "b" of anal legs chestnut brown, with indistinct outline; dorsal median seta chestnut brown, very long, thick; neighboring seta also thick, slightly shorter; lateral seta thinner, almost half as long, 6-7 thin, short to moderately long setae lateral to it; a long dark seta apically at median margin; 4 light, grayish, thin, short to moderately long setae basally; ventral seta light, small, brownish. Sclerite "c" chestnut brown, with dark reddish brown lateral margin and a small light seta.

Claw brown basally, reddish brown distally, with 2 dorsal denticles; seta 1 situated basally, short, brown; seta 2 very thin, light, moderately long, situated dorsal to suture; seta 6 situated subdorsally and laterally at suture, short, brown; seta 3 situated subdorsally on the median side, brownish, moderately long; ventral setae 7 and 8 short, light; seta 5 small, light, situated laterally; seta 4 similar, situated on inner side, both near seta 8.

Case 4.5-5.5 mm long (Figure 653), much longer and wider than larva, smooth, narrower posteriorly, with round cross section, made of fine, densely arranged sand grains.

Pupal case to 6 mm long, sometimes made entirely or in part of secretion, with a sievelike membrane at each end with numerous, very small holes. Case attached to substrate by thick, dark brown ligaments from margin at anterior and posterior end.

Mode of life and habitats. Mountain rivers and rivulets.

Distribution. USSR: The Caucasus (Zanga River).

## 2. *Micrasema setiferum* Pictet

Siltala, 1905:26-28, Figure 7. — Ulmer, 1909:277, 320. — Lestage, 1921: 880-886.

**Full-grown larva.** Length 5-6 mm. Head yellowish brown; fronto-clypeus darker anteriorly, posterior part with a wedge-shaped pattern of dark and light dots. Mandibles short, massive, each with 3 blunt teeth and a small, tooth-shaped process.

Pronotum (Figure 654) wide, with a characteristic curved, transverse ridge with 4 setae on each side; a row of setae near and at anterior margin.

Median tergites of mesonotum with indistinct dots and numerous setae anteriorly and at posterior margin; lateral tergites oblong, narrow anteriorly, with a light ridge with a row of setae near lateral margin; setae more numerous near anterior angle.

Pleurites yellowish, with black pleural groove; propleuron similar to that of *Brachycentrus subnubilus*; mid- and hind tibiae without distoventral process.

Tergite of abdominal segment 9 yellowish, indistinct, with numerous setae in posterior part, at margin and on surface (11–12 secondary setae in addition to primary setae).

Claw of anal legs short, with 3 dorsal denticles.

**Pupa.** Length 4.5 mm. Antennae reaching end of abdominal segment 7, sheaths of fore wings to end of segment 6 or beginning of segment 7.

Labrum (Figure 655, A) with a small light seta laterally at anterior margin; 5 yellowish surface setae at end, thin. Mandibles narrower distally, slightly curved, without a distinct boundary between apical and basal parts. Mid-tarsi natatorial, with numerous setae. Posterior processes of abdominal segment 1 brown, with black and dark brown spinules, divided by a relatively wide, brown space. Holding apparatus on segments 3–7; number of spinules (after Siltala): III:4–10; IV:6–11; V:4–11+20–24; VI:6–10; VII:7–12. Lateral line with dense grayish setae on segments 5–8. Gills absent. Posterior segment in both sexes with small ventral tubercles with 3 setae near base of anal rods.

Sheath of male genitalia distinct, large, short, widely separated on sides of segment; anal appendages rodlike, uniformly thin, bent upward and covered with small spinules (Figure 655, B).

Case 4.5–6.0 mm long, straight or slightly curved, slightly narrower posteriorly, smooth, made of fine sand grains, with a yellowish or brownish membrane at each end; anterior membrane with 20 holes, surrounded by a ring of darker and thicker tissue; posterior membrane pale in middle and with 14–30 holes, darker laterally.

Mode of life and habitats. Clear, rapid brooks with stony bottom.

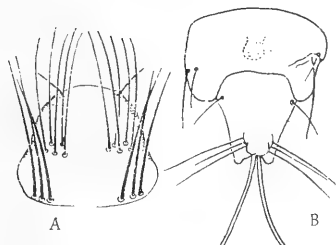
Distribution. West and northwest of the European USSR. In addition, Central Europe.

## VI. Family CALAMOCERATIDAE Ulmer

**Full-grown larva.** Medium-sized to large, 15–24 mm long. Head chestnut brown, with large light dots or spots; frontoclypeus narrow, with shallow lateral indentations; gula small, triangular; gular suture much



654



655

FIGURES 654 and 655. *Micrasema setiferum* Pict. (after Siltala):

654 – pronotum; 655 – pupa: anteclypeus and labrum (A), posterior part of male pupa, ventral (B).

longer than gula. Labrum with broadly membranous margin; dorsal sclerite with a transverse row of 12-22 strong, dark setae anteriorly. Mandibles short, massive, with small blunt teeth distally, both mandibles with dense brushes of light chaetoids in median indentation; lateral setae short, situated near base.

Pronotum varying in form, sometimes with curved, projecting anterior angles. Mesonotum with large median sclerite and a small anterior-angle sclerite; sclerites sometimes partly fused anteriorly. Metanotum with small, round, anterior-angle sclerites and 2 small median sclerites which are sometimes replaced by sclerotized dots.

Forelegs shorter than other legs, hind legs much longer and thinner, hind tibia sometimes divided.

Abdominal segment 1 partly sclerotized; dorsal process not always distinct; lateral processes displaced ventrally, with numerous black hooks on a thin sclerite apically. Lateral line on segments 3-7, with dense light hairs. Gills presegmental, with 2-3, rarely one filament on segments 2-7 or 7-8, in a dorsal, lateral, and ventral row.

Tergite of segment 9 relatively large, indistinct. Anal legs wide basally, short. Sclerite "b" with blunt, beaklike distal process curved downward.

Case made of fragments of leaves or detritus, sometimes of pieces of grass stalks or loose, black pieces of wood.

Mode of life and habitats. Small, stagnant, or slowly running, sunlit, overgrown water bodies; among vegetation or detritus on bottom.

Distribution. USSR: the Far East and Transcaucasia. In addition, Europe (Spain), Asia, Africa, America, Australia; mainly in tropical and subtropical regions.

#### Key to Genera

##### Full-grown larva

- 1 (2). Length about 15 mm; pronotum with curved anterior-angle process; anterior-angle tergite of mesonotum relatively large, partly fused with median tergite; hind tibia divided; larval case made of 2 large fragments of leaves, an upper and a lower . . . . . 1. **Anisocentropus** McL. (p. 500)
- 399 2 (1). Length about 22 mm; pronotum with straight or slightly concave anterior margin, without projecting anterior angles; mesonotum with large median and small anterior-angle tergites; hind tibia not divided; case made of a stalk of grass or a soft black fragment of wood with a tunnel inside . . . . . 2. **Ganonema** McL. (p. 506)

#### 1. Genus **Anisocentropus** McLachlan

Only one species, *A. pallidus*, occurs in the USSR.

Mode of life and habitats. Small, sunlit water bodies.

Distribution. USSR: Maritime Territory. In addition, Africa, Asia, North and South America, Australia, Sunda Islands.

1. *Anisocentropus pallidus* Martynov (*Ganonema pallidum* Martynov)

Levanidova, 1951:529-533, Figures 4-13.

**Full-grown larva.** Length 15.0-16.5 mm. Head and prothorax much narrower than mesothorax; metathorax and abdominal segments 1-8 much wider (Figure 656). Head (Figure 657, A) slightly oblong, narrower anteriorly; eyes some distance from anterior margin; antennae situated before eye in form of a brownish elevation; sensilla with a thin, light, apical seta. Frontoclypeus with a characteristic chestnut brown pattern reaching frontal sutures posteriorly with a large light spot in the middle; a wide median stripe with small lateral projections and 2 pairs of large light dots anteriorly.

Lateral anterior-angle seta transparent, curved inward, situated near margin in angle; median seta small, yellowish; intermediate seta long, dark brown, strong, also situated some distance from margin; anterior-frontal seta small, spine-shaped, thin, situated lateral to projections of median stripe; intermediate frontal seta near tentorial pit, moderately long, brown, thin; posterior frontal seta almost half as long, slightly thicker and darker. Remaining surface of head chestnut brown, with large light dots; periocular area and anterior stripe yellowish; narrow, dark stripes along frontal sutures, converging at coronal suture and with large light dots lateral to them; smaller light dots on site of lateral stripes and ventrally; gular suture with narrow dark margin near occipital foramen. Gula small, triangular, chestnut brown.

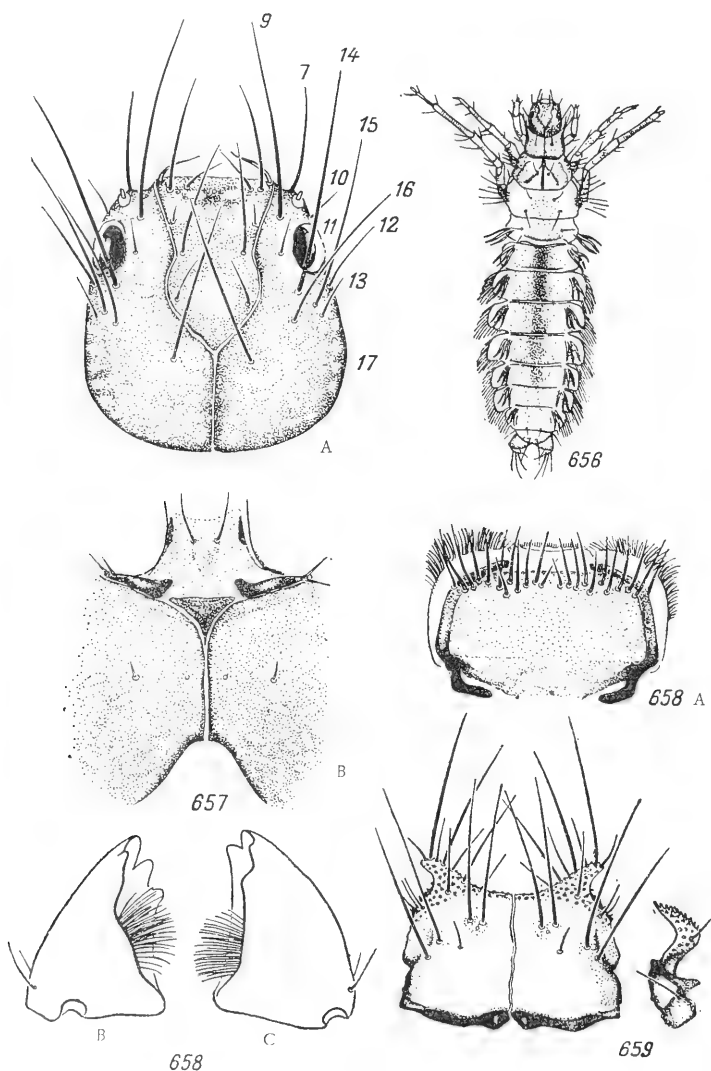
Seta 9 long, strong, dark; seta 11 situated further posteriorly, nearer to eye, small, thin, yellowish; seta 7 similar to 9 but shorter; seta 10 small, thin, on light background lateral to eye; setae 12 and 14 some distance behind eye, 14 dark, strong, longest seta on head, 12 much shorter, yellowish; a group of 3 setae posteriorly: short, thin, brownish seta 13 and large, dark brown setae 15 and 16; seta 15 longer than 16; seta 17 moderately long, situated on a small light dot. Ventral seta 8 spine-shaped, brown, situated near anterior margin; seta 18 small, light, situated among dots (Figure 657, B).

Labrum whitish, membranous anteriorly and laterally, with dense light hairs; dorsal sclerite light, with a dark reddish brown stripe at margin; posterior-angle sclerites short, curved, dark; anterior part with a transverse row of large reddish brown setae of different length, 12 on each side, one situated on membrane, the others on sclerite (Figure 658, A).

Mandibles short, brown, with darker distal part; a brush on both mandibles as a dense tuft of light hairs in deep median indentation; dorsal blade of left mandible with one large tooth in addition to distal tooth, ventral blade with 2 similar teeth; right mandible with 2 teeth on dorsal and one on ventral blade; lateral setae short, brownish, situated basally some distance from each other (Figure 658, B, C).

Maxillolabium fleshy, mainly light. Sclerites of cardo blackish brown, transverse with a large whitish yellow median spot; 2 small dark setae laterally at anterior margin. Submentum oblong, brown, narrow posteriorly, with deeply concave anterior margin and thin, relatively large, brown setae at anterior angles. Stipes large, thin, with dark brown median stripe; both setae moderately long, dark, basal larger than other. Palpifer reddish brown, 400 distinct; apical seta large, situated on membrane among numerous light hairs;

basal seta situated on membrane near median margin, small, yellowish. Maxillary palps very short; 1st segment slightly larger than following segments, which are of the same length. Galea wide, short, with a reddish brown circular sclerite, with tuberculate membranous surface and relatively large sensillae. Mentum short, reddish brown, with median process. Ventral sclerites with a small brown seta. Sclerite of palpiger horseshoe-shaped, narrow. Labial palp well developed, with brown sclerite, one sensilla large, light.



FIGURES 656-659. *Anisocentropus pallidus* Mart.:

656 - larva, dorsal; 657 - head, dorsal (A) and ventral (B); 658 - labrum (A), left (B) and right (C) mandibles, dorsal; 659 - pronotum and propleuron.

Pronotum (Figure 659) with concave anterior margin, and large, pointed, anterior-angle processes; anterior margin thick, brown, surrounding entire angle process and extending to anterior part of lateral margin as a narrow, dark brown stripe; posterior margin black, brown at triangular, posterior-angle process; base of triangular process with a brown stripe representing beginning of the brown, curved, lateral ridge extending forward on sclerite surface; other surface yellowish. Primary anterior-angle seta situated near end of process; 2 similarly thick dark setae situated medially at small intervals; 4 short brown setae situated between thick setae, and lateral to them; 2 large, dark setae situated close together near distal end of ridge some distance from anterior margin, a short thin seta near process; 2 long, dark, and a small, thin seta in middle of pronotum; dark area of lateral margin with 3 short thin setae and several small, light, conical spinules.

Mesonotum incompletely and irregularly sclerotized; median tergite large, divided by median suture, distinct mainly anteriorly, with a smaller anterior-angle tergite on each side; median tergite with a thicker, wide, brown oblique area in each half, with a large dark chestnut brown spot posteriorly, other surface yellow, thin, with pale, tapering processes posteriorly; anterior-angle tergites small, narrow, with a group of 6 dark setae at anterior margin, including 3 large setae (one of them primary), 2 shorter and one small, thin seta; anterior-margin setae short, situated near margin in light median part; medioanal seta long, similar to anterior-angle seta, dark; intermediate and lateral seta small, thin.

Metanotum membranous, with small, oblong, anterior-angle sclerites; 6 setae situated at anterior margin, primary and secondary setae longer than on mesonotum; anterior-angle setae situated on sclerotized dots; surface setae situated close together on a small oblique sclerite; medioanal seta moderately long, other 2 setae short, intermediate seta much smaller than lateral.

Pleuron with oblong, brown plate; pleural suture dark, oblique; epimeron smaller than episternum; seta of epimeron dark brown, short, situated near suture; trochantin large, sickle-shaped, covered with numerous, rough, spine-shaped processes, and small light setae, among them the short, dark, primary seta of trochantin at base of segment; small setules among small setae.

Pleurites of meso- and metathorax in form of brown triangular plates with dark pleural suture from apex to base; distal margin with dark and light areas; both setae moderately long, dark, seta of epimeron slightly shorter.

Ventral side of prothorax with a small, thin, yellowish, median sclerite with 2 small dark processes at anterior margin. Mesosternites paired, brown, transverse, small, with a narrow dark stripe. Metasternites similar but much smaller, almost intersegmental at posterior margin.

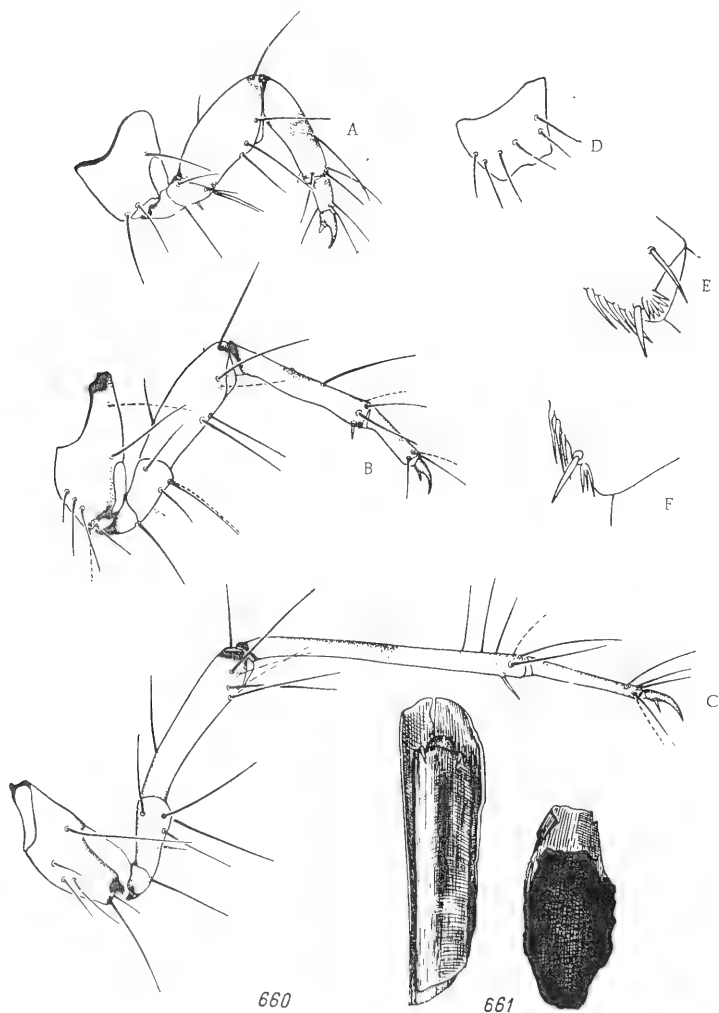
Forelegs shorter and more massive than other legs; hind legs much longer and thinner; ratio of length of legs 55:100:152.

Fore coxa (Figure 660, A, D) short, massive, wider basally with shallow distodorsal indentation; basal margin narrowly dark reddish brown. Setae dark, strong, reddish brown; both anterior dorsal setae situated close together, apical seta situated at margin of indentation, basal seta some distance further, much longer; posterior distodorsal seta similarly long;

both anterior surface setae short, strong, situated close together, about in middle of coxa; anterior of the 2 distoventral setae moderately long; posterior short, much thinner; basal part with 2 thin, secondary, ventral setae.

Trochanter short; basal part slightly smaller than apical part; anterior surface seta small, light, strong; posterior seta short, dark, thin; one of 3 anterior ventral setae situated apically, basal seta at suture, both moderately long, dark; intermediate seta small, spine-shaped, yellowish; one of 2 posterior ventral setae situated near anterior seta, of equal length; 2nd seta situated subapically, short; both setae dark.

(402)



FIGURES 660 and 661. *Anisocentropus pallidus* Mart.:

660 - right legs: foreleg (A), midleg (B), and hind leg (C), posterior; left fore coxa, anterior (D); end of left fore tibia, anterior (E); distal end of left mid-tibia, anterior (F); 661 - larval case.



Femur massive; basodorsal seta situated in basal part, short; apical dorsal seta moderately long; these 2, and other setae of femur, dark, strong; anterior seta short, subapical; posterior seta subventral, much longer; both ventral setae situated in distal part, close together, relatively long.

402 Tibia thick, slightly shorter than femur; distodorsal seta short, 2nd dorsal seta situated subapically, darker, thicker, and much longer; anterior seta situated subapically in middle, spine-shaped, reddish brown; posterior seta situated subdorsally, moderately long, thin; posterior distoventral seta in form of short, blunt, yellowish brown spine; anterior distoventral seta yellowish brown, divided fanlike into 5 spine-shaped branches, lateral branches larger, 3 middle branches smaller; row of light spinules ventrally along tibia, distal spinule larger. Tarsus short, tapering distally; setae moderately long, thin, brown, in pairs anteriorly and posteriorly; light spinules ventrally. Claw short, blunt apically, with basal seta in form of a blunt spinule.

403 Mid-coxa (Figure 660, B) with long basal part; distodorsal indentation reaching to middle; all setae dark; basal and posterior distodorsal setae long, anterior shorter; one anterior surface seta short, as on forelegs; 2nd seta displaced ventrally, thick, moderately long, resembling anterior distoventral seta; posterior distoventral seta short, thin; posterior surface subventrally with 2 pairs of secondary setae, basal pair short, brownish; 2nd pair brown, longer and stronger.

Trochanter and femur moderately long, longer than on forelegs, their setae similar but longer. Tibia straight, rodlike, thin, longer than femur; dorsal setae and both surface setae longer and thinner than on forelegs; posterior distoventral seta in form of a small, thin, brown spine, slightly larger than on forelegs; anterior distoventral seta small, divided apically into 2 yellowish, and several smaller, transparent branches; a row of small light chaetae ventrally. Tarsus half as long as tibia, rodlike, thin, with pairs of setae anteriorly and posteriorly, dorsally and subdorsally; anterior dorsal seta longer than ventral; posterior dorsal seta shorter. Claw slightly curved, thin, with a short blunt spine.

Hind legs (Figure 660, C) thin, very long. Coxa and trochanter narrower and longer than on midlegs; setae the same. Femur straight, rodlike; basodorsal seta slightly smaller than apical dorsal seta; anterior and posterior seta also long; anterior ventral seta situated at distal margin, posterior ventral seta situated subapically, both of equal length, longer than other setae. Tibia straight, rodlike, narrow, nearly twice as long as femur, with a transverse stripe in middle; distodorsal seta longer than others; 2nd dorsal and posterior seta almost equally long, anterior seta near distal seta, shorter; all 4 setae thin; both ventral setae situated subapically, posterior seta in form of a thin, slightly curved, yellow spine, anterior seta moderately long, like other setae of tibia. Tarsus straight, thinner than tibia, half as long; all 4 setae situated dorsally and subdorsally, of almost equal length. Claw slightly curved, with a small basal spine.

Abdomen flattened dorsoventrally; segments 1-2 narrower than following segments, which are almost uniformly wide, widening slightly from segments 5-7; segment 8 longer than others, narrower posteriorly. Segment 1 with a wide, shallow, dorsal process with a narrow, dark, transverse sclerite; lateral processes displaced ventrally, with a broad semicircle of rows of small hooks apically. Lateral line on segments 3-7, with dense, light, long hairs at margin of lateral processes. Gills on

segments 1–8, only dorsally segment 1, in dorsal, pleural, and ventral rows on following segments; dorsal gills situated on sides of the segment, pleural gills on a tubercle below lateral line, ventral gills situated slightly medially; gills of segments 1–6 with 3 filaments; with 2 filaments in pleural and ventral rows on segment 8, with 2 or 3 filaments in same position on segment 4 and dorsal side of segment 8.

Number and arrangement of gills of *A. pallidus*

7	3 (2)	3 (2)	3 (2)
8	3 (2)	2	2

Segment 9 with a large brown tergite; medioanal setae thick, long, dark, situated at posterior margin; anterior-angle setae similar but shorter, also at posterior margin; intermediate and lateral seta small, thin, situated between aforementioned setae together with a similar thin seta; lateral ventral seta situated laterally, thick, short, strong; intermediate ventral seta similar, median ventral seta small, thin.

Anal legs, short, thick, directed laterally. Sclerite "b" surrounding anal leg dorsally, laterally, and partly on ventral side; with 4 thick, long, dark brown, distodorsal setae. Sclerite "c" slightly lighter, with a short, thick, dark seta. Claw short, strongly curved, with a small dorsal denticle; seta 1 short, thin, situated dorsally; seta 2 slightly longer, situated more laterally than usual; seta 3 situated dorsally in distal part, long, thick, dark, much larger than other setae; seta 6 laterally situated in distal part, thin, similar to seta 2; seta 4 similar, situated basally near suture; setae 7 and 8 shorter, curved, dark; seta 5 small, situated laterally near seta 8.

Case flattened, made of 2 leaf fragments, an upper and lower, connected at sides; upper leaf longer, and usually slightly wider than lower leaf; anterior end projecting. Larva uses either fresh, green leaves of aquatic plants or decayed, black leaves. Length of case 20–26 mm, width 8–10 mm (Figure 661).

404 Mode of life and habitats. Calm, sunlit creeks of slow rivulets; among vegetation, on a bottom with abundant detritus, or on snags.

Distribution. USSR: Maritime Territory. Not recorded outside the USSR.

## 2. Genus *Ganonema* McLachlan

Only one species occurs in the USSR.

Distribution. USSR: Maritime Territory. In addition, Africa, Asia, Sunda Islands, North and South America.

## 1. *Ganonema extensum* Martynov

Levanidova, 1951: 533—537, Figures 14—21.

**Full-grown larva.** Length 24.0—24.5 mm. Head dark chestnut brown, with light periocular spots; pattern on head with light oblong dots (Figure 662, A). Frontoclypeus differing from that of *Anisocentropus* in its shorter anterior and long posterior part, with 3 oblong light dots forming a fan and a lateral, smaller dot on posterior part. Lateral anterior-margin seta as in *Anisocentropus*, transparent, short, curved inward; intermediate and median anterior-margin setae long, straight, black, the latter smaller and thinner; anterior frontal seta short, dark; intermediate frontal seta moderately long, situated near tentorial pit; posterior frontal seta slightly smaller. Dorsal stripes along sutures replaced by characteristic, oblong dots forming a row lateral to frontal sutures, and 2 rows lateral to coronal suture; rows of light dots on site of lateral stripes; similar large light dots on ventral side lateral to gular suture. Gula triangular, slightly larger than in *A. pallidus* (Figure 662, B).

Large dorsal setae brownish black, small setae lighter and much thinner. Seta 9 long, seta 11 small, both situated on dark background near margin of periocular spot; seta 7 moderately long, thinner than 9; seta 10 situated before and lateral to eye, small, brown; seta 14 situated behind eye, the largest on the head; seta 12 thinner and shorter; seta 13 short, thin; setae 15 and 16 long, situated close together one behind the other; seta 17 thin, moderately long, as long as posterior frontal seta. On ventral side, in contrast to *A. pallidus*, seta 8 small, yellowish; seta 18 larger, dark, short.

Labrum as in *Anisocentropus*, with light membranous margin and dense, short, yellowish white hairs laterally; dorsal sclerite reddish brown, with a transverse row of short, strong, blackish brown setae anteriorly, 12 setae on each side (Figure 663, A).

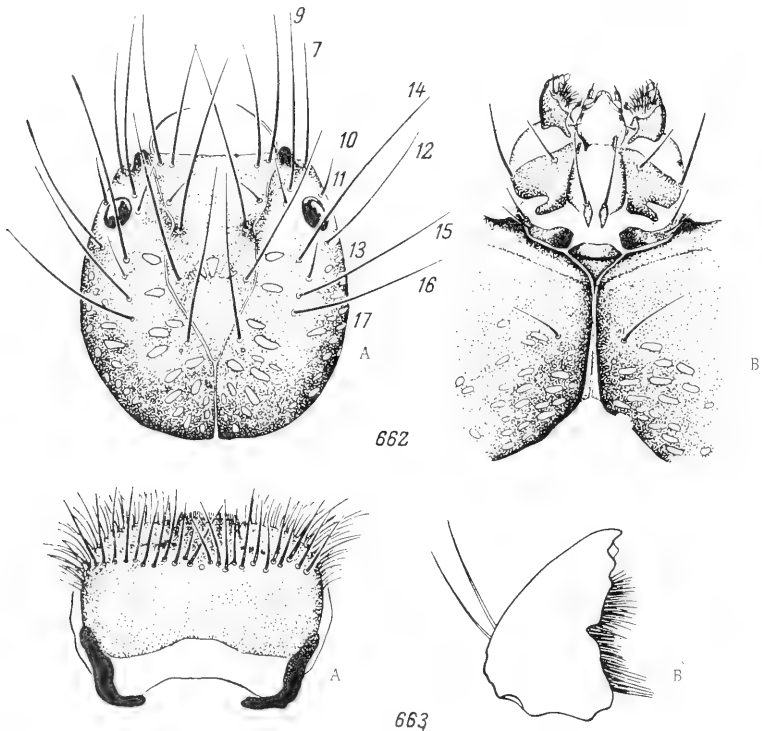
Mandibles short, massive, black, with deep median indentation; distal tooth blunt; both mandibles with a large trapezoidal process on dorsal blade near distal tooth (Figure 663, B); ventral blade with 2 teeth on left mandible, one tooth on right mandible; median indentation with a brush consisting of 3 tufts of shining, brownish yellow hairs on both mandibles; those of left mandible more dense; lateral setae situated basal, short, dark.

Pregula brown. Sclerites of cardo transverse, reddish brown, blackish laterally, on median side and at lateral margin, with 2 short setae laterally near anterior margin. Other sclerites of maxillolabium brownish. Submentum (Figure 662, B) with small oblong median sclerites; seta large, brown, distal. Stipes large; both setae strong, dark brown, of about equal length. Palpifer large, almost as long palp; distal seta small, brown; median basal seta small; both setae situated on membrane; palp small, conical, with short segments of about equal length. Mentum brown, dark brown basally, large. Ventral sclerites in form of light dots; seta small, white. Palpiger large, horseshoe-shaped, smoke brown, palp with a similar sclerite; labial lobe conical.

Prothorax (Figure 664, A) not oblong, in contrast to *Anisocentropus*; pronotum wide, each half about as long as wide. Anterior margin and anterior angles with narrow brown margin; posterior margin, posterior-angle processes, and a short posterior part of lateral margin black; surface

yellowish; a wide, dark, longitudinal stripe with narrower posterior end and light oblong dots near median suture; lateral areas with similar, wide, 405 oblique stripes which do not reach posterior margin; groups of oblong dots in posterior part of stripes.

Anterior-angle seta long, black; a row of 10–11 long, black setae at margin; 4 short, dark brown setae laterally and posteriorly in anterior part of lateral margin. Surface with a long dark seta on light background near dark median stripe, a small thin seta further anteriorly and laterally; 2 pits near setae; posterior part with similar, dark, long seta on a dark oblique stripe; anterior angles with 3 long setae on and near dark oblique stripe; 2 setae, one near lateral margin anteriorly, the other posteriorly longer, dark.



FIGURES 662 and 663. *Ganonema extensum* Mart.:

662 — head, dorsal (A) and ventral (B); 663 — labrum (A), left mandible, dorsal (B).

Mesonotum incompletely sclerotized, with a large median sclerite and small, brownish anterior-angle sclerites with 11–12 black setae, 6–7 of them long. Median sclerite chestnut brown, with large yellowish brown dots, 2 wide, short, oblique, dark stripes, lateral to suture, converging at anterior margin; anterior-margin seta situated at margin of stripe, black, large; medioanal seta black, long; lateral seta similar; intermediate seta short, thin, light brown.

Propleuron (Figure 664, B) longitudinal; pleural suture in form of a short, dark, transverse groove; epimeron with dark margin posteriorly and laterally, seta near suture thin, dark, long; episternum larger than epimeron; trochantin large, with a pointed, conical process; a small, dark seta and 2 light setules basal to process on anterior side; sclerite with numerous minute chaetoids. Pleurites of meso- and metathorax yellowish brown, oblong, with narrow, black, pleural suture and wide, short, distal margin of episternum, and a long black seta laterally; seta of epimeron similar, situated distally at suture.

406 Prosternite represented by 2 transverse sclerites, fused in middle, each with a dark anterior stripe. Sternites of meso- and metathorax in form of small light sclerites with a narrow, dark, lateral stripe.

Forelegs massive, brown. Coxa relatively short; all 3 dorsal setae dark, moderately long, strong, one of 2 anterior surface setae the same, the 2nd short; a subventral group of 9 dark, brown, short, secondary setae posteriorly; chaetoids very small anteriorly; dense on ventral side as are mid- and hind legs.

Posterior seta of trochanter moderately long, subdorsal; anterior seta short, subventral; apical of the 3 ventral anterior setae light, thin, small; intermediate seta small, brown; basal seta short, light; both posterior ventral setae situated close together subapically, dark, apical seta long, subapical shorter.

Femur slightly curved; apical dorsal seta moderately long, basodorsal seta shorter; ventral setae situated distally, long, posterior subventral seta the same; anterior subapical seta short, strong, reddish brown; small light spinules ventrally between setae. Tibia shorter than femur, with 3 moderately long setae dorsally, one of them subapical, dark, strong, other 2 thin, light brown, apical; posterior seta situated subdorsally, strong, short, dark brown; anterior seta spine-shaped, curved, reddish brown; 2 short, blunt spines ventrally, anterior one shorter; a row of light spinules ventrally.

Number and arrangement of gills of *G. extensum*

Segment	Dorsal	Pleural	Ventral
2	3	2	3 (2)
3	3	2	3
4	3	2	3
5	3	2	3
6	3	2	3
7	3 (2-1)	1	2
8	1		

Tarsus narrower and less than half as long as tibia, with 2 dorsal and 2 ventral setae. Claw large, basal seta in form of a straight spine.

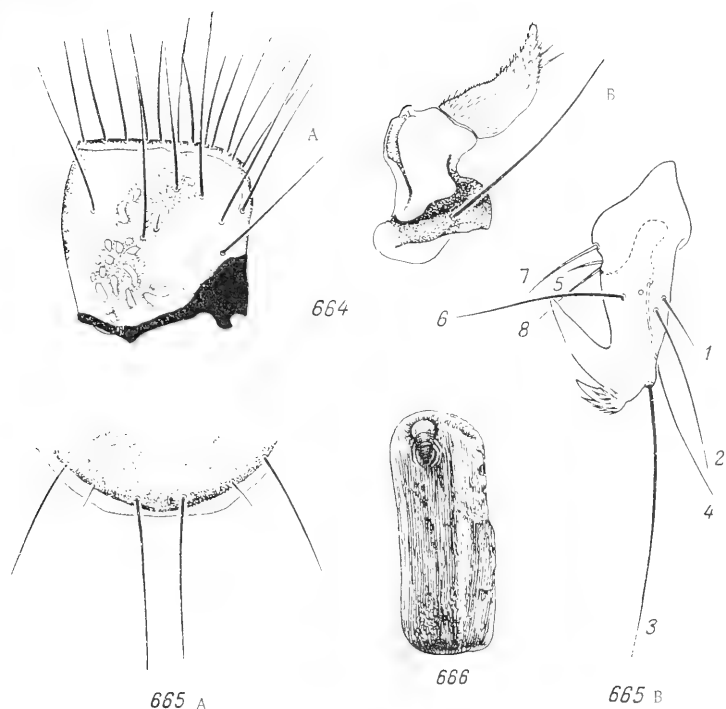
Mid- and hind legs longer and thinner than forelegs; hind legs especially long; large setae also longer. Coxa oblong; one of 2 anterior surface setae situated subdorsally, the other subventrally, almost ventrally on hind legs. Trochanter of characteristic form, flat, oblong; anterior seta small, light; posterior seta thin, moderately long; both posterior ventral setae long, situated some distance from each other, in contrast to forelegs; the apical and intermediate of the 3 anterior ventral setae of midlegs, small, light, basal seta moderately long; all 3 anterior ventral setae of the hind legs long. Femur straight, long, narrow, with differentiated, small, basal part; setae, especially on hind femur, longer than on forelegs; chaetotaxy similar, except ventral setae, which are situated some distance from apex and close together on hind legs. Tibia also straight, long, narrow, thinner than femur, slightly longer than basal part of femur on hind legs; 2 setae dorsally, one dark and long, the other (secondary) short, light brown; 2nd dorsal seta situated some distance from distal setae, longer than other setae of tibia; anterior and posterior seta moderately long, dark, situated near distodorsal seta; the posterior of 2 distoventral setae in form of a blunt, yellowish brown, spine; anterior one with a short base divided into 4 thin, light spinules. Tarsus straight, thin, long; all 4 setae thin, moderately long, situated at distal margin, 2 dorsally and 2 subdorsally; posterior seta of each pair longer than anterior. Claw especially that of hind legs longer and thinner than on forelegs; basal seta in form of a blunt spine.

Abdominal segment 2 shorter than its following segments; dorsal process large, with rounded apex; lateral processes situated nearer ventral side with thin, yellowish sclerites covered with dense, small hooks. Lateral line on segments 2-7, with a dense row of short light hairs; a row of small, reddish brown dots on segment 8, each dot with a small seta. Gills at anterior margin of segments 2-8.

Anterior margin setae of abdominal segment 1 small, brown; anterior-angle setae larger, blackish brown, near a small light secondary seta; 407 medioanal setae moderately long; setae of segments 2-7 small, thin; setae of segment 8, especially medioanal seta, larger than on preceding segments.

Tergite of segment 9 (Figure 665, A) uniformly brown, with rounded posterior angles; medioanal setae near margin dark, long; a row of 3 short, thin, brownish setae laterally, of them, an anterior-margin seta situated more posteriorly than usual, other 2 are the intermediate and lateral anal setae; anterior-angle seta separated from others, situated laterally. Ventral setae short, dark, thin; lateral seta displaced laterally and smaller than other 2 setae.

Anal legs short, massive; anal slit with a narrow, small, reddish brown stripe. Sclerite "b" convex dorsally, similar to a shell of *Ancylus* with apex turned toward the base of claw; crest of convexity with a groove; a thick, moderately long, black seta subapically; 2 similar setae medial to crest basally and subapically; a short strong seta laterally. Sclerite "c" uniformly brown, with short, dark, basal seta. Claw (Figure 665, B) sharply curved at apex, with 2 small dorsal denticles on curvature. Seta 1 situated close to base, reddish brown; setae 2 and 6 long, blackish brown; seta 3 situated above denticles; median seta 4 long, thick, black; ventral setae 7 and 8 yellowish, moderately long; seta 5 small, thin, dark, situated near seta 8.



FIGURES 664-666. *Ganonema extensum* Mart.:

664 - pronotum, dorsal (A) and propleuron (B); 665 - tergite of abdominal segment 9 (A), claw of right anal leg, lateral (B); 666 - larval case.

Case made of large, decayed, soft fragments of tree detritus, in which larva bores a cylindrical tunnel (Figure 666); posterior end remains closed.

Mode of life and habitats. Calm creeks and channels of small rivers with abundant detritus on bottom.

Distribution. USSR: Maritime Territory. Not recorded outside the USSR.

#### 408 VII. Family ODONTOCERIDAE Wallengren

**Full-grown larva.** Length 16-17 mm. Head wide, only slightly longer than wide; eyes situated some distance from anterior margin; frontoclypeus narrow, with shallow lateral indentations. Labrum oblong. Mandibles short, without teeth and brush in median depression.

Pronotum and mesonotum sclerotized. Metanotum with small tergites, 2 median and 2 lateral. Forelegs short, massive; mid- and hind legs thin, long; coxae and femora with numerous secondary setae.

Gills with tufts of filaments, presegmental on abdominal segments 2-7. Tergite of segment 9 narrow posteriorly. Anal legs short, claw blunt.

Case made of mineral particles.

**Pupa.** Length 15.0–15.5 mm. Antennae long, coiled around posterior abdominal segments. Labrum wide, with short setae. Mandibles as in Psychomyiidae, long, with thin end. Gills as in larva. Anal rods thin, with curved end.

Case as in larva, attached at posterior end.

Mode of life and habitats. Small, running, water bodies.

**Distribution.** Western part of the European USSR and eastern part of the Asiatic USSR. In addition, Europe, East Asia, North and South America.

## Key to Genera

### Full-grown larva

- 1 (2). Head and pronotum with pale pattern, without longitudinal stripes; median tergites of metanotum transverse, situated one behind the other; case made of mineral particles; the European USSR. . . . . 1. *Odontocerum* Leach (p. 512)
- 2 (1). Head and pronotum with dark stripes on light background; tergites of metanotum arranged differently, and smaller; case made of plant particles; the Asiatic USSR. . . . . 2. *Psilotreta* Banks (p. 519)

### 1. Genus *Odontocerum* Leach

Only one species, *O. albicorne*, occurs in the USSR.

Mode of life and habitats. Brooks and small rivulets.

**Distribution.** Western part of the European USSR. In addition, Europe.

### 1. *Odontocerum albicorne* Scopoli

Pictet, 1834: 164, Figure 2. — Klapálek, 1888: 35, Figure 12. — Ulmer, 1903: 99–100, Figures 7, 61, 100. — Thienemann, 1905b: 532–533, 545, Figures 60–67. — Siltala, 1907: 483–485. — Ulmer, 1909: 252, Figure 379. — Lestage, 1921: 592–597, Figure 202. — Nielsen, 1942: 450–465, Figures 93–103. — Hickin, 1942: 119–122, Figures 1–8. — Lepneva, 1940: 212.

**Full-grown larva.** Length 16–18 mm (Figure 667). Sclerites mainly yellowish light brown; pattern reddish brown with dark brown dots. Head short, broad, slightly wider posteriorly, width about 0.92 of its length; sides straight (Figure 668); eyes at about  $\frac{1}{4}$  of length from anterior margin. Antennae situated near anterior margin with small sensillae. Head with a ridge in form of a sclerotized fold from dorsal articulation of mandibles above antenna and eye; ridge becomes less distinct posteriorly, runs along coronal suture, and meets with ridge of opposite side, resembling the crown of Macronematidae.

Frontoclypeus narrow, with shallow lateral indentations; surface with a pale brownish pattern with triangular posterior part covering entire sclerite,



and an anterior part with 2 lobes; 2 large dark dots near posterior angle; 2-3 smaller dots at base of anterior part. Dorsal stripes beginning in middle of sclerite, pale, with distinct, reddish brown, transverse dots; stripes converge at coronal suture before ridge, leaving a light area at fork. Lateral stripes absent, sometimes replaced by pale dots. Ventral side laterally with pale and reddish brown spots in form of broad stripes with groups of dark dots. Gula long triangular; gular suture shorter than gula.

Lateral anterior-margin seta situated, as in *Rhyacophila*, lateral to frontal suture, transparent, thin, curved, procumbent; intermediate and median anterior-margin setae situated close together in angle, brownish, former longer than latter; anterior frontal seta procumbent, light; intermediate frontal seta short, brownish, situated near curvature of frontal suture; posterior seta situated behind curvature, lighter and thinner. Seta 9 short, brownish, situated before eye; seta 11 small, situated posteriorly near ridge at level of eye; seta 14 moderately long, brown, situated behind eye, the longest on the head; seta 15\* and brownish, procumbent seta 16 situated further posteriorly; seta 17 situated medially, short; seta 7 small, smaller than 9, seta 10 large, like setae 12 and 13, situated one behind the other. Ventral surface without dots; gula in form of a triangle; gular suture longer than gula; seta 8 strong, almost equal to 7; seta 18 small.

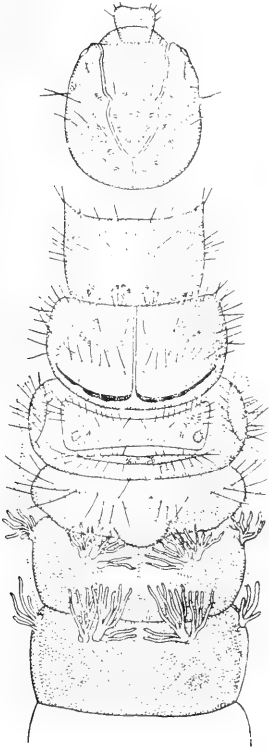


FIGURE 667. *Odontocerum albicorne* Scop. Head, thorax, abdominal segments 1-3.

Labrum (Figure 669, A) oblong, narrow, almost as long as wide, with rounded anterior angles; dorsal sclerite large, brownish yellow; median depression, posterior angles, and posterior-angle sclerites dark reddish brown; setae short, light, relatively thick situated near anterior margin; seta 1 in form of a small, blunt spine; setae 4 small, blunt, crossed; setae 2 situated laterally on anterior margin, blunt, short; setae 3 large, situated at anterior angle; setae 5 the same, situated near margin; setae 6 slightly shorter, situated anteriorly, lateral to median pit.

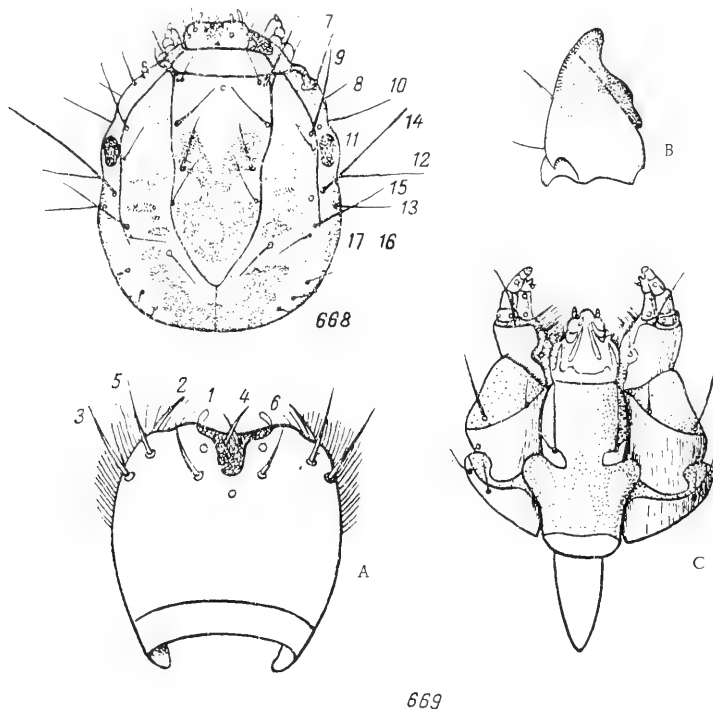
Mandibles (Figure 669, B) with blunt apex; distal part short, without teeth; dorsal blade projecting, ventral blade indistinct; lateral setae light, short, widely separated.

Pregula (Figure 669, C) in form of small reddish brown sclerite. Submentum with 5 small sclerites, 3 of them basal, light yellow, the other 2 anteriorly, dark brown, transverse, each with a short dark seta. Sclerites of cardo reddish brown, each with 2 small, light, curved setae. Stipes large, light yellow, lateral seta short, yellowish, distal seta small, light.

\* In our specimens from the Western Ukraine, setae 14 and 15 are situated on the ridge, 14 on dorsal side, 15 on ventral side. Nielsen (1942:Figure 94) is mistaken in giving number 14 to the seta ventral to the ridge and 15 to the seta dorsal to the ridge.

Palpifer brownish, both setae situated on membrane, relatively large, brownish, distal seta situated at anterior margin; median, small, light seta situated in indentation. Maxillary palp conical, short; segment 1 with open sclerite; sclerites of other segments circular. Galea cylindrical to base of distal segment. Mentum reddish brown; anterior margin concave, with lateral processes; ventral sclerites thin, rodlike, with a small, transparent seta. Palpiger horseshoe-shaped, reddish brown; labial palp with brown sclerite and large sensillae.

(410)



FIGURES 668 and 669. *Odontocerus albicorne* Scop. (after Nielsen):

668 — head, dorsal; 669 — mouth parts: labrum (A), left mandible, dorsal (B), gula and maxillolabium (C).

Pronotum large, semicircular in cross section, yellowish, with broad brown anterior margin, with pointed, projecting anterior-angle processes; lateral margin narrow anteriorly, brownish, black posteriorly, connected with broad black posterior angle; posterior margin in form of a narrow brown stripe in middle, wide, pale yellow elsewhere, with rounded posterior 410 angles; posterior part of pronotum with light yellow posterior-angle processes lateral to black margin, and continued ventrally as narrow plates which are fused in middle. Anterior margin with 5–7 dark brown, short setae, several small setae among them; anterior-angle setae, one primary seta, and a large group of short to small, secondary setae (22–25 according to Nielsen), thinner and lighter than anterior-margin setae; 4 brown, moderately long surface setae at posterior margin, one in middle, 3 laterally,

and several short or small light setae; brown part of lateral margin with several small setae and 2 moderately long setae, resembling those of anterior angle.

Mesothorax and metathorax wider than prothorax; posterior part of mesonotum laterally with a short ridge separating a small lateral part; medium part much larger, with black posterior margin; surface yellow, with several large dots along median suture and in a transverse row. Anterior margin, rounded anterior angles, and part of lateral margin, with dense, small, light setae, longer anterior-angle seta among them; surface setae in 2 transverse rows, an anterior row of several, small, light setae, and a posterior row with numerous (21–23 according to Nielsen) large and small setae behind transverse row of dots.

Metanotum with 4 tergites, 2 single, transverse, median sclerites situated one behind the other in middle, and a lateral tergite; all tergites light, yellowish. Anterior tergite largest, in form of a transverse rectangle with 3 dark lateral spots and 2 smaller median spots near anterior margin, spots marked with small light dots; lateral tergites bean-shaped, with slightly concave lateral margin, light yellow, with a brownish spot at median margin. Large anterior median tergite with a dense row of small thin setae at 411 anterior margin, several surface setae and groups of setae at anterior corners behind them. Posterior median tergite with a large median spot and a lateral row of setae, including a larger medioanal seta. Lateral tergites with setae in an anterior group (including primary anterior-angle seta) and laterally.

Propleuron long, irregularly rhomboidal, with a wide, black ridge on shorter diagonal; episternum and epimeron almost equal, epimeron with a moderately long brown seta near suture; trochantin free, not fused with episternum, apical seta short, brown, both setules situated ventrally. Epimeron of metathorax slightly larger than on mesothorax; trochantin fused with episternum, conical, with black margin and a thin, brown, distal seta; epimeron with 4–6 lateral setae on mesothorax, 7–12 on metathorax.

Ventral side of mesothorax and metathorax with large, paired, light sternites, those on mesothorax with brown anterior margin.

Legs (Figure 670) relatively long, especially hind legs, with abundant secondary chaetotaxy on coxae and femora; ratio of length of legs 84:100:114; midlegs about  $\frac{1}{3}$  of length of larva.

Fore coxa oblong, narrower distally, like mid- and hind coxae; distodorsal indentation small; dorsal groove shallow; basal margin brown in some places, mainly broad and black. Numerous (25–28)\* anterior setae at dorsal margin, among them the 2 primary setae, basal and apical, dark brown and strong, in contrast to secondary setae; posterior dorsal margin with 5–7 setae, among them one dark primary seta; anterior and posterior surface with basal groups of large secondary setae, a large, dark brown, anterior primary surface seta dorsally; 2nd anterior primary seta short, subapical; a large number of long secondary setae ventrally; both distoventral setae thick, light brown, situated at margin, posterior shorter than anterior.

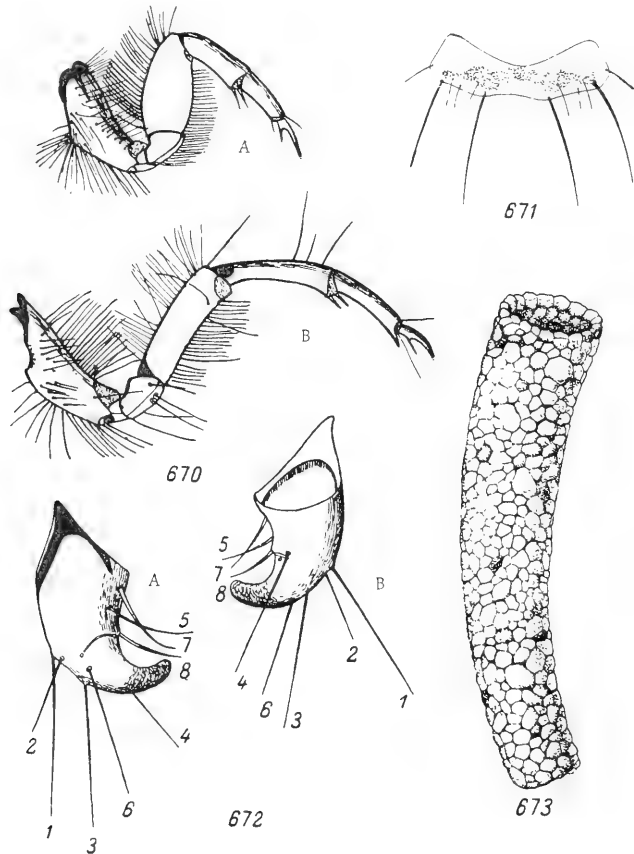
Trochanter closed dorsally; anterior surface with a subventral ridge from articulation with coxa to distal end of segment; anterior and

\* Number of setae according to Nielsen (1942:452).

posterior seta situated at distal margin, both brown, anterior slightly larger; both posterior of the 5 ventral setae (subapical and adjacent seta) moderately long; 3 anterior setae light, apical and subapical in form of short, blunt spines; basal spine short, situated near suture; a row of light, hairlike chaetoids from basal spine to distal end.

Femur convex dorsally and ventrally; both primary dorsal setae strong, brown; thinner secondary setae along entire dorsal margin; anterior primary seta dark brown, short, situated in a row of 15–20 subdorsal secondary setae; posterior primary seta situated subventrally at basal margin; both primary ventral setae large, light, spine-shaped basal seta situated near posterior surface seta.

(412)



FIGURES 670–673. *Odontocerum albicorne* Scop.:

670 – right legs, posterior: foreleg (A) and hind leg (B); 671 – tergite of abdominal segment 9; 672 – claw of anal leg, lateral (A) inner view (B); 673 – larval case (670, 672 – after Nielsen).

Tibia wider distally, without secondary setae, like tarsus; 4 short thin setae situated dorsally and subdorsally at apex and subapically, an anterior,

a posterior, and 2 dorsal setae; primary distoventral setae in form of blunt spines, posterior larger than anterior.

Tarsus with small, spine-shaped, distoventral process, and short, thin, light, primary setae near it; distodorsal setae similar.

Claw, dark brown, blunt, slightly curved; basal seta in form of a short, thick spine.

Mid- and hind coxae with numerous secondary setae as on forelegs, except for posterior dorsal secondary setae, of which there are 1-2 on midlegs and none on hind legs. Dorsal posterior, and both anterior primary setae, dark brown, long; anterior basal surface seta the same, distal seta situated among secondary setae; both distoventral setae light, larger than on forelegs, anterior larger than posterior.

Hind trochanter without secondary setae; ventral row of light chaetoids shorter and sparser on midlegs than on forelegs. Primary seta moderately long, especially those on hind legs; 2 anterior ventral setae, apical and subapical, light and spine-shaped on midlegs, larger on hind legs; long, but shorter than other 3 ventral setae.

412 Mid-femur slightly convex dorsally; hind femur straight, with nearly parallel dorsal and ventral sides; secondary setae situated dorsally, ventrally, and partly on anterior surface; primary dorsal setae situated apically and basally among secondary setae; anterior surface seta short, subapical; posterior surface seta situated subventrally, basally on midlegs, long and subapically on hind legs; both ventral setae of midlegs situated close together at base, widely separated in middle on hind legs.

Tibia wider distally, hind tibia longer than fore and mid-tibiae; dorsal and subdorsal setae moderately long; distoventral setae in form of short spines, posterior spine blunt, brownish yellow; anterior light.

Hind tarsus long, like tibia; dorsal setae relatively long; distoventral setae of mid- and hind legs short, thin, posterior seta larger, dark brown, anterior light. Claw reddish brown, with blunt, yellow, basal spine, claw of midlegs shorter and more massive than on hind legs.

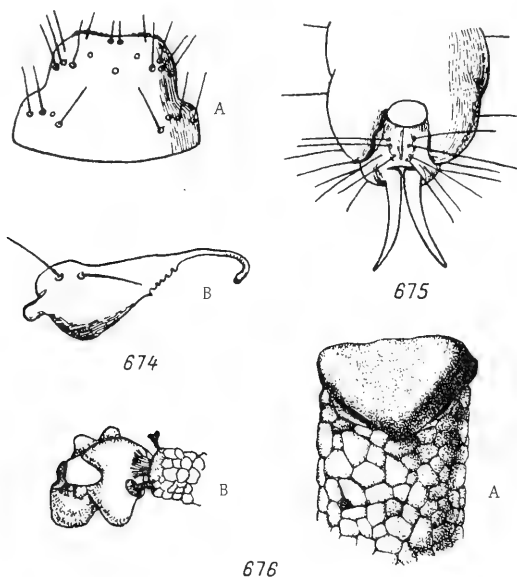
Abdomen almost uniformly wide, slightly tapering posteriorly; segment 8 only slightly wider than 9. Lateral line little differentiated, thin, consisting of small, light, thin chaetae on segments 3-7. Gills only presegmental, in a dorsal row on segments 2-8, in a lateral row on segments 2-3, in a ventral row on segments 1-8, with several filaments; each gill consisting of a basal stalk with a row of straight, thin filaments (Volume II No. 1, Figure 19); ventral gills of abdominal segment 1, lateral and dorsal gills of posterior segments very small.

413 Abdominal segment 1 shorter than following segments, with a wide, low, dorsal process; lateral processes small, with numerous curved, comblike, apical sclerites. Anterior part of segment with 15-16 golden brown, strong setae lateral to dorsal process, among them 4 primary setae (anterior-margin, and 3 surface setae); anterior angles with 7-11 setae, including primary anterior-angle seta; pleural region with 2 small setae, one dark, the other light; ventral side with a small, crescent-shaped sternite with a medioanal seta at anterior margin; intermediate ventral seta situated on membrane, lateral ventral seta absent. Following segments with only small, pale, primary setae.

Tergite of abdominal segment 9 (Figure 671) whitish yellow, covering almost entire dorsum, with a reddish brown stripe of dots posteriorly. Medioanal and anterior-angle seta situated at posterior margin, dark brown,

thick, moderately long; intermediate and lateral seta small, light, situated between former 2; another, small, thin seta situated on sclerite lateral to anterior-angle seta.

Anal legs short, wide, irregularly hemispherical. Sclerite "b" brownish, continuing ventrally as a whitish yellow stripe, with wide, dark, oblique stripes laterally and basally. All distodorsal setae thick, dark brown, strong, relatively long; median margin with a short, light brown, subapical seta; a larger dark seta closer to base near lateral margin. Sclerite "c" relatively large, brown, with a wide, black, dorsal process; seta situated subapically at ventral margin, large, reddish brown.



FIGURES 674-676. *Odontocerus albicorne* Scop. Pupa:

674 - anteclypeus and labrum (A), right mandible, ventral (B);  
 675 - posterior end of male pupa, ventral; 676 - pupal case:  
 anterior end (A), posterior end (B) (674, 675, 676, B - after  
 Nielsen).

Claw (Figure 672) short, blunt, dark brown; membranous stripe incomplete, in form of a narrow slit, mainly on ventral side. Dorsal seta 1 situated basally, dark brown, long; seta 2 short, thin, situated laterally; setae 3 and 6 situated subdorsally on sides, dark, slightly shorter than seta 1; setae 7 and 8 situated ventrally in basal part, curved, light; seta 5 situated nearby laterally and subventrally, also light; seta 4 long, dark, situated near suture.

Case made of smoothly arranged, fine, sand grains, cylindrical in anterior quarter, slightly curved and narrower posteriorly; posterior opening covered by a stone, with lateral slits on membrane (Figure 673).

**Pupa.** Length of male pupae 12.5 mm, of female, 13.6-15.6 mm. Antennae long, coiled around abdomen; proximal segment with 6-12 small, dark setae. Anteclypeus (Figure 674, A) with 3 short setae laterally. Labrum with 2 small lateral setae at anterior margin, and 4 short setae at anterior angle.

Mandibles (Figure 674, B) dark brown, conical, with a thin end, and club-shaped, inward-curved apex; blade serrated at base of thin end; lateral setae short, basodorsal seta smaller.

Wing sheaths pointed, reaching to middle of segment 7 in male pupae, to end of segment 6 in female. Hind tarsus with dense natatorial setae on segments 1-4, more numerous on dorsal side; fore tarsus with sparse setae.

414 Abdominal segment 1 sclerotized in its greater part from anterior margin, brown, transversely ridged, with a dark brown transverse ridge, and a row of small spinules.

Presegmental plates of holding apparatus on sides of segments 3-7, small, dark brown, each with a blunt, tooth-shaped process directed posteriorly; postsegmental plates of segment 5 light brown, situated close together with a lateral process directed anteriorly.

Lateral line on segments 6-8, extending partly to ventral side on segment 8; setae brownish. Gills on segments 2-7, as in larva; filaments slightly longer.

Anal rods thin, pointed, curved, without setae (Figure 675).

Case (Figure 676) shorter than in larva, attached to a stone in a strictly determined, slightly sloping position; anterior opening closed with a round, flat stone as large as width of case, and attached by a membrane with a narrow slit one third or a half as long as circumference; posterior opening with a smaller stone, its membrane with small slits near margin; case attached to a stone by several wide ligaments from near openings.

Mode of life and habitats. Brooks, small mountain rivulets, and springs with cold water, on stones; avoids rapid current.

Distribution. Western and southwestern parts of the European USSR, especially near the Carpathians. In addition, Central and Southern Europe.

## 2. Genus *Psilotreta* Banks

**Full-grown larva.** Mandibles, in contrast to *Odontocentrum*, with sharp apical, and small, blunt, basal teeth. Pronotum and mesonotum with a light median stripe and 2 dark, longitudinal, lateral stripes; dark stripes on pronotum extending from anterior to posterior margin; stripes on mesonotum to middle of tergite, where they are fused with dark posterior area. Case made of sand grains, in form of a wide, slightly curved, smooth-walled tube.

Mode of life and habitats. Running water bodies.

Distribution. USSR: Maritime Territory. In addition, Japan, China, Korea, North America.

### 1. *Psilotreta kisoensis* Iwata (*Psilotreta japonica* Banks, P. *Kyotoensis* Iwata, P. *armata* Martynov)

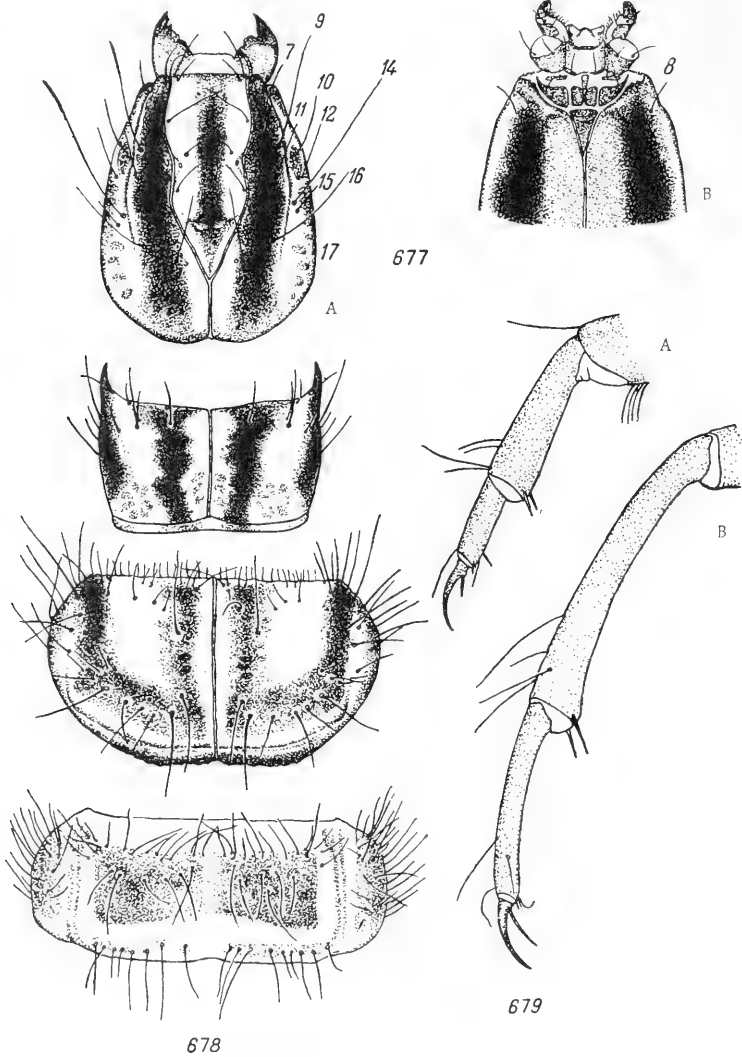
Iwata, 1928a:117-118, Figures 211-212. — Lepneva, 1958:914-919, Figures 1-3.

**Larva** (Stage 4). Length 8 mm. Head (Figure 677, A) slightly oblong; eyes small, situated some distance from anterior margin; a longitudinal

lateral ridge dorsal to eye. Frontoclypeus with a narrow, dark, longitudinal, median stripe with slightly wider, triangular posterior end; dorsal stripes wide, dark, extending from anterior to posterior margin; lateral stripes absent; ventral side with widely separated, broad, dark, longitudinal stripes extending partly to sides. Setae as in *Odontocentrum*, relatively thin, light brown.

Labrum oblong, with deep median indentation, similar to that of *Odontocentrum* in form and chaetotaxy; dorsal sclerite yellow, anterior setae short.

(415)



FIGURES 677-679. *Psilotreta kisoensis* Iwata:

677 - head, dorsal (A) and ventral (B); 678 - thoracic segments, dorsal; 679 - distal part of foreleg (A) and hind leg (B).



Mandibles yellowish basally, reddish brown in short distal part, with sharp, projecting, distal tooth, 2 small, tooth-shaped processes further basally; dorsal blade of right mandible with a large pointed apical tooth, and a tooth-shaped basal process; ventral blade with small pointed process on both mandibles; brush absent; lateral setae short, thin, widely separated.

Submentum (Figure 677, B) with 2 basal sclerites, a narrow median sclerite and 2 small apical transverse plates with setae. Stipes wide, yellow; both setae light. Palpifer similar; maxillary palps conical.

415 Mentum brown, in form of short, semicircular, curved sclerite. Labial palps small.

Pronotum (Figure 678) with pointed, projecting, blackish brown, anterior angles, a wide, dark stripe from them along the sclerite; a similar stripe in middle; yellowish surface forms 3 light, longitudinal stripes between dark stripes, one median, 2 lateral.

Mesonotum (Figure 678) with similar light and dark longitudinal stripes to middle of sclerite, connected by a wide, dark chestnut brown, transverse stripe in posterior part in each half, and with a marginal row of 5 light spots.

Anterior median tergite of metanotum (Figure 678) chestnut brown, large, covering almost entire dorsum of segment, with a light median stripe and several dots; posterior transverse tergite little differentiated, in form of a narrow, thin, interrupted setose stripe; lateral tergite slightly oblong, yellowish. Chaetotaxy as in Figure 678; setae thin.

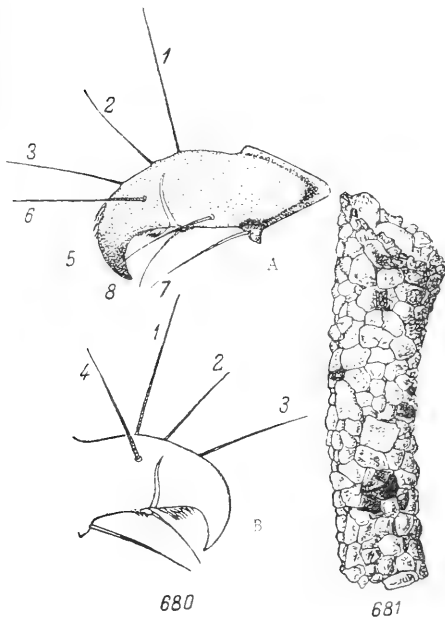
Propleuron represented by a small sclerite with short, black, pleural suture; epimeron larger than episternum; trochantin with a short seta. Pleurites of meso- and metathorax large, with blackish brown pleural suture, epimeron larger than episternum; seta of epimeron moderately long, dark brown, situated distally at suture on mesothorax closer to distoventral angle on

metathorax; trochantin fused with episternum, seta situated on process.

Fore- and midlegs differing markedly in length; hind legs longer than midlegs, with long tibiae and tarsi; form of segments and chaetotaxy as in *Odontocerum*; secondary setae brownish; femora with light, thin, almost transparent, ventral setae (Figure 679).

Abdominal segments uniformly wide; segment 9 slightly narrower than 8. Lateral line forming a row of small, white, dense hairs from middle of segment 3 to end of segment 7; lateral line replaced by a row of 10 small, reddish brown, sclerotized dots on segment 8.

416



FIGURES 680 and 681. *Psilotreta kisoensis* Iwata:

680 - claw of anal leg, lateral (A) and median (B); 681 - larval case.

Gills only presegmental, dorsal on segments 2—7, ventral on segments 2—8; a lateral row of gills could not be found in the only specimen in the collection of the Zoological Institute.

Tergite of abdominal segment 9 small, anterior margin brown, with small light dots; posterior margin with shallow median indentation; medioanal seta dark brown, moderately long; anterior-angle seta similar; intermediate and lateral seta small, thin; lateral ventral seta short, brown.

Anal legs wide, short, strongly convex laterally. Sclerite "b" chestnut brown dorsally and laterally, yellow in lateral ventral part; all 3 distodorsal setae of sclerite equally thick, dark brown, long; a short brown seta nearby subapically, a dark, strong, moderately long seta in light area. Sclerite "c" large, yellowish brown, with a strong, moderately long, brownish seta.

Claw (Figure 680) moderately long, with a narrow membranous stripe; setae as in *Odontocerum*; dorsal seta 1 moderately long, strong; seta 2 situated nearby, short; seta 3 long; seta 6 dark, situated laterally in apical part; seta 5 large, light, situated laterally in basal part near stripe; seta 4 dark, large situated medially; ventral setae 7 and 8 light, seta 8 shorter than usual.

Case made of densely arranged, fine, sand grains, slightly wider anteriorly, curved, with wide anterior and posterior openings (Figure 681).

Mode of life and habitats. Running water bodies.

Distribution. USSR: Maritime Territory, Vladivostok area. In addition, Japan, Korea.

417

#### VIII. Family MOLANNIDAE Wallengren

**Full-grown larva.** Length 12—18 mm. Body flattened dorsally. Head slightly oblong; gula extending from anterior to posterior margin, wedged between large lateral sclerites. Eyes situated some distance from anterior margin; antennae with long sensillae with a light apical seta.

Pronotum entirely sclerotized. Mesonotum with more or less marked transverse suture in some species. Metanotum with 2 small, median, anterior-margin tergites.

Fore tibia with characteristic distoventral process; this process little marked on mid-tibia; hind legs long, narrow, femur with a transverse stripe, claw modified; all legs with numerous setae.

Dorsal and lateral processes of abdominal segment 1 large, long. Lateral line on segments 3—7 forming a dense row of small light hairs; segment 8 with a row of small, reddish, sclerotized dots. Gills presegmental, with 1—4 filaments on segments 1—7. Tergite of segment 9 indistinct, thin; anal legs short, massive.

Case made of sand grains, sand grains and detritus, or detritus only, shield-shaped, consisting of a tube with an anterior hood and lateral winglike extensions.

**Pupa.** Length 10—15 mm. Antennae of male pupae almost as long as body, those of female shorter. Clypeus with 3 setae. Labrum moderately long, narrow, with small median process at anterior margin; setae short, 6 on each side.

Wing sheaths narrow, pointed, reaching beginning or middle of abdominal segment 5. Tarsi of all legs with natatorial setae, those of mid-tarsi more numerous.

Gills on abdominal segments 2-8, with 1-3, rarely 4, filaments. Holding apparatus presegmental on segments 3-6, postsegmental on segment 5. Anal rods straight, close together, with short setae.

Case as in larva; winglike extensions narrower, as larva ceases to make them before pupation; pupa lies with dorsal side downward; anterior cover with a transverse slit at dorsal margin, posterior cover with a slit at ventral margin.

Mode of life and habitats. Lakes; sandy littoral, on slightly silted, overgrown bottom; near river mouths.

Distribution. Throughout the USSR, except for Middle Asia and the Caucasus. In addition, Europe, China, Japan, India, Ceylon, Sunda Islands, North America.

## Key to Genera

### Full-grown larva

- 1 (2). Length 12-15 mm. Dorsal side of head and pronotum with characteristic pattern of stripes and dots. Claw of hind legs short, blunt. Gills with 1-3, rarely 4, filaments. Case made of sand grains or sand and detritus; wings of case well marked. . . . . 1. *Molanna* Curt. (p. 523)
- 2 (1). Length 9-10 mm. Dorsal side of head and pronotum mainly dark. Claw of hind legs long, thin. Gills with 1-2 filaments. Case made of detritus, with small wings, almost flat ventrally. . . . . 2. *Molannodes* McL. (p. 535)

### 1. Genus *Molanna* Curtis

**Full-grown larva.** Large, with distinct pattern on head and pronotum. Transverse suture of mesonotum distinct, or indicated by a row of dots. Gills with 3-4 filaments. Case shield-shaped, with wide, winglike extensions; tube distinct ventrally.

Mode of life and habitats. Calm littoral zone of lakes, river mouths, on a bottom of sand or sand and silt, at a depth of 0.5-3.0 m, sometimes deeper in upper sublittoral; often among vegetation.

Distribution. The European USSR, Siberia, the Amur Region. In addition, Europe, India, China, Japan, North America.

## 418 Key to Species

### Full-grown larva

- 1 (4). Frontoclypeus with light posterior angle.

