Bulletin of the Fisheries Research Board of Canada



195

Revision of *Hydrobaenus*, *Trissocladius*, *Zalutschia*, *Paratrissocladius*, and some related genera (Diptera:Chironomidae)

Ole A. Sæther

Fish Can SH 223 B8213 no. 195 JC

BULLETIN 195 Ottawa 1976

> Fisheries and Environment Pêches et Environnement Canada Canada Fisheries and Service des pêches Marine Service et de la mer

Revision of Hydrobaenus Trissocladius Zalutschia Paratrissocladius and some related genera (Diptera: Chironomidae)

Bulletins are designed to interpret current knowledge in scientific fields pertinent to Canadian fisheries and aquatic environments. Recent numbers in this series are listed at the back of this Bulletin.

The Journal of the Fisheries Research Board of Canada is published in annual volumes of monthly issues and Miscellaneous Special Publications are issued periodically. These series are for sale by Supply and Services Canada, Printing and Publishing, Ottawa, K1A 0S9. Remittances must be in advance, payable in Canadian funds to the order of the Receiver General for Canada.

Editor and Director of Scientific Information

J. C. STEVENSON, PH.D.

Deputy Editor J. WATSON, PH.D.

Assistant Editors

JOHANNA M. REINHART, M.SC. D. G. Cook, ph.d.

Production-Documentation

J. CAMP Mona Smith Mickey Lewis

Department of Fisheries and the Environment Fisheries and Marine Service Scientific Information and Publications Branch Ottawa, Canada K1A 0E6

BULLETIN 195

Revision of Hydrobaenus Trissocladius Zalutschia Paratrissocladius and some related genera (Diptera: Chironomidae)

Ole A. Sæther

Department of Fisheries and the Environment Fisheries and Marine Service Freshwater Institute Winnipeg, Man. R3T 2N6

DEPARTMENT OF FISHERIES AND THE ENVIRONMENT FISHERIES AND MARINE SERVICE Ottawa 1976



.

4

(e) Minister of Supply and Services Canada 1976 Available by mail from: Printing and Publishing Supply and Services Canada Ottawa, Canada K1A 0S9 or through your bookseller A deposit copy of this publication is also available for reference in public libraries across Canada

Canada: \$7.00 Other countries: \$8.40 Catalogue No. Fs94-195 ISBN 0-660-00974-9

Price subject to change without notice Ottawa

• Cover design by Christine Rusk •

Contents

1	Abstract/Résumé
3	Introduction
4	Methodology
5	Morphology
9	PHYLETIC RELATIONSHIPS
9	Relationships of the subfamily Orthocladiinae
13	Previous position of the treated genera
14	The anagenesis or evolutionary progress
23	Kladogenesis or phylogenetic branching
33	Key to some Genera of Orthocladiinae
33	Key to males of some genera of Orthocladiinae
35	Key to females of some genera of Orthocladiinae
37	Key to pupae of some genera of Orthocladiinae
39	Key to larvae of some genera of Orthocladiinae
41	Baeoctenus GEN.N.
48	Oliveria Gen.n.
54	Hydrobaenus Fries 1830
80	H. conformis group
93	H. lapponicus group
104	H. lugubris group
114	H. pilipes group
114	H. pilipes subgroup
138	H. distylus subgroup
158	H. calvescens sp.n.
160	H. tumidistylus sp.n.
163	Trissocladius KIEFFER 1908
173	Zalutschia LIPINA 1939
194	Z. mucronata group
206	Z. tatrica group
219	Z. vockerothi sp.n.
222	Z. tornetraeskensis group
250	Freemaniella GEN.N.
253	Paratrissocladius ZAVŘEL 1937

Contents (concluded)

- 266 Some Species Previously Placed in or Resembling *Trissocladius* Kieffer Sensu Brundin
- 276 Acknowledgments
- 277 References
- 284 INDEX

Abstract

SÆTHER, O. A. 1976. Revision of Hydrobaenus, Trissocladius, Zalutschia, Paratrissocladius, and some related genera (Diptera: Chironomidae). Bull. Fish. Res. Board Can. 195: 287 p.

Taxonomic revisions of the genera *Hydrobaenus* Fries, *Trissocladius* Kieff., *Zalutschia* Lipina, *Paratrissocladius* Zavřel, and some of their closest relatives are presented, along with ecological comments and distribution records. Methodology and morphology are briefly discussed.

The phyletic relationships of some subfamilies of Chironomidae are discussed, suggesting that Orthocladiinae and Chironominae combined form the sister group of the proposed new subfamily Prodiamesinae, and that these three subfamilies combined are a monophyletic group. The anagenesis and kladogenesis of the treated genera suggest that Zalutschia Lip. forms the apomorphic sister group of Trissocladius Kieff., that Oliveria gen.n. forms the sister group of Hydrobaenus Fries comb.n., and the four genera combined are possibly a monophyletic group. Baeoctenus gen.n. and Freemaniella gen.n. are closely related to the above genera.

Sixteen new species and two new subspecies are described: Baeoctenus bicolor, Hydrobaenus laticaudus, Hydrobaenus scapulapilosus, Hydrobaenus virgo, Hydrobaenus hudsoni, Hydrobaenus martini, Hydrobaenus pilipodex, Hydrobaenus spinnatis, Hydrobaenus calvescens, Hydrobaenus tumidistylus, Hydrobaenus conformis labradorensis, Zalutschia furcarca, Zalutschia vockerothi, Zalutschia lingulata, Zalutschia lingulata pawaa, Zalutschia pusa, Zalutschia trigonacies and Bryophaenocladius impectinus. In addition, 25 species have been redescribed. Both descriptions and redescriptions include male, female, pupa, and larva whenever possible. Six new synonyms are given: Hydrobaenus pilipes (Mall.) (syn. Trissocladius grandis Kieff.), Hydrobaenus johannseni (Subl.) (syn. Trissocladius domus (Subl.) and Trissocladius hamiltoni Sæth.), Paratrissocladius excerptus (Walk.) comb.n. (syn. Paratrissocladius fluviatilis (Goetgh.), Bryophaenocladius Thien. (syn. Clinocladius Subl. and Cantomyia Rob.). Most redescribed species are in new generic combinations.

Résumé

SÆTHER, O. A. 1976. Revision of Hydrobaenus, Trissocladius, Zalutschia, Paratrissocladius, and some related genera (Diptera: Chironomiade). Bull. Fish. Res. Board Can. 195: 287 p.

L'auteur présente une révision taxonomique des genres Hydrobaenus Fries, Trissocladius Kieff., Zalutschia Lipina, Paratrissocladius Zavřel et de quelques-uns de leurs

plus proches parents, avec commentaires écologiques et mentions de leur répartition. Il discute brièvement de la méthodologie et de la morphologie.

Il examine les relations phylétiques de quelques sous-familles de Chironomidae, relations qui semblent indiquer que les Orthocladiinae et les Chironominae se combinent pour former le groupe soeur de la nouvelle sous-famille qu'il propose, celle des Prodiamesinae, et que ces trois sous-familles combinées sont un groupe monophylétique. L'anagénèse et la kladogénèse des genres traités donnent à croire que Zalutschia Lip. forme le groupe soeur apomorphe de Trissocladius Kieff., qu'Oliveria gen.n. forme le groupe soeur d'Hydrobaenus Fries comb.n. et que ces quatre genres sont possiblement un groupe monophylétique. Baeoctenus gen.n. et Freemaniella gen.n. sont étroitement apparentés aux genres ci-haut mentionnés.

On décrit seize espèces et deux sous-espèces nouvelles: Baeoctenus bicolor, Hydrobaenus laticaudus, Hydrobaenus scapulapilosus, Hydrobaenus virgo, Hydrobaenus hudsoni, Hydrobaenus martini, Hydrobaenus pilipodex, Hydrobaenus spinnatis, Hydrobaenus calvescens, Hydrobaenus tumidistylus, Hydrobaenus conformis labradorensis, Zalutschia furcarca, Zalutschia vockerothi, Zalutschia lingulata, Zalutschia lingulata pauca, Zalutschia pusa, Zalutschia trigonacies et Bryophaenocladius impectinus. De plus, on redécrit 25 espèces. Les descriptions et les redescriptions incluent toutes deux le mâle, la femelle, la pupe et la larve là où la chose est possible. L'auteur donne six synonymes nouveaux: Hydrobaenus pilipes (Mall.) (syn. Trissocladius grandis Kieff.), Hydrobaenus johannseni (Subl.) (syn. Trissocladius domus (Subl.) et Trissocladius hamiltoni Saeth.), Paratrissocladius excerptus (Walk.) comb.n. (syn. Paratrissocladius fluviatilis (Goetgh.), Bryophaenocladius Thien. (syn. Clinocladius Subl. et Cantomyia Rob.). La plupart des espèces redécrites sont placées dans de nouvelles combinaisons génériques.

Introduction

Inadequate knowledge of the specific identities of chironomids taken in bottom samples has hitherto prevented the development of lists of indicator communities for Nearctic lakes, with the exception of the ultraoligotrophic communities described by Oliver (1963, 1964). The finding and description of all stages of several important members of oligotrophic and mesotrophic communities (Sæther 1973b, 1975a, b, c) has made it possible to develop preliminary lists of indicator communities for North America (Saether 1975e). One genus containing species that are members of indicator communities in Europe is Trissocladius Kieff. sensu Brundin (Brundin 1949, 1956a, b). This genus, however, appeared to be heterogeneous, with Nearctic species as dissimilar as T. obsepta (Webb) and T. pilipes (Mall.). Futhermore, as Mozley (1970: 446) showed, the larva and pupa of Hydrobaenus lugubris Fries were not generically distinguishable from some species of Trissocladius Kieff. sensu Brundin. The statement by Brundin (1956a: 19), originating from Goetghebuer (1914: 20), about the presence of "more or less" striated ventromental plates in Hydrobaenus lugubris was shown to be incorrect. This made it necessary to examine the relationship of Hydrobaenus sensu Brundin to Trissocladius sensu Brundin. Other genera and species possibly related to Trissocladius sensu Brundin have also been examined.

The opinion that there are probably no true Holarctic species except for arctic and subarctic chironomids (expressed for instance by Fittkau 1961: 960) has been invalidated (Wülker et al. 1968). The proportion of species which are Holarctic, however, seems to vary considerably from one genus to another. In *Heterotrissocladius* there apparently is only one true Holarctic species, *Heterotrissocladius marcidus* (Kieff.) (Sæther 1975c), whereas of 14 species of *Cricotopus* present in Lake Winnipeg 12 appear to be Holarctic and the remaining 2 Nearctic sister species of European species. Any revision of chironomids from the Northern Hemisphere should preferrably include Nearctic, as well as Palaearctic species, not only because of the possibility of duplication but also because the examination of more species and more life stages makes an understanding of phylogenetic relationships easier to achieve.

Methodology

All specimens selected for detailed examination were mounted on slides using the method outlined by Sæther (1969: 1). In addition, the legs and antenna from one side were not treated in KOH as this treatment often causes the longer setae to fall off and makes, for instance, the bristle ratio (BR) unmeasurable and inaccurate. Methods of preserving and preparing chironomids have been treated by several other authors including Townes (1945: 9-10), Freeman (1955: 6-8), Brundin (1956a: 14-16), Strenzke (1959: 2-3, 1966), Schlee (1966, 1968a), Reiss (1968: 185), and Hirvenoja (1973: 4-5). The advantage of studying specimens mounted on slides as opposed to pinned specimens is particularly stressed by Schlee (1966) (see also Sæther 1969: 1-2) and today nearly everyone studying chironomids recognizes this. However, the statement by Hirvenoja (1973: 5) that nearly all chironomid researchers today should be convinced of the advantages of preservation in alcohol cannot be accepted. Some disadvantages of preservation in alcohol are mentioned by Freeman (1955: 7); they include fading colors, loss of setae, increased transparency of wings, break off of legs and antenna, and, after some years, maceration in KOH becomes very difficult. Most disadvantages can be tolerated if the material is not preserved for a period exceeding about 5 years before mounting. On the other hand, pinned and dried specimens have none of these disadvantages, and it is quite easy to make excellent slides of material pinned for 50 or more years. Slide preparation is a prerequisite for detailed study and the material used should be as fresh as possible. To facilitate measurements it is necessary to dissect the chironomid imagines into the following parts: wings including squama, head, antennae, legs of one side, abdomen, and thorax with legs of the other side. It is also advantageous to separate the thorax and to mount the scutum, including the antepronotum, dorsal side up. This is often the only way to ascertain the presence or absence of acrostichals and of the suture joining the median lobes of the antepronotum anterior to the scutal projection. The head of the larva should be mounted ventral side up and carefully pressed down. This is necessary, not only to determine the width of the ventromental plates and the mental teeth, but also to facilitate the exact inspection of parts such as the labrum, the maxillae, and the premento-hypopharyngeal complex.

Measurements and ratios used in this paper follow Schlee (1966) with the additions and modifications given by Sæther (1969: 2-3). A few additional ratios appear in the list of abbreviations on p. 5. It is important to note that leg measurements do not include the basal elongation and that the wing length is measured from the arculus to the wing tip, i.e. following the recommendation of Schlee (see also Sæther 1975c).

The present revision includes a number of seemingly superfluous measurements which, in most cases, are not strictly necessary to identify the species. These measurements have, however, proved to be necessary in this case to establish species variation and phylogenetic relationships. In the species treated here the variation in these measurements, and in the shape of the hypopygium is very great, and a multitude of measurements are sometimes necessary to identify a species with certainty. In the following descriptions measurements are given as ranges followed by a mean when four or more measurements have been made, followed by the number in parentheses (n).

Holotypes, allotypes, and some paratypes of new Canadian species have been deposited in the Canadian National Collection (CNC) in Ottawa. Further material has been deposited at the Academy of Natural Sciences (ANS), Philadelphia, Penn.; British Museum of Natural History (BMNH), London, England; Cornell University Collection (CUC), Ithaca, N. Y.; Freshwater Institute (FWI), Winnipeg, Man.; Illinois Natural History Survey Collection (INHSC), Urbana, Ill.; Collection of Dr. J. E. Sublette (JES), Eastern New Mexico University, Portales, N. M.; Swedish Museum of Natural History (SMNH), Stockholm, Sweden; U. S. National Museum (USNM), Washington, D. C.; Zoological Museum, University of Helsinki (ZMUH), Helsinki, Finland; and Zoologisches Sammlung des Bayerischen Staates (ZSBS), München, West Germany. When material has been deposited in all the above collections (All) is used.

Morphology

With the recent treatments of chironomid morphology or important parts of it (Rodova 1966; Schlee 1968b; Serra-Tosio 1970; Mozley 1970; Sæther 1971b, 1974; Hirvenoja 1973; Hansen 1974) a complete morphological introduction is no longer necessary. The general terminology and morphology of this revision follows Sæther (1971b, 1974) with the following corrections and modifications discussed by Sæther (1975a, b, c): brachiolum is used instead of basal vein (Hirvenoja 1973: 13), laterosternite IX instead of laterotergite IX (Hirvenoja 1973: 19), the tarsal "Sinneszapfen" (Sz) of Hirvenoja (1973: 13-14) are called sensilla chaetica in accordance with the terminology of Serra-Tosio (1970); and stipes is used instead of cardostipes (Hansen 1974). A discussion of the volsellae is not necessary in this revision as the species treated possess only a lobe on the gonocoxite; thus, the neutral term basal lobe is retained. In any case, the term claspette should be avoided according to Hirvenoja (1973: 27). (See also discussion by Sæther 1975b: 368.)

Although Hirvenoja (1973) disagrees with Anthon (1943a) that the row of teeth in chironomids is a hypostomium (in the sense of joined subgenal margins), he prefers to use the more neutral term hypochilum for "das Postmentum und für Teile der Postgenae, die ineinander Übergegangen sind und teilweise zusammen das sogenannten 'Labium' der älteren Autoren umfassen." Nevertheless, he mentions that the mentum of *Olbiogaster* sp. (Anthon 1943b) is toothed as is the "Postmentum (?Mentum)" in chironomids, simuliids, and culicids. Thus, there is only a small difference of opinion between Hirvenoja (1973) and Sæther (1971b). I regard the embryological evidence presented by Craig (1969) and the criteria mentioned in Sæther (1971b) as sufficient justification to use the term mentum.

The following abbreviations and ratios are used in figures and/or text (terms marked with an asterisk are used in the text):

IMAGINES

AA II	anterior anepisternum II (Fig. 31A, 61A)
*Ac	acrostichals
Acc	accessory gland (Fig. 37A)
AG	accessory gonopore (Fig. 14A, 37A)
AL	aedeagal lobe (Fig. 9D, 13A, 51A, 62A)

*An anal vein (Fig. 31B) antepronotum or setae of antepronotum (text) (Fig. 31A; 38B; 61A, B; *Ap 76A; 81A) apodeme lobe of gonapophysis VIII (Fig. 10F; 14I; 52G, I) ApL arculus (Fig. 31B) Ar ultimate flagellomere *AR antennal ratio: remaining flagellomeres anapleural suture (Fig. 31A, 61A) AS *в brachiolum (Fig. 31B) longest seta of ta₁ *BR bristle ratio: minimum width of ta, about 1/3 from apex fe + tì + ta, *BV "Beinverhältnis" (Pagast 1947: 442): tag ta, ÷ *C costa (Fig. 31B) coxapodeme (Fig. 13A, 51A, 62A) Ca cercus(i) (Fig. 10A, C; 37A; 38C; 63A) Ce cornua (Fig. 9A, 31E, 38A, 60A, 66B) Co cibarial pump (Fig. 9A, 31E, 38A, 46B, 48D, 60A, 66B, 67C, 68A, 76E, 81C) CPcoronal suture (Fig. 31F, 33A, 36A, 66A) CS *Csa coxosternapodeme IX (Fig. 10D, E; 14A; 27A; 33B; 37A, C; 38E-G; 52A; 63A, B; 70A) cubitus and branch of cubitus (Fig. 31B) *Cu, Cu₁ *Dc dorsocentrals dorsomesal lobe of gonapophysis VIII (Fig. 10F, 14I, 52G) DmL F fulcrum (pivot) of gonocoxite (IX) against segment VIII (Fig. 10C; 38D, E, G) *FCu fork of cubitus (Fig. 31B) *fe femur *FR fork of radius (Fig. 31B) gonocoxite (in female Fig. 10A, B, C; 27A; 33B, C; 37A, C; 38C-G; 63; 70A) *Gc gonocoxapodeme VIII (Fig. 10A, 38G, 63B) Gca gonapophysis(es) VIII, IX (Fig. 10C, 37A, 38C, 63A) *Gp VIII, GpIX *Gs gonostylus HC humeral crossvein (Fig. 31B) humeral pit (Fig. 31A, 38B, 61A, 76A, 81A) HPlength of gonocoxite length of gonostylus *HR hypopygium ratio: length of male length of gonostylus X 10 *HV hypopygium value: intergonocoxal connective (Fig. 10A, 14A, 38F, 52F, 63B, 70A) Ig inner verticals (Fig. 31F, 33A, 36A, 46A, 48C, 60A, 66A, 76C) *IV labium(a) of female genitalia (Fig. 10E, 14A, 27A, 37C, 38F, 52A, 63B, 70A) L La lacinia (Fig. 38A, 66B, 81C) labial lonchus (Fig. 9A, 31E, 38A, 60A, 66B, 81C) $\mathbf{L}\mathbf{L}$ tal *LR leg ratio: ti LSa lateral sternapodeme (Fig. 13A, 51A, 62A)

*L/W length/width *M₁₊₂, M₃₊₄ branches of media (Fig. 31B) MA II median anepisternum II (Fig. 31A, 61A) Mb membrane or sclerotic hinge connecting gonapophyses VIII to each other (Fig. 10F, 14I, 52G, 63B) No notum (Fig. 10D, E; 14A; 27A; 33B; 38G; 52A; 63B; 70A) orifice of the salivary duct (Fig. 38A, 60A) 0 ocelli (or, in Zalutschia zalutschicola Lip., Z. furcarca sp.n. and part 0c of Z. tatrica (Pag.), frontal tubercles) (Fig. 36A, 48C, 60A, 66A, 67D) *ov outer verticals (Fig. 31F, 33A, 36A, 46A, 48C, 60A, 66A, 76C) *P1-3 legs 1-3 *Pa prealars PA II posterior anepisternum II (Fig. 31A, 61A) PC penis cavity (Fig. 9D, 13A, 51A, 62A, 66C) preepisternum (Fig. 31A, 61A, 76A) Pe PqP postgenital plate (Fig. 27A; 37A, C; 38G; 63B; 70A) phallapodeme (Fig. 9D, 13A, 51A, 62A) *Pha *Po postorbitals (Fig. 31F, 33A, 46A, 60A) Poc preoculars (Fig. 76C, F) Рр postpronotum (Fig. 31A, 38B, 61A) *Ps tarsal pseudospurs posterior tentorial pit (Fig. 9A, 31E, 38A, 48D, 66B, 67C, 81C) *PTP stem and branches of radius (Fig. 31B) *R, R, R, R₂₊₃, R₄₊₅ ramus (Fig. 10E, 14A, 52A, 63B, 70A) Ra *RM radius to media crossvein (Fig. 31B) *s sternum, sternite, gonosternite *Sa sternapodeme *Sc subcosta (Fig. 31B) *Scu setae of scutellum sensillum coeloconicum (Fig. 31E) SC *SCa seminal capsule (Fig. 10A; 33B; 37A; 38F, G; 63B; 70A) *SCh sensilla chaetica (of legs or palp) (Fig. 31E) *SDu spermathecal duct (Fig. 10A, 14D, 33B, 37A, 52A, 63B, 70A) SE spermathecal eminence (Fig. 10E, 14D, 37A, 38G, 52A, 63B) sieve pore of tentorium (new term, Fig. 9A, 31E, 38A, 48D, 66B, 81C) SP *Sp₁, Sp₂, Sp₃ spurs of tibia 1-3 stipes (Fig. 9A, 31E, 38A, 46B, 48D, 66B, 67C, 68A, 76E, 81C) *St "Schenkl-Schiene-Verhältnis" Pagast 1947: 442): fe + ti *sv ta, *т tergum, tergite, gonotergite *ta₁₋₅ tarsi 1-5 *Te tentorium (Fig. 9A, 31E, 38A, 46B, 48D, 66B, 67C, 68A, 76E, 81C) *ti tibia *TL total length total length *TL/WL wing length torma (Fig. 31E, 38A, 60A, 66B, 81C) то

transverse sternapodeme (Fig. 13A, 51A, 62A) *TSa vannal fold (Fig. 31B) Vf ventrolateral lobe of gonapophysis VIII (Fig. 10F, 14I, 52G) VlL $\frac{Cu}{M}$ venarum ratio: *VR *WL wing length wing length *WL/Pfe length of profemur *Wti1-3 width of tibia 1-3 at apex segment X of female (Fig. 10C; 27A; 33B, C; 38C, G; 63; 70A) х

PUPAE

*AM	anal macrosetae (Fig. 11C, 17A, 18A, 79C)
Ap	apophyse (Fig. 11C; 18A; 55I, J; 79C)
*FS	frontal seta(e) (Fig. 11A, 16A, 17E, 54A, 79A)
FW	frontal "wart(s)" (Fig. 11A; 16A; 17E, F; 79A)
*L ₁₋₅	lateral setae 1-5
*PcS	precorneal seta(e) (Fig. 11B, 16I, 17I, 54G, 79B)
*PSA	pedes spurii A (Fig. 18B, 55J)
*PSB	pedes spurii B (Fig. 11C, 18A, 79C)
*S	sternite(s)
*т	tergite(s)
*TH	thoracic horn
*TH/AM	length of thoracic horn length of anal macrosetae

LARVAE

A	"a" seta of maxillary palp (Fig. 12C, 20A, 23B, 58C, 80A)
Aa	antaxial seta of maxilla (Fig. 12D; 20A; 23A; 58A, B, E; 80A)
ACh	anterior chaeta of maxilla (Fig. 12D; 20A,B,C; 23; 58A,B,D,E,G; 80A,B)
*An	anal setae (of procerci) (Fig. 121, 19F, 56A)
qqA	appendix seta of maxilla (Fig. 20B, 23A-C, 58A, 80A)
	length of basal antennal segment
*AR	antennal ratio: length of remaining segments
	(Hirvenoja (1973) has reversed this ratio)
в	"b" seta of maxillary palp (Fig. 12C, 20A, 23B, 58C)
*B1	blade of basal antennal segment (Fig. 20D)
Bs	bisensillum of maxillary palp (Fig. 12C, 20A, 23B, 58C, 80A)
Ch	chaeta(e) of labrum (Fig. 12A, 21A, 22D, 57A)
ChB	chaetula(e) basales (of palatum) (Fig. 12A; 21A; 22A; 57A, B)
ChL	chaetula(e) laterales (of palatum) (Fig. 12A; 21A; 22A; 57A, B)
ChM	chaeta media (of labrum) (Fig. 12A, 21G)
G	galea (Fig. 12D; 20A; 58A, D: 80B)

L	labrum (Fig. 21A)
LG	lamelles of galea (Fig. 20A; 23A-C, G; 58A, D, E, H; 80B, 87B)
LL	lamella of labrum (Fig. 12A, 21A, 57A)
*LO	Lauterborn organ (Fig. 20E)
LR	labral rod (Fig. 21A, 57A)
MCh	maxillary chaeta(e) (Fig. 12D)
ML	median lamelles of prementum (Fig. 12B, 21L)
MS	multilobate sensilla of maxilla (Fig. 12D, 20A, 23B-C, 58F, 80B)
Р	palpiger (Fig. 12D, 20A, 58A, 80B)
Pa	paraxial seta of maxilla (Fig. 12D; 20A-C; 23; 58D, E; 80A)
*Pc	procercus(i) (Fig. 121, 56A)
PE	pecten epipharyngis (Fig. 12A; 21A; 22D; 57A, B)
PG	pecten galearis (new term, Fig. 12D; 20A; 23A, B; 58D, F; 80B)
PmL	paramedian lamelles of prementum (Fig. 12B, 21L)
*PP	posterior parapods
*RO	ring organ of antenna, mandible or maxilla (Fig. 12C, F, G; 20D; 23B; 56E; 58C; 59F; 80A, G)
*S I	seta anteriores (of labrum) (Fig. 12A, 21A, 22A, 57A)
*S II	seta posteriores (of labrum) (Fig. 12A, 21A, 22A, 57A)
*S III	seta minuscula (of labrum) (Fig. 12A, 21A, 22A, 57A)
S IV	bisensillum of labrum (Fig. 12A, 21A, 22A, 57A)
*Sa	supraanal seta(e) (Fig. 12I, 19F, 56A)
*Sa/An	length of supraanal seta
ou/ mi	length of longest anal seta
SBM	sensilla basiconica of maxilla (Fig. 12D; 20A; 23A-B; 58D, F-H)
SBP	sensilla basiconica of prementum (Fig. 12B, 21L)
SI	seta interna (of mandible) (Fig. 12F, 19A, 59F, 80G)
SM	sensilla minuscula of mandible (new term, Fig. 12F, 19A, 59F, 80G)
Sp	spinula(e) (Fig. 12A; 21A, F, G; 22A; 57A)
SP	seta premandibularis (Fig. 12A, 21A, 22A, 57A)
SSd	seta subdentalis (of mandible) (Fig. 12F, 19A, 59F, 80G)
*TA	tubuli anales or anal tubules
*TL	(in text) total length
TL	(in figures) tetrahedral lamelles of palpiger (Fig. 20A, C; 23A, B; 58A; 80B)
То	torma (Fig. 12A)
U	ungula (Fig. 12A, 21A)
*V/M	maximum width of ventromental plate (In Z. zalutschicola Lip. the width of one median tooth of mentum
	denominator is half the width of the pale median teeth.)

Phyletic Relationships

RELATIONSHIPS OF THE SUBFAMILY ORTHOCLADIINAE

The genera treated in this revision undoubtedly belong to the more plesiomorphic of the Orthocladiinae. Thus, it is imperative to evaluate the position not only of

this group relative to other Orthocladiinae, but also to assess the position of the subfamily Orthocladiinae relative to other subfamilies in order to define more clearly apomorphy versus plesiomorphy within the group. A number of features, apparently of general apomorphous character, may be plesiomorphous within this group of species, or within the subfamily as a whole, provided they are synapomorphous in the group and its sister group, or in the Orthocladiinae and its sister group (see for instance Sæther 1971a: 354).

A first attempt at evaluating chironomid relationships was by Goetghebuer (1914). Except for his conclusion that the Chironominae were derived from the Orthocladiinae, his results were generally untenable. Brundin (1956a: 51) criticized Goetghebuer's use of the presence of a swim fringe on the pupal anal lobes as a phylogenetically important character. The error, however, does not rest with the use of this feature, but in characterizing it as apomorphous within the Orthocladiinae. Although Edwards (1929) separated both the Diamesinae and the Clunioninae as subfamilies distinct from the Orthocladiinae, Brundin (1956a) regarded them merely as tribes of Orthocladiinae. Brundin (1966: 425) regarded the Tanypodinae as the apomorphic sister group of Podonominae + Aphroteniinae and these three subfamilies combined as the sister group of Diamesinae + Telmatogetoninae + Orthocladiinae + Chironominae. However, in the latter group the subfamily Chironominae was thought to form the sister group of the remaining three subfamilies, a conclusion differing from the present interpretation which suggests that the Diamesinae + Telmatogetoninae form the plesiomorphic sister group of the Prodiamesinae + Orthocladiinae + Chironominae. The evidence of the female genitalia has previously been impossible to assess completely because of the lack of extensive morphological comparisons. However, on the basis of Sæther (1974) and ongoing investigations, the main conclusions of Brundin will be strengthened. For instance, in the Podonominae, Aphroteniinae, and Tanypodinae the gonocoxites are reduced and fused with T IX forming a gonotergite IX, an obvious synapomorphy unique to these subfamilies.

To recognize phylogenetic relationships (monophyletic groups) Hennig (1950, 1957, 1966) developed a theoretical synapomorphic diagram. The kladogenesis of subfamilies and that of the genera treated in this revision are outlined according to Hennig's method. Delineation of the kladogenesis of the subfamilies Diamesinae, Telmatogetoninae, Prodiamesinae (new subfamily), Orthocladiinae, and Chironominae is attempted using a scheme of argumentation (Fig. 1) and by the following trends (a = apomorphous, p = plesiomorphous):

1. C-extension absent, C forms rounded angle with R_{4+5} (a); C-extension distinguishable or if absent C and R_{4+5} forms acute angle (p).

2. Claws of male single pointed (a), with several apical teeth (p).

3. Spurs modified into combs (a); spurs unmodified with comb absent, or consisting of separate, stiff setae (p). The absence of a comb of setae is most common within the more plesiomorphic genera of the Orthocladiinae. A comb is also absent in *Monodiamesa depectinata* Saeth. (Saether 1973b: 666). Thus, it is most likely that the lack of any true comb is a more plesiomorphous feature than the presence of a comb of setae.

4. ta, of p, longer than ti (a), shorter (p).

5. Gs of male directed more or less rigidly backwards (a), Gs folded inwards with joint with Gc flexible (p).

6. AM of pupa absent (a), present (p). - Parallel loss of AM has taken place in the *Corynoneura* group.



FIG. 1. Scheme of argumentation delineating the kladogenesis of the subfamilies Diamesinae, Telmatogetoninae, Prodiamesinae (new subfamily), Orthocladiinae, and Chironominae by means of trends 1-27 (p. 10-13).

7. Pupa with spurs on VIII (a), without (p). - Parallel development of indistinct spurs has taken place in some Zalutschia. The spurs, however, appear to be of a different nature. Z. zalutschicola Lip. also has frontal tubercles of the same type as those commonly in the Chironominae. This is, however, probably a symplesiomorphy. 8. Setae underneath ventromental plates incorporated in plates and forming striations (Hirvenoja 1973: 39) (a), ventromental plates with or without simple setae underneath (p). - Possibly an additional trend is the absence of microtrichia on Te in the Chironominae (a), versus their presence in plesiomorphic Orthocladiinae (p). However, a parallel reduction takes place within most Orthocladiinae. Because at least one species of Brillia Kieff. has three SCa and Dipocladius cultriger Kieff. has three SCa, the ancestral form of the Orthocladiinae must be assumed to have had three and, thus, be more plesiomorphic in this respect than the Chironominae. However, all other Orthocladiinae apparently have only two SCa.

9. Volsellae reduced or absent (a), well developed (p). - Parallel reduction takes place in the *Harnischia* complex. Although both Fittkau (1962: 70, 73) and Brundin (1966) apparently regard the absence of volsellae as plesiomorphous the evidence from comparative morphology (Sæther 1971b: 1248-1251; Hirvenoja 1973: 23-29) clearly suggests that their presence is generally plesiomorphous within the Chironomidae. 10. MCu absent (a), present (p).

11. T IX of female relatively small, divided (a); large, hood-shaped, undivided (p). - A parallel division of T IX takes place in many Orthocladiinae.

12. FCu below or distal to RM (a), proximal (p). - A parallel development takes place in most Telmatogetoninae.

13. Notum of female genitalia long (a), short (p). - Parallel developments take place within both the Telmatogetoninae and the Diamesinae, but the rami of Gp IX are usually fused for a shorter distance than within the other subfamilies.

14. Anal lobe of pupa with fringe of long setae (a), without (p). - The arrangements of pupal leg sheaths treated by Brundin (1962: 953; 1966: 429-434) could perhaps be reckoned here as all Telmatogetoninae and most Diamesinae have leg sheath arrangements of the *Podonomus* type and the Prodiamesinae, most Orthocladiinae, and nearly all Chironominae have leg sheath arrangements of the *Tanypus* type. However, some Orthocladiinae appear to have quite plesiomorphous leg sheath arrangements.

15. Large ventromental plates present (a), ventromentum not distinctly extending lateral of mentum (p). - The ventromental plates are secondarily reduced in several Orthocladiinae.

16. Ventromental plates either with setae underneath (on cardo) or setae incorporated in plates as striation (see trend 8) (a), without setae underneath (p). - These setae are secondarily reduced in several Orthocladiinae. However, in many larvae previously regarded as without setae, rudiments can be observed.

17. Prementum with dense hair brushes (a), without (p). - The brushes are secondarily reduced or altered in some Diamesinae such as the Protanypini.

18. T IX of female hood-shaped or divided (a); very large, elongate (p).

19. Gs absent in female (a), present (p).

20. Gp VIII relatively short, sometimes divided (a); consisting of long and simple lobes (p).

21. Pupa without "spiracle" on thoracic horn, or when "spiracle" present ring-shaped opening of horn chambers lost (Brundin 1962: 953; 1966: 370) (a); with "spiracle" overlaid by a thin membrane (p).

22. Male with 6 flagellomeres (a), more than 6 (p). - Parallel development with reduction of number of flagellomeres is well known from *Diamesa* Meig. However, only *D. ruwenzoriensis* Freem. has as few as 6 flagellomeres.

23. MCu absent (a), present (p). - Parallel loss of MCu takes place in Harrisonina Freem.

- 24.
- R_{2+3} absent (a), present (p). T VIII of female reduced (a), well developed (p). 25.
- 26. Gc of female reduced (a), well developed (p).
- 27. SCa reduced or absent (a), present and well developed (p).

Although the Chironominae are undoubtedly the most apomorphic subfamily, they have maintained some of the most plesiomorphous features especially in the genitalia. Such features include the lack of an apical spine on the Gs of the male, the presence of well-developed volsellae, some of which can be interpreted as true endomeres ("parameres"), and the presence in the female of a large, undivided T IX and relatively distinct Gc IX. There is no doubt that this subfamily is strictly monophyletic. There also appears to be little doubt about the monophyletic unity of the Prodiamesinae, Orthocladiinae, and Chironominae combined. Although the most important trends (12 and 16) not subject to parallelisms in other groups could possibly be interpreted as going in the opposite direction, there is no real evidence of this. The greatest difficulty lies in deciding whether the Prodiamesinae is the sister group of the Orthocladiinae alone, or of the Orthocladiinae and Chironominae combined (as suggested here). Although the Prodiamesinae show several similarities to the Orthocladiinae, the conformity apparently consists of symplesiomorphous features within the two above subfamilies plus Chironominae. On the other hand the evidence of trends 10 and 11 apparently verifies the present interpretation. A trend which would have been synapomorphous for the Orthocladiinae plus the Chironominae (were it not for one species of Brillia Kieff. with 3 SCa) is the reduction of SCa from three to two. Similar new findings concerning trends 10 to 11 may, although it is unlikely, show the present evaluation to be in error. The monophyletic unity of the Telmatogetoninae plus the Diamesinae is indicated by only one trend, the presence of premental hair brushes; as this can easily be interpreted as going in the opposite direction monophyly in this case is somewhat doubtful. However, more convincing arguments including series of parallel trends are mentioned by Brundin (1966: 370-373).

Even if trends 12-16 should all happen to go in the opposite direction the following features have been shown to be plesiomorphous within the Orthocladinae: T IX of female large, hood-shaped, and undivided; anal lobe of pupa with fringe of long setae; ventromental plates large; setae present underneath ventromental plates.