- 2 (3). Frontoclypeus with broad, dark, lateral areas; light median stripe narrow, sometimes interrupted in middle by a transverse row of several, large, dark dots; dorsal stripes close to epicranial suture wider in middle than at end. Gula long, distinctly broader anteriorly. Mesonotum with distinct transverse suture. . . . . 1. *M. angustata* Curt. (p. 524)
- 3 (2). Frontoclypeus with narrow, dark, lateral areas; light median stripe wide; transverse row of dots indistinct; dorsal stripes straight, uniformly narrow, converging posteriorly, forming a V; a light area behind fork of frontal sutures. Gula wider and shorter than in *M. angustata*, slightly narrower posteriorly. Transverse suture of mesonotum absent, replaced by large dark dots . . . . . 3. *M. submarginalis* McL. (p. 533)
- 4 (1). Frontoclypeus dark laterally and at posterior angle, with a narrow, light, median stripe; dorsal stripes markedly wider posteriorly. Gula as in *M. angustata*. Mesonotum without transverse suture, with a row of large dark dots . . . . . 2. *M. albicans* Zett. (p. 532)

1. *Molanna angustata* Curtis

Klapálek, 1893:84–88, Figures 22–23.—Struck, 1900:26, Plate V, Figure 35 a, b; 1903, Plate III, Figure 2.—Ulmer, 1903:98, Figures 30, 62, 63.—Thienemann, 1905b:530–532, Figures 57–59.—Siltala, 1906:38, Figure 9; 1907:455–458.—Ulmer, 1909:241–242, 304, Figure 368.—Lestage, 1921:661–667, Figures 229–232.—Hickin, 1946:55–60, Figures 1–13.—Lepneva, 1940:209.

**Full-grown larva.** Length 17–18 mm. Head oblong, main color yellow, pattern brownish (Figure 682); eyes situated a considerable distance from anterior margin; antennae on a small elevation at margin above dorsal articulation of mandibles; sensilla long, with a short light seta. Frontoclypeus wider anteriorly; clypeal suture distinct, in form of a sharp, blackish brown ridge. Clypeus with 2 large, dark dots at anterior margin; frontal area dark laterally; a light median stripe reaching posterior angle, a transverse row of several large, dark, more or less distinct dots on stripe. Dorsal stripes from anterior to posterior margin along frontal and coronal sutures. Lateral stripes replaced by rows of light brown, sometimes indistinct, dots. Ventral surface brownish lateral to gula; gula of similar color, slightly oblong, wider anteriorly; pregula in form of a light brown plate (Figure 684).

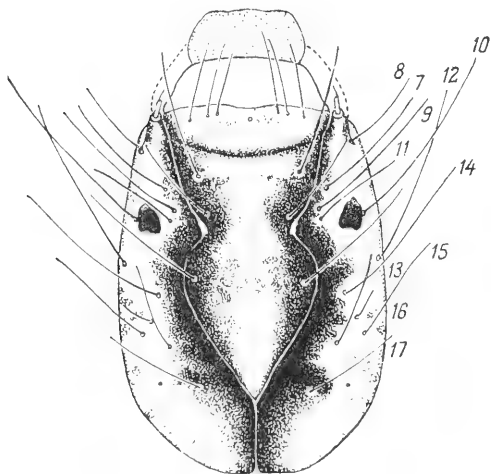
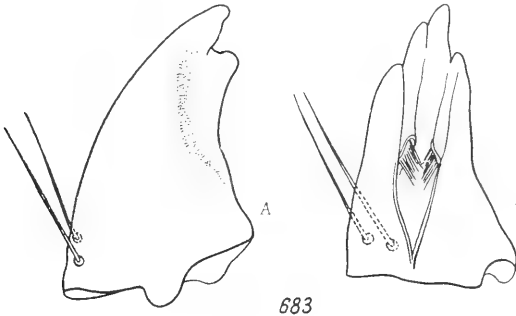
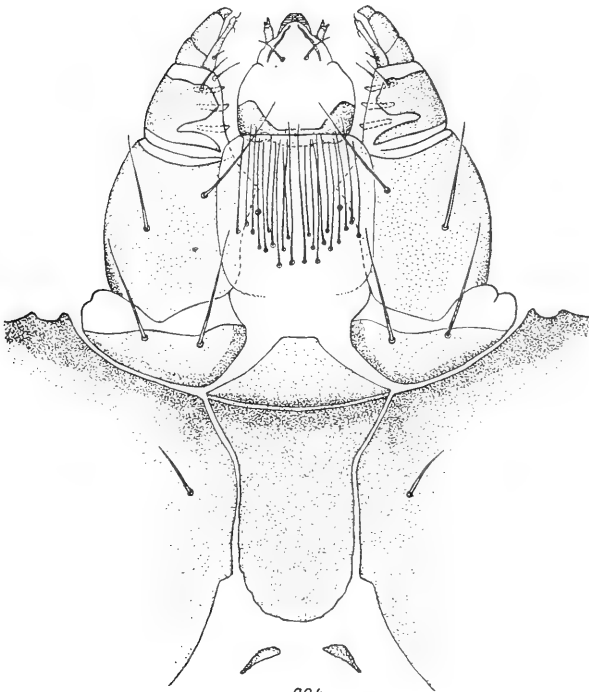


FIGURE 682. *Molanna angustata* Curt. Head, dorsal

Anterior-margin setae (Figure 682) situated lateral to dark spots; anterior and intermediate frontal setae situated one behind the other, latter a short distance before tentorial pit, 3 posterior frontal setae lateral to transverse row of dots, thin, straight, long, like anterior-margin setae. Most other dorsal setae also long; setae 9 and 14 on dark background situated close together near frontal suture; seta 7 situated far from anterior margin, and close to seta 9; seta 10 situated lateral to eye, longest on the head; setae 12 and 14 situated behind eye, large; seta 13 short, thin; setae 15, 16, and 17 moderately long. Seta 8 short, thick, situated dorsal to ventral articulation of mandibles; seta 18 thick, on dark background.



683



684

FIGURES 683 and 684. *Molanna angustata* Curt. (after Rachenskaya):

683 — right mandible, ventral (A), median side (B); 684 — gula and maxillolabium, ventral.

Labrum entirely sclerotized dorsally; anterior margin of dorsal sclerite with crenated middle; posterior-angle sclerites in form of thin reddish brown rods. Setae 1 and 2 situated on sides of sclerite, transparent, close to anterior margin; seta 3 lateral to margin; setae 4 short, thick, in middle near anterior margin; setae 5 and 6 situated posteriorly close together one behind the other, both straight, thin, long.

420 Mandibles (Figure 683) with deep, narrow, median indentation; left mandible with 2 apical teeth and one tooth on dorsal and ventral blades; right mandible with one apical tooth, and one subapical tooth on dorsal and ventral blades; both mandibles with a brush consisting of a double tuft of hairs directed inward and situated dorsally at margin of median indentation in middle; lateral setae situated basally, long, thin.

Maxillolabium (Figure 684) weakly sclerotized. Sclerites of cardo in form of narrow transverse plates with 2 short anterior setae. Submentum not sclerotized, with a single row of 12 short, thick setae laterally. Stipes narrow, reddish brown; both setae situated on membrane, moderately long, apical larger than basal. Palpifer and small sclerites of palp segments brownish; both setae of palpifer situated distally, one short and situated on membrane, the other larger, on sclerite. Maxillary palp short, segment 2 larger than 1, segments 3-4 very small. Galea finger-shaped, pressed to palp. Mentum (Figure 684) in form of a short, reddish brown, transverse plate; ventral sclerites dot-shaped, with thin setae; labial palps cylindrical, both sensillae distinct; labial lobe conical.

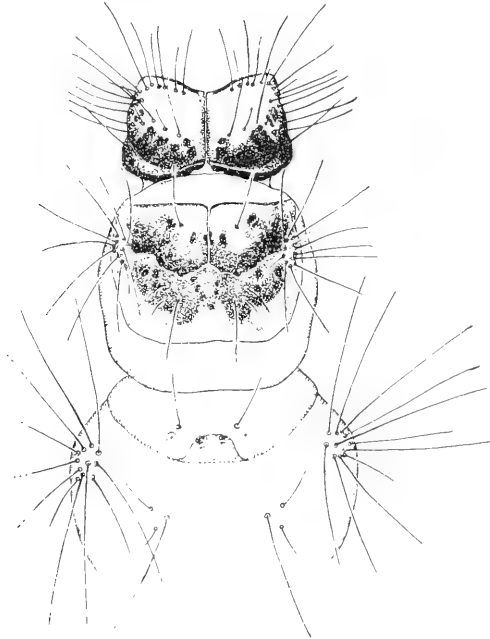


FIGURE 685. *Molanna angustata* Curt. Thoracic segments, dorsal

Pronotum (Figure 685) yellow, with broad, black, posterior margin and a narrow, reddish brown stripe at anterior margin; anterior part without dots; posterior part with oblique rows of 3–4 large, blackish brown dots; chaetotaxy as in Figure 685.

Mesonotum (Figure 685) incompletely sclerotized; tergite not reaching margin, and divided by a transverse suture; only anterior part with a median suture; pattern consisting of brownish areas and distinct dark brown dots. Anterior-margin setae short; anterior-angle setae replaced, as in Phryganeidae, by groups of 9–10 thin, moderately long setae; posterior part with a moderately long medioanal seta, a slightly smaller lateral seta, and a small, thin intermediate seta.

Metanotum (Figure 685) with a deep, transverse fold and lateral groups of 11 long anterior-margin setae; anterior part with 2–3 median pairs of small, dark, sclerotized dots on a slightly sclerotized brownish area. Anterior-margin setae short, thin; posterior part with a moderately long medioanal seta, a short lateral seta, and a smaller intermediate seta.

Propleuron with 2 small sclerites; episternal-epimeral sclerite in form of a narrow oblong plate divided by a short, black, pleural suture; trochantin darker and wider, with a blackish brown large seta; seta of epimeron short. Meso- and metathorax with large pleurites; mesopleuron with black pleural suture and wide, dark, distal margin of episternum; anterior half of mesepimeron similar, basal part of mesepimeron brownish almost to middle, mesepisternum brownish in posterior angle; metapleuron lighter, with wider epimeron; pleural suture and distal margin narrow; posterior angle with a small, light brown spot; both setae of sclerites long, situated distally in middle of margin on episternum, near suture on mesepimeron, in distoventral angle on metepimeron.

Legs yellowish brown, with large dark dots in some places; fore- and midlegs similar; hind legs long, thin, with a modified claw which forms a tactile organ. Numerous secondary setae on legs.

421 Fore coxa (Figure 686, A) without anterior dorsal secondary setae, except for a small, thin seta near large primary basodorsal seta; anterior distodorsal seta slightly shorter; posterior dorsal seta situated among numerous secondary setae at posterior dorsal margin; anterior surface with longitudinal row of numerous large setae including 2 primary setae; ventral side densely covered with long secondary setae; both distoventral setae slightly thicker, of equal length.

Trochanter with sparse secondary setae; 3 anterior ventral setae distinct among primary setae; of these, one thin, long, basal seta near suture, the 2 other setae represented by short spines. Femur with a dorsal row of sparse, short setae including a primary basodorsal seta; several large, dark dots behind setae; distodorsal seta short, thin, directed posteriorly; anterior primary seta in form of long brown spine; posterior primary seta situated ventrally, represented by a large yellow spine; both ventral setae in form of short, yellow spines in middle of femur among thin secondary setae; anterior surface with sparse secondary setae; posterior surface with a subdorsal row, and a basal group of thin long setae.

Tibia with sparse, large, dark, sometimes indistinct dots; a characteristic large posterior subapical process, serving to hold sand grains during building of case, with primary posterior distoventral seta in form of a brown spine at apex; a subventral row of similar spines anteriorly, becoming smaller toward base; other secondary setae sparse, thin.

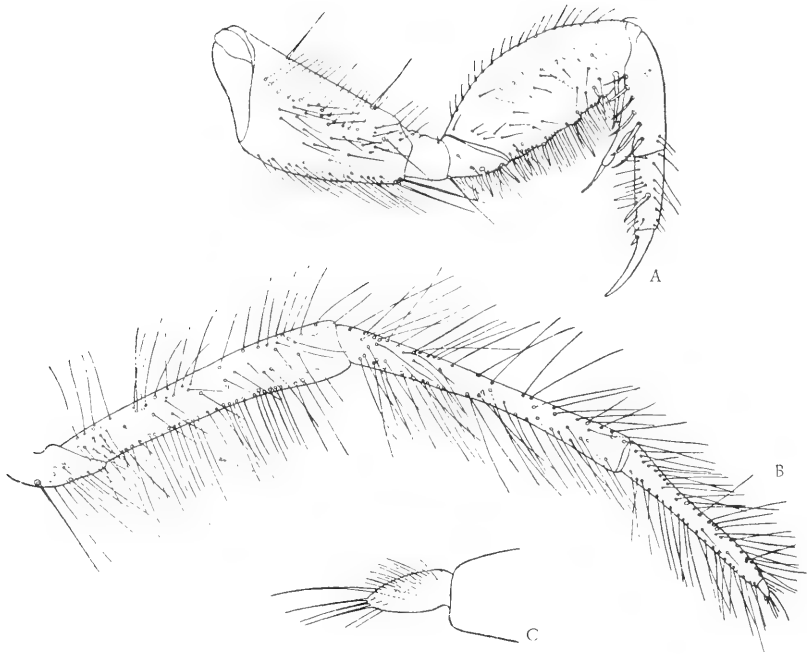


FIGURE 686. *Molanna angustata* Curt. Left legs, anterior, foreleg (A), hind leg (B); claw of right hind leg (C) (after Rachenskaya)

Tarsus with sparse thin setae and a large brown spine in middle of anterior surface. Claw slightly curved, almost as long as tarsus, basal seta in form of small spine.

(422)

Number and arrangement of gills of *M. angustata*

Segment	Dorsal	Pleural	Ventral
1	4		
2	4	2	3
3	4	1	3
4	4	1	3
5	3	1	3
6	3	1	3
7	3	1	3
8	1		



Dorsal and distoventral primary setae of mid-coxa slightly larger than those on fore coxa. Both anterior distoventral setae of trochanter represented by smaller spines. Femur with one ventral spine; subapical process and spine-shaped seta of mid-tibia smaller than on forelegs; 422 posterior subventral row replaced by a single subapical spine; thin secondary setae more numerous, like those of tarsus; anterior spine of tarsus large, similar. Claw slightly longer, its basal seta in form of a larger spine.

Hind coxa less massive; femur, tibia, and tarsus narrow, rodlike, long; tarsus shorter and narrower than tibia; tibia and femur about equal in length; tibia with a membranous stripe in middle: the following primary setae are distinct among numerous long, thin, secondary setae: both distoventral setae of coxa; basoventral seta of trochanter moderately long, thin, situated at suture and distodorsal seta of femur short, thin, directed posteriorly. Claw modified into a thin-walled tactile organ with small setae; basal seta large, longer than claw.

Abdominal segment 1 large, with high dorsal process; lateral processes also large, displaced ventrally; abdominal segments 1-6 equally wide, 7-8 slightly narrower, segment 9 much smaller. Lateral line on segments 3-7, with small, dense, light hairs; segment 8 with a row of sclerotized dots, each with 2 short thin chaetae (Figure 687, A).

Gills presegmental, on segments 1-8, with 1-4 filaments; pleural gills situated immediately below lateral line.

Abdominal segment 1 with 3 setae lateral to dorsal process; anterior-angle seta situated near lateral process; segments 2-7 with moderately long medioanal and anterior-angle setae, and small anterior-margin and posterior intermediate, and lateral setae; medioanal and lateral setae on segment 8 longer.

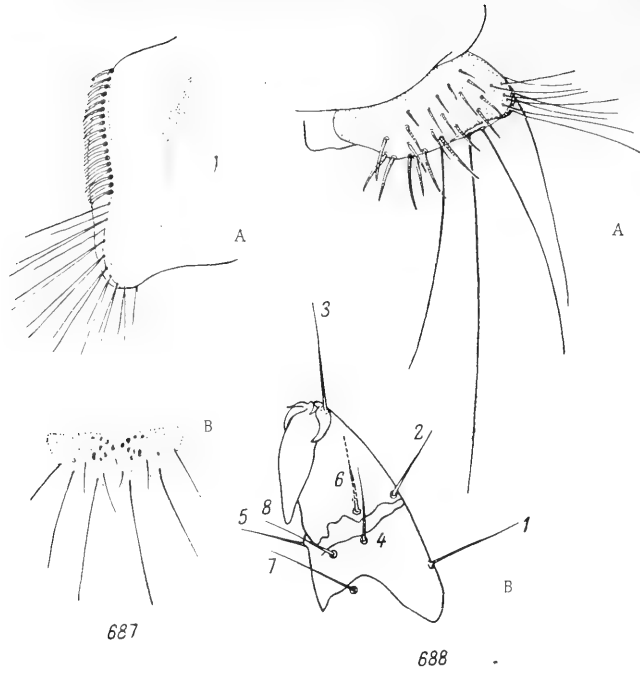
Tergite of abdominal segment 9 (Figure 687, B) yellow, rounded posteriorly dark anteriorly, with small dark brown dots; setae at posterior margin, medioanal seta, and anterior-angle seta long; intermediate seta and lateral seta small, thin; anterior-margin seta situated subapically near median seta, short; several, small, secondary setae near primary setae at posterior margin.

Sclerite "b" of anal legs dark in median dorsal area; median dorsal angle with dark reddish brown spot; lateral and ventral parts yellowish; posterior margin with narrow reddish brown margin. Three black setae dorsally at posterior margin; ventral seta also dark; dorsal side of sclerite with numerous secondary setae; those on dark median area in form of small, light, brown spines; lateral spines thin, dark, moderately long (Figure 688, A). Sclerite "c" short, triangular, with blackish brown lateral margin and a small light seta.

Claw of anal legs sharply bent in distal part (Figure 688, B), dorsal side with 2 large and 2 small subapical denticles. Seta 1 situated dorsally in basal part, moderately long, strong; seta 2 near suture; seta 3 larger, situated more distally and closer to curvature; seta 6 shorter, lateral, distal to suture; setae 8 and 7 situated ventrally one behind the other in basal part; seta 4 situated ventrally near suture; seta 5 laterally.

Case (Figure 689) made of sand grains, shield-shaped, consisting of a straight tube, slightly narrower posteriorly and with large, winglike lateral extensions; pieces of detritus sometimes among sand grains.

(423)



FIGURES 687 and 688. *Molanna angustata* Curt.:

687 — abdominal segment 8, left side (A), tergite of abdominal segment 9 (B);  
688 — right anal leg, dorsal (A), claw of right anal leg, median ventral (B)  
(687, B — after Hickin; 688, B — after Rachenskaya).

(423)

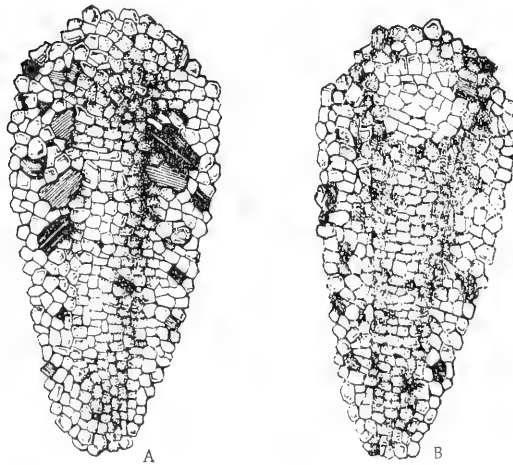


FIGURE 689. *Molanna angustata* Curt. Larval case, dorsal (A) and ventral (B)

**Pupa.** Length 11–15 mm. Antennae reaching beginning of abdominal segment 9, wing sheaths at beginning of segment 5. Labrum small, narrow, with 6 short setae at anterior margin; anteclypeus with larger setae; filtering is carried out by mandibles, the narrow, long, rodlike, distal ends of which have a ventral position and are directed anteriorly; basal setae short.

424 Midlegs natatorial, with sparse setae on tarsal segments 1–4; claws represented by indistinct processes.

Hooks of holding apparatus: III:2–5; IV:2–5; V:2–5+3–7; VI:3–5. Lateral line in form of a row of dense brownish setae on segments 3–8, opposite rows almost meeting ventrally on segment 8.

Anal rods narrow, relatively long, slightly curved, covered with minute spinules, posterior half of rod with 2 short, dark reddish brown setae; 2 setae at posterior end, median seta blunt, shorter than lateral.

Number and arrangement of gills of the pupa of *M. angustata*

Segment	Dorsal	Pleural	Ventral
2	4-3	2	3
3	4-3	2-1	3
4	4-2	2-1	3-2
5	3-2	1	3-2
6	3-2	1	3-2
7	3-2	1 (0)	3-2
8	3-1		1 (0)

Number and arrangement of gills of *M. albicans*

Segment	Dorsal	Pleural	Ventral
1	3		
2	4	2	3
3	4	2	3
4	4	2	3
5	3	2	3
6	3 (2)	2 (1)	3
7	2	1	2
8	2 (1, 0)		

Genital appendages in form of wide, posteriorly rounded processes; penis sheath wide.

Pupa situated with dorsal side downward and ventral side upward.

Wings of pupal case short, as construction ceases before pupation. Anterior opening of case with a membrane with an elliptical slit near dorsal wall, slit kept open by ends of mandibles, which make frequent cutting movements; posterior opening with a vertical slit cleaned by anal rods.

Mode of life and habitats. Lakes, on a bottom of sand with silt and a large proportion of detritus, open littoral and among vegetation, especially among reeds, *Scolochloa festucacea* and rushes; larvae avoid strong surf and prefer areas protected from wind; sometimes in lower zone of open littoral or upper sublittoral (Grebecki, Kinastowski, Kuznicki, 1954:196—231; Lepneva, 1928:49—50).

Distribution. The European USSR, Sayans (Minusinsk), Eastern Siberia (Angara, larva), Maritime Territory (Vladivostok). In addition, Europe, Japan (larva).

## 2. *Molanna albicans* Zetterstedt (*Molanna palpata* McLachlan)\*

Lepneva, 1928:46—50, Plate II, A, Figures 1—4; 1940:156, 209, Figure 156, 1—6.

**Full-grown larva.** Length 15.0—16.5 mm. Main color yellow or yellowish brown; pattern dark, brownish. Dorsal stripes as in *M. angustata*; 425 frontoclypeus more broadly dark laterally, except in area of posterior frontal seta, posterior angle dark; light transverse stripe in area of posterior frontal seta forming a light cross pattern together with narrow longitudinal stripe on dark background (Figure 690, A). Ventral side of head dark and with indistinct dots in posterior part and lateral gula. Gula slightly wider than in *M. angustata*, with almost straight posterior margin (Figure 690, B).

Pronotum dark posteriorly, with large dark dots. Mesonotum (Figure 691) different from that of *M. angustata*, without transverse suture, which is replaced by a ridge and dark spots and dots lateral to it.

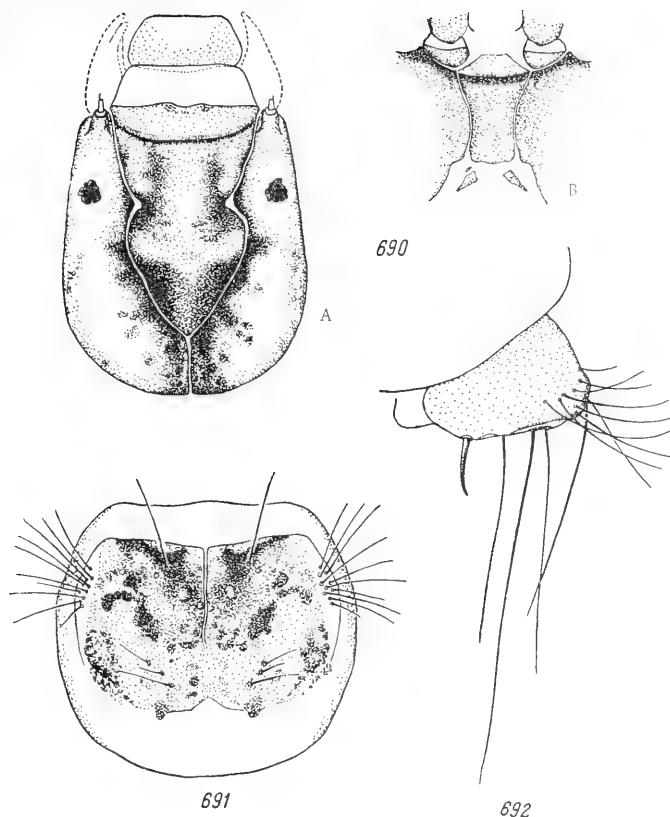
Dorsal and lateral processes of abdominal segment 1 as in *M. angustata*, as also are lateral line and setae of segments 1—7.

Tergite of segment 9 yellowish, dark at anterior margin, with indistinct dots, medioanal and lateral setae long, black, situated at posterior margin; intermediate seta short, thin; anterior margin seta situated close to intermediate seta, also short and thin; anterior-angle seta black, shorter than lateral seta.

Sclerite "b" of anal legs with 3 long, thick, black, dorsal setae posteriorly; lateral posterior margin seta thinner; surface, as in *M. angustata*, with long, thin, secondary setae; median part with light, slightly curved spines instead of numerous thin setae as in *M. angustata*; a short, thick, brown 426 spine subapically in posterior part (Figure 692). Sclerite "c" with a short, reddish brown seta; claw with 2 large dorsal denticles, as in *M. angustata*.

Case resembling that of *M. angustata* in form of dorsal shield; tube less convex ventrally, consisting mainly of coarse sand grains and detritus; some cases consist almost entirely of detritus.

\* Usually appears as *Molanna palpata* in the Soviet literature.



FIGURES 690-692. *Molanna albicana* Zett.:

690 - head, dorsal (A) and ventral (B); 691 - mesonotum; 692 - right anal leg, dorsal.

**Mode of life and habitats.** Lakes, usually on a bottom of sand with silt or with detritus in lower zone of littoral at a depth of 1-3 m; in sublittoral to 7-9 m, sometimes deeper (Lepneva, 1928:48-50).

**Distribution.** Northern and northeastern parts of the European USSR, Siberia. In addition, Northern Europe.

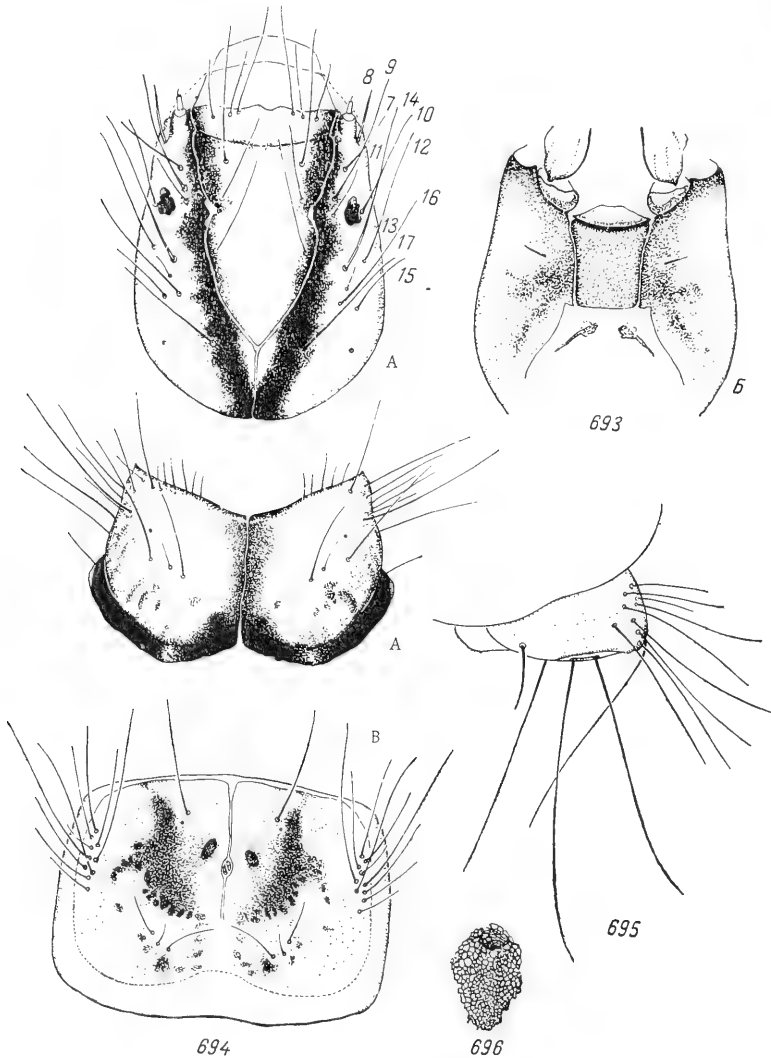
#### 427 3. *Molanna submarginalis* McLachlan

Lepneva, 1928:50-52, Plate II, C, 1-4.

**Full-grown larva.** Length 15-16 mm. Main coloration light yellow; pattern brownish, consisting of stripes and spots. Frontoclypeus (Figure 693, A) laterally with narrow dark stripes; greater part of sclerite light, including posterior angle; dorsal stripes straight, narrow anteriorly and

adjacent to sutures, wider posteriorly, converging at posterior margin; a light area lateral to coronal suture near fork of frontal sutures. Dorsal stripes forming a characteristic V-shaped pattern together with stripes of frontoclypeus. Ventral side of head dark lateral to gula, with small brownish dots. Gula chestnut brown, shorter and wider than in *M. angustata*, slightly narrower posteriorly, with nearly parallel sides (Figure 693, B).

(426)



FIGURES 693-696. *Molanna submarginalia* McL.:

693 - head, dorsal (A) and ventral (B); 694 - pronotum (A) and mesonotum (B); 695 - right anal leg, dorsal; 696 - larval case, ventral.

Pronotum (Figure 694, A) with a narrow dark brown stripe along suture in sharp contrast to light background; posterior part with several large dark dots. Transverse suture of mesonotum (Figure 694, B) replaced by a ridge and a row of dark dots; anterior part with large and small dots in each half; posterior part with a whitish median stripe and with rows of 4-5 dark dots lateral to it; groups of dots laterally. Metanotum with small oblique tergites with fine dots.

Lateral row of gills on segment 2 only.

Tergite of segment 9 indistinct, light, slightly dark in middle of anterior part, with indistinct dots; setae of posterior margin as in *M. angustata*.

Number and arrangement of gills of *M. submarginalis*

Segment	Dorsal	Pleural	Ventral
1	4		
2	4	2 (1)	3
3	4		3
4	3		3
5	3		3
6	3		3
7	3		2

Sclerite "b" of anal legs light yellow, the 4 black posterior-margin setae (3 dorsal and 1 lateral) shorter and thinner than in *M. angustata*; sides with thin, dark, secondary setae; a short, black, spine-shaped seta near median margin, in contrast to *M. albicans* (Figure 695).

Case shield-shaped, as in *M. angustata* and *M. albicans*; ventral side of tube less convex (Figure 696).

Mode of life and habitats. Littoral of lakes, on a bottom of sand or sand with silt, open littoral and among vegetation, at a depth of 1-4 m; sublittoral and upper profundal at a depth of 4-10 m.

Distribution. Northern, northwestern, and central parts of the European USSR; Eastern Siberia, the Amur Region (isolated specimens). In addition, Finland, Sweden.

## 2. Genus *Molannodes* McLachlan

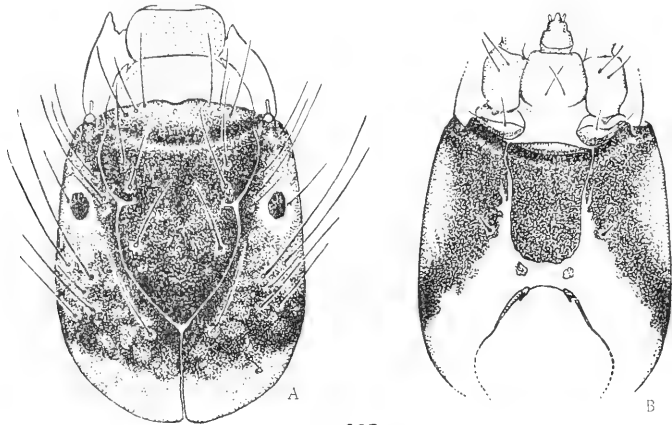
**Full-grown larva.** Length 11-12 mm. Head mainly dark. Frontoclypeus wider and relatively larger than in *Molanna*. Pronotum entirely dark. Mesonotum with distinct transverse suture. Claw of hind legs modified, long, almost as long as tarsus.

Case made of sand and detritus, sometimes of detritus only, with narrow wings and flat ventral side.

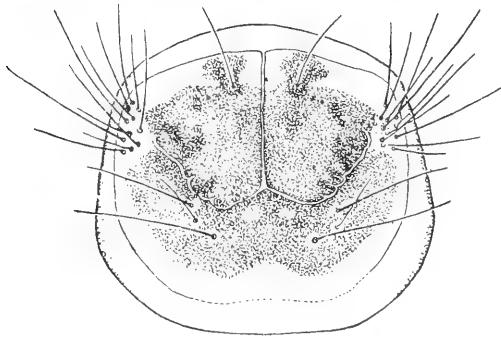
Mode of life and habitats. Calm water of littoral of lakes.

Distribution. Central, western and northern parts of the European USSR; Siberia, Maritime Territory. In addition, Central and Northern Europe.

428



697



698

FIGURES 697 and 698. *Molannodes tincta* Zett.:

697 - head, dorsal (A) and ventral (B); 698 - mesonotum.

1. *Molannodes tincta* Zetterstedt (*Molannodes zelleri* McLachlan)

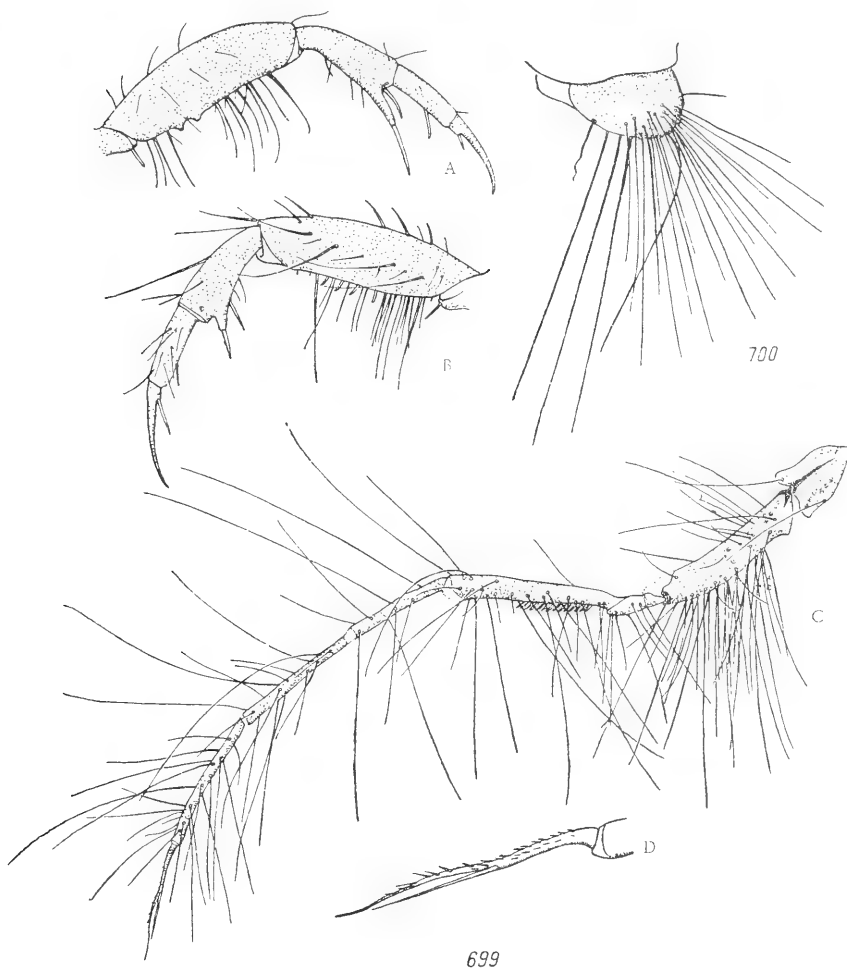
Klapálek, 1894:123-124. — Ulmer, 1903:98. — Thienemann, 1905b:530. — Siltala, 1905:40-43, Figure 10. — Ulmer, 1909:242, 304-305, Figure 368c. — Lestage, 1921:667-671, Figures 233-236. — Lepneva, 1940:209, Figure 157.

**Full-grown larva.** Length 11.0-12.5 mm. Head (Figure 697) light posteriorly, yellowish brown near occipital foramen; eyes on large light spot; remaining surface of head dark chestnut brown; frontoclypeus with light transverse striation in area of tentorial pits, 3-4 large, light median dots posteriorly. Sides of head with similar dots on dark background. Gula wide, large, rounded posteriorly (Figure 697, B). Setae thin, relatively light,



most of them as in *Molanna*; seta 11 slightly shorter, situated near seta 9; seta 17 closer to fork of frontal sutures than in *Molanna*; seta 18 small, dark, situated posteriorly.

(429)



FIGURES 699 and 700. *Molannodes tinctoria* Zett.:

699 - left foreleg, anterior (A), right midleg, anterior (B), metapleuron and left hind leg, posterior (C), claw of hind leg (D); 700 - right anal leg, dorsal.

Sclerites of cardo with 2 small light setae; submentum with a short, dark, primary seta on each side, but without the secondary setae which are characteristic for *Molanna*.

Pronotum chestnut brown, slightly lighter anteriorly.

429 Mesonotum (Figure 698) with distinct transverse suture, brown, lighter than pronotum, with sparse dots. Median tergites of metanotum light brown, indistinct.

Fore coxa dorsally with a moderately long basal and a shorter apical seta; posterior dorsal seta longer than anterior setae; distal part posteriorly with 4 secondary dorsal setae; anterior surface with small, sparse, thin, secondary setae around the 2 primary setae; ventral and subventral surface with sparse, short to long secondary setae; anterior of the 2 primary distoventral setae longer than posterior.

Anterior primary seta of trochanter short, thin; posterior primary seta slightly thicker and shorter; both posterior ventral setae moderately long; apical and intermediate setae of the 3 anterior ventral setae in form of short, thick spines; basal seta long, situated near suture; secondary setae thin, dense, light, situated ventrally and subventrally. Apical dorsal seta of  
430 femur short, thin; basodorsal seta slightly larger, situated in middle of femur; 3 shorter secondary setae further basally; anterior and posterior surface with sparse setae; a number of light secondary setae ventrally on femur, 2 primary setae among them thicker than the others, brown, with tubercles at their base.

Distoventral process of tibia (Figure 699, A) longer and thinner than in *Molanna*; apical seta in form of a dark spine, longer than process; anterior surface of tibia with a longitudinal subventral row of 5 setae, among which the apical and 2 subapical setae are dark brown spines; 2 thin setae dorsally. Tarsus shorter than tibia, with a thin distodorsal seta; 2nd distodorsal seta situated anteriorly in middle of tarsus, thick, dark brown, spine-shaped; 3rd and 4th setae thin. Claw long, with short basal spine.

Mid-femur (Figure 699, B) slightly longer than fore femur, similar in form, setae more numerous; a large apical seta, and 5 shorter setae in basal part dorsally; posterior surface with a sparse row of short and long secondary setae; anterior surface mainly with small setae and 2 long subapical setae; ventral side with a longitudinal row of short and long setae, basal setae including both primary setae, more dense; several, small, light spinules situated near setae. Tibia with ventral subapical process which is larger than in *Molanna*; both distoventral setae in form of dark spines on apex and base of process; dorsal and anterior surface with sparse setae, including several large setae. Anterior side of tarsus subdorsally with a large brown spine and 2 thin, basal setae; posterior side with a thin subventral distal seta and several, similar, secondary, surface setae; ventral side with one large, and a row of small spinules. Claw and its spine-shaped seta larger than on forelegs.

Hind legs (Figure 699, C) narrow and longer than in *Molanna*, including coxa; all setae thin. Coxa with large dark dots posteriorly and dorsally; secondary setae long, especially numerous on ventral side; only distoventral primary setae distinct.

Trochanter slightly oblong, with only 8 setae, in contrast to the other legs; anterior primary seta moderately long; all other setae long.

Femur straight, rodlike, narrower but not longer than coxa; apical dorsal seta long, basodorsal seta shorter, other setae sparse, most of them long; ventral side with a basal row of small, thick, light spinules.

Tibia narrower and much longer than femur, divided, with more numerous setae than femur, most setae long. Claw long, soft, with small, thin setae;

basoventral seta situated about in middle of claw, thin, straight, light, reaching apex of claw.

Abdomen flattened, as in *Molanna*. Segment 1 with large, high, dorsal process; lateral processes displaced ventrally. Lateral line situated on segments 3-7, consisting of short, dirty yellow hairs; segment 8 with 16 small, reddish, sclerotized dots, each with 2 small, light chaetae; 2 short, dark, lateral setae situated behind dots. Anterior dorsal angles of abdominal segments 2-8 with groups of 12-14 small, dense, sclerotized dots. Gills presegmental, as in *Molanna*.

Number and arrangement of gills of *M. tincta* (after Siltala)

Segment	Dorsal	Pleural	Ventral
1	2		
2	2	1	2
3	2	1	2
4	2-1	1	1
5	1(0)	1	1
6	1(0)	1	1
7	—	1	1

Tergite of segment 9 indistinct, whitish, without secondary setae; medioanal seta long, thick, dark brown; lateral seta and anterior-angle seta dark, large, but shorter; intermediate and anterior-margin seta situated close together, short, thin, light brown.

Sclerite "b" of anal legs brownish; 3 posterior distodorsal setae long, chestnut brown, thick; lateral seta also long, slightly thinner, curved inwards; median surface with a thick, short, dark brown seta as in *M. submarginalis*; 431 lateral part with groups of thin, dark brown setae, thinner and shorter than marginal setae (Figure 700). Sclerite "c" brownish, with a short, strong seta.

Claw with 2 large, light, dorsal denticles at curvature; setae longer than in *Molanna*.

Larval case (Figure 701) 18-20 mm long, made of detritus or of sand and detritus; wings of case narrow, anterior hood small, anterior opening of tube sometimes close to anterior margin; ventral surface almost flat.

**Pupa.** Length 10 mm. Antennae reaching end of abdominal segment 8, sheaths of fore wings reaching beginning of segment 5. Labrum with 5 dark and 1 light setae on each side. Blades of mandibles with small distal denticles, partly serrated. Claws of legs rudimentary.

Abdominal segment 1 with small spinules at posterior margin. Hooks of holding apparatus: III:2-3; IV:3-4; V:3-4+4-5; VI:3-4. Gills on segments 2-7 with 1 or 2 filaments, as in larva.

Anal rods with 2 dorsal and 2 distal setae and numerous small spinules.

Mode of life and habitats. Lakes, sometimes near mouth of slow rivers; in calm, shallow water, on a bottom of sand with silt, or sand with detritus.

Distribution. The European USSR, Siberia (not common), Maritime Territory. In addition, Europe.

#### IX. Family LEPTOCERIDAE Leach

**Full-grown larva.** Usually small, the largest species not longer than 12–14 mm, small species 5.0–8.5 mm. Head and prothorax (in some species

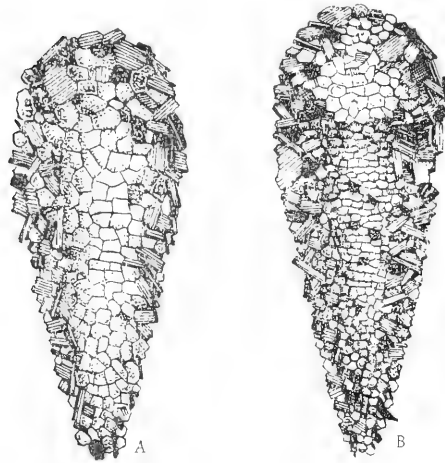


FIGURE 701. *Molannodes tinctoria* Zett.: Larval case, dorsal (A) and ventral (B)

also mesothorax) equally wide; metathorax wider than mesothorax and following abdominal segments. Head usually slightly oblong, in some species slightly wider than long; large lateral sclerites of these species with characteristic, suturelike, light lines which divide the surface into several distinct areas. Antennae situated near anterior margin, forming an elevation with a long sensilla and with a short distal seta as in Hydroptilidae; eyes some distance from anterior margin, sides of frontoclypeus concave or with a shallow indentation in the middle. Seta 17 usually long. Gula of varying form, reaching posterior margin of head, sometimes fused with large lateral sclerites.

Labrum with deep tuberculate median indentation. Mandibles short and wedge-shaped in most species; flat, long, without ventral blade in *Oecetis*. Submentum absent; segments 2–3 of maxillary palps fused.

Pronotum and mesonotum sclerotized, mesonotum sometimes incompletely; metanotum membranous, sometimes with small tergites.

Midlegs and especially hind legs much longer than forelegs; femora divided, tibiae or tibiae and tarsi sometimes divided; legs with rich secondary chaetotaxy.

Abdominal segment 1 with dorsal and lateral processes. Lateral line thin, with short hairs, on segments 3–7. Gills single or with several short filaments.

Segment 9 with small tergite; anterior-margin setae well developed, situated close to medioanal setae; anal legs short, wide; claw small, with a dorsal denticle.

Case conical, straight or curved, made of sand grains, rarely of plant fragments.

**Pupa.** Body narrow; antennae long, coiled several times around posterior end of body. Labrum of varying form, often with a small, median process at

432 anterior margin. Mandibles narrow, straight or curved, serrated in the middle. Wing sheaths usually pointed, rarely blunt. Midlegs natatorial.

Posterior angles of abdominal segment 1 with spinulose tubercles. Plates of holding apparatus presegmental on segments 3-6 or 3-7, postsegmental on segment 5. Gills as in the larva, with a single or several filaments. Lateral line with short grayish setae on segments 3-8. Anal appendages rodlike, usually narrow, long, rarely short.

Case shorter than in the larva but similar in form and material; anterior and posterior membranes with slitlike or round opening.

Mode of life and habitats. In various types of running water, from highland brooks to large rivers in the plains, with slow or rapid current; small and large bodies of stagnant water, different types of lakes, ponds, floodplain water bodies, and small, seasonal water bodies.

Distribution. Throughout the USSR. Cosmopolitan.

## Key to Genera

### Full-grown larva

- 1 (4). Gills with several filaments; body and case narrower posteriorly; case made of sand grains or of secretion, in form of a short cone in some species, wide anteriorly, convex dorsally, flat ventrally.
- 2 (3). Head with contrasting variegated pattern, or uniformly pale with barely distinguishable pattern. . . . . 1. **Athripsodes** Billb. (p. 542)
- 3 (2). Head brownish dorsally, without pattern . . . 2. **Homilia** McL. (p. 578)
- 4 (1). Gills single.
- 5 (14). Mandibles with 2 blades; gula square or of different form.
- 6 (11). Hind tibia divided, hind tarsus sometimes divided; case made of detritus, sand grains, secretion, or fresh fragments of plants.
- 7 (8). Hind tarsus divided; case straight, made of detritus or detritus and sand grains . . . . . 3. **Mystacides** Berth. (p. 579)
- 8 (7). Hind tarsus not divided; case made of small, green, plant fragments, long, of regular form.
- 9 (10). Hind legs natatorial; case in form of a narrow cone, sometimes very long, covering fragments arranged in a spiral . . . . . 4. **Trienodes** McL. (p. 500)
- 10 (9). Hind legs not natatorial; covering fragments similar but arranged differently . . . . . 5. **Erotesis** McL. (p. 611)
- 11 (6). Hind tibia not divided; case made of secretion or sand grains.
- 12 (13). Hind legs natatorial; case straight, conical, made of secretion . . . . . 6. **Leptocerus** Leach (p. 613)
- 13 (12). Hind legs not natatorial; case curved, made of sand grains . . . . . 7. **Adicella** McL. (p. 622)
- 14 (5). Mandibles with a single blade; gula small, poorly differentiated . . . . . 8. **Oecetis** McL. (p. 624)

Pupa

- 1 (2). Gills with several filaments; case made of sand grains, rarely of secretion, curved, short in some species, flat ventrally, with strongly convex dorsal side . . . . . 1. **Athripsodes** Billb. (p. 542)
- 2 (1). Gills single or absent; cases made in varying form, of mineral or plant particles.
- 3 (4). Case straight, slightly tapering posteriorly, made of detritus or of detritus and sand grains . . . . . 3. **Mystacides** Berth. (p. 579)
- 4 (3). Case different.
- 5 (8). Case made of small, usually fresh, plant fragments of symmetrical form, long, usually arranged in rows.
- 6 (7). Gills present; case long, in form of a narrow cone, covering fragments arranged in a spiral. . . . . 4. **Triaenodes** McL. (p. 500)
- 7 (6). Gills absent, case nearly cylindrical; covering fragments forming a regular sequence of distinct oblique rows . . . . . 5. **Erotesis** McL. (p. 611)
- 433 8 (5). Case made of secretion or sand grains, rarely of plant fragments, fragments of irregular form and irregularly arranged.
- 9 (10). Case made of secretion . . . . . 6. **Leptocerus** Leach (p. 613)
- 10 (9). Case made of sand grains.
- 11 (12). Case curved, markedly narrower posteriorly; covering sand grains very fine, smoothly arranged on thick-walled tube of secretion . . . . . 7. **Adicella** McL. (p. 622)
- 12 (11). Case short, slightly curved, with flat ventral side, made of sand grains, which are coarser laterally, rarely plant fragments instead of sand. . . . . 8. **Oecetis** McL. (p. 624)

1. Genus **Athripsodes** Billberg (*Leptocerus auctorum*, nec Leach)\*

**Full-grown larva.** Length 8.0–14.0 mm. Head slightly oblong or wide; light lateral stripe present; adfrontal band also present in some species; fronto-clypeus long; gula triangular or wide, cup-shaped, with rounded sides. Pattern of head and thoracic tergites distinct and variegated or pale and indistinct; sometimes absent.

Submentum in form of a thin, pale, heart-shaped sclerite, with tuberculate surface in some species.

Mesothorax sclerotized only in middle; mesonotum distinct and with dark pattern in some species, indistinct, with pale dots or without pattern in other cases; posterior angles always with coarse, black or reddish black, oblique streaks or bracket-shaped stripes.

Metathorax almost twice as wide as mesothorax, with lateral processes projecting anteriorly; metanotum membranous.

Propleuron with large lobed or conical trochantin with pointed apex; metapleuron situated at lateral process, almost twice as long as mesopleuron.

Legs usually yellow, with dark articulation between coxae and femora; hind tibia and tarsus not divided.

\* See Kimmins, 1949: 201, 202.

Dorsal process of abdominal segment 1 wide, large; lateral processes displaced ventrally and supported laterally by a narrow black strip-like sclerite; apex of process with light spinules near distal margin. Gills with several filaments, or only one.

The genus may be divided into 3 groups of species according to morphology of the larvae:

1. Head oblong, without light stripes; gula triangular; mesonotum distinct, with straight, oblique streaks in the posterior angle, case made of sand grains, with round cross section (*Athripsodes aterrimus*, *A. cinereus*, *A. bilineatus*).

2. Head wide, with distinct, light stripes, gula trapezoidal or cup-shaped; mesonotum thin, indistinct, sometimes transparent, with large, distinct, bracketlike, black or brownish streaks in posterior angle; case made of sand grains, flattened dorsoventrally (*A. excisus*, *A. annulicornis*).

3. Larva as in group 2; case made of secretion, flattened dorsoventrally (*A. fulvus*, *A. senilis*).

The first species in each group is of variegated color with distinct pattern of dots on head and pronotum; the others are pale.

Sclerite of abdominal segment 9 distinct, brownish, or absent. Claw of anal legs small, with a large dorsal denticle or with 2 denticles.

Case conical, curved, made of sand grains or secretion, flattened dorsoventrally in some species.

**Pupa.** Length 6–12 mm. Labrum with small, pointed median process. Mandibles wide, curved apically. Wing sheaths narrow, reaching abdominal segments 6–8. Gills as in larva, often less numerous. Dorsal side of abdominal segment 1 with a process with spinules directed posteriorly, a sclerite with spinules directed anteriorly in middle. Presegmental plates of holding apparatus on segments 3–7 or 3–8, postsegmental plates on segment 5. Anal rods long, pointed, rarely short, wide, with 4 setae, last 2 setae small, situated distally.

434 Case made before pupation attached at both ends by ligaments or adhesive disks; membrane with round or slitlike opening.

Mode of life and habitats. Brooks and rivers, including large rivers in plains, with running water; large and small lakes, large clear ponds, lakes of river floodplains.

Distribution. Throughout the USSR. Cosmopolitan.

## Key to Species

### Full-grown larva

- 1 (6). Head slightly oblong, without light stripes lateral to frontal suture; gula narrow, triangular; mesonotum present, with short, coarse, black or dark brown, oblique streaks at posterior angles; case made of sand grains.
- 2 (3). Head and thoracic tergites with distinct pattern of dark stripes and large dots . . . . . 1. *A. aterrimus* Steph. (p. 545)
- 3 (2). Head with pale, indistinct pattern.
- 4 (5). Ventral side of head broadly black; tergites of mesothorax with more or less distinct dots . . . . . 2. *A. cinereus* Curt. (p. 554)

- 5 (4). Ventral side of head brown; pronotum and mesonotum pale, without dots . . . . . 3. **A. bilineatus** L. (p.550)
- 6 (1). Head wide, with light stripes; gula large, transverse, irregularly trapezoidal or cup-shaped; mesonotum replaced by a slightly thickened, sometimes slightly brownish, membranous area with indistinct outline; streaks on posterior angle distinct, in form of large, long, curved, bracketlike, black stripes.
- 7 (10). Case made of sand grains.
- 8 (9). Head light brown, with indistinct pattern of dots; light stripes narrow, not always distinct; mesonotum light, without dots. . . . . 5. **A. annulicornis** Steph. (p.566)
- 9 (8). Head with distinct pattern of dots and distinct light stripes; mesonotum slightly dark, with dark dots in middle . . . . . 4. **A. excisus** Mort. (p.558)
- 10 (7). Case made entirely, or in its greater part, of secretion.
- 11 (14). Head light or dark dorsally, with distinct dark dots; pronotum without wide dark band in anterior third.
- 12 (13). Head dark dorsally: light adfrontal stripes wide, distinct; dots large, not numerous . . . . . 6. **A. fulvus** Ramb. (p.570)
- 13 (12). Head light dorsally, with numerous, oblong, dark dots . . . . . 7. **A. alboguttatus** Hag. (p.574)
- 14 (11). Head light dorsally, without pattern; pronotum with shining, black, anterior margin. . . . . 8. **A. senilis** Burm. (p.575)

Pupa

- 1 (6). Gills on segments 1—3 or 2—3; case conical, made of sand grains; anal rods straight; anterior and posterior membranes of case with round or vertical slitlike opening.
- 2 (3). Gills on segments 1—3; presegmental plates of holding apparatus on segments 3—6, with small hooks; anal rods short, wide. . . . . 1. **A. aterrimus** Steph. (p.545)
- 3 (2). Gills on segments 2—3; presegmental plates on segments 3—7, with strong, curved hooks; anal rods slightly longer and narrower.
- 4 (5). Mandibles with a large tooth at base of serrated part; segments 2—4 of hind tarsi with sparse setae . . . 2. **A. cinereus** Curt. (p.554)
- 5 (4). Blade of mandible uniformly serrated; hind tarsi without natatorial setae. . . . . 3. **A. bilineatus** L. (p.550)
- 6 (1). Gills on abdominal segments 2—7 or 2—8; anal rods narrow, pointed, more or less curved; case made of sand grains or secretion, broadly conical, slightly compressed dorsoventrally, closing membranes with a horizontal slit.
- 7 (10). Case made of sand grains.
- 435 8 (9). Dorsal presegmental gills on abdominal segments 2—7; anal rods narrower in distal third, with concave inner side and hooked apex. . . . . 5. **A. annulicornis** Steph. (p.566)
- 9 (8). Dorsal presegmental gills only on abdominal segments 2—3; anal rods curved in posterior third, narrower posteriorly . . . . . 4. **A. excisus** Mort. (p.558)



- 10 (7). Case made of secretion.
- 11 (14). Anal rods much thicker in basal half than apically, tapering posteriorly and curved at apex.
- 12 (13). Labrum rounded anteriorly, without median process. Mandibles with almost straight serrated area . . . . . 6. *A. fulvus* Ramb. (p. 570)
- 13 (12). Anterior margin of labrum crenate, rough, with small median process; serrated part of mandibles convex on median side . . . . . 7. *A. alboguttatus* Hag. (p. 574)
- 14 (11). Anal rods almost uniformly wide, with pointed, curved ends . . . . . 8. *A. senilis* Burm. (p. 575)

1. *Athripsodes aterrimus* Stephens\*

Klapálek, 1888:40–42, Figures 1–8. — Lampert, 1900:204, Figure 79. — Struck, 1903:Plate III, Figure 6. — Ulmer, 1903:101, Figures K, 19, 41, 64, 101, 117. — Thienemann, 1905b:508, Plate 16, Figures 12, 13. — Siltala, 1905:58–61, Figure 14. — Ulmer, 1909:247, 248: 307, 308, Figures 373a, b, 447h, 450. — Lestage, 1921:606–616, Figure 203, a, c, g, l, o. — Lepneva, 1940:210. — Hickin, 1943:106–108, Figures 1–13.

**Full-grown larva.** Length 11.0–12.5 mm. Head (Figure 702, A) oblong, ratio of length to width 1.4. Main color of head light yellow; pattern distinct, dark brown, consisting of stripes and spots. Frontoclypeus long, narrow, frontal sutures slightly concave near tentorial pit; coronal suture short; gula narrow, triangular (Figure 702, B), pointed posteriorly. Pattern distinct, bright. Anterior part of frontoclypeus with 3 pairs of large dots, those of middle pairs more widely separated; a large, dark spot near tentorial pits; posterior part with a transverse row of large dark dots; a narrow dark stripe along frontal sutures. Dorsal stripes with large, dark dots; small dots along coronal suture; lateral stripes replaced by longitudinal rows of dots; ventral side with large lateral groups of large dots posteriorly.

Labrum (Figure 703, A) wide, short, with a brown speck in median depression; setae 1 and 2 represented by large, light spines and pressed to anterior margin; seta 4 in form of a short, straight, light spine; setae 3, 5, and 6 situated laterally in anterior part.

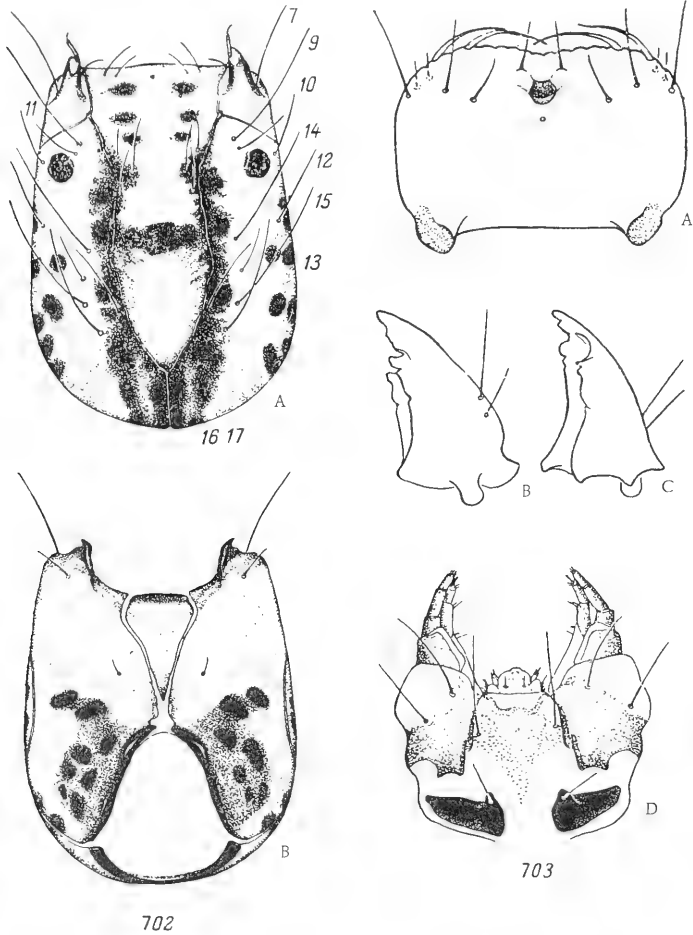
Mandibles (Figure 703, B, C) with blunt, distal tooth; left mandible with one tooth on ventral and 2 teeth on dorsal blade; right mandible with a small blunt tooth on ventral blade, dorsal blade without teeth; 2 lateral setae of different length (Figure 703, B, C).

Submentum (Figure 703, D) represented by a slightly dark, tuberculate area; setae large, light, situated laterally at anterior margin. Both setae of stipes thin, of about equal length. Palpifer wide, large; distal seta reaching middle of palp; median basal seta small; maxillary palp short, wide basally, middle segment longer than other 2, terminal segment thin, with light

\* Appears in the Soviet literature as *Leptocerus aterrimus*.

sensillae. Galea adpressed to palp. Labial lobe well differentiated, long. Ventral sclerites represented by 2 dots; setae thin, light; palps distinct, with thick sensilla with a light seta.

(436)



FIGURES 702 and 703. *Atripsodes aterrimus* Steph.:

702 — head, dorsal (A) and ventral (B); 703 — mouth parts: labrum (A), left mandible, ventral (B), right mandible, dorsal (C), maxillolabium (D).

Pronotum (Figure 704, A) large, occupying whole dorsum of segment, extending posteriorly to ventral side; short, dark, stripes with large, dark dots along posterior part of suture; groups of large dots lateral to stripes and in each half.

Short and small setae of anterior margin and in anterior part of lateral margin; one of anterior-margin seta and one anterior-angle seta longer

than the others; 2 long, surface setae in middle of tergite, a short seta between them; anterior angle with 2 setae.

Mesonotum (Figure 704, B) covering only part of segment, with concave posterior margin; median part with small, dark, transverse stripes with 4  
436 dots, situated close to suture at anterior margin; posterior part with 3 small dots along suture, one large dot lateral to anterior dot; 4 large dots in each half; posterior angles with characteristic, black, oblique streaks.

Anterior angle with one primary seta and several secondary setae lateral to sclerite on a membranous area; medioanal seta long; a median group of dots near anterior margin; 2 large setae among group of dots on sides; anterior angle with 2-3 larger and several small setae.

Metanotum membranous, with 9 anterior-angle setae on a small, yellow, sclerotized plate; medioanal seta long, situated on a sclerotized dot; lateral surface seta the same.

(437)

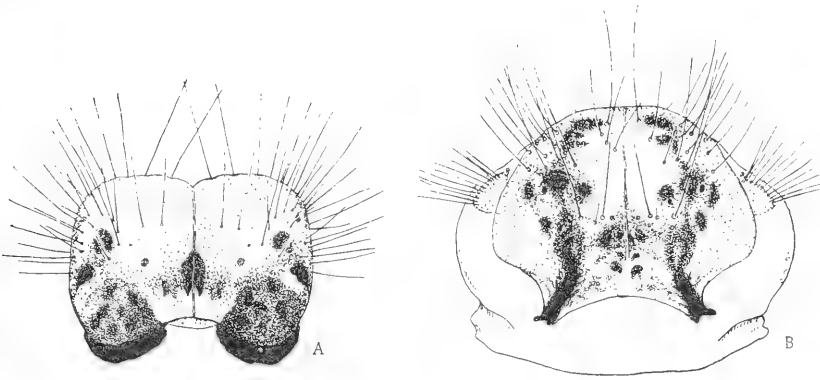


FIGURE 704. *Athripsodes aterrimus* Steph.: Pronotum (A) and mesonotum (B)

Propleuron represented by a sclerite of irregular form, with a diagonal, broad, blackish brown, pleural suture; episternum brown, dark brown laterally; epimeron yellowish, rounded posteriorly, setae situated distally near suture; trochantin forming a lobe, seta moderately long, situated laterally in subapical part; setules laterally near anterior margin. Meso-  
437 and metapleuron in form of a triangular plate, tapering basally, with a dark brown stripe representing pleural suture; basal groups of light spots on smoke brown background lateral to suture; episternum larger than epimeron, seta anterior and distal, seta of epimeron also near margin but slightly smaller.

Ratio of length of legs 55:100:136.

Forelegs short, massive (Figure 705, A). Coxa with shallow distodorsal indentation. Basodorsal seta strong, dark, moderately long, accompanied by 2 similar secondary setae; anterior distodorsal seta of fore coxa smaller, situated at margin of indentation; posterior distodorsal seta long, thin, a number of large secondary setae, and 2 primary setae situated anteriorly in middle of coxa; similar setae ventrally; both primary distoventral setae of equal length.

Distal part of trochanter with whitish chaetoids; anterior primary seta strong, small, dark brown, posterior seta larger, distal; the basal of the 3 anterior ventral setae situated near suture, the longest on the trochanter, other 2 apically and subapically in form of short, yellowish spines; both posterior ventral setae thin, moderately long, shorter than basal seta.

Femur convex dorsally and ventrally; large secondary setae situated dorsally, both primary setae among them; anterior seta situated distally, short, followed by a group of secondary setae; posterior primary seta subventral, dark, situated close to basal margin; dense, light chaetoids ventrally shorter than those on trochanter; both primary setae represented by blunt, yellow spines. Tibia short; primary dorsal setae situated subapically, close together, moderately long; 3-4 secondary setae in basal part; posterior and anterior seta short, dark, subapical; posterior distoventral seta in form of blunt spine on process of tibia; anterior distoventral seta situated some distance subventrally, spine-shaped, larger.

Tarsus with a short, secondary, basodorsal seta; posterior apical dorsal seta thin, longer; distoventral setae represented by 2 small, blunt spines, anterior seta situated near spines, subapical, spine-shaped.

Claw large, brown, with blunt, basal spine.

Midlegs long; femora, coxae, and tarsi almost straight, rodlike (Figure 705, B). Coxa with shallow distodorsal indentation; secondary setae numerous; brown, strong setae, most of them long, situated dorsally at anterior margin, in distal half of posterior margin, on anterior surface, ventrally and subventrally on posterior surface; all 3 primary dorsal setae dark brown, long; anterior setae situated among secondary setae; both distoventral setae of equal length.

Ventral side of trochanter with dense whitish chaetoids curved distally; anterior seta situated distally, small, strong, accompanied by 2 small secondary setae; posterior seta short, brown; 3 of the 5 ventral setae, moderately long and dark, basal seta situated at suture and longer than other 2, both posterior setae long. Femur with numerous secondary setae on dorsal and subdorsal surface; primary dorsal setae situated apically and subapically, long; anterior primary seta situated in middle of femur, posterior seta subventrally, both brown, long, situated near distal margin; 438 basal part of anterior surface with numerous small thick spines, and several secondary setae; 2 long, primary setae ventrally among whitish chaetoids. Tibia slightly wider distally, its dorsal and subdorsal surface with small secondary setae, some of them thin, others in form of short spines; a thin, long, primary seta apically on dorsal side, second primary seta brown, situated basally, slightly larger; anterior primary seta situated subapically in form of a large, pointed, brown spine; posterior seta long, thin, subapical; ventral side with 6-7 short, strong spines (a dark, subventral seta situated 439 posterior to basal spine). Tarsus with several short and larger, thin, secondary setae dorsally in basal part; apical dorsal seta thin, moderately long, subapical seta, slightly larger; ventral side with 4-5 sparse, short, thick spines. Claw slightly curved, with a thin, light brown spine.

Hind legs (Figure 705, C) long, trochanter, femur, tibia, and tarsus straight, narrow, rodlike. Coxa with deep distodorsal indentation; posterior surface with several, large, brown, basal dots; numerous brown, secondary setae of different length situated dorsally at posterior and anterior margin of depression, on anterior surface and ventrally; primary basodorsal seta

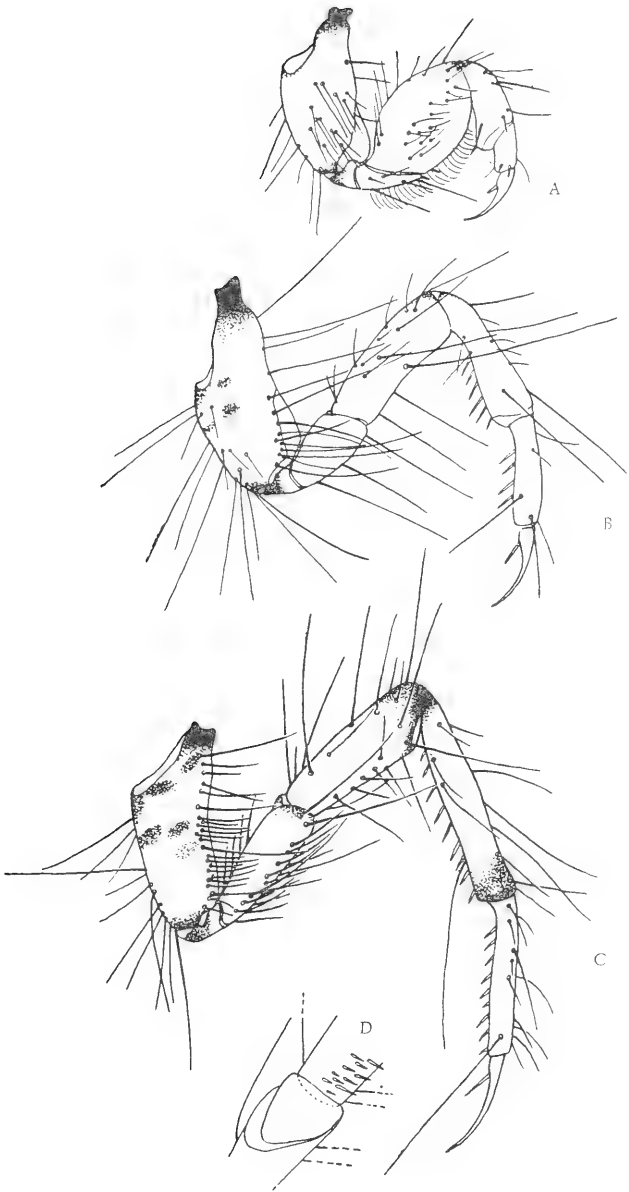
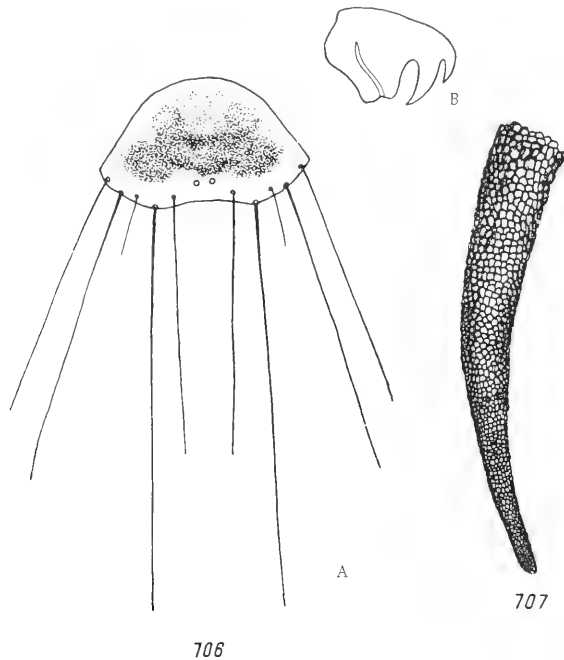


FIGURE 705. *Athripsodes aterrimus* Steph.: Right leg, posterior: foreleg (A), midleg (B), hind leg (C); and articulation of trochanter, left hind leg, anterior (D)

and both distodorsal setae (anterior and posterior) long, almost as long or slightly longer than the depression; 2 anterior setae situated among secondary setae; anterior distoventral seta dark, slightly longer than posterior.



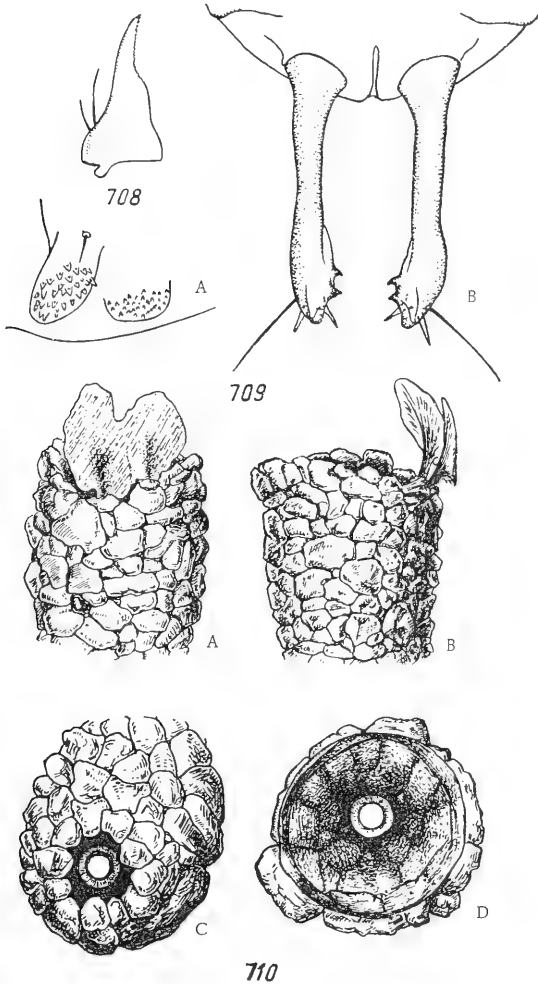
FIGURES 706 and 707. *Athripsodes aterrimus* Steph.:

706 — tergite of abdominal segment 9 (A), claw of anal leg (B);  
707 — larval case, lateral.