PREVIOUS POSITION OF THE TREATED GENERA

The genus Hydrobaenus was erected by Fries (1830) for the species H. lugubris Fries, and the genus Trissocladius Kieff. by Kieffer and Thienemann (1908) for the species T. brevipalpis Kieff. and T. heterocerus Kieff. Prior to 1935 species belonging to this group were placed in a number of genera such as Orthocladius v. d. Wulp, Chaetocladius Kieff., Psilocerus Ruthe, Spaniotoma Phil., and Dactylocladius Kieff. Thienemann (1935) showed that Trissocladius brevipalpis Kieff., Trissocladius heterocerus Kieff., Hydrobaenus lugubris Fries, Dactylocladius distylus Kieff., and Orthocladius grandis Kieff. (a junior synonym of H. pilipes Mall.) should all be placed in the genus Trissocladius because of the similarities of the immature stages. (The correct name, however, should have been Hydrobaenus according to the rules of priority.) In following years Thienemann (1937) and Gowin and Thienemann (1942) described or redescribed two species they placed in the genus Diplocladius, namely Chironomus conformis Holmgr. and Diplocladius lunzensis Gow. Thienemann (1937) noticed the close

resemblance between the pupae of these two species and that of Diplocladius cultriger Kieff. but overlooked that not only the pupae, but also the larvae were practically identical to those of the species placed in Trissocladius a few years earlier. Goetghebuer in Zavřel (1937b) described a new species, Trissocladius fluviatilis, for which Zavřel erected a new subgenus Paratrissocladius. Although Zavřel mentioned that this subgenus was very similar to Heterotrissocladius Spärck in many respects, he failed to draw the full conclusion and placed the subgenus in Trissocladius. Goetghebuer (1932) had mistakenly synonymized Orthocladius grandis Kieffer, 1924 with Orthocladius glabripennis Goetghebuer, 1921 (according to Brundin (1956a: 100) probably a junior synonym of O. consobrinus (Holmgr.)). This led to an incorrect figure of an Orthocladius grandis hypopygium by Edwards (1940), and to his conclusion that Hydrobaenus was a senior synonym of his huge genus Spaniotoma Phil. He also concluded that if Hydrobaenus and Trissocladius should be maintained as subgenera they could not include species such as grandis, which would have to be placed in Orthocladius v.d. Wulp. This, of course, also meant that if Hydrobaenus was regarded as a synonym of Orthocladius the subfamily name would be Hydrobaeninae as adopted by Townes (1945) and Johannsen (1952). It was not until 1956 that Brundin discovered the error. However, another error by Goetghebuer, not discovered by Brundin (1956a), was his description of a larva said to belong to Trissocladius griseipennis (Goetghebuer 1914: 19-20) a synonym of Hydrobaenus lugubris. This larva had "more or less" longitudinally striated ventromental plates and led Brundin (1956a: 19) to believe there were generic differences in the immature stages between Hydrobaenus Fries and his concept of the genus Trissocladius Kieff. As shown by Mozley (1970: 446), the larvae of *H. lugubris* are very similar to those of *H. distylus* Kieff.

Brundin (1956a: 76, 79) maintained *Paratrissocladius* Zavř. as a subgenus of *Trissocladius*. He failed, however, to notice the relatively strong acrostichals starting at the scutal projection and the very heavy microtrichia on the wing, and he did not reexamine the larva. He did notice that *Chaetocladius excerptus* (Walk.) redescribed by Edwards (1929: 338) could not be a *Chaetocladius*. In fact, as shown by reexamination of Edward's specimens, this species is a senior synonym of *Paratrissocladius fluviatilis* (Goetgh.).

Lipina (1939) described an unusual larva which she named Zalutschia zalutschicola. Ten years later Brundin (1949) found adults and pupae and named the species Orthocladius naumanni, a species he later transferred to Trissocladius (Brundin 1956a). In the meantime Edwards (in Thienemann 1941) described a species he called Orthocladius tornetraeskensis. Thienemann (1941), however, placed the species in the genus Trissocladius on the basis of the immatures.

The placement of the treated genera and groups in the systems of Thienemann (1935, 1941, 1944), Gowin and Thienemann (1942), Edwards (1940), Freeman (1956) and Brundin (1956a) is shown in Fig. 2.

THE ANAGENESIS OR EVOLUTIONARY PROGRESS

Different aspects of anagenesis in general are discussed by Rensch (1947, 1959) and for chironomids in particular by, for instance, Fittkau (1960) and Hirvenoja (1973). In the chironomids, anagenesis mostly manifests itself as a degeneration of existing structures and organs and the generative phase as an alteration of these. Formation of new organs probably has not taken place within the chironomids. Hirvenoja (1973: 47) mentioned the ventromental plates of the larva and the appendages of the male gonocoxite as partial new organs. However, Sæther (1971b: 1254) pointed out the structure of the ventromental plates shows a clear trend from primitive Diamesinae through primitive



FIG. 2. Generic position of the treated genera and species groups within the systems of Thienemann (1935, etc.), Edwards (1940), Freeman (1956), and Brundin (1956a).

Orthocladiinae and Prodiamesinae to Chironomariae connectens, Chironomariae genuinae (sections of Chironomini erected by Lenz), and Tanytarsini. The ventromentum itself, as part of a double-walled mentum, is present in all chironomids and, for instance, in simuliids, and the presence and development of ventromental plates exists only as a lateral expansion of the ventromentum. Similarly, the presence of volsellae on the gonocoxites is in all likelihood a symplesiomorphy.

A sufficient number of steps appear to have been found to provide a reasonable evaluation of the evolutionary progress in the treated species. However, it is important to remember that the semaphoront (Hennig 1950, 1966), not the species or the individual, is the element of biological systematics. Accordingly the evolutionary level of the imago, pupa, and larva can be expected to be different from one another, and the combined level of any two cannot be directly compared with the combined level of all three. As a consequence, and to facilitate comparison between species, the evolutionary level for each stage is shown separately in Fig. 3.

The evolution index was first used by Illies (1960) for families of the Plecoptera. The calculation consists of assigning the different recognizable anagenetic steps of each trend different numbers, starting with one for the most plesiomorphous and proceeding to the highest number for the most apomorphous. The arithmetic mean of the step values of all trends gives the evolution index. Wagner (1962) showed the evolutionary level as a summation of the step values of all trends; Schlee (1968b) thought the arithmetic mean and the percentage, and Hirvenoja (1973) the summation and the arithmetic mean, were more representative. However, as mentioned by Sæther (1970), when the evolution index is given in the above-mentioned forms trends with the most steps get the highest values and are accordingly regarded as more important. They may be more important in some cases, but in many cases the trends with only two steps are most significant. To give all trends equal importance, a second index called the adjusted evolution index, giving all trends and steps equal value regardless of the number of steps, was proposed and used by Sæther (1970) for the Chaoboridae and by Sæther (1971a) for the Harnischia complex: i.e., instead of using the scale 1-5 when there are 5 steps each number is adjusted to a scale of 1-2. The evolution index and the adjusted evolution index are shown in Table 1. The adjusted evolution index tends to smooth out differences and make the indices within each group more uniform.

In one case only, *Oliveria tricornis* (01.), is the evolutionary level of any immature stage higher than that of the imago. In *Zalutschia* (except for the *Z. tatrica*group), the larvae show the lowest index, whereas in *Trissocladius* and in *Hydrobaenus* (except for the *H. lapponicus* group, *H. lugubris* group, and *H. distylus* and its sister species *H. spinnatis*), the pupae show the lowest values. The following trends and steps are evaluated in the delineation of the anagenesis.

IMAGO

1. WL (male) 3-4 mm (1), 2-3 mm (2), or 1-2 mm (3).

2. TL/WL (male) 1.2-2.1 (1), 2.2-2.5 (2).

3. AR (male) > 2.0 (1), 1.5-2.0 (2), 1.0-1.5 (3), or < 1 (4).

4. Female antenna with 6 flagellomeres (1), with 5 (2), with 4 (3).

5. Flagellomeres 2-12, or all except first and last, flagellomere of male wider than long (1); only flagellomeres 2-6 or fewer wider than long (2).

6. IV not separated from OV, not smaller than OV, preoculars present (1); reduced, but not separated from OV, preoculars absent (2); reduced and separated from OV, preoculars absent (3).

7. Temporals numerous > 20 (1), less numerous 10-20 (2), reduced < 10 (3).



FIG. 3. Anagenetic-kladogenetic diagram showing the evolutionary progress by means of the adjusted evolution index (AEI) and trends 1-75 on p. 16-22. Numbers of species as in Table 1, phylogenetic branching as in the schemes of argumentation (Fig. 4, 5).

		_																																							
SPECIES																											_							-					-		
Bacoctenuu 1. bicolor Olivaria	1	1	1	1	1	1.5	2	1.5	2	2.5	1	2	1	2	3	1	1	2	1	1	2	1	2	1 :	:	2	2	2	1	1.5	1	2	1	1	2	2.5	1	3	3	1 2	1
2. tricornia	2	1	1	1	2	2.5	2.5	1	1	2	2	1.5	2	2	2	1	1	1	1	2	2	2	3	1 :	!	2	2	3	2	2	2	1	2	2	1	1.5	1	3	1.5	4	1
nguroaannu 3. latiseudua 4. conformio 6. furito fu 8. glaciatia 9. Lugabria 9. Lugabria 10. rufua 11. pilipea 12. nagu lapiloou 13. virgo 14. huduoni 15. mariin 16. johanuani 17. pilipoda	2 2 - 2 2 3 3 - 2 2 2 3 2 2 2 3 2 2 2 2 2	1 1 2 2 1 1 2 1 1 1 1 1 1 1 1	3 2.5 2.5 3 4 4 1.5 - 2 3 1 2 2	1.5 2 1.5 1 2.5 1.5 1.5 1.5 2	- 2 2 - 1 - 1 2 - 1 - 1 2 1 - 1 - 1 -	3 - 3 - 1.5 - 3 3 3 3 3 3 3 3 3 3 3 3 3	2.5 2 2.5 2.5 2 2 2 2 2 2 2 2 2 2 2 2 2	1.5 1.5 2.5 2 1.5 1.5 1.5	2 2 - 1 1 2 - 1 1 1 2.1 1 1 1 1	- 2.5 - 2.5 2.5 2.5 2.5 2.5 2.5		222223322222222222222222222222222222222	2 2 2 2 1 1.5 1 1 1 1 1 1 1	1.5 2 2 2 2 1 2 2 1.5 2 2 2 2 2 2 2 2 2 2	2 2 - 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	22-22-1-2222222222222222222222222222222	1 - 1 1.5 2 1 1 1 1 1 1 1	1 1.5 1.5 2 1 1 1 1 1.5 1 1.5 1.5 1.5	2 - 2 - 1 - 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	1.5 - 2 - 2 - 1.5 - 2 - 2 - 2 2 - 2 2 2 2 2 2 2 2 2	2.5 1.5 -2 2 - 1 1 1 2 3 1 2 2	233224442222222222222222222222222222222	2		- 1 2 - 1 1.5 - 1 1.5 - 1 1 1.5 - 2	- 1 2 - 2 - 1 1 - 2 1 1 - 2 1 1 - 2 1 1 - 2 - 1 1 - 2 - 2 - 1 1 - 2 - 2 - 2 - 1 - 2 - 2 - 2 - 2 - 2 - 2 - - 2 - - 2 - - - - - - - - - - - - -	22-22-222222222222222222222222222222222	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 2 2 2 1.5 1.5 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 1 - 1.5 - 1.5 - 1 1 1 1 1 1 1 2 1	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	1.5 3 - 1 1 1 1.5 2	- 1.5 - 1 1 1 1 1 2 1.5 1	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 2 3 1.5 1.5 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	3 3 3 3 3 3 7 1 1 3 3 - 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	3333-3333-33333	2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3		
TRENDS	43	44	45	46	47	48	49	50	51	52	53 5	4 5:	5 56	5 5	57 58	3 59	60	61	62	63	64 6	5 66	67	68	69	70	71	72	73	74	75	I¤ E.I.	nagine A.	5 E.I.	Pu E.I.	pa A.E.I	. E.	Larva I. J	'a A.E.I,	ComJ E.I.	bined A.E.I.
TRENDS	43	44	45	46	47	48	49	50	51	52	53 5	4 5:	5 56	5 5	57 58	3 59	60	61	62	63	64 6	5 66	67	68	69	70	71	72	73	74	75	Ir F.I.	nagine A.	s E.I.	Pu E.I.	pa A.E.I	. E.	Larv. I. j	a A.E.I.	ComJ E.I.	bined A.E.I.
TRENDS SPECIES Basocienus 1. bicolor Oliveria	43	44	45	46	47	48	49	50	51	52	53 5	4 5:	5 56	5 5	57 58	3 59	60	61	62	63	64 6	5 66	67	68	69	70	71	72	73	74	75	I# E.I. 1.57	A.	5 E.I. 36	Pu E.I.	ра А.Е.I	. E. -	Larv. I. J	а А.Е.І,	ComJ E.I.	bined A.E.I.
TRENDS SPECTES Basoctenus 1. biscolor Oliveria 2. triconnie Hydrobanus	43	44	45 2 1	46 - 2	47	48 - 2	49 - 1	50 - 1	51 - 3	52 - 1		4 5:	5 56	5 5	57 58 2 2	3 5 9 - 2	60 - 2	61 - 1	62 - 1	63 - 1	64 6 2]	5 66	67 - 2	68 - 1.5	69 - 1	70 - 1	71 - 1	72	73	74	75 - 1	IF F.I. 1.57 1.70	nagine A. 	36 45	Pu E.I. - 1.79	ра А.Е.І - 1.54	. E. - 1.	Larv. I. 2	- 1.34	ComJ E.I. - 1.65	Jined A.E.I. - 1.45

Table 1. The evolutionary level of the species treated as indicated by calculation of the evolution index (E.I.) and the adjusted evolution index (A.E.I.) by means of trends and steps ("male or female not measurements based on literature.)

Table 1. Continued

TRENDS	1	2	з	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	2D	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
SPECIES																										_																
Rudrobaenus																																										
19. spinnatis	2.5	1	2	2	1	3	2.5	2.5	1	з	1	2	2	2	2	2	1	2	2	2	2	2	2	1	2	1.5	1	2	2	2	1	z	2.5	1.5	2	2	3	3	3	з	1	1
20. calvescens	3	1	2	-	1.5	3	2	-	1	-	1	2	1	2	2	2	1.5	2	2	2	2	2	3	1	2	1	1.5	2	2	-	1	2	-	-	2	2	3	1	3	-	-	-
21. tunidistulus	2	1	4	-	2	3	3	-	1	-	1	2	1	2	2	2	1	2	2	2	z	3	2	1	2	2	2	2	2	-	2	2	-	-	2	2	3	1	з	-	-	-
Trissocladius																																										
 brevipalpis 	2.5	1	3	-	2	3	3	-	2	2	1	2.5	2	2	3	2	1	1.5	3	3	1	2	2	1	2	2	2	1	1	1	1	2	-	-	2	2	2	3	2	-	-	-
23. heterocerus	2.5	-	4	-	-	3	2	-	2	-	1	3	2	2	3	2	1	1	з	3	1	1.5	3	2	-	-	-	1	1	-	2	2	-	-	2	z	2	з	2	-	-	-
Zalutschia																																										
24. obsepta	2.5	1	3	2	2	3	з	2	2	2.5	1	2	2	1	z	2	1	2	2	3	2	2	2	1	2	2	1	2	2	1.5	2	2	2	1.5	3	1	2	3	1	2	3	2
25. megas tula	3	1	4	-	-	3	3	-	-	-	1	2	2	2	2	2	2	-	2	3	1	3	3	-	-	-	-	2	2	-	-	-	-	-	з	1	2	3	1	-	-	-
26. mucronata	3	1	3	-	2	3	3	-	2	3	1	2	2	2	2	2	1	2	2	3	2	2	2	1	2	2	2	2	2	1.5	2	2	-	-	3	1.5	2	3	2	-	-	-
27. zalutachicola	2.5	1	2.5	2	1.5	3	2	3	2	1	1	2	2	2	2	2	1	2.5	2	3	z	2	2	1	2	1.5	1	2	2	1	2	2	-	-	з	1.5	1	3	z	2	з	2
28. tatrica	2.5	1	3	2	2	3	3	2.5	2	1.5	1	2.5	2	2	2	2	1	3	2	3	1	2	3	1	2	1	1	2	2	1	2	z	2	2	3	1.5	1	3	3	2	3	2
29. furcarca	1.5	1	2	-	-	3	2.5	-	2	1	1	2	2	2	2.5	2	1	2	2	3	2	1	1	1	2	1	1	2	2	1	1.5	2	-	-	3	2	1.5	3	3	-	-	1
3D. vockerothi	3	1	4	-	2	3	3	-	2	2	1	2	2	2	2	2	2	2	2	3	2	3	2.5	1	2	z	2	1	2	1	2	2	-	-	3	2	2	3	з	-	-	-
31. lingulata	2	1	1	2	1	3	2.5	2.5	2	2.5	1	2	2	2	2	2	l	2.5	2	3	2	1.5	z	1	1	ı	1	2	2	1.5	2	2	1.5	1.5	3	2	2	3	2.5	2	3	2
32. pusa	2.5	1	-	2.5	-	3	3	2.5	2	-	1	2	2	2	2	2	1	2	2	3	-	2	2	1	-	-	-	2	2	1	2	2	2.5	2	-	•	-	-	-	2	3	2
33. tornetraeskensis	2,5	1	2	2	1	3	3	3	2	2	1	2	2	2	2	2	1	2	2	3	2	1.5	2	1	1.5	1	1	2	2	1	2	2	2	2	3	3	2	3	2.5	2	3	2
34. trigonacies	2.5	1	2	2	1	3	3	3	2	3	1	2	2	2	2	2	1	3	2	з	2	2	2.5	1	2	1	1	2	2	1	2	2	2	2	3	2	2	3	2	2	3	2
35. sp. A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

																																		Imag	jines	Pu	ipa	Laz	va	Comb	ined
TRENDS	43	44	45	46	47	48	49	SD	51	52	53	54	55	56	57	58	59	6D	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	E.I.	A.E.I.	E.I.	A.E.I.	E.I.	A.E.I.	E.I.	A.E.I.
SPECIES																																									
Hydrobaenus																																									
19. spinnatis	1	2	2	2.5	1	1.5	1	1.5	2	1	1	3	2	2.5	1	1	1	2	l	1	2	1	1	2	2	1	2	1	1	1	l	1	1	1.91	1, 55	1.57	1.33	1.31	1.28	1.72	1.45
20. calvescens	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.86*	1.53*	-	-	-	-	_	-
21. tumidistylus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.00*	1.63*	-	-	-	-	-	-
Trissocladius																																									
22. brevipalpis	-	-	-	-	1	1	2	-	1	1	1	3	1	1	1	1	1	2.5	1	1	1	1	1	-	2	1	2	1	1	1	-	1	1	1.96*	1.59*	1,25*	1.17*	1.25*	1.20*	1.66	1.42
23. heterocerus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		2,11*	1.65*	-	-	-	-	-	-
Zalutschia																																									
 obsepta 	2	1	1	2	3	1	2	3	1	2	1	з	2	1	1	1	1	2.5	1	1.5	1.5	2	1	1	1	2	2	1	2	1.5	-	-	-	1,92	1.59	1.71	1.43	1.44	1,39	1.82	1.54
25. megastyla	-	-	-	2	3	1	2	3	1	2	2	3	2	1	1	1	1	2.5	1	1	1	2	1	1	1	1	2	1	2	1	-	1.5	1	2,21*	1.67*	1.79*	1.45*	1.33*	1.28*	1.85	1.50
26. mucronata	-	-	-	1	3	1	2	5	1	z	z	3	2	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.09*	1.71*	1.86	1,45	-	-	1.89	1.55
27. zolutschicolc	2	-	2	1	з	1	2	4	1	2	ı	2	2	1	1	1	1	1.5	2	1	1.5	2	1	1	1	2	2	1	2	2	2	1	1	1.95	1.61	1.64	1.38	1.50	1,48	1.79	1,53
28. tatrica	2	1	2	2	3	1	2	2	1	2	3.5	3	2	1	1	1	1	2	2	1	1.5	2	1	1	1	2	2	1	2	1	2	2	1	2.01	1.62	1.82	1.47	1,53	1.50	1.87	1.57
 furcarca 	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.84*	1.54*	-	-	-	-	-	-
30. vockerotni	-	-	-	2	3	1	2	3	1	2	4	3	2	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.16*	1.74*	I.93	1,50	-	-	2.09	1.67
31. lingulata	2	1.5	2	2	3	1	2	3	1	2	4	3	2	1	1	1	1	2	1	1	1	2	2	1	1	2	2	1	2	1	2	1	1	1.91	1.58	1.93	1.50	1.44	1.41	1.81	1.53
32. pusa	2	1.5	2	2	3	1	2	3	1	2	3	3	2	1	1	1	1	3	i	ī	1	2	2	1	1	2	2	1	2	1	-	1	ĩ	2.D2*	1.66*	1.86	1.48	1.47	1.40	1.85	1.55
 tornetraeskensis 	2	1.5	2	2	3	1	2	5	1	2	3	3	2	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		1.99	1.62	2.0D	1.51	-	-	1.99	1.59
 trigonacies 	2	2	3	з	з	1	2	4	1	2	4	3	2	1	1	1	1	2	1	1	1	2	2	1	1	2	2	1	2	1	2	2	1	2.07	1.66	2.07	1.55	1,50	1.47	1,95	1.60
35. sp. A	-	-	-	3	3	1	2	3	1	2	4	3	z	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.D0	1.54	-	-	-	-

Table 1. Continued.

TRENDS	1	2	3	4	5	6	7	6	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	26	29	30	31	32	33	34	35	36	37	38	39	40	41	42
SPECIES																																										
Freemaniella 36. eastapi Paratrissocladius	3	1	3	-	-	-	-	-	-	-	-	2	2	1	2	1	3	2	3	2	з	-	-	-	-	-	-	2	-	-	-	-	-	2	1	3	3	2	-	-	-	-
37. excerptus 38. natalensis	2.5 3	1	3 4	2	2 2	1	2	1	2 2	3 3	1	1	2	1.5 1	1	2 2	1 1.5	2.5 3	3	3	1	2	1	1	2	2	2	1	2	2	2	2	-	-	2	1.5	2	1	3	-	-	-
Eukiejferiella 39. scanica Brucchasnogladive	2	1	3	-	2	2	2	-	2	3	1	2	2	2	3	2	1	3	2	3	1	2	3	1	2	1	1	1	2	2	2	2	-	-	2	1	1.5	1	3	-	-	-
40. impectinus Maximum no. steps	3 3	1 2	2 4	- 3	1 2	3 3	3 3	3	2 2	3 3	1 2	2 3	2 2	2 2	1.5 3	2 2	1 2	2 3	2 3	3 3	2 2	3 3	3 4	1 2	2 2	1 2	2 2	1 3	1 2	2 2	2 2	2 2	- 3	2	2.5 3	2 3	3 3	1 3	3 3	4	3	2

																						_	_											Ima	gines	P	upa	La	rva	Corr	bined
TRENDS	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	Е.І.	A.E.I.	E.I.	A.E.I.	E.I.	A.E.I.	E.I.	A.E.I.
SPECIES																							-																		
Freemaniella 36. eastopi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.16*	1.65*	-	-	-	-	-	-
Paratrissocladius 37. excerptus	2	1	2	2.5	2	1.5	1	1	2.5	1	1	3	1	1	1	1	1	з	1	2	1	1	1	1	1.5	2	2	2	1	1	2	1	1	1.78	1.51	1.46	1.25	1.47	1.41	1.65	1.44
38. natalensis Eukiefferiella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.89-	1.59*	-	-	-	-	-	-
39. scanica Brumhaenaeladium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.90*	1.57*	-	-	-	-	-	-
40. impectinus	-	-	-	-	:	ī	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		- 2	-	-	-	ž	-	- 2	2.00*	1.63*	2.71	2.00	- 2.37	- 2.00	- 2.48	- 2.00
Maximum no. steps	2	2	3	3	3	2	2	5	3	2	4	3	2	3	2	4	2	د	4	4	4	4	4	•	-	-		-	•	•		•	-		2100						

8. Coronal suture of female complete (1), incomplete (2), absent (3). 9. Te with microtrichia (1), without (2). 10. Frontal tubercles present (1), ocelli present in male (2), ocelli apparently present only in female (3). 11. Clypeus about as wide as or narrower than pedicel (1), clypeus clearly wider than pedicel (2). 12. Palp 5-segmented with segment 5 about twice as long as 3 (1), 5-segmented with segment 5 1.6 or less times as long as third (2), 4-segmented (3). 13. Median lobes of antepronotum in more or less broad contact anterior of scutal projection (1), in contact at a point only or separated (2). 14. Preepisternum and/or anepisternum II with setae (1), without (2). 15. Ac moderately long to long, starting at scutal projection (1); shorter, starting at some distance from scutal projection (2); absent (3). 16. Scu in several rows (1), in single row (2). 17. Anal lobes well developed, protruding (1); reduced (2). 18. VR 1.00-1.10(1), 1.10-1.20(2), > 1.20(3). 19. Cu, straight apically (1), very slightly curved near apex (2), more distinctly curved near apex (3). 20. Sensilla campaniformes > 40 on B (1), less than 30 on B and 2-4 on Sc (2), less than 30 on B and only 1 on Sc (3). 21. R_1 of male with more than 1 seta (1), with 0-1 (2). Squama with more than 25 setae (1), 15-25 setae (2), less than 15 (3). 22. $LR_1 \ge 0.77$ (1), 0.66-0.76 (2), 0.55-0.65 (3), < 0.55 (4). 23. 24. 25. $\begin{array}{l} BR_2 \ (male) > 3.0 \ (1) \ , < 3.0 \ (2) \ . \\ BR_3 \ (male) > 3.7 \ (1) \ , < 3.7 \ (2) \ . \\ \end{array}$ 26. 27. Ps absent (1), present on p_2 and p_3 (2), present also on p_1 (3). Comb not developed or consisting of 1 stiff seta (1), developed (2). 28. 29. 30. SCh present on p_2 in male and female (1), absent on p_2 in both sexes (2). 31. SCh in male 5 or more, in female 15 or more (1); less than 5 in male, less than 15 in female (2). 32. Small pulvilli present (1), absent (2). T I of female with 50-100 setae (1), 25-50 (2), or < 25 (3). 33. 34. S VIII of female with > 25 setae (1), with < 25 (2). 35. Sa without distinct oral projections, TSa convex at anterior margin (1); Sa with well-developed but narrow oral projections, TSa convex at anterior margin (2); oral projections of Sa well developed, broad and rounded, TSa concave or straight at anterior margin (3). 36. Anal point relatively long and strong (1), shorter (2), reduced (3). 37. Anal point proper with microtrichia and setae in apical half (1); without microtrichia, with setae (2); without microtrichia or setae (3). 38. Crista dorsalis present and well developed (1), rounded (2), absent (3). 39. Gs with long outer projection(s) (1), with very short projection or sharp pointed outer corner (2), at most angular or rounded outer corner (3). 40. T IX of female large, triangular, not clearly divided (1); smaller, faintly divided (2); clearly divided into 2 setigerous protrusions (3); setigerous protrusions reduced in size (4). 41. Ventrolateral lobe of Gp VIII larger than dorsomesal lobe (1), equally large lobes (2), ventrolateral lobe smaller than dorsomesal lobe (3).

42. Csa at most with 1 sharp curve or bend (1), with more than 1 small bend or curve (2).
43. SCa with microtrichia (1), without (2).
44. SDu without distinct curve or loop (1), with distinct curve or loop (2).
45. SDu opens separately on spermathecal eminence (1), with common opening (2), joined for a short distance (3).

PUPA

46. FS > 200 μ long (1), 100-200 μ (2), < 100 μ (3). 47. Frontal "warts" present and well developed (1), reduced (2), absent (3). 48. TH densely covered with spinules (1), sparsely (2). 49. PSB well developed (1), absent (2). 50. PSA present on IV-VIII (1), on IV-VII (2), on IV-VI (3), on IV and V (4), absent (5). 51. Shagreenation extensive on T II-VIII (1), on T II-VI (2), reduced also in T II-VI (3). Tergites without elevated patches of spinules (1), with patches of spinules (2). 52. 53. Caudolateral corners of segments rounded (1), corners of VII and VIII pointed (2), VII and VIII with imbedded spines (3), VI-VIII with imbedded spines (4). 54. Filamentous L-setae present on segment V-VIII (and sometimes IV) (1), on VI-VIII (2), on VII and VIII (3). 55. 5 L-setae on VIII (1), 4 (or occasionally less) L-setae on VIII (2). 56. Fringe of anal lobe consisting of long and well-developed setae (1), setae reduced in length but reaching AM (2), reduced and ending clearly before AM (3). 57. Anal lobe without apical spines (1), with (2). 58. Genital sac "normal" (1); large, swollen (2). 59. Genital sac without apical papillae (1), with (2). LARVA 60. AR > 2.0 (1), 1.5-2.0 (2), < 1.5 (3). 61. Bl not longer than flagellum (1), longer (2). 62. Third antennal segment as long as or longer than fourth (1), shorter (2). 63. S I finely plumose (1), coarsely plumose (2). 64. Chaetulae laterales smooth (1), some serrated (2). 65. At most 1 LG serrated (1), several serrated (2). 66. ACh flat and broad (1); longitudinally curled, often forming a nearly complete cylinder (2). 67. Setae present underneath ventromental plates (1), absent (2). 68. V/M > 1 (1), < 1 (2). 69. Mentum with 1 median tooth (1), with 2 or 3 (2). 70. Mentum with 6 lateral teeth (1), with 4 (2). Mentum with first lateral teeth as high as second lateral teeth (although often 71. worn down and apparently fused with median teeth) (1), reduced clearly lower and smaller than second lateral teeth (2). 72. Median portion of mentum dark (1), light (2). 73. Sa/An > 0.3 (1), < 0.3 (2). 74. TA as long as or shorter than PP (1), much longer than PP (2).

75. TA "normal," triangular, or narrow (1); swollen (2).

KLADOGENESIS OR PHYLOGENETIC BRANCHING

The kladogenesis of most treated genera and species is illustrated in two schemes of argumentation showing phylogenetic relationships. The first scheme (Fig. 4) shows the relationship of the genera Zalutschia Lip., Trissocladius Kieff., Hydrobaenus Fries, Oliveria gen.n., and of the species of Zalutschia. The second scheme (Fig. 5) shows relationships within the genus Hydrobaenus Fries. The position of Paratrissocladius Zavř. as the sister genus of Heterotrissocladius Spärck has been elucidated in a previous paper (Sæther 1975c). The positions of the new genera Baeoctenus and Freemaniella are somewhat uncertain as only the imagines are known. Baeoctenus may possibly form the plesiomorphic sister group of all other genera in Fig. 4 combined, or it may form the sister group of Oliveria and Hydrobaenus combined. Freemaniella may form the sister group of Trissocladius and Zalutschia combined. The genera Zalutschia, Trissocladius, Hydrobaenus, and Oliveria combined cannot, at the moment, be established as a monophyletic unit because most of their similarities consist of symplesiomorphies. The eventual finding of the immatures of Baeoctenus and Freemaniella may clear up the situation and give some idea as to what constitutes the sister group of the treated genera.

The species Hydrobaenus calvescens sp.n., H. tumidistylus sp.n., Zalutschia furcarca sp.n., and Zalutschia sp.A cannot at the moment be included in the scheme of argumentation because the first three are known only from males and the last one only from pupae. The last one, however, is at least in the pupal stage, very closely related to Z. trigonacies sp.n.

Kladogenesis within the treated genera and the genus Zalutschia (Fig. 4) is indicated by the following trends (a = apomorphous, p = plesiomorphous).

1. Vestigial ocelli present only in female (a), present in both sexes (p).

- 2. VR > 1.20 (a), < 1.20 (p).
- 3. LR < 0.69 (a), > 0.69 (p).

4. SDu joined for a short distance (a); not joined, but with common opening (p).

- 5. FS < 100 μ long (a), > 100 μ long (p).
- 6. Imbedded spines present on VI (a), absent (p).
- 7. Anal point reduced (a), distinct (p).
- 8. PSA absent on IV and V (a), present (p).
- 9. Coronal suture always absent in female (a), present in some females (p).
- 10. SDu without bulbs before common opening (a), with (p).

11. PSA absent on VI (a), present (p). - The following trends may also possibly belong here:

a) AR of male < 2.0 (a), AR $\frac{1}{2}$ 2.0 (p);

b) TA of larva longer than PP (a), shorter than PP (p). (The larva of Z.

tornetraeskensis Edw., however, has not been described although Z. korosiensis (Chern.) comb.n., and Z. fontinalis (Chern.) comb.n. also known only from larvae, are probable synonyms.)

12. T IX of male with 10-18, nearly always less than 15 setae (a); with 15-29, nearly always more than 20 setae (p).

13. T I of female with less than 20 setae (a), more than 20 setae (p).

14. AR of larva < 1.5 (a), > 1.5 (p).

15. Csa without mediolateral branch (a), with (p). (Plesiomorphic forms often seem to have a branch connecting Csa with the intergonocoxal connective. Z. *pusa* sp.n. also has a wider Csa than Z. *lingulata* sp.n. and probably represents a plesiomorphous feature.)



FIG. 4. Scheme of argumentation illustrating the relationships of the genera *Zalutschia* Lip., *Trissocladius* Kieff., *Hydrobaenus* Fries, *Oliveria* gen.n., and of the species of *Zalutschia* by means of trends 1-94 (p. 23-27).

Segment VI of pupa with imbedded spines (a), without (p). 16. 17. Ps present on legs (a), absent (p). 18. AR of male < 1 (a), > 1 (p). Male flagellomore 2-6 only wider than long (a), 2-10 or 12 wider than long (p). 19. 20. Anal lobe reduced (a), well developed (p). 21. Squama with less than 10 setae (a), more (p). - Other trends belonging here are: a) WL < 1.7 mm (a), > 1.7 mm (p); b) $BR_2 < 3.0$, $BR_3 < 3.7$ (a); $BR_2 > 3.0$, $BR_3 > 3.7$ (p). 22. Frontal tubercles absent (a), present (p). – This trend can perhaps be interpreted as going in the opposite direction. However, in the Chironominae the presence of frontal tubercles apparently is a plesiomorphous feature, and as the Orthocladiinae is considered here as its plesiomorphic sister group, it is most likely that the presence of frontal tubercles is also plesiomorphous within the Orthocladiinae. In Z. tatrica (Pag.) the frontal tubercles are present only in some specimens, while a parallel reduction has taken place in the others. 23. Anal point small, without microtrichia in apical half (a); prominent, triangular, with microtrichia and setae in apical half (p). - This trend can also be regarded as two separate trends, one concerning the size and another the chaetotaxy. 24. SDu with curve(s) or loop(s) (a), straight (p). 25. Several LG serrated (a), at most 1 or 2 serrated (p). 26. Male flagellomere 2-6 or 2-9 wider than long (a), 2-10 or 2-12 wider than long (p). - Parallel reduction in width takes place in Z. vockerothi sp.n. 27. Bl of larva longer than flagellum (a), shorter (p). 28. S I coarsely plumose (a), finely (p). 29. Flagellomere 2-6 (or 2-8) wider than long (a), 2-9 wider than long (p). VR > 1.23 (a), < 1.23 (p). 30. LR < 0.67 (a), > 0.67 (p). 31. Gs rounded (a), with outer corner (p). 32. Caudolateral corners of segments VII and VIII in pupa with imbedded spines (a), 33. rounded (p). - Parallel development of imbedded spines takes place in the Z. tornetraeskensis group. 34. TA of larva longer than PP (a), shorter (p). - Other trends belonging here are: a) temporals < 9 (a), > 9 (p); b) FS < 200 μ long (a), > 200 μ long (p); c) filamentous L-setae present only on segments VII and VIII of pupa (a), on VI-VIII (p). 35. Coronal suture absent in female (a), usually present (p). 36. PSA present on IV and V (a), on IV-VII (p). 37. Mentum with pale median portion (a), dark (p). - Another trend possibly belonging here is: R_1 without setae (a), usually with (p). 38. Gs with reduced heel or sharp outer corner or rounded (a), Gs with long outer heel (p). 39. SDu with common opening or joined for a small distance (a), SDu opens separately on spermathecal eminence (p). 40. V/M < 1 (a), > 1 (p). 41. SCh usually absent on p_2 of male (a), usually present (p). Anal point more or less parallel-sided (a); broad at base, mostly triangular (p). -42. This trend may possibly go in the opposite direction. Mesonotum with posterior shallow impression (a), without (p). 43. ${\rm R}_1$ and ${\rm R}_{4+5}$ without setae (a), with numerous setae (p). 44. 45. Heel of Gs short (a), long (p). PSA absent (a), present on IV-VI (p). 46.