Basal segment of trochanter small, as on fore- and midlegs; apical segment long, rodlike, with sparse, short, and moderately long secondary setae dorsally and on posterior surface; small spinules in anterior subventral area as on mid-femur; posterior and anterior primary setae situated dorsally and subdorsally at distal margin; on ventral side, both posterior primary setae long, the basal of the 3 anterior setae larger than the intermediate and apical setae; 2—3 thin, moderately long, secondary setae among primary setae. The white, ventral chaetoids characteristic for trochanter and femur of fore- and midlegs, absent on hind legs.

Femur slightly thicker than trochanter, but almost as long, and with a black distodorsal speck; small, blunt spinules subventrally on anterior surface (Figure 705, D); short and large secondary setae dorsally, both primary setae situated among secondary setae; posterior primary seta situated subventrally, large, a number of short secondary setae further basally; anterior primary seta dark, subdorsal; a row of short to moderately long spinules ventrally; both primary ventral setae long, situated distally.

440 Tibia longer and narrower than femur, with numerous secondary setae; primary setae situated among secondary setae; ventral side with short sparse spines, 2 distal spines lighter and smaller than the others, situated close together. Tarsus straight, dark basally, with parallel dorsal and ventral sides. Dorsal side with numerous short and long setae; long setae situated subdorsally in distal part, a strong, dark brown seta anteriorly, a brown seta with thin end situated closer to margin posteriorly; a longitudinal row of 9 short, yellowish spines ventrally, 2 apical and one basal spine smaller and lighter than the others. Claw long, slightly curved, with thin, basal spine.



FIGURES 708 — 710. *Athripsodes aterrimus* Steph.:  
 Pupa: 708 — right mandible, ventral; 709 — lateral process of abdominal segment 1 (A), anal rods (B); 710 — case: anterior end, ventral (A) and lateral (B), posterior end, lateral (C) and inside (D) (708, 709, B — after Klapálek; 709, A — after Thienemann).

Abdomen slightly tapering posteriorly; segments 2–3 largest, equally wide; segment 9 wide but shorter than segment 8. Abdominal segment 1 with wide dorsal process and large, strong, medioanal setae at anterior margin; lateral processes displaced to ventral side in form of elliptical plates covered with light spinules, and situated at anterior margin of dark, brownish, curved sclerites with 2 pleural setae at distal margin. Lateral line on segments 3–7 in form of a narrow, white stripe with small grayish hairs, a row of dots with 2–3 light, minute spinules on segment 8. Gills with several short, whitish filaments dorsally on segments 2–3, pleurally on segments 1–2 and ventrally on segments 1–3.

Tergite of segment 9 chestnut brown, with a narrow, yellowish stripe at posterior margin (Figure 706, A); anterior-margin setae thin, long, close to medioanal setae, which are longer and thicker, dark brown; intermediate seta small, light; lateral and anterior-angle seta situated close together, similar to the anterior-margin seta.

Anal legs short, massive, with 2 large, membranous, basal folds around anal slit, and with small, light spinules on ventral side. Sclerite "b" dark brown, covering anal leg dorsally, laterally, and ventrally by curving around sclerite "c"; 4 thick, dark setae of different length, and a small, light seta dorsally near margin, a similar dark, thin, moderately long seta laterally; ventral seta small, brown, thin. Sclerite "c" in form of a light brown plate with a thin seta.

441 Claw reddish brown, small, with a large dorsal denticle, sometimes with an additional smaller denticle (Figure 706, B); setae 1 and 2 small, light; seta 6 situated subdorsally on side, thick, long; seta 3 situated medially, thin; seta 4 larger and thicker; seta 5 small, situated near membranous stripe; setae 7 and 8 situated ventrally, small.

Case conical, curved, 15–16 mm long (Figure 707); longer cases of full-grown larvae consist of 2 parts, a posterior part made of fine sand grains and probably made in stage 2 or 3, and an anterior part, which forms the greater part of the case, appears later and consists of larger sand grains; posterior end disappears at end of stage 5, and the case is only slightly longer than the body before pupation.

Number of gill tufts of *A. aterrimus*

Segment	Dorsal	Pleural	Ventral
1		1	1
2	1 1	1 2	1 2 1 1
3	1		1 1 1

**Pupa.** Length 8–12 mm. Antennae of male pupae coiled 4 times around posterior end of body, those of female twice. Labrum with rounded sides and with a teat-shaped median process; setae short, reddish brown. Mandibles (Figure 708) with concave, serrated, median margin; lateral setae short, ventral setae smaller than dorsal.



(442)

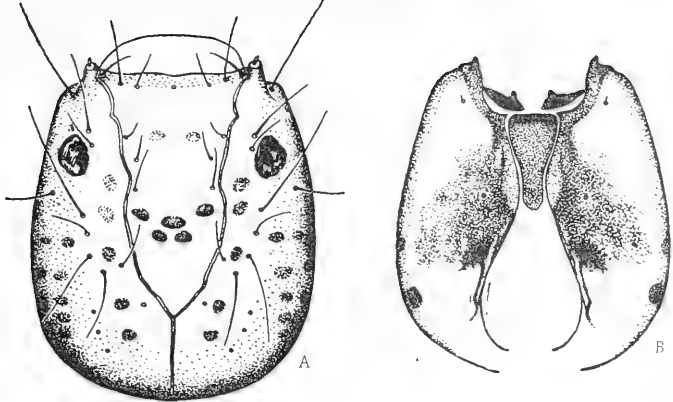


FIGURE 711. *Athripsodes cinereus* Curt. Head, dorsal (A) and ventral (B)

(442)

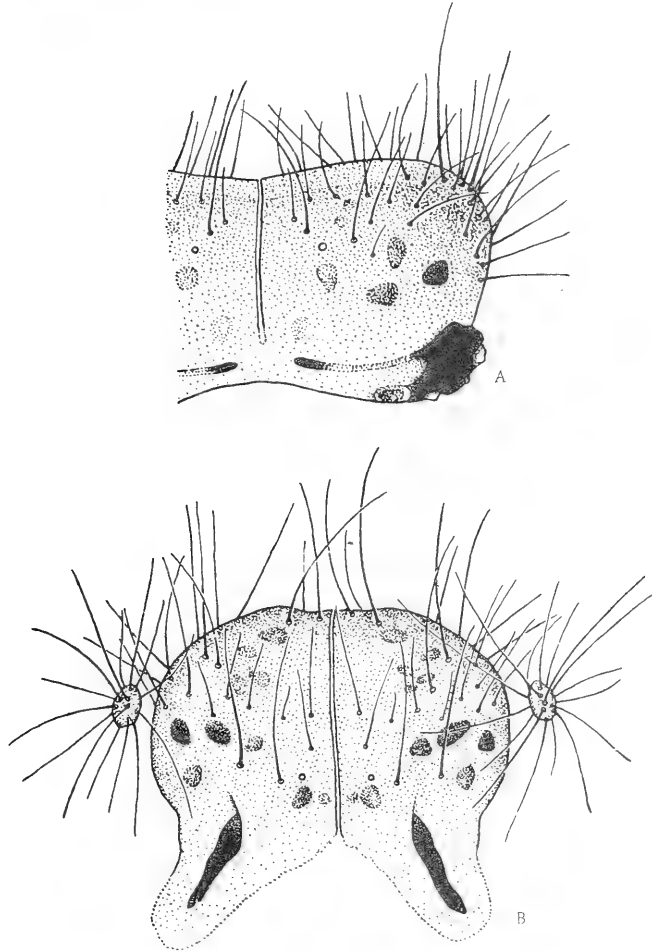


FIGURE 712. *Athripsodes cinereus* Curt. Pronotum (A), mesonotum (B)

Wing sheaths blackish brown, reaching middle or end of segment 6; mid-tarsi with dense, golden yellow, natatorial setae.

Abdominal segment 1 with small dorsal tubercles laterally at posterior margin, and covered with small spinules directed posteriorly; a small area with spinules directed anteriorly in middle (Figure 709, A); plates of holding apparatus presegmental on segments 3-4, small, with 2 dark hooks directed posteriorly; postsegmental plates of segment 5 elliptical, yellow, with 3 dark hooks directed anteriorly.

Gills on segments 1-3.

Dorsal processes near base of anal rods with 5 setae, 2 of them longer and thicker than others; a thin, short seta ventrally on each side. Anal rods short (Figure 709, B), thick, with 2 short, tooth-shaped processes in distal part; asymmetrical seta in basal third light, thin; lateral subapical seta strong, dark, large; apex with a small, light, lateral seta and a light, small spinule.

Case made of sand grains (Figure 710), 7-10 mm long, both ends with a membrane with a large, round hole; anterior end with elliptical, posterior end with round adhesive disks.

Mode of life and habitats. Phytophagous, in vegetation of stagnant and slow water bodies.

Distribution. The European USSR, Western Siberia (isolated records). In addition, Europe, mainly Central and Northern parts.

## 2. *Athripsodes cinereus* Curtis \*

Hagen, 1864:231. — Siltala, 1905:61-68, 87, 90, Figure 15. — Ulmer, 1909: 248, 308, Figure 451. — Lestage, 1921:606, 609-616, Figures 203 m, p, 205 D. — Lepneva, 1940:210-211, Figure 158.

**Full-grown larva.** Length 12-14 mm. Main color of head and thoracic sclerites brownish yellow. Anterior part of frontoclypeus with 3 pairs of dots, middle pair widely separated; posterior part with a group of 5 brownish dots (Figure 711, A). Dorsal stripes lateral to frontoclypeus replaced by 3 large dots on each side; rows of dots instead of lateral stripes. Gula and adjacent parts of large, lateral sclerites blackish brown, large lateral dots posteriorly (Figure 711, B).

443 Labrum with deep median indentation and a reddish brown median dot at anterior margin. Teeth of mandibles distinct; left mandible with 2 sharp teeth on dorsal blade in addition to distal tooth; dorsal blade of right mandible with one sharp and one blunt basal tooth; each mandible with one tooth on ventral blade. Spinulose, heart-shaped part of submentum slightly longer than in *A. aterrimus*; setae similar.

Pronotum with a lateral group of large dots posteriorly; a similar dot anteriorly near median suture; setae restricted to anterior part (Figure 712, A); medioanal seta and seta lateral to the dot larger than the others. Mesonotum (Figure 712, B) with deeply concave posterior and lateral margin; streaks in posterior angle sharp, large, dark reddish brown; an indistinct dot on each side posteriorly at median suture. Setae light, reddish brown, scattered on most of surface; 11-12 anterior-angle setae outside the sclerite, large, reddish brown.

\* Appears in the Soviet literature as *Leptocerus cinereus*.

Number of gill tufts in *A. cinereus* (after Siltala)

Segment	Dorsal	Pleural	Ventral
I		1	1
2	2 2	1-2 1	1 1 1 1
3	1-2 1 (0)		1 1 1

Number of gill tufts in pupa of *A. cinereus* (after Siltala)

Segment	Dorsal	Pleural	Ventral
2	1 (0) 1	1 1	1 (0) 1-2 1 1
3	1		1 1 1

Gills on abdominal segments 1-3; segment 1 with a gill with a single, thick filament before lateral process and a large presegmental gill with 3 thick filaments ventrally on each side; filaments of gills on segments 2-3 thin, 3-8 or more (to 17 filaments according to Siltala) in a tuft.

Tergite of segment 9 light brown, without dots; setae at posterior margin brown, their position and size as in *A. aterrimus*. Setae of sclerite "b" reddish brown. Claw with a dorsal denticle.

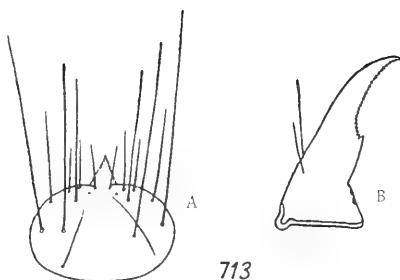
Case made of sand grains, curved, with round cross section, 12-16 mm long.

**Pupa.** Length 11.0-12.5 mm. Antennae of male pupae coiled about 3 times around body, those of female once. Labrum (Figure 713, A) with rounded sides and large, pointed, median process; setae relatively long. Blade of mandibles concave, serrated, with a small, tooth-shaped, basal process (Figure 713, B).

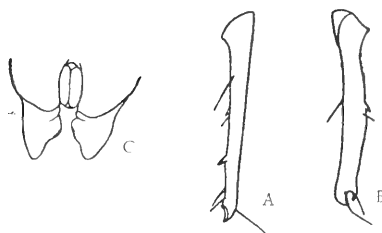
Wing sheaths reaching segment 6 or beginning of segment 7. Mid-tarsi with dense natatorial setae.

Gill tufts on segments 2-3.

Presegmental plates of holding apparatus on segments 3-7 in form of small, oval, light areas with large, dark brown, lateral hooks directed posteriorly; median hook larger than lateral; postsegmental plates of segment 5 oval, with 3-4 reddish brown spinules at posterior margin and directed anteriorly. Anal rods with a dorsal tubercle at base with 4 large, dark brown setae in 2 pairs, those of median pair larger than lateral setae. Anal rods (Figure 714, A, B) straight, thin, slightly asymmetrical; a light, large seta in basal third; a small light seta in middle near large tooth-shaped process of left rod and near tuberculate processes of right rod; 444 a strong, reddish brown seta, and a small, light, spine-shaped seta subapically; left rod also has an apical process, right rod 2 processes, one of them apical, the other subapical; median process larger than others. Sheath of penis and ventral appendages as in Figure 714, C.



713



714

FIGURES 713 and 714. *Athripsodes cinereus* Curt. Pupa (after Siltala):

713 — mouth parts: labrum (A), right mandible, ventral (B); 714 — anal rod of male (A), of female pupa (B), ventral appendages and penis sheath of male (C).

Case shorter than in larva, 10–12 mm long; anterior and posterior membrane with a round or broadly elliptical hole, surrounded with light sand grains.

Mode of life and habitats. Littoral of lakes and rivers, usually on stony and sandy-stony bottom; common on solid bottom among rushes and reeds.

Distribution. The European USSR (northern, western, and central regions), the Urals, Middle Asia, and southern Siberia. In addition, Europe, North America.

### 3. *Athripsodes bilineatus* Linné \*

Klapálek, 1893:92–95, Figure 25. — Siltala, 1905:87, 90. — Ulmer, 1909:248, 308. — Lestage, 1921:609–616. — Hickin, 1953:111–113, Figures 1–7.

**Full-grown larva.** Length 8–9 mm. Resembling *A. cinereus*, coloration lighter. Head yellowish brown, with pale pattern (Figure 715, A). Anterior part of frontoclypeus with only 2 pairs of dots, anterior pair absent; posterior part with a group of 5 small dots; area of tentorial pits slightly dark. Dorsal stripes barely visible or absent, replaced by 3 large brownish

\* See *Leptocerus bilineatus* (McLachlan, 1874–1880:308; Siltala, 1905–1906: 61).

dots; smaller dots lateral to coronal suture. Ventral side of head brown, including gula, and without dots (Figure 715, B).

Number of gill tufts in *A. bilineatus* (after Klapálek)

Segment	Dorsal	Pleural	Ventral	
1		1	3	
2	1 1	2 1	1 1	1 1
3	1 1	1	1 1	1

Labrum with deep median indentation, as in *A. cinereus*. Both mandibles with 2 teeth on dorsal blade and one tooth on ventral blade.

Pronotum and mesonotum yellowish brown, without dots (Figure 716, A); mesonotum with blackish streaks in posterior angle. Propleuron as in Figure 716, B. Legs light yellow.

Abdomen whitish; black sclerotized rod at base of lateral process of segment 1 simple, without branches (Figure 716, C).

Gills on segments 1–3; as in *A. cinereus*, segment 1 with 1 short, thick, lateral filament presegmentally, with a gill with 3 short thick filaments ventrally.

Tergite of abdominal segment 9 light, indistinct, without dots; setae as in *A. cinereus* but lighter and brown. Claw with one denticle.

Case 9–11 mm long, made of sand grains, curved, with round cross section (Figure 717).

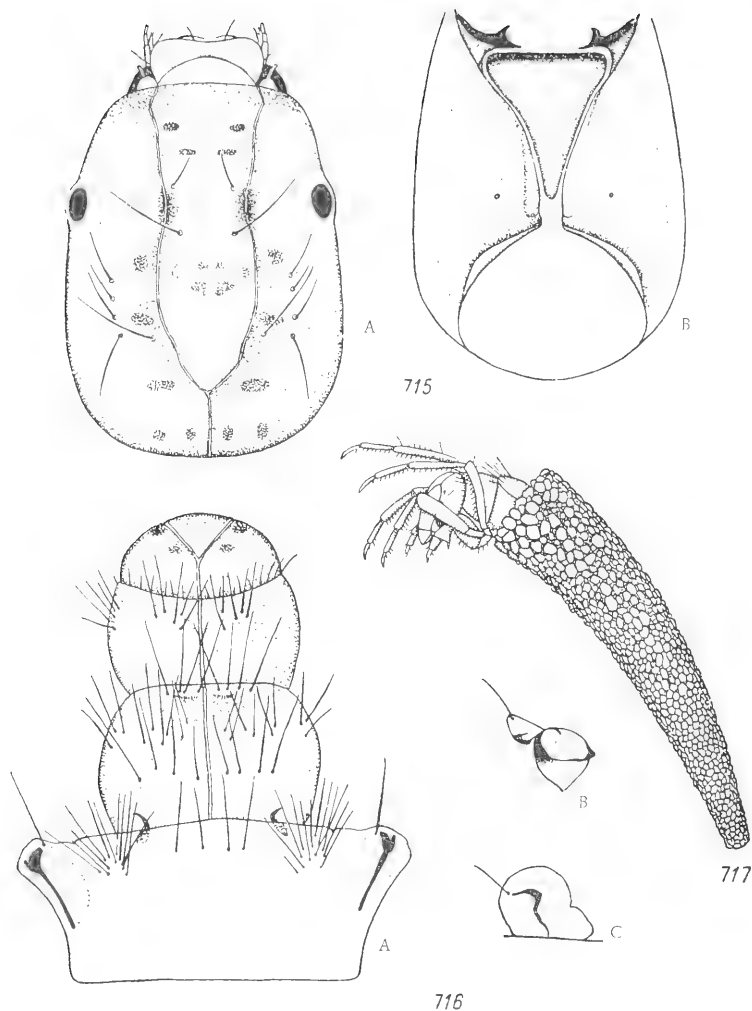
**Pupa.** Length 7–8 mm. Antennae of male pupae coiled 2.5 times around body, antennae of female 1.5 times. Labrum with indistinct anterior angles and a small, blunt, median process. Mandibles without tooth-shaped process at base of serrated blade. Wing sheaths reaching base of segment 6. Midlegs natatorial, with dense, thin, golden setae.

Abdominal segment 1 with a process with spinules directed posteriorly, and an area with minute spinules directed anteriorly; presegmental plates of holding apparatus on segments 3–7, with 2 hooks; postsegmental plate of segments 5 oval, light, with 3–5 spinules directed anteriorly. Lateral line on segments 3–8, with dense, grayish white setae. Dorsal gills absent; pleural and median ventral gills at anterior margin of segments 2–3; lateral ventral gills anteriorly and posteriorly on both segments. Dorsal tubercles with 4 thick, black setae on each side about in middle of segment 9, as in *A. cinereus*; 4 ventral setae at base of each rod.

445 Anal rods thin with 2 small denticles ventrally in the second third of the rod, a large tooth on the inner side and distally; basal part with a light seta, apical part with a dark, strong, lateral seta, both setae large; median side with a small, light seta in middle third and a similar seta at apex.

Case shorter than in larva; anterior and posterior membranes convex, covered with sand grains; anterior hole round, posterior hole elliptical.

Mode of life and habitats. Small brooks, on stony bottom.



FIGURES 715-717. *Athripsodes bilineatus* L. (after Hickin):

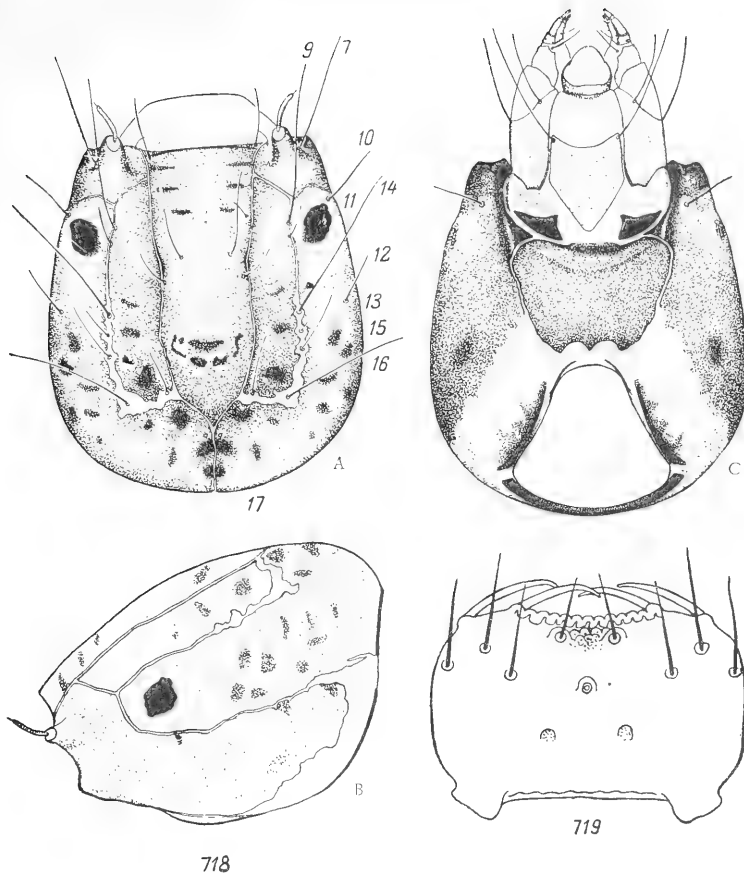
715-head, dorsal (A) and ventral (B); 716-thorax, dorsal (A), propleuron (B), lateral process of abdominal segment 1 (C); 717-larva in case.

**Distribution.** Northern, northwestern, and central parts of the European USSR. \* In addition, mostly in Northern and Central Europe.

446 4. *Athripsodes excisus* Morton

Siltala, 1905:65-68, Figure 16; 1907:462-463, 467-468; 1908b:22.

\* McLachlan (1874-1880) includes Turkestan in the list of localities according to collections of Fedchenko; this has not been confirmed.



FIGURES 718 and 719. *Athripsodes excisus* Mort.:

718—head, dorsal (A), lateral (B), and ventral (C); 719—labrum.

**Full-grown larva.** Length 8–10 mm. Head wide (Figure 718, A, B), with distinct adfrontal and lateral light stripes; gula large, cup-shaped, with small, posterior, median process (Figure 718, C). Frontoclypeus and area surrounded by light frontal stripe uniformly chestnut brown, other dark areas of large lateral sclerites brown; gula dark brown; periorcular area yellowish or light brown; a large, whitish area from lateral stripe to gula posteriorly with several brownish dots laterally; occipital foramen with a narrow, brownish black margin. Anterior part of frontoclypeus with 3 pairs of dots; posterior part with a band of 7 small, dark brown dots. Dorsal stripes replaced by 4 large dots; small, dark dots lateral to coronal suture and instead of lateral stripes. Anterior-margin setae situated at angle, median seta small, light; intermediate seta short, straight, dark, lateral seta small; anterior frontal seta small, posterior frontal seta short, thin, situated behind tentorial pit; intermediate frontal seta much longer, situated near tentorial pit. Seta 9 long, strong, blackish brown; seta 11 situated slightly posterior to 9, small, light; seta 7 short, strong; seta

447 10 thin; seta 12 short, brown, situated behind eye; 3 setae on light dorsal line: long, dark seta 14, small seta 13, and the thin seta 15; seta 16 large, dark, situated in angle of light line between longitudinal and transverse part; seta 17 situated medially near frontal suture, short, thin. Ventral seta 8 short, near base of mandibles; seta 18 minute, on light background near gula.

Labrum (Figure 719) wide, with indentation which is tuberculate in the middle; setae 1 and 2 represented by large, thick, transparent spines, curved to surface; seta 4 small, but longer and thinner than in *A. a ter rimus*; seta 3 light yellow, thick; setae 5 and 6 thin, dark brown.

Mandibles slightly oblong, with shallow, median depression; in addition to distal tooth, dorsal blade of right mandible with 2 teeth, ventral blade with 2 small, fused teeth; left mandible with 2 teeth on dorsal and ventral blade.

Maxillolabium (Figure 718, C) with a yellowish heart-shaped area on site of submentum, and with long, dark setae at anterior angles; both setae of stipes thin, moderately long; palpifer yellowish brown, apical seta large; basal seta small, light; both situated on membrane. Proximal segment of palp slightly wider than next segment; galea almost reaching apex of palp.

Pronotum white, with a narrow, blackish stripe at anterior margin (Figure 720, A); 2 large, brownish dots on each side near median suture near posterior margin; lateral groups of 9–10 darker, dense dots; anterior corners with several, pale, sparse dots; anterior margin with a row of brown, moderately long setae; 10–12 thin, straight setae at anterior angles, at margin and on surface.

Mesonotum (Figure 720, B) thin, with concave lateral and posterior margin, brownish in middle, whitish laterally; a large, reddish brown dot and 2–3 small dots posteriorly near median suture; posterior-angle streaks large, bracket-shaped, dark reddish brown; several pale dots in anterior angle; thin anterior-margin setae dark, moderately long; medioanal setae the same; lateral setae at anterior margin of streaks moderately long, thin; primary anterior-angle setae situated on membrane lateral to sclerite, among a group of 10–11 strong, long, secondary setae situated on a tubercle. Anterior-margin and medioanal setae of metanotum similar; anterior-angle groups consisting of 3–4 setae of different length.

Pleurites and leg sclerites brownish yellow. Proepisternum triangular, with narrow brown margin; pleural suture reddish brown; epimeron thin, yellow, with rounded posterior margin and a dark long seta; trochantin conical, pointed, seta not situated distally as in *A. a ter rimus*, but in middle of anterior margin; both setules lateral. Pleural suture of meso- and metathorax blackish brown; distal margin of episternum the same; seta of episternum situated at anterior end of margin, seta of epimeron at posterior margin; both setae long, dark.

Fore coxa with shallow distodorsal indentation; anterior basodorsal seta moderately long, dark; distodorsal seta short, situated near distal indentation; 8–9 thin, secondary setae between primary setae; posterior distodorsal seta long, dark brown, situated near distal indentation; 10–11 brown, moderately long, secondary setae situated further basally on dorsal and subdorsal side of coxa; primary anterior setae strong, dark; posterior surface with several secondary setae; numerous, large spinules ventrally and subventrally; both primary ventral setae moderately long.

Trochanter anteriorly with narrow, reddish brown, distal margin; primary anterior seta spine-shaped, dark brown; posterior seta short, strong, brown; both posterior ventral setae long, situated subapically close together; anterior



basoventral seta similar, situated near suture; other 2 anterior setae situated apically and subapically in form of short, blunt, thick, yellow spines; entire ventral surface, as in *A. aterrimus*, covered with hyaline, thin chaetoids curved distally.

(448)

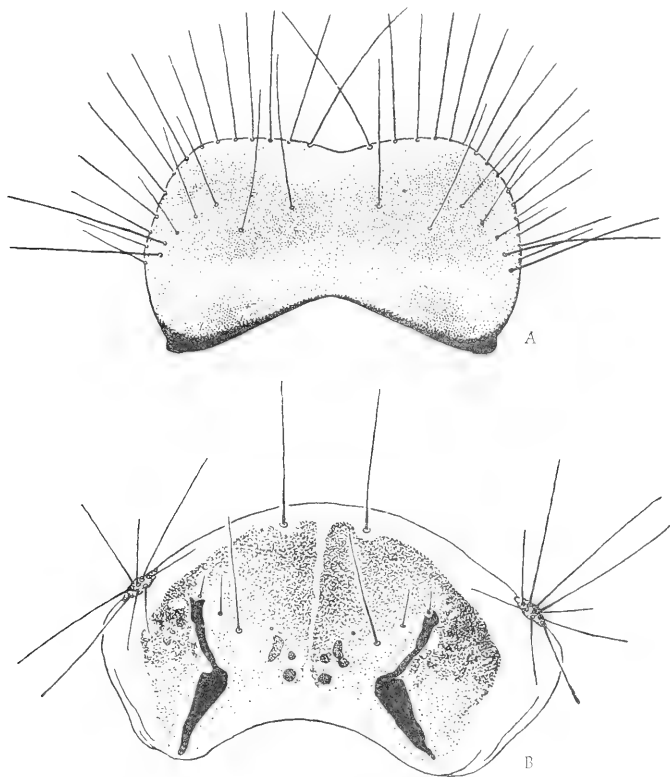


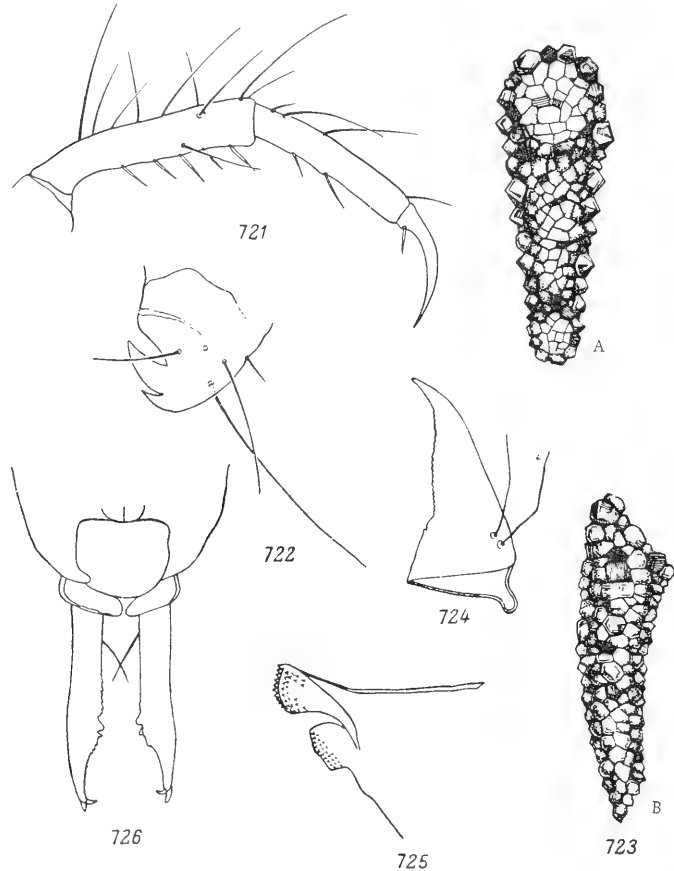
FIGURE 720. *Athripsodes excisus* Mort. Pronotum (A) and mesonotum (B)

Ventral margin of femur shorter than in *A. aterrimus*, convex only in distal part; entire dorsal side and basal part of subdorsal side with long, thin, brown setae; primary basodorsal and apical dorsal seta situated on a dark, narrow margin; anterior seta spine-shaped, short, dark brown; posterior seta situated subventrally in basal part, long, brown; ventral margin flattened, convex distal part with 4 light chaetoids forming a fan, and a short, thick, brownish, primary seta; all 5 chaetae with thin ends, a row of minute, blunt, light spinules near them; basal part with several light chaetoids similar to those in distal part, and a basoventral, primary seta in form of a short, blunt, brown spine.

448 Tibia curved ventrally, with a longitudinal row of small, light, distal spinules; apex of distal process with a posterior distoventral primary seta in form of large, blunt, light spine; second ventral seta situated subapically represented by a small, light spinule, not always distinct; anterior seta

light, thick, spine-shaped; posterior seta dark, short, thin; 6–7 brownish and darker, moderately long setae, including 2 primary setae, situated dorsally and subdorsally.

(449)



FIGURES 721–726. *Athripsodes excisus* Mort.:

721—tibia, tarsus, and claw of midleg, posterior; 722—claw of anal leg, lateral; 723—larval case, ventral (A) and lateral (B). Pupa: 724—left mandible, ventral; 725—lateral process of abdominal segment 1; 726—anal rods of male pupa, dorsal (724–726 — after Siltala).

Tarsus with 4 small, light spinules and several, branched spinules ventrally; both primary setae subventral, anterior seta in form of short, light, blunt spine; posterior seta thin, dark; primary dorsal setae short, anterior seta situated subdorsally, dark, strong; posterior seta thin, situated near 2 secondary setae. Claw slightly curved, with blunt, light, basal spine.

Mid-coxa oblong, with numerous dorsal and ventral setae; setae straight, thin, brownish or brown; posterior side with 2–3 short, subventral setae; anterior side with 2–3 longer setae basally; long, distodorsal primary seta

at margin of indentation; 2 short, anterior setae and 2 moderately long, distoventral setae dark brown, distinct.

Trochanter similar to fore trochanter, with sparse, thin, light chaetoids ventrally; setae brown; anterior seta apical; posterior seta subapical; both short, strong; posterior and anterior basal seta on ventral side thick, long; anterior apical and subapical setae short, strong.

449 Femur rodlike, slightly curved, resembling hind femur in size and form, with dark brown setae; dorsal setae short to moderately long, 2 long, primary setae among them; anterior seta short, strong, situated some distance from distal margin; 4-5 small, subdorsal, secondary setae further basally; posterior seta situated distally near ventral margin, dark, long, directed laterally; 2 long primary setae, 2-3 short and 1-2 moderately long secondary setae, ventrally in the middle.

Tibia straight, as long as, but narrower than femur; dorsal side distally with 3 pairs of long, thin setae, primary distodorsal seta longer than others; basal part with a similar long, thin seta, and 1-2 short setae; posterior surface with a long, dark reddish brown seta which projects laterally subdorsally near 2nd pair; a similar shorter seta subventrally; short, reddish setae near dorsal and ventral margin on anterior surface, a small, dark seta further basally; a row of 5-6 light spines ventrally.

Tarsus with 4 thin, large setae dorsally, one of them apical, the other 3 in the middle and basally; posterior subdorsal area with a long, reddish brown seta which projects laterally; a thin, light, short seta near distal seta anteriorly; ventral setae represented by 2 pointed, light spines like those on tibia.

Claw slightly curved, with small, basal spine (Figure 721).

450 Hind coxa long, less massive than mid-coxa, with fewer and shorter secondary setae. Basodorsal seta situated basally, long, brown; anterior primary, apical dorsal seta situated nearby, almost equally long, dark brown; a moderately long seta near indentation; a row of thin, secondary setae, including 2 long setae, situated at margin between primary anterior setae; posterior distodorsal seta situated near basal margin of indentation, long, dark brown; 7-8 thin, secondary setae further basally, most of them long; anterior surface with 4 short, secondary setae subventrally and 3 thin, secondary setae further basally; primary anterior setae situated in distal part, short, reddish brown; ventral side with about 20 long, thin setae; anterior distoventral seta short; posterior distoventral seta curved, moderately long, thin.

Trochanter long; setae brown or dark brown, both primary and secondary, in contrast to fore- and midlegs. Anterior primary seta short, subdorsal; posterior primary seta almost dorsal, situated close to anterior seta; 4 thin, moderately long, secondary setae situated anteriorly on dorsal side; posterior side with 4 thin, moderately long, secondary setae; the apical of the 3 anterior ventral setae short; the intermediate situated in distal part, long; the basal seta situated near suture, moderately long; both posterior ventral setae situated in distal part, long; 3-4 short secondary, ventral setae situated anteriorly, and 5-6 thin, moderately long setae posteriorly.

Femur short, rodlike, not longer ventrally than trochanter. Apical dorsal seta long, reddish brown, directed anteriorly; basodorsal seta longer but thinner than apical seta; 4-5 short, and 2 moderately long, thin, secondary setae along femur; apical and basal parts of anterior surface subdorsally

with 3 short setae, a similar seta in middle; primary anterior seta situated almost ventrally, short, strong, reddish brown; primary, apical ventral seta long; basal seta much shorter; the 3 anterior of the 5 secondary, ventral setae short, the 2 posterior setae moderately long.

Number of gill tufts in *A. excisus* (after Siltala)

Segment	Dorsal	Ventral	
2	1	1	1
	1		
	1		
3	1	1	1(0)
	1		1
4	1(0)	1	1(0)
	1		
5	1	1	
6	1	1	
7		1	

Tibia straight, narrow, longer than femur, with a longitudinal row of 8 moderately long setae dorsally; 3 distal setae light, very thin; 4th and 5th seta slightly thicker and darker than others; 3 basal setae also long, accompanied by 2-3 small, light setae; anterior surface distally with a long reddish brown seta projecting laterally (primary?); posterior surface with a long, brown, but thinner seta in middle; subdorsal and subventral areas with a short seta; ventral setae in form of a row of short, light spines.

Tarsus long, narrower, and slightly shorter than tibia, with 8 thin, moderately long setae dorsally, 3rd and 4th seta, and 5th and 6th seta, forming pairs anteriorly and posteriorly; posterior surface distally with a long, reddish brown (primary?) seta; 4 (sometimes 3) light spinules ventrally.

Abdominal segment 1 and metathorax are widest part of body; abdomen tapering posteriorly; dorsal process large, medioanal seta reddish brown, moderately long, situated on process; brownish black sclerite lateral to lateral processes slightly curved, in contrast to the *aterimus* group; a thin, moderately long, brown seta near distal margin; a small brownish, weakly sclerotized area with light spinules nearby, slightly basally.

Gills on segments 2-7 in one dorsal and 2 ventral rows; segment 2 ventrally with a gill with 3 short, thick filaments in median row, with one filament in lateral row.

Tergite of segment 9 absent, in contrast to the *aterimus* group; surface setae situated posteriorly on a membranous area, as on preceding segments; medioanal seta reddish brown, long; intermediate and lateral setae small, thin, yellowish; anterior-angle seta short, brown.

451 Sclerite "b" of anal legs brown; the intermediate of the 3 large, distodorsal setae black, long, thick, other 2 smaller, blackish brown;

median seta and lateral seta subapical, short, reddish brown. Sclerite "c" relatively large, yellowish brown, with a small, light seta. Claw small, with 2 small denticles (Figure 722); small, light seta 1, long, thick, median seta 3, large, brownish seta 2, and short, lateral seta 6 are distinct.

Number of filaments in tufts of gills of pupa of  
*A. excisus* (after Siltala)

Segment	Dorsal	Ventral	
2	6	7	8
	4		
	6		
3	7-11	7	4-6
	7		
4	6	7	3-7
5	6	5	
6	5-7	3	
7	3 (0)	3-4	

Case (Figure 723) made of sand grains, 9-11 mm long, in form of a wide cone, flattened dorsoventrally, with large, anterior opening and very narrow posterior part; ventral surface flat, made of fine sand grains; lateral and dorsal sand grains much larger; wide, hoodlike anterior part sometimes with a larger sand grain laterally, or with several grains, giving a winged appearance. Posterior membrane directed downward, with a round or elliptical hole.

**Pupa.** Length 6-8 mm. Antennae coiled several times around posterior end of body. Labrum shorter and wider than in *aterrimus* group, and with a small, median process. Blade of mandible with an almost straight serrated part (Figure 724).

Sheaths of fore wings reaching abdominal segments 7-8. Mid-tarsi with dense setae.

Abdominal segment 1 with large, projecting, dorsal processes laterally (Figure 725); sclerotized area with spinules directed posteriorly; area with spinules directed anteriorly situated on an elevation. Hooks on plates of holding apparatus: III:2-3; IV:2-3; V:2-3+10-14; VI:3-4; VII:2-4.

Dorsal tubercles of segment 9 with 3-4 dark setae. Anal rods (Figure 726) straight, thick, narrower distally, hooked at end; intermediate part of rod with a tuberculate median area with one large, and 2 small, denticles; basal seta short; middle seta moderately long; both apical setae small, situated on sides of curved apex. Sheath of male genitalia narrow, pointed, curved inward.

Case slightly shorter than in larva; anterior opening directed ventrally; membrane with a transverse anterior slit; posterior opening with a broadly elliptical transverse slit; anterior end of case attached at several points by ligaments; posterior end by a small disk.

Mode of life and habitats. Solid bottom in brooks and rivulets; open littoral of lakes and rivers; phytophagous.

Distribution. Northern and northwestern parts of the European USSR, Eastern Siberia, the Amur region. In addition, Northern Europe.

##### 5. *Athripsodes annulicornis* Stephens

Klapálek, 1893:88–91, Figure 24.—Struck, 1903; Plate III, Figure 5.—Ulmer, 1903:102.—Siltala, 1905:57–58, Figure 13.—Ulmer, 1909:247, 307, Figures 373c–449.—Lestage, 1921:606–615, Figures 203b, e, j, r; 207.—Lepneva, 1940:210.

**Full-grown larva.** Length 8–9 mm. Head broadly oval (Figure 727, A); color brownish, with yellowish areas ventrally around eyes and posteriorly; pattern pale, indistinct; light adfrontal, and white lateral stripes less distinct than in *A. excisus*; gula (Figure 727, B) wide, cup-shaped, brown. Frontoclypeus without pattern. Dorsal stripes, if present, slightly darker than ground color, brown; 3 large dots near frontal sutures; several small dots posteriorly. Setae reddish brown, thin; arrangement and size as in *A. excisus* (Figure 718, A).

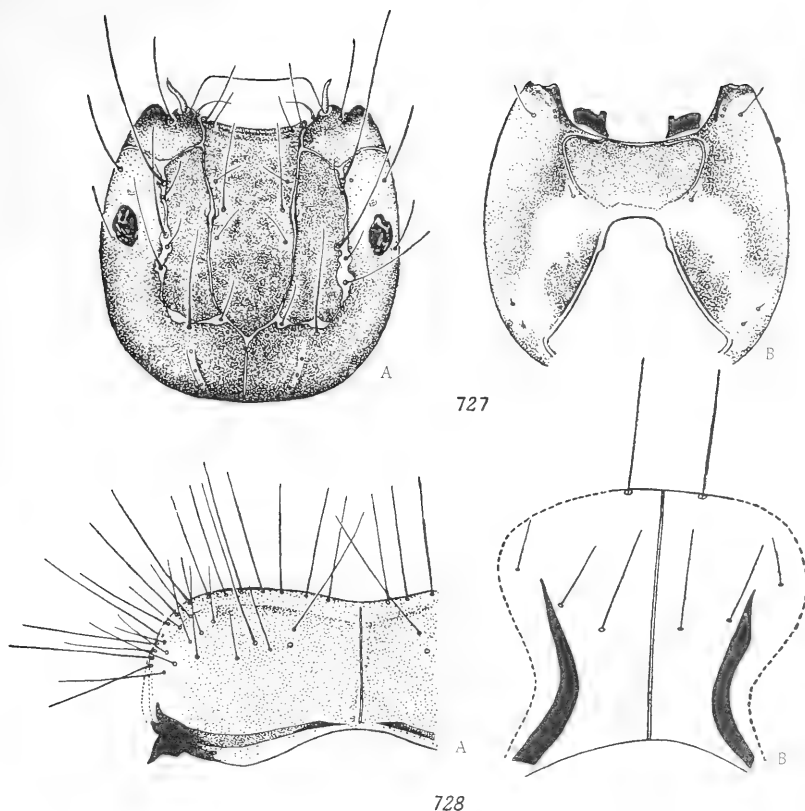
452 Labrum less wide than in *A. excisus*; setae 1 and 2 represented by light, transparent, curved spines; seta 4 in form of a small, straight spinule; seta 3 thin, dark, situated in anterior angle; seta 5 larger than seta 6.

Mandibles reddish brown, moderately long; apical tooth longer and wider than others; dorsal blade of both mandibles with 2 large subapical teeth; ventral blade with a small tooth; median brush absent; lateral setae situated basally, brown, moderately long; dorsal seta slightly larger.

Pronotum (Figure 728, A) without pattern, with narrow brown or blackish anterior margin. Mesonotum (Figure 728, B) pale, thin, distinct only near median suture, with indistinct margins; posterior-angle sclerites large, bracketlike, blackish or dark reddish brown; anterior-margin seta dark, long; medioanal seta similar; intermediate seta short, thin or very moderately long; lateral seta small, situated laterally near anterior margin of bracketlike streak; 10–11 anterior-angle setae dark, situated on membrane.

Metathorax widest segment of the body, with large lateral processes; anterior-margin seta short, strong; medioanal seta moderately long, accompanied by small, light, intermediate seta; 5–6 anterior-angle setae situated near process.

453 Propleurites yellow; pleural suture short, narrow, reddish brown; lateral margin of episternum and base of trochantin blackish brown; epimeron represented by a small, narrow plate; seta long, thick, dark, situated near pleural suture; lobe of trochantin narrow, pointed, whitish, anterior seta situated near middle, long, reddish brown; setules light, situated at lateral margin. Meso- and metapleurites thin, indistinct, whitish yellow; pleural suture yellowish or reddish brown basally, black near articulation with coxa; distal margin of episternum short, reddish brown; lighter, pinkish on mesothorax; seta at margin long, dark; seta of epimeron situated outside sclerite.



FIGURES 727 and 728. *Athripsodes annulicornis* Steph.:

727—head, dorsal (A) and ventral (B); 728—pronotum (A) and mesonotum (B).

Legs pale yellow, without pattern; small, dark spots near articulations of coxa, femur, and tibia; setae lighter and thinner than in *A. excisus*; secondary setae sparser. Fore tibia wider distally than in *A. excisus*; small spinules at ventral margin of femur, tibia, and tarsus smaller than in *A. excisus*. Mid- and hind tibiae and tarsi with fewer, large, light spines at ventral margin than in *A. excisus*: midlegs with 3 spines on tibia and one on tarsus (instead of 5 and 2 as in *A. excisus*), hind tibia with 5 (7 in *A. excisus*), hind tarsus with 3 (as in *A. excisus*).

Dorsal process of abdominal segment 1 wide, large; medioanal setae on tubercle thin, dark, rodlike; lateral sclerite of lateral tubercles with curved distal part; setae thin, brownish.

Gills with 3–11 filaments on segments 2–7.

Tergite of segment 9 absent; setae smaller than in *A. excisus*, 5 in each half; medioanal seta brownish, larger than others.

Sclerite "b" of anal legs yellowish brown; setae reddish brown; 3 distodorsal setae thinner than in *A. excisus*, intermediate seta

slightly longer and thicker than other 2; lateral and outer setae short, thin. Sclerite "c" light yellow, with a small, light seta.

Number of tufts of gills in *A. annulicornis* (after Klapálek)

Segment	Dorsal	Ventral	
2	2	1	1
	2		
3	2	1	2
	1	1	1
4	1	1	1
	1		
5	1	1	
6	1	1	
7	1	1	

Claw as in *A. excisus*, small, reddish brown, with 2 dorsal denticles; setae as in *A. excisus*.

Case (Figure 729) 8–10 mm long, curved, flattened dorsoventrally, with dorsal hood anteriorly; anterior opening directed obliquely downward, posterior opening closed by a membrane with a round or broadly elliptical hole.

Number of filaments in tufts of gills of pupa of *A. annulicornis* (after Klapálek)

Segment	Dorsal	Ventral	
2	5	4	4
	4		
	6		
3	4	10–11	5
	8–9		
4	4	9–10	4
	1–8		
5	3	9	
	6		
6	3	6	
	5		
7		5	

**Pupa.** Length 5.8–7.0 mm. Antennae of male pupae coiled about 4 times around posterior end of body, those of female about 3 times. Labrum (Figure 730, A) rounded laterally, with a small, slightly projecting rounded median



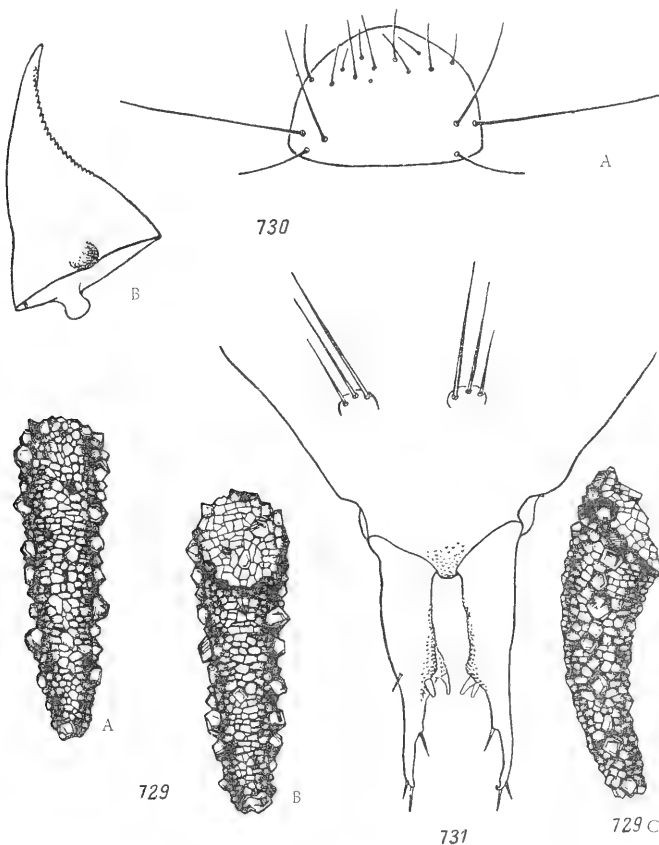
process instead of a narrow, pointed process; setae light; anteclypeus with 2 large, brownish setae. Mandibles (Figure 730, B) yellowish brown, with inward-curved distal ends; serrated part straight in its greater part.

Wing sheaths reaching beginning of segment 7. Mid-tarsi with dense grayish golden natatorial setae.

Dorsal side of abdominal segment 1 with narrow, dark brown, sclerotized processes with hooks laterally at posterior margin. Presegmental plates of segments 3–7 with 2–3 denticles; postsegmental plates of segment 5 with 12–20 small denticles directed anteriorly in 2 rows.

(454) Lateral line on segments 4–8, with grayish, fine hairs (after Klapálek). Gills on segments 2–7.

Anal rods (Figure 731) dark, brownish, more or less uniformly wide in the proximal 2/3, then, tapering with hooked apex; 2 light tooth-shaped, median spines between broad basal and narrow apical part; setae situated near spines in distal part and laterally on curved apex.



FIGURES 729–731. *Athripsodes annulicornis* Steph.:

729—larval case, dorsal (A), ventral (B), and lateral (C). Pupa: 730—mouth parts: labrum (A), right mandible, ventral (B); 731—anal rods.

Sheath of male genitalia lobe-shaped, narrow apically.

Case 8—10 mm long, its anterior dorsal end projecting so that the anterior opening is directed ventrally, anterior membrane with a narrow, slitlike, slightly curved hole near anterior margin; posterior membrane with round or slightly widened hole at dorsal wall, membrane convex basally, cup-shaped, the hole directed upward; anterior membranous end of case directed to substrate, attached by several ligaments; posterior end slightly raised (about 1 mm), attached by a disk on a stalk.

Mode of life and habitats. Usually running water; large rivers (Volga, Oka, Kama, Dnepr, Yenisei, Angara, and Amur); also oligotrophic and mesotrophic lakes (Onega, Ladoga, Segozero, Valdai Hill); large lakes in 455 Latvia (Dridza, Sivers), and others; usually in open lake littoral with moderate surf; on stones, on solid bottom of sand with stones or stones with detritus, snags, solid bottom in areas with open vegetation; in rivers with slow current on stony or sandy-stony bottom.

Distribution. The European USSR, Siberia, the Amur region, and Chukchee National District. In addition, Europe, Japan, North America.

## 6. *Athripsodes fulvus* Rambur

Struck, 1899:341—342. Figure 28; 1900:26, Figure 39. — Siltala, 1905:48—53, Figure 11; 1907:463—465, 468—469. — Ulmer, 1909:247, 309, Figure 454 a. — Lestage, 1921:606—616, Figures 203—205. — Lepneva, 1940:210.

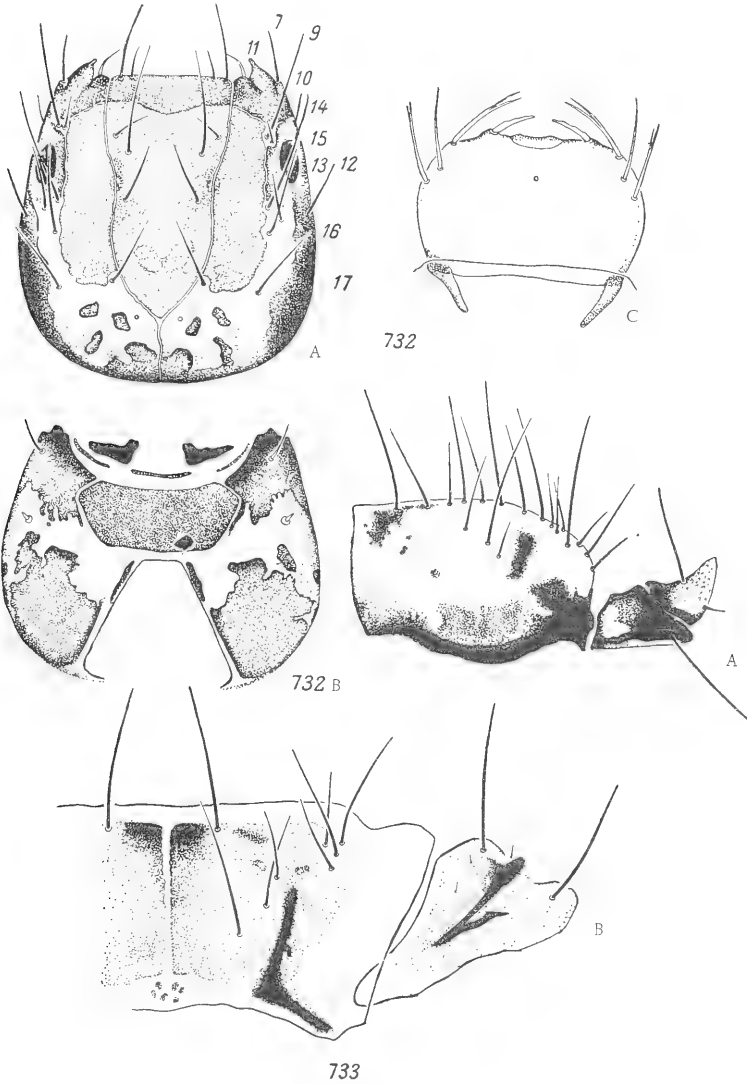
**Full-grown larva.** Length 9—11 mm. Head (Figure 732, A) wide, curved laterally; gula cup-shaped, wider than in *A. annulicornis*. Frontoclypeus uniformly reddish brown, sometimes with 4 light dots anteriorly; band in posterior part formed by 4 small, narrow, transverse, dark brown dots, poorly visible on the dark background. Sides of frontoclypeus with similar, distinct, dark brown dots near frontal sutures; white adfrontal stripes replaced by a wide, white space dividing dark median area from lateral area, which extends from light yellowish periorcular area to occipital foramen; dark dots on white background lateral to coronal suture and fork of frontal sutures. Ventral surface (Figure 732, B) white in the middle, brown anteriorly lateral to gula, reddish brown, with large, dark dots near occipital foramen. Gula dark brown. Setae strong, black or dark brown; chaetotaxy as in species of the *excisus* group.

Labrum (Figure 732, C) brownish; setae 1 and 2 sometimes branched, spine-shaped, curved to the margin; seta 5 longer than others. Mandibles short, with small, blunt teeth; both mandibles with 2 teeth on each blade, one ventral tooth sometimes indistinct. Submentum pale yellowish, in form of a thin, indistinct, slightly tuberculate plate with concave anterior margin; large, yellowish brown setae on anterior-angle processes. Stipes yellowish, setae as on submentum, situated laterally and at distal margin.

Pronotum (Figure 733, A) whitish, with narrow, reddish brown, anterior median margin; posterior submarginal area with reddish brown areas with indistinct dots laterally. Mesonotum (Figure 733, B) thin, light, distinct, with a brownish stripe along median suture, dark brown spots at anterior margin, and 2—3 dots posteriorly; black, bracketlike, posterior-angle streaks narrow, long; anterior-margin setae situated lateral to stripe, black, moderately long; medioanal setae similar; 2 short, dark setae anteriorly

on median side of anterior part of bracketlike streaks; 4–5 black anterior-angle setae situated on membrane near sclerite, 2 of them longer and thicker than others. Setae of metanotum black; medioanal seta moderately long; anterior-margin seta small; anterior-angle group consisting of a long black seta and 2 small setae.

(456)

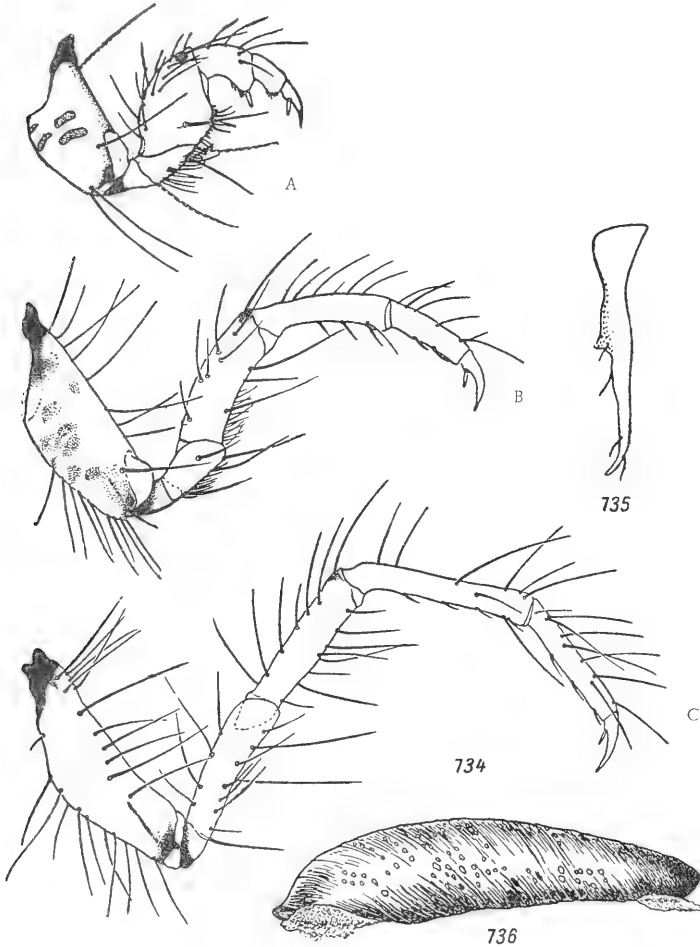


FIGURES 732 and 733. *Athripsodes fulvus* Ramb.:

732—head, dorsal (A) and ventral (B), labrum (C); 733—pronotum and propleuron (A), mesonotum and mesopleuron (B).

Propleurites (Figure 733, A) dark brown; pleural suture and margin of episternum and trochantin black; seta of trochantin black, moderately long. Pleurites of mesothorax (Figure 733, B) and metathorax light brown, with black, pleural suture and black, distal margin of episternum; seta of episternum situated at end of margin; seta of epimeron situated subapically at margin; both setae black, large.

(457)



FIGURES 734-736. *Athripsodes fulvus* Ramb.:

734—right legs: foreleg (A), midleg (B), and hind leg (C), posterior. Pupa:  
735—anal rod; 736—case, lateral. (735—after Siltala).

Legs brownish (Figure 734); all coxae laterally with 3 large, reddishbrown dots. Legs as in the excisus group in length ratio, form of segments, and chaetotaxy; ventral surface of fore femur especially short (Figure 734, A), much shorter than ventral surface of trochanter; mid-tibia with 3 light, ventral spines, mid-tarsus with one such spine (instead of 5-6 and 2-3, as

in *A. excisus*); hind tibia with 6 spines, hind tarsus with 2 spines (7 and 3 in *A. excisus*).

Dorsal process of abdominal segment 1 wide, with small, dark, median setae; sclerite of lateral processes wide, black, almost straight basally, slightly curved apically; terminal seta black, strong, moderately long. Gills on segments 1–8, with 16–18 filaments.

456 Tergite of segment 9 absent; 4 lateral setae near posterior margin, including a long, black, medioanal seta, a similar anterior-angle seta, and an intermediate and a lateral seta between them, both small, thin.

(458) Number and arrangement of gills in *A. fulvus* (after Siltala)

Segment	Dorsal	Pleural	Ventral
1	1		1 1
2	9	1	8
3	3 2		4 5
4	3 2		1 4
5	3 2		1 3
6	2 2		1 3
7	2 2		1 2
8	2 1		1

Sclerite "b" of anal legs with wide, dark brown, dorsal stripe, whitish yellow laterally, with short, wide, dark brown margin at base of claw; ventral side reddish yellow; 4 black setae dorsally near median stripe, 2 thick and long, the other 2 strong, thin, moderately long; a similar thin, black seta situated at base of lateral streak. Sclerite "c" reddish yellow, with a small, thin, curved seta. Claw small, reddish brown, with a dorsal denticle.

457 Case made of secretion, 14 mm long, conical, compressed dorsoventrally, wide anteriorly, with a dorsal hood, narrow posteriorly, with a membrane with a wide, round hole; fine sand grains sometimes present.

**Pupa.** Length 9–10 mm. Antennae of male pupae coiled about 3 times around posterior end of body. Labrum without pointed median process; seta situated in anterior part. Mandibles with almost straight, serrated area, slightly curved distally.

Wing sheaths reaching segments 7–8; midlegs natatorial.

Posterior margin of abdominal segment 1 with brown, long, lateral, spinose processes, as in *A. excisus*. Holding apparatus on segments 3–7; number of hooks: III:3–5; IV:2–5; V:4–5 + 12–18; VI:4–5; VII:3–5. Gills on segments 2–8.

Tubercles of segment 9 with 3–4 setae. Anal rods (Figure 735) thinner than in *A. annulicornis*, wide basally, tapering distally, curved apically; a large, finely tuberculate area and a light, median process between basal and 458 apical part; setae situated subapically on curved apex of rod. Sheath of male genitalia lobe-shaped, with concave median side; penis sheath short.

Pupal case (Figure 736) 12–14 mm long, its large anterior opening directed downward, closed by a membrane, and attached by ligaments on all sides, except for a small anterior area, with curved, transverse slit near margin; posterior end attached by a disk, posterior membrane exposed, with transverse dorsal slit.

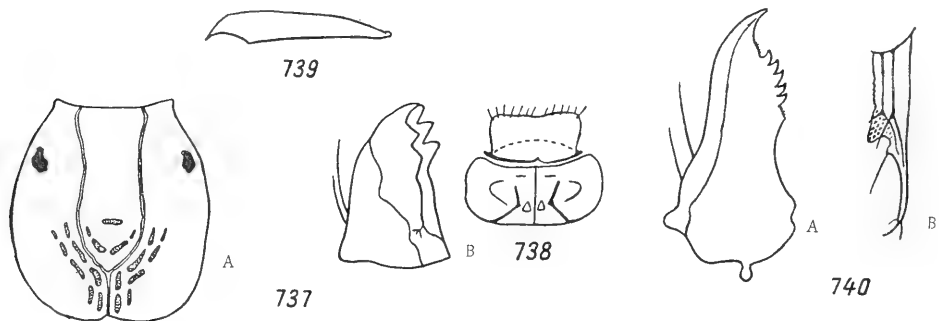
Mode of life and habitats. Open littoral of lakes, in calm water to slight surf, on solid bottom, on stones, snags, or plants, often in mucous masses of diatoms or in sponges; also in slow rivers under similar conditions.

Distribution. Northwestern, western, and central parts of the European USSR; Eastern Siberia. In addition, Northern and Central Europe.

### 7. *Athripsodes alboguttatus* Hagen

Krawany, 1937:1–6, Figures 1, 2, 4, 9, 11, 14.

**Full-grown larva.** Length 11 mm. Head (Figure 737, A) light, with oblong, dark dots in angle of frontoclypeus and lateral to epicranial suture.\* Gula wide, dark. Mandibles with 2 teeth on dorsal and ventral blade (Figure 737, B).



FIGURES 737–740. *Athripsodes alboguttatus* Hag. (after Krawany):

737—head, dorsal (A), left mandible, dorsal (B); 738—pronotum and mesonotum (schematic); 739—larval case (schematic); 740—pupa: left mandible, ventral (A), left anal rod (B).

Pronotum whitish, without dark transverse stripe at anterior margin; anterior margin light brown; posterior margin black. Mesonotum light, with large, bracket-shaped, black streaks laterally, the indistinct brownish stripe along median suture slightly darker anteriorly and posteriorly (Figure 738).

459 Gills on segments 2–8. Claw small, strong.

\* The drawing of Krawany given here is too schematic.

Larval case made of secretion, anterior dorsal end projecting so that wide anterior opening is directed downward; posterior opening round, directed upward (Figure 739).

**Pupa.** Labrum with rugose anterior margin and a slight median projection; 2 of the 6 setae situated posteriorly and larger than remaining small to moderately long setae; the median of the 3 small setae of anteclypeus larger than others. Mandibles (Figure 740, A) with dentate median margin in distal part, 5 teeth larger than others. Gills on segments 2—7. Anal rod as in Figure 740, B.

Case as in larva, attached at both ends.

Mode of life and habitats. Running water, usually among sponges.

Distribution. Northern and western parts of the European USSR. In addition, Europe.

### 8. *Athripsodes senilis* Burmeister

Klapálek, 1888:37—39, Figure 13. — Ulmer, 1903:100. — Thienemann, 1905b:534, 536, 552, Figures 14—16, 76—77, 104. — Siltala, 1905:53—57, Figure 12; 1907:463—465, 469—471. — Ulmer, 1909:247, 307, Figure 448b. — Lestage, 1921:601—617, Figures 203, 205—207. — Lepneva, 1940:210.

**Full-grown larva.** Length 8.5—10.0 mm. Head (Figure 741, A) white, pale yellowish in some places, without pattern; antennae smaller than in other species. Frontoclypeus with brownish anterior margin; adfrontal stripes indistinct, on light background. Gula wide, pinkish brown, broadly barrel-shaped, with slightly concave anterior margin. Setae light brown or yellowish (Figure 741, B); seta 17 short, directed inward.

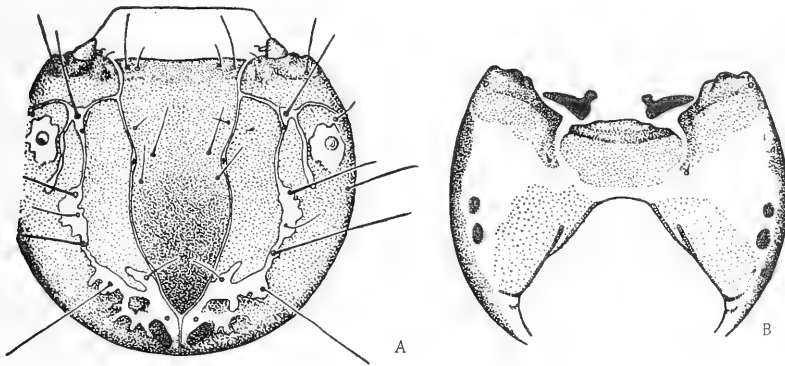


FIGURE 741. *Athripsodes senilis* Burm. Head, dorsal (A) and ventral (B)

Labrum brownish, with distinct median depression; setae 3 and 5 situated near the margin, 3 larger than 5. Mandibles short, dark brown, with a narrow, beaklike, apical tooth, and a deep, median indentation; dorsal blade projecting, with a small tooth near apical tooth; ventral blade with 2 blunt teeth; lateral setae light, of equal length.

Pronotum (Figure 742, A) light in its greater part, without dots, with a broad, dark stripe anteriorly, anterior part of stripe shining black, posterior part reddish brown, indistinct; posterior margin narrow, black, reddish brown in some places, with distinct, white or yellowish specks.

(460)

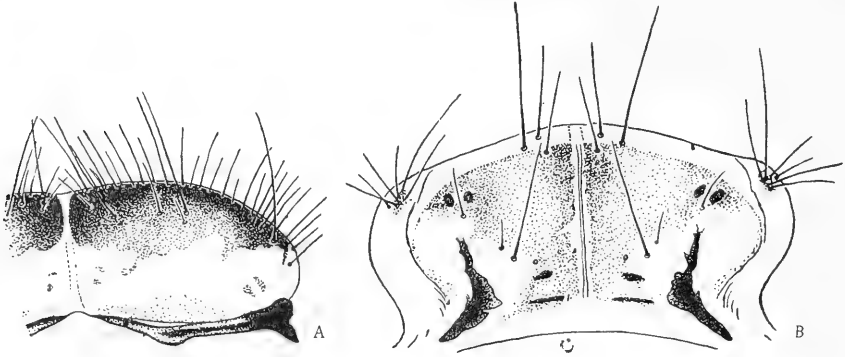


FIGURE 742. *Athripsodes senilis* Burm. Pronotum (A) and mesonotum (B)

Mesonotum (Figure 742, B) mainly light; posterior-angle streaks black, their anterior part smaller than posterior; a pale, pinkish brown stripe along median suture, darker anteriorly and posteriorly; 2 indistinct dots anteriorly before streaks, one dot laterally. Setae black or blackish brown; anterior-angle seta and medioanal seta long; intermediate seta short, thin; lateral seta small, situated before streaks; anterior-angle group consisting  
460 of 5 setae, primary seta black, longer and thicker than others. Anterior-margin seta and medioanal seta of metanotum moderately long, dark; primary anterior-angle seta long, black, accompanied by 2 small, light, secondary setae.

Propleuron yellowish white; pleural suture and margin of episternum and trochantin black; seta of trochantin situated in middle of anterior part; seta of epimeron situated distally near suture, both setae moderately long, black. Pleurites of meso- and metathorax light yellow; pleural suture and margin of episternum black; setae strong, dark, moderately long.

Legs yellow, without dots. Ventral surface of fore femur very short, convex. Hind tibia ventrally with 11 light spinules, tarsus with 8.

Dorsal process of abdominal segment 1 wide and large; anterior-margin and medioanal setae small, thin; lateral process with an almost straight, rodlike, black sclerite with narrow distal part; apical seta short, strong, black; subapical seta small, light; spinose area yellowish.

Gills on segments 1-8.

Abdominal segment 9 without tergite, with 4 setae situated on a light, membranous surface laterally at posterior margin: a long, dark, brown, medioanal seta, a similar, anterior-angle seta, a small, intermediate seta, and a short, thin, lateral seta, the latter 2 setae light.

Sclerite "b" of anal legs mainly whitish, with a longitudinal, wide, long, reddish brown stripe dorsally; a small, dark brown, marginal area with a thin, short, strong, black lateral seta at base of claw; distodorsal setae



black, situated at end of stripe, 3 of them long and thick, middle seta larger than others, 4th seta thin, strong, situated medially. Claw pinkish brown, with 2 dorsal denticles.

Number and arrangement of gills of *A. senilis* (after Siltala)

Segment	Dorsal	Pleural	Ventral
1	1		1 1-2
2	10	1	8
3	6		7
4	2 2		1 2
5	2 2		1 2
6	2 2		1 2
7	1 1		1 2
8	1		1

Case made of secretion, as in *A. fulvus*; posterior membrane with wide, curved slit dorsally.

461 **Pupa.** Length 8-10 mm. Antennae of male pupae coiled 4.5 times around posterior end of body. Labrum rounded anteriorly and laterally, without anterior median process; setae thin, reddish brown. Mandibles dorsally with whitish basal part; apical part dark brown, blade straight, coarsely serrated, with slightly curved, pointed end; lateral setae light, of equal length.

Wing sheaths of male pupae reaching end of segment 8. Mid-tarsi natatorial, with dense, golden brown setae.

Dorsal, posterior-angle processes of abdominal segment 1 narrow, reddish brown. Holding apparatus on segments 3-7 (Figure 743, A, B); number of spinules: III:3; IV:3; V:2-3+13(22); VI:4; VII:3. Gills on segments 2-8.

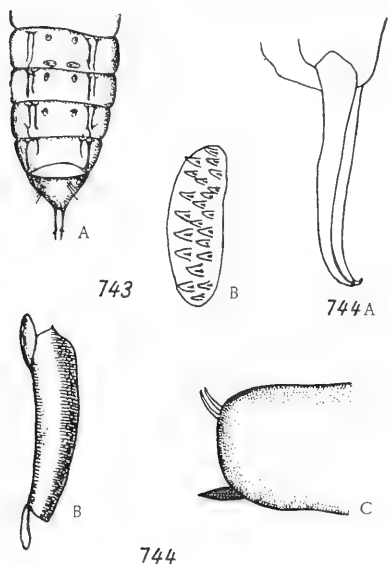
Dorsal processes of abdominal segment 9 with 4 black setae, 3 of them thick, of different length, 4th seta short, thin, situated behind others. Anal rods (Figure 744, A) narrow; anterior part uniformly wide; posterior part much longer, tapering, curved upward, with hooked ends; 2 small, light, median processes situated one behind the other between wide and narrow part on left rod, a larger process on right rod; one seta situated between wide and narrow part, one in middle of posterior part, 2 small setae subapically. Sheath of genitalia lobe-shaped, curved inward, penis sheath short.

Case attached at both ends by disks; anterior disk wide, flat, free part of the membrane with a wide, elliptical or semicircular opening directed anteriorly or obliquely downward (Figure 744, B, C). Posterior end narrower attached by a stalked disk which raises case slightly above substrate;

posterior membrane with a cuplike swelling in middle of dorsal margin; the small, elliptical or almost circular, posterior opening, therefore, directed upward; thin anal rods of pupa often project from opening in fixed material.

Mode of life and habitats. Vegetation of lakes and slow rivers; open part of lakes with moderate surf, among vegetation on solid bottom; large pure ponds; inside sponges more frequently than *A. alboguttatus*.

Distribution. The European USSR, Western Siberia, Middle Asia (Fergan Valley). In addition, Europe.



FIGURES 743 and 744. *Athripsodes senilis* Burm. Pupa:

743—abdominal segment 5 and following segments, dorsal (A), postsegmental plate of abdominal segment 5 (B); 744—anal rods, lateral (A), case and disks, lateral (B), posterior end of case, diagram (C) (743, 744, C—after Thienemann; 744, A, B—after Klapálek).

462 large teeth, ventral blade with 2 less prominent teeth, median depression with a small brush consisting of several small chaetoids pointing in different directions.

Pronotum light brown, as head; posterior margin black, wider laterally. Mesonotum with large, black, bracketlike streaks at posterior angle, as in *Athripsodes annulicornis*.

Gills present.

Case (Figure 746) conical, slightly curved, compressed dorsoventrally, with slightly flattened ventral side.

Case fairly smooth, made of large and small sand grains, several larger grains projecting laterally; anterior opening wide, almost ventral.

Mode of life and habitats. Springs, on solid bottom.

Distribution. Central zone of the European USSR, rare. In addition, Europe.

## 2. Genus *Homilia* McLachlan

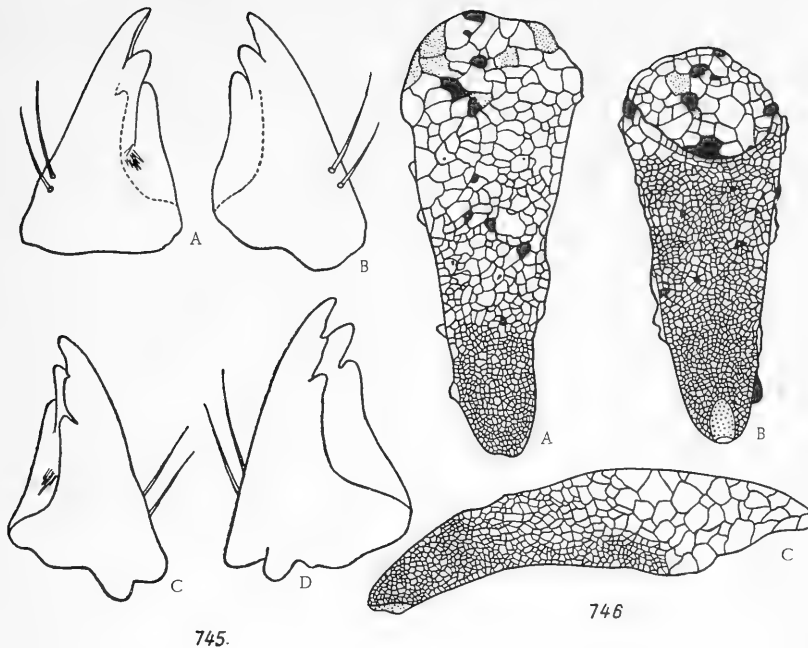
The larva of one species is described briefly.

Distribution. The European USSR, its central belt, and the Caucasus. In addition, Europe.

### 1. *Homilia leucophaea* Rambur

Botoșăneanu, 1955:793—795, Figures 3, 4.

**Larva of an older stage.** Head light brown, without pattern. Mandibles (Figure 745) short, with blunt distal tooth; dorsal blade of both mandibles with 2



FIGURES 745 and 746. *Homilia leucophaea* Ramb. (after Botoșăneanu):

745—left (A) and right (B) mandibles, dorsal; left (C) and right (D) mandibles, ventral;

746—case, dorsal (A), ventral (B) and lateral (C).

### 3. Genus *Mystacides* Berthold

**Full-grown larva.** Length 8–12 mm. Body narrow, cylindrical. Head slightly oblong, without white adfrontal stripe; lateral stripe present; sensilla of antenna very long (longer than in *Athripsodes*), slightly curved, with a short seta; gula square; pattern consisting of dark stripes and spots. Labrum wide, short. Mandibles with small, blunt teeth. Submentum absent; maxillary palps short, middle segment not longer than first.

Metathorax not wider, or only slightly wider, than mesothorax, without large, lateral processes characteristic for *Athripsodes*. Pronotum and mesonotum sclerotized, with distinct pattern. Hind tibia and tarsus divided, very long.

Abdominal segment 1 short; dorsal process high, with thin, conical apex; lateral processes low but less so than in *Athripsodes*; sclerite short, not extending into flat disk. Gills with a single filament or absent. Tergite of  
463 segment 9 distinct, dark. Claw with 2 large, dorsal denticles.

Case straight, slightly narrower posteriorly, made of sand grains or sand and detritus.

**Pupa.** Length 7.5–11.0 mm. Antennae coiled 2–4 times around body. Labrum with characteristic strong, short setae on tubercles. Mandibles with wide base; apical part narrow, with almost straight, serrated blade.

Wing sheaths reaching segments 6—7. Fore tarsi with sparse setae, mid-tarsi with dense natatorial setae.

Notum of 1st abdominal segment with small, sclerotized processes with denticles at posterior angles. Holding apparatus on segments 2—6, postsegmental plates on segment 5. Gills with a single filament or absent. Lateral line thin, with fine, grayish setae on segments 3—8. Lateral processes of segment 9 with 4 short, dark setae. Anal rods long, thin, apical part much larger than basal part, with curved or hooked apex.

Case attached at both ends by large disks; membrane with wide, round hole.

Mode of life and habitats. Stagnant, or slowly running water, among vegetation; some species occur on a bottom of sand and detritus or silt and detritus in littoral or sublittoral of large lakes.

Distribution. The European USSR, Western and Eastern Siberia, Maritime Territory, the Amur Region. In addition, Europe, Asia, North America.

### Key to Species

#### Full-grown larva

- 1 (6). Head pattern consisting of dots; dark stripes short, sometimes indistinct or absent; gills absent.
- 2 (5). Head with bright pattern of large dots; dorsal stripes narrow anteriorly, dark and distinct or less distinct; groups of dots lateral to gula.
- 3 (4). Frontoclypeus with 3 pairs of dots anteriorly, dots of posterior pair small, indistinct, pale; dots of anterior pair large, closer together, sometimes completely covered by a dark transverse stripe; dorsal stripes distinct in dark specimens, dark anteriorly, pale in middle and posteriorly; mesonotum uniformly slightly dark in middle; Europe . . . . . 1. *M. azurea* L. (p.581)
- 4 (3). All 3 pairs of dots in anterior part of frontoclypeus large, distinct, bright; a 4th, darker pair near curvature of frontal sutures; frontoclypeus without dark, anterior, transverse stripe; dorsal stripes indistinctly dark only anteriorly, in form of dots posteriorly; mesonotum with a short, reddish brown stripe in anterior part, and reaching a short, similar stripe at anterior margin; East Siberia . . . . . 2. *Mystacides* sp. (p.587)
- 5 (2). Head pattern with dots only, without dark areas; dots small but distinct, pinkish brown; Siberia . . . . . 3. *M. dentata* Mart. (p.588)
- 6 (1). Head with characteristic, H-shaped black pattern formed by dorsal stripes and band in posterior part of frontoclypeus; first pair of dots in anterior part of frontoclypeus, large or covered by a wide, black, transverse stripe; dots of 3rd pair indistinct, small, or absent; gills present.
- 7 (10). Stripes of H-shaped pattern, at coronal suture, and lateral stripes wide, occupying most of dorsal surface.
- 8 (9). Black transverse stripe not always present near anterior margin; ventral side with groups of dots; gills on segments 2—7. . . . . 4. *M. longicornis* L. (p.590)

- 9 (8). Black transverse stripe of frontoclypeus wide, shining black, constant, and partly covering 2nd pair of dots; ventral side with short, dark stripes laterally; gills on segments 2-5 . . . . . 5. *M. nigra* L. (p. 595)
- 10 (7). Dorsal and lateral stripes narrow, ground color predominant; Siberia . . . . . 6. *M. sibirica* Mart. (p. 598)

464 Pupa

- 1 (4). Gills present.
- 2 (3). Anal rod with hooked end . . . . . 4. *M. longicornis* L. (p. 590)
- 3 (2). Anal rod with slightly curved end . . . . . 5. *M. nigra* L. (p. 595)
- 4 (1). Gills absent; apex of anal rod pointed, distinctly curved . . . . . 1. *M. azurea* L. (p. 581)

1. *Mystacides azurea* Linné

Pictet, 1834: Plate XII, Figure 5. — Hagen, 1864:232. — Ulmer, 1902c:489, Figures 13-15. — Struck, 1903:Plate III, Figure 9. — Ulmer, 1903:105, Figure 65. — Siltala, 1905:69-70, 88-91, Figure 17. — Ulmer, 1909:249, 311, Figures 376 a, b. — Lestage, 1921:617-623, Figure 208 a, h, i. — Lepneva, 1940:211, Figure 2. — Macdonald, 1950:20-22, Figures 1-4.

**Full-grown larva.** Length 9.0-10.5 mm. Main color of sclerites yellow; pattern of dots distinct; stripes and spots not always distinct. Head oblong (Figure 747, A); sensilla of antenna light, almost transparent. Frontoclypeus with 3 pairs of dots near anterior margin, dots of middle pair more widely separated than others; in posterior part, median dots of row distinct, lateral dots indistinct. Dorsal stripes dark anteriorly, sometimes black, brownish posteriorly, with 3 large dots along posterior part of frontal sutures; light specimens lack stripes, only dots present; dark dots situated lateral to coronal suture, on site of lateral stripes and laterally on ventral side near occipital foramen. Gula brown (Figure 747, B). Setae thin, yellowish or light brown. The intermediate and lateral of anterior-margin setae small; anterior frontal seta like lateral seta; intermediate and posterior frontal seta moderately long, situated close together. Seta 7 short, situated near antenna; seta 9 long; seta 11 small, situated behind 9, both anterior and medial to eye; seta 10 short, situated lateral to eye; seta 14 situated in posterior part, the largest and thickest seta of the head; seta 12 smaller; setae 15 and 16 still shorter, seta 13 short, all 3 lighter and thinner than 12 and 14; seta 17 large, thin, situated near fork of epicranial sutures.

Labrum (Figure 747, C) with brown dorsal sclerite; median depression distinct; setae 1 and 2 in form of large transparent spines curved inward; median seta 4 small, straight, situated near median depression; seta 3 situated at anterior angle, straight, short, strong; setae 5 and 6 similar, situated anteriorly.

Mandibles (Figure 747, D) short, reddish brown; dorsal blade of left mandible with 2 teeth in addition to distal tooth; ventral blade with 3 teeth; right mandible with 2 teeth on each blade; lateral setae thin, light; ventral seta slightly shorter and more basal than dorsal.

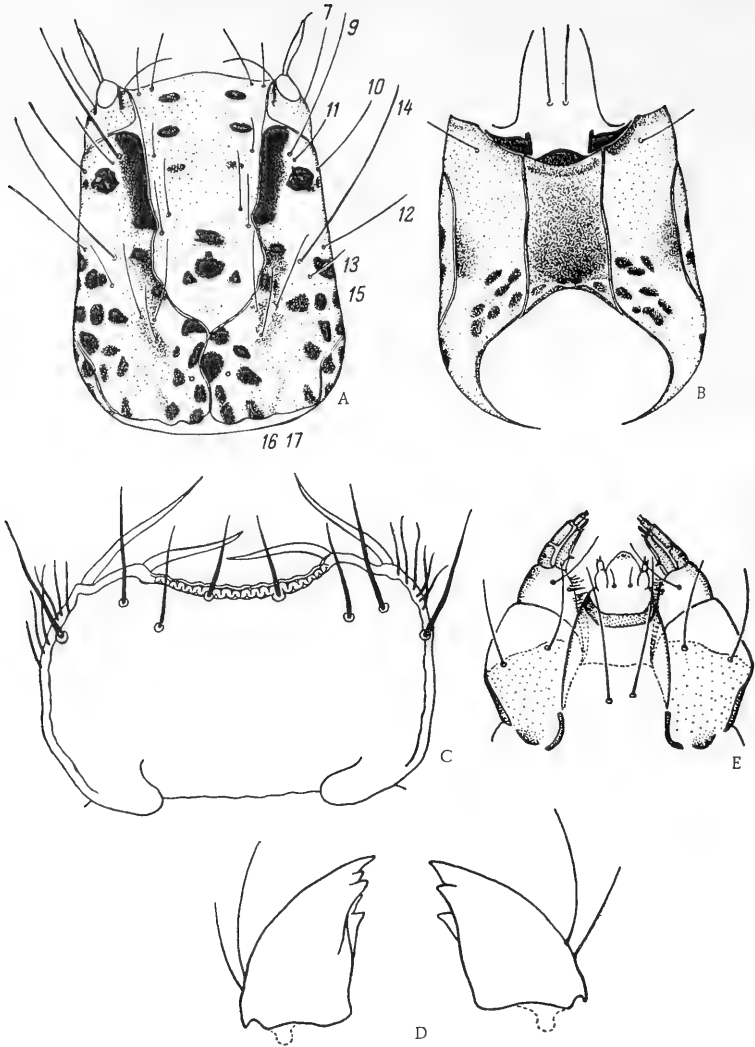


FIGURE 747. *Mystacides azurea* L.: Head, dorsal (A), ventral (B), labrum (C), mandibles, dorsal (D), maxillolabium (E)

Setae of submentum brownish, long, strong (Figure 747, B). Stipes yellowish, both setae at anterior margin short, of almost equal length. Apical seta of palpifer relatively large, basal median seta light; maxillary palps short, terminal segment shorter than 2 preceding segments; maxillary lobe nearly cylindrical, shorter than palp. Mentum in form of wide semicircle; labial lobe conical, labial palps well developed, with large sensilla (Figure 747, E).

Pronotum (Figure 748, A) light, with indistinct median suture at anterior margin; posterior margin wide, dark laterally, light, narrow, without suture

in middle; dots large; setae thin, yellowish or light brown, 2 long setae near anterior margin, a similar long, primary seta and a shorter, secondary seta at anterior angle, 3 long setae situated on surface in middle, intermediate, and lateral parts in each half; 2 small dark setae situated between first 2 setae.

(466)

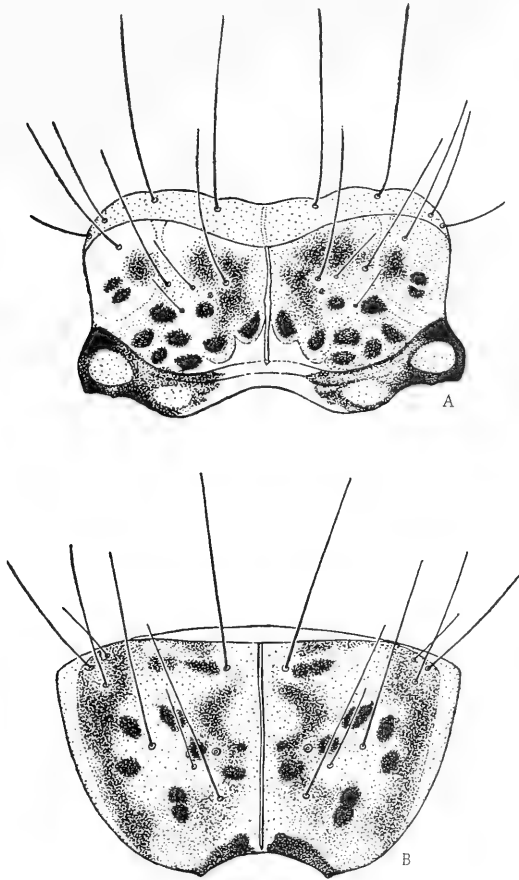


FIGURE 748. *Mystacides azurea* L. Pronotum (A) and mesonotum (B)

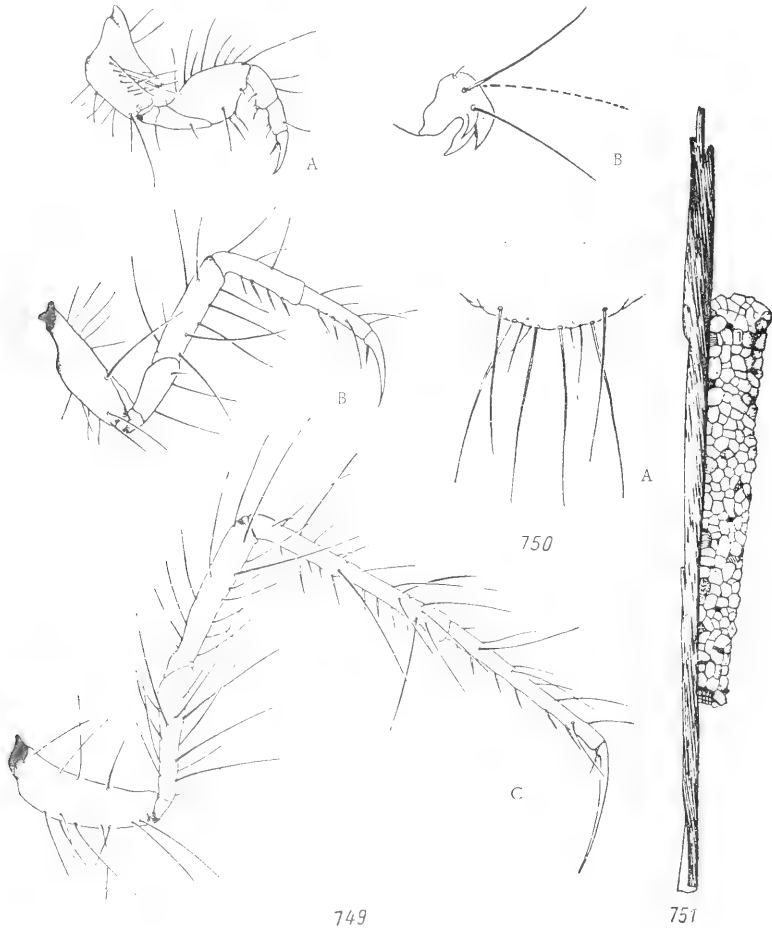
Mesonotum (Figure 748, B) with light lateral margin; posterior margin light at suture; surface whitish yellow in middle of each half, light brownish in middle and laterally; dots large; large setae as on pronotum but without 2nd anterior-margin seta; medioanal seta situated close to posterior margin.

Pleuron of prothorax with narrow, interrupted, pleural suture; margin of episternum wide, reddish brown like suture; epimeron yellowish, with a thin seta at anterior margin near suture; trochantin narrow, lobe-shaped, with deeply concave, anterior margin; seta brown, thin, relatively long, subapical.

465 Pleurites of meso- and metathorax brown; margin of episternum narrow, reddish brown like pleural suture; seta situated near margin; seta of epimeron, subapical.

Legs yellowish brown, with dark spots at articulation of femur and coxae; most setae thin, delicate, light brown or light, rarely short, strong, brown (Figure 749).

(467)



FIGURES 740-751. *Mystacides azurea* L.:

749—right foreleg (A), midleg (B), and hind leg (C) posterior; 750—tergite of abdominal segment 9 (A), claw of anal leg, lateral (B); 751—larval case.

Fore coxa slightly oblong; basodorsal seta and anterior dorsal seta situated close together, a rare condition; posterior apical dorsal seta long; 3 moderately long, and several, small, secondary setae situated further basally at margin; anterior setae short, strong, situated among similar secondary setae; anterior distoventral seta shorter than posterior; secondary ventral setae situated along whole coxa.



Anterior and posterior setae of trochanter small, strong; anterior side ventrally with a large basal seta; apical seta and subapical setae in form of short, light spines; both posterior setae situated close together in distal part, dark, long; thin, whitish chaetoids ventrally along trochanter.

Femur with markedly convex dorsal and ventral sides; dorsal and subdorsal areas with moderately long and short secondary setae, both primary setae situated among secondary setae; anterior seta situated subapically, short, strong; a row of short, thick, secondary setae further basally; posterior ventral seta situated subventrally in middle of femur; primary ventral setae in form of short, light spines; a number of short, secondary seta, and a row of light, hairlike chaetoids at margin.

Tibia much smaller than femur, curved, with small spinules ventrally; all setae primary, as on tarsus: dorsal setae situated basally and apically, basodorsal seta thick, slightly longer than apical dorsal; anterior and posterior seta situated subapically, thin, the latter larger; a small light spine ventrally, a large, brown, subventral spine more basally.

Tarsus much smaller than tibia, with small, ventral spinules; setae situated near distal margin, a small, anterior seta and a short, dark, posterior seta subdorsally, a posterior seta subventrally; a small, light spine anteriorly.

Claw large, slightly curved, with strong, basal spine.

Mid-coxa slightly oblong; basodorsal seta moderately long, strong; both apical dorsal setae, anterior and posterior, equally long; short and long secondary setae situated dorsally and ventrally at margin; primary anterior setae short, strong; several, small, secondary setae situated more basally; posterior distoventral seta long, anterior distoventral seta slightly longer.

Mid-trochanter similar in form to hind trochanter; anterior seta small, strong; posterior seta short, thin; distal and intermediate ventral setae represented by short, light spines; basoventral seta and both posterior setae long, strong, the latter widely separated; ventral chaetoids hairlike, light, sparse.

Femur rodlike, slightly shorter than coxa, dorsally with sparse, thin, short to long secondary setae and both primary setae; anterior primary seta short, strong, subapical: a row of small, light chaetae more basally; posterior primary seta long, situated subventrally in basal part; ventral side with 2 long, thin, primary setae and 3-4 secondary setae.

Tibia shorter than femur, rodlike, curved basally, with 6-7 thin, moderately long setae dorsally and subdorsally; anterior side with 2 short, spine-shaped setae, and 2 small, more basal setae; ventral side with a row of 4-6 large and small, light spines.

Tarsus straight, slightly shorter than tibia, with several, thin, sparse setae of different length at margin dorsally, with a moderately long, strong, posterior seta subdorsally; ventral side with several spinules.

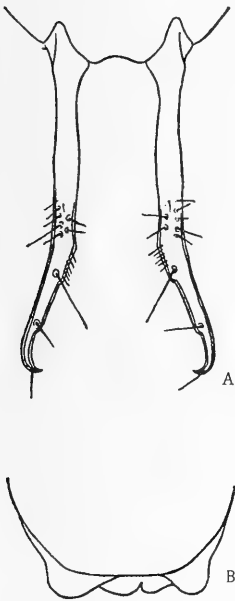


FIGURE 752. *Mystacides azurea* L. Pupa: anal rods (A), ventral appendages and penis sheath (B) (B - after Siltala).

467 Hind coxa oblong, only slightly higher basally than apically, in contrast to other segments; all other segments straight, rodlike as on midlegs, including trochanter. Basodorsal seta and anterior apical seta of hind coxa short, thin; posterior apical dorsal seta strong, straight; 4—5 smaller, secondary setae further basally; both anterior setae short, light brown; distoventral setae thin, moderately long; 8—9 similarly thin setae of different length further basally.

Trochanter narrow, straight, slightly longer than coxa, slightly wider at distal end; anterior and posterior setae short, thin; anterior basal of ventral setae thin, moderately long, apical small, light, subapical long, brown; both posterior ventral setae similar, situated more basally; dorsal side with 4—5 small secondary setae; ventral side with several thin setae of different length.

Femur slightly wider distally; anterior seta situated subventrally; posterior seta in middle, both long, brown, situated near distal margin; both 468 primary dorsal setae thinner, long; secondary dorsal setae thin, of different size, situated along whole femur; both primary ventral setae brownish, long, distal; secondary ventral setae (6—10) small, some of them thin, light, spine-shaped.

Tibia divided, longer and thinner than femur; 2 of 7 primary setae, long, thin, situated dorsally in distal part, a large, slightly thicker seta situated subdorsally posteriorly; 2 distoventral setae, anterior and posterior, the latter larger and a long, brown, ventral seta in basal part; 15—16 thin, secondary, dorsal setae, including several long setae; secondary ventral setae in form of light strong spines (Figure 749, C) situated in basal and apical part.

Tarsus divided, narrower and slightly shorter than tibia; primary setae moderately long; basal and apical part with a dorsal and a posterior subdorsal seta; secondary dorsal setae light, thin, of different length; ventral setae in form of 10—11 light spines of different size.

Claw thin, slightly curved, with a small, blunt, light spine at base.

Abdominal segment 1 with a high dorsal process; medioanal setae situated basally on each side, short, thin; lateral processes low, with a yellowish, slightly sclerotized area covered with spines; sclerite reddish brown, in form of a slightly curved rod with thick end; setae situated among spinules some distance from apex.

Gills absent. Lateral line on segments 3—8; segment 8 with about 20 small, sclerotized dots with 2 minute spinules.

Tergite of segment 9 (Figure 750, A) light chestnut brown, semicircular, with straight, anterior margin; setae situated behind sclerite at margin of segment, 5 on each side; medioanal seta and lateral seta thick, long; anterior-margin seta and intermediate seta short, thin, situated between former 2 anterior-angle seta moderately long, dark, situated near lateral seta and slightly smaller than this.

Anal legs wide, short; sclerite "b" light, whitish, with 4 distodorsal setae, including 2 long dark setae; median seta short; lateral seta slightly larger; both thin.

Claw with a large, dorsal denticle and with a smaller denticle on each side. Setae as in Figure 750, B.

Case in form of a straight, narrow tube of loosely arranged sand grains or pieces of detritus, with a rod or conifer needle which is longer than the case (Figure 751).

**Pupa.** Length 7.5–10.0 mm. Antennae of male pupae coiled 2.5 times around body, antennae of female 2 times. Labrum small, with rugose anterior margin; setae short, strong. Intermediate of the 3 setae on anteclypeus light, closer to basal margin than in other species; 3 strong setae on each side near anterior margin; 2 larger setae situated close together some distance from margin more posteriorly on each side. Distal part of mandibles relatively wide, tapering, finely serrated, slightly curved.

Wing sheaths reaching segments 6–7; natatorial setae on mid-tarsus and on first 3 segments of fore tarsus. Posterior-angle processes of 1st abdominal segment distinct, narrow, with numerous spinules. Gills absent. Holding apparatus on segments 3–6, number of spinules: III:3–4; IV:3–4; V:3–5+8–17; VI:3–7. Dorsal processes of segment 9 with 3 short, brown setae situated close together, and a moderately long seta slightly posteriorly and laterally.

Anal rods (Figure 752, A) thin, basal part more than twice as long as apical part, curved dorsally beaklike at the end; small dorsal and median spinules between the two parts; setae small, light, 3 along rod near spinules, 4th seta situated near curved apex, very small. Penis sheath and ventral appendages as in Figure 752, B.

Case 9–14 mm long, attached at both ends by an anterior and a posterior disk as well as by thin ligaments all along; posterior membrane with broad elliptical central pore.

469 **Mode of life and habitats.** Lakes, on solid bottom of sand and detritus in open littoral and sublittoral; avoids strong surf; usually at a depth of 1–4 m; often in open vegetation on bottom; also on solid bottom in pools and at mouth of rapid rivers.

**Distribution.** Northern, western, and central parts of the European USSR. In addition, Europe.

## 2. *Mystacides* sp., larva nova \*

**Full-grown larva.** Length, 9.0–10.2 mm, resembling *M. azurea* L. in morphology and coloration. Head (Figure 753, A) oblong, flattened laterally in middle, as in *M. azurea*; main color shining brown; dots distinct, reddish brown. Frontoclypeus with 3 pairs of large dots anteriorly, a 4th pair near curvature of sutures on site of tentorial pits; dots of anterior pair larger than others, slightly closer together but not connected by a dark transverse stripe; the group in posterior part formed by 4 large dots, 3 of them in a row, the 4th anteriorly. Dorsal stripes pale anteriorly, indistinct, with 2 large dots at anterior margin and near curvature of suture; 4 large dots further along suture, the last at its fork; 2 rows of large dots lateral to coronal suture; rows of dots on site of lateral stripes; a group of 4 large dots ventrally, lateral to gula near occipital foramen. Gula brownish (Figure 753, B).

Pronotum brownish, lighter anteriorly; white stripe in anterior-angle area relatively wide, distinct, as in *M. azurea*; dots reddish brown, distinct; middle of sclerite, in contrast to *M. azurea*, with a narrow smoke brown stripe with small, indistinct dots; a large, dark dot at posterior margin of stripe near median suture; a group of 6 large dots in posterior

\* Described from specimens collected by V. Ch. Dorogostaiskii on 6 November 1908 in Lake Dal'noe, Transbaikalia.

part; anterior angle with 4 dots in pairs near white stripe; posterior margin with a narrow, black line laterally.

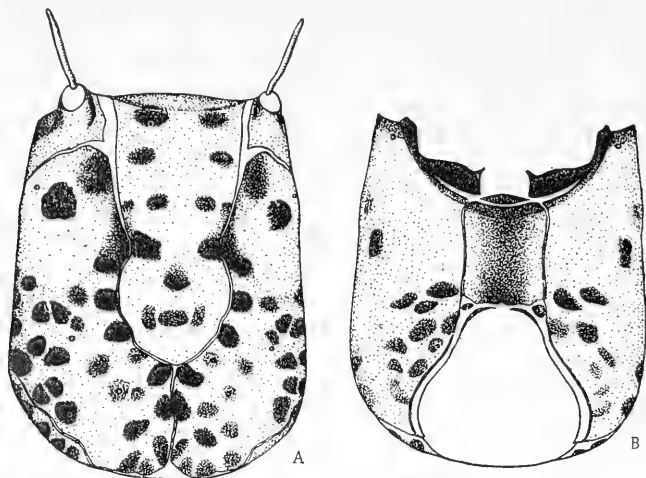


FIGURE 753. *Mystacides* sp., larva nova. Head, dorsal (A) and ventral (B)

Mesonotum mainly whitish yellow, with a smoke brown band at lateral and posterior margin; stripe at median suture indistinct posteriorly, grayish, brown, with small dots anteriorly, reaching small, dark, median part of anterior margin; an oblique row of 3 large dots on surface, as in *M. azurea*; 2 dots laterally and 3 less distinct dots in posterior part; anterior margin 470 brownish, with 2 dark dots in middle; posterior margin brownish, with 2 large, and several, small dots in middle. Chaetotaxy as in *M. azurea*; setae whitish yellow.

Meso- and metapleuron with a large, indistinct, brownish dot on episternum.

Articulation between coxa and trochanter, and between femur and tibia, slightly dark; large distal spots on tibiae and tarsi of hind legs brown, indistinct, slightly darker than ground color.

Gills absent. Darker part of segment 9, pinkish brown; anterior margin straight, as in *M. azurea*; setae the same. Sclerite "b" of anal legs pale with large, dark dots; the intermediate of the 5 distal setae thick, dark reddish brown; middle of sclerite rugose. Claw reddish brown, with 2 large, dorsal denticles laterally and 3 small denticles in middle.

Case straight, slightly tapering posteriorly, made of small, densely arranged sand grains and fragments of detritus.

Mode of life and habitats. Lakes.

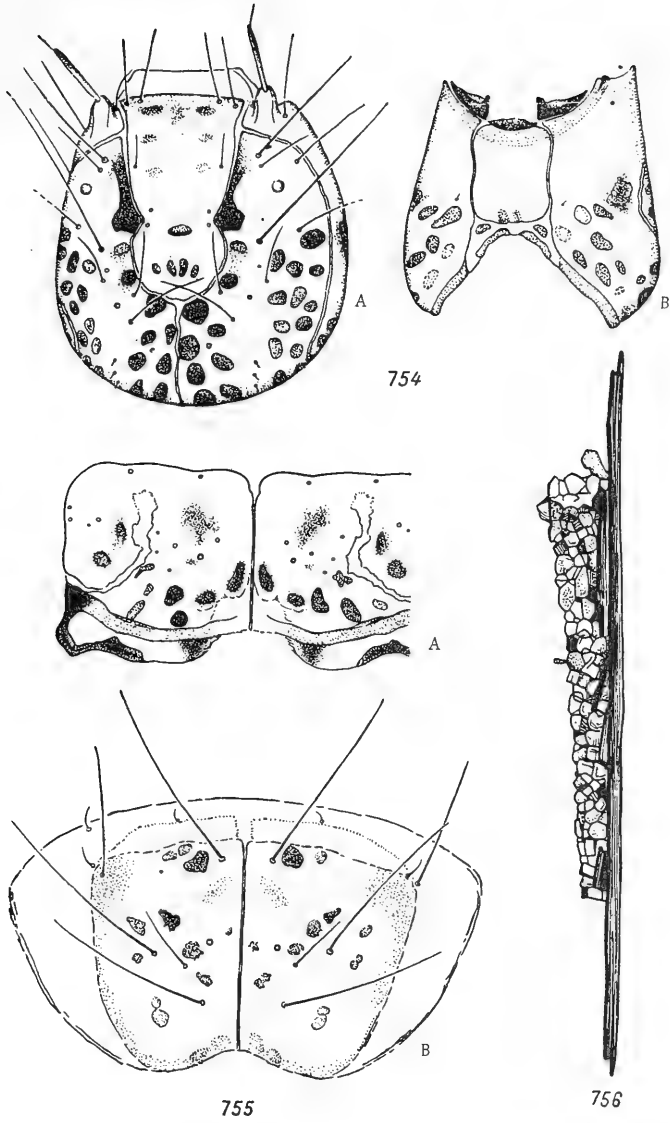
Distribution. USSR: Transbaikalia. Not recorded outside the USSR.

### 3. *Mystacides dentata* Martynov

Lepneva, 1949:168-169.

**Full-grown larva.** Length 8-9 mm. Main color of head (Figure 754, A) light yellow; dots distinct, pinkish brown; stripes and spots absent or

(471)



FIGURES 754-756. *Mystacides dentata* Mart.:

754-head, dorsal (A) and ventral (B); 755-pronotum (A) and mesonotum (B); 756-larval case.

indistinct, in contrast to *M. azurea*. Anterior pair of the 6 dots on frontoclypeus large, with a dark, transverse connection, even in dark specimens; 2nd pair smaller than 1st; pale 3rd pair indistinct; the group in posterior part formed by a row of 4 dots and 3 fused dots anterior to them; lateral dots smaller than median dots, sometimes absent. Dorsal stripes narrow, pinkish anteriorly, represented posteriorly by 3 large, distinct, brownish dots along frontal sutures; 2 rows of similar dots on each side on light background along coronal suture; lateral stripes replaced by 3 rows of distinct dots; ventral surface with 6 small dots on each side near occipital foramen. Gula brownish (Figure 754, B).

Pronotum and mesonotum whitish, lighter than head. Pronotum (Figure 755, A) with an indistinct, white stripe separating anterior angle; posterior margin, grayish, narrow laterally, reddish brown. Median and lateral stripes of mesonotum (Figure 755, B) indistinct, pale grayish. Dots and setae as in *M. azurea*. Legs as in *M. azurea*; distal spots of hind tibia and tarsus reddish brown, larger than in *M. azurea*.

Gills absent. Tergite of segment 9 with a pinkish brown area; setae situated at whitish margin, as in *M. azurea*. Anal legs as in *M. azurea*, area "b" with distinct, pinkish brown, dorsal dots.

Case straight, slightly tapering posteriorly, made of small, usually flat, pieces of detritus and sand grains, often with platelets of mica, with large pieces of detritus, small rods, or conifer needles projecting at both ends (Figure 756).

Lepneva (1949:169) assumed that larvae of *M. dentata* are indistinguishable from those of *M. azurea*. The differences in coloration just described permit easy differentiation.

Mode of life and habitats. The Siberian species is vicarious and isoecological with the European *M. azurea*. It occurs on silt-sand bottom in lower littoral and sublittoral of mountain lakes; at a depth of 10.0–20.0 m in Lake Teletskoe; at a depth of 4.0–11.0 m in Lake Nizhne Mul'tinskoe.

Distribution. USSR: Altai, Sayans. Not recorded outside the USSR.

#### 4. *Mystacides longicornis* Linné

Meyer, 1867:159. — Klapálek, 1886:42–45, Figure 15. — Struck, 1900:Figure 41; 1903:Plate III, Figure 7. — Ulmer, 1903:105, Figure L. — Thienemann, 1904b:261, Figure 18; 1905b:534–535, 552, Figures 75, 78. — Siltala, 1905:71–74, Figure 18. — Ulmer, 1909:279, 311, Figure 457b. — Lestage, 1921:618–623, Figures 208–211. — Lepneva, 1940:211, Figure 3. — Hickin, 1953:114–116, Figures 3–6. — Yamamoto and Wiggins, 1964:1108–1110, Figures 5, 11.

**Full-grown larva.** Length 8.5–11.3 mm. Body cylindrical; mesothorax, metathorax, and following abdominal segments almost equally wide. Main  
471 coloration light yellow; pattern distinct, formed by black and dark brown stripes and spots. Head (Figure 757, A) large; sensilla of antenna light, almost transparent. Frontoclypeus with 3 pairs of dark dots at anterior margin; first 2 pairs indistinct in dark specimens, situated on a dark, transverse stripe as in *M. nigra*, but 2nd pair of dots remains visible; dots of 3rd pair small, indistinct, situated between intermediate frontal setae; posterior part of sclerite with a wide, black band behind a deep median  
472 indentation and before a process. Dorsal stripes black, distinct, close to frontal sutures; wide dark stripes lateral to coronal suture. Lateral stripes

short, black, connected with dorsal stripes by a black, transverse stripe, their margin irregular, with projections forming separate dots. Ventral side with groups of dots at occipital foramen. Gula (Figure 757, B) brown, with a small reddish brown spot in the middle, with small posterior dots laterally. Setae yellowish or light brown, their form and arrangement as in *M. azurea*. In light specimens, the frontoclypeus lacks a transverse anterior stripe, and the dots are more or less distinct on the dark background of the stripes and spots.

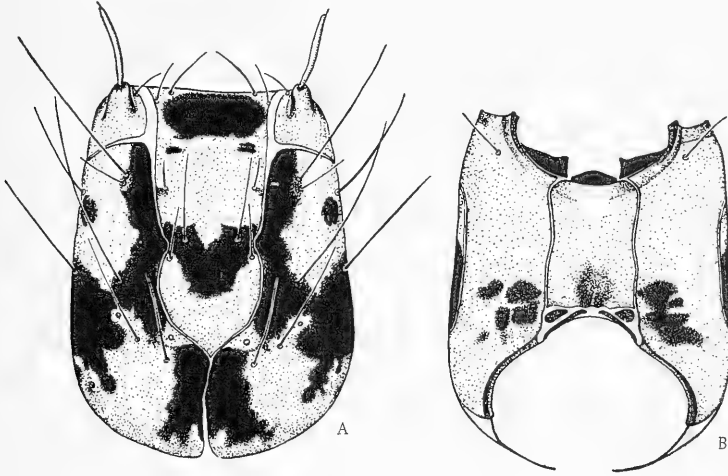


FIGURE 757: *Mystacides longicornis* L. Head, dorsal (A) and ventral (B)

Pronotum (Figure 758, A) with distinct, light, anterior margin; posterior margin wide, with light yellow and reddish brown areas, whitish in middle near median suture; posterior angles with a narrow, black stripe laterally, a wide, bracketlike, dark stripe lateral to median suture; a large dark spot in an area surrounded by a narrow white stripe near anterior angle; a dark brown area with 2 pairs of dark dots behind the spot; 3 dots lateral to bands posteriorly, one dot distinct, other 2 indistinct.

Stripe at posterior margin of mesonotum (Figure 758, B) wide, brown, with indistinct dark dots and a small, light area in middle; sides and posterior part brownish; broad blackish stripes along median suture, 4 large dark dots in a curved row on light background lateral to stripes; 2 dots near anterior margin on each side. Anterior-margin and medioanal setae of metanotum short, the latter slightly larger; primary anterior-angle setae situated on a small, dark sclerite.

Propleuron with wide, reddish brown, pleural suture; margin of episternum similar; epimeron distinct, seta situated in distal part near suture, long, blackish brown; trochantin reddish brown basally, seta strong, dark, situated near anterior margin; setules light, relatively large. Pleurites of meso- and metathorax distinct; epimeron dark brown; mesepisternum  
 473 yellow, with reddish brown, distal margin (Figure 758, C); metepisternum brown, its distal margin darker and wider than on mesothorax; setae of

episternum situated at margin; setae of epimeron dark, longer on mesothorax than on metathorax.

(472)

Number and arrangement of gills of *M. longicornis*

Segment	Dorsal	Ventral
2	1 1(0)	1 1
3	1 1(0)	1 1
4	1	1 1
5	1	1 1
6	1	1 1(0)
7	1(0)	1(0)
8	1(0)	1(0)

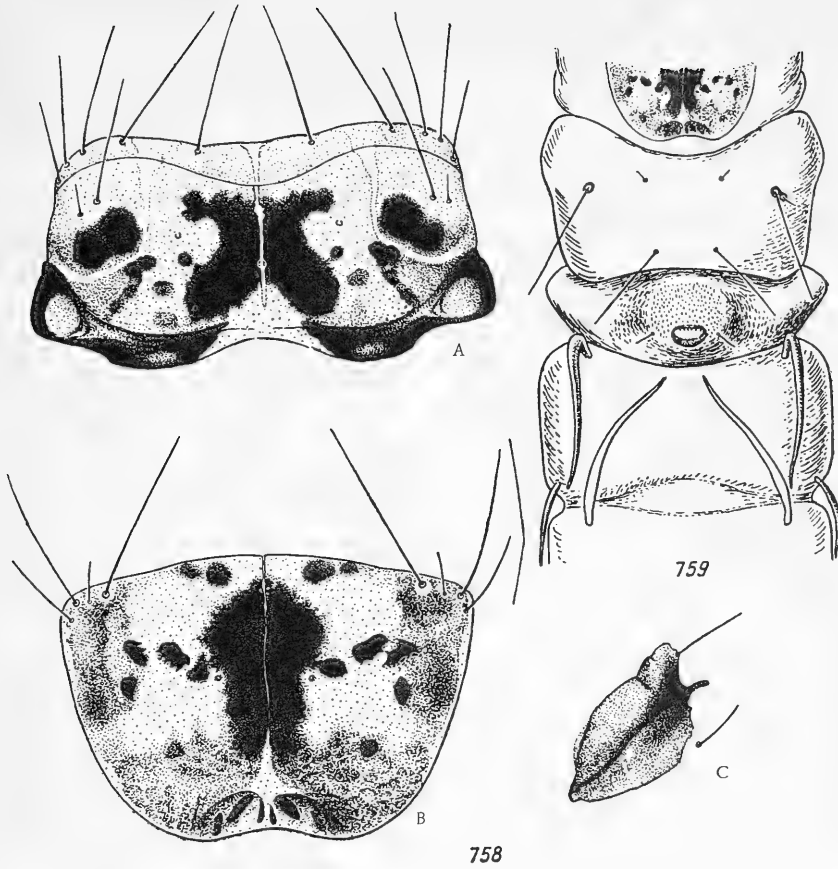
Legs as in *M. azurea* in form and chaetotaxy; pattern dark, distinct, consisting of stripes and spots. Fore coxa with a dark reddish brown spot ventrally near base and on posterior surface; articulation between fore coxa and trochanter with blackish brown spots; articulation between femur and tibia with pinkish light brown stripes; femur with a blackish basodorsal spot; distodorsal spot of tibia indistinct, pinkish, or absent. Basal spots of mid- and hind coxae darker, larger, with indistinct dots, with a large dot or several small dots dorsally; articulations between coxa and trochanter, and between femur and tibia, with wide, blackish brown stripes on mid- and hind legs; basal spot of femur and apical spot of tibia large, dark (Figure 760).

Abdominal segment 1 much shorter than metathorax and abdominal segment 2 (Figure 759); dorsal process large, medioanal setae short, dark; lateral processes distinct, not compressed; area with spines brown, situated on ventral side of process; sclerite short, reddish brown, without curved  
475 distal branch across the plate as in *Athripsodes*; seta short, reddish brown, situated near margin of sclerite.

Tergite of segment 9 whitish posteriorly and laterally; dark part larger than in *M. azurea*, brown, with indistinct, reddish brown dots; medioanal seta and lateral seta long, blackish brown, thin at end; anterior-angle seta slightly shorter and thinner; anterior-margin and intermediate seta short, thin, former smaller than latter (Figure 761).

Sclerite "b" of anal legs whitish, with a brown, median dorsal stripe with fused reddish dots; 2 large, smoke brown dots, and 3 small, fused dots further laterally near base; a large, light brown spot near ventral margin. Sclerite "c" smoke brown, with a short, strong, reddish brown seta. Claw reddish, with darker apex and 2 large, dorsal denticles.





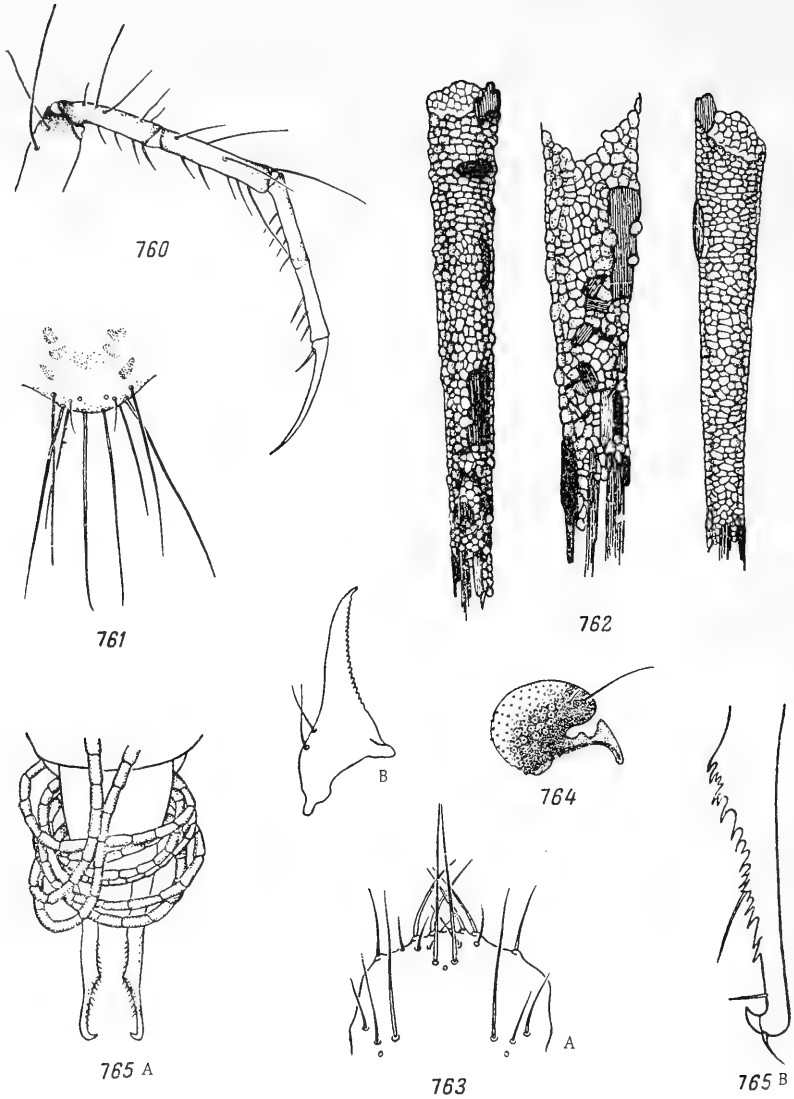
FIGURES 758 and 759. *Mystacides longicornis* L.:

758—pronotum (A), mesonotum (B), mesopleuron (C); 759—posterior margin of mesothorax, abdominal segments 1–2.

Case made of sand grains and detritus, straight, slightly tapering posteriorly, usually with a longer piece of detritus or a thin rod (Figure 762).

**Pupa.** Length 8–11 mm. Antennae of male pupae coiled about 4 times around body, antennae of female 2–2.5 times. Labrum (Figure 763, A) and anteclypeus slightly oblong, with curved sides; anterior margin with 4 short, strong, light setae on brown tubercles; 2 anterior, submarginal setae; median seta strong, light yellow, neighboring seta shorter and thinner.

Mandibles (Figure 763, B) with wide basal part, concave laterally, with beaklike apex; blade almost straight, coarsely serrate; lateral setae short, strong.



FIGURES 760—765. *Mystacides longicornis* L.:

760—hind tibia, tarsus, and claw, posterior; 761—tergite of abdominal segment 9;  
 762—larval case. Pupa: 763—labrum and anteclypeus (A), right mandible, ventral (B);  
 764—lateral process of abdominal segment 1; 765—posterior end of pupa (A), right anal  
 rod, dorsal (B). (765, A—after Klapálek; 765, B—after Thienemann).

Number and arrangement of gills in pupa of  
*M. longicornis*

Segment	Dorsal	Ventral
2	1 1-1	1 1
3	1	1 1
4	1	1 1
5	1	1 1
6		1 1(0)
7		1(0)

Wing sheaths reaching to segment 6. Natatorial setae sparse on fore tarsi, dense on mid-tibiae and tarsi. Lateral process of abdominal segment 1 as in Figure 764.

Holding apparatus on abdominal segments 3-6. Presegmental plates with 2-3 large spinules and sometimes also with 1-2 small spinules; postsegmental plates of segment 5 with 2 rows of spines, those of the anterior row larger; number of spinules 8-12. Gills on segments 2-7.

Dorsal processes of segment 9 with 4 strong, reddish brown setae, 2 of them larger than others; sometimes 1 or 2 small additional setae. Anal rods thin, long (Figure 765); apical part nearly half as long as basal part, narrow, hooked apically; a median process with large, sharp, light spinules between basal and apical parts; small spinules further basally, and at the median margin in apical part; setae situated near middle and on hooked apex of the rod.

Case 10-14 mm long, attached at each end by a large ventral disk, sometimes with 2 additional, smaller, lateral disks posteriorly.

Mode of life and habitats. Vegetation of lakes and slow rivers; feeding on algae.

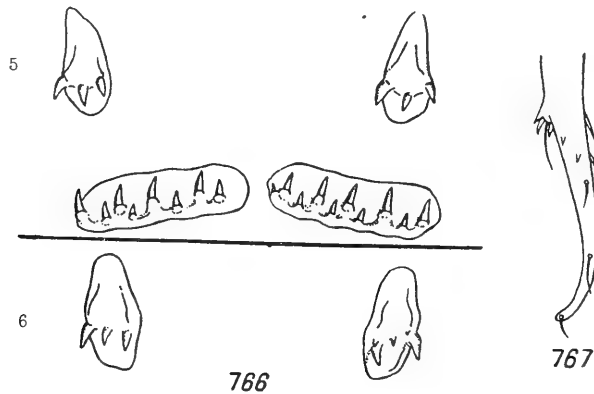
Distribution. The European USSR; Western and Eastern Siberia. In addition, Europe.

## 5. *Mystacides nigra* Linné

Pictet, 1834:Plate XI, Figure 4. — Hagen, 1864:232. — Meyer, 1867:158. — Klapálek, 1893:95-99, Figure 26. — Struck, 1903:Plate III, Figure 8. — Ulmer, 1903:105, Figure 119. — Thienemann, 1904b:261, Figure 17; 1905b:Figure 79. — Siltala, 1905:88-91. — Ulmer, 1909:249, 311, Figures 375, 376c, 457a. — Lestage, 1921:618-623, Figures 208 k, m, o, 209b, 211b. — Lepneva, 1940:211. — Hickin, 1943:69-71, Figures 1-11.

Segment	Dorsal	Ventral
2	1	1 1
3	1	1 1
4	1	1 1
5	1	1

**Full-grown larva.** Length 8.5–11.3 mm; resembling *M. longicornis*, but darker. Frontoclypeus with a broad, black, transverse stripe covering 1st pair of dots anteriorly; 2nd pair of dots situated immediately behind stripe; 3rd pair formed by small dots, sometimes only on one side or absent; 476 band in the posterior part wide, black, situated behind a light median stripe and before a wide, oval process. Dorsal stripes black, distinct, connected with lateral stripes and with wide stripes lateral to coronal suture; connections between stripes dark brown; dark dots posteriorly at margin of lateral stripes; ventral surface with short, black stripes covering dots posteriorly. Gula brownish, lighter laterally, sometimes dark only at anterior and posterior margin.



FIGURES 766 and 767. *Mystacides nigra* L. Pupa:

766—holding apparatus, segments 5 and 6; 767—anal rod.

Pattern of pronotum as in *M. longicornis*, but black stripes and spots wider; ground color light brown, slightly darker than in *M. longicornis* in dark specimens; anterior angles with distinct, light stripe; dark part of lateral area uniformly black before and behind stripe, without dots; dots present only at margin of posterior branch of wide, bracketlike, median

pattern, and on light background near posterior margin between dark median and lateral pattern; posterior-margin area dark in middle and laterally.

Dark median pattern of mesonotum larger than in *M. longicornis*; large dark dots of border area fused with pattern and forming anterior, middle, and sometimes posterior, processes; lateral dots of transverse, curved row in middle of each half large and distinct.

Metanotum with 2 anterior-angle setae situated on small, reddish brown sclerites: a long, dark primary seta and a small, light brown, secondary seta, latter shorter than in *M. longicornis*; medioanal seta strong, long\*; anterior-margin seta short.

Pleurites of meso- and metathorax darker than in *M. longicornis*; episternum with wide apical margin and large subapical dot, the latter more distinct than in *M. longicornis*.

All coxae ventrally and subventrally with large black lateral spots; mid- and hind femora brownish, slightly darker than other segments; dark distal stripes on femora, tibiae, and tarsi large, black, or blackish brown.

Gills on segments 2-5 or 2-4; dorsal row only presegmental.

477 Some full-grown larvae lack gills.

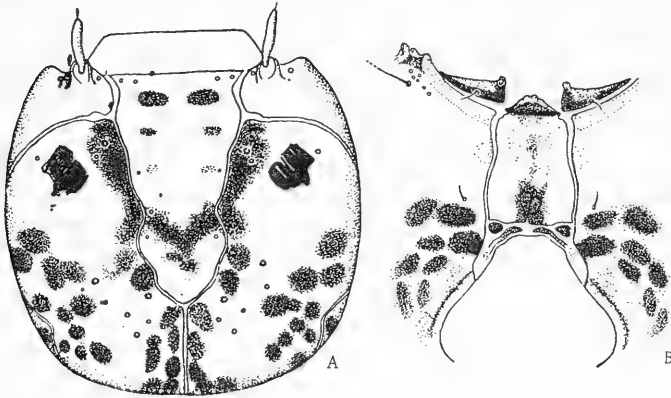


FIGURE 768. *Mystacides sibirica* Mart. Head, dorsal (A) and ventral (B)

Tergite of segment 9 reddish brown, with large dark dots; setae black, size and form as in *M. longicornis*.

Sclerite "b" of anal legs white, with large, reddish brown dots basally; setae and sclerite "c" as in *M. longicornis*. Claw with 2 denticles.

Case straight, as in *M. longicornis*, slightly tapering posteriorly, made of sand grains and pieces of detritus, some detritus fragments arranged longitudinally and longer than case.

**Pupa.** Length 8.3-9.8 mm. Closely resembling that of *M. longicornis*. Spinules on presegmental plates of holding apparatus less numerous than in *M. longicornis* (Figure 766). Median process between basal and apical part of anal rods less projecting than in *M. longicornis*; apex of rod curved and tapering, not hooked (Figure 767).

\* This seta is shown too short in Hickin (1943:71, Figure 7).

Pupal case as in *M. longicornis*.

Mode of life and habitats: Vegetation of stagnant and running water bodies; more common in running water than *M. longicornis*; occurs not only in slow rivulets, but also in creeks and backwaters with more rapid current.

Distribution. Western, central, and northern parts of the European USSR; northwestern Siberia. In addition, Europe.\*

## 6. *Mystacides sibirica* Martynov, larva nova

**Full-grown larva\*\*.** Length 8.2–10.1 mm long. Main color of head, light yellow; thoracic sclerites, yellowish white; pattern resembling that in *M. longicornis* but less dark; stripes black or blackish brown; large dots reddish brown.

Head (Figure 768, A): frontoclypeus without black stripe at anterior margin; anterior pair of dots large, 2nd pair much smaller, 3rd pair small and pale; black stripe in posterior part with a small median incision, and with a wide posterior projection. Dorsal stripes narrow, black anteriorly, blackish brown posteriorly, with 3 dark dots. Stripes along coronal suture 478 replaced by 2 rows of large, dark dots on slightly darker background; lateral stripes also replaced by large dots; ventral surface with groups of 7–8 dots near occipital foramen, dots nearest to margin fused. Gula with a wide, dark, median stripe which is sometimes present only in anterior 3rd, other surface almost entirely dark grayish brown (Figure 768, B).

Pronotum with wide, dark reddish brown, bracketlike pattern with a darker and shorter posterior branch ending in 2 large dark dots; anterior-angle area surrounded by a light stripe and with 2 large, dark spots, each of them formed by 2 dots; a similar spot of 2 fused spots behind the stripe; 4–5 large dark dots in middle of posterior margin; posterior margin with a narrow, black line, margin brown with a yellow lateral spot, except for a light median area.

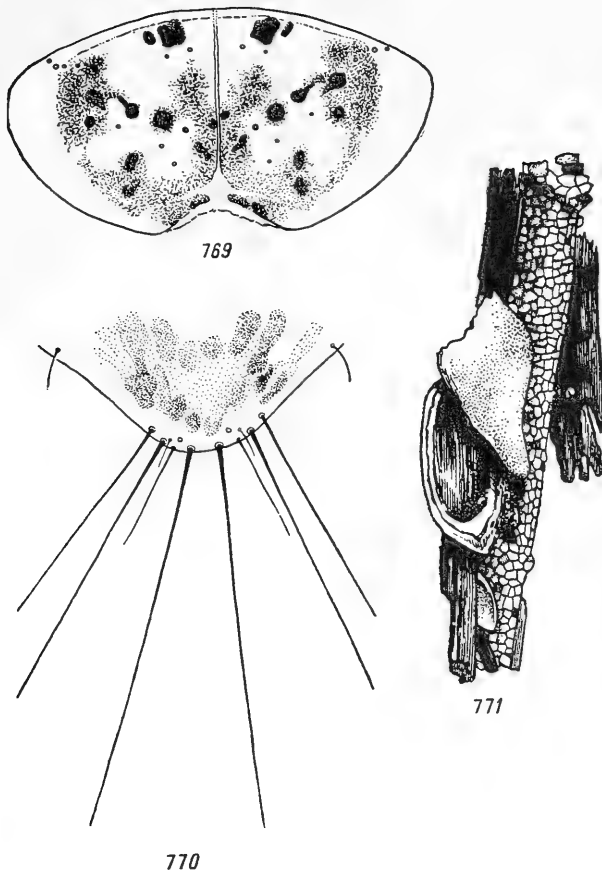
Pattern of mesonotum (Figure 769) slightly dark, brownish, darker anteriorly with large and small blackish brown dots; a narrow, light brown stripe near anterior margin; a darker area with a large and a small dot near pattern; lateral and posterior part brownish near margin; middle of each half with a curved row of reddish brown dots on light background.

Legs whitish yellow; mid- and hind femora smoke brown, darker than other segments; dark spots of coxa and distal stripes of mid- and hind 479 femora, tibiae, and tarsi reddish brown, smaller, and less distinct than in *M. nigra*.

Coloration of head and thorax of *M. sibirica* intermediate between *M. longicornis* and *M. azurea*; it differs from the latter in the presence of gills.

\* Early authors (Hagen, Banks) record this species from America; Betten and Ross do not give localities; Betten even states that his material does not include *M. nigra* (Betten, 1934:281; Ross, 1949:253, Figure 865).

\*\* Description from a specimen from Lake Tal'tsinskoe in the floodplain of the Angara, 20 July 1945, length 10.1 mm, collection of I. M. Levanidova (which also includes a male pupa). Other material from the following localities: 1) coastal area of Sea of Japan, Lake No. 1, 6 August 1927, 7 specimens, length 8.2–9.0 mm, collection of E. F. Gur'yanova; 2) Ussuri Territory, Maikhe Rivulet near village Maikhe, near the bridge, 4 June 1929, 4 specimens, collection of P. D. Rezvoi.



FIGURES 769-771. *Mystacides sibirica* Mart.:  
 769—mesonotum; 770—tergite of abdominal segment 9;  
 771—larval case.

Processes and sclerites of first abdominal segment as in *M. longicornis*. Gills on segments 2-7.

Tergite of segment 9 (Figure 770) reddish brown, irregularly heart-shaped, with large dark dots at anterior margin.

Setae and anal legs as in *M. longicornis*.

Case 10-13 mm long, straight, slightly tapering posteriorly, made of fine sand grains and detritus including shells of ostracods, seeds, and large fragments of trees, which project at both ends and sometimes form lateral plates (Figure 771).

Mode of life and habitats. Lakes and calm parts of rivers.

Distribution. USSR: Eastern Siberia, Maritime Territory, and the Amur Region. Not recorded outside the USSR.

Number and arrangement of gills of *M. sibirica*

Segment	Dorsal	Ventral
2	1	1 1
3	1	1 1
4	1	1 1
5	1	1 1
6	1	1 1
7	1	1 1

#### 4. Genus *Triaenodes* McLachlan

**Full-grown larva.** Length 8.5–13 mm long, body almost uniformly wide, slightly tapering posteriorly. Head slightly oblong, without white adfrontal stripe; lateral stripes present; sensilla of antenna as in *Mystacides*, long, with a short seta. Gula square, with a posterior median indentation. Labrum with deep median indentation. Mandibles short, with large blunt teeth. Submentum absent; maxillary palps short, middle segment slightly longer than adjacent segments.

Pronotum and mesonotum sclerotized, with distinct or pale pattern. Metathorax much wider than mesothorax, with large lateral processes directed anteriorly. Hind legs natatorial, with very long, divided tibiae and undivided tarsi. Gills single. Tergite of segment 9 small, heart-shaped. Claw of anal legs with 2 dorsal denticles.

Case straight, narrower posteriorly, often much longer than larva, made of spirally arranged, small plant particles.

**Pupa.** Length 8.0–11.0 mm. Antennae of male pupae coiled 3–3.5 times around body. Labrum with small, teat-shaped, median process; setae short. Median margin of mandibles coarsely serrated, with a characteristic process in middle. Wing sheaths reaching to segments 6–7. Fore and mid-tarsi with natatorial setae. Holding apparatus on segments 3–6. Gills single. Dorsal processes of segment 9 large, with 4 setae. Anal rods thin, long, with shorter distal part, and with numerous, small setae on inner side.

**Mode of life and habitats.** Stagnant and slowly running water, often in vegetation, rarely on solid bottom.

**Distribution.** The European USSR, including the Caucasus; Middle Asia, Western and Eastern Siberia, Maritime Territory, the Amur Region. In addition, cosmopolitan.



Key to Species

Full-grown larva

- 1 (2). Head and thoracic sclerites with distinct pattern of numerous dots; dark dorsal and ventral stripes present; gula light, slightly narrower posteriorly . . . . . 1. **T. bicolor** Curt. (p. 601)
- 2 (1). Head pattern less distinct, dots less numerous; dorsal and ventral stripes absent; pronotum and mesonotum with pale, indistinct pattern.
- 480 3 (4). Gula markedly tapering posteriorly . . . . . 2. **T. conspersus** Ramb. (p. 607)
- 4 (3). Gula almost uniformly wide, rectangular, dark . . . . . 3. **Trienodes** sp. (p. 609)

Pupa

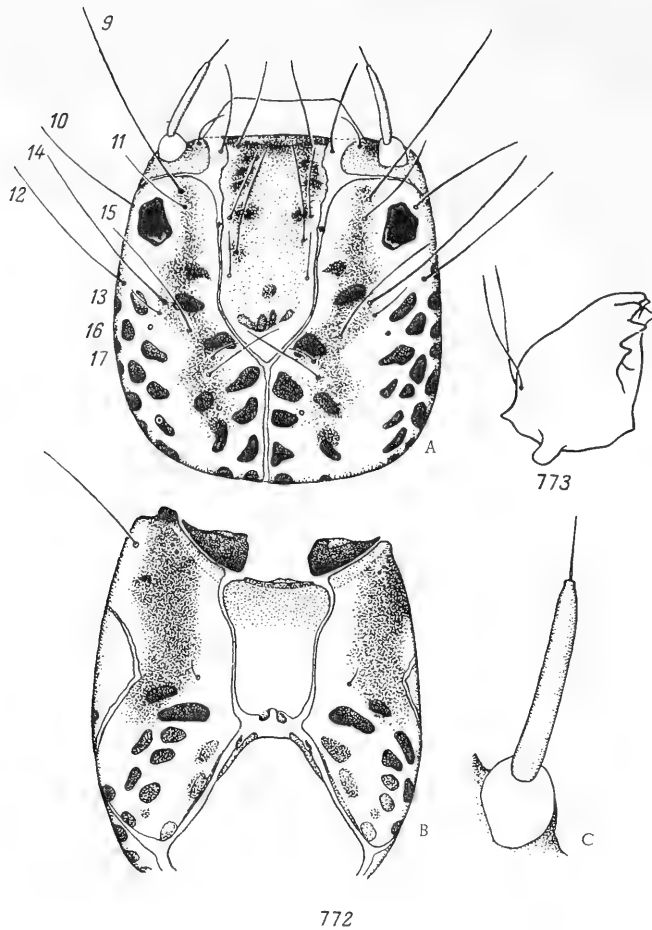
- 1 (2). Apical part of anal rod distinctly differentiated from basal part, and with sharply narrowed apex . . . . . 1. **T. bicolor** Curt. (p. 601)
- 2 (1). Basal and apical parts of anal rod little differentiated, rod gradually tapering posteriorly . . . . . 2. **T. conspersus** Ramb. (p. 607)

1. **Trienodes bicolor** Curtis

Réaumur, 1737:177, Figures 6, 8, 10.—Hagen, 1864:133, 233.—McLachlan, 1874—1880:321.—Klapálek, 1888:45—48, Figure 16.—Lampert, 1900:204—205, Figure 80.—Struck, 1900:Figure 42; 1903:Plate III, Figure 10.—Ulmer, 1903:107, Figures 31, 68.—Thienemann, 1905b:534—535.—Siltala, 1905:74—77, Figure 19; 1907:472—479.—Ulmer, 1909:249, 310, Figures 374 a, e.—Lestage, 1921:623—631, Figure 212.—Lepneva, 1940:211, Figure 4.—Hickin, 1942:12—13, Figures 1—8.

**Full-grown larva.** Length 8.5—13.0 mm. Main color of head ocher yellow (Figure 772, A). Frontoclypeus slightly darker near margin with 3 pairs of dark dots anteriorly, those of middle pair more widely separated than others; posterior part with a transverse row of 4 dots, another dot before the row. Dorsal stripes narrow, extending posteriorly along coronal suture, with 3 large, and several, small dots; 4 large dots along coronal suture. Ventral surface with wide, dark, longitudinal stripes, a group of large dots behind stripes (Figure 772, B). Antenna long (Figure 772, C). Gula light, with smoke brown transverse stripe at anterior margin, with dark lateral streaks posteriorly.

Setae light brown or yellow; seta 9 at anterior end of dorsal stripe, long; seta 11 situated slightly posteriorly, short, thin; seta 10 situated lateral to eye, moderately long; seta 7 similar, situated at anterior margin; seta 12 large, situated in middle, behind eye; seta 14 long, situated medial to 12; setae 13 and 15 situated posteriorly, 13 short, 15 moderately long; seta 16 short, light, curved inward; seta 17 moderately long situated at level of posterior angle. Ventral side: seta 8 short, situated near anterior margin; seta 18 small, light, situated lateral to gula.



FIGURES 772 and 773. *Triaenodes bicolor* Curt :

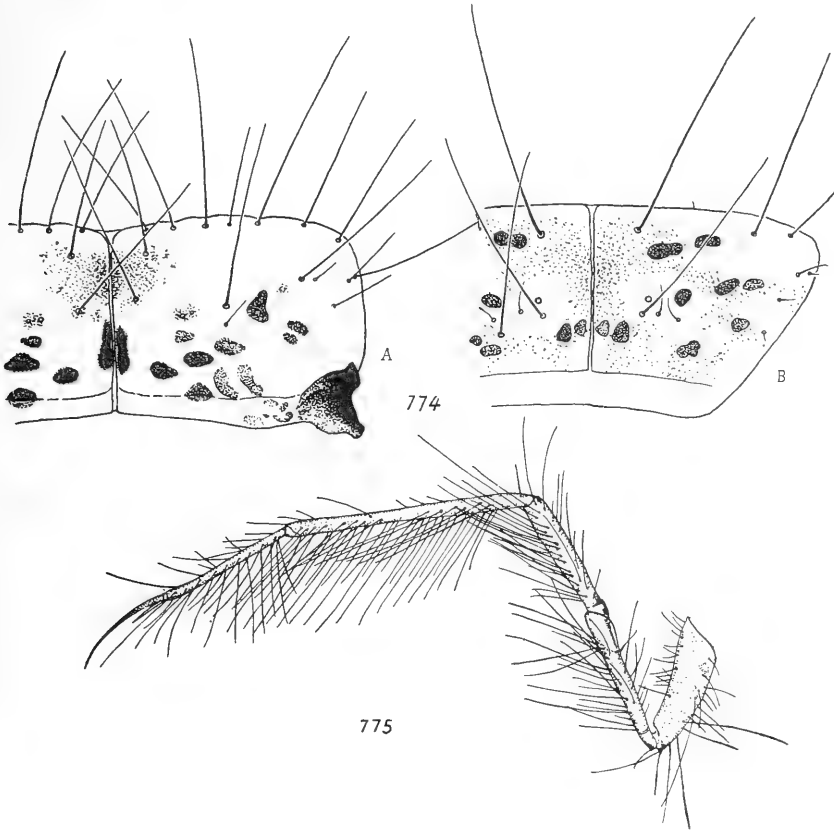
772—head, dorsal (A) and ventral (B), antenna (C); 773—right mandible, ventral.

Labrum short, wide, with deep median indentation; dorsal sclerite light yellow; posterior-angle sclerites short, with rounded ends; setae 1 and 2 small (smaller than in *Athripsodes* and *Mystacides*), in form of light, curved spines; other setae dark; seta 4 relatively large, seta 3 laterally at anterior margin, curved slightly inward; setae 5 and 6 equally long. Mandibles (Figure 773) short, wide, with large blunt teeth; distal tooth slightly longer than 2 teeth of dorsal blade and 2 teeth of ventral blade.

Submentum absent; setae strong, moderately long, dark. Stipes wide, yellowish, both setae of equal length. Mediodistal seta of palpifer strong, dark. Maxillary palps short, middle segment slightly larger than others. Galea cylindrical, with large sensillae. Labial lobe in form of a blunt cone. Mentum in form of a narrow, reddish brown, transverse stripe. Ventral sclerites represented by small dots with short light setae. Palpiger yellowish; labial palps small, with 2 sensillae.

Pronotum (Figure 774, A) light brown, with reddish brown dots like mesonotum; anterior part without dots; posterior part with dark streaks near median suture, each with 2 dots; groups of large dark dots laterally in each half. Mesonotum (Figure 774) lighter, yellow; one small and one large dot lateral to median suture; each half with a broad, curved row of 6 dots; 2 large dots laterally at anterior margin. Chaetotaxy as in Figure 774.

(482)



FIGURES 774 and 775. *Triaenodes bicolor* Curt.:

774—pronotum (A) and mesonotum (B); 775—left hind leg, posterior.

Propleuron yellow, with wide, blackish brown, pleural suture, and similar margin of episternum; trochantin with dark basal spots; epimeron pale, indistinct, seta dark situated at end of suture; trochantin large, oblong, with markedly concave anterior margin; seta strong, dark, subapical. Pleurites of meso- and metathorax mainly light yellow, the latter much longer than former; pleural suture narrow, dark reddish brown; margin of episternum short, restricted to suture, pinkish on mesopleuron, blackish brown on metapleuron; sclerites with a brownish, basal spot, that of mesothorax more distinct and with 2 large dark dots; seta of episternum

481

situated distally some distance from margin; seta of epimeron situated on membrane, both setae dark, equally long.

Ratio of length of legs 66:100:160. Legs yellow, dots brown, spots at articulations small, reddish brown.

Fore coxa with dense small spinules on anterior, ventral, and dorsal sides; basodorsal seta large, strong; anterior apical dorsal seta situated close to basal seta together with 2-3 secondary setae; posterior apical dorsal seta long; anterior setae moderately long, accompanied by 2-3 secondary setae; ventral side with short and long secondary setae, mainly in posterior part; anterior distoventral seta shorter than long posterior seta.

Anterior and posterior seta of trochanter short, thin, the latter slightly larger; anterior side with a dark, moderately long, basal seta ventrally; distal and intermediate seta in form of short, light spines; 2 similar, smaller spines, and a minute spine further basally; both posterior setae moderately long, brown; ventral side with thin, long, whitish chaetoids.

482 Ventral side of femur less short and convex than in *Mystacides*; dorsal side with shorter secondary setae in addition to 2 long primary setae; similar secondary setae in posterior subdorsal area; anterior seta situated subventrally at distal margin, anterior seta in middle, both long; anterior surface with sparse, thin setae; posterior surface with larger and thicker setae; ventrobasal area with primary setae in form of 2 thin, light spines; large, whitish chaetoids along whole femur.