AR of male < 1 and antennal plume somewhat reduced (a), AR > 1 and antennal 47. plume normal (p). 48. WL < 1.5 mm (a), > 1.5 mm (p). 49. Anal lobe of wing reduced (a); well developed, protruding (p). 50. Squama with less than 15 setae (a), with more than 15 setae (p). 51. FS < 200 μ long (a), > 200 μ long (p). 52. Anterior anepisternum II and preepisternum always without setae (a), often with setae (p). 53. Caudolateral corners of segments VII and VIII of pupa pointed (a), rounded (p). 54. Anal point with apical enlargement (a), without (p). 55. Oral projections of Sa well developed, rounded, TSa straight or concave (a); projections absent or narrow, triangular, TSa convex (p). 56. Ventrolateral lobe of Gp VIII much smaller than dorsomesal lobe (a), as large or larger (p). 57. Csa with several bends or curves (a), at most with one strong bend (p). 58. Frontal "warts" of pupa absent (a); present, although sometimes apparently small (p). 59. Tergites of pupae with elevated patches of spinules (a), tergites flat (p). 60. Segment VIII with 4 or less filamentous L-setae (a), with 5 (p). 61. Chaetulae laterales serrated (a), smooth (p). Mentum with first lateral tooth conspicuously reduced compared to second lateral 62. tooth (a), not conspicuously reduced (p). - Other trends belonging here, but with much parallelism occurring in other genera are: a) wing membrane with very fine punctation of microtrichia (a), with strong punctation (p); b) VR higher than 1.10 (a), usually lower than 1.10 (p); c) SCh on ta₁ of p_3 less than 5 in male, less than 15 in female (a), higher numbers (p); d) Ps present (a), absent (p). 63. Palp 4-segmented in normal specimens (a), 5-segmented (p). - A parallel development takes place in H. Lugubris Fries and H. rufus (Kieff.), but here all palpal segments are reduced and shortened (probably related to a specialized sexual behavior such as copulation on the ground or on a quiet water surface). 64. Ac absent (a), present (p). 65. Cu, distinctly curved (a), very slightly curved apically (p). 66. Apical spine of Gs conspicuously elongated (a), normal (p). Setae absent underneath ventromental plates (a), present (p). 67. 68. AR of male < 0.9 and antennal plume reduced (a), AR > 0.9 and antennal plume normal (p). SCh < 5 on ta, of p_3 of male (a), > 5 (p). 69. 70. LR < 0.70 (a), > 0.70 (p). 71. $BV_2 > 3.8$ (a), < 3.8 (p). Temporals < 10 (a), > 10 (p). 72. 73. VR > 1.06 (a), < 1.06 (p). 74. T IX of male including anal point with less than 40 setae (a), with more than 40 setae (p). 75. Te without microtrichia (a), with (p). 76. Median lobes of antepronotum at most meeting at a point (a), joined along a broad or very narrow suture (p). 77. Only one sensilla campaniformes on Sc (a), more than one (p). PSB absent (a), present (p). - A number of other trends belong here or with trends 78. 55-62. Eventually some trends 55-62 may belong here. Until the female of Trissocladius has been described, and the immatures redescribed, a full evaluation of these trends and of the position of Trissocladius is not possible.

SCh absent on p_2 in both sexes (a), usually present on p_2 in both sexes (p). 79. SDu with distinct bends, curves, or loops (a); nearly straight or with only weak 80. bends or curves (p). Shagreenation reduced on T II-VIII of pupa (a), very extensive (p). 81. 82. Fringe of anal lobe short and reduced (a), setae and fringe long and well developed (p). 83. ACh longitudinally curled, often forming a nearly complete cylinder (a); not longitudinally curled (p). - Trend 67 could also be repeated with parallel reduction of the setae underneath the ventromental plates taking place in Trissocladius. These setae may have been overlooked in previous descriptions of Trissocladius larvae, as they have been in Zalutschia. 84. Pulvilli absent (a); small, but distinct (p). 85. Gs at most with short outer projection, usually angular or rounded (a), with long outer "heel" (p). 86. Sa with well-developed oral projections (a), oral projections absent or very small (p). 87. SCa ovoid or oblong (a), sphaerical (p). 88. SDu with common opening (a), open separately (p). - Belonging here are: a) pubescence of eyes weak (a), eyes strongly pubescent, almost hairy (p); b) mentum with two median teeth (a), with one (p). 89. Clypeus wider than pedicel (a), narrower (p). 90. Ps present on p_1 (a), absent (p). - This trend may possibly go in the opposite direction. 91. T IX of male with heavy black appendages (a), without (p). T IX of female reduced (a), well developed (p). 92. 93. Genital sac of pupa large, swollen, overreaching anal lobe (a); normal (p). 94. Some chaetulae laterales serrated (a), all smooth (p).- Other trends belonging here are: a) AR of male < 1 (a), > 1 (p). - Parallel developments take place in H. lugubrisand H. tumidistylus; b) median lobes of antepronotum separated (a), joined along a suture (p). - Parallel developments take place in some Hydrobaenus; c) shagreenation of pupa reduced on T II-VI (a), relatively extensive (p); d) segment VI of pupa without filamentous L-setae (a), with (p). - Parallel reductions take place in H. johannseni (Subl.), H. pilipodex sp.n., H. spinnatis sp.n., and H. distylus (Kieff.); e) anal lobe with apical spines (a), without (p); f) genital sac of pupa with apical papilla (a), without (p). - Parallel development of papillae takes place in *H. fusistylus* (Goetgh.) and *H. lapponicus* (Brund.); g) seta subdentalis very thin and long (a), broad (p); h) Sa/An < 0.30 (a), > 0.30 (p). - Parallel development takes place at least in H. fusistylus and H. lunzensis (Gow.). The kladogenesis within the genus Hydrobaenus (Fig. 5) is indicated by the following trends: Coronal suture of female absent or at most 80 μ long (a), complete or nearly 1.

complete or at least 70 μ long in all specimens (p). 2. Median lobes of antepronotum not in contact anterior to scutal projection (a), in contact (p).

3. Anal point conspicuously thin (a), of normal width for the genus (p).



FIG. 5. Scheme of argumentation illustrating the relationships within the genus *Hydrobaenus* Fries by means of trends 1-86 (p. 27-31).

T IX of female with less than 35 setae (a), more (p). 4. 5. $BR_3 < 3.7$ (a), > 3.7 (p). Usually 5 flagellomeres in female (a); usually 6 flagellomeres, when only 5 the 6. first partially divided by a constriction (p). T IX of female with less than 43 setae (a), more (p). 7. 8. TH sparsely covered with spinules (a), densely (p). 9. Segment VIII of pupa with 4 L-setae in normal specimens (a), with 5 (p). Fringe of anal lobe not reaching AM (a), reaching AM in some specimens (p). 10. AR of male < 2.0 (a), > 2.0 (p). 11. Squama with less than 25 setae (a), more (p). 12. 13. $BR_1 < 3.4$, $BR_2 < 3.5$, $BR_3 < 4.5$ (a); $BR_1 > 3.4$, $BR_2 > 3.5$, BR_3 usually > 4.5 (p). - Another trend which could be used here is: less than 4 SCh on ta₁ of p₃ in male (a), 4 or more (p). Pha with apical annulations (a), without (p). 14. Anal lobe of pupa rugulose (a), smooth (p). 15. Anal lobe of pupa without median setae (a), with (p). - Although these setae 16. regularly have been overlooked they are present or at least indicated in several plesiomorphic genera including Heterotrissocladius (Sæther 1975c). 17. Filamentous L-setae absent on segment VI of pupa (a), present (p). 18. Fringe of anal lobe not reaching AM (in a few abnormal specimens the fringe can occasionally reach AM) (a), always reaching AM (p). Only flagellomeres 2-7 wider than long (a), 2-12 wider than long (p). 19. AR < 1.6 (a), > 1.6 (p). 20. Pha with sharp preapical bend (a), without (p). 21. 22. Gs without apical microtrichia (a), with (p). 23. Sa/An < 0.4 (a), > 0.4 (p). - Other trends belonging here are: a) antepronotum with less than 11 setae (a), with more than 20 setae (p); b) squama with less than 20 setae (a), with more (p); c) $BR_1 < 3.0$ (a), $BR_1 > 3.0$ (p); d) AR of larva < 2.2 (a), > 2.2 (p). 24. $BR_2 < 2.6$, $BR_3 < 3.5$ (a); $BR_2 > 2.6$, $BR_3 > 3.5$ (p). 25. Pha with faint apical annulations (a), without (p). 26. FS < 100 μ long (a), > 100 μ (p). 27. Usually 5 flagellomeres in female (a), usually 6 (p). 28. Pha < 115 μ long (a), > 115 μ long (p). 29. SCa without microtrichia (a), with (p). - Both trends 27 and 29 are uncertain as the female of *H. hudsoni* sp.n. is unknown. If the female is similar to that of *H*. martini sp.n. the following two trends can be added here: a) T IX of female with less than 50 setae (a), more (p); b) S VIII of female with less than 25 setae (a), more (p). 30. Anterior LG serrated (a), smooth (p). 31. Female with a mean of 21 SCh on ta_1 of p_3 (a), with a mean of 29 SCh (p). 32. Female genitalia reduced (a), normal (p). 33. Csa with a sharp bend (a), evenly rounded anteriorly (p). 34. WL/Pfe < 2.8 (a), > 2.8 (p). 35. AR of male mostly < 2.0 (a), mostly > 2.0 (p). $BR_2 < 3.3$, $BR_3 < 3.9$ (a); $BR_2 > 3.3$, $BR_3 > 3.9$ (p). 36. Pa⁴-13 (a), 12-25 (p). 37. S VII of female with less than 60 setae and S VIII with less than 45 setae (a), 38. more numerous setae on S VII and VIII (p). 39. IV separated from OV at least in size, preoculars absent (a); IV not separated

from OV, not much smaller than IV, preoculars present (p).
40. Scu in single row (a), in more than one row (p). Anal point relatively slender, without setae and microtrichia in apical half (a); 41. strong, with microtrichia and setae in apical half (p). 42. T IX of female strongly divided into two setigerous protrusions (a); large, triangular, undivided (p). 43. First lateral tooth of mentum clearly narrower and lower than median teeth (a); only slightly narrower or of same width as the low median teeth (p). - Other trends belonging here are: a) temporals < 20 (a), > 20 (p); b) preepisternum and/or anepisternum II without or with altogether less than 3 setae (a), with more than 3 setae (p); c) Cu very slightly curved apically (a), straight apically (p). 44. TL/WL > 2.3 (a), < 2.2 (p). 45. Coronal suture of female absent or incomplete, if incomplete less than 50 μ long (a); coronal suture present, more than 50 μ long (p). 46. Te without microtrichia (a), with (p). 47. $LR_1 < 0.55$, $BV_2 > 3.9$, tarsal segments shortened, segments broad (a); $LR_1 > 0.55$, $BV_2 < 3.9$, legs normal (p). Ventrolateral lobe of Gp VIII of same size as dorsomesal lobe (a), ventrolateral 48. lobe larger than dorsomesal lobe (p). 49. Frontal warts of pupa reduced or absent (a), relatively well developed (p). 50. Pupa with 4 filamentous L-setae on VIII (a), with 5 (p). - Other trends belonging here are: a) AR < 1 (a), > 1 (p). - Parallel reduction takes place in H. tumidistylus, which, however, at the moment cannot be placed in the synapomorphic diagram or scheme of argumentation. The reduction of the palp in the H. lugubris group is different from Trissocladius where only the last palpal segment is lost. This reduction in H. Lugubris and H. rufus as well as the above trend and trends 44, 45, and 47 probably all are connected with a general reduction and an adaption to specialized sexual behavior such as copulation on the ground. b) SCa without microtrichia (a), with (p). - A parallel reduction of microtrichia takes place in H. martini and H. virgo sp.n. 51. Frontal warts of pupa absent (a), present although reduced (p). Head capsule of larva < 0.40 mm long, postmentum < 170 μ long (a); head capsule 52. > 0.40 mm long, postmentum > 170 μ long (p). 53. Anal lobe of wing reduced (a), well developed (p). Pc about as high as wide (a), nearly twice as high as wide (p). 54. 55. Female with 4 or 5 flagellomeres (a), with 6 (p). Palp 4-segmented (a), 5-segmented (p). 56. ta_{μ} shorter than ta_5 (a), longer (p). 57. Last flagellomere claw-shaped (a), cylindrical (p). - H. glacialis Lundstr. has 58. not been examined and may actually not even belong in Hydrobaenus. However, if it belongs in the genus its only possible placement seems to be as the sister group of H. lugubris plus H. rufus. 59. S I of larva with less than 15 branches (a), with more (p). 60. Median pair of median lamellae of prementum serrated (a), smooth (p). Accessory tooth of premandible not clearly erect, clearly less than half as long 61. as second apical tooth (a); clear and erect, nearly half as long as second apical tooth (p). - The larva of H. Lapponicus is not known, thus validity of trends 59-61 is somewhat uncertain.

62. Only flagellomeres 2-6 of male wider than long (a), 2-10 or 2-12 wider than long (p). 63. Median lobes of antepronotum at most meeting at a point anterior of scutal projection (a), joined at a broad or narrow suture (p). 64. Anal point reduced (a), distinct (p). 65. Frontal warts of pupa reduced (a), well developed (p). 66. Genital sac of pupa with apical papillae (a), smooth (p). 67. V/M < 1.15 (a), > 1.15 (p). 68. Sa/An < 0.35 (a), > 0.35 (p). - Other trends belonging here are: a) SCh on ta_1 of p_3 usually less than 7 in male and always less than 15 in female (a), SCh on ta₁ of p_3 usually more than 7 in male and always more than 15 in female (p). -Parallel reduction takes place in H. pilipodex and H. tumidistylus; b) TH sparsely covered with spinules (a), densely (p); c) fringe of anal lobe not reaching AM (a), reaching AM (p). - Parallel reduction takes place in H. johannseni, H. pilipodex, H. lugubris and, to a lesser extent, in H. distylus, H. spinnatis, and H. rufus. 69. AR of male < 1.20 (a), > 1.20 (p). 70. Anal point indistinct (a), distinct although reduced (p). 71. Frontal plate of pupa rugulose (a), smooth (p). 72. Gs at most with rounded outer corner (a), Gs with sharply pointed outer angle or short projection (p). 73. Filamentous L-setae absent on IV and V (a), present on V and occasionally on IV (p). 74. Te without microtrichia (a), with (p). Median lobes of antepronotum separated or at most meeting at a point anterior to 75. scutal projection (a), lobes joined along a broad to very narrow suture (p). Frontal warts of pupa reduced (a), well developed (p). 76. Segment VIII of pupa with 4 filamentous L-setae (a), with 5 (p). 77. 78. TA swollen, large (a); normal, triangular (p). Sa/An < 0.34 (a), > 0.35 (p). 79. T IX including anal point with less than 10 setae (a), more (p). 80. Gs with not very pronounced outer corner (a), with pronounced outer corner (p). 81. Anal point relatively narrow (a), broader (p). 82. 83. Pha strongly bent apically (a), straight apically (p). Male AR < 1.3 (a), > 1.3 (p). 84. Squama with 19 or less setae (a), with 19 or more setae (p). 85. $BV_2 > 3.7$ (a), < 3.7 (p). 86.

From the schemes of argumentation and the above trends it is quite clear that the genera as used here are all good monophyletic units based on partly constructive and nonambiguous trends. Within the genus *Zalutschia* and the genus *Hydrobaenus*, however, the relationships are less certain.

Although Z. tornetraeskensis group (Z. lingulata, Z. pusa, Z. tornetraeskensis, and Z. trigonacies) and Z. mucronata group (Z. obsepta (Webb), Z. megastylus (Shil.), and Z. mucronata (Brund.)) are clearly monophyletic, the position of Z. tatrica is doubtful. The imago and particularly the larva indicate close relationship with Z. zalutschicola Lip. (trends 22-28, p.25), whereas the pupa definitely resembles Z. vockerothi and Z. tornetraeskensis group more closely. Trends 33, 34, 34b, and 34c (p.25) would suggest Z. tatrica as the plesiomorphic sister group of Z. vockerothi plus Z. tornetraeskensis group, which may be the case. However, many plesiomorphous features are common in Z. zalutschicola and Z. tatrica, and with the apomorphous

31

ł

characters evenly split between suggesting the above, and suggesting Z. zalutschicola as the sister group of Z. tatrica and Z. vockerothi plus Z. tornetraeskensis group as their sister group, the symplesiomorphies have been taken into consideration.

Hydrobaenus can be divided into four well-defined monophyletic units - H. conformis group, H. lapponicus group, H. lugubris group, and H. pilipes group: the latter can be divided into H. pilipes subgroup and H. distylus subgroup. Although H. distylus subgroup is secured by trends 17 and 18 (p. 29), there appears to be no synapomorphous trend for H. pilipes subgroup. Thus, particularly the positions of H. hudsoni and H. martini are uncertain.

Although this presentation of phylogenetic relationships between the different groups of Hydrobaenus is well supported by several trends (Fig. 5) a number of parallelisms can be found. If trends 74 (= 46) and 77 (= 50) (the reduction of microtrichia on Te and the reduction of filamentous L-setae on segment VIII of pupa) were regarded as less subject to parallelism, they would suggest that H. conformis and H. lugubris groups combined constitute the sister group of H. lapponicus and H. pilipes groups combined. Similarly trends 75 (= 63) and 79 (= 68) (the reduction of the suture joining the median lobes of the antepronotum and the lowering of the Sa/An ratio) would, if not regarded as parallelism, suggest H. conformis and H. lapponicus groups as the sister group of H. lugubris plus H. pilipes groups. Yet another interpretation is suggested by trend 76 (= 65 = 49) (the reduction of the frontal warts in the pupa), namely that H. conformis, H. Lapponicus, and H. Lugubris groups combined are the sister group of H. pilipes group. However, from the scheme of argumentation (Fig. 5) trends 75, 77, and 79 are subject to parallelisms within the genus no matter how the relationships are interpreted; there are parallelisms also within H. pilipes group. Furthermore, trends 74 and 76 are subject to parallelisms within the other genera treated. Trends 59-61 (p. 30) show H. lugubris plus H. pilipes groups as a monophyletic unit, whereas trends 72-73 (p. 31) secure H. lapponicus, H. lugubris, and H. pilipes groups combined as a monophyletic group. Trends 74-79 indicate that H. conformis group is the sister group of the other groups combined, although only trend 78 does not appear to be subject to parallelism.

No attempt is made here to classify the genera Oliveria, Hydrobaenus, Trissocladius, and Zalutschia combined as one monophyletic group. Although this may be the case, the morphological similarities are primarily based on symplesiomorphies. The new genus Baeoctenus is evidently closely related to these genera, but primarily to Hydrobaenus. The new genus Freemaniella appears to be related to Zalutschia, but it may also be related to genera such as Chaetocladius Kieff. and Bryophaenocladius Thien. Hydrobaenus appears to be more closely related to genera such as Diplocladius Kieff. and Brillia Kieff., whereas Zalutschia in many respects shows similarities to Chaetocladius Kieff. and related genera (see pupa described on p. 269). The genus Paratrissocladius Zavř. has already been shown to be the sister group of Parametriocnemus Goetgh. and Paraphaenocladius Thien. (Sæther 1975c). These genera combined may eventually be shown to form the sister group of the genera treated in the above schemes of argumentation.

Key to Some Genera of Orthocladiinae

The genera treated here show many similarities with several other genera of Orthocladiinae; to facilitate their separation, determination keys to some males, females, pupae, and larvae are given below. Because some genera are extracted from the subfamily and represented in a key should not, however, be taken as an indication of phylogenetic relationships. The genera in the pupal and larval keys primarily represent paraphyletic groups with the similarities based on symplesiomorphies; those in the keys to males and females in part represent polyphyletic groups with the similarities based on convergence.

Key to males of some genera of Orthocladiinae

1	Eyes naked; no setae on wing membrane; squama with several setae; pulvilli absent or vestigial (in <i>Oliveria</i> gen.n.); Gs with apical spine; at least rudiments of an anal point present; either with more than 2 Ac, or with heavy punctation of microtrichia, or without a distinct tibial comb, or with anterior margin of TSa straight or concave 2				
	Without the above combination of characters not keyed				
2	Ac long to moderately long, starting in front at scutal projection 3				
	Ac short or absent, usually starting some distance from scutal projection				
3	Wing membrane with heavy punctation of microtrichia 4				
	Wing membrane without, or with very fine punctation 5				
4	Anal point conical, with short reduced setae on anal point proper; R_{4+5} ends distal of M_{3+4} ; Ps absent				
	Anal point flat, transparent, usually broad, without setae, but with strong setae on T IX; R_{4+5} ends proximal, above or distad to M_{3+4} ; Ps absent or present Bryophaenocladius Thien. (p. 271)				

5 Ac long and decumbent; R_{4+5} ends proximal of M_{3+4} ; anal point strongly sclerotized, without setae freemaniella gen.n. (p.250) Ac shorter; R_{4+5} ends above or distad of M_{3+4} ; anal point with setae Orthocladius v.d. Wulp (Brundin 1956a, p. 93) 6 Wing membrane with heavy punctation of microtrichia; Ac absent, or if present starting in front at scutal projection, and tibial spurs with an apical row of stronger denticles7 Wing membrane without, with fine, or with moderately heavy punctation; when punctation moderately heavy Ac starts some distance from scutal projection, and tibial spurs without stronger apical denticles 10 7 Ac present; tibial spurs with an apical row of stronger denticles; C not or barely extended Chaetocladius Kieff., pro parte (Brundin 1956a, p. 121) Ac absent; tibial spurs without apical row of stronger denticles; 8 Gs with outer corner or short projection; palp 4 or 5 segmented; tibial comb absent or vestigial; anal point sharply pointed Trissocladius Kieff. (p.163) Gs without outer corner or projection; palp 5-segmented; tibial comb 9 Antepronotum normally developed; anal point without setae or microtrichia Paralimnophyes Brund. (Brundin 1956a, p. 129) Antepronotum strongly developed; preepisternum with setae; anal point when present with setae and microtrichia Limnophyes (Eat.) (Brundin 1947, p. 38; Saether 1975d) 10 Hind tibial comb absent or reduced to 1 spine; Ac present or absent 11 Hind tibial comb normal; Ac present (always?) 12 11 Scutum with a large, oval membranous area with weak Ac; spurs of hind tibia of nearly same size; less than 30 sensilla campaniformes on B Abiskomyia Edw.

12

- 14 Anal point with several weak and reduced setae; R₄₊₅ ends distad to M₃₊₄ Heterotrissocladius Spärck, pro parte (Sæther 1975c)

Anal point with a few normal setae: $R_{\mu+5}$ usually ends above or proximal to M_{3+4} Euklefferiella Thien., pro parte (p.266)

Oral projections of TSa well developed; anal point usually without setae and microtrichia (except *H. lugubris* group, with reduced palp, antenna, and legs); no projections on T IX *Hydrobaenus* Fries (p. 54)

Key to females of some genera of Orthocladiinae

Without the above combination of characters not keyed

2 Ac long to moderately long, starting in front at scutal projection 3 Ac short or absent, usually starting some distance from scutal projection 6 3 Wing membrane with heavy punctation of microtrichia 4 Wing membrane without, or with very fine punctation 5 4 Squama fully fringed; R_{4+5} ends distad of M_{3+4} ; ventrolateral lobe of Gp VIII well developed, about as large as dorsomesal lobe; apodeme lobe well sclerotized, but partly covered by lobes of Gp VIII; T IX strongly divided into two setigerous protrusions Paratrissocladius Zavř. (p. 253) Squama with reduced number of setae; R_{4+5} ends proximal, above, or distad to $M_{3,\mu}$; genitalia not as above Bryophaenocladius Thien. (p.271) 5 Ac shorter than above; R_{4+5} ends above or distad of M_{3+4} ; T IX partly or completely divided; ventrolateral and dorsomesal lobes of Gp VIII 6 Wing membrane with heavy punctation of microtrichia; Ac absent, or if present starting in front at scutal projection, and tibial spurs with an apical row of stronger denticles 7 Wing membrane without, with fine, or with moderately heavy punctation; when punctation moderately heavy Ac starts some distance from scutal projection, and tibial spurs without stronger apical denticles 10 7 Ac present; tibial spurs with an apical row of stronger denticles; C not or barely extended Chaetocladius Kieff. pro parte Ac absent; tibial spurs without apical row of stronger denticles; C 8 Tibial comb absent or vestigial; palp 4- or 5-segmented Trissocladius Kieff. (p.163) Tibial comb present; palp 5-segmented 9

Antepronotum normally developed; preepisternum probably without setae Paralimnophyes Brund.

9

Antepronotum strongly developed; preepisternum with setae ... Limnophyes Eat. (Sæther 1975d)

10 Hind tibial comb reduced to 1 spine; Ac absent; more than 40 sensilla campaniformes on B; T IX large, triangular, very faintly divided; dorsomesal and ventrolateral lobes of Gp VIII about equal in size¹ Baeoctenus gen.n. (p. 41)

Hind tibial comb normal; Ac present (always?); less than 30 sensilla campaniformes on B; when T IX large and triangular, palp, antenna, and legs reduced; dorsomesal and ventrolateral lobes of Gp VIII about equal in size or ventrolateral lobe smaller or larger than dorsomesal lobe 11

T IX either large and triangular or completely divided into 2 setigerous protrusions; ventrolateral lobe of Gp VIII as large as or larger than dorsomesal lobe; Csa at most with 1 sharp curve or bend 12

Key to pupae of some genera of Orthocladiinae

¹ In *Abiskomyia* Edw. (Edwards 1937a: 140; Brundin 1956a: 67) only the ventrolateral lobe of Gp VIII is well developed. The genus, which otherwise would have keyed here, thus is excluded from the key.

2	Anal lobe with about 18 pairs of long lateral setae and 3 stronger setae (AM), 1 proximal, the 2 others on small sclerotized tubercles on the apical fourth of the lobe (Thienemann 1941, fig. 37); PSB present on II and III (Thienemann 1941, fig. 36) Mesocricotopus Brund.
	Anal lobes with more than 18 pairs of long setae or with short setae, with normal AM; PSB absent or present only on II 3
3	L-setae of V-VIII as 1:1:1:5 Plecopteracoluthus Steffan (Steffan 1965)
	V-VIII with at least 3 L-setae 4
4	Caudal margin of S VIII conspicuous, with spines in the male, with 2 sharp, triangular projections with imbedded spines in the female Heterotrissocladius Spärck (Sæther 1975c)
	S VIII without spines or with a single, spine-covered lobe in the male, S VIII of female straight or bilobed, bare
5	TH usually bifid at apex (Spärck 1922, fig. 4); S VIII of male with a single spine-covered lobe, of female bilobed and bare (Thienemann 1944, fig. 58) Brillia Kieff.
	TH never bifid; S VIII not as in <i>Brillia</i> 6
6	L ₁ (and L ₃ when present) on II-VI short, but strong and spinelike; PSB absent
	${\tt L}_1$ and ${\tt L}_3$ on II-VI longer, never spinelike; PSB present or absent 7
7	Anal lobes with a fringe of short setae, about one third as long as width of segment VIII, or shorter, or at least several setae reduced; PSB well developed; PSA present on IV-VII and usually also on VIII
	Anal lobes with long setae; PSB and PSA present or absent 9
8	Anal lobe with apical spines; genital sheaths of male conspicuously long and wide, far overreaching the apex of anal lobe Oliveria gen.n. (p. 48)
	Anal lobe at most with apical rugulosity; genital sheaths of male short, barely reaching tip of anal lobe <i>Hydrobaenus</i> Fries comb.n. (p. 58)

9

T without elevated patches of spinules; caudolateral corners of segments rounded; PSB present or absent; PSA at least sometimes present on IV-VIII; VIII with 5 filamentous L-setae 11

rugulose Paratrissocladius Zavř. (p.254)

Key to larvae of some genera of Orthocladiinae

L	Antenna well developed; S I branched or plumose, not palmate; premandible with 1 or 2 apical teeth; apical teeth of mandible shorter than the combined width of the 3 first lateral teeth; mentum with 10-15 teeth; no conspicuously long setae or tufts of setae on abdomen or on Pc; Pc well developed
	Without the above combination of characters not keyed
2	Antenna 7-segmented, but with segment 7 vestigial and hairlike; third antennal segment much smaller than fourth 4
	Antenna at most 6-segmented with segment 6 vestigial; third antennal segment as long as or longer than fourth
3	Mentum with 13-15 teeth; ventromental plates conspicuous, without or with weak setae underneath; no serrated or plumose scales between S I and epipharyngeal area
	Without the above combination of characters not keyed

L

Mentum with 4 pairs of lateral teeth in normal specimens and narrow ventromental plates; premandible simple; pecten epipharyngis consists of 3 simple, sclerotized spines; Pc with caudally directed preapical tooth Paratrissocladius Zavř. (p.258)

8 Mentum with 1 wide median tooth, not strongly sclerotized; shorter chaetulae laterales conspicuously serrated; S I finely plumose with more than 30 branches; seta subdentalis thin² Oliveria gen.n. (p. 52)

 $^{^{2}}$ An undetermined larva from Bathurst Island, N.W.T., has a slightly trifid median tooth, but it is otherwise most similar to *Hydrobaenus*.

Baeoctenus gen.n.

Type species: Baeoctenus bicolor sp.n. by original designation.

IMAGO

Diagnosis - Eyes (Fig. 6D, 8B) naked, slightly elongated dorsally. Flagellomeres 13 in male, 6 in female; antennal groove in male reaching flagellomere 4; flagellomeres 1-3 with SCh. Temporal setae not divided into groups, few Po. Cornua of cibarial pump in male short, blunt; in female long. Te wide at PTP. Palp 5-segmented, last segment as long as third segment, with 2 SCh at apical sensillum coeloconicum. Antepronotum broad, well developed; median lobes not in contact anterior of scutal projection, widely gaping; antepronotals numerous (Fig. 6C). Dc normal, Ac absent, Pa numerous. Scu in single transverse row. Wing membrane void of setae, with fine punctation of microtrichia. Anal lobe strongly developed, protruding (Fig. 6E). C slightly extended; R_{4+5} ends distal of M_{3+4} ; An ends distal to FCu; Cu₁ straight; R1 and R415 without setae in male. Squama fully fringed. Sensilla campaniformis numerous, about 29-32 at base of B, 0-4 below setae of B, about 12 or 13 at apex of B, 5-7 in basal half of Sc, 1 at base of R_1 , and 1 on RM or FR. Pulvilli absent. Comb reduced to 1 heavy spiniform seta. Ps present on ta_1 of p_2 and p_3 , on ta_2 of p_2 , and usually on ta₂ of p_3 , often numerous. SCh absent on p_2 in male, present or absent on p_2 in female, numerous on proximal half of p_3 in male, very numerous on p_3 in female. Setae of tergites scattered without any obvious pattern. Setae of sternites in median group and lateral rows. Anal point not set off from T IX, broad, bluntly rounded at apex, with microtrichia also at apex and with numerous setae (Fig. 7). Pha well developed, sclerotized for its full length. Aedeagal lobe circular, sclerotized (Fig. 7, 51A). TSa normal. Spines of penis cavity absent or vestigial. Gc with basal lobe. Gs without outer corner, without crista dorsalis, apical spine long. Gc of female, normal, with several setae. T IX of female (Fig. 8H) very large, triangular with numerous setae in two groups. Ventrolateral and dorsomesal lobe of Gp VIII about equally long (Fig. 8G); apodeme lobe well developed, but only weakly sclerotized. Labia well developed. Csa wide, strongly sclerotized. SCa ovoid, sclerotized in apical half, and with distinct microtrichia. SDu nearly straight, with common opening. Cerci well developed.

Ecology and Distribution

This monotypical genus is known only from Lake Winnipeg, Man.



FIG. 6. *Baeoctenus bicolor* gen.n. sp.n., male. A) T I-IV; B) cibarial pump, Te and St; C) thorax; D) apex of head; E) wing; F) apex of hind tibia.

Baeoctenus bicolor sp.n.

(Fig. 6; 7; 8; 51A)

MALE IMAGO (n = 2)

TL 7.71-7.75 mm. WL 3.83-3.87 mm. TL/WL 1.97-1.99. WL/Pfe 2.84. Thorax brown to brownish black. Scutum with median and lateral vittae, humeral and prealar area light. Ventral part of anepisternum II and dorsal parts of preepisternum light. Legs bright brown with dark coxae and trochanters, extreme proximal and distal parts of fe, ti, and ta_1-ta_4 and whole of ta_5 dark (Fig. 8E). Abdomen brown with blackish markings as in Fig. 6A. Hypopygium with similar markings on T IX (Fig. 7).

Antenna - Pedicel L/W (microns): 124-150/221-231. Flagellomeres L/W (microns): 84-90/66-78, 36-42/63-64, 36-40/63-64, 36/63-64, 36-38/62, 37-38/61-62, 36-37/57-60, 38-40/54-55, 38/54, 37-40/52-53, 38-40/51-52, 39-40/52-53, 1073-1122/51-53. AR 2.22-2.26.

Head - Temporal setae (Fig. 6D) 18, Po 2, OV 11, IV 5. Clypeus with 18 setae. Cibarial pump, Te, and St as in Fig. 6B. Te 288-290 μ long, 72-73 μ wide, width anterior of PTP 27-28 μ , distance from apex to PTP 50 μ . St 215-226 μ long, 100-108 μ wide. Ocelli present in one specimen, 8 μ apart. Palp lengths (microns): 62-64, 80-88, 146-155, 120-122, 144-146.

Thorax (Fig. 6C) - Ap 21. Dc 10-13, Ac absent, Pa 15. Scu 6 or 7.

Wing (Fig. 6E) - Anal lobe well developed, protruding. C-extension ll6-ll8 μ . VR l.17-1.19. B with 2, R with 8 setae. Squama with 59-62 setae.

Legs (Fig. 8E) - Sp₁ 102-103 μ , Sp₂ 56-58 μ and 35 μ , Sp₃ 117-124 μ and 30-40 μ . Wti₁ 86-87 μ , Wti₂ 99-100 μ , Wti₃ 102-103 μ . Sp/Wti₁ 1.18-1.19. Comb (Fig. 6F) reduced to 1 heavy spiniform seta 51-52 μ long. Ps 36-54 μ long; 3 on ta₁ of p₂, 2 on ta₂ of p₂, 4 on ta₁ of p₃, 2 on ta₂ of p₃. SCh absent on p₂, 19 or 20 between basal 1/6 and basal half on p₃. Lengths (microns) and proportions of legs:

	fe	ti	tal	ta ₂	ta ₃	ta ₄
P_1	1349-1362	1742-1748	1300-1306	711-736	527	301-307
P2	1410-1423	1693-1717	883-895	485-497	368	251
P3	1595-1607	2049	1165-1178	644~650	478-485	276-282
	ta ₅	LR	BV	SV	BR	
Pl	178	0.74	2.53-2.56	2.38	2.40	
P2	178-184	0.51-0.53	3.09-3.12	3.47-3.56	2.59-2.88	
рз	178-184	0.57	3.01-3.06	3.09-3.14	2.91-3.03	

Hypopygium (Fig. 7, 51A) - T IX including anal point with 61-63 setae. Laterosternite IX with 14-16 setae. Pha 175-180 μ long. TSa 140-142 μ long. Gc 540-570 μ long. Gs 198-206 μ long. HR 2.72-2.76; HV 3.73-3.82.

FEMALE IMAGO (n = 2)

TL 7.00-7.69 mm. WL 4.60-4.73 mm. TL/WL 1.52-1.63. WL/Pfe 3.36-3.38. Thorax brown to brownish black. Coloration of thorax and abdomen about as in male. Legs dark brown with slightly lighter trochanter, and extreme proximal part of femur pale brown (Fig. 8F).

Antenna - Pedicel L/W (microns): 84/122-136. Flagellomeres L/W (microns): 100-110/65-70, 44-46/51-52, 70-76/50-51, 80-82/38-40, 76-80/32-36, 203-250/27-30. AR 0.53. Distal flagellomere as in Fig. 8A.

Head - Temporal setae (Fig. 8B) 16-18, Po 2-4, OV 8 or 9,IV 5 or 6. Clypeus (Fig. 8C) with 15-19 setae. Cibarial pump, Te, and St as in Fig. 8D. Te 240-296 μ long, 60-61 μ wide, width anterior of PTP 28-32 μ , distance from apex to PTP 44-53 μ . St 215-258 μ long, 86-88 μ wide. One ocellus 34 μ from coronal suture. Coronal suture nearly complete, but divided into 2 portions 220-250 μ and 60 μ long. Palp lengths (microns): 68, 80-90, 144-146, 108-118, 140-148.

Thorax - Ap 23-25. Dc 16 or 17, Ac absent, Pa 19-24. Scu 6 or 7.

Wing - C-extension 170-200 μ long. VR 1.24-1.25. B with 2 or 3, R with 11-17, R1 with 5-8, R_{4+5} with 3 setae. Squama with 84-98 setae.

Legs (Fig. 8F) - Sp₁ 104-109 μ , Sp₂ 64-72 μ and 45-50 μ , Sp₃ 124 μ and 42-48 μ . Wti₁ 102 μ , Wti₂ 110-114 μ , Wti₃ 117-128 μ . Sp₁/Wti₁ 1.02-1.07. Comb reduced to 1 or 2 heavy spiniform setae 48-59 μ long. Ps 40-59 μ long; 2-5 on ta₁ of p₂, 1 on ta₂ of p₂, 2 on ta₁ of p₃,0 orlon ta₂ of p₃. SCh 0-2 on p₂, 42-45 on p₃. Lengths (microns) and proportions of legs:

	ïe	ti	tal	ta ₂	ta ₃	ta4
p_1	1360-1409	1951-1981	1321-1340	729-749	522-532	315
P2	1478-1597	1843-1902	907-946	493-503	365-394	256-266
P3	1675-1715	2188-2208	1212-1222	650-660	493-503	276-286
	ta ₅	LR	BV	sv	BR	
p_1	187-197	0.68	2.63-2.65	2.51-2.53	1,79	
P2	187-197	0.49-0.50	3.15-3.37	3.66-3.70	1.47-1.75	
P3	187-197	0.55-0.56	3.12-3.17	3.16-3.23	1.76-1.79	

Genitalia (Fig. 8G, H) - Gc with 26-30 setae. T IX with 62-70 setae. Cercus 290-380 μ long. SCa 120 μ long, 94-95 μ wide, dark sclerotized area 60 μ long, with strong microtrichia.