Tibia short, wider distally, with small spinules ventrally; posterior primary seta situated ventrally in form of a large, light spine; anterior ventral seta represented by a similar subventral spine; other primary setae situated among numerous short and long secondary setae. Tarsus uniformly wide, with 2-3 small spinules ventrally; posterior primary setae situated distally near ventral and dorsal margin, thin, short, dark; anterior subdorsal seta the same; 2nd anterior seta situated subventrally in form of a large, light spine. Claw large, strongly curved, with a large spine-shaped basal seta.

Mid-coxa slightly oblong, with sparse small spinules anteriorly near base, with 3-4 large brownish dots posteriorly and dorsally; thin, brown setae dorsally and subdorsally, most of them long, 3 thicker, dark brown setae among them, the primary basodorsal and both apical dorsal setae, anterior apical seta longer than posterior; both primary anterior setae thin, moderately long, accompanied by 1-2 large secondary setae; posterior surface with 5-6 small setae; ventral side with numerous, long setae, anterior distoventral seta shorter than posterior.

483 Trochanter rodlike, resembling hind trochanter but shorter; anterior and posterior seta short, brown, posterior seta slightly longer and thinner; several, small, sparse, secondary setae on anterior and posterior sides; basoventral seta on anterior side, long, dark brown; intermediate and apical ventral setae in form of large, thick, light spines in a row of 6-7 smaller spines; posterior ventral setae long, dark brown, strong, together with 5-6 thin, shorter secondary setae; large, sparse, thin, whitish chaetoids among setae.

Femur slightly longer than trochanter, with slightly convex dorsal side; apical dorsal seta long, dark brown; basodorsal seta slightly shorter; large and small secondary setae situated dorsally and subdorsally between above

primary setae, some secondary setae long; anterior and posterior seta situated subventrally at distal margin, both long, dark; anterior surface with several small setae; 2—3 longer setae at distal margin; anterior surface ventrally and subventrally with 22—23 small, thick, light spines; 2 long, strong, dark, primary, ventral setae and 3—4 moderately long, thin, secondary setae behind spinules; basal part with thin, whitish, long chaetoids between setae.

Tibia shorter than femur, rodlike, not wider distally; dorsal side with 7 long, thin setae and several smaller setae; an anterior and a posterior primary seta at distal margin, both long, dark; other secondary setae situated among secondary setae; anterior side with 3 short, strong, secondary setae subdorsally, with 2 large and 3 small spines subventrally; posterior side with 4 small, thin setae, 2 slightly longer setae subventrally; a row of 9 large, strong spines ventrally.

Tarsus straight, shorter and narrower than tibia, not tapering distally; dorsal side with 2 pairs of long, thin setae near distal margin and in middle; several, short setae situated between former and more basally; anterior side with a large spine subventrally; posterior side with a long, brown subapical primary seta, a thin smaller seta slightly more basally; ventral side with 5 large, light spines, as on tibia. Claw strong, slightly curved, with a light basal spine.

Hind leg natatorial (Figure 775). Coxa long, almost uniformly high, with several large brownish spots at base; surface with minute spinules anteriorly and ventrally as on forelegs. Basal part with a group of setae including a large basodorsal seta; 2 rows, anterior and posterior, of thin, short, and long setae further along coxa; anterior and posterior distodorsal setae long, strong, dark brown; anterior surface with several smaller secondary setae in addition to long primary setae; ventral and posterior subventral areas with long dense setae, among them both primary distoventral setae near margin.

Trochanter long, rodlike as are femur, tibia, and tarsus; anterior and posterior seta short, dark; anterior surface with 4—6 secondary setae; thin, relatively short to long setae situated dorsally, ventrally, and on posterior side.

Femur slightly longer and wider than trochanter; anterior primary seta situated subapically, long, strong, reddish brown; several, small, secondary setae situated more basally on anterior side; a distodorsal seta and several, small, thin, light setae at dorsal margin; 20—22 long, dense, natatorial setae subdorsally on posterior side; 2nd natatorial row of similar long, thin setae on ventral side, including both primary setae; primary distoventral seta longer than others.

Tibia divided, much longer than femur, with several small setae and one long, thick, dark brown (primary?) subventral seta anteriorly; 2 rows of natatorial setae, a posterior subdorsal row of numerous, long, thin setae, and a ventral row of similar long setae.

Tarsus shorter and thinner than tibia; posterior dorsal row of natatorial setae with thin setae which are shorter than on tibia; thin, long setae of ventral row alternate with large, strong spines.

Claw long, thin, slightly curved, with spine-shaped basal seta.

First abdominal segment much shorter than metathorax and 2nd abdominal segment, as in *Mystacides*; dorsal process high, conical, with retractile

apex; lateral processes low but distinct; area with spines light yellow, different in form from that of *Mystacides*; sclerite indistinct, small, 484 pinkish. Lateral line thin but distinct, consisting of small, whitish hairs on segments 3–7; segment 8 with small dots with 2 chaetoids on each.

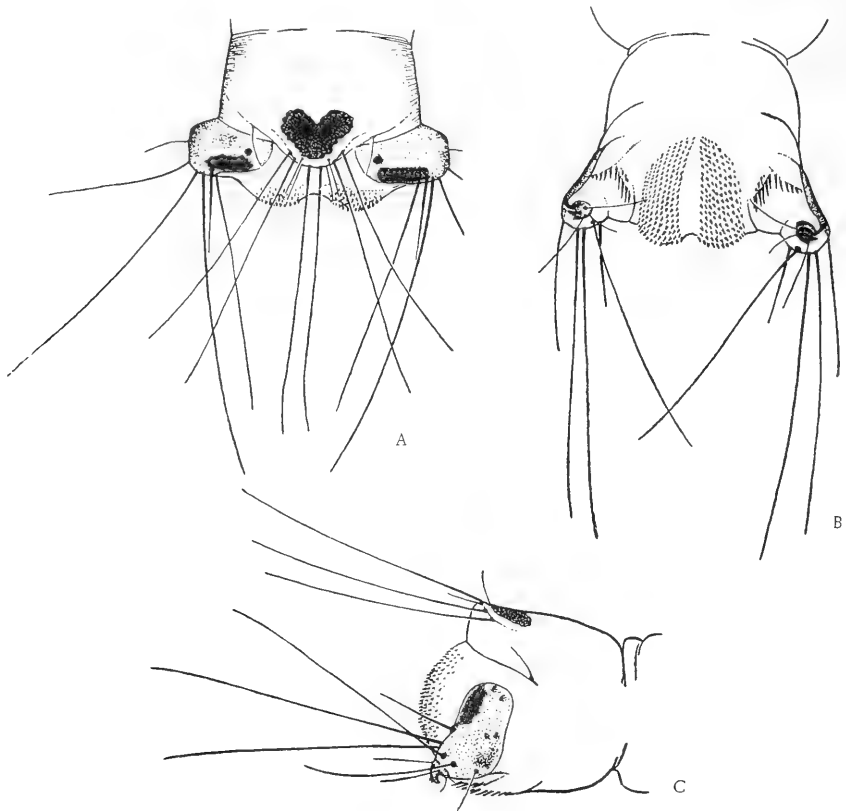


FIGURE 776. *Triaenodes bicolor* Curt.: Abdominal segment 9 and anal legs, dorsal (A), ventral (B), and lateral (C)

Gills with a single filament on segments 2–8, in dorsal and ventral rows; an additional lateral row sometimes present on segment 2.

Tergite of abdominal segment 9 small, pinkish, heart-shaped (Figure 776, A); setae dark reddish brown, situated behind tergite; medioanal seta long, lateral and anterior-angle seta the same; intermediate and anterior-margin seta short, thin, situated near medioanal seta.

Anal legs slightly longer than in *Mystacides* and *Athripsodes*, with tapering apex (Figure 776). Sclerite "b" white, with a narrow reddish gray stripe dorsally at median margin; setae dark; a strong, short, but thicker seta at margin of stripe; 2 long setae above claw; 2 thinner and shorter setae laterally. Sclerite "c" reddish yellow, with small, thin seta. Claw with 2 denticles.

Case straight, in form of an elongate cone made of small plant fragments arranged in a spiral, with narrower apex; length 14–16 mm, rarely 20–25 mm (Figure 777).

**Pupa.** Length 9–10 mm. Antennae of male pupae coiled 3.5 times around posterior end of body (Figure 778, B). Anteclypeus with 3 short, strong setae on each side. Labrum with large median process; strong, dense setae behind process. Median blade of mandible coarsely serrated, 485 deeply concave (Figure 778, A). Wing sheaths reaching to middle of segment, 6 in male pupae. Mid-tarsi with dense natatorial setae on 4 proximal segments; fore tarsi with a sparse row on 3 proximal segments.

Number and arrangement of gills of *T. bicolor* (after Siltala)

Segment	Dorsal	Pleural	Ventral
2	1 1	1(0)	1
3	1 0–1		1
4	1		1
5	1		1
6	1		1
7	1(0)		1(0)
8	1(0)		1(0)

Holding apparatus on segments 3–6; number of denticles: III:2–3; IV: 2–3; V:2–4+6–7; VI:2–3. Gills single, on segments 3–8, as in the larva. Dorsal processes of segment 9 with 4 setae, including one relatively long seta and 3 short strong setae. Anal rods long, swollen basally, basal part uniformly wide, more than 2.5 times as long as narrow apical part; a sharp boundary between basal and apical part; all 4 setae light, large, 3 of them on median side, the 4th situated subapically on outer side, curved; small thin setae on whole rod, except for basal and apical part, a group of such setae in middle of left rod.

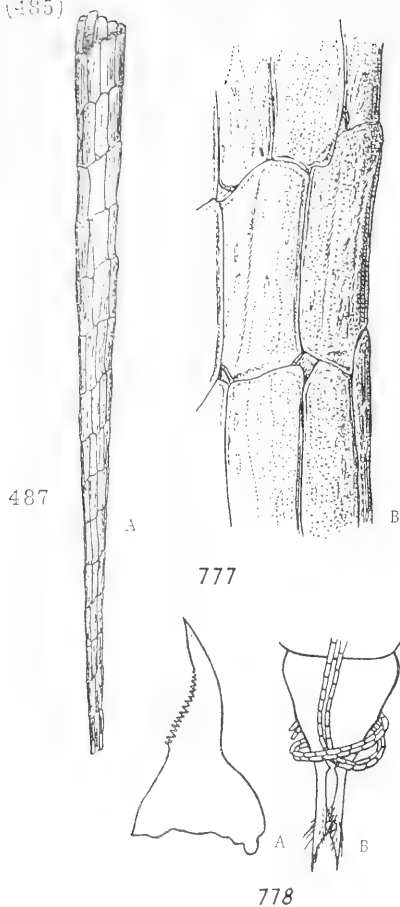
Mode of life and habitats. Stagnant and slowly running waters, in vegetation, usually in shallow places close to bank, at a depth of 0.2–1.5 m; frequent in lower reaches of slow rivers and rivulets with rich vegetation.

Distribution. Western, northern, and central parts of the European USSR. In addition, Europe, especially Northern and Central parts.

## 2. *Triaenodes conspersus* Rambur\*

Struck, 1903:Plate III, Figure 11. — Ulmer, 1903:107, Figures 67, 88, 102, 118, 127; 1903a:70, Figures 1–8; 1909:249, 310, Figures 447f, 456. — Lestage, 1921:623–631, Figure 212 f. — Hickin, 1954:153–155, Figures 1–4, 6.

\* Appears in the literature as *Triaenodes conspersa*.



FIGURES 777 and 778. *Triaenodes bicolor* Curt.:

777 - larval case (A) and detail (B);  
778 - pupa: left mandible, ventral (A),  
anal rods (B) (778, B - after Klapálek).

rods (Figure 781, D) straight, thin, tapering posteriorly, with strong spine-shaped seta between basal and apical part; median side with thin, hairlike setae.

Case as in *T. bicolor*.

Mode of life and habitats. Slowly running waters, calm areas among vegetation.

Distribution. Central and western parts of the European USSR. In addition, Europe.

**Full-grown larva.** Length 10-12 mm. Yellow ground color of head (Figure 779, B) visible near eye and posteriorly; other parts of head brownish, slightly darker dorsally; pattern indistinct, except in some parts posteriorly only, where it is distinct. Frontoclypeus without pattern anteriorly or sides slightly darker and with indistinct dots; posterior part with 2 median dots situated one behind the other, instead of in a transverse row; lateral dots absent or indistinct. Dorsal stripes rarely slightly visible, with indistinct dots; a row of 4 large dots along coronal suture, 2-3 dots further laterally; lateral stripes replaced posteriorly by longitudinal rows of large dots; ventral surface with large, indistinct dots (Figure 779, C). Gula slightly dark, tapering posteriorly. Setae as in *T. bicolor*.\*

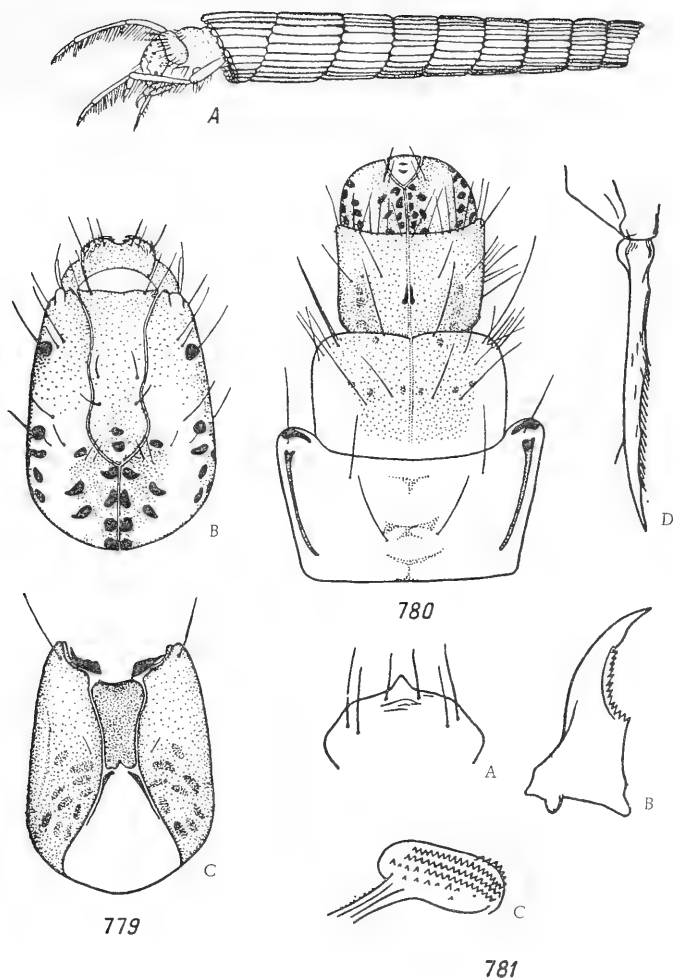
Main color of thoracic sclerites yellow; pattern pale (Figure 780). Pronotum with 2 dark streaks near median suture, each streak with 2 dots, which are sometimes indistinct; posterior part laterally with groups of pale dots on a brownish background. Mesonotum brownish in middle, 1-2 large dots on each side of anterior margin, and a transverse row of 3-4 pale dots lateral to suture.

Case (Figure 779, A), as in *T. bicolor*, made of spirally arranged, small, oblong, plant particles, case sometimes 15 mm long tapering posteriorly.

**Pupa.** Length 9-10 mm. Labrum (Figure 781, A) wide, short, with distinct teat-shaped median process. Mandibles with strongly concave, coarsely serrate blade (Figure 781, B). Sheaths of fore wings reaching to segment 6. Lateral process of 1st abdominal segment as in Figure 781, C. Holding apparatus on segments 3-6. Anal

\* Only part of the setae are shown in the drawing (after Hickin, 1954, Figure 3).





FIGURES 779-781. *Triaenodes conspersus* Ramb.:

779 - larva in case (A), head, dorsal (B), ventral (C); 780 - thoracic segments, dorsal; 781 - pupa: labrum (A), right mandible, ventral (B), lateral protuberance, 1st abdominal segment (C), anal rod (D) (779, 780, after Hickin; 781, after Ulmer).

### 3. *Triaenodes* sp., larva nova

**Full-grown larva.** Length 10-11 mm. Main color of head yellow; dots reddish brown; setae brown (Figure 782, A). Frontoclypeus with pale, narrow, lateral stripes and 3 pairs of large, indistinct dots anteriorly, dots of middle pair more widely separated than others; posterior part with

a row of 4 dots situated behind a single dot. Dorsal stripes present only anteriorly, 3 large dots along suture further posteriorly; lateral stripes replaced by 3 rows of dots; ventral surface with 3 large and 4 smaller dots on each side posteriorly (Figure 782, B). Gula square, reddish brown, slightly narrower posteriorly, with deep median indentation.

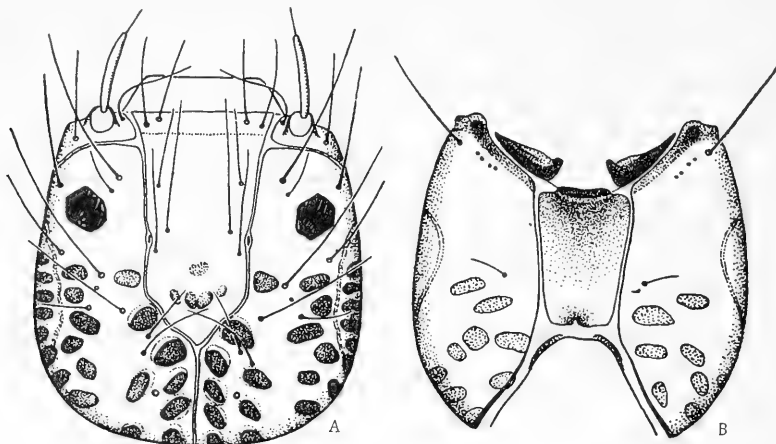


FIGURE 782. *Triaenodes* sp., larva nova: Head, dorsal (A) and ventral (B)

Median and intermediate anterior-margin setae situated in angles, the latter seta near suture; lateral anterior-margin seta on the other side of suture, light, curved inward; anterior frontal seta smaller than others; intermediate and posterior frontal setae situated one behind the other near tentorial pits, former moderately long, latter much shorter. Setae 9 and 11 situated in anterior lateral angle of dorsal stripe; setae 7 and 10 moderately long; seta 12 situated behind eye, slightly shorter; setae 14, 15, and 16 situated one behind the other parallel to row of dots near frontal suture; seta 13 short, thin, situated lateral to 15; seta 17 short, light, curved inward, situated medial to 16 (Figure 782, A); seta 8 large; seta 18 small, thin.

Labrum with deep median indentation; setae 1 and 2 in form of thick, transparent spines situated close to anterior margin; setae 4 thin, relatively large; setae 3, 5, and 6 as in *T. bicolor*. Distal tooth of left mandible large, separated by a shallow, longitudinal fold from 2 teeth of dorsal blade and a deep indentation from 3 teeth of ventral blade; 1st of 3 teeth of ventral blade as large as distal tooth. Right mandible with 2 teeth on each blade in addition to the distal tooth; lateral setae thin, equally long.

Pronotum (Figure 783, A) yellow, with pale pattern; a group of indistinct dots on each side posteriorly; posterior margin pinkish brown; posterior angles dark. Setae in Figure 783, A.

Mesonotum (Figure 783, B) light yellow, with indistinct dots.

Legs yellow, without pattern. Natatorial setae of hind legs as in *T. bicolor*.

Lateral processes of 1st abdominal segment with a light yellowish area with spines, indistinct on this light surface; sclerite absent.

Gills on segments 2-7.

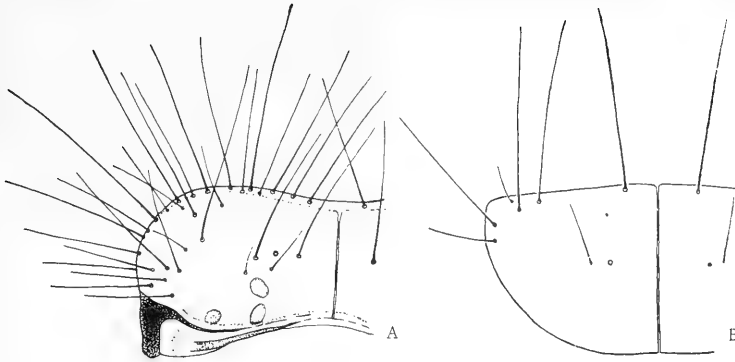


FIGURE 783. *Triaenodes* sp., larva nova: Pronotum (A) and mesonotum (B)

Tergite of segment 9 light brown, with concave anterior margin; setae as in *T. bicolor*. Anal legs similar; sclerite "b" white, with an indistinct, brownish, basal dot dorsally; setae and claw as in *T. bicolor*.

Case straight, tapering posteriorly made of small pieces arranged in a spiral, slightly coarser than in *T. bicolor*.

This larva may be that of *T. interna* McL., according to its distribution.

Localities. 1) Ob' near Novosibirsk, 10 June 1925, canal between Bugrinskii Island and the left bank, 2 specimens collected by S.G. Lepneva; 2) Astrakhan Nature Reserve, 2 May 1954, No. 15, 1 specimen, collected by A.A. Kossova; 3) Urals, Lake Berendysh, 15 July 1929, collected by N.N. Lipina.

## 5. Genus *Erotosis* McLachlan

**Full-grown larva.** Length 8.0–8.5 mm. Head mainly dark; sensilla of antenna very long; gula rectangular. Pronotum and metanotum sclerotized. Hind tibia divided. Gills absent. Tergite of segment 9 present; anal legs moderately long, as in *Triaenodes*. Case straight, made of fine plant particles.

Mode of life and habitats. Small bodies of stagnant water.

Distribution. Western and northwestern parts of European USSR. In addition, Europe.

### 1. *Erotosis baltica* McLachlan

Siltala, 1905:77–79, Figure 20. — Ulmer, 1909:250, 310, Figure 377. — Lestage, 1921:631–634, Figure 218. — Lepneva, 1940:210.

489 **Full-grown larva.** Length 8.0–8.5 mm. Head oblong, dark; sensilla of antenna very large, longer and thicker than in *T. bicolor*, slightly thicker apically (Figure 784, A, C); seta relatively large. Ground color of head brownish yellow in pericocular area; greater part of head chestnut

490 brown. Frontoclypeus dark brown laterally and sometimes at anterior margin, with a narrow, light yellow, median stripe along coronal suture to the occipital foramen. Dorsal stripes narrow, dark brown, adjacent to dark stripes of frontoclypeus, extending from anterior margin to occipital foramen; other surface uniformly chestnut brown, including gula; light brown dots in the posterior part; white lateral stripes distinct. Gula rectangular, slightly narrower posteriorly (less than in *T. bicolor*), with a dark brown transverse stripe at anterior margin (Figure 784, B); setae 13 and 16 procumbent, strongly curved.

(489)

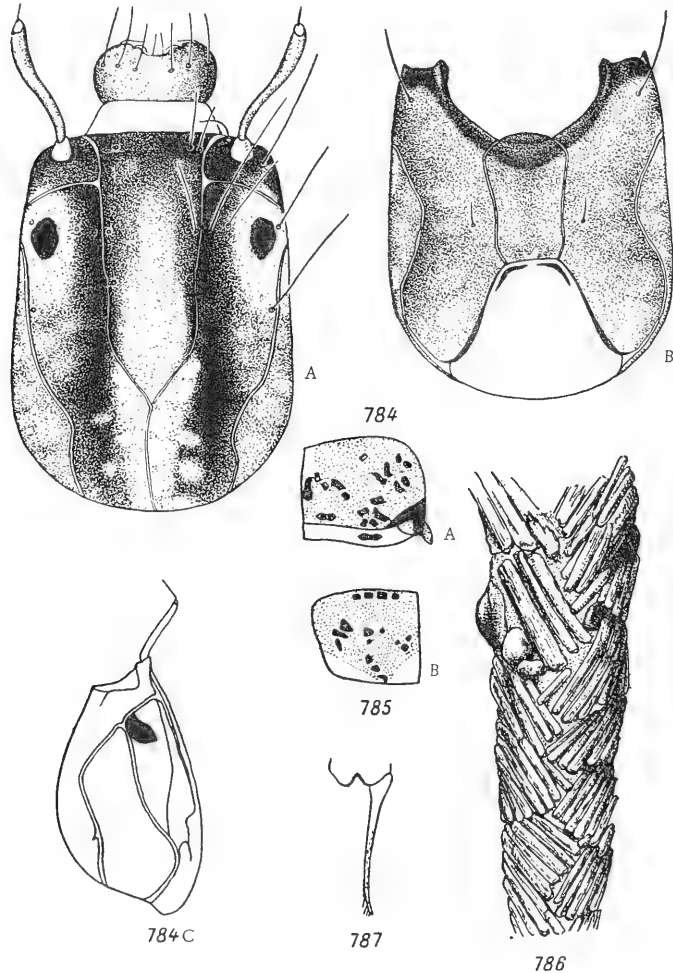


FIGURE 784-787. *Erotosis baltica* McL.:

784 - head and labrum, dorsal (A), ventral (B), lateral (C); 785 - pronotum (A) and mesonotum (B); 786 - part of larval case, lateral; 787 - right anal rod of pupa, dorsal (784, C, 785, 787 - after Siltala).

Pronotum (Figure 785, A) yellowish brown, with large, indistinct, brownish, lateral pattern in form of a wide bracket; 2 small, pinkish brown streaks near median suture; large and small, pinkish brown dots in each half; posterior margin mainly light, with large, chestnut brown, lateral areas with dark outline. Mesonotum (Figure 785, B) slightly lighter; 3 dots at anterior margin in each half; one dot near the median suture; a number of large and small, pinkish brown dots in a curved row on the surface. Chaetotaxy as in *T. bicolor*.

Propleuron: trochantin lobe-shaped with rounded distal part and almost straight anterior margin; seta subapical, large, strong, light.

Forelegs brownish, darker than mid- and hind legs. Hind legs yellowish brown; tibia divided; femur shorter and thicker than tibia; tarsus undivided, narrow, slightly shorter than tibia.

Dorsal process of 1st abdominal segment high and large as in *Mystacides* and *Triaenodes*; area with spines on lateral processes yellowish, with a distinct, slightly darker stripe at posterior margin; dark sclerite absent. Gills absent.

Tergite of abdominal segment 9 whitish, indistinct, with small, pinkish brown dots; submarginal setae dark brown, as in *T. bicolor*; median setae long; lateral and anterior-angle setae shorter, the latter slightly thinner; intermediate seta and anterior-margin seta short, thin.

Anal legs relatively long, as in *T. bicolor*; sclerite "b" white, with brownish, basal dots, with dark brown setae apically; 3 long, thick, distal setae at the base of the claw; a moderately long, strong seta further basally and laterally. Claw small, reddish, with 2 dorsal denticles.

Case 9–10 mm long, straight, slightly narrower posteriorly made of small plant fragments arranged in regular rows as in *Triaenodes*, but in oblique semicircles, not spirals; the opposite semicircles meet in an irregular zig-zag line dorsally and ventrally (Figure 786); posterior end open, as in *Triaenodes*, without membrane.

**Pupa.** Length 8.0–8.5 mm. Gills absent. Holding apparatus on segments 3–6; number of denticles; III: 3–4; IV: 3–4; V: 4+ 7–9; VI: 4. Anal rods (Figure 787) long, nearly uniformly thin, with very short distal part and with 4 small setae.

Case as in larva, 8–10 mm long; anterior membrane with round central hole; posterior membrane with an elliptical, transverse slit.

Mode of life and habitats. Small, often marshy stagnant water bodies.

Distribution. Western and northwestern parts of the European USSR. In addition, mainly Central and Northern parts of Europe.

## 6. Genus *Leptocerus* Leach (*Setodes* McLachlan, 1884, partim group 1)

**Full-grown larva.** Length 8–10 mm. Head oblong; pattern consisting mainly of dots; white lateral stripes distinct. Gula triangular; gular and coronal suture absent. Pronotum and mesonotum sclerotized; hind legs natatorial in some species. Gills absent. Tergite of abdominal segment 9 absent. Claw with a large, dorsal denticle, sometimes with 3 denticles. Case made of secretion or with a few fine sand grains.

Mode of life and habitats. The species described live in stagnant waters, among vegetation, often in large numbers.

### Key to Species

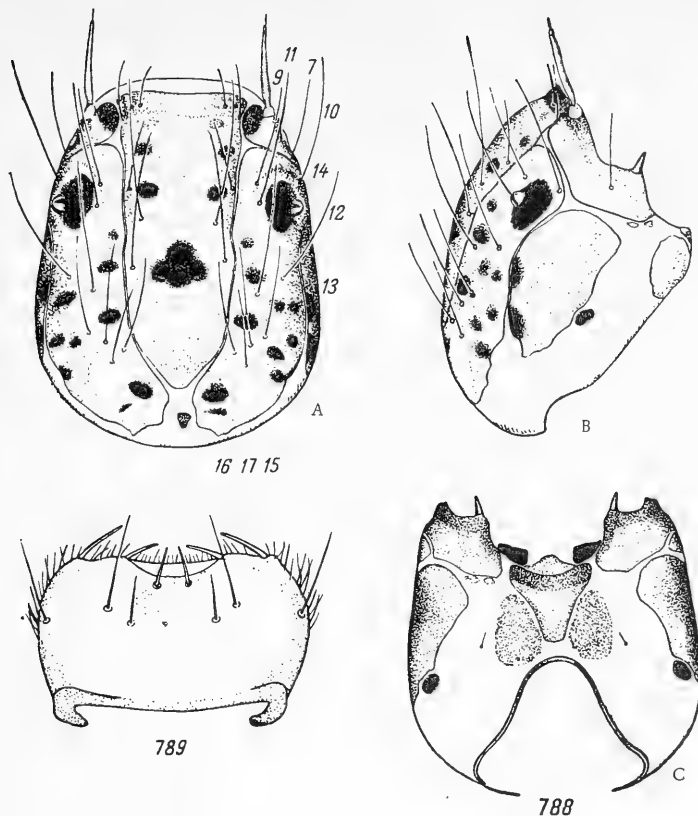
#### Full-grown larva

- 1 (2). Head yellowish brown dorsally; anterior of the 3 pairs of dots in anterior part of frontoclypeus, paler and smaller than the other two; case thin-walled, yellow or yellowish brown; European USSR . . . . . 1. *L. tineiformis* Curt. (p. 614)
- 491 2 (1). Head pinkish brown dorsally; anterior of the 3 pairs of dots in anterior part of frontoclypeus, larger than the others; case thick-walled, brownish, often with fine sand grains posteriorly; Maritime Territory . . . . . 2. *L. valvatus* Mart. (p. 621)

#### 1. *Leptocerus tineiformis* Curtis

Struck, 1900: Figure 40; 1903:70, Plate III, Figure 13.— Ulmer, 1903: 102–103, Fig. 66; 1909:250, 309, Figures 378, 455.— Lestage, 1921:650–655, Figures 226a, d, h, i, 227, 228.— Lepneva, 1940:210–211.— Hickin, 1953: 74–76, Figures 1–8.

**Full-grown larva.** Length 8 mm. Head (Figure 788, A, B) oblong, yellowish brown and whitish and with reddish brown dots ventrally and at occipital foramen. Sensilla of antenna narrow apically; seta short. Frontoclypeus narrow, with small lateral indentation; anterior part slightly darker at anterior margin and laterally, with 3 pairs of large dots, those of the anterior pair slightly closer together, paler, and smaller than the others; pattern in posterior part situated near tentorial pits, formed by 3 large dots and a smaller dot before them. Area of coronal suture white, suture absent. Dorsal stripes narrow, indistinct; 3 large dots lateral to posterior part of frontal sutures, 2 other dots further posteriorly; anterior and posterior dot of row smaller and paler than others. Lateral region with a group of 5 small  
492 dots dorsal to white stripe and 2 large dots ventral to stripe; a similar dot laterally on ventral side; distinct brownish areas on white background lateral to gula. Gula white, triangular, dark brown anteriorly; posterior angle broadly rounded; large lateral sclerites fused behind the gula; gular suture absent. Anterior margin of head with a strong, pointed, spine-shaped process near ventral articulation of mandible (Figure 788, C). Setae thin, yellowish or light brown. Median and intermediate anterior-margin setae small, situated close together; lateral seta slightly larger, situated on the suture; anterior frontal seta short, intermediate and posterior frontal setae longer, situated near the tentorial pit lateral to the pattern. Setae 9 and 11 almost equally long, situated medial to eye; seta 10 large; seta 7 slightly shorter; setae 14 and 12 larger, situated in posterior part; setae 13, 15, and 16 moderately long; seta 18 slightly shorter, situated behind the others; ventrally: seta 8 short, light, seta 18 small; the greater length of setae 11 and 13, which are usually short is characteristic for *Leptocerus*.



FIGURES 788 and 789. *Leptocerus tineiformis* Curt.:  
788 - head, dorsal (A), lateral (B), and ventral (C); 789 - labrum.

Dorsal sclerite of labrum (Figure 789) light yellow, with shallow, concave median indentation flanked by setae 1 in form of straight, light spines with blunt apex situated lateral to indentation; setae 2, lighter and larger, spine-shaped, slightly curved; setae 4 smaller, straight, light; setae 3, 5, and 6 yellowish, short, thin; pit situated slightly right of median line. Posterior-angle sclerites short, blunt, dark brown.

Mandibles short, dark reddish brown; distal tooth pointed, strong, divided by ridge from prominent dorsal blade, which has an undulate margin without teeth; ventral blade with 2 teeth on both mandibles; lateral setae short, thin, situated close together.

Sclerites of cardo dark brown, with a short light seta; submentum without sclerite; seta light, large; stipes pale yellow; palps short, middle segment larger than the other 2 segments.

Main color of pronotum (Figure 790) light yellow; wide, irregularly colored stripes ending before posterior margin along the median suture; stripes black at anterior margin, brown in middle, and indistinct, light brown posteriorly; anterior angles and lateral parts brownish; posterior part with 2 oblong dark dots at median suture; groups of dots laterally in

493 each half; posterior margin of sclerite yellow, connected with the pleuron by a thick black line. Anterior margin with 4 strong, moderately long setae in the dark part of the stripe; 8 similar setae situated laterally at anterior margin, among them an anterior-angle seta; 5-6 smaller setae at lateral margin; middle of surface with 4 setae, 2 of them large; several smaller setae laterally.

(492)

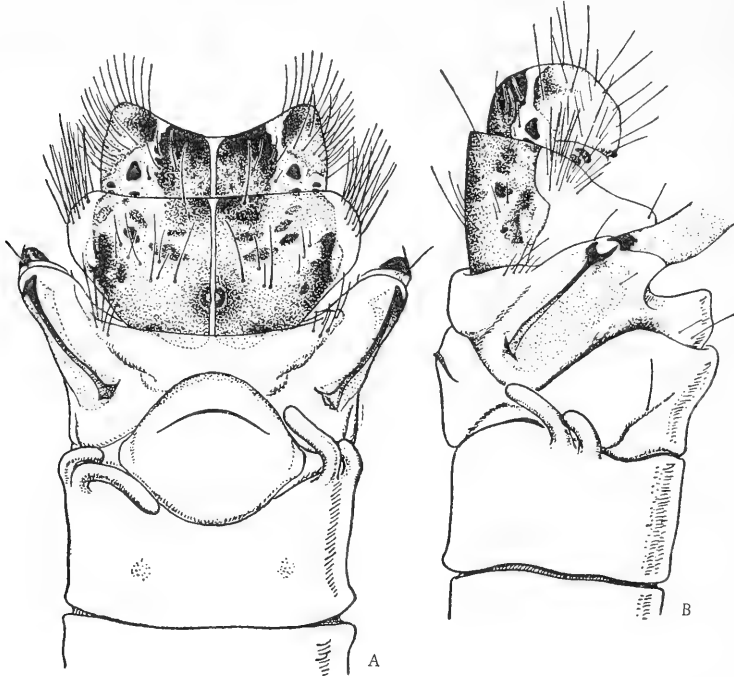


FIGURE 790. *Leptocerus tineiformis* Curt.: Thoracic segments, 1st and 2nd abdominal segments, dorsal (A) and lateral (B)

Mesonotum (Figure 790) light yellow, with a large dot on each side at anterior margin, 2 large dots posteriorly near median suture, and 2 small dots in anterior part; a curved pattern of dots and a transverse row of 3 dots in anterior part on surface of each side. A large seta lateral to dot at anterior margin; 3 large and a small seta in the middle; 3 small setae laterally; anterior-angle group of 20-22 setae situated on membrane near anterior margin.

Metanotum with 5-6 short anterior-margin setae. Propleuron brown, with wide, blackish brown, pleural suture and dark, short margin of episternum; trochantin lobe-shaped, darker at posterior margin, with almost straight, slightly concave anterior margin and rounded apex; seta large, subapical; epimeron brownish yellow, seta situated on suture. Pleurites of meso- and metathorax (Figure 790, B) of same form, the latter much larger; pleural



suture narrow, margin of episternum short; seta situated at end of margin; epimeron light yellow, indistinct, seta large, situated on membrane near margin.

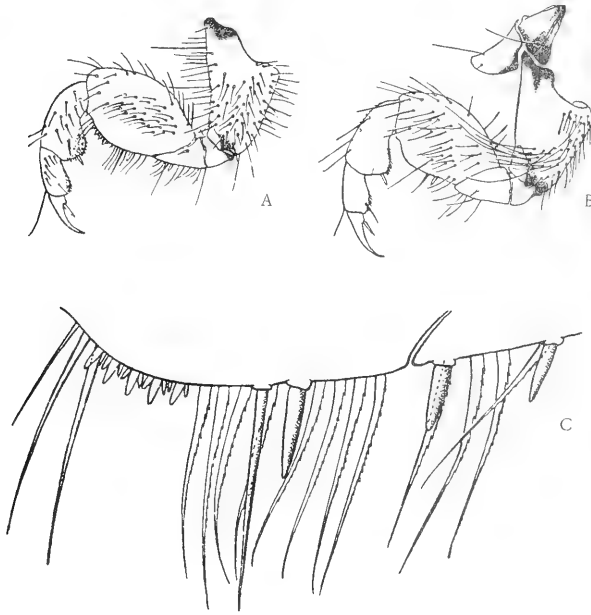


FIGURE 791. *Leptocerus tineiformis* Curt.: Right foreleg, anterior (A), left foreleg, posterior (B), ventral margin of fore trochanter and femur, anterior (C)

Legs yellow, with pale brown, basal spots; ratio of length of legs 68:100:146.

Forelegs (Figure 791) resembling those of *T. bicolor* but with thinner setae. Base of coxa posteriorly with 2–3 large, indistinct, pale brown spots; anterior basodorsal seta moderately long; anterior apical dorsal seta short; posterior apical dorsal seta long; secondary setae anteriorly at dorsal margin and on surface, more numerous than in *T. bicolor*, short, with both primary setae situated among them; ventral and posterior sub-ventral areas with light secondary setae; both distoventral setae thin.

Anterior and posterior seta of trochanter small, spine-shaped; both posterior ventral setae moderately long, close together; anterior basal seta same; apical and subapical setae represented by small, thick, light  
 494 spines; large, partly feathered chaetoids on the trochanter from suture (Figure 791, C).

Femur with thin setae dorsally and subdorsally; primary basodorsal and apical dorsal seta moderately long, situated at the end of the row; short setae anteriorly; anterior primary seta strong, situated near the distal margin; posterior primary seta large, situated subventrally nearer to

middle among long, thin, secondary setae; basal of the 2 primary ventral setae forming a short, light spine, the second spine-shaped, longer and thinner, both situated among large light chaetoids like those on the trochanter; ventral margin distally has a row of 4–5 smaller, sharp, light spines with small spinules nearby; 2–3 short, light setae distally.

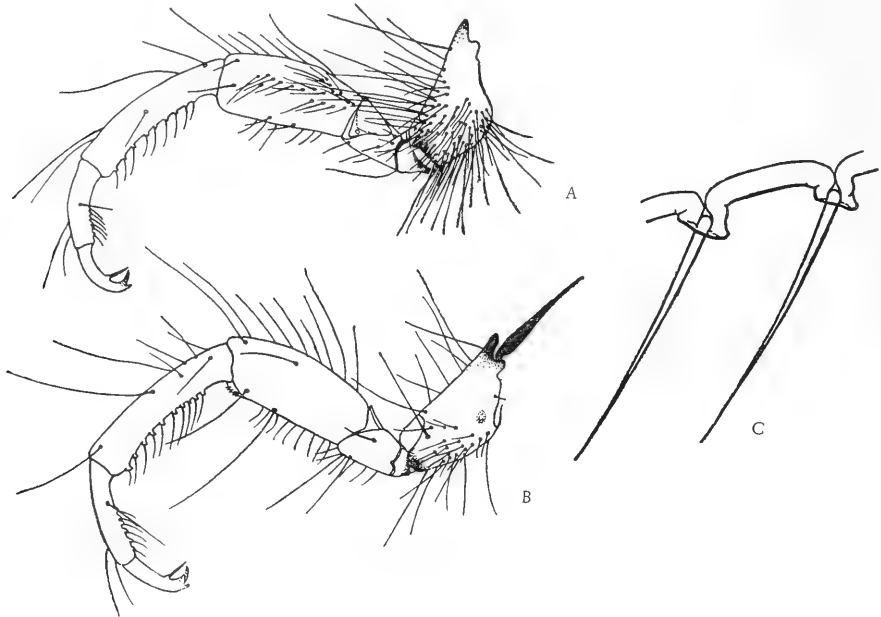


FIGURE 792. *Leptocerus tineiformis* Curt. Midlegs: right leg, anterior (A), left leg, posterior (B), spine-shaped setae at ventral margin of tibia (C)

Setae of tibia thinner and shorter than in *T. bicolor*; both distoventral setae in form of short, light spines. Tarsus with 2–3 thin setae dorsally, with a group of short, sparse setae subdorsally; primary ventral setae situated subapically: the anterior in form of a light spine, the posterior small, strong. Claw strong, with a basal spine.

Midlegs markedly different from those of *T. bicolor* (Figure 792). Coxa with dense, long setae anteriorly, dorsally, and on the surface, all 4 primary setae situated among them, distodorsal seta darker and thicker than others; dorsal side with sparse, long setae posteriorly; ventral side, including subventral areas of distal part, with large, long setae, including both primary distoventral setae.

Trochanter resembling fore trochanter more closely than hind trochanter, in contrast to *T. bicolor*; anterior and posterior primary setae short, dark; apical and subapical of anterior ventral setae, in form of large, light spines; basal seta and both posterior setae long, light; feathered chaetoids at margin shorter and fewer than on forelegs.

Femur straight, slightly shorter than tibia; dorsal side with long, thin, sparse setae, including both primary setae; anterior and posterior primary setae moderately long, situated in distal part, the latter subventrally; short, thin secondary setae in middle of anterior area; primary ventral setae: a long, dark and a short, light seta; light feathered chaetoids in 2 rows along femur.

495 Tibia slightly curved, longer and thinner than femur, with sparse, thin setae dorsally and subdorsally on posterior side; anterior side with a short, strong seta subventrally, with a row of 9, light, spine-shaped setae ventrally, setae situated on a tubercle with a funnel-shaped depression (Figure 792, C).

Tarsus shorter than tibia, 2, thin, primary setae situated one behind the other dorsally in the distal part: one of them short, the other moderately long; a posterior and an anterior primary setae subventrally in the middle, both large, strong, dark; ventral side with 5 setae like those on tibia but smaller, with a funnel-shaped tubercle at base. Claw characteristic, long, thick, bifid, with a subapical seta in form of a large, light spine.

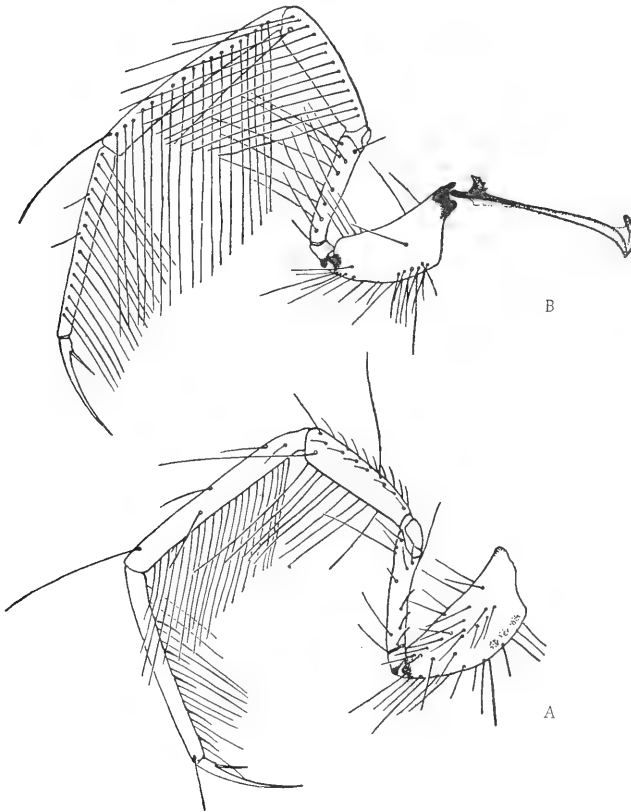


FIGURE 793. *Leptocerus tineiformis* Curt. Hind legs: right leg, anterior (A), left leg, posterior (B)

Hind legs long, with straight, rodlike, narrow segments, including trochanter (Figure 793). Coxa with 3 large, brownish spots anteriorly; near base anterior basodorsal seta light, strong, moderately long, apical dorsal seta slightly longer; 5-6 long, secondary setae situated at margin between primary setae; posterior apical dorsal seta strong, brown, moderately long, situated in about the middle; anterior surface with short to moderately long setae, including both primary setae; moderately long, secondary setae and both primary distoventral setae situated on ventral side and also subventrally in distal part.

Trochanter slightly wider distally; anterior and posterior setae short; 3-4 short, anterior setae situated subdorsally; a row of 6 long setae posteriorly which form beginning of natatorial row; anterior basoventral seta strong, moderately long; apical and subapical setae spine-shaped; both posterior setae situated subapically, long, situated in a row of several, long, sparse secondary setae.

496 Dorsal side of femur with several, short, sparse secondary setae; primary basodorsal seta moderately long, longer than apical dorsal seta; anterior and posterior setae situated at distal margin, the former subventrally; posterior surface with a subdorsal longitudinal row of 12-13 long setae forming part of natatorial row; a similar row of long setae ventrally, including both primary setae.

Tibia longer than femur, with 3-4 short, anterior setae dorsally; a larger seta subapically; a subdorsal natatorial row of 17-18 long setae posteriorly; a similar row ventrally.

Tarsus narrower and slightly shorter than tibia, with shorter setae; subdorsal area with a short strong seta anteriorly, with a subdorsal row of 15-16 setae posteriorly; ventral row with 12-16 setae, 6 of them in form of pointed light spines.

Claw long, slightly curved, with a thin, light, basal seta.

First abdominal segment (Figure 790) short, with wide, dorsal process; a curved row of minute, brown spinules near anterior margin; lateral processes displaced ventrally; disk with spines indistinct, with indistinct yellowish white sclerite.

Gills dorsally only at anterior margin of segment 2, with short, thick, cylindrical filaments, 1 or 2 on each side. Lateral line absent; pleural area of segment 8 with a row of 21-23 sclerotized dots, each with 2 hairlike spinules of different size.

Posterior part of segment 9 with a strong, brown, medioanal seta laterally near posterior margin; a short, thin, lateral seta nearby; small, light setae between intermediate and anterior-margin setae; tergite absent.

Anal legs (Figure 794) short; sclerite "b" white, without pattern; 4 large setae dorsally at distal margin: 2 of them above claw, 2 slightly more basally; a short, brownish seta laterally; short, strong, spine-shaped, blunt setae and small, thin setae basally at median margin; lateral groups of of such setae ventrally. Sclerite "c" with a small, light seta. Claw reddish, with 2 dorsal denticles, one above the other.

Case made of secretion, in form of a straight, elongate, conical tube (Figure 795).

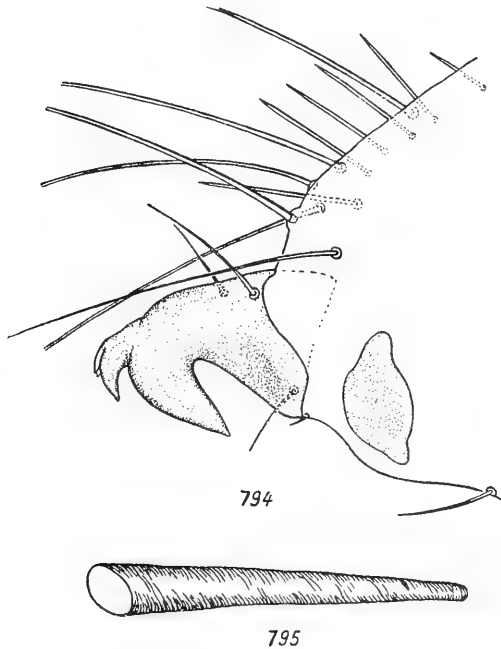
Mode of life and habitats. Among vegetation in stagnant and slowly running waters; often in reservoirs.

Distribution. European USSR, including Caucasus. In addition, mainly Central and Southern areas of Europe.

## 2. *Leptocerus valvatus* Martynov, larva nova

**Full-grown larva.** Length 8.0—8.5 mm. Head pinkish brown dorsally and laterally, whitish ventrally at occipital foramen and on light, lateral stripe. Frontoclypeus with 3 pairs of large dots, anterior pair larger than the others, in contrast to *L. tineiformis*; pattern in posterior part formed by 3 small dots and a large dot before them; posterior angle slightly darker, with a light spot in the middle. A large dot at curvature of suture near tentorial pit lateral to frontoclypeus; 3 dots further posteriorly; the posterior dot larger than the others; 3 dots on each side in area of absent coronal suture; 6 dots behind eye, dorsal to white, lateral stripe, 3 dots ventral to stripe. Ventral surface with a large, brownish dot and a dark brown dot laterally; 2 pinkish brown spots behind gula; gula pinkish brown anteriorly; gular suture absent.

(496)



FIGURES 794 and 795. *Leptocerus tineiformis* Curt.:  
794 - right anal leg, lateral; 795 - larval case.

Main color of pronotum yellowish white; wide stripes with a pinkish brown, anterior part lateral to the suture (lighter than in *L. tineiformis*), posterior part slightly darker; a large dot lateral to median suture in posterior part; 2 large dots situated one behind the other, lateral to the stripe; 2 large dots behind dark, lateral area; several dots in light space in each half; posterior margin light, with a pale pinkish spot and in the middle and, pinkish brown laterally, with a large, black spot.

Mesonotum pinkish yellow, each anterior angle with a group of 20—25 setae on the membrane.

Legs as in *L. tineiformis*; natatorial setae of hind legs dense, strong, golden brown.

First abdominal segment with large dorsal process, with an arc of denticles in form of a thin, brownish stripe; lateral processes with whitish disks; spinules light; sclerites indistinct, yellowish white (Figure 796).

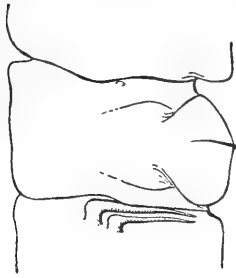


FIGURE 796. *Leptocerus valvatus* Mart. First and second abdominal segments, lateral

Abdominal segment 2 with 2 thick, dorsal gill filaments at anterior margin on each side; filaments normally developed in contrast to *L. tineiformis*, pointed (Figure 796).

Abdominal segment 9 with a thin, reddish brown, medioanal seta laterally at posterior margin and with a short, thin, lateral seta. Sclerite "b" of anal legs light; distodorsal setae as in *L. tineiformis*.

Case 10—11 mm long, made of secretion, straight, brown, elongate, conical, darker and harder than in *L. tineiformis*, with fine, mineral grains among threads of posterior part, which is made earlier.

Mode of life and habitats. Among vegetation in slowly running water.

Distribution. USSR: Maritime Territory and Amur region.

The larva is described from specimens collected in a creek of the Daubikhe River at Kvamuka bee-farm near the village of Yakovlevka, 1 July 1927; 2 specimens, collected by I. I. Sokolov; 19 adults, same day, same locality (Martynov, 1934:254).

## 7. Genus *Adicella* McLachlan

The larva of only one species is known.

Mode of life and habitats. Small running water bodies, mainly springs.

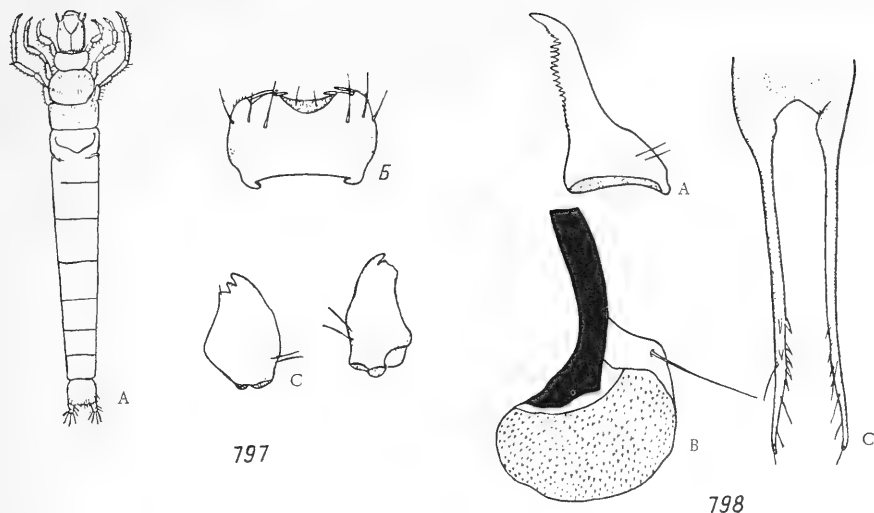
Distribution. Western border areas of the USSR, Caucasus. In addition, Europe, Africa, India, China, Sunda Islands.

### 1. *Adicella filicornis* Pictet

Morton, 1904:82—84, Figures 1—11. — Ulmer, 1909:251, 309, Figure 454b. — Lestage, 1921:Figure 219.

**Full-grown larva.** Length 6—7 mm. Body narrow (Figure 797, A). Head slightly oblong, uniformly reddish brown; gula square, its posterior margin narrower than anterior margin. Antennae slightly wider distally, with a short seta.

Labrum (Figure 797, B) with deep median indentation, setae 1 and 2 curved inward, in form of light spines; seta 4 straight, small, thin; setae 3, 5, and 6 straight, thin, and of about equal length. Mandibles (Figure 797, C) short, massive, with sharp, projecting, distal tooth; dorsal blade of left mandible prominent, with toothless rugose margin; ventral blade of left mandible with one tooth; right mandible with 2 teeth on each blade.



FIGURES 797 and 798. *Adicella filicornis* Pict.:

797 — larva: general view (A), labrum (B), mandibles, dorsal (C); 798 — pupa: left mandible, ventral (A), lateral process of first abdominal segment (B), anal rods (C) (797, A — after Lestage, others after Morton).

Pronotum reddish brown; mesonotum wider than pronotum, with light, indistinct tergite.

Hind legs longer than midlegs, but less long than in other genera; hind tibia undivided.

498 First abdominal segment wider than others; dorsal process high, large; plate with spines of lateral processes with a long, large, distinct black sclerite at base. Gills single, thin. Lateral line with small, thin, light hairs on segments 3–7; segment 8 with a row of dots. Claw of anal legs with a dorsal denticle.

Case conical, strongly curved, smooth, made of small sand grains in the anterior part and of secretion in the posterior part, with thick walls, 8–10 mm long.

**Pupa.** Body narrow, cylindrical. Antennae coiled around posterior end of abdomen. Labrum with anterior median process. Mandibles (Figure 798, A) deeply concave laterally, with sharp, hooklike apex; blade coarsely serrated; lateral setae short. Wing sheaths narrow, reaching posterior margin of segment 6. Midlegs with sparse, natatorial setae.

First abdominal segment with processes with spines at the posterior angles, (Figure 798, B). Plates of holding apparatus on segments 3–7, number of spinules: III:3–4; IV:3–4; V:3+10–12; VI:2–3; VII:2. Lateral line on segments 3–8. Anal rods (Figure 798, C) long, thin, with small spinules in posterior third; setae small, apical.

Case as in larva.

Mode of life and habitats. Springs and brooks, often among moss in oozing springs.

Distribution. USSR: not recorded, but possibly occurring in the western part of the European USSR. In addition, Europe.

8. Genus *Oecetis* McLachlan

**Full-grown larva.** Length 8–14 mm. Head wide; sensilla of antenna shorter than in preceding genera; adfrontal and lateral, light stripes absent; gula small, dark, fused with large, lateral sclerites; gular suture absent.

Labrum wide, with small, deep, median indentation; dorsal sclerite with numerous, small, secondary setae. Mandibles flat, knife-like; ventral blade undeveloped. Maxillary palps thin, long; middle segment formed by fusion of second and third segment, much longer than the other two segments. Galea thin, long, fused with palpifer and with first 3 segments of the palp, adjacent to palp at end.

Pronotum and mesonotum sclerotized; mesonotum narrower posteriorly. Hind tibiae undivided, claw of mid- and hind legs with rudimentary, basal seta in some species.

499 Gills single. Lateral line on segments 3–7. Tergite of segment 9 pale, weakly sclerotized or absent; several secondary setae, in addition to the primary setae on the tergite or on its site in some species. Claw of anal legs with 2, sometimes 3–4 dorsal denticles.

Case made of fine sand grains or of plant fragments, conical, slightly curved in some species.

**Pupa.** Length 8–12 mm. Antennae of male pupae coiled about 4 times around the body. Labrum with teat-shaped, median process and numerous, small, secondary setae, in addition to primary setae. Mandibles curved in the middle; blade coarsely serrated basally.

Wing sheaths reaching to segments 6–7. Natatorial rows of setae present on mid-tarsi and partly on fore tarsi. Gills absent. Lateral line on segments 3–8.

Dorsal processes of abdominal segment 9 large, with 3–4 or more (to 20) strong setae. Anal rods large, long, tapering, apical part much smaller than basal part.

Mode of life and habitats. Mainly stagnant and slowly running, large or small water bodies, littoral and sublittoral of lakes; some species occur in brackish water.

Distribution. European and Asiatic parts of the USSR. Cosmopolitan.

Key to Species

Full-grown larva

- 1 (6). Basal seta of claw of mid- and hind legs normal or almost normal, in form of a short, thin, light spine; case made of plant fragments.
- 2 (5). Claw of mid- and hind legs with pointed, basal spine; ventral side of case not flattened.
- 3 (4). Head pattern variegated, consisting of numerous, large, brown dots; case rough, made of transversely arranged plant fragments of different form . . . . . 4. *O. furva* Ramb. (p. 637).
- 4 (3). Head pattern with less numerous dots; case smooth, made of uniform rectangular fragments in regular spirals . . . . .  
. . . . . 5. *Oecetis* sp. 1 (Lake Kurgal'dzhin) (p. 643)



- 5 (2). Basal seta of claw of mid- and hind legs with blunt, apparently broken apex; case made of small, densely arranged plant fragments, with convex, rooflike dorsal side and flat ventral side . . . . . 6. *Oecetis* sp. 2 (p. 647)
- 6 (1). Basal seta of claw of mid- and hind legs rudimentary, in form of a small tubercle, sometimes absent; case made of mineral particles.
- 7 (8). Head pattern pale, larvae in brackish water . . . . . 2. *O. intima* McL. (p. 632)
- 8 (7). Head pattern distinct, larvae in fresh water.
- 9 (10). Prothorax with several thin secondary setae on lobe of trochantin, in addition to the primary seta; posterior margin of segment 9 only with primary setae . . . . . 3. *O. lacustris* Pict. (p. 634)
- 10 (9). Prothorax with one primary seta on lobe of trochantin; posterior margin of segment 9 with several secondary setae in addition to primary setae . . . . . 1. *O. ochracea* Curt. (p. 625)

Pupa

- 1 (4). Case made of plant fragments; mandibles curved at end, very thin, with slightly concave lateral part basally, blades with large basal denticles.
- 2 (3). Case made of small, transversely arranged particles, posterior part tapering, anterior part sometimes tapering, surface not smooth . . . . . 4. *O. furva* Ramb. (p. 637)
- 3 (2). Case straight, cylindrical, with regular rows of rectangular, obliquely arranged particles . . . . . 5. *Oecetis* sp. 1 (Lake Kurgal'dzhin) (p. 643)
- 4 (1). Case made of sand grains; mandibles regularly curved, less tapering distally, their basal part with straight lateral margin; basal denticles of blade slightly larger than apical denticles.
- 500 5 (6). Anterior margin of labrum with large, long median process; fore and mid tibiae with numerous setae; number of spurs 1, 2, 2; dorsal processes of segment 9 with 9—12 setae . . . . . 1. *O. ochracea* Curt. (p. 625)
- 6 (5). Anterior margin of labrum with short median process; fore and mid tibiae with few setae; number of spurs 0, 2, 2; dorsal processes of segment 9 with 3—4 setae . . . . . 3. *O. lacustris* Pict. (p. 634)

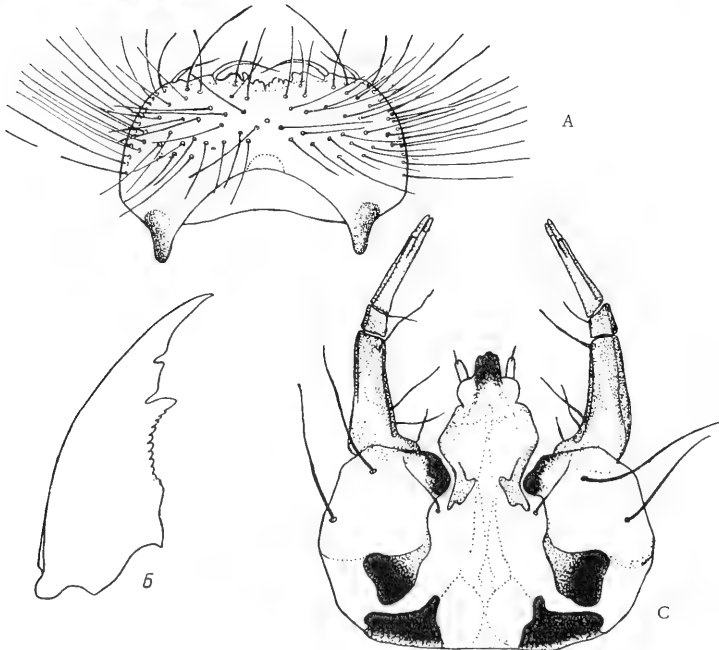
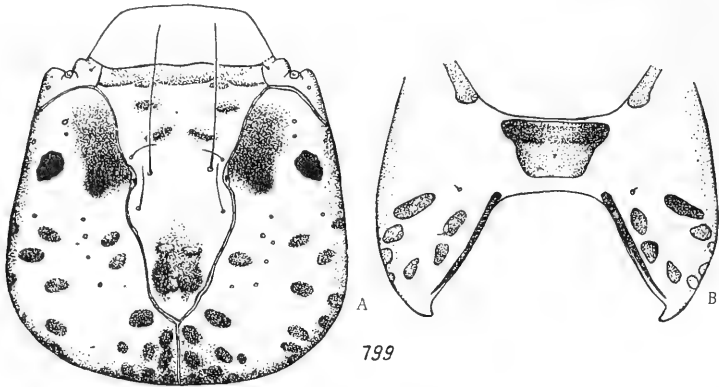
1. *Oecetis ochracea* Curtis

Klapálek, 1893:99—103, Figure 27. — Ulmer, 1903:109—110. — Siltala, 1905: 81—84, Figure 21; 1907:480—482. — Ulmer, 1909:246—247, 308, Figure 452a. — Lestage, 1921:639—647, Figure 221b, c, f, j, n, o. — Lepneva, 1940:193, 210, Figure 147b.

**Full-grown larva.** Length 13—14 mm. Head (Figure 799, A) slightly oblong, pale yellow, with distinct pattern of dots; eyes small, situated some distance from the anterior margin; antennae situated at margin; sensilla thin, light, much smaller than in preceding species, with a small seta. Frontoclypeus

large, wider anteriorly than posteriorly, with 3 pairs of dots; posterior dots larger, formed by 2 fused dots, forming oblique streaks; posterior part with a dark, slightly curved stripe near angle and with 5 small dots; 2 dots before the former. Dorsal stripes short, distinct only anteriorly; 2 large dots further posteriorly; 2 rows of oblong dots lateral to coronal suture, 2—3 of them in a row; lateral stripes replaced by numerous, small dots and some large dots; pale, oblong dots ventrally lateral to occipital foramen. Gula wide, light brown, with a dark stripe at anterior margin; gular suture absent (Figure 799, B).

(501)

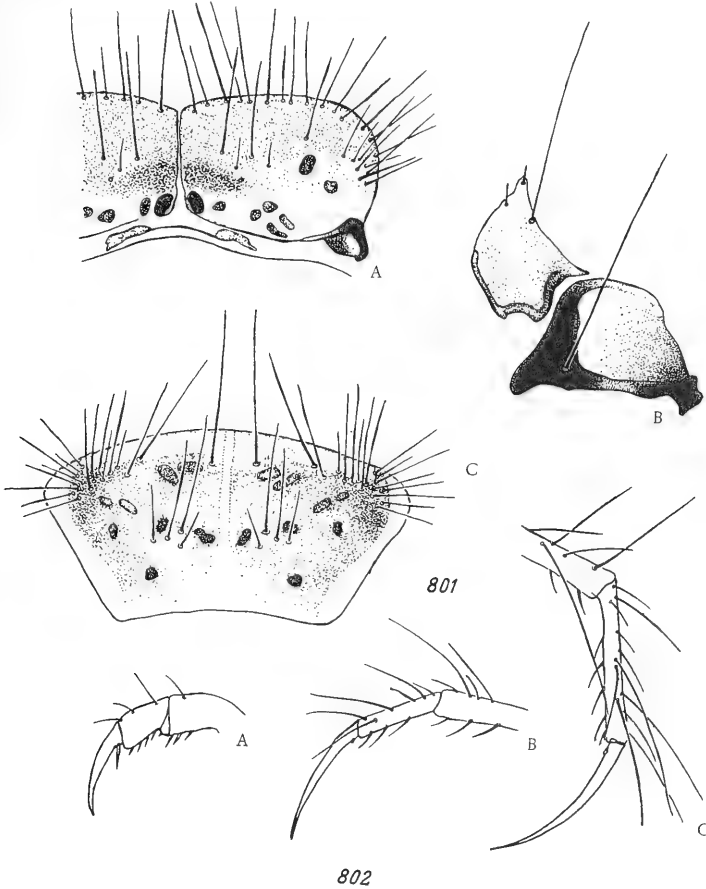


FIGURES 799 and 800. *Oecetis ochracea* Curt.:

799 — head, dorsal (A) and ventral (B); 800 — mouth parts: labrum (A), left mandible, dorsal (B), maxillolabium (C).

Median anterior-margin seta and intermediate anterior-margin seta moderately long, thin; lateral anterior-margin seta situated at margin, small, curved, light; anterior frontal setae small, situated lateral to posterior pair of dots; intermediate frontal setae long, situated before the tentorial pit; posterior frontal setae short, situated behind the tentorial pit. Seta 9 long; seta 11 moderately long, both situated at the anterior lateral angle of dorsal stripe; seta 7 situated lateral to antenna; setae 10 and 14 long, 14 situated at posterior margin of dorsal stripe; setae 12 and 13 shorter and thinner; seta 15 moderately long; seta 16 light, thin, shorter; seta 17 long, brown; these three setae situated posteriorly one behind the other in the adfrontal area. Ventral setae 8 and 18 small (Figure 799, B).

(502)



FIGURES 801 and 802. *Oecetis ochracea* Curt.:

801 - pronotum (A), propleuron (B), mesonotum (C); 802 - distal part of tibia, tarsus, and claw of left foreleg (A) and midleg (B) and right hind leg (C), posteriorly.

Labrum of characteristic form (Figure 800, A); median indentation with finely serrated margin, with 3 large teeth on each side; posterior-angle sclerites straight, short, brown. Setae 1 and 2 represented by thick, curved,

light spines; other primary setae situated among secondary setae at margin and on surface of anterior part.

Mandibles (Figure 800, B) long, narrow, flat, knifelike, without ventral blade; distal tooth sharp; the basal of the 2 teeth of dorsal blade with serrated base; lateral setae relatively long, situated close together.

Sclerites of cardo black; submentum without sclerite, setae thin, light, moderately long; stipes with a large, black, median spot basally; both setae of stipes thin, yellowish; palpifer relatively long, fused with base of galea; maxillary palp thin, long.

Mentum short, brown; ventral sclerites dot-shaped, with small, light setae; labial palps distinct, with small, light sensilla (Figure 800, C).

Pronotum (Figure 801, A) pale yellow, with slightly darker anterior and lateral parts; 2 large dots at posterior margin near median suture; 4 dots laterally; several dots laterally on surface; posterior margin light, with a large, pinkish brown spot laterally and wide, black margin at the articulation with pleuron. A row of long, light setae at anterior margin and rounded anterior angle; 3 long and 4 small setae on surface; a group of thin short to moderately long setae laterally and submarginally.

Mesonotum (Figure 801, C) pinkish yellow, light brownish in some places, with 3-4 large dots at anterior margin; similar dots on the surface in a transverse row of 5 dots on each side; posterior margin wide, light; 3-4 long setae laterally at anterior margin, 17-18 setae in anterior-angle group, surface with 4 setae on each side, 2 of them long.

501 Metanotum membranous, with long median anal seta; anterior-margin seta short, thin; anterior angles with groups of 14-15 moderately long, strong, brown setae.

Propleuron with pointed apex, as in *Athripsodes*; seta dark, strong, nearer to middle of trochantin; seta of epimeron similar, situated on black, pleural suture (Figure 801, B).

Pleurites of meso- and metathorax yellowish, indistinct; pleural suture in form of narrow, black stripe, slightly wider distally; margin of episternum indistinct, brownish; seta situated near end of margin; seta of epimeron situated on membrane behind sclerite; both setae strong, dark, moderately long.

502 Metathorax with a transverse row of golden brown, strong, short and moderately long setae ventrally, 19-21 on each side.

Fore coxa with several, large brownish dots posteriorly; rows of long, golden brown setae dorsally at anterior and posterior margin; primary basodorsal seta longer than the others; both apical setae thick situated at margin of depression; both anterior primary setae moderately long, situated distally; anterior ventral and anterior subventral surface with numerous, large, secondary setae; both primary distoventral setae situated among them.

Trochanter with short anterior and posterior primary setae, the former smaller, dark brown, both situated distally; basal primary seta of the 5 ventral spines long, brown; the 2 following anterior setae in form of brown, strong spine: one of them apical, the other subapical; both posterior ventral setae long; secondary setae few, short, thin, mainly on posterior surface and ventrally, ventral side with 10-12 thin, white chaetoids among setae.

Femur with numerous short and long dorsal setae; apical dorsal of the 2 primary setae larger than basodorsal seta; a row of short and moderately

503 long setae anteriorly; posterior surface with sparse, short setae; anterior and posterior primary setae strong, dark brown, moderately long; the former subapical, the latter at basal margin; ventral setae forming a row of 10–11 short, strong spines, including both primary setae; 9–10 white chaetoids among the spines.

Tibia short, with rounded distoventral process; numerous, thin dorsal and subdorsal setae of various size with 2 primary setae among long setae; anterior surface seta situated subventrally in form of a light, strong, large spine, posterior seta strong, dark brown situated in the middle; primary ventral setae situated close together and represented by large, light spines; a row of small spines further basally; a number of minute chaetoids at ventral margin, a small, light, conical chaetoid and 2 lobed chaetoids with fanlike, feathered apex; smaller, spine-shaped chaetoids ventrally among the large spines.

Tarsus with fewer setae; anterior and posterior primary setae brown, short, strong, situated in distal part in the middle and subventrally; dorsal and subdorsal areas with short to moderately long, thin, sparse setae; 2 moderately long, brown primary dorsal setae among the dorsal setae.

Claw large, strong, longer than tarsus, slightly curved, with straight basal spine (Figure 802, A).

Mid coxa with 4–5 large, brownish dots on posterior surface; rows of large, light brown, strong setae anteriorly and posteriorly on dorsal side; primary basodorsal seta darker, long; both apical dorsal setae situated at margin of depression; anterior primary setae short, dark, situated together with 2–3 secondary setae; ventral side with numerous, long, strong, golden brown setae, including the primary distoventral setae.

Trochanter slightly oblong; anterior seta short, strong; posterior seta larger; the basal of the primary ventral setae long, thin, situated near the suture; apical and subapical setae situated in middle of trochanter, short, strong, spine-shaped; both posterior ventral setae long; secondary setae short, thin, situated on surface and ventrally; ventral side with thin, short, strong, light spines and 11–12 white chaetoids.

Femur straight, with slightly convex dorsal surface; dorsal and subdorsal areas with numerous short and long setae, including a primary basal and a primary apical seta; primary anterior seta moderately long, brown, situated at distal margin; posterior primary seta strong, shorter, situated subventrally like the former; posterior surface with 3–4 short setae; ventral side posteriorly with 2 thin setae at the margin; other ventral setae represented by 12–13 strong spines, including 2 larger spines, i. e., primary setae; small spinules subventrally on anterior side.