FIG. 7. Baeoctenus bicolor gen.n. sp.n., male hypopygium.



FIG. 8. Baeoctenus bicolor gen.n. sp.n., (A-D) female: A) tip of antenna; B) apex of head; C) clypeus; D) cibarial pump, LL, tormae, Te and St (cross-hatched). E) p_2 of male. (F-H) female: F) p_1 ; G) genitalia, ventral view; H) genitalia, dorsal view.

- --

Material Examined

Holotype: male, light trap, Gull Harbour, Lake Winnipeg, Man., 16/7/69, S. S. Chang (CNC No. 13476). Allotype: female, same data as for holotype (CNC). Paratypes: male, female, same data as for holotype (FWI).

Ecology and Distribution

The species is only known from Gull Harbour at the northern end of Hecla Island in Lake Winnipeg, Man.

Oliveria gen.n.

Type species: Trissocladius tricornis Oliver (1976) by original designation.

IMAGO

Diagnosis - Eyes strongly pubescent, but microtrichia not as long as the height of an ommatid (hence "naked" in the usual terminology), with a broad dorsal elongation. 13 flagellomeres in male, 6 in female; antennal groove in male reaching flagellomere 3; flagellomeres 2 or 3 with SCh. Temporal setae divided in Po, OV, and IV, IV shorter than OV. Te narrow, with a few microtrichia in anterior half (Fig. 9A, B). Palp 5-segmented, last segment about 12 times as long as third segment, with 2 SCh at apical sensillum coeloconicum. Antepronotum well developed, median lobes not in contact anterior of scutal projection. Dc normal; Ac a few short, but strong in center of scutum. Scu in double to triple transverse row. Wing membrane void of setae, with relatively strong punctation of microtrichia. Anal lobe well developed (Fig. 9C). C barely extended; R_{4+5} ends slightly distad to M_{3+4} ; An ends distad to FCu; Cu₁ straight; R_{4+5} with a few setae also in male. Squama fully fringed. Sensilla campaniformes about 10-12 at base of B, 3 or 4 below setae of R_1 , about 8-10 at apex of R, 3 or 4 on Sc, 1 on RM or FR, and 1 at base of R_1 . Pulvilli present, but reduced. Comb present. Ps weak, but present on ta, and ta, of all legs, and occasionally on ta, of all legs and on ta, of p2. SCh present only in proximal half of ta_1 of p_3 in both sexes (about 1 or 2 in male, about 7 in female). Setae of tergites scattered without any obvious pattern. Setae of sternites in median group and lateral rows. Anal point broad at apex, with setae and microtrichia (Fig. 9D). Pha well developed. Oral projections of Sa reduced or absent (Fig. 9D, 51B). Spines of penis cavity short, but conspicuously strong (Fig. 51B). Gc with basal lobe. Gs (Fig. 9D) with apical elongation, without crista dorsalis. T IX of male with strong and black sclerotized appendages (Fig. 9D-G). T IX of female divided with the 2 setigerous protrusions much reduced (Fig. 10B). Ventrolateral lobe of Gp VIII (Fig. 10F) much larger than dorsomesal lobe; apodeme lobe (Fig. 10G) relatively large, but only weakly sclerotized. Labia (L in Fig. 10E) normal. Csa (Fig. 10E) smooth and evenly rounded. SCa (Fig. 10A, C) round, with microtrichia. SDu curved, with separate openings on spermathecal eminence. Cerci normal.

Pupa

Diagnosis - FS present, not on tubercles, frontal plate (Fig. 11A) with "warts." TH (Fig. 11B) long, with spinules. Three PcS in a single row. Thorax and wing sheath smooth. T I without, T II-VI (Fig. 11C) with weak and not extensive shagreenation. PSB well developed. PSA present on S IV-VIII. Segment II-VII with 4 L-setae, 2 on VI



FIG. 9. Oliveria tricornis (Ol.) gen.n. comb.n. A) cibarial pump, Te and St of male; B) same of female. (C-G) male: C) wing; D) hypopygium of specimen from Greenland; (E-G) spines of T IX and anal point on specimens from E) Hazen Lake, Ellesmere Island, F) Char Lake, Cornwallis Island, and from G) Melville Island.



FIG. 10. *Oliveria tricornis* (01.) gen.n. comb.n., female genitalia. A) ventral view; B) dorsal view; C) lateral view; D) Gp IX and Csa lateral view with variation of Csa to the right; E) Gp IX, Csa, spermathecal eminence, and labia, ventral view; F) Gp VIII, ventral view; G) apodeme lobe, ventral view.



FIG 11. *Oliveria tricornis* (Ol.) gen.n. comb.n., pupa. A) frontal plate; B) TH, different views; C) abdomen.

and all on VII filamentous; segment VIII with 5 filamentous L-setae. Genital sac of male (Fig. 11C) large, swollen, longer than anal lobe, and with apical papilla. Fringe of anal lobe reduced. Three equally long AM. Anal lobe with apical short spines (Fig. 11C).

LARVA

Diagnosis - Antenna (Fig. 12G) 6-segmented, segments consecutively smaller, segment 6 vestigial; LO distinct; Bl shorter than segments 2-5 combined; RO in basal fourth. S I (Fig. 12A) finely plumose, S II and S III simple. Labral lamella (Fig. 12A) simple, triangular. Pecten epipharyngis (Fig. 12A) consists of three simple, sclerotized, smooth spines. Two pairs of apically split chaetulae basales; 8 pairs of chaetulae laterales, 2 or 3 serrated. Premandible (Fig. 12H) with 2 apical and 1 distinct accessory tooth. Mandible (Fig. 12F) with seta interna, and thin and long seta subdentalis. Maxilla (Fig. 12D) with longitudinally curled ACh which, however, do not form more than half a cylinder; LG simple or at most 1 LG serrated. Mentum (Fig. 12E) with 1 median and 6 lateral teeth, median portion slightly lighter; ventromental plates relatively well developed without setae underneath. Parapods well developed. Pc (Fig. 12I) well developed, sclerotized caudally, with 7 apical and 2 lateral setae. Sa about 1/3 of An. TA shorter than PP.

Ecology and Distribution

The only species known from this genus is a typical Arctic ultraoligotrophic lake dweller (Oliver 1976; Sæther 1975e as gen.n. near *Hydrobaenus*). It was known previously from Spitsbergen, Greenland, Ellesmere Island, Baffin Island, Melville Island, Ellef Ringnes Island, and Cornwallis Island (Oliver 1976). To this an interesting new record from Thingplats, Iceland (G. Bretscko 21/8/70), and records from Kuhulu Lake, Baffin Island, N.W.T. (B. Fallis 23/8/74), and Stanwell-Fletcher Lake, Somerset Island, N.W.T. (A. P. Wiens 7/6/75) can be added.

Oliveria tricomis (Oliver) comb.n.

(Fig. 9; 10; 11; 12; 51B)

Trissocladius tricornis Oliver 1976: 1055 For a description of the species see Oliver (1976).



FIG. 12. Oliveria tricornis (01.) gen.n. comb.n., larva. A) labrum and palatum; B) apex of premento-hypopharyngeal complex; C) maxillary palp, ventral view; D) maxilla, dorsal view; E) mentum; F) mandible; G) antenna; H) premandible; I) posterior abdominal segments.

Hydrobaenus Fries 1830

Hydrobaenus Fries 1830: 176, 1831: 1350. Chironomus Meigen 1830: 254, pro parte. Psilocerus Ruthe 1831: 1207. Hydrobaenus Fries Schiner 1864: 595. Orthocladius subgen. Orthocladius Kieffer 1906: 26, pro parte, nec v.d. Wulp 1874. Trissocladius. Goetghebuer 1913: 154, 1914: 19, pro parte. Dactylocladius Kieffer 1915: 85, pro parte, nec Kieffer 1906. Trissocladius. Thienemann 1935: 216, pro parte. Diplocladius Thienemann 1937: 362, pro parte, nec Kieffer in Kieffer and Thienemann 1908. Hydrobaenus. Edwards 1940: 154, pro parte. Trissocladius subgen. Eutrissocladius Goetghebuer, 1940-50: 148. Hydrobaenus. Brundin 1956a: 72. Trissocladius. Brundin 1956a: 73, pro parte.

Type species: Hydrobaenus lugubris Fries, 1830: 176, 1831: 1350.

IMAGO

Diagnosis - Eyes naked, more or less elongated dorsally. 8-13 flagellomeres in male, 3-6 (usually 5 or 6) in female; antennal groove in male reaching flagellomere 4; flagellomeres 2 or 3 or 1-3 in male with SCh. Temporal setae usually clearly separated into IV, OV, and Po at least by size; IV often conspicuously reduced in size. Coronal suture usually nearly complete in female. Palp 4- or 5-segmented; when 4-segmented, all segments reduced; 1-3 SCh at apical sensillum coeloconicum of third segment. Antepronotum normally to well developed; median lobes joined along a more or less broad suture with an anterior notch, in broad contact, in contact at a point only, or occasionally not in contact. Dc normal, few to numerous; Ac reduced in size, few to numerous, starting some distance posterior to scutal projection; Pa normal, sometimes numerous. Scu mostly in single transverse row. Wing membrane void of setae, with distinct punctation of microtrichia. Anal lobe usually well developed and often strongly protruding, occasionally reduced. C not, to moderately extended; $R_{4,2}$ ends distad of M_{3+4} ; An ends distad to FCu; Cu₁ straight to slightly curved apically; R₁ and R₄₊₅ without or with a few setae in male. Squama fringed. Sensilla campaniformes 10-14 at base of B, 3 or 4 below setae of B, 9-12 at apex of B, 2 or 3 at base of Sc, 1 at base of R_1 , and 1 on or near FR. Pulvilli absent. Ps present at apex of ta₁ of p_2 and p_3 , and often on ta₂ of p_2 and p_3 . SCh absent on p_2 of males, always present on p_3 of male, usually absent on p_2 of female, always present and often relatively



FIG. 13. Hydrobaenus spp., apodemes of male hypopygium. A) H. lugubris Fries; B-C)
H. pilipes (Mall.); D) H. scapulapilosus sp.n.; E) H. johannseni (Subl.) comb.n.;
F) H. pilipodex sp.n.; G) H. hudsoni sp.n.; H) H. spinnatis sp.n.; I) H. calvescens
sp.n.; J) H. lapponicus (Brund.) comb.n.; K) H. fusistylus (Goetgh.) comb.n.; L) H.
martini sp.n.; M) H. conformis conformis (Holmgr.) comb.n.; N) H. conformis
labradorensis subsp.n.; O) H. laticaudus sp.n.



FIG. 14. Hydrobaenus spp., female genitalia. (A-H) Gp IX, labia, and Csa (broken line indicates posterior margin of S VIII): A) H. lugubris Fries; B) H. johannseni (Subl.) comb.n.; C) H. spinnatis sp.n.; D-E) H. pilipes (Mall.); F) H. conformis conformis (Holmgr.) comb.n.; G) H. fusistylus (Goetgh.) comb.n.; H) H. scapulapilosus sp.n. (I-O) Gp VIII: I) H. lugubris Fries; J) H. pilipes (Mall.); K) H. spinnatis sp.n.; L) H. conformis (Holmgr.) comb.n.; O) H. scapulapilosus (Goetgh.) comb.n.; N) H. johannseni (Subl.) comb.n.; O) H. scapulapilosus sp.n.

numerous on p₃ of female. Setae of tergites scattered without any obvious pattern. Setae of sternites in median group and lateral rows. Anal point minute to small, nearly always without setae and microtrichia on anal point proper. Pha and aedeagal lobe normal. Anterior margin of TSa convex (Fig. 13C-N), oral projections pointed, never conspicuously thickened. Spines of penis cavity mostly moderately long. Gc with well-developed basal lobe. Gs rounded, with a sharp or rounded outer corner, or with a very short, pointed outer projection; crista dorsalis usually absent. Gc of female normal, with several setae. T IX of female usually strongly divided into 2 setigerous protrusions (Fig. 27, 37, 38), when not divided large, triangular and with a small apical notch. Ventrolateral lobe of Gp VIII large, larger than dorsomesal lobe (Fig. 14I-O); apodeme lobe indistinct, but apex usually visible in ventral view. Labia small, apically rounded. Csa at most with 1 sharp curve or bend (Fig. 14, 15). SCa ovoid to elongate, dark sclerozized in oral 2/3 to 4/5, usually with microtrichia. SDu with widened common opening and with indications of bulbs before opening (Fig. 14B-H). Cerci normal.

Description - Medium to large species, WL 1.5-3.6 mm. Coloration uniformly brown to black. AR 0.4-2.8 in male, 0.5-0.8 in female. Male flagellomere 2 (in H. tumidistylus), 2-5, 6 or 7 (in H. lapponicus, H. fusistylus, and H. martini), or 2-10, 11 or 12 (remaining species), wider than long. Coronal suture of female usually incomplete, absent only in some specimens of H. spinnatis. Temporals 5-30. Clypeus with 4-42 setae. Ap 3-25. Dc 2-41; Pa 2 (in female H. conformis labradorensis) to 25 (in female of *H. scapulapilosus*); Ac 2-27, usually about 6-20; anepisternum II and preepisternum with setae in H. lugubris and in some specimens of H. distylus, H. laticaudus, and H. scapulapilosus. Scu 5-45, most numerous in H. lugubris. Anal lobe of wing often strongly developed and protruding, occasionally reduced as in H. lugubris (Fig. 31B). VR 1.01-1.18, thus, mostly lower than in Zalutschia; VR highest in H. spinnatis with 1.10-1.18, and in male of H. pilopodex with 1.08-1.18. R1 and R_{4+5} of male without setae in about half the species, with 1-6 in the other half. Squama with 9-57 setae, most numerous in H. pilipes, H. johannseni, and H. scapulapilosus. LR 0.52-0.76 except in H. lugubris when it measures only 0.43-0.45. Ps present in all species although sometimes reduced in *H. lugubris*. Front tarsi with distinct beard in H. pilipes, H. johannseni, and H. hudsoni, with some indications of beard in some other species; middle tarsi with distinct beard in H. johannseni and in some specimens of other species such as H. conformis, H. pilipes, H. martini, and H. fusistylus; hind tarsi with distinct beard in most species, with indication of beard in remaining species except H. lugubris and some species of H. distylus. SCh 2-14, usually 6-8, on p_3 of male; usually absent also in female from p_2 , 1 or 2 in some specimens of H. lugubris and H. pilipes; 8-49 on p3 of female, fewest in H. lugubris (8-15) and H. fusistylus (10-15), most numerous in H. spinnatis (35-49) and H. distylus (34-39). TIX with 11-143 setae in male (11-20 in H. conformis labradorensis, 120-143 in H. lugubris), 11-85 in female (12-14 in H. conformis labradorensis, 75-85 in H. lugubris). Anal point proper without setae and microtrichia except in H. lugubris, vestigial to medium small, parallel-sided to triangular. Gc usually rounded, sometimes with sharp outer corner or very short projection (in H. conformis, H. lunzensis, and H. laticaudus). Crista dorsalis usually absent, present only in H. calvescens and H. tumidistylus. T IX of female strongly divided into two setigerous protrusions except in H. lugubris where it is large, triangular, and with apical notch. Lobes of Gp VIII approximately of same shape in all females



FIG. 15. Hydrobaenus spp., female, Gp IX and Csa, lateral view. A-C) H. pilipes (Mall.); D-E) H. johannseni (Subl.) comb.n.; F) H. lugubris Fries; G) H. scapulapilosus sp.n.; H) H. spinnatis sp.n.; I-J) H. fusistylus (Goetgh.) comb.n.; K) H. conformis conformis (Holmgr.) comb.n.

(Fig. 14J-O) except in *H. lugubris* (Fig. 14I) where ventrolateral lobes are smaller than in other species. Csa (Fig. 14A-H, 15) with pronounced anterior loop in *H. fusistylus*, at most with sharp bend in other species, often with more or less pronounced mediolateral branch. SDu mostly with loop or strongly curved, common opening often distinctly widened and triangular (Fig. 14B-H).

PUPA

Diagnosis - FS present, usually not on tubercles, frontal plate with vestigial to distinct (occasionally absent) additional "warts" (Fig. 16A-H, 17 E-H). TH long,



FIG. 16. Hydrobaenus spp., pupa. (A-H) frontal plate: A) H. lugubris Fries; B) H. pilipes (Mall.); C) H. pilipodex sp.n.; D) H. johannseni (Subl.) comb.n.; E) H. spinnatis sp.n.; F) H. lunzensis (Gow.) comb.n.; G) H. lapponicus (Brund.) comb.n.; H) H. fusistylus (Goetgh.) comb.n. (I-R) TH, and precorneal setae: I) H. lugubris Fries; J) H. pilipes (Mall.) comb.n.; K) H. scapulapilosus sp.n.; L) H. pilipodex sp.n.; M) H. johannseni (Subl.) comb.n.; N) H. hudsoni sp.n.; O) H. spinnatis sp.n.; P) H. lunzensis (Gow.) comb.n.; Q) H. lapponicus (Brund.) comb.n.; R) H. fusistylus (Goetgh.) comb.n.





FIG. 17. Hydrobaenus spp., pupae. (A-D) last two segments: A) H. conformis (Holmgr.) comb.n.; B) H. martini sp.n.; C) H. distylus (Kieff.) comb.n.; D) H. rufus (Kieff.).
(E-H) frontal plate: E) H. conformis (Holmgr.) comb.n.; F) H. distylus (Kieff.) comb.n.; G) H. martini sp.n.; H) H. rufus (Kieff.). (I-L) TH and PCS: I) H. conformis (Holmgr.) comb.n.; J) H. distylus (Kieff.) comb.n.; K) H. martini sp.n.; L) H. rufus (Kieff.).

densely to sparsely covered with spinules (Fig. 16I-R, 17I-L). Three PcS, usually in single row. Thorax smooth to faintly rugulose. Wing sheath smooth. T II with faint median shagreenation and weak posterior recurved spines; T III-VI with more extensive shagreenation (Fig. 18A-H); T VII-IX with faint anterior median shagreenation. PSB well developed. PSA present on IV-VIII (Fig. 18B-H), but weak and possibly absent in some specimens of some species on VIII. Segment I with 2 or 3 L-setae; II-VI with 4 L-setae, 0-4 of them filamentous; VII nearly always with 4 filamentous L-setae, occasionally with 3 filamentous L-setae and 0 or 1 additional seta; VIII with 4 or 5 L-setae, 4 or 5, or only 3 in some abnormal specimens, filamentous. Genital sac of male ending near apex of anal lobe, with short apical projection or protuberance. Anal lobe with full to reduced fringe of short setae (Fig. 17A-D, 18I-P). Three equally long AM.

Description - 3.0-7.4 mm long (H. martini shortest, H. pilipes, and H. johannseni longest). TH/AM 1.00-1.89. FS 50-200 μ long (about 50 μ in H. fusistylus var. octomerus var.n., 120-200 μ in H. lapponicus (Brund.)). TH 0.23-0.51 mm long, sparsely covered with spinules in H. conformis, H. lunzensis, and H. lapponicus, more densely covered in remaining species. Segment VI without filamentous L-setae in H. johannseni, H. pilipodex, H. spinnatis, and H. distylus, with 2-4 (usually 2) in remaining species; segment VII with 4 filamentous L-setae except in H. pilipodex and some specimens of H. pilipes which have only 3; segment VIII with 5 filamentous Lsetae in H. scapulapilosus, H. pilipodex, H martini, H. fusistylus, H lapponicus, most specimens of H. johannseni, and some specimens of H. pilipes, with 4 filamentous L-setae in remaining species except some specimens of H. pilipes where there may be only 3. Anal lobe with 10-36 setae; often restricted to anterior half. Apex of anal lobe smooth or with lines (H. pilipes) or rugulosity (H. johannseni).

LARVA

Diagnosis - Antenna (Fig. 19M-S; 20D-F) 6-segmented, segments consecutively smaller, segment 6 vestigial; LO distinct, about as long as segment 3 or slightly shorter; B1 shorter than segments 2-5 combined; RO in basal third. S I coarsely plumose; S II and S III simple (Fig. 19A-H). Labral lamella (Fig. 21A, B; 22A, D) simple, triangular. Pecten epipharyngis consists of 3 simple, sclerotized, smooth spines (Fig. 21A, B; 22A, D). Two pairs of chaetulae basales; 7 or 8 pairs of chaetulae laterales, all smooth (Fig. 21A, B; 22A, D). Premandible (Fig. 19G-L, 22B) with 2 apical teeth and more or less pronounced inner accessory tooth. Mandible (Fig. 19A-E; 22C, E, F) with seta interna, apical tooth shorter than combined width of remaining teeth, seta subdentalis apically serrated or indented. Maxilla (Fig. 20A-C, 23) with longitudinally curled ACh often forming nearly complete cylinder; LG simple or at most 1 LG serrated. Mentum (Fig. 20G-I, 24) with 2 median and 6 pairs of lateral teeth; ventromental plates well developed, without setae underneath. Parapods well developed. Pc well developed, sclerotized caudally, with 7 apical and 2 lateral setae. Sa 1/4-3/4 as long as An. TA shorter to slightly longer than PP.

Description - TL of fourth instar 4.3-8.8 mm. Head capsule length 0.40-0.68 mm. AR 1.4-2.5 (highest in *H. hudsoni*). Basal antennal segment 2.75-4.50 times as long as wide (2.75-3.33 in *H. fusistylus*, 4.22-4.50 in *H. martini*). Premandible 70-105 μ



FIG 18. Hydrobaenus spp., pupa, abdomen. A) H. lugubris Fries, abdominal tergites. (B-H) T V (left) and S V (right): B) H. pilipes (Mall.); C) H. pilipodex sp.n.; D) H. johannseni (Subl.) comb.n.; E) H. spinnatis sp.n.; F) H. lunzensis (Gow.) comb.n.; G) H. fusistylus (Goetgh.) comb.n.; H) H. lapponicus (Brund.) comb.n. (I-P) T VIII-IX of male (I-N, P) and female (O): I) H. pilipes(Mall.); J) H. pilipodex sp.n.; K) H. spinnatis sp.n.; L) H. johannseni (Subl.) comb.n.; M) H. lunzensis (Gow.) comb.n.; N) H. fusistylus (Goetgh.) comb.n.; O-P) H. lapponicus (Brund.) comb.n.



FIG. 19. Hydrobaenus spp., larvae. (A-E) mandible: A) H. lugubris Fries; B) H. lungensis (Gow.) comb.n.; C) H. johannseni (Subl.) comb.n.; D) H. fusistylus (Goetgh.) comb.n.; E) H. pilipodex sp.n. F) H. lunzensis (Gow.) comb.n. posterior segments. (G-L) premandible: G) H. lugubris Fries; H) H. fusistylus (Goetgh.) comb.n.; I) H. scapulapilosus sp.n.; J) H. pilipes (Mall.); K) H. johannseni (Subl.) comb.n.; L) H. lunzensis (Gow.) comb.n. (M-S) antenna: M) H. lugubris Fries; N) H. pilipodex sp.n.; O) H. fusistylus (Goetgh.) comb.n.; P) H. scapulapilosus sp.n.; Q) H. hudsoni sp.n.; R) H. johannseni (Subl.) comb.n.; S) H. lunzensis (Gow.) comb.n.



FIG. 20. Hydrobaenus spp., larvae. (A-C) maxilla: A) H. distylus (Kieff.) comb.n. (with maxillary palp); B) H. martini sp.n.; C) H. rufus (Kieff.). (D-F) antenna: D) H. distylus (Kieff.) comb.n.; E) H. martini sp.n.; F) H. rufus (Kieff.) comb.n. (G-I) mentum: G) H. distylus (Kieff.) comb.n.; H) H. martini sp.n.; I) H. rufus (Kieff.).



FIG. 21. Hydrobaenus spp. larvae. (A-B) labrum and palatum: A) H. lugubris Fries;
B) H. johannseni (Subl.) comb.n. (C-H) S I, spinulae (F-G) and chaeta media (G):
C) H. hudsoni sp.n.; D) H. pilipodex sp.n.; E) H. scapulapilosus sp.n.; F) H. fusistylus (Goetgh.) comb.n.; G) H. lunzensis (Gow.) comb.n.; H) H. pilipes (Mall.).
(I-M) apex of prementum: I) H. lugubris Fries; J) H. lunzensis (Gow.) comb.n.; K)
H. scapulapilosus sp.n.; L) H. johannseni (Subl.) comb.n.; M) H. fusistylus (Goetgh.)


FIG. 22. *Hydrobaenus* spp., larvae. (A-C) *H. distylus* (Kieff.) comb.n.: A) labrum and palatum; B) premandible; C) mandible. (D-E) *H. rufus* (Kieff.): D) labrum and palatum; E) mandible. F) *H. martini* sp.n., mandible.



FIG. 23. Hydrobaenus spp., larvae, maxilla, or part of maxilla, dorsal view. A) H. scapulapilosus sp.n.; B) H. johannseni (Subl.) comb.n. (with ventral view of maxillary palp); C) H. hudsoni sp.n.; D) H. pilipodex sp.n.; E) H. lugubris Fries; F) H. fusistylus (Goetgh.) comb.n.; G) H. lunzensis (Gow.) comb.n.



FIG. 24. Hydrobaenus spp., larvae, mentum. A-C) H. pilipes (Mall.) (B, third instar from Selenter See, Germany); D) H. pilipodex sp.n.; E) H. scapulapilosus sp.n.; F) H. fusistylus (Goetgh.) comb.n.; G) H. johannseni (Subl.) comb.n.; H) H. lunzensis (Gow.) comb.n.; I) H. hudsoni sp.n.; J) H. lugubris Fries.

long. Mandible 130-200 μ long. V/M 0.91-2.00 (lowest in *H. lunzensis* and *H. fusistylus*, highest in *H. scapulapilosus*). Postmentum 160-248 μ long. Sa/An 0.25-0.84 (lowest in *H. fusistylus* and *H. lunzensis*, highest in *H. pilipes*). TA 110-260 μ long, longest in *H. lunzensis*.

Ecology and Distribution

The larvae live in the littoral zone of lakes, in ponds, puddles, ditches, rivers, and streams. Most species are northern and, in lakes, appear to prefer oligotrophic situations. The most southerly record from Europe is for *H. lunzensis*, the only species known to reach the Alps. In North America the most southerly records are *H. pilipodex* from Benton Co., Ark. and Decatur, Ala., and a larva of *H. pilipes* from Liberty Co., Fla.; *H. martini*, *H. lapponicus*, and *H. conformis* are arctic-subarctic forms; *H. fusistylus* arctic and alpine. At least *H. pilipes* and an undetermined species from Bathurst Island, N.W.T. (see footnote 2) and probably most other species, aestivate during the summer forming a circular shaped canopylike structure around the second instar larva (Hudson 1971: 162). All species except *H. conformis labradorensis* appear to have only one generation a year with a very early emergence period. At least *H. pilipes* and *H. lugubris*, and probably most other species, mate on a sub-stratum (Fries 1830; Zetterstedt 1850: 3575; Stahl 1975). For *H. pilipes* the mating invariably occurs in an end-to-end position (Stahl 1975).

Key to known males of Hydrobaenus

1	Gs triangular with small outer projection or sharp point (Fig. 25, 26)
	Gs rounded, or if more triangular, outer corner rounded
2	Anal point broad, short, and usually apically truncate (Fig. 25); AR about 1.0; 12-19 setae on squama; fifth palpal segment 0.9-1.1 times as long as third; BV_2 3.9-4.2; Sp_1/Wti_1 about 1.2; Pha 122-140 μ long
	Anal point more slender and usually longer, not apically truncate (Gowin and Thienemann 1942, fig. 1; Fig. 26); AR 1.4-2.1; 19-31 setae on squama; fifth palpal segment 1.2-1.5 times as long as third ³ ; BV ₂ 3.2-3.7 ³ ; Sp ₁ /Wti ₁ 1.4-1.8 ³ ; Pha 76-120 μ^3 long
3	Anal point nearly triangular, T IX apparently with only about 9 setae (Gowin and Thienemann 1942, fig. 1); Gs with pronounced outer corner
	Anal point more parallel sided and slender; T IX with 11-28 setae; outer corner of Gs usually less pronounced (Fig. 26) (Holarctic) 4
4	WL 2.1-2.8 mm; WL/Pfe 3.0-3.5; 20-31 setae on squama; 0 or 1 seta on R_{4+5} ; Scu 9-23; SV ₁ 2.7-3.2; HR 2.3-2.7; anal point 26-36 μ long
	WL 1.9-2.0 mm; WL/Pfe 2.8-2.9; 19-22 setae on squama; 3-5 setae on R_{4+5} ; Scu 6; SV ₁ 2.6-2.8; HR 1.8-2.3; anal point 18-28 μ long
5	Palp usually reduced, with 4 or 5 segments; antenna reduced, with 8-13 flagellomeres, AR 0.4-1.1; LR 0.5 or lower
	Palp not reduced, with 5 segments; antenna usually with 13 flagellomeres, AR 0.8 or higher; LR_1 higher than 0.5

 $[\]frac{5}{5}$ Measurements concern only *H. conformis*, but *H. lunzensis* most likely will fall within the same ranges.

6	Blackish brown with whitish halteres; last flagellomere claw-shaped; palp 5-segmented; AR unknown <i>H. glacialis</i> Lundstr. (Palaearctic) (p.104)
	Not completely blackish brown, or with blackish halteres; last flagellomere not claw-shaped, palp usually 4-segmented; AR about 0.4-0.6
7	Coloration reddish, anal lobe developed
	Coloration brown to brownish black; anal lobe reduced; seta present on preepisternum and/or anepisternum II; legs thick and strong, tarsal segments, particularly ta ₁ , reduced; setae present on anal point proper, altogether 120-155 setae on T IX (Fig. 32)
8	Anal point vestigial (Fig. 28D, 29, 30); AR 1.0-1.5 or only 8 flagellomeres present; 24-48 setae on T IX; 12-27 setae on squama 9
	Anal point larger; AR lower than 1.0 or 1.4 or higher, 13 flagellomeres; 14-75 setae on T IX; 10-57 setae on squama 11
9	Basal lobe of Gc small (Fig. 30), AR 1.0-1.3, T IX with 33-48 setae
	Basal lobe of Gc larger (Fig. 28D, 29); AR 1.2-1.5; T IX with 24-36 setae H. fusistylus (Goetgh.) comb.n. (Nearctic) 10
10	Antenna normal; LR ₁ 0.67-0.73, LR ₃ 0.54-0.59; HR 2.34-2.58 H. fusistylus var. fusistylus (p. 94)
	Antenna with 8 flagellomeres; LR ₁ about 0.64, LR ₃ about 0.52; HR about 2.31 H. fusistylus var.octomerus var.n. (p. 99)
11	Gs with large median swelling (crista dorsalis?) (Fig. 47); HR about 1.6, HV about 2.2; AR about 0.8; Ac apparently 2, very small in centre of scutum H. tumidistylus sp.n. (p.160)
	Crista dorsalis if present smaller and near apex; HR 2.0-2.9, HV 3.0-4.9; AR 1.4-2.8; 3-24 Ac 12
12	Gs with a pronounced preapical crista dorsalis (Fig. 46C); IV conspicuously reduced; about 29 setae on T IX

Gs without or with a very small crista dorsalis; IV smaller than OV, but less conspicuously so; 14-75 setae on T IX 13

- 14
 T IX with 14-35 setae
 15

 T IX with 37-75 setae
 17
- Squama with 28-57 setae; AR 2.0-2.6; BR₁ 3.8-5.0; Pha with more or less distinct apical annulations (Fig. 13E, 41); Ac 3-12 starting at anterior 1/3-1/2 of scutum H. johannseni (Subl.) comb.n. (Nearctic) (p.139)

Squama with 10-24 setae; AR 1.4-2.0; BR₁ 2.4-2.9; Pha without apical annulations; Ac 6-20 starting at anterior 1/10-1/2 of scutum 16

16 Gs with an apical area void of microtrichia (Fig. 39B-D); laterosternite IX without anteriolateral spine; spines of penis valve long and strong (Fig. 13L); TSa not wide in the middle; Ac 8-20 starting at anterior 1/10-1/7 of scutum; squama with 10-18 setae; LR₁ 0.59-0.66, LR₂ 0.45-0.47; SV₂ 4.10-4.28 H. martini sp.n. (Holarctic) (p.134)

WL 1.9-3.5 mm; TL/WL 1.7-2.2; 5-19 antepronotals; Ac 11-22; BR1 lower or only slightly higher than BR3; Pha apparently without apical annulations (Fig. 13B-D, F)...... 18

18	BR ₁ 4.0-6.3; AR 2.0-2.8; 19-51 setae on squama; Pa 4-13, usually about 8 <i>H. pilipes</i> (Mall.) (Holarctic) (p.115)
	BR ₁ 2.5-3.3; AR 1.6-2.0; 16-20 or 31-47 setae on squama; Pa 4-6 or 12-14
19	Squama with 31-47 setae; Pa 12-14; AR 1.9-2.0
	Squama with 16-23 setae; Pa 4-6; AR 1.6-1.9

Key to known females of Hydrobaenus

1 T IX large, triangular, not divided but usually with an apical notch (about as in *Baeoctenus* gen.n. Fig. 8H); palp reduced; Dc 20-34; Scu 26-45; setae present on preepisternum and/or anepisternum II; setae sometimes present on Cu; legs thick and strong, SV₂ 6.6-7.1, only 7-16 SCh on tal of p3 H. *lugubris* Fries (Palaearctic) (p.107)

T IX divided into 2 setigerous protrusions (Fig. 27B, E; 37B, D; 38D; 40C; 45D); palp not reduced; number of setae on thorax and T IX lower than above; Cu without setae; legs normal, usually more than 17 SCh on ta₁ of p₃ (except *H. fusistylus*) 2

2 Notum absent or vestigial; SCa reduced or absent; Csa reduced (Fig. 38E-G); WL/Pfe about 2.9-3.1; S VIII with 29-54 setae, S VII with 22-54 setae; 17-27 SCh on ta1 of p3 H. virgo sp.n. (Nearctic) (p.128)

Notum, SCa and Csa normal; WL/Pfe 2.8-3.8; S VIII with 12-51 setae; S VII with 6-65 setae; 10-49 SCh on tal of p_3 3

Csa with at most a sharp anterior bend (Fig. 14A-F, H); Gc with 10-35 setae; SDu with or without bulbs; coronal suture incomplete or sometimes absent; WL/Pfe 3.4-3.8 or 3.0-3.6; 17-49 SCh on tal of p₃ 4

4	SDu abruptly, but slightly, widened before common opening, without any real bulbs; Csa with a small, anterior, anteriorly directed branch (Fig. 14F, 27D); S VIII with 12-25 setae; Ac 1-6 in the middle of scutum; WL/Pfe 3.35-3.80 <i>H. conformis</i> (Holmgr.) comb.n. (and probably <i>H. lunzensis</i> (Gow) comb.n. from the Alps)
	SDu either with distinct bulbs, or not abruptly widened and without bulbs; Csa without anterior, anteriorly directed branch; S VIII with 18-51 setae; Ac 5-27 starting at anterior 1/10-1/2 of scutum; WL/Pfe 3.00-3.55
5	T IX with 24-30 setae; Scu 13-25; Pa 4-8; 5 or 6, usually 6, flagel- lomeres; TL/WL 1.2-1.4; WL/Pfe 3.5-3.8; BV ₂ 3.6-4.0; WL 2.2-2.5 mm
	T IX with 12-14 setae; Scu 5-8; Pa 2-4; 5 flagellomeres; TL/WL 1.4-1.5; WL/Pfe 3.4-3.6; BV ₂ 2.9-3.1; WL 1.8-2.0 mm
6	Ventrolateral lobe of Gp VIII not covering or touching part of dorsomesal lobe (Fig. 40A); squama with only about 10-13 setae; Ac about 10-13 start- ing at anterior 1/8-1/10 of scutum; about 24-30 SCh on tal of p3
	Ventrolateral lobe touching dorsomesal lobe or covering part of it (Fig. 14J-O); squama with 15-57 setae; Ac 5-15 starting at anterior $1/8-1/2$ of scutum; 17-49 SCh on ta ₁ of p ₃ 7
7	SDu without bulbs or abrupt widening before common opening (Fig. 14C); 34-49 SCh on tal of p3; 5 flagellomeres; Ac 6-15 starting at anterior third of scutum
	SDu with small bulbs before opening; $17-37$ SCh on ta ₁ of p ₃ ; often 6 flagellomeres or, when only 5, often first flagellomere with a median constriction; Ac 5-13 starting at anterior $1/3-1/2$ of scutum, or $12-27$ starting at anterior $1/8-1/3$
8	Coronal suture usually absent, occasionally to 80 μ long; WL 1.7-2.2 mm; WL/Pfe 3.3-3.5; Sp ₁ /Wti ₁ 0.75-0.95; setae on each Gc more numerous (18-29) than those on T IX (11-19); S VII with 8-22 setae; 35-49 SCh on ta ₁ of p ₃ <i>H. spinnatis</i> sp.n. (Holarctic) (p.153)
	Coronal suture nearly complete, about 70-115 μ long; WL about 2.3 mm; WL/Pfe about 3.0; Sp ₁ /Wti ₁ about 1.10; setae on each Gc less numerous (13-19) than those on T IX (20-28); S VII with 25-26 setae; 34-39 SCh on ta ₁ of p ₃ H. distylus (Kieff.) comb.n. (Palaearctic) (p.149)

Csa with a sharp anterior angle, with some fine spinules on the inside of angle (Fig. 14B, 37C); Ac 5-13 starting at anterior 1/3-1/2 of scutum; 5 flagellomeres; Gc with 10-16 setae; 17-25 SCh on tal of pa H. johannseni (Subl.) comb.n. (Nearctic) (p. 140) Csa more rounded anteriorly, no spinules on inside of angle, small branch connecting Csa with intergonocoxal connective (Fig. 14D-E, H; 37A); Ac 10-27 starting at anterior 1/8-1/3 of scutum; 5 or 6, usually 6, flagellomeres; Gc with 17-35 setae; 23-37 SCh on ta_1 of p_3 10

10 WL/Pfe 2.3-2.7; Ac 10-15; Pa 13-25; BV1 2.7-3.0; Csa narrow (Fig. 14H) H. scapulapilosus sp.n. (Nearctic) (p. 125) WL/Pfe 2.9-3.5; Ac 12-27; Pa 6-8; BV1 3.6-4.3; Csa mostly broader than

above (Fig. 14D, E) H. pilipes (Mall.) (Holarctic) (p. 1.19

Key to known pupae of Hydrobaenus

V with 1 or 2, IV with 0 or 1 filamentous L-setae; longest setae in 1 fringe of anal lobe 60-90 μ long; VIII with 4 filamentous L-setae 2 V and IV without filamentous L-setae; longest setae in fringe of anal lobe longer than 90 µ except in H. lugubris and H. rufus; VIII with 3-5 filamentous L-setae 3 2 TH (Fig. 171) 0.38-0.47 mm long, L/W 3.6-5.0, mean 4.2; arctic circumpolar species H. conformis (Holmgr.) comb.n. (Holarctic) (p. 87) TH (Fig. 16P) 0.29-0.37 mm long, L/W 4.2-6.7, mean 5.0; species from the Alps H. lunzensis (Gow.) (Palaearctic) (p. 92) ٦ VI with 2-4 filamentous L-setae VI without filamentous L-setae 4 VIII normally with 5 filamentous L-setae, if only 4 (as in a few abnormal 4 specimens), tip of anal lobe with rugulosity of small papillae (Fig. 18L) or anal lobe with setae dorsal of genital sheath (Fig. 18J).....