Tibia and tarsus straight, rodlike; tibia smaller than femur; tarsus smaller than tibia; setae short and moderately long, situated dorsally and subdorsally; 5 setae of tibia longer than the others; ventral side of tibia with 4 brown spines, the 2 middle spines larger than spines at margin; tarsus with 4–5 smaller spines, 1–2 middle spines larger than the others.

Claw thin, slightly curved, longer than tarsus, with a rudimentary basal seta in form of a small tubercle (Figure 802, B).

Hind coxa slightly smaller than mid coxa, with an anterior and 2 posterior dots; numerous, strong setae of different size situated dorsally at anterior and posterior margin, including 2 long setae: a basodorsal and a posterior apical dorsal seta; anterior apical dorsal seta shorter; anterior surface

with short to moderately long setae basally and subdorsally, both primary setae situated distally and stronger than the others; ventral side with numerous, large setae, longer setae posteriorly; both distoventral setae moderately long, situated among the secondary setae.

Trochanter rodlike, moderately long, with numerous setae, larger setae dorsally and ventrally; anterior and posterior primary setae subdorsal, thin, the latter long; the basal of the 3 primary anterior ventral setae moderately long, the other 2 apical, short, strong; both posterior setae long, situated among long secondary setae.

Femur shorter and only slightly thicker than trochanter; baso- and apical dorsal setae situated in a row of secondary setae; basal primary seta longer than the others; anterior and posterior primary setae situated subventrally, the former long, near basal margin, the latter situated basally, thin, shorter, accompanied by 2–3 thin, moderately long setae; 7–8 small, light, secondary spines further ventrally, among them the primary ventral setae in form of 2 large, brown spines; small subventral spinules anteriorly.

Tibia longer and narrower than femur, with sparse dorsal and subdorsal setae, including several long setae; 2 similar long setae posteriorly; ventral side with 6–7 strong spines, including 3 large spines in the middle; primary setae indistinct among the secondary setae.

504

Number and arrangement of gills of *Oe. ochracea*

Segment	Dorsal	Pleural	Ventral
2	1	1	1
3	1		1
4	1		1
5	1		1
6	1		1
7	1		1
8	1		1

Tarsus shorter and narrower than tibia; dorsal and subdorsal setae denser; ventral side with 5–7 setae, 2 or 3 setae in the middle larger than others.

Claw slightly curved, thinner and longer than on the midlegs, also with a rudimentary basal seta (Figure 802, C).

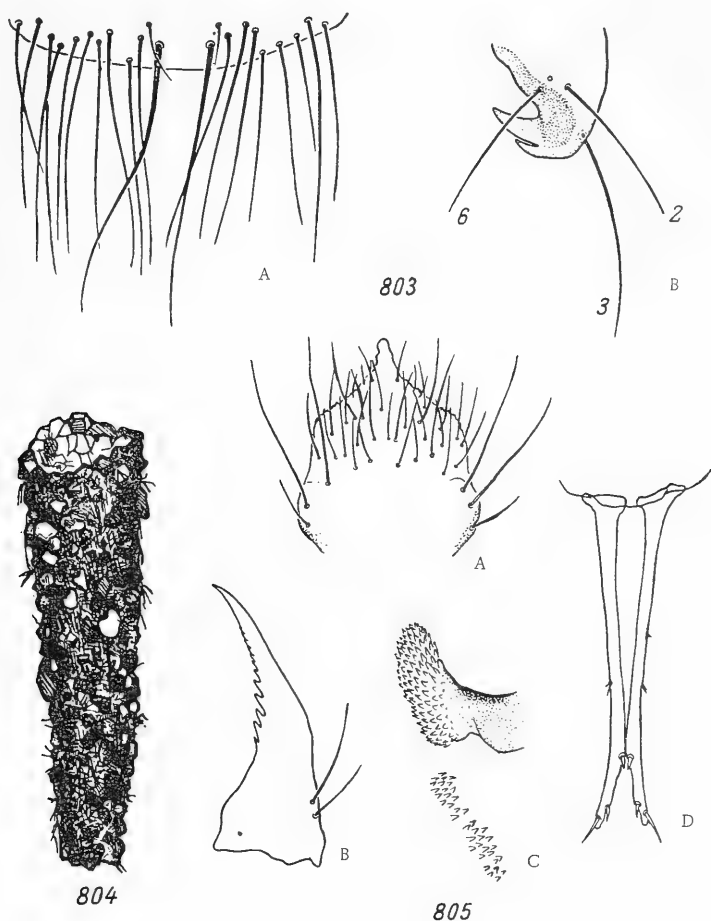
Abdomen slightly narrower posteriorly. Dorsal process of abdominal segment 1 conical, large; lateral processes situated more ventrally than usual; disk with spines yellowish, with a small, black seta and smaller, light seta; dark sclerite absent, replaced by a small, brownish stripe.

Lateral line on segments 3–7, indistinct, with small, pale hairs; segment 8 without sclerotized dots. Gills single, with a thick, long filament on segments 2–8 dorsally and ventrally at anterior margin; segment 2 also with a lateral gill at posterior margin.

Tergite of segment 9 (Figure 803, A) large, brown, sometimes darker at anterior margin; posterior margin laterally with 16–17 setae, including a thick, long, black, medioanal seta; 3–4 similar large, thick setae among the strong, golden brown other setae.

Sclerite "b" of anal legs brownish, narrow; setae at distal margin thick, black, 2–5 long setae above claw and 3 short setae, including a subapical seta at median margin and 2 lateral setae. Sclerite "c" with a short, thin, brown seta. Claw reddish, small, with 2–4 dorsal denticles (Figure 803, B).

Case (Figure 804) slightly curved, tapering posteriorly, made of sand grains, sometimes also with silt particles, smooth; ventral surface slightly flat, made of smaller grains.



FIGURES 803–805. *Oecetis ochracea* Curt.:

803 – posterior part of abdominal segment 9 (A), claw of anal leg (B); 804 – larval case; 805 – pupa: labrum and anteclypeus (A), left mandible, ventral (B), lateral process of 1st abdominal segment (C), anal rods (D).

**Pupa.** Length 10–14 mm. Antennae of male pupae coiled about 4 times around body; antennae of female pupae shorter; first segment large, with several short setae. Labrum (Figure 805, A) with a distinct, pointed process; anterior part with numerous, short, secondary setae and all primary setae; anteclypeus with 2 long and a short (posterior) setae. Mandibles (Figure 805, B) long, curved, narrow distally; blade with 4–5 large teeth at the curvature, serrated distally; lateral setae short, strong, apical dorsal seta larger than ventrobasal seta. Wing sheaths narrow, reaching abdominal segments 6–7. Fore and mid tibiae and tarsi natatorial, with dense, large, thin setae.

First abdominal segment with disk with spines and lateral processes dorsally at the posterior angles (Figure 805, C). Holding apparatus on segments 3–7, plates with the following number of denticles: segment III: 2–3, segment IV: 2–4; segment V: 2–3+6–9; segment VI: 2–4; segment VII: 3–4. Lateral line on segments 3–8, with small, grayish setae. Gills single as in larva, long, presegmental on segments 2–8 dorsally and ventrally, also lateral postsegmental gills on segment 2. Sclerite of segment 9 laterally with small lobe-shaped processes with 9–12 strong, dark brown setae, 2 of them longer and thicker than the others. Rudimentary female genitalia on segment 9 in form of a tubercle divided into 2 parts by a median groove; male genitalia longer; penis sheath short, wide. Anal rods thin, long, slightly curved (Figure 805, D) with small spinules from the base; setae small, light; the first and second seta near the base of apical part, the other 2 setae subapically.

505 Pupal case 11–14 mm long, attached at both ends by ventral disks; anterior membrane with wide round hole; posterior membrane with oblong hole; membranes sometimes surrounded by small plant particles.

Mode of life and habitats. Lakes and ponds, mostly on solid and slightly silted bottom, rarely among vegetation or in the sublittoral; river mouths; reservoirs.

Distribution. The European USSR, the Caucasus, Western and Eastern Siberia, Middle Asia. In addition, Europe, Mongolia.

## 2. *Oecetis intima* McLachlan, larva nova

**Full-grown larva.** Length 5–6 mm. Resembling *Oe. ochracea* but smaller, pale; sclerites yellowish white, without pattern or with sparse, indistinct, pinkish or brownish spots. Head wide, slightly longer than wide; dots on yellowish white background not always distinct; eyes small; sensilla of antenna small, transparent, with small, light seta. Frontoclypeus with wide, brownish, anterior margin; anterior part without dots or with 2 pairs of narrow, indistinct dots, dots of anterior pair more widely separated; posterior angle with 2 large dots situated behind 2 transverse or several small dots. Dorsal stripes absent, replaced in some specimens by a longitudinal row of 4 small dots parallel to the frontal sutures; 2 large dots close to suture near fork; 2 large, longitudinal dots and a pale, indistinct dot lateral to coronal suture; ventral side light; gula wide, smoke brown.

506 Median and intermediate anterior-margin setae long; lateral anterior-margin seta small, indistinct; anterior frontal seta small, thin, situated lateral to intermediate frontal seta; the latter long, situated before tentorial



pit; posterior frontal seta situated behind pit, slightly shorter and thinner. Setae of large, lateral sclerites thin, light, as in *Oe. ochracea*.

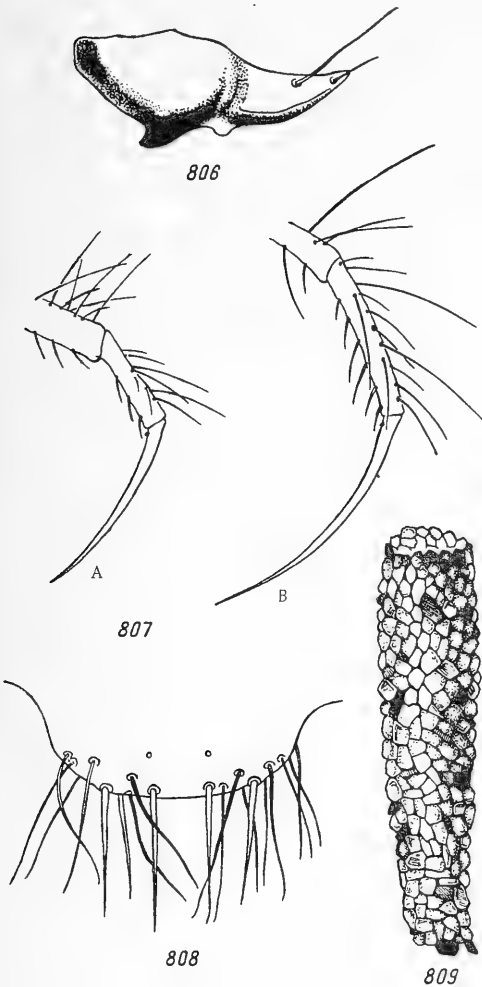
Labrum with 3–4 tubercles in median indentation; setae 1 and 2 in form of large, thick, inward curved, transparent spines; setae 4 situated lateral to indentation; setae 3 at anterior angle, both 3 and 4 short, thin, yellowish; setae 5 and 6 lateral to median indentation, slightly larger than short, strong, secondary, surface setae. Posterior angle sclerites brownish, thick, straight or slightly curved.

Mandibles long, narrow, with large teeth which are serrated at base. Sclerites of cardo reddish brown; stipes with reddish brown basal spot; palpifer and palps as in *Oe. ochracea*.

Pronotum light, whitish yellow, without pattern, sometimes with 2 indistinct, yellowish, posterior spots near median suture; posterior margin laterally with a brownish spot and wide, reddish black, lateral margin; chaetotaxy as in other species of *Oecetis*.

Mesonotum pale, without dots; anterior-margin seta long, situated some distance from margin; a second, longer anterior-margin seta situated closer to margin near anterior-angle group, which consists of 17 setae of different size; medio-anal and lateral surface setae long; intermediate seta short, thin.

Propleuron (Figure 806) with narrow, reddish brown, pleural suture and similar lateral margin of episternum; epimeron light, indistinct, seta at suture strong, large; lobe of trochantin moderately long, narrow distally, with a long seta in the middle. Pleurites of meso- and metathorax as in *Oe. ochracea*; pleural suture pinkish, lighter and narrower.



FIGURES 806–809. *Oecetis intima* McL. larva nova:

806 – propleuron; 807 – tarsus and claw of midleg (A) and hind leg (B); 808 – posterior part of segment 9, dorsal; 809 – larval case.

Legs (Figure 807) as in *Oe. ochracea* in form and chaetotaxy; claws of mid- and hind legs much longer than tarsi; basal seta rudimentary.

First abdominal segment as in *Oe. ochracea* with a large, wide, dorsal process and a pale, small, indistinct sclerite near spinulose disk of lateral processes, which are situated more ventral than usual.

Gills as in *Oe. ochracea*, presegmental on segments 2–8 in dorsal and ventral rows; segment 2 with one postsegmental pleural gill.

Tergite of segment 9 (Figure 808) large, whitish yellow; medioanal seta and lateral seta thick, moderately long, situated near posterior margin, pinkish; intermediate seta and anterior-margin seta almost as long as the former, situated some distance from margin; 5–6 similarly large setae, most of them thin, laterally at margin and subapically; primary anterior-angle seta and 2–3 secondary setae thicker than the others.

Sclerite "b" of anal legs whitish, indistinct; setae large, pinkish; 2 thick setae situated above claw longer than the others; a similar thick, but short, pinkish seta dorsally; 2 thin, moderately long, lateral, distal setae. Sclerite "c" brownish, with a small, thin seta. Claw pinkish, with 2–3 dorsal denticles.

Case straight, with thin walls made of light, loosely cemented sand grains; posterior end slightly narrower (Figure 809).

Mode of life and habitats. Halophilous. The larvae live in brackish water; coast of Caspian Sea (numerous in some places); Aral' Sea; Lake Chelkar in the Urals; Lake Balkhash, and other brackish and salt water bodies.

Distribution. Southeastern part of European USSR; Kazakhstan, Western and Eastern Siberia. In addition, Iran, Mongolia.

### 3. *Oecetis lacustris* Pictet

Klapálek, 1893:107–111, Figure 29.— Struck, 1903:Plate III, Figure 15.— Ulmer, 1903:109, Figure 104.— Siltala, 1905:84–86, 90; 1907:480–482.— Ulmer, 1909:246, 309, Figure 447g.— Lestage, 1921:639–647, Figures 221g, k, 222c.— Lepneva, 1940:210.— Hanna, 1958:21–24.

**Full-grown larva.** Length 8–10 mm; sclerites brighter, ground color yellowish. Head (Figure 810, A) relatively wide; sensilla of antenna small, thin, shorter than anteclypeus; seta small, light. Anterior part of frontoclypeus with 3 pairs of dots, posterior pair with oblong dots closer together; middle and posterior parts of the sclerite with a brownish, median stripe which widens posteriorly and includes 4 large and several small dots. Dorsal stripes distinct, dark brown near anterior branch of frontal sutures; a large, dark dot and 2 large dots along suture further posteriorly; 3 rows of smaller dots lateral to coronal suture; rows of dots on site of lateral stripes; a brownish stripe with small, indistinct, light dots ventrally at occipital foramen; 4–5 large dots lateral to stripe. Setae as in *Oe. ochracea*. Gula dark, reddish brown, smaller than in *Oe. ochracea* (Figure 810, B).

Seta 1 of labrum in form of a light spine. Mandibles as in other species of *Oecetis*, flat on median side, with 2 large teeth, basal tooth with coarse serration, denticles with blunt, light apex. Maxillolabium as in *Oe. ochracea*.

Pronotum (Figure 811, A) whitish at anterior and lateral margin, with a narrow light stripe along median suture; other surface chestnut brown, with large dark brown dots: 2 dots posteriorly at median suture, 4 large dots lateral to dark part; posterior margin light, with a large brown spot in the middle, a chestnut brown area with a wide, black margin near lateral margin. Mesonotum (Figure 811, B) with a wide, light, anterior area with a small seta in the middle and 2 small setae at anterior angle; chestnut brown part with  
 509 2 large, dark dots at anterior margin, 2 on surface and 3 at anterior angle; posterior margin with a light stripe which is wider in the middle and with 2 large dots. Secondary setae less numerous than in *Oe. ochracea*.

(507)

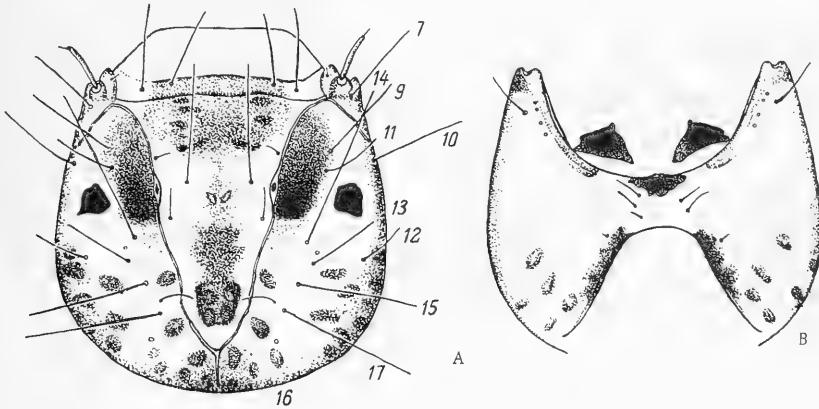


FIGURE 810. *Oecetis lacustris* Pict.: Head, dorsal (A) and ventral (B)

Metanotum with a pale sclerite with 8–9 setae in anterior angle, primary seta and one of the secondary setae larger than the others; a row of 8–9 large dark setae ventrally in each half.

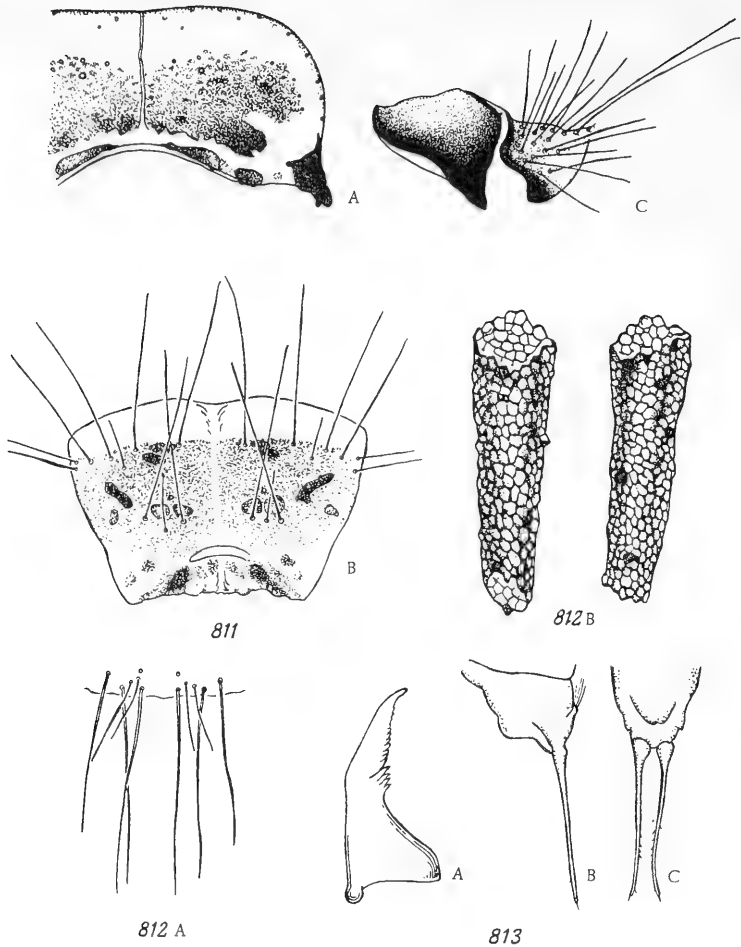
Propleuron (Figure 811, C) short; pleural suture black, episternum chestnut brown, with small, indistinct, light spots and black margin; epimeron light, thin, indistinct; trochantin whitish yellow, wide basally, chestnut brown, with narrow, black margin; 5 setae at anterior margin, including a primary distal seta; 11–12 light, moderately long, secondary setae on surface; setule situated subapically.

Pleurites of mesothorax and metathorax yellowish, narrow, indistinct, with narrow, brownish black, pleural suture; both setae dark, long, situated on the membrane.

Legs as in *Oe. ochracea* in size and form; forelegs light brown; mid- and hind legs brownish yellow. Claw with rudimentary basal seta.

Dorsal process and lateral processes of abdominal segment 1 as in *Oe. ochracea*. Presegmental gills in a dorsal and ventral row on segments 2–8; postsegmental pleural gills only on segment 2. Lateral line on segments 2–7, with small grayish hairs.

Tergite of segment 9 (Figure 812) whitish, indistinct, without spots; secondary setae absent; primary setae large, blackish brown; medioanal seta thicker than the others; lateral and anterior-angle setae shorter; intermediate and anterior-margin setae short, thin. Sclerite "b" of anal legs light, indistinct, with 5 setae, 2 distal setae thicker than the others, situated above claw, median dorsal seta and both lateral setae brownish, moderately long.



FIGURES 811–813. *Oecetis lacustris* Pict.:

811 – pronotum (A), mesonotum (B), propleuron (C); 812 – posterior part of segment 9, dorsal (A), larval case (B); 813 – pupa: right mandible, ventral (A), anal rods of female pupa, lateral (B), ventral (C) (813 – after Klapálek).

Case made of sand grains, smooth, slightly curved, slightly tapering posteriorly; posterior membrane in form of narrow ring with a broad oval hole (Figure 812, B).

**Pupa.** Length 6.5–7.2 mm in male pupae; female pupae 8.4 mm. Antennae of male pupae coiled about 5 times around the body. Median process of labrum shorter and wider than in *Oe. ochracea*. Mandibles (Figure 813, A) slightly wider distally than in *Oe. ochracea*. Wing sheaths narrow, reaching abdominal segments 6–7. Fore and mid tibiae without natatorial setae, in contrast to *Oe. ochracea*; fore and mid-tarsi with dense natatorial setae.

Lateral line on segments 3–8; gills as in larva. Holding apparatus on segments 3–7, number of spinules: segment III: 2–3; segment IV: 2–9; segment V: 2–3+9; segment VI: 2–4; segment VII: 3–4.

Dorsal processes of segment 9 with 4 dark setae, 2 of them smaller than the others. Anal rods long, thin, resembling those of *Oe. ochracea* (Figure 813, B).

Pupal case 8.0–10.5 mm long, made of larger sand grains and plant fragments, almost cylindrical, slightly tapering posteriorly, with coarser surface than in larva; both openings sometimes covered with small plant fragments; membranes yellowish brown. Case attached to plants and stones by large disks.

Mode of life and habitats. Small, eutrophic lakes, littoral and sublittoral; on solid bottom of sand and detritus or silt; sometimes among plants; in creeks or mouths of slow rivers; small floodplain water bodies; ponds.

Distribution. Northern, western, and central parts of the European USSR; Western and Eastern Siberia, Maritime Territory, Amur region. In addition, Europe, northeastern China.

#### 4. *Oecetis furva* Rambur

Klapálek, 1893:103–107, Figure 28.— Lampert, 1900:205, Figure 81.— Struck, 1900:Figure 43; 1903:Plate III, Figure 14.— Ulmer, 1903:108–109, Figures 32, 42.— Thienemann, 1905b:534–537.— Siltala, 1905:82–90.— Ulmer, 1909:245–246, 309, Figures 372, 454a.— Lestage, 1921:639–646, Figures 221a, d, e, m, 222B, 223.— Lepneva, 1940:210.

**Full-grown larva.** Length 7.5–9.8 mm. Head almost as long as wide, brownish, lighter around eyes (Figure 814). Eyes small. Sensilla of antenna thin but long; seta small, light. Frontoclypeus with short, anterior and long, posterior part; anterior part occupied by 3 pairs of large dots arranged in a circle, dots of posterior pair larger than the others; a small, dark stripe at anterior margin before dots; posterior angle with 2 dark spots situated one behind the other (sometimes fused), each spot with 2 large, blackish dots. Dorsal stripes pale; 3 dots along posterior part of frontal suture, 2 anterior dots very large; several small, pale dots at base of setae between and before large dots. Four to five dots lateral to coronal suture, large dots on site of lateral stripes and ventrally in posterior part. Gula brownish, trapezoidal, large, separated from occipital foramen by a narrow, light stripe.

Median anterior-margin seta longer than the others; intermediate anterior-margin seta situated in the angle, large; lateral anterior-margin seta small, thin; anterior frontal seta short, curved inward; intermediate frontal seta moderately long, larger than the others, both latter setae situated lateral to large dot of posterior pair; posterior frontal setae small, thin. Setae 9 and 11 long; seta 7 slightly shorter; seta 10 larger and thicker than 7; seta 14 situated near large dot, long, thick; seta 12 much smaller; setae 13, 14, and 16 situated one behind the other further posteriorly near dorsal stripe; seta 17 large. Ventral side: seta 8 small, light; seta 18 smaller, setuliform.

Labrum wide, short, golden yellow, with a brownish spot near median pit; anterior margin with a small, median indentation with small, indistinct tubercles at margin; setae 1 and 2 in form of thick, transparent spines close to anterior margin; other setae short, strong, golden yellow. Mandibles (Figure 815) dark brown, with 2 teeth on serrated blade. Sclerites of cardo small, reddish brown; stipes with reddish brown, basal spot.

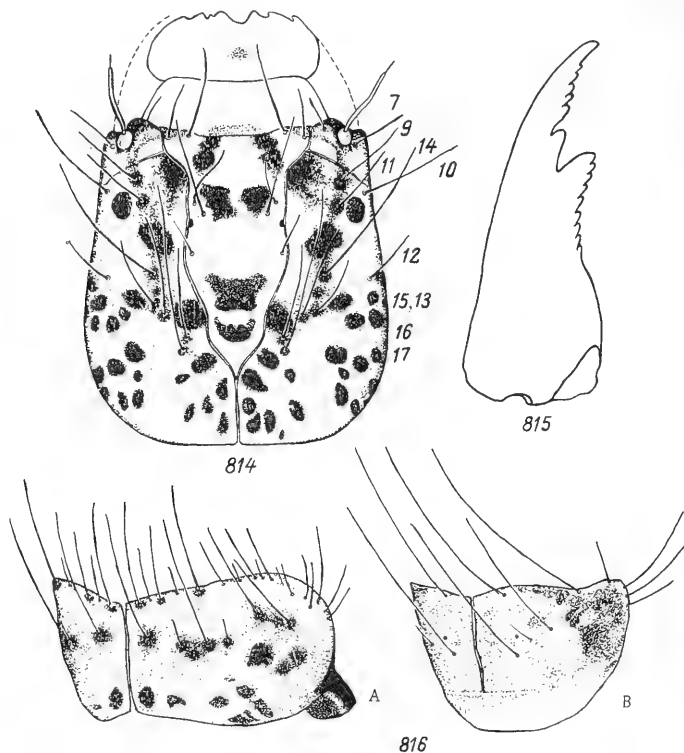


FIGURE 814-816. *Oecetis furva* Ramb.:

814 - head, dorsal; 815 - left mandible, dorsal; 816 - pronotum (A) and mesonotum (B).

Pronotum (Figure 816, A) yellow in its greater part, with brownish areas 511 in middle, and laterally; dots large, distinct; posterior margin narrow, light, with a chestnut brown spot laterally and a broad black lateral margin. Anterior part of pronotum with 3-4 small, narrow, dark dots close to margin; large, blackish brown dots, some of them on darker background on anterior surface, near posterior margin and laterally. Mesonotum (Figure 816, B) indistinct in pale specimens, brownish in dark specimens, with large dots in anterior angles, posteriorly and laterally; both anterior-margin setae very long; both large, surface setae also long, dark, with a short, light brown seta between them; anterior-angle group with 2 short and 2 moderately long setae. Metanotum with long medioanal setae; anterior angle with 3 long setae and 2 short setae.

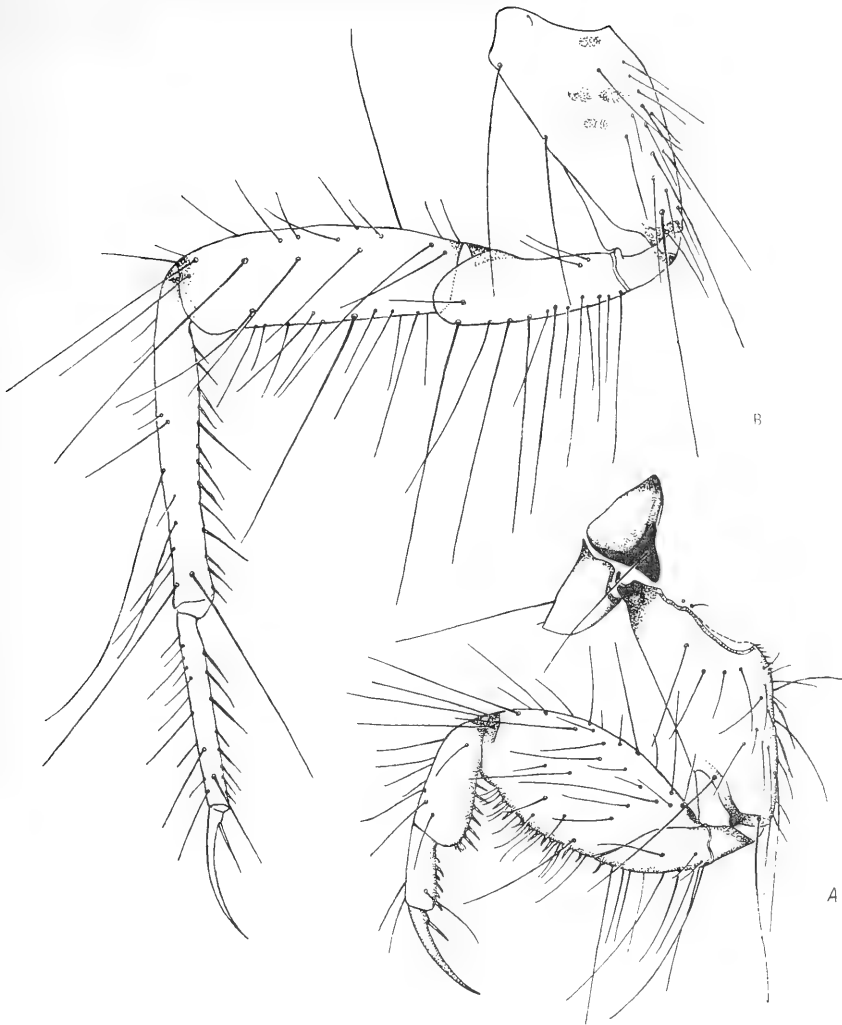


FIGURE 817. *Oecetis furva* Ramb. Left legs, posterior: foreleg and propleuron (A), midleg (B)

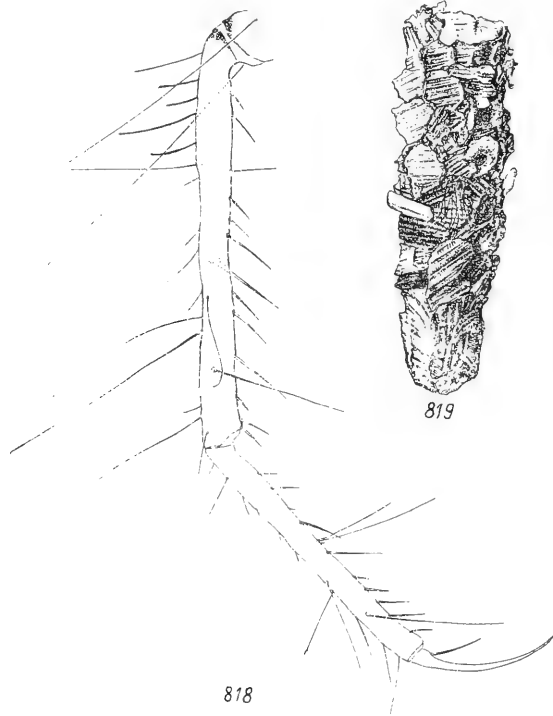
Propleuron (Figure 817, A) brownish; pleural suture mainly reddish brown, margin of episternum reddish brown; epimeron indistinct, seta long, dark, situated near suture; trochantin large, with brown basal margin, seta black, strong, situated near distal margin, setule subapical. Pleurites of mesothorax and metathorax distinct, with narrow, reddish brown, pleural suture and long, black setae.

Mid- and hind legs longer than in *Oe. ochracea*.

Forelegs (Figure 817, A) as in *Oe. ochracea*; coxa with large distinct dots laterally, with less distinct dots at base on anterior side; anterior basal seta and anterior apical dorsal seta strong, of about equal length and sparse, with thin, secondary setae between them; posterior distodorsal seta very long, much longer than anterior seta; anterior surface with a group of

several short setae, including 2 thicker primary setae; ventral secondary setae thin, moderately long; posterior distoventral primary seta strong, long.

Anterior seta of trochanter short, strong: a thin, secondary seta situated slightly more basally; posterior primary seta longer and thinner; primary basoventral seta long, strong; 2 other anterior setae represented by strong spines, one apical and one subapical; both posterior setae long, dark, longer than basal seta: ventral side with a row of thin, secondary setae and sparse, white chaetoids together with primary setae.



FIGURES 818 and 819. *Oecetis furva* Ramb.:

818 - tibia, tarsus, and claw of the left hind leg, posterior; 819 - larval case.

Femur with short and moderately long, thin setae dorsally and subdorsally, basodorsal seta and apical dorsal seta longer than the others; anterior surface with a row of 5-6 short setae, subapical primary anterior seta larger and stronger than the others; posterior surface with short to moderately long setae, a long, strong, primary posterior seta subventrally in basal part; ventral side with a row of 11 small spines closer to anterior margin, spines alternating with primary setae, one of them in form of a large spine; thin, white chaetoids in addition to spines.

Tibia short, distoventral process less developed than in *Oe. ochracea*; small lobe-shaped spinules apically and subapically; setae moderately long and short, dorsally on anterior surface, several thin setae posteriorly;



primary distal setae including a posterior subventral seta in form of a large, thick, strong spine and a similar but smaller anterior ventral seta; a row of small, light spines in addition to primary setae ventrally. Tarsus with 5 thin, moderately long setae, including 2 apical setae dorsally; anterior subventral seta forming a thick, strong spine as on tibia, but smaller; posterior surface with dark, short, strong subapical seta. Claw large, slightly curved, with a short, strong spine at base.

513 Midlegs (Figure 817, B) resembling hind legs more closely than in *Oe. ochracea*. Coxa slightly oblong, with large, brownish, basal dots laterally. Basodorsal seta and posterior apical dorsal seta long; anterior apical dorsal seta shorter; several, long and small, secondary setae dorsally; anterior surface with a group of 3–4 setae, including 2 moderately long, primary setae; ventral and subventral setae numerous; both distoventral setae large, situated among secondary setae.

Anterior seta of trochanter strong, moderately long; posterior seta thin; 2 posterior basal setae dorsally, a row of secondary setae anteriorly; basoventral seta and both posterior ventral setae long, strong; 2 anterior ventral setae smaller, situated among short and long, secondary setae, some of them in form of small, light spines; sparse, white, hairlike chaetoids in addition to setae.

Number and arrangement of gills of *Oe. furva*

Segment	Dorsal	Pleural	Ventral
2	1	1	1
3	1		1
4	1		1
5	1		1
6	1		1
7	1		1
8	1		0

Femur with a long basodorsal and a long apical dorsal primary seta, the latter among almost equally large, secondary setae; sparse setae further basally at dorsal margin; sparse, long setae subdorsally; ventral side with setae of different length, small, light spinules and light chaetoids.

Tibia with a long, strong, primary subapical seta posteriorly; a similar large, dark seta situated in anterior subdorsal area in the middle of the tibia; thin, sparse setae dorsally and subdorsally, among them several moderately long, thin setae; a row of 12–13 strong, light spines, including 2 large spines ventrally.

512

Tarsus with shorter setae; posterior surface with a strong, dark subapical seta: a similar anterior subdorsal seta in the middle; ventral side with 10–11 thin spines, one of them larger than the others. Claw thin, moderately long, slightly curved; basal seta in form of a thin, light spine.

Hind coxa narrow, moderately long, only slightly wider in basal part; basodorsal seta and posterior apical dorsal seta long; anterior apical dorsal seta shorter: secondary dorsal setae sparse; anterior surface with short setae basally and in the middle, including both primary setae; ventral side with numerous, large setae, especially in the middle; both distoventral setae long.

Trochanter rodlike, almost as long as femur; anterior and posterior setae large, situated more distal than usual: both ventral posterior primary setae and anterior basal seta long; short and moderately long, strong setae, including 2 anterior primary setae in the distal part. Femur straight, rodlike; basodorsal primary seta and apical dorsal primary seta long, strong; anterior and posterior setae the same; both ventral setae situated among secondary setae; secondary setae short to long, along whole femur, mainly in the distal part. Tibia narrow, longer than femur; distal part with a long, dorsal seta and 2 subdorsal setae, an anterior and a posterior; 2 large setae close together in the middle anteriorly: dorsal side with a longitudinal row of sparse, short setae and several moderately long, thin setae; ventral side with 11–12 light, small to large spines. Tarsus more than half as long as the tibia, chaetotaxy as on the mid-tarsus (Figure 818). Claw thin, slightly curved, longer than on midlegs; basal seta in form of a thin, light spine.

First abdominal segment with large dorsal process; lateral processes displaced ventrally, with light disk with spines and an indistinct, dark sclerite. Lateral line on segments 3–7, with small, light hairs; segment 8 without sclerotized dots. Gills on segments 2–8.

Postsegmental pleural gill of segment 2 thin, smaller than the others; segment 8 only with dorsal gills.

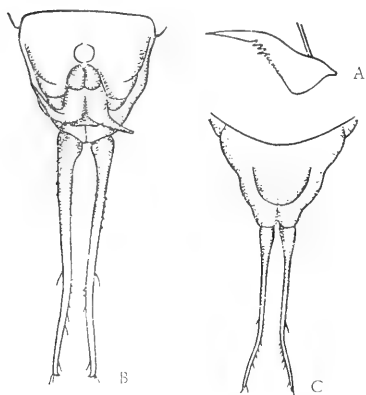
Tergite of segment 9 white, indistinct; medioanal and lateral setae thick, long, pinkish brown; intermediate and anterior setae short, thin.

Sclerite "b" of anal legs yellowish; distal part with 2 long setae above the claw and 2 shorter and thinner setae laterally; a large, thick seta and 2 thin, short setae dorsally; sclerite "c" very small. Claw pinkish brown, with 2 dorsal denticles.

Case made of plant fragments, more or less smooth, with large, round posterior opening (Figure 819).

**Pupa.** Length 7.0–9.2 mm in male pupae, 9–11 mm in female pupae; body

narrow. Antennae thin, coiled around body about 5 times in male pupae, 3.5 times in female pupae; proximal segment almost as long as head. Labrum small, with blunt, wide anterior median process. Mandibles



514 FIGURE 820. *Oecetis furva* Ramb.  
Pupa: left mandible, ventral (A), genitalia and anal rods of male pupa (B) and female pupa, ventral (C) (after Klapálek).

(Figure 820, A) slightly concave laterally, blade serrated, with 3 large denticles in the middle; lateral setae short, close together.

Wing sheaths narrow, long, anterior sheaths reaching abdominal segments 7-8. Tibiae without natatorial setae: fore and mid-tarsi natatorial, with dense rows of setae.

Gills as in larva, larger on anterior than on posterior segments. Holding apparatus on segments 3-7; number of denticles: segment III:2-4; segment IV:2-5; segment V:2-5+15-18; segment VI:2-6; segment VII:2-4. Lateral line thin, with small, grayish setae on segments 3-8. Processes of segment 9 with 4 dark setae in the male pupa, 2 of the setae small, much shorter than the other 2. Anal rods as in *Oe. ochracea*, thin, long, basal part almost 3 times as long as apical part: 3 median spinules at curvature in the male pupa: one seta distal to spinules on left rod, 3 such setae on right rod, one seta laterally at curvature, 3 subapical setae; the median setae and spinules at curvature are slightly more numerous in female pupa (Figure 820, C). Penis sheath bilobed, lobes of genitalia long, rodlike (Figure 820, B).

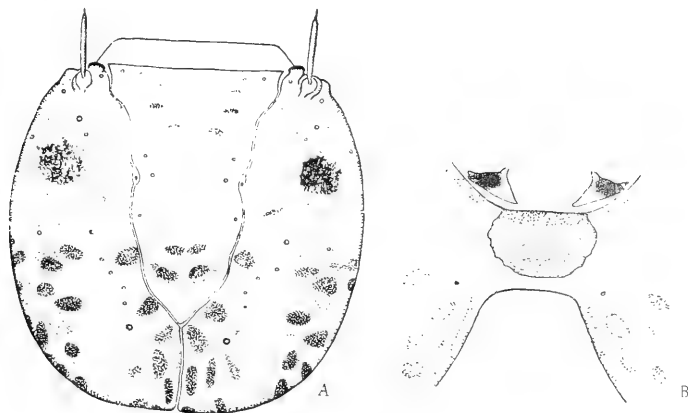


FIGURE 821. *Oecetis* sp. 1, larva nova: Head, dorsal (A) and ventral (B)

Case to 12 mm long, straight, ends sometimes slightly tapering, made of plant fragments; anterior membrane with a round hole, posterior membrane with a wide transverse slit. Attachment by disks at both ends.

Mode of life and habitats. Usually in vegetation in small, sunlit water bodies; sometimes numerous in ponds.

Distribution. Northwestern, central, and southern parts of the European USSR, Ciscaucasia, Western Siberia (rare), Maritime Territory. In addition, Central and Northern Europe, Iran.

##### 5. *Oecetis* sp. 1, larva nova\*

**Full-grown larva.** Length 8-9 mm. Head (Figure 821, A) mainly light brown, with whitish yellow periocular and anterior lateral areas. Anterior part of frontoclypeus with 3 pairs of dots, those of posterior pair closer together; posterior angle with 2 large dots and a group of small dots.

\* Lake Kurgal'dzhin, 20 June 1950, 2 larvae, 1 pupa, collected by S. K. Tyutenkov.

Dorsal stripes absent or indistinct (brownish), with 2 large, dark dots and 2 indistinct, pale dots along posterior part of frontal suture; rows of 2 and 3 dots and one dot between them lateral to coronal suture; large dots laterally and in posterior ventral part of head. Gula wide, brownish (Figure 821, B).

Pronotum light yellow, mesonotum whitish yellow; dots pinkish brown, setae dark (Figure 822). Metanotum membranous; medioanal setae long; anterior angles with 5 setae, 2 of them long, the other 3 short, thin; metasternum with 3 long, strong, black setae on each side.

Propleuron (Figure 822, C) with lobe-shaped trochantin, as in *Oe. furva*; long, black seta situated in about the middle, setule light.

Claw of mid- and hind legs with thin, light basal spine; claw of hind legs very thin, slightly curved.

Gills on segments 2-7.

- 515 Postsegmental pleural gill of segment 2 small, thin, covered in fixed specimens by presegmental ventral gill of segment 3; segment 7 without ventral gill.

Tergite of segment 9 large, whitish yellow, with long, thick, pinkish brown, medioanal and lateral setae posteriorly; anterior-angle seta also long but thinner; intermediate seta and anterior-margin seta short, thin, situated some distance from margin.

Sclerite "b" of anal legs whitish yellow; setae reddish brown; 2 thick setae above claw: one of lateral setae thick; median dorsal seta and second lateral seta thin, shorter. Claw pink, with 2 large, dorsal denticles.

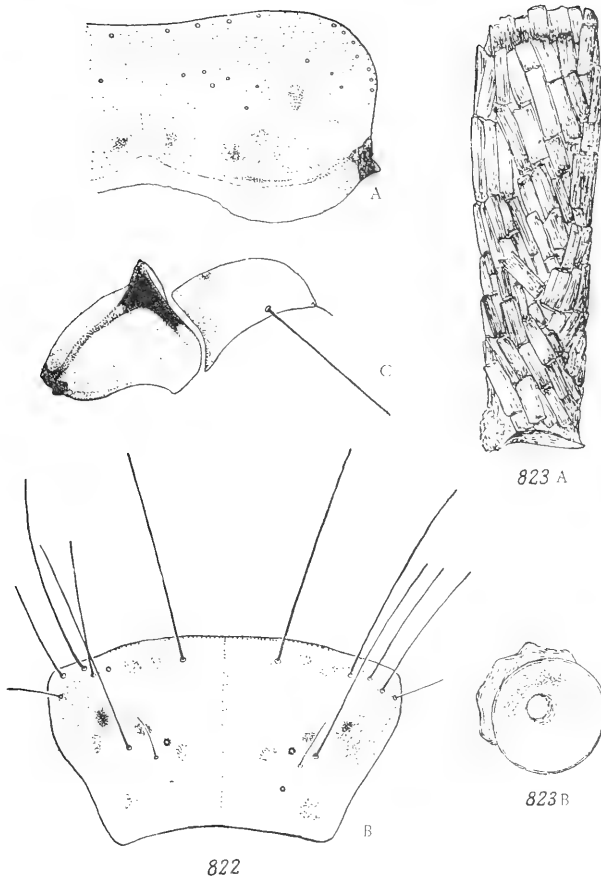
Number and arrangement of gills of *Oecetis* sp. 1

Segment	Dorsal	Pleural	Ventral
2	1	1	1
3	1		1
4	1		1
5	1		1
6	1		1
7	1		0

Case conical, slightly curved, made of symmetrical, rectangular plant fragments in oblique rows which converge dorsally and ventrally near the median line; large fragments interspersed with algae, which form whole posterior part of case made by the young larva.

**Pupa.** Length 10.5 mm in male pupa. Antennae coiled about 4 times around posterior end of body. Labrum rounded, with large, median process. Mandibles as in *Oe. furva*, concave laterally between apical and basal part; median blade serrated, 3 basal teeth larger than the others; lateral setae strong, dark.

Wings reaching abdominal segment 7. Mid tibiae without setae, tarsi with dense natatorial setae.



FIGURES 822 and 823. *Oecetis* sp. 1, larva nova:  
 822 — pronotum (A), mesonotum (B), propleuron (C); 823 — pupal case  
 (A), posterior opening of case (B).

Holding apparatus on segments 3–6; number of spinules: segment III:2–3; segment IV:3–4; segment V:3–4+21–23; segment VI:3–4; spinules of postsegmental plate in 2 rows, an anterior row of 10–11 large spinules and a posterior row of 11–12 small spinules.

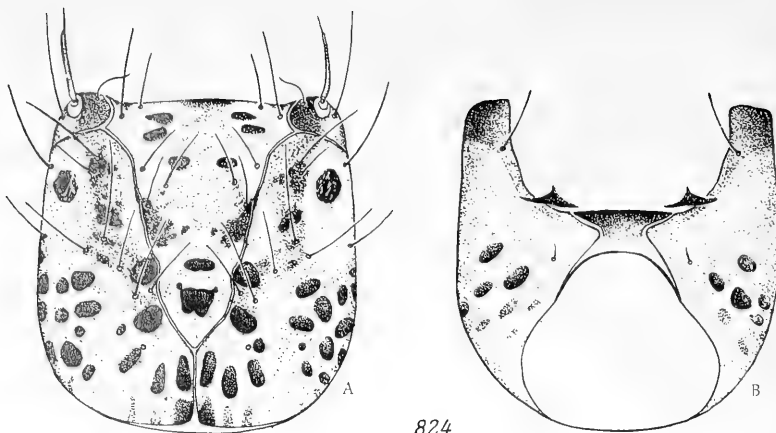
Processes of segment 9 large, each with 4 dark setae.

Anal rods thin, long, thick at base, slightly curved between long, basal and short, apical part, with hooked apex directed ventrally; 3 median spinules between basal and apical part on right rod, 2 on left rod; apical part with 2 spinules on right rod, one on left rod; right rod with 3 light setae in basal part and at beginning of apical part, left rod with 4 such setae; 2 subapical setae.

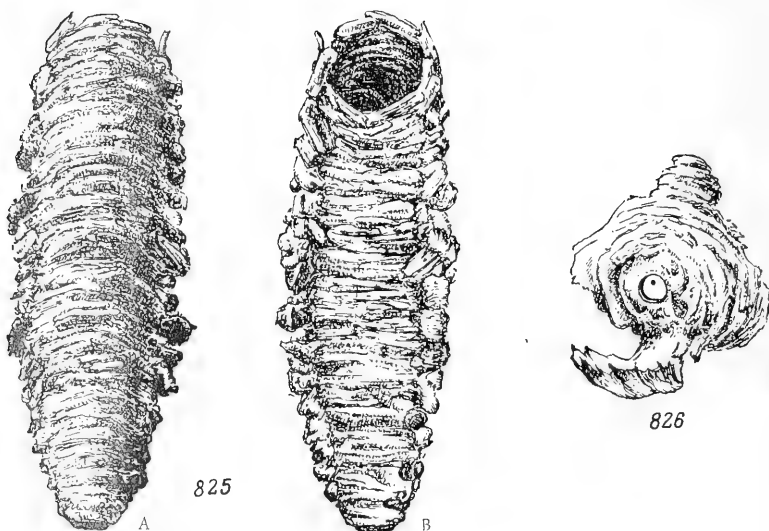
Pupal case (Figure 823) shorter, almost straight, not tapering posteriorly made of large plant fragments; posterior membrane with round hole.

Mode of life and habitats. Lakes with brackish water, in vegetation.

Distribution. USSR: Middle Asia. Not recorded outside USSR.



824



825

826

FIGURE 824-826. *Oecetis* sp. 2, larva nova:

824 - head, dorsal (A) and ventral (B); 825 - larval case, dorsal (A) and ventral (B); 826 - posterior end of pupal case.

## 6. *Oecetis* sp. 2, larva nova\*

**Full-grown larva.** Length 6-7 mm. Head (Figure 824, A) slightly longer than wide; ground color yellow; dots distinct, reddish brown. Frontoclypeus with a small, dark, median stripe at anterior margin; middle of 3 pairs of dots in anterior part situated closer to anterior pair; diverging brownish stripes behind posterior pair of dots; a light brown spot near tentorial pit; 2 dark spots in posterior angle, each spot with a pair of distinct, reddish

\* Described from collections from a canal of the Khora River near Khabarovsk, 8 August 1949, on snags, 2 specimens collected by I. M. Levanidova.

brown dots. Dorsal stripes pale, differing from those of *Oe. furva* in having 2 small, indistinct, dots only in anterior part and a larger stripe; 2 large, dark dots further posteriorly along suture. Oblong dots, 2 or 3 in a row lateral to coronal suture; large dots on site of lateral stripes and laterally on ventral side. Gula large, golden brown, with dark brown anterior margin. Setae thin, brownish (Figure 824).

518 Labrum golden brown; median depression shallow, with 4 small tubercles. Mandibles reddish brown, darker basally, slightly concave laterally between the basal and apical part; basal of the 2 teeth on median blade much larger than the small subapical tooth; lateral setae light. Sclerites of cardo large, black; area of submentum membranous, white, setae light brown, moderately long. Stipes wide, yellowish, with a large, blackish brown, basal spot and a reddish, median stripe; basal seta slightly shorter than apical seta. Mentum brownish.

Pronotum yellowish at margin, with a wide, brownish, transverse area in the middle; dots reddish brown, not very distinct; posterior margin light, with a wide, black lateral stripe and a dark, transverse stripe. Anterior margin and anterior angles with more numerous secondary setae than in *Oe. furva*; medioanal surface seta strong, moderately long, dark brown; lateral seta also long but lighter and thinner; intermediate seta thin, large.

Mesonotum grayish, pale, with 2 indistinct dots at anterior margin; 2 paler dots at anterior angle and at lateral margin; 3 indistinct dots on surface. One long seta situated between dots at anterior margin, another similar seta lateral to these dots; 3 smaller setae at anterior angle: medioanal seta and lateral seta very long; intermediate seta also long.

Metanotum with 5 setae in anterior angles, among them one primary and one secondary seta longer than the others; medioanal surface seta moderately long.

Propleuron, as in *Oe. furva*, with wide lobe-shaped trochantin; seta subapical, dark; setule situated at base of a small, light, distal process.

Legs as in *Oe. furva*; claws of mid- and hind legs as in *Oe. furva*, thin, long; basal seta in form of small, light spine. Mid tibia with 11-12 large, light setae at ventral margin; tarsus with 6-7 ventral spines. Hind trochanter, femur, and tibia with dorsal and subdorsal rows of long setae almost as dense as in natatorial rows of *Leptocerus tineiformis*; tarsus with a ventral row of 7-8 light spines.

Gills on segments 2-7.

Tergite of segment 9 thin, pale; medioanal seta and lateral seta thick, long, dark reddish brown; anterior-angle seta also long but slightly thinner and lighter; intermediate seta and anterior-margin seta moderately long, thin.

Anal legs short. Sclerite "b" mainly light; 3 thick, dark reddish brown setae situated close together and a short, light seta dorsally; a dark, thin, moderately long seta laterally and distally. Claw pinkish, with 2 dorsal denticles.

Case made of small plant fragments, tapering posteriorly, with convex dorsal and flat ventral sides, resembling the case of *Athripsodes annulicornis* or *A. excisus*; plant fragments on dorsal wall projecting laterally, forming a ridge which separates ventral wall; posterior end with broad, oval, transverse hole (Figure 825).

**Pupa.** Case as in larva; attachment at both ends by a large disk with a short, thick stalk; posterior opening with a membrane with a round hole which is much smaller than in larva (Figure 826).

Mode of life and habitats. Snags, canals with a slow current.

Distribution. USSR: Amur region.

X. Family BERA EIDAE Wallengren

**Full-grown larva.** Small, 4–10 mm long; head and thoracic segments relatively wide; abdominal segments tapering posteriorly.

Frontoclypeus with rounded sides; anterior part much wider than posterior part; a foldlike comb with higher anterior and lower posterior part lateral to articulation of mandibles. Antennae situated at end of fold; sensilla with membranous apex and a subapical seta; eye situated at posterior end of fold. Ventral side without gular suture; gular area slightly darker.

Labrum wide, short. Mandibles massive, with small, blunt teeth; a brush in median depression of each mandible. Submentum with 2 sclerites; maxillary palps short, with wide segments.

- 519 Pronotum entirely sclerotized; mesonotum with thin, sometimes incomplete, light sclerite; both segments with numerous, secondary setae. Metanotum membranous. Midlegs and especially hind legs long, thin; all legs with numerous secondary setae.

Species living in humid biotopes without dorsal and lateral processes on the first abdominal segment and gills; aquatic species have normally developed processes and gills with 2–9 short filaments. Lateral line absent; segment 9 without tergite.

Anal legs wide, large, partly fused basally; area "b" with reduced sclerite, a teat-shaped or conical membranous process with a long, thick, dark apical seta dorsally at apex.

Claw of characteristic form, with large, thick, basal part and numerous secondary setae, which is rare in Trichoptera; apex of claw with one or 2 dorsal denticles.

Case made of sand grains, conical, smooth, slightly or markedly curved; posterior membrane with a wide, central hole.

**Pupa.** Body narrow, nearly cylindrical; antennae of male pupae almost reaching posterior end of body, antennae of female pupae shorter. Labrum rounded anteriorly. Mandibles with almost straight or curved distal part, and serrated inner side. Wing sheaths narrow, reaching about middle of abdomen. Mid-tarsi with natatorial setae, or bare, or with sparse, short setae. Holding apparatus absent or little developed; gills as in larva, small or absent.

Anal appendages short, lobe-shaped in species living outside water in aquatic forms, thin, rodlike, long.

Case resembling that of larva, usually slightly shorter, attached at anterior end; anterior membrane with narrow curved slit at ventral margin; posterior membrane as in larva or with a wider hole.

Mode of life and habitats. Small brooks and springs; in water among moss or humid leaves.

**Distribution.** Western part of European USSR; Caucasus; Middle Asia. In addition, Europe, Iran, Australia, North America.

Key to the Genera

Full-grown larva

- 1 (4). Mandibles without lateral distodorsal chaetoids; hind tarsus shorter than tibia, both segments with long secondary setae; gills absent.



- 2 (3). Area "b" of anal legs with a small teat-shaped process near the distodorsal seta posteriorly . . . . . 1. **Berea** Steph. (p. 649)
- 3 (2). Distodorsal process of anal leg high, narrow, conical; distodorsal seta thick . . . . . 2. **Ernodes** Wall. (p. 657)
- 4 (1). Mandibles with lateral distodorsal chaetoids at the end; hind tibia as long as tarsus, secondary setae of tibia small, restricted to distodorsal area; gills present . . . . . 3. **Beraeodes** Eaton (p. 659)

Pupa

- 1 (4). Distal part of mandibles straight, relatively wide, slightly curved at apex; mid-tarsus bare or with sparse setae; gills and holding apparatus absent; anal appendages short, wide at the base; occurring outside water, among humid detritus or moss.
- 2 (3). Length 5–6 mm; length of case 6–7 mm; western part of European USSR . . . . . 1. **Beraea** Steph. (p. 649)
- 3 (2). Length 4 mm; case length 4–5 mm; Caucasus . . . . . 2. **Ernodes** Wall. (p. 657)
- 4 (1). Distal part of mandibles narrow, sickle-shaped; mid-tarsus with natatorial setae; gills and holding apparatus present; anal appendages rodlike, long; small brooks . . . . . 3. **Beraeodes** Eaton (p. 659)

1. Genus **Beraea** Stephens

520 **Full-grown larva.** Light, length 5–7 mm. Head and pronotum reddish yellow or brownish yellow. Mandibles with a dense brush in median depression. Gills absent. Area "b" of anal legs with short, teat-shaped process near the large seta.

**Pupa.** Distal part of mandibles straight, wide, with slightly curved apex. Mid-tarsus bare or with sparse, small setae. Gills and holding apparatus absent. Anal appendages short, lobe-shaped, with knifelike posterior margin.

**Mode of life and habitats.** Near springs, outside water, in moss and in coarse, humid, plant detritus.

**Distribution.** European USSR, Middle Asia. In addition, Europe, North America.

Key to Species

Full-grown larva

- 1 (2). Head and pronotum yellow, or orange yellow; basal brush of chaetoids in median depression of right mandible longer than on left mandible . . . . . 1. **B. pullata** Curt. (p. 650)
- 2 (1). Head and pronotum brownish red; basal brush of chaetoids of about equal length on both mandibles . . . . . 2. **B. maurus** Curt. (p. 654)

## 1. *Beraea pullata* Curtis

Morton, 1886:146, 148-149. — Ulmer, 1903:285-286, Figure 2; 1909:244, 305-306. — Lestage, 1921:944, 953-954. — Thienemann, 1923:183-186, Figure 7. — Lepneva, 1940:210. — Nielsen, 1942:414-428, Figures 64-76. — Hickin, 1959:85-87, Figure 21.

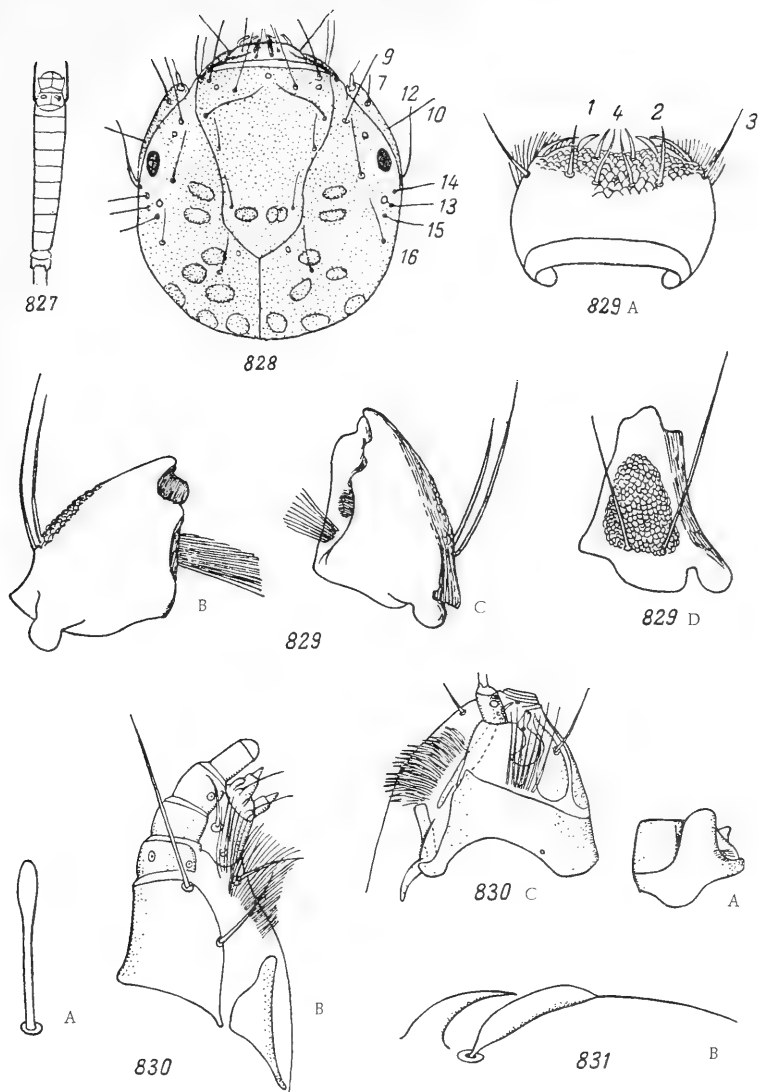
**Full-grown larva.** Length 6.0-6.9 mm (Figure 827). Head (Figure 828) reddish yellow, with indistinct, large, light dots; antennae situated on dorsal process of fold; eyes in a light area near posterior margin of fold. Median and intermediate anterior-margin setae of frontoclypeus short, strong; lateral seta longer, thin, procumbent; anterior frontal seta similar, intermediate and posterior setae short, light. Setae 9 and 11 (Figure 828) of about equal length (rare condition) and distant from each other; seta 7 situated on fold behind antennae; setae 10 and 12 slightly longer than 7, situated lateral to eye, seta 12 thick, curved anteriorly; setae 13, 14, and 15 small, thin, close together; setae 16 and 17 short, strong; ventral seta 8 light, with feathered apex; seta 18 small, spine-shaped.

Anteclypeus short. Labrum (Figure 829, A) with shallow median depression, rounded laterally; dorsal sclerite and anterior third tuberculate; posterior angle sclerites short, wide. Setae 1 and 2 situated near anterior margin, seta 4 situated medially some distance from margin, all 3 setae small, in form of small spines; seta 3 short, strong, situated in anterior angle; setae 6 and 5 spine-shaped, situated near posterior margin of tuberculate area.

Mandibles (Figure 829, B, C, D) massive, wedgelike, tuberculate laterally, without transverse groove; in addition to the distal tooth, each blade of left mandible with 2 teeth, basal tooth of dorsal blade in form of a wide, rounded process; median depression of right mandible with a brush of long chaetae, median depression of left mandible with a group of 12 short chaetae at the base, with 2 rows of small, flattened chaetoids apically in the depression; lateral setae situated basally behind tuberculate area; ventral seta longer and thinner than dorsal seta.

Sclerites of cardo transverse, setae large, especially lateral seta. Basal seta of stipes large; apical seta short, club-shaped (Figure 830, A). Palpifer (Figure 830, B) long, both setae situated on sclerite; segments of palps short, first 2 segments with open sclerites; galea broadly cylindrical, with large setae and sensillae. Mentum (Figure 830, C) in form of wide semicircle, membrane with 7 strong, short setae on each side anteriorly; ventral sclerites oblong, seta well developed; palpiger like a horseshoe, labial palp with 2 large sensillae; labial lobe domelike; concentric grooves around opening.

Pronotum (Figure 831, A) mainly reddish yellow, with projecting, lobe-shaped anterior angles; posterior angles produced in form of a light, whitish plate which is curved ventrally and surrounds epimeron; surface with a folded semicircular ridge from base of anterior-angle process toward anterior margin; surface also with minute spinules and numerous, secondary setae, about 200; setae at anterior angles with sausagelike basal part and very thin apical part (Figure 831, B). Mesonotum whitish, thin, covered with small secondary setae. Metanotum membranous, with a few secondary setae at anterior margin, at anterior angles, and in posterior part.



FIGURES 827-831. *Beraea pullata* Curt. (after Nielsen):

827 - larva; 828 - head, dorsal; 829 - labrum (A), right (B) and left (C) mandible, ventral and right mandible, lateral (D); 830 - maxillolabium: distal seta of stipes (A); palpifer, galea, and maxillary palp, lateral (B); mentum and labium, lateral (C); 831 - pronotum, lateral, diagrammatic (A), spinule and seta of anterior angle of pronotum (B).

Propleuron reddish yellow; trochantin small, lobe-shaped, without setules; primary seta small; epimeron weakly sclerotized, with one primary and 6-11 small, secondary setae.

Mesopleuron and metapleuron light yellow, with a short, black groove on pleural suture; mesopleuron with 2 primary setae (on episternum and epimeron) and 19–25 secondary setae; metapleuron without secondary setae, with a primary seta on episternum; epimeron without setae.

Legs relatively short; hind legs longest, about 0.3 of length of body; ratio of length of legs 84:100:123. Fore- and midlegs mainly reddish yellow, hind legs yellowish; legs with numerous secondary setae.

Fore coxa (Figure 832, A) with distinct, dorsal groove and shallow, distodorsal indentation. Anterior surface with thin, hairlike chaetoids and 2 large primary setae; primary basodorsal seta long; anterior apical dorsal seta small, strong, posterior apical dorsal seta situated in a row of 12–16 long setae; thin and long setae ventrally and subventrally on posterior surface; both primary distoventral setae long, posterior seta thicker than anterior. Trochanter of all legs with incomplete basal suture, indistinct on posterior surface; distal part long, anterior primary seta short, strong, posterior seta in form of a small, curved spine; basal part with large secondary setae ventrally, a row of short, strong spinules further apically, among them 3 primary ventral setae; distal seta in form of a short, blunt spine.

Femur short, with a row of thin, moderately long secondary setae, dorsally among them both primary setae; anterior seta long, thin, situated in a group of 8–12 similar secondary setae; posterior primary seta situated subventrally in the basal part, short, spine-shaped; posterior surface with numerous, thin secondary setae; a row of thin, sharp spinules ventrally, among them both primary setae in form of short, blunt, yellow spines.

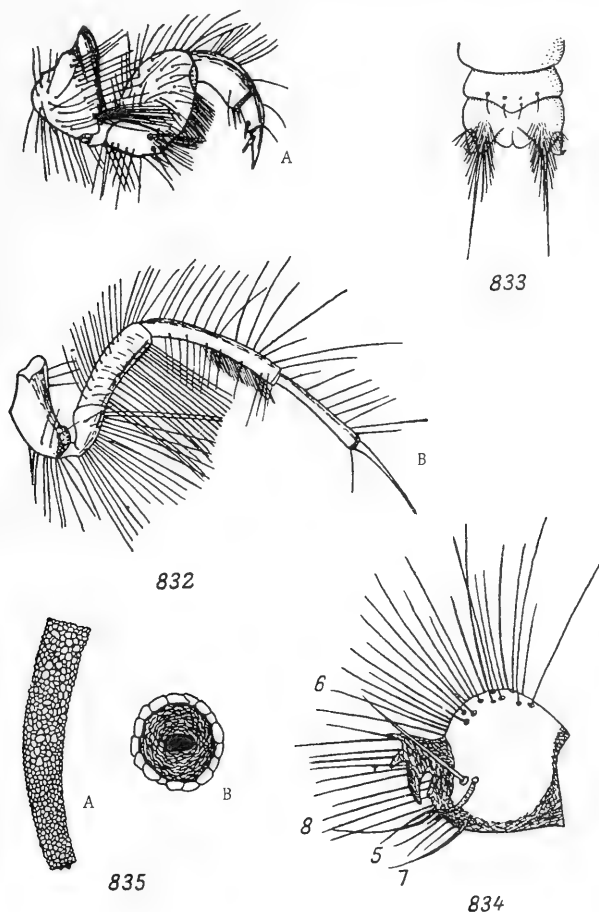
Tibia slightly curved, with 6–8 short secondary setae and one primary seta dorsally near the base, the other primary seta situated apically and dorsally; anterior seta spine-shaped, subdorsal; posterior seta subventral; both distoventral setae in form of short, strong spines. Tarsus without secondary setae; primary dorsal setae short; ventral setae thin, in form of small, yellow spinules. Claw strong, with a basal spine.

Mid coxa with numerous secondary setae in a posterior, dorsal row and a large group situated on ventral, on posterior, and partly on anterior side; both anterior primary dorsal setae strong, long; posterior seta similar, situated among the secondary setae; one primary anterior seta; posterior distoventral primary seta shorter and thicker than anterior. Trochanter shorter than on forelegs; posterior primary seta spine-shaped, yellow; ventral surface with long, thin secondary setae in addition to primary setae, which include 3 thick, long setae.

Femur rodlike, slightly curved, with numerous, short, thin setae dorsally and subdorsally, including both primary setae; anterior seta moderately long, 5–8 secondary anterior setae; primary posterior seta short, situated subventrally at distal margin; ventral surface with about 30 long, thin setae, among them a short, basoventral seta. Tibia narrow, not longer than femur, with 16–20 thin, long setae dorsally and subdorsally, with a subventral row of 3–5 thick, long setae posteriorly, primary posterior seta situated subapically; ventral side with a row of thin chaetae; both primary setae forming short strong subapical spines. Tarsus without secondary setae, the primary setae situated subapically, 3 of them short, thin, the 4th anterior seta in form of a thick spine. Claw thin, curved, with a strong, basal seta.

Hind coxa (Figure 832, B) smaller than on the other legs; posterior apical dorsal seta and anterior basodorsal seta thin, moderately long; 1–2 secondary setae near anterior seta; anterior apical dorsal seta small; ventral and posterior subventral area with 7–11 secondary setae of different length; anterior primary distoventral seta long; posterior seta small, spine-shaped. Trochanter ventrally with 20–25 long, straight, secondary setae and primary setae, including 2 large, posterior setae; a row of small, light spinules among setae in middle of segment; posterior primary seta small, thin.

(523)



FIGURES 832–835. *Beraea pullata* Curt. (after Nielsen):

832 – foreleg (A) and hind leg (B), posterior; 833 – abdominal segments 8 and 9, dorsal; 834 – claw of right anal leg, lateral; 835 – larval case, lateral (A) and posterior (B).

Femur rodlike, shorter and thinner than on midlegs. Dorsal side with 30–33 long, thin setae; anterior surface with one primary and 7–12 secondary

523 setae; posterior surface with short, thin spinules and a posterior subventral primary seta; 30–31 thin, long setae ventrally, among them both primary setae. Tibia narrow, much longer than femur, with 16 long, thin setae, including 4 primary setae dorsally and with short, thin setae and a row of small spines ventrally. Tarsus thin, straight, with 8–10 setae, including 4 primary setae dorsally. Claw thin, slightly curved, with a small, basal seta.

Abdominal segment 1 without dorsal or lateral processes; anterior part with lateral rows of large, paired spinules. Gills and lateral line absent. Dorsal setae of segments 1–7 small, thin; pleural setae of segment 1 relatively large, one of them larger than the other; segments 2–8 with 2 small, primary pleural setae and small secondary setae situated in anterior half of segment 2, on whole of segment 3, on greater part of segments 4–7, and in posterior half of segment 8 (Nielsen, 1942:423–424).

Abdominal segment 9 without tergite; medioanal seta and anterior-angle seta situated near posterior margin and larger than the others.

524 Anal legs (Figure 834) divided by a longitudinal fold into a median and a lateral lobe. Sclerite "b" in form of narrow basoventral stripe; distodorsal seta of area "b" long, thick, almost twice as long as anal leg, situated at apex of a "support" – a teat-shaped membranous process of the posterior margin; other setae thin, 53–59 in number, situated near distal seta in posterior part. Sclerite "c" in form of small triangular plate; seta small, yellow.

Sclerotized part of claw (Figure 834) with a narrow, membranous, lateral cross-stripe subventrally; ventral and median sides almost entirely membranous; distal part strongly sclerotized, dark brown, with 2 dorsal denticles. Secondary setae situated in a fan dorsally, on median side near apex and ventrally between setae 7 and 8; primary setae 1, 2, and 3 long, situated dorsally among secondary setae. Seta 5 short, strong, situated on membrane near seta 8; setae 7 and 8 long, curved, light; seta 6 thick, long, situated on sclerite near the end of membranous cross-stripe.

525 Case (Figure 835) 6–8 mm long, slightly tapering posteriorly; anterior margin straight, without dorsal process; posterior membrane with a wide, elliptical slit.

**Pupa.** Case as long as in larva, attached at anterior end by broad, loosely woven ligaments; anterior opening covered by a large-holed, outer membrane; inner membrane 0.1–0.2 mm from anterior end, dense, with a narrow, curved slit at ventral margin; posterior membrane as in larva or narrower, with a wider hole.

Mode of life and habitats. Springs, helocrene springs, edge of limnocrene and rheocrene springs, among humid plants and detritus. Feeding on microphytobenthos, especially mycelium of fungi.