VIII with 4 filamentous L-setae; no, or only sparse, rugulosity, and no central setae on anal lobes 6

9

5	Tip of anal lobe with rugulosity of small papillae (Fig. 18L); anal lobe without setae dorsad of genital sheath; TL 5.0-7.4 mm; anterior 2 PcS of about same thickness, median PcS usually slightly longer
	genital sheath (Fig. 18J); TL about 4.8 mm; anterior PcS slightly thicker and longer than median PcS <i>H. pilipodex</i> sp.n. (Nearctic) (p.145)
6	TH about 0.37-0.47 mm long, ending in 1 or more strong spines (Fig. 17J); TH/AM 1.26-1.47; PSA usually distinct on S VIII; TL 5.1-6.0 mm H. distylus (Kieff.) comb.n. (Palaearctic) (p.151)
	TH about 0.31-0.38 mm long, without apical spines or with only weak ones (Fig. 160); TH/AM 1.00-1.26; PSA indistinct or absent on S VIII; TL 3.6-4.7 mm H. spinnatis sp.n. (Holarctic) (p.157)
7	VIII normally with 4 filamentous L-setae; setae in fringe of anal lobe short, the longest 40-96 μ ; genital sheath not ending in papilla (Fig. 18A)
	VIII normally with 5 L-setae, 3-5 filamentous; setae in fringe of anal lobe longer, or if nearly as short as above, genital sheath ending in papilla
8	TL about 4.1 mm; TH about 0.33 mm long and about 6.2 times as long as wide
	TL 4.5-5.7 mm; TH 0.34-0.41 mm long and 4.2-5.8 times as long as wide H. <i>lugubris</i> Fries (Palaearctic) (p.110)
9	Genital sheath ending in papilla (Fig. 18N-P); TH with few and sparse spinules (Fig. 16Q, R); 40-126 μ between AM and nearest seta of fringe; VIII with 5 filamentous L-setae 10
	Genital sheath constricted near apex, but not ending in papilla (Fig. 17B, 18I); TH with more numerous and denser spinules; some setae of fringe between AM; VIII with 4 or mostly 5 filamentous L-setae 12
10	Papilla of genital sheath dark, sclerotized (Fig. 18N); 2 or 3 PcS; FS 50-120 μ long H. fusistylus (Goetgh.) comb.n. (Nearctic) ll
	Papilla of genital sheath lighter (Fig. 180, P); 3 PcS; FS 120-200 μ H. lapponicus (Brund.) comb.n. (Palaearctic) (p.102)

11 Three PcS; TH/AM about 1.5; TH 0.23 mm long H. fusistylus var. octomerus var.n. (Nearctic) (p. 100) Usually only 2 PcS; TH/AM about 1.7-1.9; TH 0.26-0.33 mm long H. fusistylus var. fusistylus (Nearctic) (p. 98) 12 VIII with 4 filamentous and 1 strong nonfilamentous seta; VI with 3 filamentous and 1 additional L-seta; middle PcS strong, about 4 μ wide, and nearly twice as long as anterior PcS; TL about 4.4 mm H. hudsoni sp.n. (Nearctic) (p. 132) VIII usually with 5 filamentous setae; VI with 2-4 filamentous L-setae; middle PcS not quite as strong, nearly twice as long, or of about same length as anterior PcS; TL 3.0-3.7 mm or 4.5-7.4 mm 13 13 TL 3.0-3.7 mm; TH 0.27-0.29 mm long; anterior PcS about 1/2-3/4 as long as median PcS H. martini sp.n. (Holarctic) (p.136)

TL 4.5-7.4 mm; TH 0.36-0.51 mm long; anterior two PcS of approximately same length H. pilipes (Mall.) (Holarctic) (p.121) H. scapulapilosus sp.n. (Nearctic) (p.126)

Key to known larvae of Hydrobaenus

1	Sa/An 0.25-0.35; head capsule 0.40-0.48 mm long; postmentum 160-200 μ long
	Sa/An 0.44-0.84; head capsule about 0.33 mm or 0.43-0.68 mm long; postmentum 158 μ or 184-250 μ long 4
2	TA shorter than PP; V/M 1.6-1.7 (Fig. 20H); AR about 1.9; basal antennal segment 4.5 times as long as second segment
	TA swollen, about as long as PP (Fig. 19F); V/M 0.9-1.1; AR 1.4-1.8; basal antennal segment 2.8-4.1 times as long as second segment 3
3	Pc about 73-94 μ high; basal antennal segment 3.5-4.1 times as long as wide: posterior IG servated (Fig. 23G)

⁴ According to Brundin (1956a: 75).

4 Head capsule about 0.33 mm long; postmentum about 158 μ; first lateral teeth of mentum as wide as median teeth (Fig. 201); Pc distinctly higher than wide; Sa 4 μ wide at base H. rufus (Kieff.) (Palaearctic) (p.113)

6 Basal antennal segment about 7.3 times as long as second segment; AR about 2.5 H. hudsoni sp.n. (Nearctic) (p.132) Basal antennal segment 3.8-5.0 times as long as second segment; AR

- 9 First lateral teeth of mentum nearly as long as medians (Fig. 20G); Sa/An 0.4-0.5; AR 1.6-1.9; mandible not quite twice as long as premandible; V/M 1.3-1.6 H. distylus (Kieff.) (Palaearctic) (p.151)

 5 A larva from Kuhulu Lake, Baffin Island, appears to have Pc as in H. lugubris, however, with median mentum teeth higher than first lateral teeth.

First lateral teeth of mentum distinctly shorter than medians (Fig. 24A, B, C, E); Sa/An 0.5-0.8; AR 1.8-2.3; V/M 1.4-2.0 10

H. conformis group

Imagines without microtrichia on Te; median lobes of antepronotum at most meeting at point anterior to scutal projection; Ac few in number (less than 10), starting at anterior 1/3-1/2 of scutum; Gs of male triangular with small outer corner or sharp point; SDu abruptly, but slightly, widened before common opening, without any real bulbs; Csa with small, anteriorly directed branch; T IX of female divided into 2 setigerous protrusions.

Pupa with reduced frontal warts, filamentous L-seta also on segment V and occasionally on segment IV, and 4 filamentous L-setae on VIII. Larva with TA swollen and large, as long or longer than PP; Sa/An lower than 0.35.

Hydrobaenus laticaudus sp.n.

(Fig. 130; 25)

The male imago is characterized by the normally broad triangular and usually truncate anal point, and by the Gs with its distinct and sharp outer corner. Other characteristics are an AR of about 1.0, 22-23 setae on T IX, 12-19 setae on the squama, 6 or 7 Ac starting at anterior 1/3 of the scutum, a BV₂ of 3.9-4.2, and the occasional presence of setae on the preepisterum and/or anepisternum II.

MALE IMAGO

TL 3.42-4.14, 3.63 mm (4). WL 2.07-2.33 mm (3). TL/WL 1.63-1.78 (3). WL/Pfe 2.60-2.70 (2).

Antenna - Last flagellomere 399-429 µ (2) long. AR 1.02-1.03 (2).

Head - Temporal setae 9-12, 11 (4); Po 3 or 4, 4 (4); OV 3-5, 4 (4); IV 3 or 4, 3 (4). Clypeus with 7-13 (3) setae. Te 180-192 μ (3) long, 34-42 μ (3) wide, width anterior of PTP 9-11 μ (3); distance from apex to PTP 20-38 μ (3). St 172 μ (1) long, 50 μ (2) wide. Palp lengths (microns, n = 2 or 3): 38-39, 46-78, 110-122, 90-100, 106-138.

Thorax - Ap 7-13, 10 (4), median lobes of antepronotum in contact at point only at scutal projection. Dc 4-10, 6 (4); Ac 6 or 7 (3) starting at anterior 1/3 of mentum; Pa 4-6, 5 (4); posterior anepisternum II with 0 or 1, 0.5 (4) setae; preepisternum with 0-3, 1 (4) setae. Scu 11-16, 14 (4).

Wing - Anal lobe well developed, but only slightly protruding. C-extension 20-60 μ (2) long. VR 1.05-1.12 (3). R with 9 (1), R₁ with 1 or 2 (2), R₄₊₅ with 1 (2) seta. Squama with 12-19, 16 (4) setae.

Legs - Sp₁ 62-70 μ (2); Sp₂ 28-34 μ (2) and 20-27 μ (3); Sp₃ 66-78, 72 μ (4) and 22-33, 28 μ (4). Wti₁ 48-60 μ (2); Wti₂ 48-60, 54 μ (4); Wti₃ 49-65, 57 μ (4). Sp₁/Wti₁ 1.17-1.24 (3). Comb with 7 or 8, 8 (4) setae, shortest seta 16-25, 21 μ (4), longest 34-50, 43 μ (4). Ps 20-24 μ (2) long; 2 on ta₁ of p₂ and p₃, 0 or 1 on ta₂ of p₂. SCh 4 or 5 (2) on ta₁ of p₃. Lengths (in microns) and proportions of legs (n = 1-3).

	fe	ti	tal	ta ₂	ta ₃
Pl	797-895	871-1030	589-668	350-411	215-264
P2	785-883	810-981	399-454	227-264	159-190
P3	834-1006	951-1159	509-595	264-331	221-251
	ta ₄	ta ₅	LR	BV	sv
pl	-	-	0.65-0.68	-	2.70-2.88
\mathbb{P}_2	110-129	110	0.46-0.50	-	3.94-4.16
Рз	123-147	110	0.51-0.54	3.20	3.51-3.64

Hypopygium (Fig. 25, 130) - Anal point triangular, relatively broad, usually truncate at apex but occasionally pointed, without microtrichia or setae. T IX with 22-33, 27 (5) setae. Laterosternite IX with 10-14, 12 (4) setae. Pha 122-140, 132 μ (4) long. TSa 100-134, 114 μ (4) long. Gc 254-300, 273 μ (5) long, basal lobe with a posteriorly directed projection void of microtrichia. Gs 99-115, 104 μ (5) long; broad, triangular, with distinct and sharp outer corner. HR 2.54-2.70, 2.62 (5); HV 3.32-3.60, 3.42 (4).

Remarks

At first glance the hypopygium of this species appears to resemble some members of *Zalutschia* more than other species of *Hydrobaenus*. However, the important characters of the TSa and the anal point void of setae and microtrichia, as well as other characteristics, show that the species is a good *Hydrobaenus* of the *H. conformis* group.

Material Examined

Holotype: male, pond 6, Ogotoruk Creek, Cape Thompson, Alaska, 11/6/60, W. C. Hanson (CNC No. 13477). Paratypes: 3 males, 1 male hypopygium, ponds 4 and 6, otherwise as holotype (USNM, JES, FWI).

Ecology and Distribution

The species is known only from the type locality ponds in Alaska.





FIG. 25. Hydrobaenus laticaudus sp.n., male hypopygium. A) holotype; B-D) variation of paratypes.

Hydrobaenus conformis (Holmgren) comb.n.

(Fig. 13M, N; 14F, L; 15K; 17A, E, I; 26; 27D-F)

Chironomus conformis Holmgren 1869: 42 (male) Orthocladius conformis (Holmgr.) Kieffer 1906: 27, 1919: 47 (male), 1922a: 13 (male); Edwards 1924: 168 (male), 1937b: 361 (male); Goetghebuer 1940-50: 75 (male) Orthocladius (Chaetocladius) natvigi Goetghebuer 1933: 25 (male), 1940-50: 62 (male) Orthocladius obesus Goetghebuer 1940: 60 (male) Diplocladius conformis (Holmgr.) Thienemann 1937: 362 (pupa), 1944: 579 (pupa) Diplocladius aquilonaris Thienemann 1941: 216 (pupa), 1944: 579 (pupa), nec Goetghebuer 1940: 63 Chaetocladius paralaminatus Brundin 1947: 26 (male) Trissocladius conformis (Holmgr.) Brundin 1956a: 76 (male), nec Orthocladius ? conformis Edwards 1922: 207 (male), 1923: 238 (male)

(= Chaetocladius festivus (Holmgr.))

The imagines are characterized by having 1-7 Ac in the center of the scutum, and 9-33 setae on the squama. The male has an AR of 1.4-2.1, WL/Pfe 2.8-3.5, BR₃ 4.4-5.2, and T IX with 11-28 setae. The anal point is relatively well developed, slender, and tapering; the Gs has a sharp but small outer corner. The female has 5 or 6 flagellomeres, incomplete coronal suture, WL/Pfe 3.4-3.8, 12-30 setae on T IX, 9-22 on S VII, and 12-25 setae on S VIII. SDu are without bulbs but widen abruptly before the opening. The Csa has a small anterior, anteriorly directed branch.

The pupa has 1 or 2 filamentous L-setae on V in addition to 2 on VI and 4 on VII and VIII. TH is 0.38-0.47 mm long and 3.6-5.0 times as long as wide.

The larva is not known, but in all likelihood will be very close to that of *H. lunzensis* (p. 92).

The species is divided into two subspecies which may eventually, when all stages are known, be full species.

Hydrobaenus conformis conformis (Holmgren)

(Fig. 13M; 14F, L; 15K; 26A-C; 27E, F)

The male image of *H. conformis conformis* differs from that of *H. conformis* labradorensis subsp.n. by having a WL of 2.1-2.8 mm (compared to 1.9-2.0 mm), WL/Pfe of 3.0-3.5 (compared to 2.8-2.9), clypeus with 8-16 setae (compared to 6 or 7 setae), Scu 9-23 (compared to 6), R_{4+5} with 0 or 1 seta (compared to 3-5), squama with 20-31 setae (compared to 19-22), LR₁ of 0.56-0.66 (compared to 0.66-0.71), T IX with 13-28 setae (compared to 11-20), and HR of 2.3-2.7 (compared to 1.8-2.3).

The female image of *H. conformis conformis* has a WL of 2.3-2.5 mm (compared to 1.8-2.0 mm in *H. conformis labradorensis*), WL/Pfe of 3.5-3.8 (compared to 3.4-3.6), Scu 13-15 (compared to 5.8), squama with 20-33 setae (compared to 9-19), BV₂ 3.6-4.0 (compared to 2.9-3.1), and T IX with 24-30 setae (compared to 12-14).

MALE IMAGO

TL 3.51-4.57, 3.86 mm (10). WL 2.05-2.76, 2.46 mm (22). TL/WL 1.48-1.71, 1.60 (10). WL/Pfe 2.97-3.45, 3.14 (10).

Antenna - Pedicel L/W (microns): 69-126, 95(8)/134-186, 152(8). Flagellomeres L/W (microns, n = 9): 53-76, 62/35-50, 45; 20-30, 25/33-45, 41; 20-34, 25/33-49, 40; 21-35, 26/32-50, 41; 21-38, 27/33-49, 41; 21-34, 26/30-47, 39; 24-34, 27/30-45, 37; 24-36, 29/30-45, 35; 26-35, 29/29-44, 34; 24-36, 29/29-41, 33; 27-38, 29/29-37, 33; 26-39, 30/27-40, 32; 586-753, 675/22-39, 29. AR 1.43-2.06, 1.74 (21).

Head - Temporal setae 7-13, 11 (5); Po 2-4, 3 (7); OV 3-6, 4 (7); IV 1-4, 3 (5). Clypeus with 8-16, 12 (9) setae. Te 142-210, 176 μ (6) long; 36-48, 43 μ (6) wide; width anterior of PTP 12-15, 14 μ (6); distance from apex to PTP 21-31, 26 μ (6). St 136-180, 158 (6) long; 34-68, 55 μ (5) wide. Palp lengths (microns, n = 6): 31-50, 37; 45-82, 64; 113-127, 119; 102-124, 113; 134-188, 162.

Thorax - Ap 4-6, 5 (6); median lobes of antepronotum in contact at a point at scutal projection. Dc 7-13, 10 (22); Ac 2-7, 4 (20) starting at anterior 1/3-1/2 of scutum; Pa 4-7, 6 (19). Scu 9-23, 17 (21).

Wing - Anal lobe well developed, protruding. C-extension 45-63, 52 μ (9) long. VR 1.06-1.15, 1.09 (9). B with 1 (10); R with 3-6, 5 (10); R₁ with 0 or 1, 0.1 (10); R₄₊₅ with 1 (10) seta. Squama with 20-31, 25 (19) setae.

Legs - Sp₁ 60-84, 70 μ (10); Sp₂ 24-36, 29 μ (10) and 20-32, 24 μ (9); Sp₃ 60-84, 68 μ (10) and 20-30, 25 μ (8). Wti₁ 39-50, 45 μ (7); Wti₂ 40-49, 43 μ (6); Wti₃ 48-58, 52 μ (8). Sp₁/Wti₁ 1.36-1.79, 1.52 (7). Comb with 10-13, 11 (9) setae; shortest seta 19-36, 26 μ (8); longest 32-70, 49 μ (8). Ps 15-40, 27 μ (9) long; 2 (9) on ta₁ of p₂; 0-2, 0.6 (10) on ta₂ of p₂; 1 or 2, 1.8 (9) on ta₁ of p₃; 0-2, 0.6 on ta₂ of p₃. Sch 3-10, 6 (6) γ ta₁ or p₃. Lengths (in microns) and proportions of legs (n = 8-10):

	fe	ti	tal	ta ₂	ta ₃
\mathbf{p}_1	660-926,772	810-1129,943	530-711,595	297-393,337	218-276,238
p ₂	724-981,832	742-1036,853	333-485,391	196-276,227	147-221,171
p3	773-1055,918	889-1214,1042	455-638,554	276-362,318	196-276,227
	ta4	ta ₅	LR	BV	
p_1	135-190,156	86-110,97	0.56-0.66,0.63	2.61-2.78,	2.71
P2	92-166,118	73-114,91	0.45-0.48,0.46	3.22-3.65,	3.44
РЗ	109-184,135	85-124,101	0.49-0.56,0.53	3.07-3.35,	3.21
	SV	BR			
P1	2.72-3.20,2.88	2.73-3.62,3.11			
P ₂	4 16-4.46.4.30	2.88-4.23.3.65			

~ ~	4.10 1014000	2.00 1-2070-00
P3	3.37-3.79,3.52	4.35-5.19,4.82

Hypopygium (Fig. 26A-C) - Anal point relatively slender, tapering without setae and microtrichia. T IX with 13-28, 19 (22) setae. Laterosternite IX with 9-13, 11 (10) setae and usually with distinct anteriolateral spine. Pha 87-120, 103 μ (7) long, curved apically (Fig. 13M). Gc 224-314, 267 μ (10) long, with more or less pointed basal lobe. Gs 94-135, 110 μ (10) long, with sharp outer corner. HR 2.27-2.67, 2.42 (10); HV 3.25-4.12, 3.50 (10).

FEMALE IMAGO (n = 8, EXCEPT WHEN OTHERWISE STATED)

TL 2.78-3.33, 3.04 mm. WL 2.27-2.53, 2.35 mm. TL/WL 1.22-1.36, 1.29. WL/Pfe 3.49-3.80, 3.67.

Antenna - Pedicel L/W (microns): 37-60, 48/71-81, 76. Flagellum with 5 or 6 flagellomeres, depending on whether first and second flagellomeres are separated, partially separated, or fused about 2/3 from base; flagellomere 1 (when 5 flagellomeres) or 1 + 2 (when 6 flagellomeres) L/W (microns): 86-94, 91/32-40, 35; remaining flagellomeres L/W (microns): 34-46, 38/28-34, 30; 39-43, 40/27-31, 29; 36-48, 42/21-29, 27; 94-148, 122/21-24, 23. AR 0.52-0.71, 0.58.

Head - Temporal setae 5-11, 7 (7); Po 1-3, 2 (7); OV 1-7, 4; IV 1-3, 2. Clypeus with 8-16, 12 setae. Te 122-170, 149 μ (6) long; 29-40, 32 μ wide; width anterior of PTP 7-10, 8 μ (6); distance from apex to PTP 10-27, 15 μ (16). St 134-180, 151 μ (6) long, 23-60, 47 μ (5) wide. 1 or 2, usually 2 ocelli present 36-66, 53 μ (5) apart. Coronal suture reduced, to nearly complete, 30-150, 95 μ (7) long. Palp lengths (microns): 31-40, 37; 44-63, 56; 85-111, 98; 84-107, 96; 111-144, 134.

Thorax - Ap 5-11, 8 (6). Dc 6-13, 10; Ac 1-6, 3, starting at anterior 1/3-1/2 of scutum; Pa 4-8, 6. Scu 13-25, 17.

Wing - C-extension 40-76, 56 μ long. VR 1.06-1.13, 1.09. B with 1-3, 1 (7); R with 7-13, 10; R₁ with 3-5, 4; R₄₊₅ with 2-6, 4 setae. Squama with 20-33, 25 setae.

Legs - Sp₁ 35-52, 41 μ (7); Sp₂ 22-30, 25 μ and 16-28, 20 μ ; Sp₃ 55-76, 60 μ and 20-30, 21 μ . Wti₁ 36-44, 41 μ ; Wti₂ 40-45, 42 μ ; Wti₃ 44-55, 49 μ . Sp₁/Wti₁ 0.80-1.03, 0.93 (6). Comb with 9-13, 11 (7) setae; shortest setae 18-30, 24 μ long; longest 34-54, 42 μ . Ps 16-32, 25 μ long; 2 on ta₁ of p₂, 0-2, 1 on ta₂ of p₂, 1 or 2, 1.9 on ta₁ of p₃, 0-2, 0.3 on ta₂ of p₃. SCh 17-27, 23 on ta₁ of p₃. Lengths (in microns) and proportions of legs:

	fe	ti	ta _l	ta ₂	ta ₃
P1	607-705,642	724-855,777	393-515,470	245-294,262	172-221,185
P2	687-773,708	699-810,741	319-374,342	172-202,184	116-141,130
P3	730-822,774	853-969,900	446-515,475	245-276,258	165-211,185
	ta ₄	ta ₅	LR	BV	
p_1	80-140,109	68-97 , 77	0.52-0.65,0.61	2.75-3.10,	2.99
P2	80-122,93	63-94,75	0.43-0.49,0.46	3.57-3.95,	3.72
P3	89-124,102	76-98.84	0 49-0 56 0 53	3 29-3 55	3 42



FIG. 26. *Hydrobaenus conformis* (Holmgr.) comb.n., male hypopygium. A-B) specimens from Greenland; C) specimen from West-Spitsbergen; D) *H. c. labradorensis* subsp.n. from Astray Lake, Que.

	SV	BR	
\mathbf{p}_1	2.85-3.50,3.03	2.31-3.27,2.69	
p2	4.11-4.40,4.24	2.29-2.92,2.57	
P3	3.26-3.78,3.53	2.90-3.57,3.27	(6)

Abdomen - Number of setae on T I-VIII as: 39-56, 46 (7); 32-53, 40; 22-37, 31; 23-36, 30; 25-32, 29; 23-35, 27; 20-30, 26; 27-34, 29 (7). Number of setae on S I-VIII as: 0; 3-9, 6; 5-17, 8; 8-15, 11; 12-22, 17; 9-23, 16; 9-22, 16; 12-25, 20.

Genitalia (Fig. 14F, L; 15K; 27E, F) - Gc with 20-27, 23 (7) setae. T IX (Fig. 27F) divided, with 24-30, 27 (7) setae. Cercus 144-175, 163 μ long. SCa 98-109 μ (2) long, 53-55 μ (2) wide, sclerotized in apical two thirds. SDu with anterior loop abruptly widened before common opening, but without bulbs. Csa with anterior, anteriorly directed, small branch (Fig. 14F, 27F); Csa relatively narrow in ventral view, wide in lateral view (Fig. 15K). Lobes of Gp VIII (Fig. 14L) normal.

PUPA (n = 3)

TL 4.00-4.65 mm. TH/AM 1.48-1.81.

Cephalothorax - TH (Fig. 17I) 380-466 μ long, 84-114 μ wide, 3.58-4.96 times as long as wide. Anterior PcS 150-160 μ long, strong, located 15-26 μ from median PcS and 12-23 μ from posterior PcS. Median PcS 170-194 μ long, strong, located 11-18 μ from posterior PcS. Posterior PcS 42-80 μ long, located 66-90 μ from TH. FS (Fig. 17E) 120-135 μ long, frontal warts indistinct, with rugulosity.

Abdomen (Fig. 17A) - PSA on S IV-VII or VIII, longest spinules on IV 6-9 μ long, on V 4-7 μ , on VI 6-7 μ ; on VII 3-5 μ ; on VIII 0-2 μ long. I with 2 or 3, II-VIII with 4 L-setae; l or 2 on V, 2 on VI, and all 4 on VII and VIII filamentous. Anal lobe with 239-282 μ long AM, and 19-27 setae in fringe; longest setae in fringe 60-90 μ , shortest 5-16 μ ; distance from fringe to nearest AM 100-118 μ .

LARVA

Not examined. According to Brundin (1956a: 75) it is not separable from *H. lunzensis* from the description by Gowin and Thienemann (1942: 101).

Material Examined

Six pairs in copulation, 14 additional males, 1 additional female, Nedre Midsommer Sö, Greenland, 2/7-3/8/66, Canadian Peary Land Expedition (CNC, FWI, JES, SMNH, USNM, ZSBS); 3 males, Adventdalen, West-Spitsbergen, Svalbard, 8 and 13/7/65, J. Kaisila; 1 female, Moskushamn, West-Spitsbergen, Svalbard 4/8/64, E. S. Nyholm (ZMUH); 1 exuvium,



FIG. 27. *Hydrobaenus* spp., female genitalia. (A-C) *H. fusistylus* (Goetgh.) comb.n., ventral A), dorsal B), and lateral C) view. (D-F) *H. conformis conformis* (Holmgr.) comb.n., ventral D), dorsal E), and lateral F) view.

small lake at Kopparåsen, Swedish Lapland, 18/6/36, A. Thienemann; 2 exuvia, Lower Lake Kårsavagge, Swedish Lapland, 17/7/37, A. Thienemann (last two records as *Diplocladius aquilonaris* in Thienemann 1941: 176) (ZSBS).

Ecology and Distribution

The species is an arctic, subarctic, circumpolar lake form with relict occurrence in the deep Swedish lakes, Vättern and Sommen, and in the alpine lakes of southern Norway. The subspecies *H. c. labradorensis* apparently has two generations a year, and there is a possibility that *H. c. conformis* is also a bivoltine species, particularly in Swedish Lapland and in Lake Vättern and Lake Sommen.

Distribution of *H. c. conformis*: Frans Josef Land (Goetghebuer 1933: 25), Svalbard (Holmgren 1869: 42; Edwards 1924: 168; 1937b: 360; Hirvenoja 1967: 53), Greenland (Goetghebuer 1933: 25 as *Orthocladius (Chaetocladius) natvigi*; Sublette and Sublette 1965: 155), Sweden (Thienemann 1941: 176, 179 as *Diplocladius aquilonaris* and *Orthocladius obesus*; Brundin 1956a: 79; Wiederholm 1974b: 37), Norway (Thienemann 1941: 176, 179 as *Diplocladius aquilonaris* and *Orthocladius obesus*; Sæther 1968: 460).

Hydrobaenus conformis labradorensis subsp.n.

(Fig. 13N; 26D)

The differences between this subspecies and H. c. conformis are outlined on p. 83.

MALE IMAGO (n = 4, EXCEPT WHEN OTHERWISE STATED)

TL 3.04-3.41, 3.21 mm. WL 1.85-2.01, 1.93 mm. TL/WL 1.60-1.73, 1.66. WL/Pfe 2.79-2.94, 2.86.

Antenna - Pedicel L/W (microns): 83 (1)/102-138, 121. Flagellomeres L/W (microns): 42-57 (2)/37-41 (2); 19-25 (2)/36-41 (2); 24 (1)/32 (1); 24 (1)/25 (1); 19-23 (2)/ 26-44 (2); 16-24 (3)/24-44 (3); 19-24, 22/23-42, 29; 21-24, 23/21-41, 28; 22-26, 24/21-37, 27; 23-27, 24/21-34, 26; 24-29, 27/19-32, 24; 23-29, 26/19-26, 23; 441-588, 507/16-22, 19. AR 1.50-1.69 (3).

Head - Temporal setae 8-15, 11. Po 1-5, 3; OV 1-6, 5; IV 1-7, 4. Clypeus with 6 or 7, 6 setae. Te 130-141, 134 μ long; 34-49, 41 μ wide; width anterior of PTP 10-17, 12 μ ; distance from apex to PTP 23-32, 28 μ . St 122-154 μ (3) long. 1 or 2 ocelli. Palp lengths (microns): 21-32, 26; 41-47, 42; 78-91, 84; 81 (1); 109-130, 119.

Thorax - AP 4 or 5 (2). Dc 6-8, 7; Ac 2 (2) in center of scutum; Pa 4-6 (3). Scu 6 (3).

Wing - Anal lobe well developed, protruding. C-extension 41-49 μ (2). VR 1.07-1.09, 1.08. B with 1, R with 3-5, 4, R₁ without, R₄₊₅ without setae. Squama with 19-22 (3) setae.

Legs - Sp₁ 62-68 μ (3); Sp₂ 28-30, 29 μ and 24-26, 25 μ ; Sp₃ 64-70, 67 μ and 20-28 μ (3). Wti₁ 40-42 μ ; Wti₂ 38-40, 40 μ ; Wti₃ 44-50, 47 μ . Sp₁/Wti₁ 1.52-1.66 (3). Comb with 8-12, 10 setae; shortest seta 21-23 μ (3), longest 32-40 μ (3). Ps 21-26, 23 μ long; 2 on ta₁ of p₂, 0-2 on ta₂ of p₂, 1 or 2 on ta₁ of p₃. SCh 2-5, 4 (5) on ta₁ of p₃. Lengths (in microns) and proportions of legs:

	fe	ti	tal	ta ₂	ta ₃
pl	638-706,682	746-924,798	528~594,558	313-350,326	221-257,227
P2	669-726,695	673-759,724	330-366,352	188-211,199	132-158,142
P3	756-812,790	805-911,870	449-495,474	267-294,277	142-198,181
	ta ₄	ta ₅	LR	BV	
$\mathbf{p_1}$	135-162,143	76-96,86	0.66-0.71,0.69	2.31-2.62,2.51	
p2	79-112,97	53-92,73	0.47-0.50,0.49	3.22-3.87,3.49	
рз	99-116,106	79-92,88	0.54-0.56,0.54	3.11-3.54,3.28	
	SV	BR			
$\mathbf{p_1}$	2.56-2.76,2.70	2.70-2.92,(3)			
p2	3.91-4.09,4.03	3.00-3.50,3.20			
P3	3.48-3.54,3.51	4.50-5.00,4.71			

Hypopygium (Fig. 13N, 26D) - T IX with 11-20, 15 setae. Laterosternite IX with 7 or 8, 7 setae and anteriolateral spine. Pha 76-94, 86 μ long. TSa 84-92 μ (3) long. Gc 165-196, 185 μ long. Gs 84-90, 87 μ long. HR 1.84-2.22, 2.13; HV 3.65-3.98, 3.80.

FEMALE IMAGO (n = 2, EXCEPT WHEN OTHERWISE STATED)

TL 2.57-2.90 mm. WL 1.79-1.97 mm. TL/WL 1.43-1.47. WL/Pfe 3.35-3.57.

Antenna - Pedicel L/W (microns) 49/58-63. Five flagellomeres L/W (microns): 68-75/27; 28/23-24; 31-34/23-24; 32/23-24; 86-115/17-24. AR 0.63-0.70.

Head - Temporal setae 5 or 6, Po 1, OV 3 or 4, IV 0-2. Clypeus with 8-10 setae. Te 100-110 μ long, 21-24 μ wide, width anterior of PTP 5-6 μ , distance from apex to PTP 10-16 μ . St 99-105 μ long. 2 ocelli, 53 μ (1) apart. Palp lengths (microns): 22-23, 34-37, 68-72, 70-79, 104-105.

Thorax - Ap 3-9. Dc 6 or 7, Ac not measurable, Pa 2-4. Scu 5-8.

Wing - C-extension 41-60 μ . VR 1.07-1.10. B with 1, R with 6 or 7, $R_{\rm l}$ with 2, $R_{\rm 4+5}$ with 4 or 5 setae. Squama with 9-19 setae.

Legs - Sp₁ 44-46 μ , Sp₂ 26-28 μ and 23-24 μ , Sp₃ 60-67 μ and 22-24 μ . Wti₁ 36-41 μ , Wti₂ 38-41 μ , Wti₃ 43-44 μ . Sp₁/Wti₁ 1.12-1.22. Comb with 10 (1) setae, 17-32 μ long. Ps 15-23 μ long, 2 on ta₁ of p₂. SCh not measurable. Lengths (in microns) and proportions of legs:

	fe	ti	tal	ta ₂	tag	ta ₄
P1	535-552	647-705	406-442	244-282	162-190	99-110
P2	541-601	587-656	271-313	158-190	135-168	79-98
РЗ	637-687	693-773	429 (1)	196 (1)	92 (1)	92 (1)
	ta ₅	LR	BV	SV	BR	
P1	76-86	0.63	2.54-2.83	2.83-2.91	2.61-2.72	
P2	79-86	0.46-0.48	2.88-3.08	4.02-4.17	2.50-2.64	
РЗ	86 (1)	0.56 (1)	2.93 (1)	3.40 (1)	3.54 (1)	

Abdomen (n = 1) - Number of setae on T I-VIII as: 28, 28, 17, 16, 15, 18, 15, 12. Number of setae on S III-VIII as: 6, 4, 7, 9, 6, 18.

Genitalia - Gc with 14 or 15 setae. T IX with 12-14 setae. Cercus 138-150 μ long. SCa 83-100 μ long, 53-59 μ wide.

Material Examined

Holotype and allotype: male, female, Astray Lake, Labrador, Nfld., 31/8/57, D. R. Oliver (CNC No. 13540). Paratypes: male, female, same data as holotype; 1 male, Manitou Gorge, Kaniapiskau River, northern Labrador, Que., 5/9/57, G. Power; 1 male, Lac Aigneau, southeastern Labrador, Que., 15/6/55, D. R. Oliver (CNC, FWI).

Ecology and Distribution

This subspecies appears to be a subarctic lake form restricted to the Labrador Peninsula (Quebec, Newfoundland), and to have two generations a year.

Hydrobaenus lunzensis (Gowin) comb.n.

(Fig. 16F, P; 18F, M; 19B, F, L, S; 21G, J; 23G; 24H)

Diplocladius (Orthocladius) lunzensis Gowin in Gowin and Thienemann 1942: 101 (male, female, pupa, larva) Diplocladius lunzensis Gow., Thienemann 1944: 579, 620, 638 (pupa, larva) Trissocladius lunzensis (Gow.) Brundin 1956a: 75 (generic placement)

The imagines of this species have not been examined. However, according to the original description of the male of H. *lunzensis*, the anal point is more triangular,

the outer corner of Gs is more strongly projecting, and the T IX has fewer setae (about 9) in H. *lunzensis* than in H. *conformis* (Gowin and Thienemann 1942, fig. 1).

The pupa is characterized by having 0 or 1 filamentous L-seta on IV, 1 or 2 on V, 2-4 on VI, and 3 or 4 on VII and VIII. The TH is 0.29-0.37 mm long and 4.2-6.7 (mean 5.0) times as long as wide.

The larva has a Sa/An of 0.28-0.35, an AR of 1.4-1.6, with basal antennal segment 3.5-4.1 times as long as wide, TA swollen and at least as long as PP, a VM of 0.9-1.1, posterior LG serrated, and Pc 73-94 μ high.

PUPA (n = 10, EXCEPT WHEN OTHERWISE STATED)

TL 3.55-4.77, 4.01 mm. TH/AM 1.28-1.76, 1.43.

Cephalothorax - TH (Fig. 16P) 294-368, 332 μ long; 55-76, 67 μ (8) wide; 4.20-6.69, 4.97 (8) times as long as wide; rounded and without spinules at extreme apex. Anterior PcS 100-110, 104 μ (6) long; located 10-15 μ (3) from median PcS and 10-18 μ (3) from posterior PcS. Median PcS 120-145, 130 μ (6) long; located 6-9 μ (3) from posterior, PcS. Posterior PcS 50-70, 62 μ (6) long; located 60-95 μ (2) from TH. FS (Fig. 16F) 100-145, 111 μ (8) long, frontal warts small and low, without rugulosity.

Abdomen (Fig. 18F, M) - PSA on S IV-VIII, longest spinules on IV-VI 6-8, 7 μ (5) long; on VII 3-4, 4 μ (5); on VIII 1-2, 2 μ (5) long. I with 3, II-VIII with 4 L-setae; IV with 1 filamentous L-seta in 1 of 10 specimens; V with 1 or 2, 1.8; VI with 2-4, 2.2; VII with 3 or 4, 3.9; VIII with 3 or 4, 3.8 filamentous L-setae. Anal lobe with 202-258, 234 μ long AM, and 8-26, 17 setae in fringe; longest seta in fringe 70-86, 77 μ (8), shortest 2-20, 14 μ long; distance from fringe to nearest AM 70-200, 121 μ (8).

FOURTH INSTAR LARVA (n = 6, EXCEPT WHEN OTHERWISE STATED)

TL 5.42-5.81 mm (2). Head capsule length 0.41-0.48, 0.44 mm (5).

Head - Antenna as in Fig. 195. Lengths of antennal segments in microns: 59-62, 61; 20-22, 21; 7-8, 8; 6-8, 7; 5-7, 6; 1.2-1.5, 1.5. AR 1.38-1.56, 1.48. Basal antennal segment 15-17, 16 μ wide; 3.47-4.13, 3.78 times as long as wide; distance from base to RO 4-11, 9 μ ; to basal mark of seta 4-10, 8 μ ; to distal mark of seta 15-21, 18 μ ; Bl 26-35, 31 μ long. LO 7-8, 7.5 μ (5) long. S I (Fig. 21G) very coarsely plumose or biforked with each main branch divided in 4 or 5 small branches. Premandible (Fig. 19L) 76-81, 78 μ (5) long. Mandible (Fig. 19B) 142-150, 146 μ long with seta subdentalis more slender than in other species of the genus. Maxilla (Fig. 13G) with anterior LG serrated. Width of 1 median tooth of mentum (Fig. 24H) 10-12, 11 μ ; ventromental plate 10-12, 11 μ wide; V/M 0.91-1.10, 1.02. Postmentum 178-190, 184 μ (5) long.

Abdomen (Fig. 19F) - Pc 73-94, 79 μ high; 42-48, 44 μ wide. Sa 125-150, 138 μ (5) long. An 393-491, 449 μ long. Sa/An 0.28-0.35, 0.31 (5). TA 180-260, 215 μ long; 80-130, 110 μ wide; longest ones as long as or nearly as long as PP. PP 233-294, 265 μ (5) long.

Material Examined

Syntypes: Thirteen pupae, 58 larvae, Lunz, Austria, 1942, A. Thienemann and F. Gowin (see Gowin and Thienemann 1942: 104) (ZSBS).

Ecology and Distribution

The species has been found only in two trout ponds and a stream near the Biological Station at Lunz, Austria. The larva forms a nonattached cylindrical, or weakly conical case of mud. Also the pupal case is nonattached (Gowin and Thienemann 1942: 103).

H. lapponicus group

Imagines with microtrichia on Te; only flagellomeres 2-6 of male wider than long; coronal suture of female mostly complete; median lobes of antepronotum at most meeting at point anterior to scutal projection; SCh on ta_1 of p_3 less than 7 in male and always less than 15 in female; Gs rounded; anal point reduced; T IX of female divided into two setigerous protrusions; Csa with nearly circular anterior loop; SDu with bulbs before common opening.

Pupa with reduced frontal warts; TH sparsely covered with spinules; filamentous L-setae present on segments VI and VII with 5 filamentous L-setae on VIII; genital sacs of both sexes with apical papillae.

Larva with finely plumose S I; median pair of median lamellae of prementum smooth; accessory tooth of premandible clear and erect, nearly half as long as second apical tooth; V/M less than 1.15, Sa/An less than 0.35; and TA shorter than PP.

Hydrobaenus fusistylus (Goetghebuer) comb.n.

(Fig. 13K; 14G, M; 15I, J; 16H, R; 18G, N; 19D, H, O; 21F, M; 23F; 24F; 27A-C; 28; 29)

Chaetocladius fusistylus Goetghebuer 1933: 26 (male) Orthocladius (Chaetocladius) fusistylus (Goetgh.) Goetghebuer 1940-50: 60 (male) Trissocladius fusistylus (Goetgh.) Oliver 1963: 177 (generic placement)

The imagines are characterized by having 9-13 Dc; 3-11 Ac starting in center of the scutum; a squama with 12-27 setae; a WL/Pfe of 2.8-3.2 in the male, 3.4-3.7 in the female; and a T IX with 24-36 setae in the male, 12-19 setae in the female. The

male imago has a reduced anal point, an AR of 1.2-1.4, BR_3 of 2.7-5.2, and Gs with a rounded outer margin. The female imago has a Csa with a nearly circular anterior loop, only 10-15 SCh on p_3 , a Gc with only 7 or 8 setae, and SDu with bulbs before common opening.

The pupa has a TH with sparse and weak spinules; the genital sheath ends in dark, sclerotized papillae; FS is 50-120 μ long; and VI has 2, VII 4, and VIII 5 filamentous L-setae.

The larva has a Sa/An of 0.25-0.30, a V/M of 1.0-1.1, an AR of 1.5-1.8, a basal antennal segment 2.8-3.3 times as long as wide and a Pc about 50 μ high.

A variety, *H. fusistylus* var. *octomerus* var.n. is described. Although it differs slightly both as male and pupa from the typical *H. fusistylus* it seems most likely that it does not deserve a higher rank because the typical *H. fusistylus* was found in the same locality and the reduction in numbers of flagellomeres, etc., probably is a common occurrence in arctic areas.

Hydrobaenus fusistylus var. fusistylus (Goetghebuer)

(Fig. 13K; 14G, M; 15I, J; 16H, R; 18G, N; 19D, H, O; 21F, M; 23F; 24F; 27A-C; 28; 29A-C)

MALE IMAGO (n = 11-12, EXCEPT WHEN OTHERWISE STATED)

TL 3.42-4.18, 3.76 mm. WL 2.21-2.86, 2.43 mm. TL/WL 1.49-1.69, 1.58. WL/Pfe 2.77-3.20, 2.95.

Antenna - Pedicel L/W (microns): 90-130, 120/130-174, 147. Flagellomeres L/W (microns): 50-80, 65/35-48, 40; 24-32, 29/30-46, 38; 24-34, 31/27-45, 36; 25-36, 33/30-45, 35; 30-40, 34/29-48, 36; 31-40, 35/28-45, 36; 34-43, 36/27-44, 35; 33-46, 37/23-43, 35; 35-50, 38/29-43, 35; 35-48, 39/26-42, 34; 37-49, 40/26-42, 33; 37-48, 41/23-48, 33; 534-840, 612/28-42, 34. AR 1.21-1.92, 1.35 (1.92 in specimen from Montana, 1.44 highest among other specimens.)

Head - Temporal setae 5-12, 9; Po 2-8, 4; OV 1-4, 3; IV 1-3, 2. Clypeus with 7-13, 10 setae. Cibarial pump, Te, and St as in Fig. 28A. Te 160-190, 172 μ (10) long; 34-45, 39 μ wide; width anterior of PTP 9-14, 11 μ ; distance from apex to PTP 28-40, 33 μ . St 165-205, 177 μ long; 40-68, 59 μ (10) wide. Ocelli present in 3 out of 12 specimens, 11-12 μ apart. Palp lengths (microns): 30-40, 35; 50-76, 56; 105-170, 128; 90-162, 115; 130-224, 160.

Thorax (Fig. 28B) - Ap 4-10, 6; median lobes of antepronotum apparently in contact at point at scutal projection. Dc 2-7, 4 (37); Ac 4-11, 6; Pa 3-7, 5. Scu 6-10, 7.

Wing (Fig. 28C) - Anal lobe well developed, slightly protruding. C-extension 2-35, 27 μ long. VR 1.06-1.13, 1.09. B with 1-2 (10); R with 5-11, 6; R₁ without; R₄₊₅ with 0 or 1, 0.5 seta. Squama with 12-27, 18 (36) setae.



FIG. 28. *Hydrobaenus fusistylus* (Goetgh.) comb.n., male. A) cibarial pump, Te and St; B) thorax; C) wing; D) hypopygium.

Legs - Sp₁ 44-74, 59 μ ; Sp₂ 30-48, 37 μ and 18-31, 23 μ ; Sp₃ 54-80, 67 μ and 19-26, 22 μ . Wti₁ 37-52, 43 μ ; Wti₂ 40-51, 44 μ ; Wti₃ 44-60, 49 μ . Sp₁/Wti₁ 1.10-1.62, 1.37. Comb with 10-12, 11 setae; shortest seta 20-32, 25 μ long, longest 34-60, 49 μ . Ps 20-40, 29 μ long; 2 on ta₁ of p₂ and p₃, 0-2 on ta₂ of p₂ and p₃. Sch 2-7, 5 on ta₁ of p₃. Lengths (in microns) and proportions of legs:

	fe	ti	tal	ta ₂
Рl	736-1030,828	853-1251,989	619-877,684	343-503,390
P2	785-1091,866	779-1129,892	368-601,439	227-350,261
РЗ	834-1067,908	908-1282,1039	534-828,605	288-417,324
	tag	ta4	ta ₅	LR
Pl	227-380,276	150-239,176	100-135,110	0.67-0.73.0.69
P2	159-270,192	112-184,130	90-116,100	0.43-0.53.0.49
РЗ	209-374,261	130-233,156	100-141,113	0.54-0.59,0.56
	BV	sv	BR	
Pl	2.41-2.77,2.63	2.57-2.74,2.65	2.46-3.25,2.94	
P2	2.43-3.47,3.18	3.69-4.61,4.03	2.61-3.73.3.06	
P3	2.70-3.27,3.07	3.14-3.49,3.34	2.71-5.15,3.76	

Hypopygium (Fig. 13K, 28D, 29A-C) - Anal point very small, without setae or microtrichia. T IX with 23-36, 27 (38) setae. Laterosternite IX with 3-10, 6 setae; with anteriolateral spine in nearly all specimens from Colorado, many from Ellesmere Island, and a few from Greenland. Pha (Fig. 13K) 94-123, 106 μ (14) long. TSa 102-127, 114 μ (14) long. About 3 distinct pairs of spines in penis cavity (Fig. 13K). Gc 204-248, 226 μ (14) long; with basal lobe somewhat reduced in size. Gs 86-99, 93 μ (14) long; outer margin rounded. HR 2.34-2.58, 2.44 (14); HV 3.83-4.35, 4.04.

FEMALE IMAGO (n = 10, EXCEPT WHEN OTHERWISE STATED)

TL 2.92-3.39, 3.09 mm. WL 2.11-2.27, 2.21 mm. TL/WL 1.33-1.50, 1.40. WL/Pfe 3.40-3.70, 3.50.

Antenna - Pedicel L/W (microns): 35-50, 43/60-85, 71. 5 or 6 flagellomeres, when only 5 flagellomeres the first constricted about 2/3 from base; L/W of 4 last flagellomeres (microns): 30-38, 33/26-29, 27; 32-38, 35/24-27, 26; 32-40, 35/24-27, 25; 96-124, 115/21-32, 25. AR 0.55-0.69, 0.63.

Head - Temporal setae 1-8, 4; Po 0-4, 1.6; OV 1-3, 1.6; IV 0-3, 1. Clypeus with 6-11, 8 setae. Te 130-170, 149 μ (8) long; 20-29, 25 μ wide; width anterior of PTP 4-7, 6 μ ; distance from apex to PTP 4-16, 11 μ (9). St 130-173, 157 μ long, 40-60, 50 μ wide. 1 or 2, 1.9 ocelli 31-47, 42 μ (9) apart. Coronal suture complete or nearly complete 72-130, 97 μ (13) long. Palp lengths (microns): 29-38, 32; 39-46, 43; 85-103, 96; 81-100, 89; 118-152, 132.

Thorax - Ap 4-7, 6. Dc 2-9, 5; Ac 3-10, 6, in center of scutum; Pa 3-6, 4. Scu 6-9, 7.



FIG. 29. *Hydrobaenus fusistylus* (Goetgh.) comb.n., male hypopygium. A) specimen from Greenland; B) from Alaska; C) from Ellesmere Island; D) *H. f.* var. *octomerus* var.n. from Ellesmere Island.

Wing - C-extension 20-38, 30 μ long. VR 1.02-1.12, 1.08. B with 1 or 2, 1 (8); R with 4-12, 9; R₁ with 2 or 3, 3; R₄₊₅ with 1-4, 2 (9) setae. Squama with 13-27, 18 setae.

Legs - Sp₁ 34-50, 42 μ (9); Sp₂ 30-40, 34 μ and 17-24, 20 μ ; Sp₃ 54-62, 59 μ and 18-22, 20 μ . Wti₁ 34-42, 38 μ ; Wti₂ 34-39, 37 μ ; Wti₃ 42-52, 46 μ (7). Sp₁/Wti₁ 1.00-1.24, 1.13 (9). Comb with 10-12, 11 setae; shortest seta 20-28, 22 μ , longest 40-51, 45 μ . Ps 22-32, 27 μ long; 2 on ta₁ of p₂ and p₃; 0-2, 0.3 on ta₂ of p₂; 0 or 1, 0.1 on ta₂ of p₃. Sch 10-15, 13 on ta₁ of p₃. Lengths (microns) and proportions of legs:

	fe	ti	tal	ta ₂
p_1	589-650,631	711-810,758	478-534,513	276-313,294
P2	638-699 , 677	617-748,693	313-343,333	130-202,190
P3	717-803,751	822-920,867	435-527,479	245-270,258
	tag	ta_4	ta ₅	LR
p_1	184-221,200	116-142,129	76-96,87	0.64-0.72,0.68
p2	123-147,136	82-103,95	72-89,81	0.45-0.51,0.48
P3	184-207,195	97-118,109	78-102,91	0.52-0.58,0.55
	BV	SV	BR	
p_1	2.47-2.81,2.65	2.62-2.81,2.70	2.35-2.91,2.60	(9)
p2	3.14-3.53,3.38	3.99-4.24,4.14	2.27-2.91,2.62	(8)
P3	3.08-3.39,3.21	3.26-3.65,3.38	3.27-3.75,3.56	(8)

Abdomen - Number of setae on T I-VIII as: 18-26, 22; 14-26, 23; 14-21, 18; 15-21, 18; 15-22, 18; 12-22, 17; 10-17, 14; 11-16, 13. Number of setae on S I-VIII as: 0; 0-4, 3; 1-10, 6; 2-12, 9; 7-15, 11; 11-18, 14; 12-16, 14; 18-27, 22.

Genitalia (Fig. 14G, M; 15I, J; 27A-C) - Gc with 7 or 8, 7 setae. T IX (Fig. 27B) divided, with 12-19, 15 setae. Cercus 112-136, 121 μ long. SCa 100-128, 115 μ long, 60-80, 73 μ (8) wide; sclerotized in apical 60-90, 77 μ (9); with microtrichia. SDu with bulbs before the wide opening (Fig. 14G, 27A). Csa with anterior almost circular loop (Fig. 14G), with point and serrations in lateral view (Fig. 15I, J). Lobes of Gp VIII (Fig. 14M) normal.

PUPA (n = 3, EXCEPT WHEN OTHERWISE STATED)

TL 3.74-4.53 mm. TH/AM 1.66-1.89, 1.76 (4).

Cephalothorax - TH (Fig. 16R) 288-331, 298 μ (4) long; 45-70, 58 μ (4) wide; 4.30-7.09, 5.31 (4) times as long as wide; with sparse spinules. Anterior PcS absent in all specimens except 1 where it is present only on one side of thorax. Median PcS 120 μ (2) long, often split, located 18-20 μ (2) from posterior PcS. Posterior PcS 40-45 μ (2) long, located 80-100 μ (2) from TH. FS (Fig. 16H) 90-120, lol μ (4) long; frontal plate distinctly rugulose; frontal warts small, but distinct.

Abdomen (Fig. 18G, N) - PSA on S IV-VIII; longest spinules on IV-VI 4-9 μ , on VII 4-5 μ , on VIII 1 μ long. I with 3, II-VII with 4, VIII with 5 L-setae; 2 on VI, and

all on VII and VIII, filamentous. Anal lobe with 155-178,168 μ (4) long AM and 13-17 setae in fringe; fringe setae 7-260 μ , mostly about 100 μ long; distance from fringe to nearest AM 50-110 μ .

FOURTH INSTAR LARVA (n = 3, EXCEPT WHEN OTHERWISE STATED)

TL 5.52 mm (1). Head capsule length 0.40-0.44 mm (2).

Head - Antenna as in Fig. 190. Length of antennal segments (in microns): 55-62; 19-23; 7-9; 6; 4; 1. AR 1.48-1.76. Basal antennal segment 18-20 μ wide, 2.75-3.33 times as long as wide, distance from base to RO 8-12 μ , to basal mark of seta 7-11 μ , to distal mark of seta 20-21 μ ; Bl 32-34 μ long; LO 7-9 μ long. S I (Fig. 21F) less coarsely plumose than in other species, with about 15-20 branches. Premandible (Fig. 19H) 70-82 μ long, with well-developed accessory tooth. Mandible (Fig. 19D) 130-139 μ long. Maxilla (Fig. 23F) with all LG nonserrated. Median lamella of prementum (Fig. 21M) smooth. Width of 1 median tooth of mentum (Fig. 24F) 11.5-12 μ ; ventromental plate 12.0-13.5 μ wide; V/M 1.04-1.13. Postmentum 160-170 μ long.

Abdomen - Pc 48-50 μ (2) high, 31-32 μ (2) wide. Sa 170-200 μ long. An 675 μ (2) long. Sa/An 0.25-0.30 (2). TA 176 μ (1) long, 66 μ (1) wide.

Hydrobaenus fusistylus var. octomerus var.n.

(Fig. 29D)

This variety differs from the typical form by having only 8 flagellomeres and a slightly different anal point; the pupa has smaller TH and FS, and 3 PcS.

MALE IMAGO (n = 1)

TL 3.73 mm.

Antenna - Flagellomeres L/W (microns): 68/42; 31/38; 30/39; 44/40; 36/42; 53/40; 54/40; 503/40. AR 1.63.

Head — Te 155 μ long. St 72 μ long. Third palpal segment 95 μ long. Otherwise within the variation of the typical form.

Thorax and Wing - Within variation of typical form.

Legs - Within variation of typical form except that all segments of p_1 are about 10% shorter than the shortest legs of typical male, and that LR_1 is 0.64, LR_3 0.52.

Hypopygium (Fig. 29D) - Anal point slightly wider and more truncate than in the typical form. HR 2.31, HV 4.24. Otherwise as in the typical form.

PUPA (n = 1)

TL 4.31 mm. TH/AM 1.46.

Cephalothorax - TH 227 μ long, 28 μ wide, 7.68 times as long as wide. Anterior PcS present, 80 μ long, located 14 μ from median PcS and 21 μ from posterior PcS. FS only 50 μ long. Otherwise as in typical form.

Abdomen - Only 10 or 11 setae in fringe of anal lobe. Otherwise as in typical form.

Remarks

The specimen from Hamilton, Mont., and that with only 8 flagellomeres from Hazen Lake Camp, Ellesmere Island (*H. f. octomerus* var.n.) may both eventually deserve rank of species. However, the only difference found between the specimen from Montana and the remainder is in the much higher AR, 1.92, as opposed to the normal range of 1.21-1.44. D. R. Oliver (personal communication) found that 8 flagellomere forms can often be found in the arctic together with the corresponding normal 13 flagellomere form. Thus, even if several differences exist between the two forms described here it is unlikely they are more than varieties. Additional material of forms with high AR as well as of the variety with 8 flagellomeres, however, is needed to decide their position with greater certainty.

Material Examined

One mature male pupa reared from larva, 1 female reared from larva, 12 pairs in copulation, 5 males, Nedre Midsommer Sö, Greenland, 19/6-4/8/66, Canadian Peary Land Expedition; 2 males reared from larvae, 1 female reared from larva, 1 male reared from pupa (= *H. fusistylus* var. *octomerus* var.n.), 15 males, 2 females, Hazen Camp, Lake Hazen, Ellesmere Island, N.W.T., 20-31/7/58, 26/7-12/8/61, 15/7/65, D. R. Oliver and I. McLaren; 1 pupal exuvium, Stanley FletCher Lake, Somerset Island, N.W.T., 5/66, L. Johnson; 1 male, 2 male hypopygia, UA Botany Plot 4, Cape Thompson, Alaska, 16/7/60, W. C. Hanson; 1 male, Hamilton, Mont., 4/4/60, C. B. Philip; 10 males, North Boulder Creek, near Green Lake 5 (see Elgmork and Sæther 1970, fig. 1), 3650 m above sea level, Colo., 2-3/8/71, O. A. Sæther; 1 larva, Lower Cameron Lake, Waterton National Park, Alta., S. Anderson (ANS, CNC, CUC, FWI, INHSC, JES, USNM).

Ecology and Distribution

The larva lives in arctic and high mountain lakes and ponds. Of the localities collected, only in Montana is there a possibility for two generations a year.

Distribution - Greenland, Northwest Territories (Ellesmere Island (Oliver 1963: 177), Somerset Island), Alaska, Alberta, Montana, Colorado.

Hydrobaenus lapponicus (Brundin) comb.n.

(Fig. 13J; 16G, Q; 18H, O, P; 30)

Trissocladius lapponicus Brundin 1956a: 76 (male, pupa)

The male imago is characterized by the vestigial anal point without microtrichia, the reduced basal lobe of Gc, an AR of 1.0-1.3, squama with 7-18 setae, Ap 3 or 4, only 3-8 Dc, and T IX with 33-48 setae.

The pupa has 2 filamentous L-setae on VI, 4 on VII, and 5 on VIII. The genital sheath ends in a light colored papilla. FS is 120-200 μ long.

MALE IMAGO (n = 3 EXCEPT WHEN OTHERWISE STATED)

TL 3.35-3.84 mm (2). WL 2.08-2.28 mm. TL/WL 1.54-1.69 (2). WL/Pfe 2.73-2.86.

Antenna - Pedicel L/W (microns): 95-103/130-148. Flagellomeres L/W (microns): 60-65/40-44, 30-35/36-41, 30-40/32-40, 27-34/31-40, 28-35/29-40, 32-35/30-40, 33-38/ 27-42, 36-41/26-35, 37-41/24-35, 37-41/22-34, 40-41/23-32, 43-44/22-33, 466-550/ 21-38. AR 1.03-1.19. (Brundin (1956a: 77) gives an AR of 1.10-1.25.)

Head - Temporal setae 8-13, Po 3-6, OV 2-4, IV 3. Clypeus with 4-10 setae. Te 140-160 μ (2) long, 32 μ (2) wide, width anterior of PTP 9 μ (2), distance from apex to PTP 25-30 (2). St 140 (1) long. Palp lengths (microns, n = 2-3): 38-44, 52-62, 98-108, 94-108, 140-160.

Thorax - Ap 3 or 4. Dc 3-8; Ac 6-10 (2), starting at anterior 1/3 of scutum; Pa 5 or 6. Scu 8-14.

Wing - Anal lobe well developed, slightly protruding. C-extension 28 μ (1) long. VR 1.14-1.15 (2). B with 1 (2), R with 6 or 7 (2), R₁ without, R₄₊₅ with 0 or 1 (2) seta. Squama with 15-18 (2) setae. (Brundin (1956a: 77) mentions 7-12 setae on squama.)

Legs - Sp₁ 57-64 μ, Sp₂ 32-40 μ and 26-28 μ, Sp₃ 66-70 μ and 23-25 μ. Wti₁ 42-46 μ,
Wti₂ 44-46 μ , Wti₃ 51-53 μ . Sp₁/Wti₁ 1.23-1.48. Comb with 11 (1) setae; shortest seta 25-28 μ (2), longest 45-52 μ (2). Ps 22-23 μ long; 2 on ta₁ of p₂, 1 or 2 on ta₂ of p₂, 0-2 on ta₁ of p₃, 0 or 1 on ta₂ of p₃. Sch 4 or 5 (2) on ta₁ of p₃. Lengths (in microns) and proportions of legs (n = 2-3):

	fe	ti	tal	ta ₂	tag	ta ₄
P1	761-797	865-920	595-644	325-356	221-251	144-160
p2	785-803	810-840	393-417	221-239	153-165	114-116
P3	859-895	945-1012	509-546	288-313	221-239	130-142
	ta ₅	LR	BV	sv	BR	
Pı	103-107	0.69-0.70	2.70-2.79	2.66-2.73	2.15-2.37	
P2	88-99	0.48-0.50	3.38-3.40	3.94-4.06	2.59-2.71	
P3	98-110	0.54	3.05-3.14	3.49-3.54	2.79-3.23	

Hypopygium (Fig. 30) - Anal point vestigial, barely indicated by an apical area void of microtrichia. T IX with 33-48 setae. Laterosternite IX with 11 or 12 setae. Pha (Fig. 13J) 85-110 μ (2) long. TSa 102-104 μ (2) long. Gc 205-240 μ long, with reduced basal lobe. Gs 104-110 μ long, with rounded outer margin. HR 1.98-2.18; HV 3.25-3.49.

PUPA (n = 8 EXCEPT WHEN OTHERWISE STATED)

TL 4.43-4.63, 4.50 mm. TH/AM 1.37-1.80, 1.68.

Cephalothorax - TH (Fig. 16Q) 294-337, 331 μ long; 55-90, 57 μ wide; 3.74-5.81, 4.93 times as long as wide; spinules sparse and weak. Anterior PcS 100-120, 113 μ (4) long; located 8-14 μ (2) from median PcS and 10-22 μ (2) from posterior PcS. Median PcS 120-180, 150 μ (4) long; located 7-10 μ (2) from posterior PcS. Posterior PcS 50-70, 60 μ (4) long; located 70 μ (2) from TH. FS (Fig. 16G) 120-200, 150 μ (4) long; frontal warts weak.

Abdomen (Fig. 18H, O, P) - PSA on IV-VIII; longest spinules 8-11, 9 μ long on IV-VI; 4-8, 7 μ on VII; 1-3, 2 μ on VIII. I with 3, II-VII with 4, VIII with 5 L-setae; 2 L-setae on VI and all on VII-VIII filamentous. Anal lobe with 178-215, 192 μ long AM, and 14-24, 20 setae in fringe; longest seta in fringe 105-170, 131 μ (5) long, shortest 20-40, 28 μ (5); distance from fringe to nearest AM 40-126, 69 μ . Genital sheath ending in small papilla in both sexes.

LARVA

Not known, but probably similar to that of H. fusistylus.



FIG. 30. Hydrobaenus lapponicus (Brund.) comb.n., male hypopygium.

Material Examined

Lectotype: male with pupal exuvium, Swedish Lapland, L. Brundin (see Brundin 1956a: 77) (SMNH). Paralectotypes: 2 males, 7 exuvia, otherwise as lectotype (SMNH).

Ecology and Distribution

The species is known only from the type localities in Swedish Lapland (Lake Katterjaure and perennial pools near the summit of Norddalsfjäll).

H. lugubris group

Imagines without microtrichia on Te; 9-13 flagellomeres in male, AR lower than 1, and plume reduced; coronal suture of female usually absent, sometimes incomplete but less than 50 μ long; temporals numerous, IV not separated from OV, not much smaller than IV, preoculars present; palp usually reduced; median lobes of antepronotum broad, joined along a broad suture anterior to scutal projection; Scu in more than 1 row; preepisternum and/or anepisternum II with more than 3 setae; TL/WL of male higher than 2.3; Cu₁ straight; LR less than 0.55, tarsal segments broad and shortened; Gs rounded; anal point strong, with microtrichia and setae in apical half; T IX of female large, triangular, undivided; ventrolateral lobe of Gp VIII of same size as dorsomesal lobe; SCa without microtrichia.

Pupa with frontal warts reduced or absent, filamentous L-setae on VI-VIII, 4 filamentous L-setae on VIII, and fringe of anal lobe reduced and nearly always ending before AM.

Larva with first lateral tooth of mentum only slightly narrower or of same width as the low median teeth, S I coarsely plumose and Sa/An higher than 0.6.

Hydrobaenus glacialis Lundström

Hydrobaenus glacialis Lundström 1915: 17 (male), Goetghebuer 1940-50: 208 (male) Psilocerus glacialis (Lundstr.) Kieffer 1923: 3 (generic placement)

The male of this species has not been examined, but according to the description it appears to be distinct from *H. lugubris* and *H. rufus*. The male is blackish brown with white halteres, the last flagellomere is claw-shaped, the palp is 5-segmented, an

anal lobe is apparently present, and ta_4 is longer than ta_5 . The hypopygium is figured by Lundström (1915, fig. 23). The possibility that the species is not a *Hydrobaenus* but belongs to another genus where similar sexual adaptions take place, cannot be excluded.

Hydrobaenus glacialis is described from the island Kotelnyj, one of the New Siberian Islands.

Hydrobaenus lugubris Fries

(Fig. 13A; 14A, I; 15F; 16A, I; 18A; 19A, G, M; 21A, I; 23E; 24J; 31; 32; 33)

Hydrobaenus lugubris Fries 1830: 176 (male, female, pupa, larva), 1831: 1350 (male, female, pupa, larva); Schiner 1864: 595, 601 (male, female); Giard 1904: 164 (male, female, pupa, larva); Kieffer 1906: 11 (male, female, pupa, larva); Edwards 1940: 154 (male); Brundin 1956a: 72 (male); Mozley 1970: 446 (larva) Chironomus occultans Meigen 1830: 254 (male, female); Zetterstedt 1850: 3575 (male, female), 1851-52: 4348 (male, female) Psilocerus occultans (Meig.) Ruthe 1831: 1207 (male, female) Trissocladius griseipennis Goetghebuer 1913: 154 (male, female), 1914: 19 (pupa? not larva), 1932: 51 (male, female, pupa, larva); Potthast 1915: 329 (pupa); Zavřel 1937b: 7, 9 (pupa, larva); Thienemann 1944: 588, 634 (pupa, larva); Chernovskii 1949: 148 (larva); Pankratova 1970: 137 (pupa, larva) Trissocladius praticola Kieffer 1915: 86 (male, female); Zavřel 1937b: 4, 9 (pupa, larva); Thienemann 1944: 588, 634 (pupa, larva) Trissocladius praticola var. boiemicus Kieffer 1922b: 164 (male, female) Trissocladius lugubris (Fries) Goetghebuer 1921: 91 (male, female) Trissocladius (Eutrissocladius) griseipennis Goetghebuer 1940-50: 148 (male, female) nec Trissocladius griseipennis Goetghebuer 1914: 19 (larva, pupa?) nec Goetghebuer 1913

The imago is characterized by the reduced palp, antenna, and legs; the AR of 0.4-0.6; the blackish halteres; and the characteristic male and female genitalia with numerous setae present on the anal point and on T IX in both sexes.

The pupa has vestigial or no "warts" on the frontal plate; none of the L-setae are filamentous on IV and V, while 2 on VI, and all 4 on VII and VIII are filamentous. The longest setae in the fringe of anal lobe are only $40-96 \ \mu$ and the genital sac does not end in a papilla. The TL is $4.5-5.7 \ mm$, TH $0.34-0.41 \ mm$ long.

The larva has an Sa/An of 0.6-0.7, a head capsule length of 0.4 mm, the first lateral teeth of the mentum are nearly as high and wide as the median teeth, and the Pc is about as high as it is wide.

MALE IMAGO (n = 10, EXCEPT WHEN OTHERWISE STATED)

TL 3.55-4.23, 3.76 mm. WL 1.40-1.70, 1.56 mm. TL/WL 2.31-2.63, 2.42. WL/Pfe 1.74-1.89, 1.82.

Antenna - Pedicel L/W (microns): 54-72, 63/94-114, 103(7). 9-12, 10.6(8) flagellomeres, with second and/or second last flagellomere sometimes partially divided; L/W (microns) of first flagellomere 54-76, 67/40-48, 44 (7); of fourth flagellomere 26-34, 30/30-37, 33 (7); of last flagellomere 138-210, 167/29-35, 34 (8). AR 0.46-0.57, 0.52 (7).

Head - Temporal setae (Fig. 31F) 15-30, 21 (9); Po 2-8, 5(9); OV 5-10, 8 (9); IV 6-13, 8 (9); preoculars 0-4, 1 (9). Clypeus with 28-42, 35 (9) setae. Cibarial pump, Te, and St as in Fig. 31E. Te 102-180, 153 μ (7) long; 20-30, 24 μ (8) wide; width anterior of PTP 7-10, 8 μ (8); distance from apex to PTP 2-20, 11 μ (7). St 140-170 μ (3) long, 50-55 μ (2) wide. Vestigial ocelli usually present 34-36 μ (3) apart. Palp (Fig. 31E) lengths (microns, n = 9): 34-48, 39; 46-64, 55; 64-110, 85; 64-90, 76.

Thorax (Fig. 31A) - Ap 16-25, 20; median lobes of antepronotum joined along a broad suture anterior of scutal projection (Brundin 1956a, fig. 28). Dc 26-41, 30; Ac 6-10, 7, starting about at anterior third; Pa 5-9, 7; anterior anepisternum II with 1 or 2, 1 (9) setae; posterior anepisternum II with 1-3, 2 (9) setae; preepisternum with 1-9, 4 setae. Scu 33-45, 40, in double to triple transverse rows.

Wing (Fig. 31B) - Anal lobe reduced. C-extension 20-45, 39 μ (9) long. VR 1.03-1.11, 1.08. B with 1-3, 2 (8); R with 10-17, 12; R₁ with 0-6, 3; R₄₊₅ with 1-6, 3; M with 0 or 1, 0.1; M₁₊₂ with 0-2, 0.3; M₃₊₄ with 0 or 1, 0.1; Cu with 0-12, 4; Cu₁ with 0 or 1, 0.1 setae. Squama with 7-31, 18 setae.

Legs (Fig. 31C, D) - Sp1 50-63, 55 μ ; Sp2 34-45, 41 μ and 34-40, 37 μ (8); Sp3 61-80, 70 μ (9) and 23-34, 30 (8). Wti₁ 56-68, 62 μ ; Wti₂ 57-68, 62 μ ; Wti₃ 66-82, 72 μ . Sp₁/Wti₁ 0.74-1.00, 0.89. Comb with 9-12, 11 (8) setae; shortest seta 23-32, 28 μ (8) long; longest 34-48, 42 μ (8). Ps 20-35, 24 μ (8) long; 0-2, 2 on ta₁ of p₂; 0 or 1, 0 on ta₁ of p₃. SCh none on p₂; 7-14, 8 on ta₁ of p₃. Lengths (in microns) and proportions of legs:

	fe	ti	tal	ta ₂	ta ₃
pl	773-951,852	834-981,911	380-442,411	172-204,180	123-150,133
P2	761-908,841	846-1000,923	3 209-258,238	123-152,133	86-114,100
P3	871-1043,946	846-957,909	282-337,312	147-182,167	123-158,138
	ta4	ta5	LR	BV	
p_1	76-100,89	86-110,102	0.44-0.46,0.45	4.10-4.51,4.33	
P2	57-84,73	76-110,91	0.24-0.27,0.26	4.77-5.40,5.07	
P3	63-90,79	92-107,98	0.33-0.36,0.34	4.29-4.89,4.57	
Р1 Р2 Р3	SV 4.15-4.54,4.2 7.18-7.95,7.4 5.72-6.21,5.9	BR 29 1.00-1.45 42 0.80-1.04 96 0.83-1.27	3,1.14 +,0.89 (9) 7,1.00 (9)		

Hypopygium (Fig. 13A, 32) - Anal point relatively broad and strong with microtrichia at apex. T IX and anal point with 120-166, 144 setae. Laterosternite IX with 10-12, 11 setae. Pha 122-159, 137 μ (9) long. TSa 104-130, 115 μ (9) long. Oral projections of Sa prominent, but narrow. Gc 319-405, 358 μ long; with two median lobes. Gs 135-158, 144 μ long, rounded. HR 2.25-2.62, 2.49; HV 2.47-2.75, 2.62.