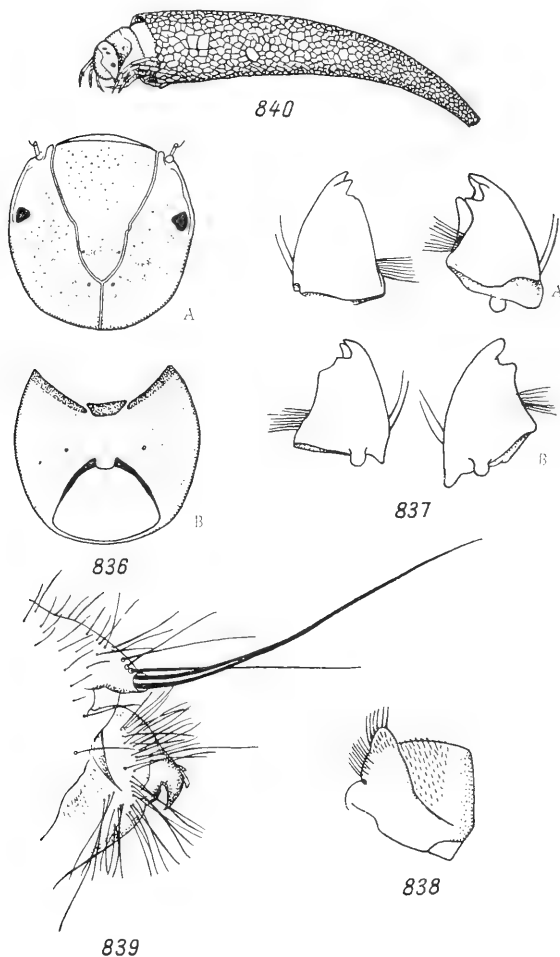
Distribution. Western part of the European USSR (Latvia, Leningrad region, western part of Ukraine). In addition, Europe.

## 2. *Beraea maurus* Curtis

Morton, 1890:231–233, Plate II, Figures 1–8. – Ulmer, 1903:96. – Thienemann, 1905b:529–530, 547, 553, 555, Figures 52–56, 109. – Ulmer, 1909:243–244. – Lestage, 1921:942, 953–954. – Thienemann, 1923:181–186, Figures 2, 5, 6; 1925:50, Figures 21. – Hickin, 1959:87–88, Figures 11–20.

**Full-grown larva.** Length 6–7 mm. Form of body as in *B. pullata*; head darker, reddish or reddish brown (Figure 836). Teeth of mandibles (Figure 837) less blunt, dorsal blade of left mandible with one tooth near distal tooth, ventral blade with 2 teeth; right mandible with one large and one small tooth on dorsal blade and one tooth on ventral blade; median depression of each mandible with a basal brush of long chaetoids, those on right mandible slightly denser. Submentum with 2 sclerites which are wider in middle; a short, strong seta on membrane near anterior margin.

(524)

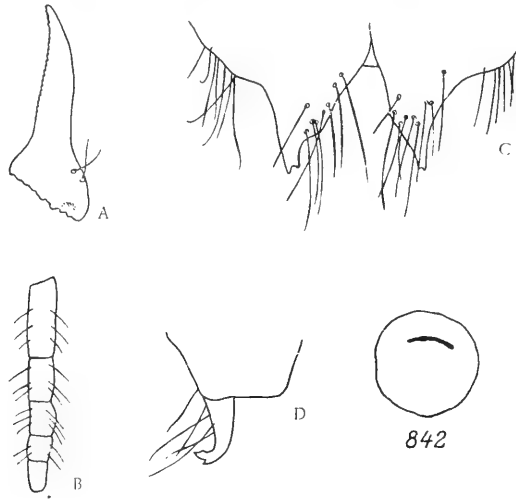


FIGURES 836–840. *Beræa maurus* Curt.:

836 – head, dorsal (A) and ventral (B); 837 – mandibles, dorsal (A) and ventral (B); 838 – pronotum, lateral; 839 – left anal leg and claw, lateral; 840 – larva in case (836, 838, 840 – after Hickin; 837 – after Morton; 839 – after Thienemann).

Pronotum (Figure 838) reddish brown or reddish, its form as in *B. pullata*, also with projecting anterior angles. Mesonotum, metanotum, and legs as in *B. pullata*. Ratio of length of legs 64:100:120.

Gills and lateral line absent. Teat-shaped process of anal legs with a strong seta at apex which is much smaller and about half as long as neighboring thick seta (Figure 839). Claw as in *B. pullata*, with 2 denticles. Case as in Figure 840.



841

842

FIGURES 841 and 842. *Beraea maurus* Curt.: Pupa (after Thienemann):

841 — right mandible, dorsal (A), mid-tarsus (B), anal lobes, dorsal (C), left anal rod, lateral (D); 842 — membrane of anterior opening of case.

**Pupa.** Length 5–6 mm. Body narrow, with transverse labrum. Distal part of mandibles (Figure 841, A) relatively wide, slightly curved at end, inner side serrated; lateral setae situated close together at base, short. Mid-tarsus bare with sparse setae (Figure 841, B). Holding apparatus little developed; segments 3–6 with small presegmental plates, each with a small hook directed posteriorly; postsegmental plate of segment 5 with 2 (or 3) hooks directed anteriorly.

Anal appendages (Figure 841, C) short, wide at base, irregularly triangular in dorsal view, tapering at end, in form of a small, sclerotized, forked process curved dorsally (Figure 841, D); appendages and process with strong, dorsal setae.

526

Case as in larva; anterior membrane with narrow, curved, ventral slit as in *B. pullata* (Figure 842); posterior membrane convex, slightly projecting dorsally above wide elliptical median hole.

Mode of life and habitats. On rocks in surf of brooks; outside water near springs, among humid leaves and moss.

Distribution. Western border area of European USSR, Caucasus. In addition, Europe.



## 2. Genus *Ernodes* Wallengren

**Full-grown larva.** Length 4.0–4.5 mm. Head and pronotum brownish; pronotum with rounded anterior-angle processes and a transverse ridge. Mid- and hind femora less thin than in *Beraea*, of more normal form; hind legs with much less numerous secondary setae than midlegs. Gills absent.

Area "b" of anal legs with a long, thick seta situated on apex of a high, narrow, conical support posteriorly; another large, dark seta at base of support and a smaller seta at apex. Claw with a dorsal denticle at end.

Mode of life and habitats. Near springs outside water, among humid plants or detritus.

Distribution. Western border area of European USSR, Caucasus. In addition, Europe.

### Key to Species

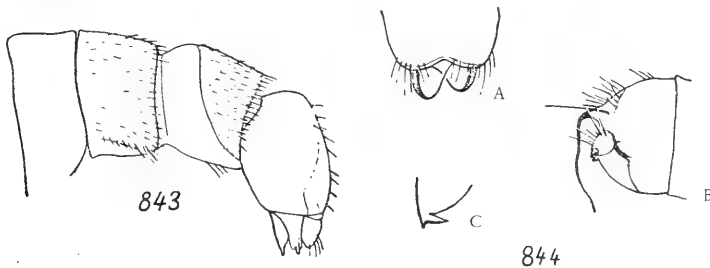
#### Full-grown larva

- 1 (2). Support near large posterior margin seta of sclerite "b" of anal leg less than 1/4 of length of seta; Caucasus 1. *E. palpata* Mart. (p. 657)
- 2 (1). Support near large posterior margin seta of sclerite "b" of anal leg very large, more than 1/4 of length of seta; western part of European USSR, Europe . . . . . 2. *E. articularis* Pict. (p. 658)

### 1. *Ernodes palpata* Martynov

Martynov, 1926:36–37, Figures 31–33.

**Full-grown larva.** Length 4–5 mm. Head brownish, yellowish areas near eyes, posteriorly and ventrally. Pronotum with anterior-angle processes; area anterior to ridge dark, posterior and lateral parts yellow. Mesonotum with an indistinct, light sclerite only in anterior part and with numerous, small setae on the surface. Metanotum membranous (Figure 843). According to Martynov (1926:36), fore- and midlegs with long anterior and posterior setae, hind legs much longer, mid and hind femora convex dorsally and wider distally, in contrast to *Beraea*; tibiae and tarsi without secondary setae.



FIGURES 843 and 844. *Ernodes palpata* Mart. (after Martynov):

843 – head and thorax, lateral; 844 – posterior end of body, dorsal (A), lateral (B), part of claw (C).

Abdomen nearly cylindrical. Gills absent. Thick seta of anal legs black, situated at apex of a high, conical process and curved downward and slightly inward, so that opposite setae are crossed (Figure 844).

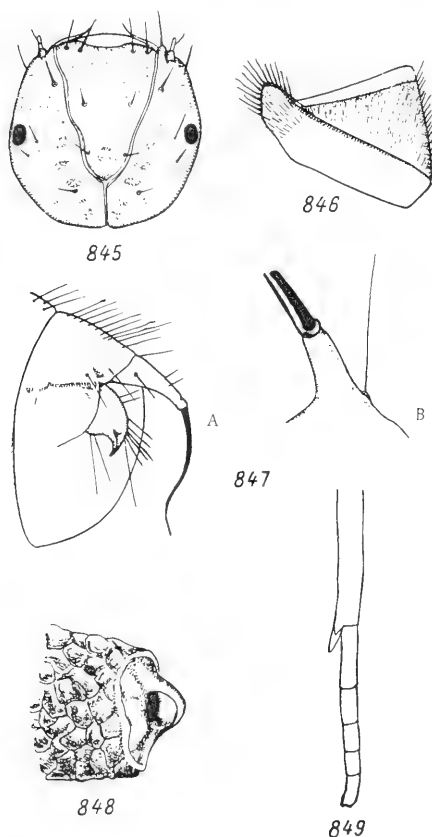
Case smooth, made of small sand grains, with convex, posterior membrane.

Mode of life and habitats. Outside water in humid detritus and moss near springs.

Distribution. USSR: Caucasus. Not recorded outside USSR.

## 2. *Ernodes articularis* Pictet

Thienemann, 1923:182-186, Figures 1, 4, 8, 9. — Botoșăneanu, 1959: 136, 137, Figure 18. — Hickin, 1959:84-85, Figures 22-25.



FIGURES 845-849. *Ernodes articularis* Pictet.

845 - head, dorsal; 846 - pronotum (diagrammatic); 847 - left anal leg, lateral (A), distodorsal process of the area "b" (B); 848 - posterior end of larval case; 849 - distal end of mid tibia and mid-tarsus of pupa (845-847, A - after Hickin; the rest after Thienemann).

**Full-grown larva.** Length 4.5-4.6 mm. Head (Figure 845) brownish; posterior angle of frontoclypeus with small, brown dots; large, dark dots lateral to coronal suture and posterior part of frontal sutures; setae light.

Pronotum (Figure 846) with wide, light yellow, anterior margin; transverse ridge dark, distinct; surface before the ridge dark, reddish brown, with thin, light setae, surface behind ridge light; anterior-angle processes with dense, thin, short setae. Claw of hind legs shorter than in *Beraea*, less than half as long as tarsus. Area "b" of anal leg with a high process or support, about 1/4 as long as black, thick seta (Figure 847, A, B); a short, strong seta nearby; lateral seta at base of cone about half as long as first seta; other setae small, thin. Claw with a dorsal denticle.

Case smooth, made of small sand grains, sometimes with diatoms at posterior end (Botoșăneanu, 1959: 136, 137); posterior membrane convex, projecting dorsally like a roof above central hole (Figure 848).

**Pupa.** Mid-tarsus without natatorial setae (Figure 849). Gills absent. Anal appendages as in *Beraea*, short, wide at base, tapering posteriorly.

Mode of life and habitats. Outside water near springs in humid environment.

Distribution. Western part of European USSR. In addition, Europe, mainly Central Europe.

### 3. Genus *Beraeodes* Eaton

**Full-grown larva.** Length 7–9 mm. Mandibles with distal rows of short, stiff chaetoids laterally, in addition to brush in median depression. Hind tibia and hind tarsus longer than femur; tarsus without secondary setae, tibia with few setae; claw of hind legs thin, slightly curved, long. Claw of anal legs with 2 dorsal denticles.

Case conical, curved, made of sand grains.

**Pupa.** Labrum slightly oblong; mandibles with sickle-shaped distal part. Midlegs natatorial. Gills and holding apparatus present.

Mode of life and habitats. Rheophilic, in small brooks.

Distribution. Western border area of European USSR. In addition, Europe.

#### 1. *Beraeodes minuta* Linné

Morton, 1884:27–29; 1890:233–235, Plate I, Figure 11, Plate 2, Figures 1–8. — Klapálek, 1893:80–84, Figures 1–10. — Struck, 1900:24, Figure 37; 1903: Plate III, Figure 1. — Ulmer, 1903:96, Figures 60, 99, 116; 1903b:218. — Thienemann, 1905b:555. — Siltala, 1905:33–34; 1907:452–454. — Ulmer, 1909:242–243, 305–306, Figures 369, a, b, d, 445a, b. — Lestage, 1921:942–950, Figures 337. — Hickin, 1959:83–85, Figures 1–10.

**Full-grown larva.** Length 9.0–9.3 mm (Figure 850). Head brown dorsally, with blackish pattern, other parts light yellow, with 2 large, brown dots lateral to coronal suture (Figure 851, A). Ventral side with black line on margin of occipital foramen. Gula oblong, extending from anterior to posterior margin of head, fused with lateral sclerites and clearly separated by ridges of gular sutures; pregula dark. Antennae as in Figure 851, B. Labrum short, with distinct anterior-angle area. Mandibles (Figure 851, C, D) convex laterally, humplike; basal setae reaching almost to apex; both mandibles with a dense, short brush of chaetoids in median depression; chaetoids of lateral, distal row small. Sclerites of submentum narrow in the middle; seta situated on sclerite.

Number and arrangement of gills of *B. minuta* (after Klapálek)

Segment	Dorsal	Pleural	Ventral
1	6	2	—
2	6	2	2
3	5		4
4	3		2
5	1		2

Number and arrangement of gills of pupa of *B. minuta* (after Klapálek)

Segment	Dorsal	Pleural	Ventral
2	8	4	4
3	7		4
4	3		4
5	2-3		3
6			2
7			1-2 (0)

Pronotum yellowish, with dark spots, without anterior-angle processes. Mesonotum grayish, with a few dark dots. Numerous secondary setae on pronotum and mesonotum (Figure 852). Metanotum membranous.

Legs (Figure 852, B, C) yellowish; ratio of length of legs 70:100:160. Hind legs narrow, very long, femur with slightly convex dorsal margin and straight ventral margin, shorter than tibia; numerous secondary setae on femur, trochanter, and coxa; tibia and tarsus rodlike, narrow, almost of equal length, with long, thin, primary setae; tibia with about 15 small, secondary setae dorsally near base. Claw thin, slightly curved, longer than tarsus, with thin, spine-shaped, basal seta.

First abdominal segment with dorsal and lateral processes. Lateral line replaced by small sclerotized dots with a small seta on segments 3-8. Gills with 2-6 short filaments.

529 Gills sometimes present also on segments 6-7 (Morton, 1890:234).

Claw of anal legs with 2 dorsal denticles at apex.

Case (Figure 850) 7-9 mm long, made of sand grains, with smooth surface, conical, markedly tapering posteriorly.

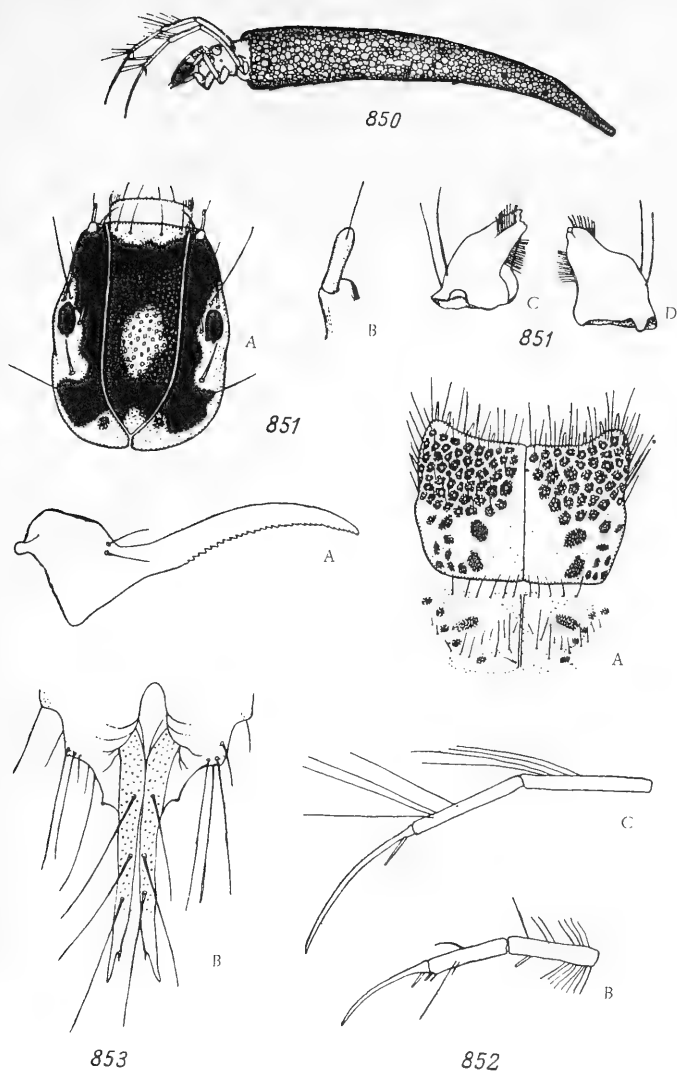
530 **Pupa.** Body narrow, 4.3-6.0 mm. long. Male pupae smaller than female pupae. Antennae thin, filiform, almost reaching end of body in male pupae, to the posterior margin of abdominal segment 6 in female pupae. Labrum more semicircular than in *B. aerea*; anteclypeus with strong, moderately long setae. Distal part of mandibles narrow, sickle-shaped, with serrated inner side (Figure 853, A).

Wing sheaths narrow, with pointed ends, reaching abdominal segment 6 in male pupae, segment 5 in female pupae. Midlegs natatorial, with normally developed setae on tarsal segments.

Gills with 2-8 filaments on segments 2-7.

Lateral line absent. Presegmental plates of segments 3-6 small, oval, with 1 or 2 hooks; segment 5 with transverse, oval, lateral, postsegmental plates with 2-3 spinules directed anteriorly.

Anal appendages (Figure 853, B) rodlike, long, pointed, with 3 long setae dorsally; inner side with a small, subapical process with a strong, spine-shaped seta at apex.



FIGURES 850-853. *Beraeodes minuta* L.:

850 - larva in case, lateral; 851 - head, dorsal (A), antenna (B), left mandible, dorsal (C) and ventral (D); 852 - pronotum and mesonotum (A), distal end of midleg (B) and hind leg (C); 853 - pupa; right mandible, ventral (A), anal rods, dorsal (B). (850, 851, A, 852 - after Hickin, others after Morton).

Case slightly shorter than in larva but of similar form; anterior membrane, as in *Beraea*, with a narrow, curved, ventral slit; posterior membrane in form of a narrow ring around a large, central hole.

Mode of life and habitats. Rheophilic, in small, cool brooks.

Distribution. Western border area of European USSR. In addition, Europe.

XI. Family SERICOSTOMATIDAE Stephens

**Full-grown larva.** Medium-sized, 15.0–16.5 mm long. Head and pronotum chestnut brown. Head relatively wide, slightly shorter than wide; fronto-clypeus as in Brachycentridae, long, narrow; a longitudinal ridge laterally in anterior part dorsal to eye; gula short, wide, fused in some genera with large, lateral sclerites.

Pronotum with projecting anterior-angle processes with primary anterior-angle seta at apex. Mesonotum light, short, slightly sclerotized in anterior part. Metanotum membranous or with anterior tergites in form of small, sclerotized dots. Numerous, dense secondary setae in anterior part of pronotum and mesonotum.

Forelegs short; midlegs and especially hind legs long; coxae, femora and tibiae of all legs with numerous secondary setae.

Lateral line replaced by small, sclerotized dots on segments 3–8. Gills on segments 1–8, with 1–2 or 3–5 filaments.

Anal legs short, thick: area "b" slightly sclerotized only laterally and ventrally, with numerous secondary setae dorsally.

Claw with short, distal part, with a large, dorsal and 2 smaller denticles.

Case made of sand grains, in form of a wide tube, slightly curved, smooth, gradually tapering posteriorly.

The larva passes 6–7 stages (Siltala, 1907:524–526; Nielsen, 1942: 262–263, 428–429) which differ in size, chaetotaxy, form of gills (which appear in stage 3), number of sclerotized dots on sides of abdominal segments, and other characters.

**Pupa.** Length 9–15 mm. Setae of anteclypeus relatively long, thicker and longer than on labrum; mandibles wide distally, with coarsely serrated median blade. Tarsi (including mid-tarsi) without natatorial setae, or mid-tarsi with distinct natatorial setae, fore tarsi with sparse setae. Anal appendages in form of thin rods with moderately long setae.

Case as in larva; both ends with a membrane with a slitlike hole.

Mode of life and habitats. Running water, often in slowly running or almost stagnant overflows of springs.

Distribution. European part of USSR including Caucasus; Maritime Territory (isolated records). In addition, Europe, Africa, southwest Asia, Iran, Japan, North and South America.

Key to Genera

Full-grown larva

- 1 (2). Gula well differentiated, wide, pointed posteriorly; gular suture distinct, with short, single part; metanotum entirely membranous . . . . . 1. *Notidobia* Steph. (p. 663)
- 531 2 (1). Gula fused with large, lateral sclerites; gular suture absent; sclerites behind gula fused; metanotum with a small, sclerotized dot on each side anteriorly. . . . . 2. *Sericostoma* Latr. (p. 672)

Pupa

- 1 (2). Length 9–12 mm; tarsi without natatorial setae . . . . . 1. *Notidobia* Steph. (p. 663)
- 2 (1). Length 11–15 mm; mid-tarsus with dense natatorial setae; fore tarsus with sparse setae . . . . . 2. *Sericostoma* Latr. (p. 672)

1. Genus *Notidobia* Stephens

**Full-grown larva.** Length 14–17 mm. Dorsal side of head dark chestnut brown, with large, light dots, some of them transverse; light near occipital foramen; gula wide, pointed posteriorly; gular suture distinct, with short, single, posterior part. Mesonotum entire, light brown, with a few brownish larger dots; metanotum membranous. Case 17–18 mm long.

**Pupa.** Length 9–14 mm. Wing sheaths of male pupae reaching to segments 6–7, those of female pupae to segments 4–5. All tarsi without natatorial setae. Gills with 3–5 filaments on segments 3–6. Case to 14 mm long, attached at both ends.

**Mode of life and habitats.** Phytophagous, living in shallow water, on stones in brooks and rivulets, or in small brooks and ditches with clear, running water; littoral of small clear lakes. Pupae are found under stones or among roots.

**Distribution.** European USSR, Caucasus. In addition, Europe.

1. *Notidobia ciliaris* Linné

Pictet, 1834: Plate XIV, Figure 5a. — Hagen, 1864: 238. — Walser, 1864: 52–53. — McLachlan, 1865: 78. — Meyer, 1867: 167. — Meyer-Dür, 1875: 401. — Klapálek, 1893: 43–47, Figure 12. — Struck, 1900: 23, Plate III, Figure 28; 1903: 108, Plate II, Figure 14. — Ulmer, 1903: 80–81, Figures 16, 54, 77, 96, 112. — Thienemann, 1905b: 520–521, 570, 574, Figures 34, 116. — Siltala, 1905: 10–13, Figure 3; 1907: 524–529, Figure 12. — Ulmer, 1909: 279, 320, Figure 467b. — Lestage, 1921: 922, 932–940, Figures 332–336. — Lepneva, 1940: 218. — Hanna, 1956: 77–81. — Brindle, 1964: 196, Figures 2, 4.

**Full-grown larva.** Length 12–16 mm. Head (Figure 854) uniformly chestnut dark brown; light periocular spot of irregular form, with pointed posterior median angle; a longitudinal ridge dorsal to the eye near spot, separating a slightly flattened middle area of head; antenna situated near anterior margin, dorsal to end of ridge. Frontoclypeus oblong, narrow; frontal sutures curved anteriorly; posterior angle with 2 large, light dots situated close together and with a median dot anteriorly. Four large, transverse, oblong, light brownish dots lateral to posterior part of frontal suture, some of them divided; small, indistinct, brownish dots lateral to coronal suture. Ventral surface dark laterally, with light spots; middle of ventral surface light, sometimes almost white, slightly brownish anteriorly in dark specimens; small seta 18 and pit behind seta situated on brownish dots. Gula brown or darker. Gular suture present (Siltala, 1905: 3, Figure 3a).

Anterior-margin setae situated in angle, thick, dark brown, moderately long, median seta slightly smaller, lateral seta light, situated on the suture, curved inward, thick at base, filiform apically; anterior frontal seta shorter, procumbent, intermediate frontal seta short, thin, brown, posterior frontal seta small, situated near curvature of sutures. Seta 7 situated at anterior margin ventral to antenna, strong, moderately long; seta 9 slightly longer and thinner, dorsal and anterior to eye near margin of light pericocular spot; seta 10 situated lateral to spot, brown, thin; seta 11 small, thin, situated behind seta 9; seta 12 situated more ventrally near 14 behind eye, light brown, relatively large, strong, moderately long; seta 14 longer, dark, situated near posterior margin of eye; seta 13 situated medially near 14, small, brown; seta 15 brown, thin, moderately long, situated behind 14; seta 16 dark, short, procumbent; seta 17 small, dark. Ventral side: seta 8 small, strong, brown; seta 18 smaller.

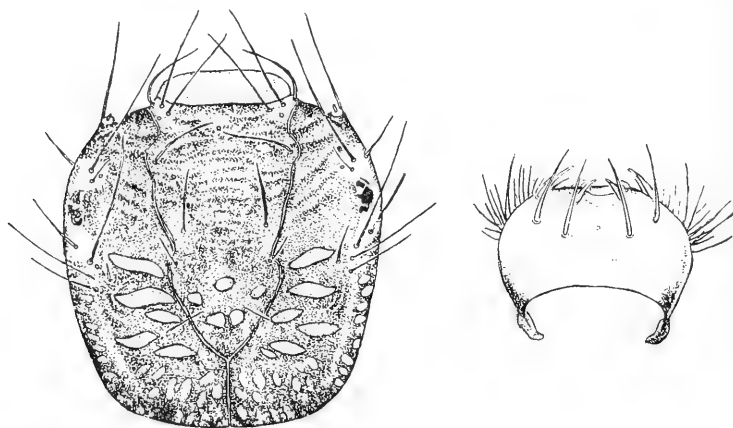


FIGURE 854. *Notidobia ciliaris* L. Head, dorsal and labrum

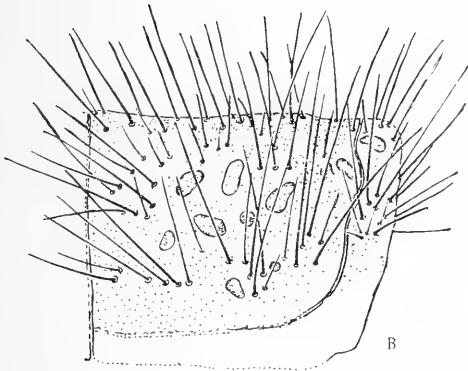
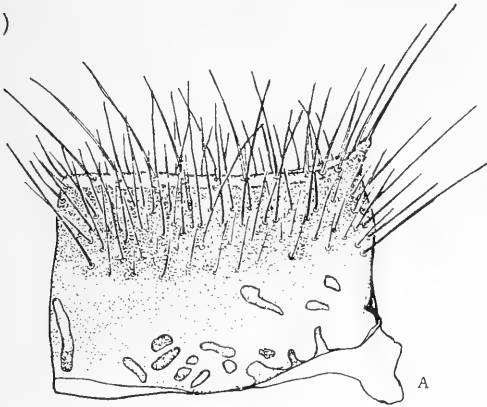
Labrum (Figure 854) slightly oblong, rounded anteriorly, narrower posteriorly; dorsal sclerite chestnut brown, with deep median depression and tuberculate anteriorly; median pit asymmetrical; a large, light brownish spot in posterior part. Seta 1 in form of a thick, blunt, small spine; seta 4 slightly longer and thinner, blunt, light; seta 2 much larger, short, thick, pointed; seta 3 slightly longer and thinner, situated at anterior angle; setae 2 and 3 light; setae 5 and 6 grayish, situated medially to 3, also large.

Mandibles short, massive; basal part large, black, divided by a ridge from small, reddish apical part; distal tooth of left mandible situated in a row with 2 ventral teeth, all of them blunt, distinct; 2 rounded processes dorsally on left mandible; distal tooth of right mandible larger than others, 2 small, rounded processes ventral to it, a wide rounded process and a large, triangular tooth dorsally on dorsal blade; brush with pale yellowish chaetoids; lateral setae situated some distance from basal margin, short, of equal length; dorsal seta reddish brown, strong; ventral seta thinner and lighter.



Sclerites of cardo transverse, dark reddish brown, setae situated in lateral part, both relatively large, lateral seta thick, more median seta thin.

(533)



533 FIGURE 855. *Notidobia ciliaris* L. Pronotum (A), mesonotum (B)

further posteriorly; anterior margin narrow, brown; posterior margin light, widened and extending ventrally at posterior angle; posterior surface with large, brownish or light dots of different form, one of them long and parallel to median suture; the only recognizable primary seta is the anterior-angle seta, situated on apex of process; a dense row of light, moderately long, pale yellowish setae at anterior margin, some of them small, thin, transparent; dark surface uniformly covered with dark brown setae of different size, including several long setae.

Mesonotum (Figure 855, B) incompletely sclerotized, membranous posteriorly; anterior third of sclerite chestnut brown, posterior parts light, yellowish; median suture extending from anterior to posterior margin,

Sclerites of submentum brown, transversely oblong, setae situated on membrane near anterior margin, thin, moderately long. Stipes brown, reddish brown laterally; setae thin, smaller than on submentum. Palpiger long, narrow, as long as palp, apical seta relatively large, longer than galea, basal seta small, strong, light; palp large, first 3 segments of almost equal width, 4th segment slightly narrower, segment 1 shorter than the others, segments 2 and 4 of equal length, segment 3 longer than segments 2 and 4. Galea long, slightly tapering; one of distal sensillae barrel-shaped, much larger than others.

Mentum in form of a narrow, reddish brown semicircle; ventral sclerites represented by a relatively large, oblong, reddish brown plate, which is wider at base; seta situated on membrane on median side, light, larger than usual. Sclerite of palpiger in form of narrow, horseshoe-shaped, thin, reddish brown stripe; labial palp relatively large, with brownish sclerite, slightly longer than end of labium.

Pronotum (Figure 855, A) broad, covering dorsal surface completely and partly covering sides of segment, with a characteristic beak-shaped process at anterior angles; anterior part chestnut brown, a slightly brownish area

as shown also in Brindle (1964:195, Figure 2); numerous, brownish dots on surface; setae thin, brown, numerous (Figure 855, B), forming a dense group at anterior angle, a similar group on whole anterior third of sclerite, and a sparser posterior row of setae at margin of sclerotized area.

Metanotum without tergites but with slightly harder membranous areas laterally at anterior margin, each area with 19–20 setae; posterior part with a similar row of 23–25 setae in each half; anterior-angle group formed by 18–19 thin setae, including a longer primary anterior-angle seta.

Pleuron large, chestnut brown; episternum larger than epimeron; pleural groove deep, blackish brown; epimeron light brown, indistinct, roughly triangular; trochantin large, distinct, dark posteriorly, with a light, horn-shaped process at anterior angle; primary seta of epimeron moderately long, dark, accompanied by several small teat-shaped chaetae; trochantin with 4 moderately long setae at anterior margin and subapically on surface, one of setae primary, 2–3 others small. Pleurites of meso- and metathorax weakly sclerotized, in form of indistinct, pale grayish membranous areas; pleural suture distinct, widening apically into a cross, blackish brown, in form of a narrow, brownish stripe basally; setae sparse, thin, much shorter and smaller than on mesonotum. Primary seta of mesepimeron moderately long, situated distally close to suture near 3 similar secondary setae; a short, thin seta situated more basally; primary seta of episternum accompanied by a secondary seta at margin of weakly sclerotized, light anterior-angle stripe. Primary seta of metepimeron situated in a group of 9–10 thin secondary setae at margin of pleural suture; anterior angle of episternum with a thin, moderately long primary seta and 2–3 secondary setae.

534 Ratio of length of legs 70:100:121; large setae reddish brown.

Fore coxa (Figure 856, A) massive, short, conical, very wide basally, slightly dark at dorsal margin, reddish brown subdorsally on anterior and posterior sides, with 3 large light dots posteriorly; distodorsal depression shallow; anterior basodorsal seta strong, brown, moderately long; anterior apical dorsal seta small; posterior apical dorsal seta situated near depression, thin, brown, relatively long, longest on leg; 2 moderately long, brown secondary setae and 3 shorter and thinner yellowish setae further distally at the margin; middle of anterior surface with 15–16 short to moderately long strong setae, including 2 thicker anterior primary setae; posterior surface subdorsally and basal to primary seta with a row and group of 14–15 thin, short to moderately long setae, with 5–6 sparse, lighter setae in middle; subventral and posterior ventral areas with numerous secondary setae of various size, most of them long; both distoventral setae strong, moderately long, dark brown, posterior seta situated subventrally.

Trochanter mainly shining brown, like following segments; basal part slightly darker dorsally, with 2 large, light dots; a black spot ventrally at articulation. Anterior seta small, uniformly thick, forked; posterior seta smaller, blunt, spine-shaped, situated subventrally, like former seta; anterior apical ventral seta in form of large, thick, blunt spine; subapical seta represented by a smaller spine; a row of secondary, spine-shaped setae situated more basally; posterior ventral setae light, moderately long, situated apically and subapically, a similar secondary seta situated more

basally and closer to suture; a dense row of large, feathered, light, hairlike chaetoids and straight, thin, longer, setiform chaetoids between anterior and posterior ventral setae along the distal part of the trochanter; primary basoventral seta brown, strong, moderately long, situated near suture in a group of similar and thinner secondary setae; distal part also with some thin, moderately long secondary setae dorsally near suture.

Femur with a dark reddish brown spot dorsally near articulation; dorsal margin strongly convex, ventral margin with a large, almost rectangular process. A row of numerous, dense, short to long setae at dorsal margin, both primary setae among them; anterior seta short, strong, brown, situated subapically; posterior seta light brown, smaller, situated subventrally in basal part; primary apical ventral seta situated on apex of process, light, moderately long, strong; basoventral seta like anterior distoventral seta of the trochanter, in form of a large, thick, light spine but slightly longer and thinner; 4 secondary setae in form of thick, light, short spines situated basally near base of femur; 5-6 secondary setae in form of much smaller spines situated more distally among primary setae; light, thin, long, feathered chaetoids on ventral margin.

Tibia shorter than femur, as in Figure 856, A; a row of spinules including 4 primary setae dorsally and subdorsally; posterior distoventral seta in form of a short, strong, brown spine; anterior distoventral seta slightly smaller, situated subventrally and more basally; small, light spinules on ventral margin; a strong brown seta and 2-3 thin setae further basally and slightly anteriorly; 4 strong, brown, moderately long setae and a shorter, more basal seta posteriorly and subventrally.

Tarsus shorter than tibia, with only primary setae; posterior distoventral seta brown, larger than short, light anterior seta; posterior subventral seta reddish brown, thicker, moderately long; a 4th seta situated anteriorly in subdorsal area, in form of a large, thick, blunt, curved claw-like, brown spine; distal part with a ventral row of small spinules, a larger, light spine situated distally (Figure 856, D).

Claw large, slightly curved, slightly shorter than tarsus, basal seta in form of a short, light spine.

Mid coxa (Figure 856, B) massive, oblong, light brown, lighter in apical part; basodorsal margin black; a short, blackish, brown basal stripe between dorsal and posterior surface; distoventral margin reddish brown. Setae brown; primary setae chestnut brown; secondary setae numerous, thin, lighter; anterior basodorsal seta strong, moderately long; sparse thin secondary setae situated distally on anterior side on whole dorsal margin and also subapically on surface; anterior apical dorsal seta situated among secondary setae; posterior apical dorsal seta situated at margin of depression, long, chestnut brown; 5-6 similarly dark, strong but shorter secondary basal setae at distal margin; a row of 12-14 large secondary setae at dorsal margin, a row of 6-8 thinner, short setae posteriorly; anterior surface almost without setae, except sparse small setae and a small group of thin setae of different length (including both primary setae) subapically; a large group of large secondary setae situated in distal third ventrally and subventrally and on part of posterior surface; both distoventral primary setae moderately long, dark, situated close together, slightly shorter but thicker than long secondary setae.

Hind coxa (Figure 856, C) longer. Mid tibia shorter than femur, hind tibia longer, hind tarsus and claw longer than on midlegs. Setae as in Figure 856; some of primary setae of first 4 segments indistinguishable among numerous secondary setae.

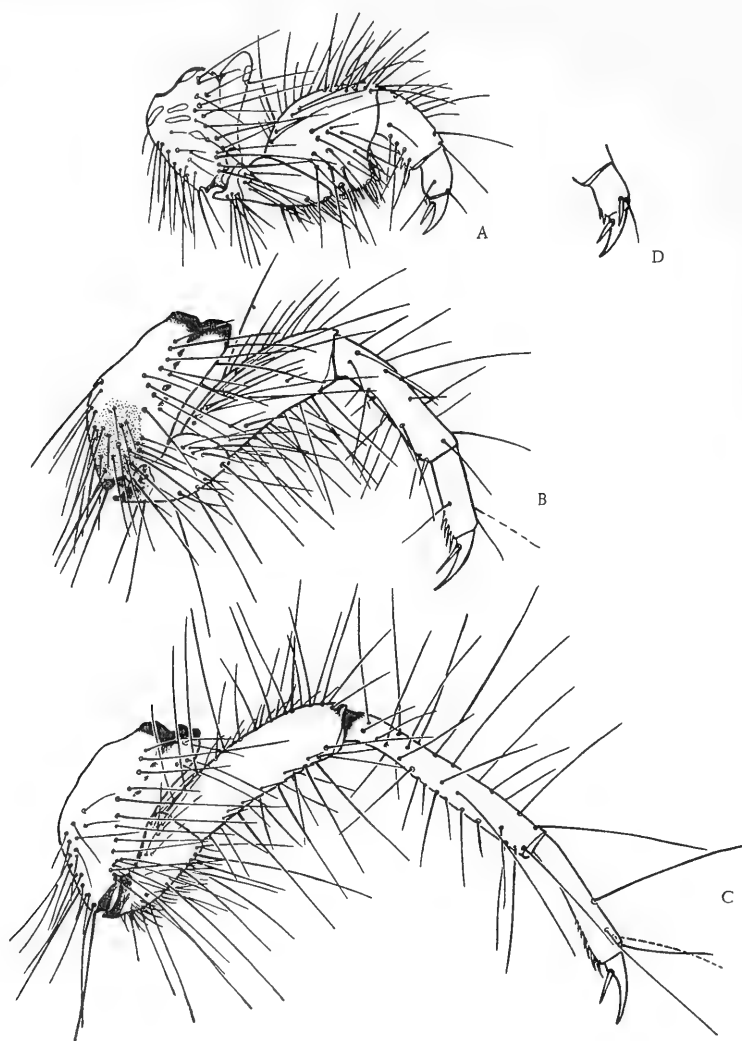


FIGURE 856. *Notidobia ciliaris* L. Right foreleg (A), midleg (B) and hind leg (C), posteriorly; tarsi and claw of left foreleg, anterior (D)

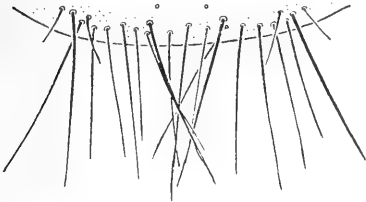
Mid- and hind tarsi without secondary setae. Mid-tarsus with 2 light, thin, moderately long, dorsal apical and subapical setae; the other 2 setae slightly longer and thicker, brown; the posterior seta larger, situated

subventrally and slightly further from distal margin. All 4 primary setae of hind tarsus situated dorsally and subdorsally; the distodorsal seta thin, light, moderately long; the second dorsal seta closer to base, long, strong, and brown like dorsal setae of tibia; anterior and posterior setae situated subdorsally, lateral and slightly basal to distal seta, the first seta long, the second slightly shorter, both strong, brown.

Claw of hind legs longer and thinner than on midlegs, basal seta in form of a thinner and lighter spine.

Dorsal process of first abdominal segment low, wide; a narrow, oblong black sclerite and a small stripe of small, dense, setiform chaetoids near lateral processes.

Lateral line absent; segments 3-8 with small lateral sclerotized dots. Gills on segments 1-8, with 1-3, rarely 4-5 filaments; ventral gills larger than dorsal gills; gills of segment 1 situated in middle; dorsal and ventral rows on segments 2-8 only presegmental; pleural row with distinct, large presegmental gills on segments 2-7 and small, blunt gill appendages near anterior margin of segments 4-7; segments 3-7 with small processes at posterior margin and directed posteriorly.



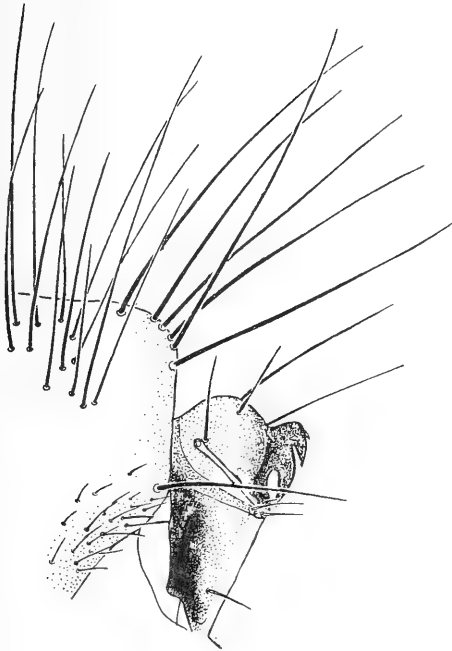
857

Segment 9 without tergite; a row of 23-24 setae on a membranous area near posterior margin, including the widely spaced, thin, moderately long, medioanal setae; anterior-angle setae also large, slightly thicker; other setae thinner, light, shorter, some of them small (Figure 857). Anal rods (Figure 858) short, thick; area "b" membranous dorsally, slightly sclerotized laterally and ventrally; 3 distodorsal setae long, thick, blackish brown; dorsal surface with numerous, strong, mainly large, golden brown setae.

Sclerite "c" yellowish, with broad, black, lateral margin and a small basal seta.

Claw (Figure 858) with large, strongly convex, yellowish, basal part; apical part reddish brown; apex reddish, with a very large dorsal denticle and 2 smaller denticles.

Case 16-18 mm long, made of coarse sand grains, tubular, relatively wide, slightly curved, slightly tapering posteriorly; posterior membrane slightly convex, with round central hole.



858

FIGURES 857 and 858. *Notidobia ciliaris* L.:

857 - tergite of abdominal segment 9; 858 - left anal leg, lateral.

(536)

Number and arrangement of gills of *N. ciliaris* (after Siltala)

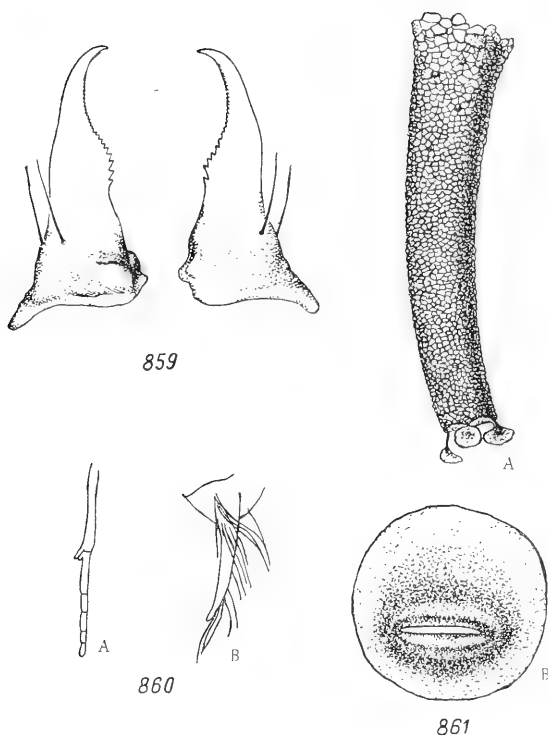
Segment	Dorsal	Pleural	Ventral
1	1-2		1-3
2	2-4	2-3	2-4
3	3-4	3-4 1	3-4
4	2-4	1 1	3-5
5	2-3	1 1	3-5
6	1 (0)	1 1	3-4
7		1 1	3-4
8			2-3

Siltala (1907:524-533) observed 6 larval stages with the following length: Stage 1 - 1.05-1.3 mm; 2 - 1.5-1.9 mm; 3 - 5.5 mm; 4 - 6-7 mm; 5 - 7-10 mm; 6 (full-grown larva) length not given by Siltala, but Ulmer (1909:279) gives 12-17 mm.

**Pupa.** Length 9-14 mm. Antennae slightly curved at end, longer than body in male pupae, reaching segments 8-9 in female pupae; proximal segment of antenna longer and thicker than the others, with a median process at base, several small setae on surface. Setae of anteclypeus thin; intermediate and median setae moderately long, intermediate seta larger, lateral seta short, thin. Labrum rounded anteriorly; anterior margin seta small, light; 5 surface setae thin, small, much smaller than setae of anteclypeus (Klapálek, 1893:44). Mandibles long, curved at end, with serrated inner side; lateral setae short, dorsal seta larger than ventral (Figure 859).

Wing sheaths reaching segments 6-7 in male pupae, segments 4-5 in female pupae. Mid-tarsus (Figure 860, A) without natatorial setae, like fore and mid-tarsi.\*

\* Klapálek (1893:46) states: "Alle Tarsi ganz kahl" (All tarsi quite bare); Thienemann (1905:55): "Ziemlich unverständlich bleibt mir das Fehlen der Schwimmhaare bei *N. ciliaris*. Vorbereitet wird es schon bei den *Sericostoma*-Puppen durch eine recht schwache Bewimperung der Mitteltarsen" (I find it difficult to understand the absence of natatorial setae in *N. ciliaris*; this is already indicated in the pupae of *Sericostoma*, in which the mid-tarsi have only sparse setae). Ulmer (1909:321) makes similar observations. Siltala (1905:12), on the other hand, inexplicably does not mention the characters of the legs in the description of the pupa of *N. ciliaris*. We found tarsi without natatorial setae in pupae of *N. ciliaris* in the Borzhomi area (14V 1951, collected by V. N. Vinogradova). The absence of natatorial adaptations in the pupae of *N. ciliaris* is associated with the shallow aquatic environment of the larvae and pupae; the pupa leaves the water before hatching, not by swimming but crawling on stones or plants near the bank. A more detailed treatment of this subject is found in the first part of this work (Lepneva, 1964a:89, 102).



FIGURES 859--861. *Notidobia ciliaris* L.: Pupa:

859 - mandibles, ventral; 860 - distal end of mid-tibia and mid-tarsus (A), anal rods (B); 861 - pupal case (A), anterior membrane (B) (860, A - after Thienemann; 860, B - after Ulmer).

First abdominal segment with sclerotized posterior margin. Holding apparatus on segments 3-7; number of hooks: segment III: 2-3; segment IV: 2-3; segment V: 2-3+2-3; segment VI: 2; segment VII: 2-3. Lateral line little developed, from posterior end of segment 6 to segment 8, setae not meeting ventrally (according to Klapálek).

First abdominal segment without gills, in contrast to larva; postsegmental gills of pleural row disappear, presegmental gills shorter and thicker than in larva; presegmental lateral gill of segment 7 situated ventral to lateral line.

Anal rods (Figure 860, B) thin, slightly curved upward, thick at base, with small, strong setae dorsally and ventrally; 4 strong, yellow distoventral setae.

Genital appendages of male pupae in form of short, blunt lobes; penis sheath short.

Case (Figure 861, A) as in larva but slightly shorter, 14 mm long; anterior and posterior ends closed by a brown membrane with a slitlike hole, anterior membrane horizontal (Figure 861, B), posterior membrane vertical; both openings covered with interwoven small roots and other plant fragments.

Number and arrangement of gills of *N. ciliaris* (after Siltala)

Segment	Dorsal	Pleural	Ventral
2	3-4	2-5	4-5
3	4-5	3-4	4-5
4	2-5	1-2	3-5
5	1-4	1	3-5
6	1-3	1	3-5
7	1 (0)	1 (0)	2-5
8			2-4

Mode of life and habitats. Phytophagous, in brooks and rivulets with a rapid current.

Distribution. Northern, central, and western parts of the European USSR; Caucasus. In addition, Central and Northern Europe.

## 2. Genus *Sericostoma* Latreille

**Full-grown larva.** Length 11.0-16.5 mm. Head brownish dorsally, with light dots, light ventrally; gula wide, cup-shaped, rounded posteriorly, fused with large, lateral sclerites; gular suture absent. Mesonotum thin, light, very weakly sclerotized, divided in each half, with a thin, curved suture separating a narrow, long, lateral area. Metanotum membranous, with a small sclerotized dot in anterior part. Gills with 2-4 filaments, or single and small. Case 15-18 mm long, made of sand grains, smooth, slightly curved, slightly tapering posteriorly.

The larva passes 6-7 stages.

**Pupa.** Length 11.0-14.2 mm. Wing sheaths reaching middle or posterior margin of segment 7; segments 1-4 of mid-tarsi with thin, grayish, natatorial setae; sparse setae on segments 1-4 of fore tarsi. Gills with 2-4 filaments, some of them single.

Case 12-16 mm long, usually lying on bottom, sometimes, if current is strong, attached to stones at posterior end; anterior end laterally with large sand grains or small stones; posterior end with domelike, convex membrane with a single slitlike hole.

Mode of life and habitats. Detritophagous, in springs and brooks, in shallow areas of calm water near the bank; sometimes among humid vegetation in oozing springs.

Distribution. Northern and western parts of the European USSR, Caucasus. In addition Europe, southwest Asia.



Key to Species

Full-grown larva

- 1 (4). Dorsal side of head with light, distinct dots in sharp contrast to dark background.
- 2 (3). Dots lateral to coronal suture transverse; gula dark only anteriorly . . . . . 2. *S. personatum* Spence (p. 681)
- 3 (2). Dots lateral to coronal suture mainly round; gula entirely dark . . . . . 1. *S. pedemontanum* McL. (p. 673)
- 4 (1). Dorsal side of head with dark dots, less distinct . . . . . 3. *S. grusiense* Mart. (p. 684)

1. *Sericostoma pedemontanum* McLachlan

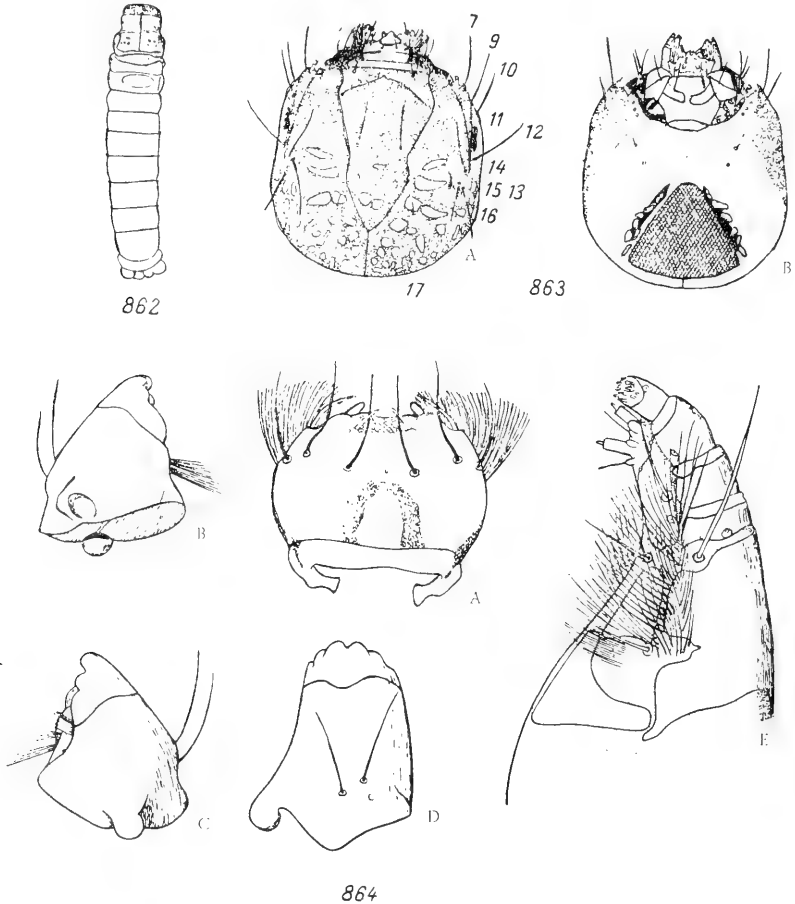
Pictet, 1834:176, Plate XIV, Figure I. — Kolenati, 1848:90. — Klapálek, 1893:39–43, Figure 11. — Struck, 1900: Figure 27. — Ulmer, 1903:80; 1909:280, 321. — Lestage, 1921:923–931, Figures 328e, 329 B, 330 A. — Nielsen, 1942:428–450, Figures 77–92.

**Full-grown larva** (Stage 7). Length 11.0–16.2 mm (Figure 862). Head broad, oval (Figure 863, A), slightly longer than wide, mainly brownish, with light dots; eyes on light background; antennae situated at anterior margin, sensilla dark, with one seta. Frontoclypeus narrow, oblong; anterior part larger than posterior part; posterior angle with 2 large, light dots and several small, indistinct dots. A longitudinal ridge extending lateral to frontal sutures between eye and margin of head, dorsal to eye. Dorsal and lateral stripes absent; dorsal stripes replaced by large, light, transverse dots along posterior branch of frontal suture; light, oblong and round, smaller dots lateral to coronal suture and on site of lateral stripes; ventral surface mainly mat, white or yellowish; gular suture absent. Gula cup-shaped, dark, fused with large, lateral sclerites (Figure 863, B); gula distinct.

Anterior setae of frontoclypeus situated in angle; median and intermediate setae dark, moderately long, the latter longer; lateral seta light, curved inward, procumbent, moderately long; anterior frontal seta the same; intermediate frontal setae strong, thin, long, situated near tentorial pit; posterior frontal setae small.

Seta 7 situated near anterior margin ventral to ridge and antenna. Seta 9 situated close to anterior margin of eye dorsal to ridge; seta 11 small, situated behind 9; seta 10 small, light, situated before eye; seta 14 situated behind eye dorsal to ridge; seta 12 situated slightly more ventral, immediately behind eye, relatively large; seta 13 small, slightly medial to 14; seta 15 thin, situated directly behind 13; seta 16 short, dark, situated behind 13; seta 17 situated before fork near frontal suture, small, thin. Ventral side: seta 8 small, situated at anterior margin; seta 18 small, situated at level of posterior margin of gula. Occipital foramen with a black line at margin.

540 Labrum (Figure 864, A) narrow, rounded; median depression shallow; dorsal sclerite light brown, covering dorsal surface of labrum completely, with a large, dark dot posteriorly in middle; posterior-angle sclerites short, dark. Seta 1 situated lateral to median depression, in form of a thick, blunt, light spine; seta 4 situated near posterior margin of depression, thinner and slightly longer, light; seta 2 curved, light, larger than 4; seta 3 situated anteriorly on each side, short, light; setae 5 and 6 situated on surface, brownish, slightly larger.



FIGURES 862-864. *Sericostoma pedemontanum* McL. (after Nielsen):  
 862 - larva, dorsal; 863 - head, dorsal (A) and ventral (B); 864 - labrum (A), left mandible, dorsal (B), ventral (C) and lateral (D), right palpifer, galea, and maxillary palp (E).

Mandibles (Figure 864, B, C, D) short, black, massive, spatulate, left mandible slightly larger than right mandible, inner side more deeply concave, transverse ridge near distal margin distinct; teeth blunt, short;

both mandibles with one tooth and 2 indistinct tooth-shaped processes on dorsal blade, in addition to wide median tooth; tooth-shaped processes larger on right mandible than on left; ventral blade with 2 teeth; brush tuftlike, situated near dorsal margin; 2 additional short brushes in basal part of left mandible in median depression. Lateral setae situated basally, short, of equal length.

541 Pregula short, transversely elliptical, fused with gula. Sclerites of cardo mainly black; both setae small, thin. Submentum with 2 yellowish brown, transverse stripes, divided by a narrow median space; setae situated on membrane, moderately long, brown. Stipes light brown, with slightly concave, anterior margin; lateral seta moderately long, situated on membrane; median seta shorter, situated on margin. Lateral ventral sclerite of palpifer yellowish brown, moderately long (Figure 864, D); apical ventral seta situated on membrane, short, strong, basal seta small, light, situated in a depression at anterior margin. Galea with a dark sclerite ventrally; 2 of sensillae very large; proximal segment of maxillary palp sclerotized only ventrally and laterally, sclerites of 3 following segments ringlike, terminal segment shorter and narrower than the other two. Mentum semicircular; anterior margin slightly concave; ventral rods pointed, with small, light, subapical seta. Palpiger in form of a curved sclerite with pointed anterior end; labial palp with brownish sclerite, with 2 large sensillae; labial lobe wide; opening of silk glands surrounded by small spinules.

Pronotum (Figure 865, A), chestnut brown; anterior margin concave, lateral margin convex, anterior angle pointed, beaklike; posterior part with dark and light spots in middle of each half; posterior margin light yellowish; posterior angles produced, curved ventrally; 2 large, dark dots between posterior angle and other part of posterior margin; 34-37 setae at anterior margin and angle; about 200 setae on surface.

Mesonotum (Figure 865, B) divided in 2 parts in each half; a larger, median and smaller, lateral part; median sclerite light, thin, brownish yellow, with dark brown dots and dark, posterior margin; lateral sclerite brown, with a large dot in anterior part. Setae: 55-69 in anterior angle, 64-77 in anterior part of surface, 27-39 in posterior part.

Metanotum (Figure 865) shorter than mesonotum, with a deep, curved, transverse fold; a small, yellowish, sclerotized dot on each side before fold; anterior angles with 25-29 setae; anterior part with 40-46 setae, posterior part with 25-32 setae. Number of setae according to Nielsen.

Propleuron lighter than pronotum; episternum much larger than epimeron, with distinct, large dots and blackish margins; epimeron with black, posterior margin, a group of 8-10 setae near distal margin, anterior primary seta longer and thicker than the others; trochantin large, distinctly separated from episternum, with large dark spot laterally, distal anterior-angle process pointed; 13-16 sparse, thin setae at anterior margin and on surface, one of them primary. Pleural area of mesothorax and metathorax weakly sclerotized, sclerotized part restricted to the distal area near pleural suture which forms a black spot and stripe; mesopleuron longer than metapleuron; midlegs inserted more ventrally than hind legs. Setae: mesepisternum 1-3, mesepimeron 5-7; metepisternum 5-8, metepimeron 5-9.

Legs as in Figure 866; hind legs longer than others, about 1/3 of length of larva; ratio of length of legs 71:100:126.

Forelegs short. Fore coxa conical, massive, with yellowish or light brown basal spots posteriorly; distodorsal depression shallow; dorsal groove as on mid- and hind coxae; primary setae distinguishable among numerous secondary setae; posterior apical dorsal seta long, strong, anterior apical dorsal seta smaller; anterior basodorsal seta relatively long; both anterior surface setae yellowish, moderately long, thick, feathered at apex; ventrodorsal setae strong, shorter, posterior seta thicker than anterior. Anterior dorsal secondary setae absent; posterior side with 26-27 straight thin dorsal secondary setae; ventral surface with groups of long and thin secondary setae from base to apex, and also on posterior side in distal part; anterior surface also with short, black setae; coxa with 39-49 surface and ventral secondary setae.

Fore trochanter large, slightly shorter than coxa, basal segment with 9-12 secondary setae; anterior seta situated distally, spine-shaped posterior seta similar, subventral; primary distoventral seta in form of a short, strong spine; other primary ventral setae yellow, spine-shaped; secondary setae forming a row of 6-10 long setae and short spinules; ventral margin of the distal part densely covered with feathered, hairlike chaetoids.

543 Fore femur shorter than mid- and hind femora; laterally compressed, high, with strongly convex dorsal and ventral margin; dorsal and ventral margin grayish brown, with several dots anteriorly and posteriorly; a row of 53-59 long, black setae at margin, including 2 primary setae; ventral margin with a rectangular process with a primary ventral seta at apex; basoventral seta situated nearby, shorter and thicker than apical seta; anterior surface seta situated distally, short, dark, strong; posterior seta thinner, situated between basal seta and base of femur; 23-29 secondary setae on posterior surface, 2-3 on anterior surface, all small, light; ventral side with light feathered chaetoids, which are shorter and sparser than on trochanter.

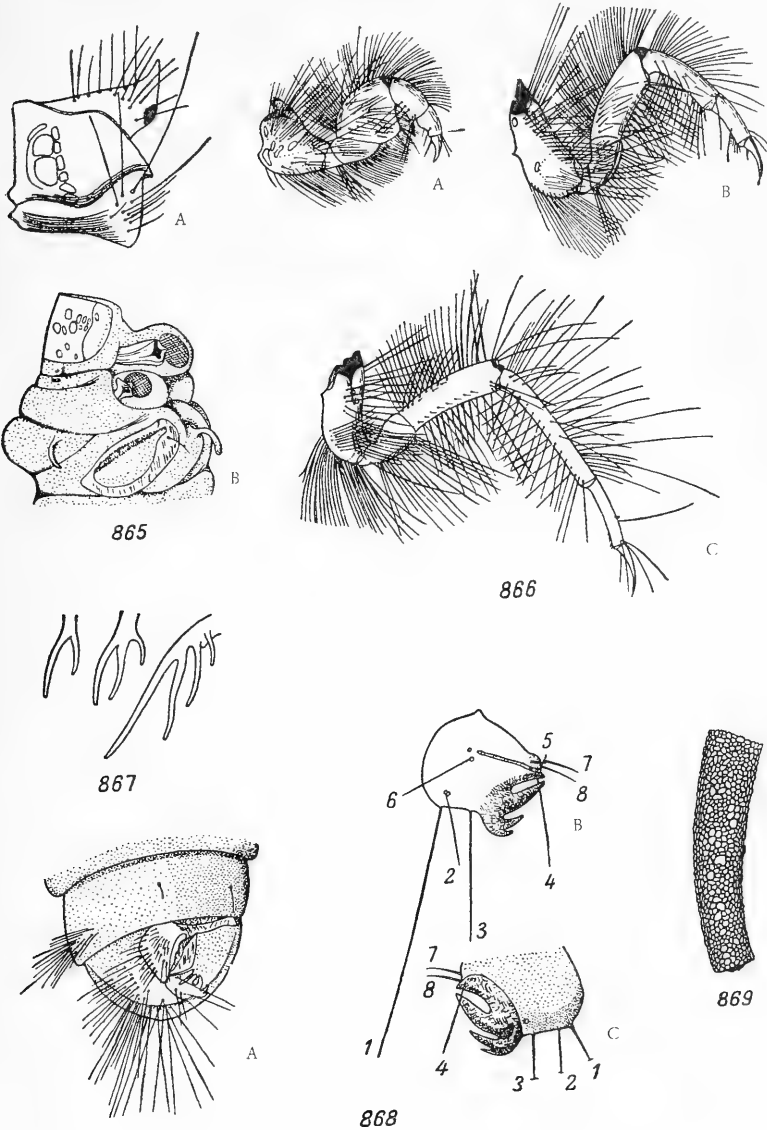
Fore tibia and tarsus short, massive, light brown. Tibia with a black stripe at basal margin; 24-32 thin, long setae dorsally and subdorsally at margin, 4 of them primary; posterior surface with a subventral row of 7-9 long, thick secondary setae; both distoventral setae spine-shaped, short, strong. Both dorsal setae of tarsus short, thin, situated apically and subapically; posterior of the 2 ventral setae situated subapically, short, strong, anterior spine-shaped, thick, situated almost in middle of tarsus; a row of short, thin spinules near distal margin. Claw short, thick basally, slightly curved, with a strong basal seta.

Mid- and hind coxae (Figure 866, B, C) oblong, with broad, black, baso-dorsal margin; distal part light brown posteriorly, brown anteriorly, margin at articulation with trochanter black; distodorsal indentation small on midlegs, deeper on hind legs; dorsal groove brown, with small dots; several dots on posterior surface. Primary setae situated among numerous secondary setae; a dorsal row of long, thin setae anteriorly, 14-18 setae on midlegs, 13-15 on hind legs; 35-41 setae on midlegs and 16-19 on hind legs posteriorly on dorsal side; distal half of surface with about 75 long, thin setae on midlegs, about 40 on hind legs anteriorly, posteriorly, and ventrally.

Femora of mid- and hind legs rodlike; hind femur longer and thinner; dorsal margin grayish brown, with a dark brown spot on the midlegs, a blackish spot on hind legs; light dots in subdorsal part anteriorly. Primary

setae situated among secondary setae; anterior primary seta of mid-femur short, thick, black; secondary dorsal setae at margin, long, black, about 100 on mid-femora, together with posterior subdorsal seta, 60–75 setae on the hind legs; 40–46 secondary ventral setae on midlegs, 46–54 on hind legs; anterior side with 5–9 setae on mid-femora, 5–6 on hind femora.

(542)



FIGURES 865–869. *Sericostoma pedemontanum* McL. (after Nielsen):  
 865 – pronotum (A), mesothorax, metathorax, and first abdominal segment, lateral (B); 866 – right foreleg (A), midleg (B) and hind leg (C), posterior; 867 – gills;  
 868 – segment 9 and right anal leg, right side (A), claw, lateral (B) and inner side (C);  
 869 – larval case.

Mid-tibia and tarsus massive, yellowish brown, much longer than on forelegs. Tibia with a dark spot dorsally; primary dorsal setae situated among numerous secondary setae; a row of similar thin, long setae ventrally; about 65 secondary setae; primary distoventral setae in form of 2 strong spines, anterior spine subapical and shorter than posterior. Distoventral part of tarsus with a row of spinules, 2 of them longer than others; both primary distodorsal setae short, thin, anterior seta slightly subdorsal, the 2 other primary setae slightly larger, subventral. Claw longer than on forelegs, with a light, basal spine.

Number and arrangement of gills of *S. pedemontanum*  
(after Nielsen)

Segment	Dorsal	Pleural	Ventral
1	1-2		1
2	2-4	1-3	2-3
3	2-4	2-4 1	3-4
4	3 (0)	1 1	2-4
5	3 (0)	1 1	2-4
6	2 (0)	1 1	2-3
7		1 1	1-3
8			2 (0)

Hind tibia and tarsus thin, long, mainly with tactile function; tibia rodlike, long, with long, thin, dorsal setae, ventral setae shorter, in 2 rows, pointing in different directions. Tarsus thin, with a ventrodorsal row of small spinules; all 4 primary setae situated dorsally and subdorsally, 3 apical, 1 subapical. Claw thin, long, strongly curved, with a thin, short, basal seta.

Abdominal segments uniformly wide; segment 9 much narrower.

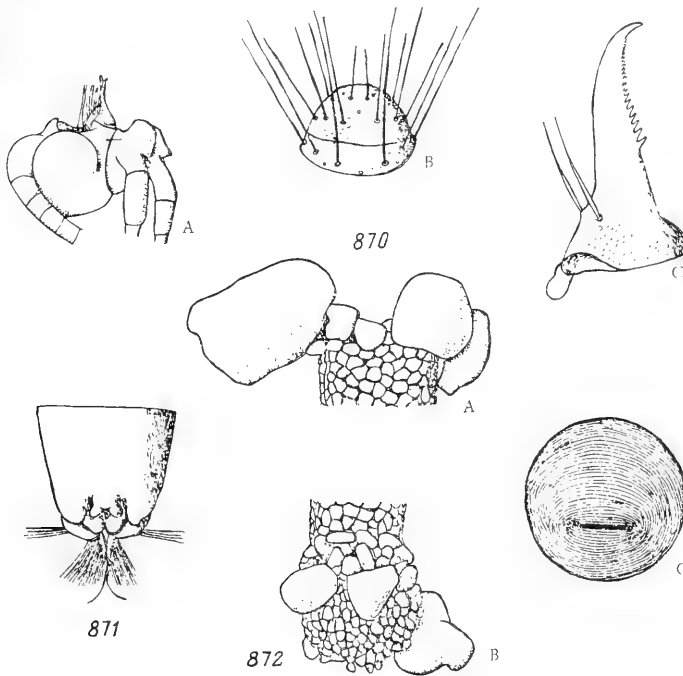
First abdominal segment with a low, wide, dorsal process; lateral processes small, with a stripe with a black sclerite at base and a dense cover of thin, grayish spinules directed anteriorly and laterally (Figure 865, B).

544 Gills (Figure 867) on segments 1 and 8, single or with 1, 2, or 3 shorter and thinner branches at base, forming gills with 2, 3, or 4 filaments.

Gills of segment 1 situated at base of dorsal process and slightly ventral to lateral process.

Lateral line absent; anterior half of segments 3-8 with a longitudinal, lateral row of small, light brown sclerotized dots; each sclerite on segments 3-7, with a small, spine-shaped seta; a short, thin seta situated before the row, a similar seta behind the row; these are the 2 primary

lateral setae, the setae on sclerites are secondary; small dot-shaped sclerites of lateral row slightly larger on segment 8, pointed ventrally, 12–20, each sclerite with a strong, light, double spinule; a small, lateral seta situated on a sclerotized dot in the middle of the row, slightly more ventrally; 2nd lateral seta on segment 8 absent.



FIGURES 870–872. *Sericostoma pedemontanum* McL. (after Nielsen):  
 870 – head of female pupa, lateral (A), anteclypeus and labrum (B), left mandible, dorsal (C); 871 – posterior end of male pupa, ventral; 872 – pupal case: anterior end (A), posterior end (B), anterior membrane (C).

Segment 9 without tergite; 27–29 moderately long, dark setae at posterior margin, including primary setae (Figure 868, A).

Anal legs short, wide; area "b" not sclerotized dorsally, with a thin, pale sclerite with slightly dark, distal margin laterally and ventrally; setae numerous, thin, of different size, 72–80, several long, thick setae dorsally in distal part (Figure 868, A).

Sclerite "c" with a short, light seta.

Claw short, massive (Figure 868, B, C), strongly curved apically, with 2 dorsal denticles. Seta 1 longer than the others, situated basally; setae 2 and 3 long, thin, situated above suture in distal part; setae 6 situated lateral and distal to suture; setae 7 and 8 short, light; seta 5 small, situated lateral to 8; seta 4 situated on median side, relatively large.

Case made of sand grains, slightly curved, with smooth walls, with round cross section, only slightly tapering posteriorly, 15–16 mm long; posterior membrane with small, round, central hole (Figure 869).

545

**Young larva.** Nielsen (1942:429-432) distinguishes 7 larval stages; their characters are partly given in the following table.

Length and number of some setae of stages 3-7 of *S. pedemontanum* (after Nielsen)

	Stage				
	1st	2nd	3rd	4th	5th
Length, mm	3.4-4.2	4.3-6.9	5.5-8.5	8.0-12.0	11.0-16.2
Setae:					
anterior angle of mesonotum	12-14	17-18	30-40	38-49	55-69
anterior angle of metanotum	4	7-8	12-14	16-18	25-29
trochantin . . . . .	2	3-4	9	8-10	13-16
tergite of segment 9 . . . . .	11-13	13-17	19-22	23-27	27-29

**Pupa.** Length 11.5 mm in male pupae, 12.4-14.2 mm in female pupae. Head (Figure 870, A) of characteristic form; frontoclypeus brown, saddle-shaped, concave in the middle, with a dark tubercle and a smaller tubercle with flat or convex, anterior side at posterior margin; anterior margin of epicranium pale, with a large process, so that anteclypeus and labrum are situated almost horizontally. Anteclypeus covered with small tubercles; labrum semicircular, with small tubercles and long, thin spinules at anterior margin (Figure 870, B). All 3 setae of anteclypeus large, lateral seta usually yellow. Labrum with 5 setae: 2 yellow setae at anterior margin, median seta 1 small, the other 3 setae situated near the middle, all three dark, lateral seta thinner than the others. Mandibles (Figures 870) long, directed anteriorly; distal part narrow, with coarsely serrated median margin; lateral setae situated some distance from basal margin, small, strong, of equal length.

Number and arrangement of gills of pupa of *S. pedemontanum* (after Nielsen)

Segments	Dorsal	Pleural	Ventral
2	2-3	2	2-3
	2	1-2	2
3	3	3	3-4
	2-3	3	2-3
4	2	1	3
	1-2		3
5	1	1	3
	1 (0)		2-3
6		1	3
			2
7		1	1-3
			2
8			2
			2 (0)



Antennae reaching middle of segment 9 or slightly further; basal segment of antenna of male pupa with a tuft of thin, dense setae projecting inward.

Wing sheaths reaching to middle or posterior margin of segment 7; segments 1-4 of mid-tarsi with dense natatorial setae (about 130 on proximal segment); fore tarsi with sparse natatorial setae on segments 1-3 (about 5 setae per segment).