FIG. 31. Hydrobaenus lugubris Fries, male. A) thorax; B) wing; C) p_3 ; D) comb and spurs of hind tibia; E) cibarial pump, Te, St and palp; F) apex of head.

FEMALE IMAGO

TL 3.94-4.59, 4.30 mm (4). WL 1.45-1.84, 1.60 mm (9). TL/WL 2.40-2.79, 2.55 (4). WL/Pfe 2.31-2.46, 2.40 (9).



FIG. 32. Hydrobaenus lugubris Fries, male hypopygium.

Antenna - Pedicel L/W (microns): 46, 50, 48 (4)/72-88, 78 (4). 3-5 flagellomeres L/W (microns): 52-100, 80/32-50, 39; 32-50, 40/26-44, 32; 24-34, 29/26-36, 30; 31-56, 39/26-38, 30; 117-150, 134/26-37, 31; of specimen with 3 flagellomeres 100/46, 50/30, 110/28. AR 0.60-0.81, 0.73 (9).

Head - Temporal setae (Fig. 33A) 14-26, 19 (9); Po 4-7, 5 (9); OV 3-9, 6 (9); IV 4-9, 7 (9); preoculars 0-2, 1 (9). Clypeus with 23-33, 28 (9) setae. Te 160-180 μ (3) long, 16-30 μ (3) wide, width anterior of PTP 6-8 μ (2), distance from apex to PTP 10 μ (2). Vestigial ocelli not observed. Coronal suture present in 2 of 8 specimens, 20-50 μ long. Palp lengths (microns, n = 10): 31-46, 38; 32-68; 46; 40-80, 64; 52-95, 76.

Thorax - Ap 14-23, 17 (10). Dc 20-34, 27 (9); Ac 3-8, 6 (4) starting at anterior 1/3; Pa 5-9, 7 (10); anterior anepisternum II with 1 or 2 (2) setae; posterior anepisternum II with 0-2, 1 (4) setae; preepisternum with 0-3 (13) setae. Scu 26-45, 37 (9), in double to triple transverse row.

Wing - C-extension 30-60, 45 μ (6) long. VR 1.03-1.16, 1.10 (8). B with 2 or 3, 2 (6); R with 8-15, 10 (9); R₁ with 3-5, 4 (9); R₄₊₅ with 2-5, 3 (9); M with 0-2, 0.2(9); M₁₊₂ with 0 or 1, 0.1 (9); Cu with 0-6, 1.4 (8) setae. Squama with 6-22, 12 (10) setae.

Legs - Sp₁ 39-54, 46 μ (10); Sp₂ 26-50, 37 μ (10) and 24-34, 29 μ (10); Sp₃ 56-72, 66 μ (10) and 19-34, 26 μ (10). Wti₁ 48-60, 54 μ (10); Wti₂ 49-61, 56 μ (10); Wti₃ 60-70, 66 μ (8). Sp₁/Wti₁ 0.76-0.96, 0.84 (10). Comb with 8-11, 9 (8) setae; shortest seta 20-32, 26 μ (9) long, longest 36-48, 42 μ (9). Ps 16-30, 23 μ (8) long; 0-2, 1.4 (8) on ta₁ of p₂; 0-2, 0.9 (8) on ta₁ of p₃. Sch 0-2, 0.2 (10) on p₂; 7-16, 11 (10) on p₃. Lengths (in microns) and proportions of legs (n = 10):

	fe	ti	tal	ta ₂	ta ₃
pı	589-797,665	687-895,79 1	313-393,359	129-184,158	98-125,115
p ₂	638-785,714	692-859,795	190-245,219	98-134,113	69-106,90
рз	730-908,816	754-920,833	251-319,288	123-159,143	98-135,118
	ta ₄	ta ₅	LR	вV	
p ₁	57-80,74	80-108,95	0.42-0.48,0.46	3.87-4.39,4	•13
p_2	51-74,60	74-100,86	0.21-0.29,0.27	4.43-5.49,5	.00
P_3^-	57-86,70	80-106,95	0.33-0.37,0.35	4.18-4.93,4	- 56
	sv	I	3R		

p ₁	3.81-4.38,4.07	0.98-1.40,1.17
p_2	6.57-7.24,6.90	0.71-1.08,0.89
p3	5.23-6.00,5.73	0.93-1.18,1.04

Abdomen - Number of setae on T I-VIII (n = 3-4) as: 8-23; 17-36; 16-26; 16-26; 20-26; 27-29; 27-36; 26-35, 29. Number of setae on S I-VIII (n = 3-7) as: 0-4; 22-33; 32-39; 34-36; 39-46; 36-45; 30-49, 39; 26-48, 37.

Genitalia (Fig. 14A, I; 15F; 33B, C) - Gc with 8-11, 10 (8) setae. T IX large, triangular, not divided, but with apical notch; with 57-81, 66 (8) setae. Cercus 218-260, 231 μ (7) long. SCa 98-144, 125 μ (7) long; 38-82, 69 μ (6) wide. Csa (Fig. 14A, 15F) without curves, sharp bends, or sharp points. Ventrolateral lobe of Gp VIII (Fig. 14I, 33B) relatively small.



FIG. 33. *Hydrobaenus lugubris* Fries, female. A) apex of head; (B-C) female genitalia, ventral B) and lateral C) views.

PUPA

TL 4.50-5.66, 5.00 mm (11). TH/AM 1.05-1.26, 1.16 (10).

Cephalothorax - TH (Fig. 16I) 343-411, 368 μ (10) long; 64-82, 71 μ (11) wide; 4.18-5.84, 5.20 (10) times as long as wide. Anterior PcS 60-110, 89 μ (4) long; located 10-25, 18 μ (4) from median PcS and 28-42, 33 μ (4) from posterior PcS. Median PcS thicker, 95-150, 116 μ (5) long; located 12-18, 15 μ (4) from posterior PcS. Posterior PcS 50-70, 58 μ (4) long; located 92-130 μ (4) from TH. FS (Fig. 16A) 40-130, 100 μ (9) long; frontal warts vestigial or sometimes apparently absent.

Abdomen (Fig. 18A) - PSA on S IV-VIII; longest spinules 8-10, 9 μ (10) long on IV and V; 5-8, 7 μ (10) on VI; 4-8, 6 μ (10) on VII; 2-5, 4 μ (10) on VIII. I with 3, II-VII with 4, VIII with 4 or 5 (5 in 1 of 11 specimens) L-setae; 2 (or all in 1 of 11 specimens) on VI, and all on VII and VIII filamentous. Anal lobe with 301-350, 321 μ (11) long AM, and 10-22, 18 (11) setae in fringe; longest setae of fringe 40-96, 68 μ (10) long; distance from fringe to nearest AM 0-110, 34 μ (10).

FOURTH INSTAR LARVA

TL 4.14-6.50 mm (2). Head capsule length 0.43-0.49 mm (3).

Head - Antenna as in Fig. 19M. Lengths of antennal segments (microns, n = 9): 64-78, 73; 15-20, 17; 9-11, 10; 7-9, 8; 2-5, 4; 1-2, 1. AR 1.52-1.77, 1.69 (9). Basal antennal segment 19-24, 20 μ (7) wide; 2.92-3.90, 3.60 (7) times as long as wide; distance from base to RO 10-20, 15 μ (7), to basal mark of seta 12-18, 15 μ (6), to distal mark of seta 30-52, 39 μ (8); Bl 33-40, 37 μ (7) long; accessory blade 14-18, 16 μ (5) long. Subapical style of second segment 8-11, 9 μ (6) long; LO 7-9, 8 μ (7) long. S I (Fig. 21A) coarsely plumose, with about 7-10 branches. Premandible (Fig. 19G) 86-110, 94 μ (10) long. Mandible (Fig. 19A) 165-190, 176 μ (8) long. Maxilla (Fig. 23E) occasionally with 1 LG bifid, but not posterior one. Width of 1 median tooth of mentum (Fig. 24J) 9.5-12, 11 μ (6); ventromental plate 14-20, 17 μ (8) wide; V/M 1.27-1.79, 1.48 (6). Postmentum 184-225, 200 μ (8) long.

Abdomen - Pc 46-67, 58 μ (6) high; 40-66, 51 μ (6) wide. Sa 310-400 μ (3) long. An 510-613, 569 μ (4) long. Sa/An 0.61-0.68 (3). TA and PP not measurable.

Remarks

The imagines of *H. lugubris* at first glance seem to be very different from the other species of *Hydrobaenus*. However, most deviating characters are apparently developed as an adaptation to specialized sexual behavior (copulation on the ground or on a quiet water surface). Characters such as reduced antennal plume, reduced number of flagellomeres, reduced palp, thickened and shortened legs, and enlarged hypopygium, are all characters often found in species with similar adaptations (Wülker 1959: 61; Brundin 1966: 186; Sæther 1968: 472). However, the adults also differ in a few additional characters such as the hairy anal point of the male, and the large, triangular, and undivided T IX of the female. These characters are plesiomorphous features and do not justify erection of a separate genus or subgenus. The immatures are typical *Hydrobaenus* in all details.

Material Examined

One hundred sixty seven males, 149 females, numerous exuvia, 13 larvae, meadow ponds, Münster, Westphalen, Germany (BRD), A. Thienemann or H. Gripekoven (as

Trissocladius praticola Kieff.); 4 males, 2 females, 3 exuvia, Damhussjø at Copenhagen, Denmark, 24/3/1914 det., W. Lundbeck; 1 mature female pupa, 1 larva, Danube River, Czechoslovakia, 23/3/66 and 12/6/70, E. Ertlová (as Trissocladius distylus in Ertlová 1970: 292) (CNC, FWI, ZSBS).

Ecology and Distribution

The larva lives in small ponds, puddles, and in the moss of large rivers. Hydrobaenus lugubris appears to have one emergence period lasting from the end of March through April. According to Fries (1830) and Zetterstedt (1850: 3575) the species is often caught in copulation which apparently takes places on a quiet water surface.

Distribution - Sweden and Denmark (Fries 1830: 176; Zetterstedt 1850: 3575), Austria (Schiner 1864: 595), Belgium (Goetghebuer 1913: 154), Holland (Goetghebuer 1940-50: 208), France (Giard 1904: 164), Germany (Kieffer 1915: 86), Czechoslovakia (Kieffer 1922b: 165; Ertlová 1970: 292 as Trissocladius distylus), USSR: European parts and East Siberia (Pankratova 1970: 137).

Hydrobaenus rufus (Kieffer)

(Fig. 17D, H, L; 20C, F, I; 22D, E)

Trissocladius rufus Kieffer 1922b: 163 (male) Trissocladius (Eutrissocladius) rufus Kieff. Goetghebuer 1940-50: 148 (male) Hydrobaenus rufus (Kieff.) Brundin 1956a: 73 (generic placement)

The male of this species has not been examined. However, according to the description the male is characterized by the presence of an anal lobe on the wing and by the reddish coloration. Goetghebuer (1940-50: 148) also mentions in his key that the AR is l.l. This, however, has to be an error as the last flagellomere is said to be slightly longer than the 5 preceeding flagellomeres both in Kieffer's original description and in Goetghebuer's redescription. The hypopygium is said to be identical to that of *H. lugubris*.

The pupa is characterized by the lack of "warts" on the frontal plate; none of the L-setae are filamentous on IV and V, 2 on VI, and all 4 on VII and VIII are filamentous. The longest setae in the fringe of the anal lobe are only 70 μ long, and the genital sac does not end in a papilla. The TL is 4.1 mm, TH 0.33 mm long.

The larva has an Sa/An of 0.6, a head capsule length of 0.33 mm, first lateral teeth of mentum as wide as but slightly lower than the median teeth, and Pc distinctly higher than wide.

PUPA (n = 1)

TL 4.14 mm. TH/AM 1.17.

Cephalothorax - TH (Fig. 17L) 331 μ long, 54 μ wide, 6.19 times as long as wide. Anterior PcS 80 μ long, located 38 μ from median PcS and 41 μ from posterior PcS. Median PcS 120 μ long, split in 2 near base, other branch 70 μ long, located 12 μ from posterior PcS. Posterior PcS 40 μ long, located 60 μ from TH. FS (Fig. 17H) 96 μ long.

Abdomen (Fig. 17D) - PSA on S IV-VIII, longest spinules on IV-VIII (microns): 8, 6, 5, 3, 2, I with 3, II-VIII with 4 L-setae, 2 on VI and all on VII and VIII filamentous. Anal lobe with 282 μ long AM and 16 setae in fringe; fringe setae 30-70 μ long, distance from fringe to nearest AM 20 μ .

FOURTH INSTAR LARVA (n = 1)

TL 4.93 mm. Head capsule length 0.33 mm.

Head - Antenna as in Fig. 20D. Lengths of antennal segments in microns: 62, 14, 8, 8, 3, 1. AR 1.77. Basal antennal segment 18 μ wide, 3.44 times as long as wide, distance from base to RO 14 μ , to basal mark of seta 15 μ , to distal mark of seta 45 μ , Bl not measurable. Subapical style of second segment 10 μ long, LO 8 μ long. S I (Fig. 22D) coarsely plumose with about 10 branches. Premandible 86 μ long. Mandible (Fig. 22E) 150 μ long. Width of 1 median tooth of mentum 10 μ (Fig. 20I), ventromental plate 15 μ wide, V/M 1.50. Postmentum 158 μ long.

Abdomen - Pc 60 μ high, 38 μ wide. Sa 280 μ long. An 460 μ long. Sa/An 0.61. TA 100 μ long, 60 μ wide at base, about half as long as PP.

Remarks

Judging by the male imago and the pupa, *H. rufus* could be a subspecies or merely a form of *H. lugubris*. The larvae however, differ in several details such as the size, the mentum, and the Pc; on the basis of the present material the two species cannot be synonymized.

Material Examined

Pupal exuvium, 1 larva, no data, as *Trissocladius rufus* sp.n. from collection of A. Thienemann. (Kieffer (1922b: 164) states that his species was reared by Zavřel. Most likely this pupa and larva mounted on the same slide originate from Zavřel. The larva is not a larval exuvium and the possibility of incorrect association thus exists.) (ZSBS)

Ecology and Distribution

The species is presently known only from Czechoslovakia (Kieffer 1922b: 164).

H. pilipes group

Imagines with microtrichia on Te; antenna, palp, and legs normal; IV reduced and separated from OV, preoculars absent; coronal suture of female nearly always present and longer than 50 μ ; median lobes of antepronotum joined along narrow suture, meeting at point or separated anterior to scutal projection; Scu in single row; anal point slender, small, but not reduced, without setae or microtrichia in apical half; Gs rounded on outer margin, or with rounded outer angle; T IX of female divided into 2 setigerous protrusions, SCa usually with microtrichia.

Pupa with well-developed frontal warts; usually with 5 filamentous L-setae on VIII (except H. distylus and H. spinnatis).

Larva with coarse S I, first lateral tooth of mentum clearly narrower and lower than median teeth, Sa/An higher than 0.3.

This group can be divided into 2 subgroups based on the pupa, the H. pilipes subgroup and the H. distylus subgroup.

H. pilipes subgroup

Pupa with filamentous L-setae on segment VI, fringe of anal lobe always reaching AM.

Hydrobaenus pilipes (Malloch)

(Fig. 13B, C; 14D, E; 15A-C; 16B, J; 18B, I; 19J; 21H; 24A-C; 34; 35B-D; 36C-L; 37A-B)

Orthocladius (Orthocladius) pilipes Malloch 1915: 522 (male); Frison 1927: 174
 (designation of lectotype)
Orthocladius grandis Kieffer 1921: 101 (male, female), 1924: 63 (male, female) syn.nov.
Orthocladius grandis var. tristylus Kieffer 1924: 63 (male, female)
Orthocladius grandis var. ciliatipes Kieffer 1924: 63 (male, female)
Orthocladius grandis var. grossus Kieffer 1924: 64 (male, female)
Orthocladius grandis var. barbatipes Kieffer 1924: 64 (male, female)
Orthocladius grandis var. permixtus Kieffer 1924: 64 (male, female)
Orthocladius grandis var. permixtus Kieffer 1924: 64 (female) (by error the authorship is assigned to Thienemann)
Trissocladius grandis (Kieff.) Thienemann 1935: 216 (generic placement), 1944: 588
 (pupa); Zavřel 1937b: 9 (pupa); Brundin 1956a: 76 (male); Mozley 1970: 433 (larva)

Trissocladius grandis var. ciliatipes (Kieff.) Thienemann 1935: 216 (generic placement), 1944: 588 (pupa, as synonym of *T. grandis*); Zavřel 1937b: 9 (pupa) Trissocladius grandis var. grossus (Kieff.) Thienemann 1935: 216 (generic placement),

1944: 588 (pupa, as synonym of *T. grandis*); Zavřel 1937b: 9 (pupa) Trissocladius grandis var. tristylus (Kieff.) Thienemann 1935: 216 (generic placement) Trissocladius grandis var. barbatipes (Kieff.) Thienemann 1935: 216 (generic placement) Spaniotoma (Orthocladius) nivoriunda Johannsen 1937: 64 (pupa, ?larva) nec Chironomus

(= Diamesa) nivoriundus Fitch 1847: 243, nec Orthocladius nivoriundus Johnson 1900: 627; Johannsen 1905: 274, nec Orthocladius johannseni Sublette 1967: 504 (new name for Orthocladius nivoriundus Johannsen nec Fitch), nec Trissocladius johannseni (Sublette) 1970: 50 (not Sæther 1969: 45 (= H. pilipes) see below). Johannsen must have had a mixed population of H. johannseni and H. pilipes because his pupal descriptions do not fit H. johannseni, but H. pilipes.

Chaetocladius crassistylus Brundin 1947: 27 (male), 1956a: 128 (as synonym of Trissocladius grandis)

Hydrobaenus (Hydrobaenus) pilipes (Mall.) Johannsen 1952: 23, male

Trissocladius johannseni Sæther 1969: 45 (generic placement) nec Sublette 1967: 504 (new name for *O. nivoriundus* Joh. nec Fitch). The identification of the female reared from larva was based on the description by Johannsen (1937; 64) of the immature stages.

Hydrobaenus pilipes (Mall.) Stahl 1975: 69 (ecology)

? Dactylocladius nivoriundus Kieffer 1917: 359 nec Fitch

nec Orthocladius grandis as synonym of Orthocladius glabripennis Goetgh.

Goetghebuer 1932: 89; 1940-50: 45; Edwards 1940: 154 (see Brundin 1956a: 74, 100)

The imagines are characterized by having 8-19 Ap, 11-27 Ac starting at anterior 1/8-1/4 of the scutum, 4-13 Pa, the squama with 19-57 setae, and T IX with 37-75 setae in the male and 19-30 setae in the female. The male has an AR of 2.0-2.8, BR₁ 4.0-6.3, BR₂ 2.3-3.8, BR₃ 3.9-5.4, anal point small to very small, and Gs usually with an indication of a rounded outer angle. The female has 5 or 6, usually 6 flagel-lomeres; a WL/Pfe of 2.9-3.5; a BV₁ of 3.6-4.3; 23-37 SCh; S VII with 20-56 setae; S VIII with 23-44 setae; Gc with 17-31 setae; SDu with weak bulbs before a common opening; and Csa with sharply pointed mediolateral branch.

The pupa is 4.5-7.4 mm long, with a TH of 0.36-0.51 mm; it has 2-4 filamentous L-setae on VI, usually 4 on VII and usually 5 filamentous L-setae on VIII. The 2 anterior PcS are of approximately the same length.

The larva has a postmentum length of $209-252 \mu$, AR 1.8-2.6, VM 1.4-1.9, Sa/An 0.5-0.8, the first lateral tooth of the mentum is distinctly shorter than the median teeth, the small accessory tooth of the mandible is usually distinct, and the mandible is slightly less than twice as long as the premandible.

MALE IMAGO

TL 3.99-6.11, 5.13 mm (23). WL 1.92-3.45, 2.75 (35). TL/WL 1.70-2.18, 1.94 (23). WL/Pfe 2.64-3.09, 2.76 (24).

Antenna - Pedicel L/W (microns): 100-162, 133/150-210, 183 (24). Flagellomeres L/W (microns, n = 24-25): 60-85, 71/44-78, 57; 20-38, 27/44-65, 55; 19-32, 25/46-63, 55; 20-30, 24/50-65, 56; 18-30, 24/42-70, 56; 20-28, 24/42-69, 54; 20-30, 24/42-69,

54; 22-30, 25/40-68, 53; 23-32, 26/39-65, 51; 21-32, 26/38-67, 50; 24-32, 27/38-65, 48; 24-34, 28/37-64, 47; 644-994, 800/36-64, 47. AR 2.02-2.78, 2.38 (42).

Head - Temporal setae 8-19, 14 (27); Po 4-12, 7 (27); OV 2-6, 3 (27); IV 1-6, 3 (27). Clypeus with 8-22, 16 (27) setae. Te 175-250, 215 μ (24) long; 39-70, 53 μ (24) wide; width anterior of PTP 10-20, 14 μ (24); distance from apex to PTP 25-64, 47 μ (24). St 150-240, 195 μ (24) long; 58-106, 84 μ (22) wide. Ocelli 0-2, 1 (24); when present 5-18, 9 μ (12) apart. Palp lengths (microns, n = 24-26): 30-66, 47; 55-106, 69; 110-190, 142; 98-190, 129; 125-226, 180.

Thorax - Ap 9-19, 13 (27); median lobes in contact anterior of scutal projection. Dc 6-17, 11 (30); Ac 11-22, 20 (25) starting at anterior 1/6-1/4 of scutum; Pa 4-13, 8 (39). Scu 8-19, 13 (27).

Wing - Anal lobe well developed, very strongly protruding. C-extension 35-90, 55 μ (25). VR 1.04-1.12, 1.07 (25). B with 1 or 2, 1 (23); R with 3-9, 7 (27); R₁ with 0 or 1 (27); R₄₊₅ without setae. Squama with 19-51, 36 (41) setae.

Legs (n = 23-24, except when otherwise stated) - Sp₁ 73-122, 100 μ ; Sp₂ 40-70, 52 μ and 24-48, 34 μ (10); Sp₃ 70-104, 91 μ and 20-46, 35 μ (21). Wti₁ 46-84, 62 μ ; Wti₂ 50-75, 61 μ ; Wti₃ 54-92, 70 μ . Sp₁/Wti₁ 1.25-2.04, 1.64. Comb with 9-14, 12 setae; shortest seta 22-38, 29 μ long; longest 40-66, 57 μ . Ps 20-42, 34 μ long; 2 or 3, 2 on ta₁ of p₂; 0-2, 2 on ta₁ of p₃; 0 or 1, 1 on ta₂ of p₂; 0 or 1 on ta₂ of p₃. SCh 5-12, 9 on ta₁ of p₃. Lengths (in microns) and proportions of legs:

	fe	ti	tal	ta ₂
P1	711-1202,967	877-1472,1168	589-1116,827	331-577,443
P2	711-1214,1004	810-1362,1104	368-675,526	209-356,286
P3	785-1398,1132	945-1656,1322	527-920,711	307-515,398
	tag	ta4	ta ₅	I,R
pl	233-460,342	152-343,225	104-165,129	0.65-0.76,0.69
P2	150-282,219	104-227,156	94-147,116	0.45-0.53,0.48
P3	221-423,303	130-227,176	95-165,132	0.49-0.57,0.54
	BV	SV	BR	
P1	2.33-2.94,2.60	2.40-2.84,2.60	4.00-6.33,	4.75 (39)
p2	3.09-3.63,3.39	3.65-4.31,4.02	2.29-3.82,	3.01 (39)
P3	2.87-3.35,3.14	3.25-3.86,3.45	3.91-5.40,	4.58 (38)

Hypopygium (Fig. 13B-C, 34, 35B-D) - Anal point small to very small, triangular to parallel sided. T IX with 37-75, 53 (39) setae. Laterosternite IX with 10-15, 13 (10) setae; often with small anteriolateral spine. Pha (Fig. 13B, C) 118-174, 143 μ (21) long. TSa 105-196, 147 μ (21) long. Gc 253-370, 313 μ (25) long; basal lobe posteriorly directed; without microtrichia at extreme apex. Gs 91-142, 125 μ (25) long; usually with a rounded outer angle, but without projection or sharp pointed corner. HR 2.26-2.86, 2.50 (25); HV 3.62-4.67, 4.15 (23).



FIG. 34. *Hydrobaenus pilipes* (Mall.), male hypopygium. A) specimen from hatchery pond, Gavins Pt. Nat. Fish Hatchery, S.Dak.; B) from Ed's Creek, S.Dak.; C) from Old Chelsea, Que.; D) from Gavins Pt. Nat. Park, S.Dak.



FIG. 35. *Hydrobaenus* spp., male hypopygium. A) *H. scapulapilosus* sp.n. (B-D) *H. pilipes* (Mall.): B) specimen from the river Fulda, Germany; C) from Plön, Germany; D) from Selenter See, Germany.

FEMALE IMAGO (n = 13-14, EXCEPT WHEN OTHERWISE STATED)

TL 3.25-5.66, 4.54 mm. WL 2.16-3.57, 2.89 mm. TL/WL 1.28-1.65, 1.55. WL/Pfe 2.89-3.54, 3.28.

Antenna - Pedicel L/W (microns): 44-73, 60/80-103, 93. 5 or 6, usually 6, flagellomeres, when 5 flagellomeres first 1 constricted at slightly less than twothirds from base. Flagellomere 1 when 5 flagellomeres or 1 plus 2 when 6 flagellomeres L/W (microns): 90-140, 110/35-46, 42. Last 4 flagellomeres L/W (microns): 38-54, 48/31-46, 38; 38-63, 52/30-44, 37; 43-72, 60/30-43, 36; 123-180, 154/23-34, 31. AR 0.49-0.79, 0.59(15).

Head - Temporal setae (Fig. 36C, D) 4-15, 11; Po 3-8, 5; OV 1-6, 3; IV 0-4, 2; IV slightly more than half as long as OV and Po. Clypeus with 10-27, 17 setae. Te 170-214, 192 μ long; 30-55, 42 μ wide; width anterior of PTP 8-15, 11 μ ; distance from apex to PTP 20-39, 29 μ . St 154-206, 192 μ long; 40-110, 73 μ wide. 1 or 2, 1.9 ocelli; 32-78, 51 μ apart. Coronal suture incomplete, 95-170, 135 μ long. Palp lengths (microns): 36-52, 46; 58-68, 64; 90-150, 128; 90-148, 119; 136-197, 169.

Thorax - Ap 8-19, 13. Dc 7-14, 10; Ac 12-27, 19, starting at anterior 1/8-1/4 of scutum; Pa 6-8, 7. Scu 11-26, 16.

Wing - C-extension 58-110, 84 μ long. VR 1.01-1.12, 1.07. B with 1-5, 2; R with 11-22, 15; R₁ with 3-10, 5; R₄₊₅ with 3-20, 7 setae. Squama with 19-57, 39 setae.

Legs - Sp₁ 52-86, 68 μ (11); Sp₂ 38-62, 47 μ (11) and 26-45, 34 μ (11); Sp₃ 70-107, 90 μ and 28-42, 35 μ (10). Wti₁ 43-70, 60 μ ; Wti₂ 48-77, 63 μ ; Wti₃ 56-85, 73 μ . Sp₁/Wti₁ 1.00-1.26, 1.15 (11). Comb with 10-12, 11 (12) setae; shortest seta 28-36, 31 μ (11) long; longest 52-64, 57 μ (11). Ps 25-40, 34 μ long; 2-4, 2 on ta₁ of p₂; 2 or 3, 2 on ta₁ of p₃; 0-2, 1 on ta₂ of p₂; 0 or 1, 0 on ta₂ of p₃. SCh 0 or 1, 0.2 on ta₁ of p₂; 23-37, 29 on ta₁ of p₃. Lengths (in microns) and proportions of legs:

P1 656-1067,882 932-1343,1145 595-828,708 288-476,3 P2 773-1153,961 810-1312,1087 399-570,481 202-301,2 P3 865-1349,1109 987-1582,1315 564-816,684 313-460,3	67 45 87
P2 773-1153,961 810-1312,1087 399-570,481 202-301,2 P3 865-1349,1109 987-1582,1315 564-816,684 313-460,3	45 87
P3 865-1349,1109 987-1582,1315 564-816,684 313-460,3	87
	07
ta_3 ta_4 ta_5 LR	
P1 209-325,272 144-210,175 92-129,115 0.56-0.71	,0.62
P2 140-209,171 90-147,113 80-116,101 0.40-0.58	,0.45
P3 233-356,292 129-178,155 94-135,116 0.47-0.59	,0.52
BV SV BR	
P1 2.45-3.21,2.96 2.62-3.22,2.88 1.60-2.65,2.00 (10)	
P2 3.61-4.29,4.00 3.23-4.72,4.26 1.67-2.38,1.98 (10)	
P3 2.58-3.54,3.26 3.14-3.89,3.54 2.00-3.68,3.12 (11)	



FIG. 36. *Hydrobaenus* spp., females. (A-B) *H. scapulapilosus* sp.n.: A) apex of head; B) female genitalia, ventral view. (C-L) *H. pilipes* (Mall.): C-D) apex of head; E) female genitalia lateral view; F-I) variation of cerci; J-L) variation of SCa.

Abdomen - Number of setae on T I-VIII as: 52-106, 74; 37-87, 60; 31-69, 44; 17-57, 39; 21-52, 36; 20-44, 33; 16-39, 28; 19-37, 30. Number of setae on S I-VIII as: 0-3, 0.4; 2-8, 5; 4-15, 9; 9-19, 13; 13-25, 19; 17-36, 27; 20-56, 37; 23-44, 34.

Genitalia (Fig. 14D-E, J; 15A-C; 36E, J-L; 37A-B) - Gc with 17-31, 23 setae. T IX divided, with 19-30, 27 setae. Cercus (Fig. 36E-I) 104-216, 177 μ long; highly variable as in other members of the genus. SCa (Fig. 36E, J-L; 37A) 146-235, 195 μ (11) long; 85-101, 93 μ (11) wide; sclerotized in oral 102-175, 138 μ (11); ovoid to cylindrical, sometimes constricted, with microtrichia. SDu with weak bulbs before common wide opening. Csa (Fig. 14D, E; 15A-C) with sharply pointed mediolateral branch, visible both in lateral and ventral views. Lobes of Gp VIII (Fig. 14J) normal.

PUPA

TL 4.53-7.41, 5.93 mm(20). TH/AM 1.17-1.41, 1.27(16).

Cephalothorax - TH (Fig. 16J) 356-503, 446 μ (18) long; 55-120, 96 μ (20) wide; 3.79-6.47, 4.81 (18) times as long as wide. Anterior PcS 90-132, 112 μ (13) long; located 6-30, 14 μ (10) from median PcS and 8-44, 23 μ (10) from posterior PcS. Median PcS 110-140, 126 μ (15) long; located 4-18, 11 μ (10) from posterior PcS. Posterior PcS 50-90; 66 μ (13) long; located 90-150, 127 μ (10) from TH. FS (Fig. 16B) 75-145, 106 μ (17) long; frontal warts distinct.

Abdomen (Fig. 18B, I) - PSA on S IV-VIII; longest spinules on IV and V 8-16, 11 μ (19) long; on VI 5-11, 8 μ (19); on VII 4-10, 6 μ (19); on VIII 1-4, 2 μ (17) long. I with 3; II with 3 or 4; III-VI with 4; VII with 3 or 4, 4 (20); VIII with 3-5, 4.8 (21) L-setae; 2-4, 2.4 (20) filamentous on VI, all filamentous on VII, and all except 1 seta in 1 of 21 specimens filamentous on VIII. Anal lobe with 276-405, 344 μ (18) long AM, and 25-36, 30 (20) setae in fringe; longest seta in fringe 150-240, 190 μ (14) long, shortest 15-110, 62 μ (14); 0-6, 3 (17) setae located between, or mediad, of bases of AM.

FOURTH INSTAR LARVA (n = 11-12, EXCEPT WHEN OTHERWISE STATED)

TL 5.26-8.75, 6.68 mm (6). (According to Mozley (1970: 435) the total length may reach 12 mm.) Head capsule length 0.49-0.61, 0.54 mm (9).

Head - Antenna (Mozley 1970, fig. 5) as in *H. scapulapilosus* sp.n. (Fig. 19P). Lengths of antennal segments in microns: 72-92, 82; 16-22, 19; 6-10, 8; 6-9, 8; 3-6, 4; 0.7-1.5, 1.2. (Mozley found 80-106, 92 μ (23) for basal segment and 19-27, 23 μ (23) for second segment.) AR 1.83-2.26, 2.05 (12) (Mozley found 1.93-2.61, 2.15 (23).) Basal antennal segment 21-26, 23 μ wide; 3.08-5.00, 3.58 times as long as wide; distance from base to RO 10-22, 14 μ (10); to basal mark of seta 11-30, 21 μ (6); to distal mark of seta 37-62, 51 μ (8); B1 33-40, 36 μ (9) long; accessory blade 12-14 μ (2) long. LO 7-10, 8 μ (7) long. S I (Fig. 21H; Mozley 1970, fig. 4) with 7-12 branches. Premandible (Fig. 19J) 86-105, 97 μ long; with accessory tooth usually well developed. Mandible (Mozley 1970, fig. 6) 145-191, 170 μ long; slightly



FIG. 37. *Hydrobaenus* spp., female genitalia. (A-B) *H. pilipes* (Mall.), ventral A) and dorsal B) view; (C-D) *H. johannseni* (Subl.) comb.n., ventral C) and dorsal D) view.

less than twice as long as premandible. Maxilla (Mozley 1970, fig. 7) as in *H.* scapulapilosus sp.n. (Fig. 23A) with posterior LG serrated or bifid. Width of 1 median tooth of mentum (Fig. 24A-C) 10-14, 11 μ ; ventromental plate 15-24, 19 μ wide; V/M 1.38-1.85, 1.66. Postmentum 209-240, 222 μ long. (Mozley found 214-252, 235 μ (26).)

Abdomen (Mozley 1970, fig. 2) - Pc 70-81, 75 μ (9) high; 50-56, 52 μ (5) wide. Sa 345-600, 479 μ (9) long. An 580-834, 707 μ (9) long. Sa/An 0.52-0.84, 0.68 (9). TA 160-185 μ (2) long. PP 230 μ (1) long.

Remarks

Hydrobaenus pilipes is an extremely variable species with the largest specimen about 1.6 times as large as the smallest. The largest specimens are from Grosser Plöner See, a bay of the River Fulda in Germany, and from South Dakota. The smallest specimens are from Old Chelsea, Que., and South Dakota. Although the variation, particularly in the male hypopygium, seems to indicate there may be more than one species involved, most variation can be found within the same population.

Material Examined

Lectotype: male, Urbana, Ill., (INHSC No. 14781), 21/3/1889, J. Martin (slide 2997). Paralectotypes: 3 males, same data as for lectotype (INHSC). Other material: 4 males reared from larvae, pond, 2 males reared from pupae, submerged leaves, 6 pairs in copula, laboratory, all Gavins Point National Fish Hatchery, Yankton, S.D., 15-20/ 4/68, 5/2-5/4/71, P. L. Hudson; 2 males, 2 females, Laboratory window, North Central Reservoir Investigations, Yankton, S.D., 3/4-4/5/71, P. L. Hudson; 2 males reared from larvae,10 males, 10 females, 3 exuvia, Yankton, S.D., 4/68, 16/4/69, 30/3/70, spring 72, P. L. Hudson; 3 males reared from larvae, 2 females reared from larvae, Platte Creek, Platte, S.D., 12/4/68, 12/4-10/5/70, P. L. Hudson; 2 females reared from larvae, 5 males, Lake Francis Case, Platte Bay, Platte, S.D., 14/4-18/5/67, P. L. Hudson; 1 male reared from larva, 1 female reared from larva, periphyton, Lewis and Clark Lake, S.D., 20/4-10/6/71, P. L. Hudson; 1 male, Missouri River, Clay County Park, Vermillion, S.D., 16/4/72, P. L. Hudson; 3 males, white light trap, Hart Memorial Woods, Mahomet, Ill., 20-25/3/66, M. W. Saunderson; 3 larvae, shore to 15 m, Cayuga Lake, N.Y., March-April 74, NUS Corporation; 1 larva, Apalachicola River at Hwy. 20, Liberty Co., Fla., 13/3/73, P. H. Carlson; l male reared from larva, 3 females reared from larvae Bear Creek at Carlsbad Springs, Ont., 19/4-17/5/66 J. Martin and A. L. Hamilton; 1 male, inside blackfly cage on drainage ditch, Stittsville, Ont., 30/4/50, J. R. Vockeroth; 1 male, 1 female, Old Chelsea, Que., 24/4/58, J. R. Vockeroth; 1 male reared from larva, 14 larvae, 2 pupae Selenter See, W. Germany, 1969 (male 16/4/69), F. Reiss and S. Mozley; l male reared from pupa, 4 exuvia, Gulnensee, W. Germany, 3/55, I. Müller-Liebenau; l male reared from pupa, l male, River Fulda, W. Germany, 19/3/54, E. J. Fittkau; 4 larvae, 3 - 4/36, A. Meuche. (All)

Ecology and Distribution

The larvae live in the littoral zone of lakes and ponds and in slow flowing rivers or large streams. The species has been found in oligotrophic to eutrophic lakes as well as in polytrophic lakes (Mozley 1970: 447). The larvae aestivate in the second instar forming a circular, canopylike structure around themselves (Hudson 1971: 162). The emergence period is very early spring and there is only one generation a year. The mating invariably takes place on a substratum in the end to end position (Stahl 1975: 70).