First abdominal segment laterally with blackish brown, transverse tubercles forming a dark ridge; dorsal sclerites of following segments large yellowish brown, with black margin and large, slightly curved, brown, hook-shaped spines; number of hooks: segment II:2-3; segment III:2+2-4; segment IV:2; segment V:2-3. Segments 9 and 10 partly sclerotized, with small, rounded, brownish tubercles.

546 Gills on segments 2-8; gills of segments 4-7 short, relatively thick, on ventral side only on segment 8.

Lateral line on segments 5-8. Anal rods thin, short, with numerous, large, basal setae; a row of 4-6 large, strong setae, sometimes with 2 branches distally on ventral side (Figure 871).

Pupal case (Figure 872) long; anterior end with fine sand grains and small stones at margin, attached to substrate; posterior end as in Figure 872, B; anterior membrane with horizontal slit close to ventral margin, posterior membrane with round, central hole.

Mode of life and habitats. Brooks near the banks, often among plants, in overflows of springs, in calm areas on the bottom, sometimes at the edge among humid fallen leaves or on the lower side of branches of trees.

Distribution. USSR: not recorded with certainty, but possibly occurring in the southwest. In addition, Europe.

## 2. *Sericostoma personatum* Spence

Pictet, 1834:178. Plate XIV. Figure 2. — Kolenati, 1848:90. — Hagen, 1864:238. — Klapálek, 1888:25-28, Figure 9. — Ulmer, 1903:79-80. — Siltala, 1905:13-14. — Thienemann, 1905b:520-522, Figures 7, 29-33, 117. — Ulmer, 1909:280, 321. — Lestage, 1921:923-931, Figures 328 a, f, 329A, 330B, 331. — Lepneva, 1940:218. — Hickin, 1951:93-96, Figures 1-11. — Jacquemart, 1960:5, Figures 16-20. — Brindle, 1964:196, Figures 1, 3, 10.

**Full-grown larva.** Length 11.5-12.0 mm (Figure 873, A). Head (Figure 874, A) chestnut brown dorsally, with large, light spots. Eyes on light background; antennae small, situated near anterior margin. Frontoclypeus with 3 light, transverse dots in posterior part; larger, transverse dots lateral to posterior branch of frontal sutures, smaller dots near coronal suture; ventral surface light, with large, light, indistinct dots near occipital foramen. Gula fused with large, lateral sclerites, with distinct, dark, anterior part (Figure 874, B). Chaetotaxy as in *S. pedemontanum*; only a few of the setae are shown.

Labrum, as in *S. pedemontanum*, with rounded anterior angle; median indentation deep; posterior-angle sclerites short, blunt; setae as in *S. pedemontanum*.

Number and arrangement of gills of *S. pedemontanum* (after Siltala)

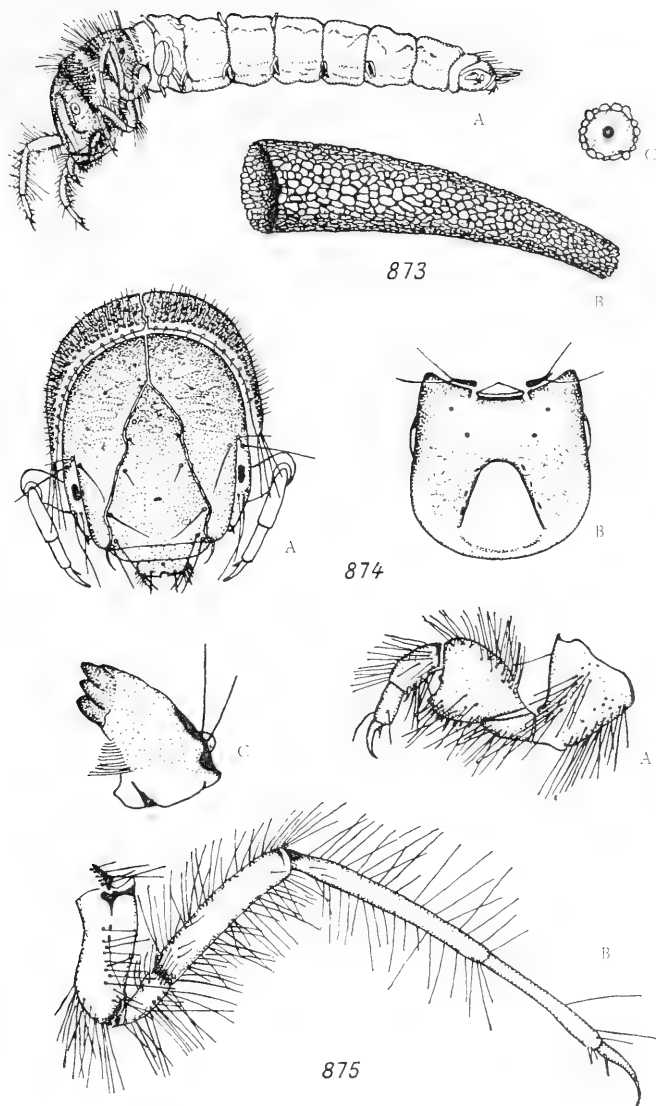
Segment	Dorsal	Pleural	Ventral
1	1-2		1-3
2	3-4	2-4	2-3
3	3-4	2-5 1	2-4
4	1-3	1 1	2-4
5	2 (0)	1	2-3
6	1 (0)	1 1	2-3
7		1 1	1-2
8			2 (0)

Number and arrangement of gills of pupa of *S. pedemontanum* (after Siltala)

Segment	Dorsal	Pleural	Ventral
2	3	3	2-3
3	2-3	3-5	3
4	2-3		3
5	1 (0)		3
6	1 (0)		3
7			2-3
8			1-2

Distal teeth of mandibles (Figure 874, C) sharp, larger than in *S. pedemontanum*; each mandible with 3 teeth at distal margin and a tooth-shaped process on dorsal blade.

548 Pronotum dark brown, with numerous setae anteriorly; posterior part with a dark stripe near median suture and 2 large dots laterally. Mesonotum lighter, yellowish, weakly sclerotized, with several indistinct, brownish dots. Mesonotum membranous, with an anterior and a posterior row of setae.



FIGURES 873-875. *Sericostoma personatum* Spence (after Hickin):

873 - larva, lateral (A), case (B), posterior opening of larval case (C); 874 - head, dorsal and part of prothorax, anterior (A), head, ventral (B), right mandible, dorsal (C); 875 - left foreleg (A) and right hind leg (B), posterior.

Legs as in *S. pedemontanum* (Figure 875).

Gills on segments 1-8.

Anal legs as in *S. pedemontanum*, short; area "b" with numerous strong, black setae dorsally; claw small, strongly convex at base, with short, beaklike distal part, with one large and 2 smaller denticles situated one above the other.

Case 15–16 mm long, made of sand grains, relatively wide, with smooth walls, curved, only slightly tapering posteriorly, end truncate; posterior opening wide, with a dark membrane only at margin (Figures 873, B, C).

**Pupa.** Length 10.5–11.0 mm. Antennae filiform, reaching end of body; proximal segment much thicker and longer than others. Two blunt processes above labrum. Labrum small, its form as in *S. pedemontanum*; setae of anteclypeus shorter than on labrum, as in *S. pedemontanum*. Mandibles large, with long, curved, distal part with coarsely serrated median side.

Wing sheaths reaching to end of segment 7.

Holding apparatus with following number of hooks: segment III:2; segment IV:2–3; segment V:2–3+2–3; segment VI:2–4; segment VII:2–3. Lateral line with dense, brown setae on segments 5–8. Gills on segments 2–8.

Anal rods slightly curved. Genital appendages broad, longer than penis sheath.

Case as in larva, made of sand grains, 16–18 mm long, with coarser grains at anterior margin; anterior and posterior membranes with a slit-shaped hole.

Mode of life and habitats. Brooks and rivulets with a rapid current; estuaries of lakes.

Distribution. Western and northwestern parts of European USSR. In addition, Europe.

### 3. *Sericostoma grusiense* Martynov

Meshkova, 1964:67–71, Figures 1–6.

549 **Full-grown larva.** Length 11–12 mm. Head (Figure 876, A) uniformly dark reddish brown, dorsally with indistinct, large, dark dots in posterior angle of frontoclypeus and lateral to epicranial suture. Ventral side with dark areas laterally like dorsal side, with large, light dots; gula brownish, darker anteriorly, clearly marked off by a light stripe (Figure 876, B).

Pronotum with small, pointed processes at anterior angles; anterior part of surface brown, with numerous setae, posterior part lighter, brownish, with indistinct, darker brown spots, posterior margin yellowish.

Mesonotum brownish, whitish posteriorly, with indistinct dots.

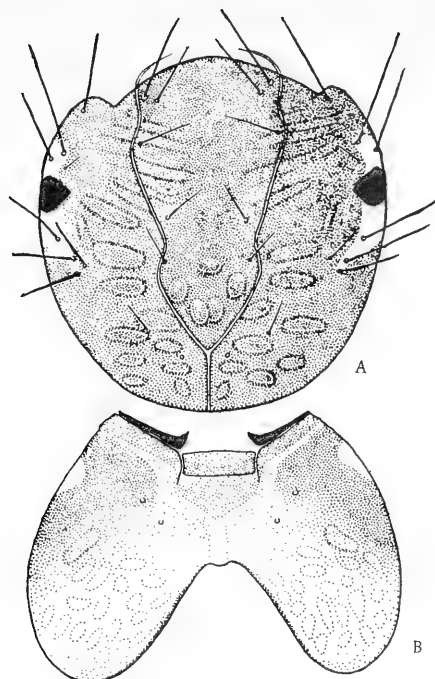
Propleuron brown, with dark brown pleural suture.

Legs brown; secondary setae of mid- and hind legs numerous on coxae and femora, sparse on tibiae.

Case 12–15 mm long, in form of a wide, slightly curved tube with a smooth surface of fine, uniformly arranged sand grains; posterior membrane with large, round, central hole.

**Pupa.** Antennae of female pupae reaching end of body, antennae of male pupae slightly longer. Wing sheaths reaching to abdominal segments 6–7. Sclerites of holding apparatus presegmental on segments 3–7, postsegmental on segment 5; denticles large, 2 on presegmental sclerites, 2–4 on postsegmental sclerites.

Pupal case slightly smaller than that of larva, 10–11 mm in male pupae, 11–12 mm in female pupae, often occurring in groups of to 200 specimens (Figure 877).



876



877

FIGURES 876 and 877. *Sericostoma grusiense* Mart.:

876 — head, dorsal (A) and ventral (B); 877 — group of pupal cases (after Meshkova).

**Mode of life and habitats.** Small rivulets on stony bottom, in large aggregations; phytophagous, feeding on remains of plants and algae, sometimes also on remains of animals, e. g., mayflies. An important food of Sevan trout.

**Distribution.** USSR: Caucasus. Not recorded outside the USSR.

## Bibliography\*

(Compiled by S. G. Lepneva and E. A. Temyueva)

### Publications in Russian

- Botoșăneanu, L. and St. Negrea. Rodnikovyi kompleks v Korbii Chundzh' — reliktovyi vodnyi oasis v Rumynskoi ravnine (The Spring Complex of Korbii Chundzh — a Relict Water Oasis in the Rumanian Plateau). — Byulleten' Nauchnoi Informatsii, Seriya Estestvennykh Nauk, No. 2: 85—88. 1961.
- Golyshkina, R. A. Fauna rucheinikov (Trichoptera) reki Angary (Trichoptera of the Angara River). — Zoologicheskii Zhurnal, 41 (11): 1646—1658. 1962.
- Kachalova, O. L. Rucheiniki nizhnego techeniya reki Daugavy (Trichoptera of the Lower Reaches of the Daugava). — Latv. Ent., No. 3: 69—74. 1961.
- Kachalova, O. L. Novye dannye po faune rucheinikov (Trichoptera), naselyayushchikh vodoemy Latviiskoi SSR (New Data on the Trichoptera of Latvia). — Izvestiya AN Latviiskoi SSR, Vol. 5: 80—84. 1964.
- Kachalova, O. L. Sravnitel'nyi obzor fauny rucheinikov Latvii i Karelii (Comparative Review of the Trichoptera of Latvia and Karelia). — Latv. Ent., Vol. 8: 25—41. 1964.
- Kachalova, O. L. Rucheiniki Karelii (Trichoptera of Karelia). — In Sbornik: Fauna ozer Karelii, Bespozvonochnye, pp. 209—220, Moskva—Leningrad, Izd. "Nauka." 1965.
- Kazlauskas, R. S. Entomofauna (Ephemeroptera, Plecoptera, Trichoptera) rek Litovskoi SSR i ee znachenie v pitanii foreli (The Fauna of Ephemeroptera, Plecoptera, Trichoptera in Lithuania and its Role in the Food of Trout). pp. 1—14. Author's Summary of Thesis. Vilnius. 1963.
- Lepneva, S. G. Rucheiniki triby Baicalinini Mart. (Trichoptera, Limnophilidae). Lichinochnaya faza (Trichoptera of the Tribe Baicalinini Mart. (Trichoptera, Limnophilidae) Larvae). — Entomologicheskoe Obozrenie, 43 (3): 669—676. 1964.
- Lepneva, S. G. Fauna SSSR. Novaya seriya, 88. Rucheiniki, II, 1. Lichinki i kukolki podotryada kol'chatoshchupikovykh (Annulipalpia) (Fauna of the USSR, New Series, 88, Trichoptera, II, 1. Larvae and Pupae of the Suborder Annulipalpia). pp. 1—560. 1964a.
- Levanidova, I. M. Baikalskie rucheiniki i nekotorye soobrazheniya o prichinakh ikh endemizma (Trichoptera of Lake Baikal and Considerations on their Endemism). Thesis. Vol. 1: 219. 1945.

\* Addition to the list in Fauna of the USSR, Trichoptera, Volume II, No. 1.

- Levanidova, I. M. K faune rucheinikov ozera Kosogol (Mongol'skaya Narodnaya Respublika) (The Fauna of Trichoptera of Lake Kosogol in Mongolia). — Doklady AN SSSR, 55 (6): 561—563. 1947.
- Levanidova, I. M. Kormovaya baza molodi lososei v basseine Amura i perspektivy ee izucheniya (The Food Supply of Young Salmon in the Amur Basin and the Prospects of its Study). — In: Lososevoe khozyaistvo Dal'nego Vostoka, pp. 153—174, Moskva. 1964.
- Levanidova, I. M. K zoogeografii gidrofauny yuzhnykh raionov Dal'nego Vostoka (Zoogeography of the Aquatic Fauna of the Southern Parts of the Far East). — Izvestiya Tikhookeanskogo Nauchno-Issledovatel'skogo Instituta Rybnogo Khozyaistva i Okeanografii, Vol. 55: 175—195. 1964.
- Levanidova, I. M. and L. S. Rubanenkova. O metodike izucheniya zhiznennykh tsiklov amfibioteskikh nasekomykh (Methods of the Examination of Life Cycles in Amphibiotic Insects). — Zoologicheskii Zhurnal, 44 (1): 34—45. 1965.
- Meshkova, A. M. K sistematike i biologii *Sericostoma grusiense* Mart. (Trichoptera) (Taxonomy and Biology of *Sericostoma grusiense* Mart. (Trichoptera)). — Izvestiya AN Armyanskoi SSR, Biologicheskie Nauki, 17 (3): 67—71. 1964.
- Rubanenkova, L. S. Razmernaya i vesovaya kharakteristika nekotorykh massovykh donnykh bespozvonochnykh basseina Amura (Characteristics of Size and Weight of Some Benthic Invertebrates Occurring in Masses in the Amur Basin). — Izvestiya Tikhookeanskogo Nauchno-Issledovatel'skogo Instituta Rybnogo Khozyaistva i Okeanografii, Vol. 55: 239—244. 1964.
- Sibirtseva, L. K. Fauna bespozvonochnykh basseina reki Chirchik (Invertebrate Fauna of the Chirchik River). Author's Summary of Thesis. pp. 1—14, Tashkent. 1964.
- Spuris, Z. D. Materialy po faune rucheinikov ozer Latviiskoi SSR (On the Fauna of Trichoptera of the Lakes of Latvia). — Latv. Ent., Vol. 6: 55—75. 1962.
- Spuris, Z. D. Zametki o rucheinikakh Zemgal'skoi ravniny (Notes on the Trichoptera of the Zemgal Plain). — Latv. Ent., Vol. 7: 41—44. 1963.
- Spuris, Z. D. Rucheiniki ozer severnoi Latvii (Trichoptera of the Lakes of Northern Latvia). — Latv. Ent., Vol. 8: 3—24. 1964.
- Zarechnaya, S. N. Rucheiniki volzhskikh vodokhranilishch. Fauna i biologiya (Trichoptera of the Volga Reservoirs. Fauna and Biology). Author's Summary of Thesis, pp. 1—20, Leningrad. 1964.
- Zarechnaya, S. N. Zhelezy lichinok rucheinikov. II. Zhil'sonovy zhelezy (Glands of Larvae of Trichoptera. II. Gilson's Glands). — In Sbornik: Ekologiya i biologiya presnovodnykh bespozvonochnykh; Trudy Instituta Biologii Vnutrennikh Vod AN SSSR, 8 (11): 113—117. 1965.

#### Publications in Other Languages

- Allegret, P. and C. Denis. Étude morphologique de l'appareil séricigène des larves de quelques espèces de Trichoptères et conséquences physiologiques immédiates. — Bull. Soc. zool. Fr., 88 (5/6): 556—568. 1964.

- Baker, W. V. Some Observations on the Associations of Trichopterous Larvae. — Entomologist's mon. Mag., Ser. 4, Vol. 22, 261: 192. 1961.
- Baker, W. V. Some Notes on the Taxonomy of the Last Instar Larvae of British Species of the Subfamily Goerinae (Trichoptera: Sericostomatidae). — Proc. R. ent. Soc. Lond., (B), 32 (11/12): 171—174. 1963.
- Bansk, N. A Classification of Our Limnophilid Caddis Flies. — Can. Ent., 48 (4): 117—122. 1916.
- Bitsch, J. and B. Frochot. Données récentes sur les Trichoptères cavernicoles. — Spelunca, Vol. 2: 64—70. 1962.
- Boettger, C. R. Lebende Weichtiere als Baumaterial an Gehäusen von Köcherfliegen-Larven. — Natur und Volk, 80 (4): 146—150. 1950.
- Botoșăneanu, L. La larve d'un Anisocentropus de Ceylan, et la larve et la nymphe de Pseudostenophylax rotundipennis de Karakoram (Ins. Trichoptera). — Senckenberg. biol., 38 (5/6): 295—308. 1957.
- Botoșăneanu, L. and J. Sykora. Nouvelle contribution à la connaissance des Trichoptères de Bulgarie. — Sb. faun. Pracienc. Odd. nár. Mus. Praze, 9, Vol. 77: 121—142. 1963.
- Bournaud, M. Résistance d'une larve de trichoptère aux courants d'eau. — C. r. Congr. Socs. sav. Paris, Sect. Sci., Vol. 2: 373—379. 1964.
- Bournaud, M., M. T. Casoli-Mein, and C. Collardeau-Roux. Observations sur la biologie de *Micropterna testacea* (Gmel.) (Trichoptera, Limnophilidae). — Bull. mens. Soc. linn. Lyon, 30 (3): 44—47. 1961.
- Bournaud, M., M. T. Casoli-Mein, and C. Collardeau-Roux. La larve de *Micropterna testacea* (Gmel.). — Bull. mens. Soc. linn. Lyon, 31 (1): 8—20. 1962.
- Brindle, A. The Larval Taxonomy of the British Trichoptera. — Entomologist's Rec. J. Var., 76 (7/8): 194—198. 1964.
- Collardeau, C. Influence de la température sur la consommation d'oxygène de quelques larves de Trichoptères. — Hydrobiologia, 18 (3): 252—264. 1961.
- Corbet, P. S. Larvae of Certain East African Trichoptera. — Revue Zool. Bot. afr., 58 (3/4): 203—213. 1958.
- Cummins, K. W. Factors Limiting the Microdistribution of Larvae of the Caddis Flies *Pycnopsyche lepida* (Hagen) and *Pycnopsyche guttifer* (Walker) in a Michigan Stream (Trichoptera: Limnophilidae). — Ecol. Monogr., 34 (3): 271—295. 1964.
- Décamps, H. Note sur quelques espèces de Trichoptères troglodytes. — Anns. Spéleol., 17 (4): 577—583. 1962.
- Décamps, H. Larves Pyrénéennes du genre *Rhyacophila* (Trichoptères). — Annales Limnolog., 1 (1): 51—72. 1965.
- Denning, D. G. Trichoptera. — In: R. L. Usinger. Aquatic Insects of California, pp. 237—270, Berkeley and Los Angeles. 1956.
- Edington, J. M. The Taxonomy of British Polycentropid Larvae (Trichoptera). — Proc. zool. Soc. Lond., 143 (2): 281—300. 1964.
- Edington, J. M. The Effect of Water Flow on Populations of Net-spinning Trichoptera. — Mitt. int. Verein. theor. angew. Limnol., Vol. 13: 40—48. 1965.



- Fischer, F. Trichopteroorum catalogus. V. Phryganeidae, Limnocoenopodidae, Molannidae. pp. I—VI + 1—214, Amsterdam. 1964.
- Fischer, F. Zwei Jahrhunderte Systematik der Köcherfliegen (Trichoptera). — Proc. XII Int. Congr. Ent., pp. 124—125, London. 1964, 1965.
- Fischer, F. Trichopteroorum catalogus. VI. Calamoceratidae, Philorheithridae, Odontoceridae, Leptoceridae, Part 1, pp. I—VI + 1—242. 1965.
- Fischer, F. Trichopteroorum catalogus. VII. Leptoceridae, Part 2, pp. 1—163, Amsterdam. 1966.
- Flint, O.S. Notes on Some Nearctic Psychomyiidae, with Special Reference to their Larvae (Trichoptera). — Proc. U.S. Nat. Mus., 115(3491): 467—481. 1964.
- Fotius-Jaboulet, M.C. La Larve de *Drusus trifidus* MacLachlan (Trichoptera, Limnophilidae). — Trav. Lab. Zool. Stn. aquic. Grimaldi Dijon, Vol. 39: 1—19. 1961.
- Fotius-Jaboulet, M.C. Anatomie des glandes cephaliques de la larve de *Rhyacophila septentrionis* (Trichoptera-Rhyacophilidae). — Bibliogr. France Dijon, 152(49): 1303. 1963.
- Fotius-Jaboulet, M.C. Description de la larve de *Rhyacophila praemorsa* McL. et comparaison de cette larve a celle de *Rhyacophila septentrionis* McL. (Trichoptera, Rhyacophilidae). — Trav. Lab. Zool. Stn. aquic. Grimaldi Dijon, Vol. 62: 1—13. 1964.
- 552 Frochot, B. La larve de *Stenophylax permistus* McL. (Trichoptera, Limnophilidae). — Trav. Lab. Zool. Stn. aquic. Grimaldi Dijon, Vol. 42: 1—16. 1962.
- Hanna, H.M. Methods of Case-building and Repair by Larvae of Caddis Flies. — Proc. R. ent. Soc. Lond., (A), Vol. 35: 97—106. 1960.
- Hanna, H.M. The Larva of *Hydroptila sparsa* Curtis (Trichoptera: Hydroptilidae). — Entomologist's Gaz., Vol. 12: 69—75. 1961a.
- Hanna, H.M. A Study of the Morphology and Feeding Habits of Certain Species of Caddis Larvae (Trichoptera). — Bull. Soc. ent. Egypte, Vol. 45: 435—444. 1961b.
- Harnisch, O. Beobachtungen am Tracheensystem einiger Trichopterenlarven, besonders von *Polycentropus flavomaculatus* bei erniedrigtem O<sub>2</sub>-Partialdruck. — Zool. Anz., 159 (3/4): 39—44. 1957.
- Harnisch, O. Tracheenkiemen Gehäuse-tragender, raupenförmiger Trichopterenlarven bei erniedrigtem O<sub>2</sub>-Partialdruck. — Zool. Anz., 160 (3/4): 42—47. 1958.
- Hellman, E. A. Havaintoja vesiperhosten (Trichoptera) esiintymisestä eräillä pohjois-Suomen paikkakunnilla. — Suom. hyönt. Aikak., Vol. 3: 133—136. 1952.
- Illies, J. Der biologische Aspekt der limnologischen Fließwassertypisierung. — Arch. Hydrobiol., Suppl., 22 (3/4): 337—346. 1955.
- Illies, J. Versuch einer allgemeinen biozönotischen Gliederung der Fließgewässer. — Int. Revue ges. Hydrobiol. Hydrogr., 46 (2): 205—213. 1961.
- Illies, J. and L. Botoşăneanu. Problèmes et méthodes de la classification et de la zonation écologique des eaux courantes, considérées surtout du point de vue faunistique. — Mitt. int. Verein. theor. angew. Limnol., Vol. 12: 1—57. 1963.

- International Code of Zoological Nomenclature Adopted by the XV International Congress of Zoology, pp. I—XVII + 1—176, London. 1961.
- Internationale Regeln für die Zoologische Nomenklatur, Beschlossen vom XV Internationalen Kongress für Zoologie. — Deutscher Text, pp. I—VIII + 1—90, Frankfurt am Main. 1962.
- Jacquemart, S. and I. Coineau. Un Trichoptère modificateur principal dumilieu, *Stenophylax stellatus* Curtis. — *Vie Milieu*, 14(1): 155—168. 1963.
- Johnston, G. W. Stridulation by Larval Hydropsychidae (Trichoptera). — *Proc. R. ent. Soc. Lond.*, (A), 39(10/12): 146—150. 1964.
- Kaiser, P. *Leptocerus fulvus* Rambur, eine in Süßwasserschwämmen minierende Köcherfliegenlarve. — *Mitt. Hamb. zool. Mus. Inst.*, Vol. 61: 79—82. 1964.
- Klapálek, F. The Metamorphoses of *Apatania muliebris* McL.—*Entomologist's mon. Mag.*, Vol. 25: 241—242. 1889.
- Korboot, K. Comparative Studies of the External and Internal Anatomy of Three Species of Caddis Flies (Trichoptera). — *Pap. Dep. Ent. Univ. Qd.*, 2(1): 1—44. 1964.
- Libosvářský, J. Příspěvek k poznání larv chrostíků řeky Moravice hlavně s ohledem k čistotě vody. — *Časopis pro zveřejňování vědecké činnosti učitelů a studentů*, No. 2: 161—173. 1955.
- Marlier, G. Les metamorphoses de deux Limnophilidae (Trichoptera) de l'Amerique du Sud. — *Arch. Hydrobiol.*, 59(2): 243—252. 1963.
- Mayer, K. Chrostíci povodí Blanice a Zlatého potoka. — *Sbor. přír. klubu přír. v. Brně*, pp. 1—6. 1933.
- Mayer, K. Postranni čára a pouzdro larv chrostíka. *Anabolia laevis* Zett. — *Čas. čsl. Spol. ent.*, Vol. 34: 16—24. 1937a.
- Mayer, K. Ein Beitrag zur Ethologie der Larve von *Anabolia laevis* Zett. (Trichoptera). — *Faculté Sci. Université Masaryk.*, Vol. 243: 1—9, Brno. 1937b.
- Mecom, J. O. and K. W. Cummins. A Preliminary Study of the Trophic Relationships of the Larvae of *Brachycentrus americanus* (Banks) (Trichoptera: Brachycentridae). — *Trans. Am. microsc. Soc.*, 83(2): 233—243. 1964.
- Merrill, D. The Stimulus for Case-building Activity in Caddis-worms (Trichoptera). — *J. exp. Zool.*, 158(1): 123—131. 1965.
- Mishimura, N. and R. Ohgushi. On the Feeding Activity of Two Species of Net-spinning Caddis Fly Larvae (Stenopsychidae: Trichoptera). — *Jap. J. Ecol.*, 8(1): 49—53. 1957.
- Morton, K. I. The Preparatory Stages of *Adicella filicornis* Pictet. — *Entomologist's mon. Mag.*, Ser. 2, Vol. 15: 82—84. 1904.
- Nachträge zu: Internationale Regeln für die Zoologische Nomenklatur. Beschlossen vom XV Internationalen Kongress für Zoologie. Deutscher Text. 45(5): 441—442, Senck. Frankfurt am Main. 1964.
- 553 Neațsu, P. Cercetări asupra biologiei și ecologiei stadiilor postembrionare de *Limnophilus flavicornis* Fabr. (Ord. Trichoptera). — *An. Univ. București, ser. Stiint. Nat. Biol.*, 12(38): 125—137. 1963.
- Neboiss, A. The Trichoptera Types of Species Described by J. Curtis. — *Beitr. Ent.*, 13(5/6): 582—635. 1963.
- Nielsen, A. Spring Fauna and Speciation. — *Proc. int. Ass. theor. appl. Limnol.*, Vol. 11: 261—263. 1951.

- Novák, K. Die Verbreitung der Arten der Gattung *Rhyacophila* Piet. in Böhmen (Trichoptera). — Čas. čsl. Spol. ent., 59 (3): 250—265. 1962.
- Novák, K. and F. Sehnal. The Development Cycle of Some Species of the Genus *Limnephilus* (Trichoptera). — Čas. čsl. Spol. ent., 60 (1/2): 68—80. 1963.
- Nybom, O. List of Finnish Trichoptera. — Soc. Fauna Flora Fauna Fenn., Vol. 6: 1—56. 1960.
- Philipson, G. N. The Fifth Instar Larva of *Potamophylax stellatus* (Curtis) (Limnephilidae: Trichoptera). — Hydrobiologia, Vol. 18: 321—326. 1961.
- Riedel, W. Chrušćiki (Trichoptera) Tatr. — Fragm. faun., 9 (26): 417—438. 1962.
- Ross, H. Evolution of Caddis-worm Cases and Nets. — Amer. Zoologist, 4 (2): 209—220. 1964.
- Satiya, G. R. The Structure of the Alimentary Canal and Mouth-parts of Trichoptera Larvae with Special Reference to Food and Feeding Habits. IV. Mouth-parts of *Tinodes waeneri*, *Athripsodes alboguttatus*, *Rhyacophila dorsalis*, *Agapetus fuscipes*, *Phryganea striata* and *Plectrocnemia conspersa*. — Res. Bull. Panjab Univ. Sci., 11 (1/2): 1—10. 1960.
- Satiya, G. R. The Structure of the Alimentary Canal and Mouth-parts of Trichoptera Larvae with Special Reference to Food and Feeding Habits of *Tinodes waeneri*, *Athripsodes alboguttatus*, *Rhyacophila dorsalis*, *Agapetus fuscipes*, *Phryganea striata*, *Plectrocnemia conspersa*. — Res. Bull. Panjab Univ. Sci., 15 (3/4): 221—224. 1964.
- Sattler, W. Beobachtungen an den Larven von *Crunoecia irrorata* Curt. (Trichoptera). — Ber. limnol. Flusssstn. Freudenthal, Vol. 8: 18—32. 1957.
- Sattler, W. Die Larven- und Puppenbauten von *Diplectrona felix* McLach. (Trichoptera). — Zool. Anz., 170 (1/2): 53—55. 1963a.
- Sattler, W. Über den Körperbau, die Ökologie und Ethologie der Larve und Puppe von *Macronema pict.* (Hydropsychidae). — Arch. Hydrobiol., 59 (1): 26—60. 1963b.
- Szlep, R. Selection of Building Material for the *Molanna angustata* Case. — Folia biol., 6 (4): 301—306. 1958.
- Tindal, A. Ya. Specific Gravity of the Cases of the Larvae of *Limnephilus* and *Triaenodes* (Trichoptera). — Nature, 196 (4855): 690—691. 1962.
- Tindal, A. Ya. Some Observations on the Biology and Caddis Larvae. — Entomologist's Gaz., 14 (1/2): 28—30. 1963.
- Tindal, A. Ya. The Skeleton and Musculature of the Larval Thorax of *Triaenodes bicolor* Curtis (Trichoptera: Limnephilidae). — Trans. R. ent. Soc. Lond., 116 (8): 151—210. 1964.
- Tobias, W. Die Gehäusebauten der Köcherfliegen (Trichoptera) unter Berücksichtigung der bis 1961 erschienenen Literatur. pp. 1—126, Schlitz-Hessen. 1961.
- Ulmer, G. Hamburgische Elb-Untersuchung. V. Trichopteren. — Mitt. naturh. Mus. Hamb., Vol. 20: 279—289. 1903.

- Wiggins, G. B. The Immature Stages of Trichoptera. — Can. Ent., 96 (1-2): 163. 1964.
- Wiggins, G. B. Additions and Revisions to the Genera of North American Caddisflies of the Family Brachycentridae with Special Reference to the Larval Stages (Trichoptera). — Can. Ent., 97 (10): 1089-1106. 1965.
- Yamamoto, T. and G. B. Wiggins. A Comparative Study of the North American Species in the Caddis Fly Genus *Mystacides* (Trichoptera: Leptoceridae). — Can. J. Zool., Vol. 42: 1105-1126. 1964.
- Zacwilichowska, K. Chruściki (Trichoptera) potoku Wielka Puszcza. — Acta hydrobiol., Krakow, 6 (2): 139-154. 1964.

## ALPHABETIC INDEX OF LATIN NAMES\*

554

- abstrusus, *Limnophilus* 7, 173, 185, 186\*  
 Adicella 10, 432, 433, 497  
 Adicella filicornis 10, 497, 498\*, 552  
 admorsus, *Glyphotaenius* 151  
 admorsus, *Nemotaulius* 6, 145, 151, 152\*, 153  
 affinis, *Limnophilus* 7, 174, 213, 214\*, 215  
 Agapetus fuscipes 552  
 Agrypnetes 17, 27, 5  
 Agrypnetes crassicornis 5, 27\*, 28\*, 29\*, 30, 31\*  
 Agrypnia 5, 17, 18, 32, 34, 46, 48, 50, 52  
 Agrypnia obsoleta 39  
 A. pagetana 5, 18, 20\*, 21\*, 22\*, 23\*, 24, 25\*, 26, 29, 30, 39, 41  
 A. picta 5, 18, 26\*, 39  
 Agrypnia varia 41  
 albicans, *Molanna* 10, 418, 424, 425\*, 427  
 albicorne, *Odontocerum* 9, 408, 409\*, 410\*, 412\*, 413\*  
 alboguttatus, *Athripsodes* 10, 434, 435, 458\*, 552  
*Allophylax* 75  
 americanus, *Brachycentrus* 552  
 amurensis, *Asynarchus* 7, 145, 245, 246\*, 247\*, 248\*, 250  
 Anabolia 7, 145, 235, 244, 245  
 Anabolia furcata 7, 236, 242, 243  
 A. laevis 242, 552  
 Anabolia modesta Hag. 248  
 A. nervosa 7, 236, 241, 242, 243\*, 245  
 A. soror 7, 236, 237\*, 238\*, 239\*, 240, 241\*, 242, 243  
 A. sororcula 236  
 angustata, *Molanna* 10, 418\*, 419\*, 420\*, 421\*, 422, 423\*, 424—427, 553  
 Anisocentropus 9, 398, 399, 404, 551  
 Anisocentropus pallidus 9, 399, 400\*, 402\*, 403, 404  
 Anisogamodes 8, 250, 289  
 Anisogamodes flavipunctatus 8, 289, 290\*, 291\*, 292  
 Annitella 8, 297, 304  
 Annitella obscurata 8, 305, 306\*, 307  
 annulicornis, *Athripsodes* 10, 433—435, 451, 452\*, 453, 454\*, 455, 457, 462, 518  
 Annulipalpia 13  
 Apatania 6, 88, 110, 111, 117, 124, 127, 133, 137, 138, 323, 324, 327, 328, 335, 344, 346, 347, 356  
 Apatania auricula 6, 112, 142\*, 143\*  
 A. bulbosa 111  
 A. copiosa 6, 111, 135\*, 136\*, 137  
 A. crymophila 6, 111, 120, 122\*, 123, 125  
 A. majuscula 6, 111, 131, 132\*, 133\*, 134  
 A. muliebris 6, 111, 138, 139\*, 140\*, 143, 552  
 A. stigmatella 6, 112, 124, 125\*, 126\*, 127  
 A. subtilis 6, 111, 116, 117\*, 119\*, 120  
 A. wallengreni 6, 112, 113\*, 115  
 A. zonella 6, 111, 128, 129\*, 130\*, 131, 132, 134  
 Apataniana 111  
 Apataniinae 6, 62, 63, 86, 88, 91, 97, 393, 342  
 Apataniini 6, 86, 87, 110, 111  
 Apatelia 110, 111  
 Apatidelia 111  
 Apatidelia martynovi 111  
 armata, *Psilotreta* 414  
 articularis, *Ernodes* 11, 526, 527\*  
 Asynarchus 7, 145, 244, 245  
 Asynarchus amurensis 7, 145, 245, 246\*, 247\*, 248\*, 250  
 A. fusorius 248  
 A. lapponicus 7, 245, 248, 249\*  
 aterrimus, *Athripsodes* 10, 433, 434, 435, 436\*, 437\*, 438\*, 439\*, 440\*, 441, 443, 447, 450, 451  
 Athripsodes 10, 432, 433, 451—453, 456, 462, 463, 473, 480, 484, 495, 501  
 Athripsodes alboguttatus 10, 434, 435, 458\*, 552  
 A. annulicornis 10, 433—435, 451, 452\*, 453, 454\*, 455, 457, 462, 518  
 A. aterrimus 10, 433, 434, 435, 436\*, 437\*, 438\*, 439\*, 440\*, 441, 443, 447, 450, 451  
 A. bilineatus 10, 433, 434, 444, 445\*  
 A. cinereus 10, 433, 434, 441, 442\*, 443\*, 444  
 A. excisus 10, 433—435, 446\*, 448\*, 449\*, 450, 451, 453, 455, 457, 518

\* Italics indicate synonyms; bold figures denote numbers of pages [Russian page nos., appearing in the left-hand margin of this translation] where a description is given; numbers with an asterisk indicate the page on which a figure is shown of the form in question; italicized numbers refer to names taken from the literature.

- A. fulvus* 10, 433—435, 455, 456\*, 457\*, 458, 460  
*A. senilis* 10, 433—435, 459\*, 460\*, 461\*  
*atomarius*, *Grammotaulius* 7, 156, 157, 158\*, 160\*, 161, 162, 164, 167—170, 203  
*atrata*, *Holostomis* 53  
*atrata*, *Semblis* 5, 49, 51, 53, 54\*  
*auricula*, *Apatania* 6, 112, 142\*, 143\*  
*auricula*, *Limnophilus* 7, 174, 226, 227\*  
*azurea*, *Mystacides* 10, 463, 464, 465\*, 466\*, 467\*, 468\*, 469, 470, 472, 475, 479  
*Baicalina* 6, 87, 88, 92, 96, 104  
*Baicalina bellicosa* 6, 97, 98\*, 99\*, 100\*, 102—107  
*B. spinosa* 6, 97, 102\*, 103\*, 104\*  
*B. thamastoides* 6, 97, 102—104, 105\*, 106  
*Baicalinella* 6, 87, 88, 107  
*Baicalinella foliata* 6, 107, 108\*, 109\*  
*Baicalinini* 6, 87, 88, 110—112, 121, 129, 550  
*Baicalodes* 6, 87, 88, 92  
*Baicalodes ovalis* 6, 92, 93\*, 94\*, 95, 96\*  
*baltica*, *Erotosis* 10, 488, 489\*  
*basalis*, *Lasiocephala* 9, 368\*  
*bellicosa*, *Baicalina* 6, 97, 98\*, 99\*, 100\*, 102—107  
*Beraea* 11, 519, 526, 527, 529, 530  
*Beraea maurus* 11, 520, 524\*, 525  
*B. pullata* 11, 520, 521\*, 523\*, 525, 526  
*Beraeidae* 11, 14, 15, 518  
*Beraeodes* 11, 519, 527  
*Beraeodes minuta* 11, 528, 529\*  
*bifoliatum*, *Micrasema* 9, 393  
*bilineatus*, *Athripsodes* 10, 433, 434, 444, 445\*  
*bilineatus*, *Leptocerus* 444  
*bicolor*, *Trienodes* 479, 480, 481\*, 482\*, 484\*, 485\*, 487—490, 493, 494, 553  
*bipunctata*, *Phryganea* 5, 32, 33\*, 34\*, 35\*, 36\*, 37\*, 38  
*bipunctatus*, *Limnophilus* 7, 173, 204, 205\*, 206  
*borealis*, *Limnophilus* 7, 173, 200, 202\*, 203\*, 204  
*Brachycentridae* 9, 14, 369, 383, 388, 530, 552  
*Brachycentrus* 9, 370, 378, 381, 383, 385, 387, 391  
*Brachycentrus americanus* 552  
*B. caucasicus* 9, 370, 378, 380\*  
*B. montanus* 9, 370, 377, 378\*  
*B. subnubilus* 9, 370, 371\*, 372\*, 374\*, 375, 376\*, 377—381, 389, 397  
*brevipennis*, *Phacopteryx* 7, 232, 233\*, 234\*, 235  
*bulbosa*, *Apatania* 114  
*Caborius* 75  
*Calamoceratidae* 9, 14, 398, 551  
*caucasicus*, *Brachycentrus* 9, 370, 378, 380\*  
*caucasicus*, *Drusus* 8, 309, 310, 311\*, 313\*, 314—316  
*centralis*, *Limnophilus* 7, 174, 216, 217\*, 218, 219\*  
*ciliaris*, *Notidobia* 11, 531, 532\*, 533\*, 535\*, 536\*, 537\*, 538  
*Chaetopterygini* 8, 144, 296  
*Chaetopterygopsis* 8, 297, 307  
*Chaetopterygopsis maclachlani* 8, 307, 308\*  
*Chaetopteryx* 8, 297, 305, 308  
*Chaetopteryx obscurata* 305  
*Ch. sahlbergi* 8, 297, 298\*, 299\*, 300, 301\*, 302, 303  
*Ch. villosa* 8, 297, 301, 302\*, 303, 304\*  
*cinereus*, *Athripsodes* 10, 433, 434, 441, 442\*, 443\*, 444  
*clathrata*, *Hagenella* 5, 59\*  
*Colpotaulius* 232  
*Colpotaulius incisus* 231  
*conspersa*, *Plectrocnemia* 553  
*conspersa*, *Trienodes* 485  
*conspersus*, *Trienodes* 480, 485, 486\*  
*copiosa*, *Apatania* 6, 111, 135\*, 136\*, 137  
*crassicornis*, *Agrypnetes* 5, 27\*, 28\*, 29\*, 30, 31\*  
*Crunoecia* 9, 350, 363, 368, 369  
*Crunoecia irrorata* 9, 363, 364\*, 365\*, 366, 367\*, 553  
*crymophila*, *Apatania* 6, 111, 120, 122\*, 123, 125  
*Dasystegia* 5, 17, 39  
*Dasystegia obsoleta* 5, 29, 39, 40\*, 41\*, 42\*, 43  
*D. varia* 5, 39, 41, 43\*  
*decipiens*, *Limnophilus* 7, 173, 198, 199\*, 200, 201\*  
*dentata*, *Mystacides* 10, 463, 470, 471\*  
*despectus*, *Limnophilus* 227  
*Dicosmoecinae* 6, 62, 63  
*Dicosmoecus* 6, 63, 71  
*Dicosmoecus palatus* 6, 64\*, 66\*, 67\*, 68\*, 69\*, 70\*  
*digitata*, *Ecclisomyia* 6, 71, 72\*, 74\*  
*digitatus*, *Halesus* 8, 281, 287\*, 288  
*digitatus*, *Præcosmoecus* 71  
*Dinarthrum* 9, 350, 356, 362  
*Dinarthrum pugnax* 9, 356, 358\*, 359—361, 363  
*D. reductum* 9, 356, 359, 360\*, 361  
*D. tchaldyrense* 9, 356, 360, 361, 362\*  
*Diplectrona felix* 553  
*dipterus*, *Thamastes* 6, 88, 89\*, 91\*, 92, 93  
*discolor*, *Drusus*, 8, 309, 316, 317\*, 318\*  
*dorsalis*, *Rhyacophila* 552  
*Drusinae* 8, 62, 63, 308  
*Drusus* 8, 309, 315  
*Drusus caucasicus* 8, 309, 310, 311\*, 313\*, 314—316  
*D. discolor* 8, 309, 316, 317\*, 318\*  
*D. trifidus* 8, 309, 314, 315\*, 316, 551  
*dubia*, *Ironoquia* 6, 75\*, 76\*, 79\*  
*Ecclisomyia* 6, 63, 71  
*Ecclisomyia digitata* 6, 71, 72\*, 74\*  
*Ecclisopteryginae* 308  
*Ecclisopteryx* 8, 309, 319

- 556 *Ecclisopteryx guttulata* 8, 319, 320\*, 321, 322\*  
*elegans*, *Limnophilus* 7, 173, 222, 223\*  
*Enoicyla* 250  
*Enoicyla pusilla* 13  
*Ernodes* 11, 519, 526  
*Ernodes articularis* 11, 526, 527\*  
*E. palpata* 11, 526\*  
*Erotesis* 10, 432, 488  
*Erotesis baltica* 10, 488, 489\*  
*excisus*, *Athripsodes* 10, 433—435, 446\*, 448\*, 449\*, 450, 451, 453, 455, 457, 518  
*excisus*, *Potamophylax* 7, 251, 266, 267\*, 268\*  
*excisus*, *Stenophylax* 266  
*extensum*, *Ganonema* 9, 404, 405\*, 406, 407\*  
*extricatus*, *Limnophilus* 7, 174, 210, 211\*, 212\*, 213\*, 223
- filicornis*, *Adicella* 10, 497, 498\*, 552  
*flavicornis*, *Limnophilus* 7, 173, 188, 189\*, 190\*, 191\*, 192, 193, 552  
*flavipunctatus*, *Anisogamodes* 8, 289, 290\*, 291\*, 292  
*flavomaculatus*, *Polycentropus* 551  
*foliata*, *Baicalinella* 6, 107, 108\*, 109\*  
*fulvus*, *Athripsodes* 10, 433—435, 455, 456\*, 457\*, 458, 460  
*furcata*, *Anobolia* 7, 236, 242, 243  
*furva*, *Oecetis* 10, 499, 509, 510\*, 511\*, 512\*, 513, 514\*, 515, 517, 518  
*fuscicornis*, *Limnophilus* 7, 175, 209, 210\*  
*fuscipes*, *Agapetus* 552  
*fusorius*, *Asynarchus* 248
- Ganonema* 9, 399, 404  
*Ganonema extensum* 9, 404, 405\*, 406, 407\*  
*Ganonema pallidum* 399  
*Glyphotaelius* 7, 145, 154  
*Glyphotaelius admorsus* 151  
*G. pellucidus* 7, 154, 155\*, 156  
*Glyphotaelius punctatolineatus* 145  
*Goera* 8, 323, 328, 332, 334, 335, 338, 339, 348, 356  
*Goera pilosa* 8, 323, 324, 325\*, 326\*, 327, 328\*, 331, 332  
*G. sajanensis* 8, 324, 328, 329\*, 330\*, 331\*, 340  
*Goeridae* 8, 14, 322, 342—345, 348, 351, 356  
*Goerinae* 551  
*Grammotaulius* 7, 145, 156, 168  
*Grammotaulius atomarius* 7, 156, 157, 158\*, 160\*, 161, 162, 164, 167—170, 203  
*G. nitidus* 7, 156, 167, 168\*, 169  
*G. sibiricus* 7, 156, 170, 171\*  
*G. signatipennis* 7, 156, 161, 163\*, 165\*, 166, 168, 169  
*grandis*, *Phryganea* 5, 32, 37, 38\*  
*griseus*, *Limnophilus* 7, 174, 221, 228, 229\*, 230  
*grusiense*, *Sericostoma* 11, 539, 548\*, 550  
*guttifer*, *Pycnopsyche* 551
- guttulata*, *Ecclisopteryx* 8, 319, 320\*, 321, 322\*
- Hagenella* 5, 17, 18, 58  
*Hagenella clathrata* 5, 59\*  
*Halesinus* 80  
*Halesus* 8, 250, 279, 287  
*Halesus digitatus* 8, 281, 287\*, 288  
*H. interpunctatus* 8, 281, 283\*, 284\*, 285—287  
*H. tessellatus* 8, 281, 285, 286\*  
*hirtum* *Lepidostoma* 9, 350, 352\*, 354—359, 361, 366  
*Holostomis* 48  
*Holostomis atrata* 53  
*Holostomis phalaenoides* 49  
*Homilia* 10, 432, 461  
*Homilia leucophaea* 10, 461, 462\*  
*hostilis*, *Nemotaulius* 153  
*Hydatophylax* 7, 250, 268, 269, 282  
*Hydatophylax infumatus* 7, 269, 277, 278\*  
*H. magnus* 7, 269, 270\*, 271\*, 272, 273\*, 274, 276, 277  
*H. nigrovittatus* 7, 269, 274, 275\*, 276\*, 277
- Hydropsychidae* 552, 553  
*Hydroptila sparsa* 551  
*Hydroptilidae* 431, 551
- ignavus*, *Limnophilus* 7, 174, 228  
*Imania* 63  
*incanus*, *Lithax* 8, 347, 348\*, 349  
*incisus*, *Colpotauius* 231  
*incisus*, *Limnophilus* 7, 175, 231\*  
*infernale*, *Radema* 88  
*infumatus*, *Hydatophylax* 7, 269, 277, 278\*  
*Integripalpia* 5, 13, 16, 403  
*internus*, *Trienodes* 488  
*interpunctatus*, *Halesus* 8, 281, 283\*, 284\*, 285—287  
*intima*, *Oecetis* 10, 499, 505, 506\*  
*Ironoquia* 6, 63, 75  
*Ironoquia dubia* 6, 75\*, 76\*, 79\*  
*irrorata*, *Crunoecia* 9, 363, 364\*, 365\*, 366, 367\*, 553
- japonica*, *Psilotreta* 414
- kisoensis*, *Psilotreta* 9, 414, 415\*, 416\*  
*kyotoensis*, *Psilotreta* 414
- lacustris*, *Oecetis* 10, 499, 500, 507\*, 508\*  
*laevis*, *Anobolia* 242, 552  
*lapponica*, *Neuronia* 47  
*lapponica*, *Oligotricha* 5, 44, 47\*, 48  
*lapponicus*, *Asynarchus* 7, 245, 248, 249\*  
*Lasiocephala* 9, 350, 366, 368  
*Lasiocephala basalis* 9, 368\*  
*lateralis*, *Micropterna* 8, 293, 294, 295\*, 296  
*latipennis*, *Potamophylax* 7, 251, 262\*  
*lepida*, *Pycnopsyche* 551  
*Lepidostoma* 350, 357, 358, 364—366, 368  
*Lepidostoma hirtum* 9, 350, 352\*, 354—359, 361, 366

- Lepidostomatidae 9, 14, 62, 349  
 Leptoceridae 10, 13, 14, 431, 551, 553  
 Leptocerus 10, 432, 433, 490, 492  
*Leptocerus aterrimus* 435  
*Leptocerus bilineatus* 444  
*Leptocerus cinereus* 441  
*L. fulvus* 552  
*L. tineiformis* 10, 490, 491\*, 492\*, 493\*, 494\*, 495\*, 496\*, 497, 518  
*L. valvatus* 10, 491, 496, 497\*  
 leucophaea, *Homilia* 10, 461, 462\*  
 Limnocentropodidae 551  
 Limnophilidae 551, 552, 553  
*Limnophilus* 552, 553  
*Limnophilus modestus* 248  
 Limnophilidae 6, 14, 61, 65, 172, 232, 327, 338, 349, 351, 353, 356, 550—552  
 Limnophilinae 6, 62, 63, 86, 110, 143, 178, 323, 346, 349, 351  
 Limnophilini 6, 144, 154—156  
*Limnophilus* 7, 145, 154, 172, 183, 194, 198, 204, 210, 231, 232, 234, 235, 241, 251, 252, 255  
*Limnophilus abstrusus* 7, 173, 185, 186\*  
*L. affinis* 7, 174, 213, 214\*, 215  
*L. auricula* 7, 174, 226, 227\*  
*L. bipunctatus* 7, 173, 204, 205\*, 206  
*L. borealis* 7, 173, 200, 202\*, 203\*, 204  
*L. centralis* 7, 174, 216, 217\*, 218, 219\*  
*L. decipiens* 7, 173, 198, 199\*, 200, 201\*  
*L. despectus* 227  
*L. elegans* 7, 173, 222, 223\*  
*L. extricatus* 7, 174, 210, 211\*, 212\*, 213\*, 223  
*L. flavicornis* 7, 173, 188, 189\*, 190\*, 191\*, 192, 193, 552  
*L. fuscicornis* 7, 175, 209, 210\*  
*L. griseus* 7, 174, 221, 228, 229\*, 230  
*L. ignavus* 7, 174, 228  
*L. incisus* 7, 175, 231\*  
*L. lunatus* 7, 175, 207, 208\*  
*L. marmoratus* 7, 173, 186, 187\*, 188  
*L. nigriceps* 7, 173, 195, 196\*, 197\*, 198, 200  
*L. politus* 7, 173, 181, 182\*, 183, 184\*, 186—188, 192  
*L. rhombicus* 7, 172, 173, 175, 177\*, 178\*, 180, 181\*, 182—185, 188—190, 192, 193, 198, 206, 209, 222  
*L. sericeus* 7, 174, 227\*  
*L. sparsus* 7, 174, 223, 224\*, 225\*  
*L. stigma* 7, 172, 173, 192, 193\*, 194, 195\*  
*L. vittatus* 7, 174, 218, 220\*, 221\*, 222  
*L. xanthodes* 7, 175, 283\*  
*Lithax* 8, 323, 346  
*Lithax incanus* 8, 347, 348\*, 349  
*L. obscurus* 8, 347\*, 349  
*longicornis*, *Mystacides* 10, 463, 464, 470, 472\*, 473\*, 474\*, 475—477, 479  
*lunatus*, *Limnophilus* 7, 175, 207, 208\*  
  
*maclachlani*, *Chaetopterygopsis* 8, 307, 308\*  
*Macronema* 553  
 Macronematinae 408  
*maculatum*, *Oligoplectrum* 9, 387, 388\*, 389\*, 390, 391\*, 392\*  
*magnus*, *Hydatophylax* 7, 269, 270\*, 271\*, 272, 273\*, 274, 276, 277  
*magnus*, *Stenophylax* 269  
*majuscula*, *Apatania* 6, 111, 131, 132\*, 133\*, 134  
*marmoratus*, *Limnophilus* 7, 173, 186, 187\*, 188  
*martynovi*, *Apatidelia* 111  
*maurus*, *Beraea* 11, 520, 524\*. 525  
*Micrasema* 9, 370, 391, 397  
*Micrasema bifoliatum* 9, 393  
*M. setiferum* 9, 393, 397\*  
*M. sp.* 9, 393, 394\*, 395\*  
*Micropterna* 8, 250, 292  
*Micropterna lateralis* 8, 293, 294, 295\*, 296  
*M. nycterobia* 8, 293, 294\*, 296  
*M. sequax* 8, 293, 295, 296\*  
*M. testacea* 551  
 minor, *Phryganea* 60  
 minor, *Trichostegia* 5, 60\*  
*minuta*, *Beraea* 11, 528, 529\*  
*modesta*, *Anabolia* 248  
*modestus*, *Limnophilus* 248  
*Molanna* 10, 46, 417, 427, 428, 430, 431  
*Molanna albicans* 10, 418, 424, 425\*, 427  
*M. angustata* 10, 418\*, 419\*, 420\*, 421\*, 422, 423\*, 424—427, 553  
*M. palpata* 424  
*M. submarginalis* 10, 418, 426\*, 427, 430  
*Molannidae* 10, 13, 14, 417, 551  
*Molannodes* 10, 417, 427  
*Mollanodes tincta* 10, 428\*, 429\*, 430, 431\*  
*M. zelleri* 428  
*montanus*, *Brachycentrus* 9, 370, 377, 378\*  
 Moropsychini 87  
*muliebris*, *Apatania* 6, 111, 138, 139\*, 140\*, 143, 552  
*Mystacides* 10, 432, 462, 468, 473, 475, 479, 480, 482—484, 490, 553  
*Mystacides azurea* 10, 463, 464, 465\*, 466\*, 467\*, 468\*, 469, 470, 472, 475, 479  
*M. dentata* 10, 463, 470, 471\*  
*M. longicornis* 10, 463, 464, 470, 472\*, 473\*, 474\*, 475—477, 479  
*M. nigra* 10, 463, 464, 471, 475, 476\*, 477, 479  
*M. sibirica* 10, 463, 477\*, 478\*, 479  
*M. sp.* 10, 463, 469\*  
  
*Nannophryganea* 59  
*Nannophryganea minor* 60  
*Nemotaulius* 6, 145, 157, 158  
*Nemotaulius admorsus* 6, 145, 151, 152\*, 153  
*N. hostilis* 153  
*N. punctatolineatus* 6, 145, 146\*, 148\*, 150, 151\*, 152, 153, 155, 158, 259, 273  
 Neophylacinae 6, 62, 63, 80  
*Neophylax* 6, 80  
*Neophylax ussuriensis* 6, 80, 81\*, 83\*, 84, 85\*



- nervosa*, *Anisolia* 7, 236, 241, 242, 243\*, 245  
*Neuronia* 43  
*Neuronia lapponica* 47  
*Neuronia ruficrus* 44  
*nigra*, *Mystacides* 10, 463, 464, 471, 475, 476\*, 477, 479  
*nigriceps*, *Limnophilus* 7, 173, 195, 196\*, 197\*, 198, 200  
*nigricornis*, *Potamophylax* 7, 251, 255, 256, 257\*, 258\*, 259, 260, 261\*, 273  
*nigricornis*, *Silo* 8, 332, 342, 343\*, 344, 345\*, 346, 349  
*nigrovittatus*, *Hydatophylax* 7, 269, 274, 275\*, 276\*, 277  
*nigrovittatus*, *Platyphylax* 274  
*nitidus*, *Grammotaulius* 7, 156, 167, 168\*, 169  
*Notidobia* 11, 530, 531  
*Notidobia ciliaris* 11, 531, 532\*, 533\*, 535\*, 536\*, 537\*, 538  
*nycterobia*, *Micropterna* 8, 293, 294\*, 296  
  
*obscurata*, *Annitella* 8, 305, 306\*, 307  
*obscurata*, *Chaetopteryx* 305  
*obscurus*, *Lithax* 8, 347\*, 349  
*obsoleta*, *Agrypnia* 39  
*obsoleta*, *Dasystegia* 5, 29, 39, 40\*, 41\*, 42\*, 43  
*obsoleta*, *Phryganea* 39  
*obsoleta*, *Prophryganea* 39  
*ochracea*, *Oecetis* 10, 499, 500, 501\*, 502\*, 504, 505\*, 506—509, 512  
*Odontoceridae* 9, 14, 408, 416, 551  
*Odontocerum* 9, 408, 414, 416  
*Odontocerum albicorne* 9, 408, 409\*, 410\*, 412\*, 413\*  
*Oecetis* 10, 431—433, 498, 500, 505, 506, 508, 513, 515  
*Oecetis furva* 10, 499, 509, 510\*, 511\*, 512\*, 513, 514\*, 515, 517, 518  
*O. intima* 10, 499, 505, 506\*  
*O. lacustris* 10, 499, 500, 507\*, 508\*  
*O. ochracea* 10, 499, 500, 501\*, 502\*, 504, 505\*, 506—509, 512  
*O. sp.1* 10, 499, 514, 515\*, 516\*  
*O. sp.2* 10, 499, 516, 517\*  
*Oligoplectrodes* 9, 370, 381, 387—389, 391, 394  
*Oligoplectrodes potanini* 9, 381, 382\*, 383\*, 385\*, 386\*, 388  
*Oligoplectrum* 9, 370, 387  
*Oligoplectrum maculatum* 9, 387, 388\*, 389\*, 390, 391\*, 392\*  
*Oligostomis* 5, 17, 18, 55, 59  
*Oligostomis reticulata* 5, 55, 56\*, 57, 58\*, 59  
*Oligotricha* 5, 17, 18, 43, 57  
*Oligotricha lapponica* 5, 44, 47\*, 48  
*O. striata* 5, 44, 45\*, 46, 48  
*ovalis*, *Baicalodes* 6, 92, 93\*, 94\*, 95, 96\*  
  
*pagetana*, *Agrypnia* 5, 18, 20\*, 21\*, 22\*, 23\*, 24, 25\*, 26, 29, 30, 39—41  
*palatus*, *Dicosmoecus* 6, 64\*, 66\*, 67\*, 68\*, 69\*, 70\*  
*pallidum*, *Ganonema* 399  
  
*pallidus*, *Anisocentropus* 9, 399, 400\*, 402\*, 403, 404  
*pallipes*, *Silo* 8, 332, 333\*, 334\*, 336\*, 338\*, 339—342  
*palpata*, *Ernodes* 11, 526\*  
*palpata*, *Molauna* 424  
*pedemontanum*, *Sericostoma* 11, 539, 540\*, 542\*, 543, 544\*, 545, 546, 548  
*pellucidus*, *Glyphotaelius* 7, 154, 155\*, 156  
*permistus*, *Stenophylax* 8, 279, 280\*, 551  
*personatum*, *Sericostoma* 11, 539, 546, 547\*  
*Phacopteryx* 7, 145, 232  
*Phacopteryx brevipennis* 7, 232, 233\*, 234\*, 235  
*phalaenoides*, *Holostomis* 49  
*phalaenoides*, *Semblis* 5, 49, 50\*, 52, 53  
*Philorheithridae* 551  
*Phryganea* 5, 17, 25, 30, 46, 48—50, 52, 55, 61  
*Phryganea bipunctata* 5, 32, 33\*, 34\*, 35\*, 36\*, 37\*, 38  
*Ph. grandis* 5, 32, 37, 38\*  
*Phryganea minor* 60  
*Phryganea obsoleta* 39  
*P. striata* 32, 553  
*Phryganea varia* 41  
*Phryganeidae* 5, 13, 14, 15, 19, 26, 49, 57, 420, 551  
*picta*, *Agrypnia* 5, 18, 26\*, 39  
*pilosa*, *Goera* 8, 323, 324, 325\*, 326\*, 327, 328\*, 331, 332  
*Platyphylax nigrovittatus* 274  
*Plectrocnema conspersa* 553  
*Polycentropus flavomaculatus* 551  
*politus*, *Limnophilus* 7, 173, 181, 182\*, 183, 184\*, 186—188, 192  
*Potamophylax* 7, 250, 256, 257, 263, 265, 268, 277, 287  
*Potamophylax excisus* 7, 251, 266, 267\*, 268\*  
*P. latipennis* 7, 251, 262\*  
*P. nigricornis* 7, 251, 255, 256, 257\*, 258\*, 259, 260, 261\*, 273  
*P. rotundipennis* 7, 251, 263, 264\*, 265  
*P. stellatus* 7, 251, 252\*, 253\*, 254\*, 255\*, 263, 266, 268, 552  
*potanini*, *Oligoplectrodes* 9, 381, 382\*, 383\*, 385\*, 386\*, 388  
*Praecosmoecus* 71  
*Praecosmoecus digitatus* 71  
*Prophryganea obsoleta* 39  
*Prophryganea varia* 41  
*proximus*, *Silo* 8, 332, 340\*, 341\*, 342  
*Pseudostenophylax rotundipennis* 551  
*Psilotreta* 9, 408, 414  
*Psilotreta armata* 414  
*P. japonica* 414  
*P. kisoensis* 9, 414, 415\*, 416\*  
*P. kyotoensis* 414  
*Psychomyiidae* 408, 551  
*pugnax*, *Dinarthrum* 9, 356, 358\*, 359—361, 363  
*pullata*, *Beraea* 11, 520, 521\*, 523\*, 525, 526  
*punctatolineatus*, *Glyphotaelius* 145

- punctatolineatus, *Nemotaulius* 6, 145, 146\*, 148\*, 150, 151\*, 152, 153, 155, 158, 259, 273  
 pusilla, *Enoclyla* 13  
*Pycnopsyche guttifer* 551  
*Pycnopsyche lepida* 551
- Radema* 87, 88  
*Radema infernale* 88  
*R. setosum* 88  
*R. uncinatum* 88  
 reductum, *Dinarthrum* 9, 356, 359, 360\*, 361  
 reticulata, *Oligostomis* 5, 55, 56\*, 57, 58\*, 59  
 rhombicus, *Limnophilus* 7, 172, 173, 175, 177\*, 178\*, 180, 181\*, 182—185, 188—190, 192, 195, 198, 206, 209, 222  
*Rhyacophila* 409, 551, 552  
*Rhyacophila dorsalis* 552  
*Rh. praemorsa* 551  
*Rh. septentrionis* 551  
*Rhyacophilidae* 551  
 rotundipennis, *Potamophylax* 7, 251, 263, 264\*, 265  
 rotundipennis, *Pseudostenophylax* 551  
*rulicrus*, *Neuronia* 44
- sahlbergi, *Chaetopteryx* 8, 297, 298\*, 299\*, 300\*, 301\*, 302, 303  
 sajanensis, *Goera* 8, 324, 328, 329\*, 330\*, 331\*, 340  
 Semblis 5, 17, 18, 44, 48, 56, 57, 59  
 Semblis atrata 5, 49, 51, 53, 54\*  
*S. phalaenoides* 5, 49, 50\*, 52, 53  
 senilis, *Athripsodes* 10, 433—435, 459\*, 460\*, 461\*  
 septentrionis, *Rhyacophila* 551  
 sequax, *Micropterna* 8, 293, 295, 296\*  
 sericeus, *Limnophilus* 7, 174, 227\*  
*Sericostoma* 11, 531, 538, 549  
*Sericostoma grusiense* 11, 539, 548\*, 550  
*S. pedemontanum* 11, 539, 540\*, 542\*, 543, 544\*, 545, 546, 548  
*S. personatum* 11, 539, 546, 547\*  
*Sericostomatidae* 11, 14, 15, 530, 551  
 setiferum, *Micrasema* 9, 393, 397\*  
*Setodes* 490  
 setosum, *Radema* 88  
 sibirica, *Mystacides* 10, 463, 477\*, 478\*, 479  
 sibiricus, *Grammotaulius* 7, 156, 170, 171\*  
 signatipennis, *Grammotaulius* 7, 156, 161, 163\*, 165\*, 166, 168, 169  
 Silo 8, 323, 327, 331, 332, 339, 343, 344, 346—349  
*Silo nigricornis* 8, 332, 342, 343\*, 344, 345\*, 346, 349  
*S. pallipes* 8, 332, 333\*, 334\*, 336\*, 338\*, 339—342  
*S. proximus* 8, 332, 340\*, 341\*, 342  
 soror, *Anobolia* 7, 236, 237\*, 238\*, 239\*, 240, 241\*, 242, 243  
*sororcula*, *Anobolia* 236  
 sp., *Micrasema* 9, 393, 394\*, 395\*  
 sp., *Mystacides* 10, 463, 469\*  
 sp. 1, *Oecetis* 10, 499, 514, 515\*, 516\*  
 sp. 2, *Oecetis* 10, 499, 516, 517\*  
 sp., *Triaenodes* 480, 487\*, 488\*  
 sparsa, *Hydroptila* 551  
 sparsus, *Limnophilus* 7, 174, 223, 224\*, 225\*  
 spinosa, *Baicalina* 6, 97, 102\*, 103\*, 104\*  
 stellatus, *Potamophylax* 7, 251, 252\*, 253\*, 254\*, 255\*, 263, 266, 268, 552  
 stellatus, *Stenophylax* 251, 552  
*Stenophylacini* 7, 144, 250, 269, 282, 297  
*Stenophylax* 8, 250, 279  
*Stenophylax excisus* 266  
*Stenophylax magnus* 269  
*S. permistus* 8, 279, 280\*, 551  
*Stenophylax stellatus* 251, 552  
*Stenopsyche* 269  
*Stenopsychidae* 552  
 stigma, *Limnophilus* 7, 172, 173, 192, 193\*, 194, 195\*  
 stigmatella, *Apatania* 6, 112, 124, 125\*, 126\*, 127  
 striata, *Oligotricha* 5, 44, 45\*, 46, 48  
 striata, *Phryganea* 32, 553  
 submarginalis, *Molanna* 10, 418, 426\*, 427, 430  
 subnubilus, *Brachycentrus* 9, 370, 371\*, 372\*, 374\*, 375, 376\*, 377—381, 389, 397  
 subtilis, *Apatania* 6, 111, 116, 117\*, 119\*, 120
- tchaldyrense, *Dinarthrum* 9, 356, 360, 361, 362\*  
 tessellatus, *Halesus* 8, 281, 285, 286\*  
 testacea, *Micropterna* 551  
 Thamastes 6, 87, 88, 92, 104  
 Thamastes dipterus 6, 88, 89\*, 91\*, 92, 93  
 Thamastini 87  
 thamastoides, *Baicalina* 6, 97, 102—104, 105\*, 106  
 tineiformis, *Leptocerus* 10, 490, 491\*, 492\*, 493\*, 494\*, 495\*, 496\*, 497, 518  
 tincta, *Molannodes* 10, 428\*, 429\*, 430, 431\*  
 Tinodes waeneri 552  
 Triaenodes 432, 479, 488, 490, 553  
 Triaenodes bicolor 479, 480, 481\*, 482\*, 484\*, 485\*, 487—490, 493, 494, 553  
*T. conspersa* 485  
*T. conspersus* 480, 485, 486\*  
*T. internus* 488  
 Triaenodes sp. 480, 487\*, 488\*  
 Trichoptera 550, 551, 552, 553  
 Trichostegia 5, 17, 18, 59  
 Trichostegia minor, 5, 60\*  
 trifidus, *Drusus*, 8, 309, 314, 315\*, 316, 551
- uncinatum, *Radema* 88  
 ussuriensis, *Neophylax* 6, 80, 81\*, 83\*, 84, 85\*
- valvatus, *Leptocerus* 10, 491, 496, 497\*  
 varia, *Agrypnia* 41  
 varia, *Dasystegia* 5, 39, 41, 43\*  
 varia, *Phryganea* 41  
 varia, *Prophryganea* 41

560

*villosa*, *Chaetopteryx* 8, 297, 301, 302\*, 303, 304\*  
*vittatus*, *Limnophilus* 7, 174, 218, 220\*, 221\*, 222  
*waeneri*, *Tinodes* 552  
*wallengreni*, *Apatania* 6, 112, 113\*, 115  
*xanthodes*, *Limnophilus* 7, 175, 283\*  
*zelleri*, *Molannodes* 428  
*zonella*, *Apatania* 6, 111, 128, 129\*, 130\*, 131, 132, 134

Errata to Vol. II, No. 1 †

Printed	Should read
Agrypnia — p. 70.	Dasystegia.
Agrypnia obsoleta — p. 39, 59*, 60, 71*, 126, 127, 129, 175.	Dasystegia obsoleta.
Agrypnia varia — p. 30, 60, 126.	Dasystegia varia.
Holostomis — p. 70, 87, 114, 159.	Semblis.
Holostomis phalaenoides — p. 60.	Semblis phalaenoides.
Leptocerus — p. 25, 30, 67, 108, 111, 112.	Athripsodes.
Leptocerus aterrimus — p. 68, 90*, 101*, 123, 125, 126.	Athripsodes aterrimus.
Leptocerus annulicornis — p. 69*, 99, 119–122, 124, 125, 127.	Athripsodes annulicornis.
Leptocerus cinereus — p. 125, 126, 175.	Athripsodes cinereus.
Leptocerus excisus — p. 69*, 99, 122, 124, 125.	Athripsodes excisus.
Leptocerus fulvus — p. 60, 122, 125, 126.	Athripsodes fulvus.
Leptocerus senilis — p. 60, 91*, 99, 101*, 122, 125, 128.	Athripsodes senilis.
Molanna palpata — p. 105, 125–127.	Molanna albicans.
Nannophryganea minor — p. 60.	Trichostegia minor.
Neochaetoidea — p. 7, 151, 152, 159, 164, 166–169, 207, 208, 413, 464, 551.	Hydropsychoidea.
Neuronia — p. 114.	Oligotricha.
Neuronia ruficornis — p. 60, 129.	Oligotricha striata.
Paleochaetoidea — p. 5, 151, 152, 164–170, 173, 206–208, 551.	Philopotamoidea.
Phryganea striata — p. 29*, 30, 39, 54*, 60, 68*, 72, 89*, 90*, 99*, 105, 121, 123, 125–128, 175, 176, 188.	Phryganea bipunctata.
Setodes — p. 67, 77.	Leptocerus.
Silo proximum — p. 116.	Silo proximum.
Rhyacophilinae Ulmer — p. 5, 209, 210.	Rhyacophilinae Stephens.
Glossosomatinae Ulmer — p. 6, 297, 298.	Glossosomatinae Wallengren.
Hydroptila femoralis — p. 6, 123, 331, 332*, 333*, 335*, 336*, 337, 338.	Hydroptila tineoides.
Hydropsychinae Ulmer — p. 8, 478.	Hydropsychinae Curtis.

Supplement to Errata, V. II, No. 1

Page	Printed	Should read
282	segments	segments, as in <i>Himalopsyche</i> sp. "larva <i>hoplura</i> "
284	Fig. 319–321. <i>Himalopsyche gigantea</i> Mart.	Fig. 319. <i>Himalopsyche</i> sp. "larva <i>hoplura</i> " Lepn. Fig. 320, 321. <i>Himalopsyche gigantea</i> Mart.

† [Page Nos. referred to are those of the Russian original.]













3 9072 00103880 5