Distribution - Illinois (Malloch 1915: 522; Stahl 1975: 69), New York (Johannsen 1937 as Spaniotoma nivoriunda in part), Florida, Quebec, Ontario (Sæther 1969: 45 as Trissocladius johannseni, South Dakota (Hudson 1971: 167), Poland (Kieffer 1921: 101), Germany (Kieffer 1924: 64; Thienemann 1935: 216; Nietzke 1938: 48, 56, 69 (as Trissocladius glabripennis, see Mozley 1970: 447); Humphries 1938: 541; Meuche 1939: 481; Thienemann 1954: 266, 361, 457, 461, 474; Ehrenberg 1957: 123; Mozley 1970: 28; Lehmann 1971: 490), Sweden (Brundin 1947: 27 as Chaetocladius crassistylus, 1949: 733; Wiederholm 1974a: 37, 1974b: 37).

Hydrobaenus scapulapilosus sp.n.

(Fig. 13D; 14H, O; 15G; 16K; 19I, P; 21E, K; 23A; 24E; 35A; 36A, B)

The imagines are characterized by having 10-18 Ac starting at anterior 1/8-1/3 of the scutum, 12-25 Pa, a squama with 17-47 setae, and T IX with 39-68 setae in the male and 18-49 setae in the female. The male has an AR of 1.9-2.0, BR₁ about 2.5, BR₂ 2.5-3.2, and BR₃ 3.4-3.9, the anal point is moderately small, and the Gs has a rounded outer angle. The female has 6 flagellomeres, a WL/Pfe of 2.3-2.7, a BV₁ of 2.7-3.0, 29-31 SCh, S VII has about 65 setae, S VIII about 51 setae, Gc 24-35 setae, and the Csa is relatively narrow with a sharply pointed mediolateral branch.

The pupa is 5.9-6.6 mm long with a 0.42-0.51 mm long TH, has 2 or 3 filamentous L-setae on VI, 4 on VII, and 5 on VIII. The 2 anterior PcS are approximately the same length. The pupa is indistinguishable from that of H. pilipes Mall.

The larva has a postmentum length of $214-240 \mu$, AR 1.9-2.0, V/M 1.8-2.0, Sa/An 0.6-0.7, the first lateral tooth of the mentum is distinctly shorter than the median teeth, the small accessory tooth of the mandible is indistinct, and the mandible is twice as long as the premandible.

MALE IMAGO (n = 2, EXCEPT WHEN OTHERWISE STATED)

TL 4.75-4.85 mm. WL 2.52-2.61 mm. TL/WL 1.86-1.88. WL/Pfe 2.67-2.76. Antenna - Pedicel L/W (microns): 130-140/180. Flagellomeres L/W (microns):

70-80/50, 28-32/48-52, 28-30/50, 25/48-50, 22-26/46-49, 23-26/46, 23-28/43-45, 25-31/ 39-44, 28-29/37-42, 27-28/35-40, 27-29/36-39, 27-33/36-38, 724/37-38. AR 1.90-2.03.

Head - Temporal setae 12, Po 5 or 6, OV 3 or 4, IV 3. Clypeus with 11-15 setae. Te 170-220 μ long, 41-54 μ wide, width anterior of PTP 11-20 μ , distance from apex to PTP 36-42 μ . St 180-200 μ long, 62-100 μ wide. Ocelli present in 1 of 2 specimens, 12 μ apart. Palp lengths (microns): 42-48, 74, 148, 132, 169-196.

Thorax - Ap 9 or 10, median lobes in broad contact anterior of scutal projections. Dc 10-14, Ac 18 (1) starting at anterior 1/4 of scutum, Pa 12-14. Scu 15 or 16.

Wing - Anal lobe well developed, strongly protruding. C-extension 50 μ long. VR 1.06-1.07. B with 1, R with 8, R₁ and R₄₊₅ without setae. Squama with 31-47 setae.

Legs - Sp₁ 88-100 μ , Sp₂ 56 μ and 30 μ (1), Sp₃ 104 μ (1) and 30 μ . Wti₁ 56.63 μ , Wti₂ 57-62 μ , Wti₃ 65-70 μ . Sp₁/Wti₁ 1.57-1.59. Comb with 11-13 setae, shortest seta 28 μ , longest 56-65 μ . Ps 26-38 μ long; 3 or 4 on ta₁ of p₂, 2 on ta₁ of p₃, 1 or 2 on ta₂ of p₂, 0 or 1 on ta₂ of p₃. SCh 6-10 on ta₁ of p₃. Lengths (microns) and proportions of legs:

	fe	ti	tal	ta ₂	ta ₃	ta ₄
\mathbf{p}_1	945	1121-1190	779-895	417-497	294-374	172~215
p2	957-1018	1055-1122	503-577	270-307	196-245	129-159
P3	1043-1098	1251-1325	675-754	380-454	294-356	147-190
	ta ₅	LR	BV	sv	BR	
\mathbf{p}_1	123-135	0.69-0.75	2.51-2.80	2.39-2.66	5 2.50	
P2	110-123	0.48-0.51	3.31-3.50	3.71-4.00	2.50-	3.24
P3	123-135	0.54-0.57	2.80-3.15	3.21-3.40	3.75~	3.90

Hypopygium (Fig. 35A) - Anal point moderately small, parallel sided, or tapering to point. T IX with 39-68 setae. Laterosternite IX with 14 or 15 setae. Pha 120-150 μ long. TSa 130-134 μ long. Gc 263-330 μ long, basal lobe posteriorly directed without microtrichia at extreme apex. Gs 131-150 μ long. HR 2.16-2.20, HV 3.23-3.63.

FEMALE IMAGO (n = 2, EXCEPT WHEN OTHERWISE STATED)

TL 4.43-4.49 mm. WL 2.38-2.92 mm. TL/WL 1.54-1.86. WL/Pfe 2.33-2.74.

Antenna - Pedicel L/W (microns): 70-80/90-95. Flagellomeres L/W (microns): 68-82/ 44, 40-57/38-39, 44-60/34-40, 44-60/37-40, 54-63/39-40, 138-168/32-39. AR 0.54.

Head - Temporal setae (Fig. 36A) 14 (1), Po 4 (1), OV 6 (1), IV 4 (1). Clypeus with 16 or 17 setae. Te 220 μ (1) long, 45 μ (1) wide, width anterior of PTP 11-15 μ , distance from apex to PTP 12-24 μ . St 180-224 μ long, 86 μ (1) wide. 1 or 2 ocelli, 13-18 μ from coronal suture. Coronal suture nearly complete, 100-112 μ long. Palp lengths (microns): 44-58, 70-80, 106-152, 96-148, 170-234.

Thorax - Ap 9. Dc 10-18, Ac 10-15 starting at anterior 1/3 of scutum, Pa 13-25, anepisternum II with 1 or 2 setae, preepisternum with 0 or 1 seta. Scu 14-17.

Wing - C-extension 80-84 μ long. VR 1.09. B with 2-4, R with 16-18, R1 with 4 or 5, R4+5 with 9-11, An with 0 or 1 seta. Squama with 17-45 setae.

Legs - Sp₁ 60-70 μ , Sp₂ 46-50 μ and 30-50 μ , Sp₃ 90-95 μ and 28-38 μ . Wti₁ 57-58 μ , Wti₂ 58-70 μ , Wti₃ 78-80 μ . Sp₁/Wti₁ 1.03-1.23. Comb with 12 or 13 setae, shortest seta 28-30 μ , longest 45-62 μ . Ps 20-38 μ long; 3 on ta₁ of p₂, 2 or 3 on ta₁ of p₃, 1 or 2 on ta₂ of p₂, 0 or 1 on ta₂ of p₃. Sch 29-31 on ta₁ of p₃. Lengths (microns) and proportions of legs:

fe	ti	tal	ta ₂	ta ₃	ta4
871-1055	1049-1251	687-883	350-497	270-350	159-210
828-1067	1018-1116	466-582	233-239	165-233	110-152
932-1165	1196-1460	601-785	350-466	258-368	135-190
	fe 871-1055 828-1067 932-1165	fe ti 871-1055 1049-1251 828-1067 1018-1116 932-1165 1196-1460	fe ti ta ₁ 871-1055 1049-1251 687-883 828-1067 1018-1116 466-582 932-1165 1196-1460 601-785	fe ti ta ₁ ta ₂ 871-1055 1049-1251 687-883 350-497 828-1067 1018-1116 466-582 233-239 932-1165 1196-1460 601-785 350-466	fe ti ta ₁ ta ₂ ta ₃ 871-1055 1049-1251 687-883 350-497 270-350 828-1067 1018-1116 466-582 233-239 165-233 932-1165 1196-1460 601-785 350-466 258-368

	ta ₅	LR	BV	SV	BR
p_1	98-116	0.65-0.71	2.72-2.97	2.61-2.79	1.60-1.75
p2	88-122	0.46-0.52	3.71-3.87	3.75-3.96	1.77-1.81
p3	104-140	0.50-0.54	2.93-3.22	3.34-3.54	2.08-2.29

Abdomen - Number of setae on T I-VIII as: 85-100, 48-86, 17-64, 7-48, 4-55, 9-55, 19-44, 18-41. Number of setae on S I-VIII as: 2-6, 4-6, 6-16, 5-15, 5-30, 3-45, 7-65, 30-51.

Genitalia (Fig. 14H, O; 15G, 36B) - Gc with 24-35 setae. T IX divided, with 18-49 setae. Cercus 140-180 μ long. SCa 180-190 μ long, 105-130 μ wide, sclerotized in oral 138-140 μ , ovoid, with microtrichia. Csa (Fig. 14H, 15G) with sharply pointed mediolateral branch visible both in ventral and lateral view, Csa narrow. Lobes of Gp VIII normal (Fig. 140).

PUPA (n = 3, EXCEPT WHEN OTHERWISE STATED)

TL 5.91-6.64 mm. TH/AM 1.26-1.54.

Cephalothorax - TH (Fig. 16K) 417-509 μ (2) long, 90-110 μ wide, 4.63 (2) times as long as wide. Anterior PcS 100-120 μ (2) long, located 5 μ (1) from median PcS. Median PcS 120 μ (2) long, located 4 μ (1) from posterior PcS. Posterior PcS 60-90 μ (2) long, located 110 μ (1) from TH. FS 80-110 μ (2) long, frontal plate about as in H. pilipes (Fig. 16B).

Abdomen - PSA on S IV-VII or VIII, longest spinules on IV and V 7-14 μ long, on VI 8 μ , on VII 6 μ , on VIII 0-1 μ . I with 3, II-VII with 4, VIII with 5 L-setae; 2 or 3 filamentous on VI, all filamentous on VII and VIII. Anal lobe with 331 μ long AM and 29-33 setae in fringe, longest seta in fringe 170-300 μ , shortest 40-160 μ , 2-4 setae located between or mediad of bases of AM.

FOURTH INSTAR LARVA (n = 3, EXCEPT WHEN OTHERWISE STATED)

TL 7.88 mm (1). Head capsule length 0.48-0.68 mm.

Head - Antenna as in Fig. 19P. Lengths of antennal segments in microns: 80-92, 20-31, 7-8, 8-10, 4-5, 1. AR 1.90-1.96. Basal antennal segment 24-25 μ wide, 3.33-3.68 times as long as wide, distance from base to RO 20 μ , to distal mark of seta 55-66 μ (2), Bl 39-42 μ (2) long. LO 6.5 μ (1) long. S I (Fig. 21E) with about 10-12 branches. Premandible (Fig. 19I) 80-100 μ long, with accessory tooth vestigial. Mandible 164-200 μ long, twice as long as premandible. Maxilla (Fig. 23A) with anterior LG serrated. Width of 1 median tooth of mentum (Fig. 24E) 11-12 μ , ventromental plate 20-24 μ wide, V/M 1.82-2.00. Postmentum 214-240 μ long.

Abdomen - Pc 70-76 μ high, 46-54 μ wide. Sa 503-552 μ (2) long. An 675-797 μ long. Sa/An 0.64-0.69.

Remarks

Although there appear to be some significant differences between this species and H. pilipes both are highly variable, and H. scapulapilosus may eventually be shown not to deserve species rank. In the male the most significant difference is in the BR1 and BR3. Even when all setae appear to be present, the BR is an unreliable ratio unless a large number of specimens are measured, particularly when the ratio is determined by a few very long setae and not by a dense beard. There are also differences in the HR and HV; although the differences are small, very large numbers of H. pilipes have been examined and the differences appear to hold up. The females of H. scapulapilosus have significantly lower WL/Pfe and BV1 and an extremely high number of Pa. However, the variation between the two females from the same population in Bells Corners Stream, Ont. is extremely large, particularly in the chaetotaxy. The pupae are not separable from H. pilipes. The larvae however, differ from those of H. pilipes by lacking a distinct premandibular accessory tooth, and with the mandible twice as long as the premandible. With the material available, H. scapulapilosus has to be regarded as a full species. However, it is not impossible that the Alaskan specimen belongs to H. pilipes, or that in fact both populations are extreme forms of H. pilipes.

Material Examined

Holotype and allotype: male and female reared from larvae, Bells Corners Stream, Ont., 10/4/66, D. R. Oliver (CNC No. 13478). Paratypes: female reared from larva, same data as holotype; male, Point Barrow, Alaska, 21/7/53, P. D. Hurd (USNM).

Ecology and Distribution

The species is known only from Ontario and Alaska.

Hydrobaenus virgo sp.n.

(Fig. 38)

This species is characterized by the vestigial or absent notum and SCa, showing that it has to be obligate parthenogenetic. It has a WL/Pfe of 2.9-3.1, a BV_1 of 2.7-2.9, 10-22 Ac starting at anterior 1/10-1/6 of scutum, and 17-27 SCh on ta₁ of p_3 .

FEMALE IMAGO (n = 10, EXCEPT WHEN OTHERWISE STATED)

TL 3.21-4.04, 3.78 mm. WL 2.30-2.88, 2.65 mm. TL/WL 1.37-1.49, 1.43. WL/Pfe 2.92-3.05, 2.99.

Antenna - Pedicel L/W (microns, n = 8): 42-80, 54/81-96, 85. 5 or 6 usually 6, flagellomeres; when 5 flagellomeres first one constricted at slightly less than two thirds from base. Flagellomere 1 when 5 flagellomeres, or 1 plus 2 when 6 flagellomeres L/W (microns): 84-119, 101/35-46, 41. Last 4 flagellomeres L/W (microns): 40-53, 48/32-40, 35; 46-57, 52/31-37, 34; 46-64, 56/30-35, 33; 130-163, 153/26-38, 31. AR 0.53-0.74, 0.62.

Head - Temporal setae 9-15, 12; Po 4-7, 5; OV 2-6, 4; IV 2 or 3, 3. Cibarial pump, tentorium, and stipes as in Fig. 38A. Te 163-220, 191 μ long; 31-44, 38 μ wide; width anterior of PTP 9-12, 11 μ ; distance from apex to PTP 18-36, 38 μ . St 190-220, 208 μ long; 54-80, 63 μ wide. 2 ocelli; 31-44, 38 μ apart. Coronal suture nearly complete; 84-160, 124 μ (9) long. Palp lengths (microns): 44-62, 51; 61-86, 76; 134-166, 151; 115-152, 131; 170-203, 186.

Thorax (Fig. 38B) - Ap 8-15, 10; median lobes in broad contact anterior of scutal projection; Dc 7-13, 10; Ac 10-22, 19 starting at anterior 1/10-1/6 of scutum; Pa 5-9, 7. Scu 9-13, 11.

Wing - Anal lobe well developed, protruding. C-extension 10-60, 38 μ (9) long. VR 1.05-1.13, 1.09. B with 1-3, 2; R with 12-19, 16; R₁ with 3-10, 7; R₄₊₅ with 5-17, 12 setae. Squama with 28-45, 35 setae.

Legs - Sp₁ 49-74, 59 μ (8); Sp₂ 40-45, 43 μ and 24-34, 29 μ (6); Sp₃ 66-91, 82 μ (8) and 25-30, 27 μ (4). Wti₁ 50-60, 56 μ ; Wti₂ 52-66, 59 μ (9); Wti₃ 58-76, 65 μ (9). Sp₁/Wti₁ 0.96-1.28, 1.05 (8). Comb with 10-12, 11 setae; shortest seta 28-38, 33 μ (9);



FIG. 38. *Hydrobaenus virgo* sp.n., female. A) cibarial pump, labial lonchus, tormae, Te and St; B) apex of thorax; (C-G) female genitalia, lateral C), dorsal D), and ventral E-G) view.

longest 53-68, 60 μ (8). Ps 24-38, 32 μ long; 2 or 3 on ta₁ of p₂ and p₃, 2 on ta₂ of p₂, 0 or 1 on ta₂ of p₃. Sch 17-27, 21 on ta₁ of p₃. Lengths (microns) and proportions of legs:

	fe	ti	tal	ta ₂
p_1	785-951,885	981-1208,111	1 668-846,75	8 343-435,394
P2	803-994,918	902-1104,102	8 429-564,49	4 221-282,246
Рз	902-1098,1024	1092-1343,124	3 619-767,68	331-417,375
	ta3	ta ₄	ta ₅	LR
p_1	258-319,292	172-209,197	104-123,113	0.66-0.70,0.68
P2	159-209,180	98-129,116	92-110,100	0.46-0.51,0.48
P3	258-313,280	135-165,148	98-123,111	0.54-0.57,0.55
	BV	SV	BR	
p_1	2.72-2.87,2.77	2.55-2.73,2.	64 1.88-2.5	0,2.24 (5)
P2	3.62-3.96,3.80	3.69-4.12,3.	95 1.94-2.4	7,2.12 (8)
P3	3.15-3.35,3.23	3.18-3.37,3.	30 2.11-2.8	2,2.39 (8)

Abdomen - Number of setae on T I-VIII as: 56-104, 73; 48-85, 62; 36-61, 43; 25-60, 36; 23-50, 34; 21-46, 30; 21-40, 28; 18-33, 25. Number of setae on S I-VIII as: 0; 4-6, 5; 7-13, 10; 10-18, 13; 13-22, 18; 18-37, 27; 22-52, 36; 29-54, 42.

Genitalia (Fig. 38C-G) - Gc with 15-24, 18 setae. T IX divided, with 22-34, 29 setae. Cercus 140-173, 160 μ long. SCa present in 4 of 10 specimens; when present 56-90, 73 μ long; 34-70, 53 μ wide. SDu when present, without bulbs before opening. Csa partly reduced, often with mediolateral branch. Lobes of Gp VIII reduced.

Remarks

On the basis of characters other than those found in the genitalia the species most closely related to this species appears to be *H. pilipes* Mall. and *H. scapulapilosus* sp.n. *Hydrobaenus virgo* has a WL/Pfe ratio within the range of that of *H. pilipes* whereas the BV_1 is nearly identical to that of *H. scapulapilosus*.

Material Examined

Holotype: female, Jack River, 0.5 miles from Munster Hamlet, Ont., 13/5/72, A. R. Soponis (CNC No. 13479). Paratypes: 933 females, same data as for holotype (All).

Ecology and Distribution

This obligate partherogenetic species has only been found from the type locality in Ontario.

Hydrobaenus hudsoni sp.n.

(Fig. 13G; 16N; 19Q; 21C; 23C; 24I; 39A)

The male imago is characterized by an AR of about 2.0, TL/WL 2.3, about 21 setae on the squama, about 22 antepronotals, about 24 Ac, BV_3 2.8, BR_1 4.0, BR_2 2.5, BR_3 3.0, the basal lobe of the Gc has microtrichia at its apex, the anal point is parallel sided, and the Pha possesses apical annulations.

The pupa has 4 L-setae on VI and VII, 5 on VIII; 3 on VI, all on VII, and 4 on VIII filamentous; the middle PcS strong, about 4 μ wide, nearly twice as long as the anterior PcS.

The larva has an AR of about 2.5, and the basal antennal segment is about 7.3 times as long as the second segment. The V/M is about 1.5, the Sa/An 0.6, and the length of the postmentum 214 μ .

MALE IMAGO (n = 1)

TL 4.12 mm. WL 1.77 mm. TL/WL 2.33. WL/Pfe 2.67.

Antenna - Pedicel L/W (microns): 118/160. Flagellomeres L/W (microns): 53/46, 20/45, 17/44, 21/48, 22/50, 22/50, 23/50, 25/48, 24/50, 24/50, 23/50, 25/48, 527/46. AR 1.96.

Head - Temporal setae 10, Po 6, OV 2, IV 2. Clypeus with 16 setae. Te 180 μ long, 50 μ wide, width anterior of PTP 11 μ , distance from apex to PTP 23 μ . St 150 μ long, 80 μ wide. Palp lengths (microns): 35, 68, 120, 110, 153.

Thorax - Ap 22, median lobes in contact anterior of scutal projection. Dc 7, Ac 24 starting at anterior 1/5 of scutum, Pa 7 or 8. Scu 12.

Wing - Anal lobe well developed, protruding. C-extension 40 μ long. VR 1.10. B with 1, R with 6, R₁ and R₄₊₅ without setae. Squama with 21 setae.

Legs - Sp₁ 80 μ , Sp₂ 40 μ and 32 μ , Sp₃ 69 μ and 28 μ . Wti₁ 50 μ , Wti₂ 48 μ , Wti₃ 55 μ . Sp₁/Wti₁ 1.60. Comb with 10 setae, 16-50 μ long. Ps 23-30 μ long; 2 on ta₁ and ta₂ of p₂ and p₃. SCh 8 on ta₁ of p₃. Lengths (microns) and proportions of legs:

	fe	ti	tal	ta ₂	ta 3	ta_4	ta ₅	LR	BV	SV	BR
\mathbf{p}_1	662	785	540	307	227	142	100	0.69	2.56	2.68	4.00
P2	613	754	356	196	150	102	88	0.47	3.21	3.84	2.50
Рз	754	873	478	294	227	130	110	0.55	2.77	3.41	3.00

Hypopygium (Fig. 39A) - Anal point parallel sided. T IX with 57 setae. Laterosternite IX with 8 setae. Pha (Fig. 13G) 110 μ long, with indications of apical annulations. TSa 135 μ long. Gc 260 μ long, basal lobe with microtrichia also at apex. Gs 105 μ long, broad. HR 2.48, HV 3.92.

PUPA (n = 1)

TL 4.40 mm. TH/AM 1.36.

Cephalothorax - TH (Fig. 16N) 368 μ long, 70 μ wide, 5.26 times as long as wide. Anterior PcS 55 μ long, located 16 μ from median PcS. Median PcS 105 μ long, 4 μ wide, filamentous, located 8 μ from posterior PcS. Posterior PcS 44 μ long, located 90 μ from TH. FS 80 μ long, plate about as in *H. pilipes* (Fig. 16B).

Abdomen - PSA on IV-VIII, longest spinules on IV-VIII (microns) as: 8, 6, 6, 3, 2. I and II with 3, III-VII with 4, VIII with 5 L-setae; 3 on VI, all on VII, and 4 on VIII filamentous. Anal lobe 270 μ long AM, and 25 setae in fringe, fringe setae 44-215 μ long, 3 between or mediad to bases on AM.

FOURTH INSTAR LARVA (n = 1)

TL 4.34 mm. Head capsule length 0.52 mm.

Head - Antenna as in Fig. 19Q. Lengths of antennal segments in microns: 82, 11, 7, 9, 4, 1. AR 2.48. Basal antennal segment 24 μ wide, 3.42 times as long as wide, distance from base to RO 12 μ , Bl 29 μ long, LO 9 μ long. S I (Fig. 21C) with two main branches each divided in 4 or 5. Premandible 98 μ long. Mandible 166 μ long. Maxilla (Fig. 23C) apparently with no bifid or serrated LG. Width of 1 median tooth of mentum (Fig. 24I) 11 μ , ventromental plate 16 μ wide, V/M 1.45. Postmentum 214 μ long.

Abdomen - Pc 70 μ high, 42 μ wide. Sa 368 μ long. An 662 μ long. Sa/An 0.56.

Material Examined

Holotype: male reared from larva, flooded terrestrial vegetation covered with periphyton, St. Phillips Bay, Pickstown, S.D., 14/5/69, P. L. Hudson (CNC No. 13480).



FIG. 39. Hydrobaenus spp., male hypopygium. A) H. hudsoni sp.n. B-D) H. martini sp.n.

Ecology and Distribution

The species is known only from the reared holotype from South Dakota.

Hydrobaenus martini sp.n.

(Fig. 13L; 17B, G, K; 20B, E, H; 22F; 39B-D; 40)

The imagines have 8-20 Ac starting at anterior 1/10-1/7 of the scutum, 10-18 setae on the squama, and T IX with 16-22 setae in males and 19-26 setae in females. The male has an AR of 1.2-1.6, BR₁ 2.5-2.9, BR₂ 2.6-3.9, BR₃ 3.8-4.1, the Pha is strongly bent apically and 96-108 μ long, and the Gs has a rounded outer angle void of microtrichia. The female has a BV₁ of about 2.5, Gc with 11-14 setae, and 24-30 SCh. The Csa is narrow with a sharp anterior bend.

The pupa has 2 filamentous L-setae on VI, 4 on VII, and 5 on VIII. TL is 3.0-3.7 mm, TH 0.27-0.29 mm, and the anterior PcS about 1/2-3/4 as long as median PcS. The larva has an Sa/An of about 0.34, AR about 1.9, V/M 1.6-1.7 and TA shorter than PP.

MALE IMAGO (n = 10, EXCEPT WHEN OTHERWISE STATED)

TL 2.85-3.65, 3.37 mm. WL 2.03-2.31, 2.21 mm. TL/WL 1.50-1.65, 1.56(9). WL/Pfe 2.83-2.96, 2.87(9).

Antenna - Pedicel L/W (microns): 110-124, 118/148-166, 154. Flagellomeres L/W (microns): 61-76, 69/43-49, 46; 28-36, 31/41-48, 43; 30-32, 31/40-48, 42; 30-37, 33/37-48, 41; 31-39, 35/36-44, 40; 32-37, 34/33-44, 38; 32-38, 36/32-42, 37; 34-39, 36/30-38, 34; 33-40, 36/30-38, 32; 33-40, 37/28-37, 31; 34-40, 36/28-37, 30; 34-40, 38/24-36, 29; 613-681, 645/23-36, 28. AR 1.43-1.56, 1.49 (specimen from Swedish Lapland about 1.2).

Head - Temporal setae 9-19, 12; Po 3-12, 6; OV 3 or 4, 4; IV 2-4, 3. Clypeus with 8-13, 10 setae. Te 185-200, 192 μ long; 34-46, 38 μ wide; width anterior of PTP 11-13, 12 μ ; distance from apex to PTP 18-34, 28 μ . St 180-192, 186 μ (9) long; 60-80, 68 μ (7) wide. Ocelli present in 3 of 10 specimens, when present 12 μ (2) apart. Palp lengths (microns): 30-42, 39; 54-72, 63; 120-148, 134; 110-136, 122; 140-190, 168 (9).

Thorax - Ap 3-10, 6 (11). Dc 5-9, 7 (11); Ac 8-20, 14 (11) starting at anterior 1/10-1/7 of scutum; Pa 3-5, 4 (11). Scu 7-10, 9.

Wing - Anal lobe well developed, protruding. C-extension 0-10, 5 μ long. VR 1.06-1.13, 1.09. B with 1 (9); R with 6-10, 8; R₁ with 0 or 1, 0.2; R₄₊₅ without setae. Squama with 10-18, 13 setae.

Legs - Sp₁ 60-67, 63 μ (9); Sp₂ 25-32, 29 μ (7) and 20-30, 25 μ (6); Sp₃ 60-68, 65 μ (8) and 22-30, 25 μ (5). Wti₁ 44-50, 48 μ ; Wti₂ 43-49, 46 μ ; Wti₃ 50-56, 53 μ (9). Sp₁/Wti₁ 1.22-1.50, 1.33 (9). Comb with 9-12, 11 setae; shortest seta 22-28, 25 μ (9); longest 40-53, 46 μ (9). Ps 27-36, 32 μ long; 0-2, 1 on ta₁ of p₂ and p₃. Sch 4-10, 7 on ta₁ of p₃. Lengths (microns) and proportions of legs:

	fe	ti	tal	ta ₂
Pl	711-803,768	883-1012,960	521-668,614	343-405,382
P2	724-859,808	797-926,868	368-423,399	209-245,228
P3	785-908,856	981-1122,1053	509-601,559	288-343,315
	ta ₃	ta4	ta ₅	LR
\mathbf{p}_1	233-282,262	147-172,165	98-110,105	0.59-0.66,0.64
P2	141-172,161	104-124,114	92-104,98	0.45-0.47,0.46
P3	209-245,232	128-141,134	104-116,107	0.51-0.54,0.53
	BV	SV	BR	
p_1	2.46-2.64,2.56	2.71-3.06,2	.82 2.50-2.8	5,2.65 (9)
P2	3.29-3.64,3.45	4.10-4.28,4	.19 2.67-3.8	7,3.10
P3	2.94-3.22,3.13	3.36-3.53,3	.41 3.82-4.1	3,3.94

Hypopygium (Fig. 39B-D) - Anal point usually narrow (Fig. 39C), occasionally broader (Fig. 39D), tapering to parallel sided. T IX with 16-22, 19 (11) setae. Laterosternite IX with 7-9, 8 setae and sometimes with anteriolateral spine. Pha 76-108, 100 μ (11) long; with strong, characteristic apical bend (Fig. 13L). TSa 99-122, 107 μ long. Spines of penis cavity strong (Fig. 13L). Gc 180-245, 230 μ (11) long; basal lobe triangular, well developed. Gs 80-114, 106 μ (11) long; with rounded outer angle void of microtrichia. HR 2.01-2.27, 2.17 (11); HV 3.03-3.56, 3.20.

FEMALE IMAGO (BASED ON PARTLY EMERGED MATURE PUPAE)

TL 2.48-2.96, 2.69 (4).

Antenna - Flagellomeres L/W (microns, n = 3): 58-74/26-30, 34-36/23-27, 38-40/ 21-26, 40-41/21-26, 90-119/20-25. First flagellomere partially divided in one specimen. AR 0.55-0.68 (2).

Head - Palp lengths (microns, n = 2): 30-40, 52-55, 98-102, 102-104, 122-152.

Thorax - Ap 6 or 7 (3). Dc 6-13, 8 (6); Ac 10-13 (3), starting at anterior 1/10-1/8 of scutum; Pa 3 or 4, 4 (5). Scu 9-11, 9 (5).

Wing - Squama with 10-13, 12 (6) setae.

Legs - Sp₁ 42-44 μ (2), Sp₂ 27-34 μ (2) and 23-25 μ (2), Sp₃ 56-62 μ (2) and 22-25 μ (2). Wti₁ 42-44 μ (2), Wti₂ 36-38 μ (2), Wti₃ 44 μ (1). Sp₁/Wti₁ 1.07-1.17 (2). Comb with 12 (1) setae, 24-49 μ (1) long. Ps 24-36 μ (2) long, 2 on ta₁ of p₂ and p₃. SCh 24-30 (2) on ta₁ of p₃. Lengths (microns) and proportions of legs (n = 1, except for LR):

	fe	ti	ta_1	ta ₂	ta ₃	ta_4	ta ₅	LR (2)	BV	sv
P1	564	638	417	282	172	110	80	0.64-0.65	2.41	2.88
P2	589	626	294	172	110	86	76	0.46-0.47	4.07	4.13
P3	589	675	380	221	141	80	80	0.56	3.15	3.23

Abdomen - T VII with 18 or 19 (2) setae, T VIII with 22-30 (2) setae. S VII with 21 (1) setae, S VIII with 15 (1) setae.

Genitalia (Fig. 40) - Gc with ll-l4, l2 (6) setae. T IX divided with l9-26, 22 (6) setae. Cercus 90-l17, l03 μ (6) long; often extremely narrow at tip. SCa l02-ll2, l08 μ (6) long; 44-59, 52 μ (6) wide; sclerotized in oral 70-76, 73 μ (6); ovoid, apparently without microtrichia. SDu without clear bulbs before common opening. Csa relatively smooth, without branches or spines.

Pupa

TL 3.00-3.74, 3.40 mm (6). TH/AM 1.05-1.22, 1.13 (7).

Cephalothorax - TH (Fig. 17K) 270-294, 280 μ (7) long; 22-50, 38 μ (7) wide; 5.40-12.27, 7.76 (7) times as long as wide. Anterior PcS 60-120, 84 μ (5) long; sometimes strong; located 7-25, 14 μ (5) from median PcS and 16-37, 24 μ (5) from posterior PcS. Median PcS strong; 130-160, 146 μ (5) long; located 6-12, 9 μ (5) from posterior PcS. Posterior PcS 20-30, 27 μ (5) long; located 40-64, 54 μ (5) from TH. FS (Fig. 17G) 120-130 μ (2) long.

Abdomen (Fig. 17B) - PSA on IV-VIII; longest spinules on IV and V 5-8, 6 μ (5) long; on VI and VII 2-5, 4 μ (5); on VIII 1-3, 2 μ (5) long. I and II with 3, III-VII with 4, VIII with 5 L-setae; 2 or 3 on VI, all on VII and 4 or 5 (usually 5) on VIII filamentous. Anal lobe with 221-258, 248 μ (7) long AM and 20-27, 24 (6) setae in fringe; longest setae in fringe 100-160, 127 μ (6); shortest 18-30, 27 μ (6); 1-5, 2 (6) located between or mediad of bases of AM.

FOURTH INSTAR LARVA (n = 2, EXCEPT WHEN OTHERWISE STATED)

TL 6.31-6.52 mm. Head capsule length 0.42-0.43 mm.

Head - Antenna as in Fig. 20E. Lengths of antennal segments (microns): 72-76, 16-17, 7-8, 7-8, 4, 2. AR 1.89-1.90. Basal antennal segment 16-18 μ wide, 4.22-4.50 times as long as wide, distance from base to RO 14-15 μ , to basal mark of seta 10-14 μ , to distal mark of seta 35-40 μ , Bl 31-32 μ , accessory blade 17 μ (1). Subapical style of second segment 8 μ (1) long, LO 8 μ long. S I about as in *H. hudsoni* or *H. pilipodex* (Fig. 21C, D), with only about 10 branches. Premandible 76 μ (1) long. Mandible (Fig. 22F) 130-146 μ long. Maxilla (Fig. 20B) apparently without any serrated or bifid LG. Width of 1 median tooth of mentum (Fig. 20H) 9-10 μ , ventromental plate 15-16 μ wide, V/M 1.60-1.67. Postmentum 196 μ long.



FIG. 40. *Hydrobaenus martini* sp.n., female genitalia, ventral A), lateral B), and dorsal C) view.

Abdomen - Pc 66-70 μ high, 36-46 μ wide. Sa 190-200 μ long. An 558 μ (1) long. Sa/An 0.34 (1). TA 110-118 μ long, 50-54 μ wide. PP 170-190 μ long.

Remarks

It cannot be regarded as quite certain that the males from Melville Island belong to the same species as the partly emerged or fully mature male and female pupae from
Swedish Lapland. However, the characteristic male Gs and Pha is distinct in the single male from Swedish Lapland, and in other details this specimen differs only by being of a smaller size and having a smaller AR.

Material Examined

Holotype: male, Bailey Point, Melville Island, N.W.T., 30/7/65, J. E. H. Martin (CNC 13481). Allotype: partly emerged female with exuvium, Swedish Lapland, 1936, A. Thienemann (as *Trissocladius* sp. *B* in Thienemann (1941: 174), i.e. locality either spring area between Abisko and Björkliden 10/6/36 or Abiskojaure 23/6/36) (ZSBS). Paratypes: 30 males, 24/7/65, otherwise as for holotype; 1 mature male pupa, 5 mature female pupae, 2 larvae, same data as for allotype (All).

Ecology and Distribution

The species is probably an arctic-subarctic circumpolar species presently known only from Melville Island, N.W.T., and Swedish Lapland.

H. distylus subgroup

Pupa without filamentous L-setae on segment VI, fringe of anal lobe not reaching AM in normal specimens.

Hydrobaenus johannseni (Sublette) comb.n.

(Fig. 13E; 14B, N; 15D, E; 16D, M; 18D, L; 19C, K, R; 21B, L; 23B; 24G; 37C, D; 41)

Orthocladius nivoriundus Johnson 1900: 627, nec Fitch (misidentification of Chironomus (= Diamesa) nivoriundus Fitch); Johannsen 1905: 274 (male, female, pupa, larva, pupa and larva probably only in part), 1934: 348 (synonomy); Kieffer 1906: 28; Potthast 1915: 361 (pupa, larva)

Orthocladius nigritus Malloch 1915: 525, pro parte (see Sublette 1966: 594 and below) Trissocladius nivoriundus (Joh.) Thienemann 1944: 585, 588, 534 (pupa, larva) Hydrobaenus (Chaetocladius) nivoriundus (Joh.) Johannsen 1947: 173 (male, female) Hydrobaenus (Hydrobaenus) nivoriundus (Fitch) Johannsen 1952: 23 (male, female) Hydrobaenus nivoriundus (Joh.) Roback 1957: 76, 81 (pupa, larva) Orthocladius domus Sublette 1966: 594 (male), syn.n. (based on a paratype male of

0. nigritus Mall.)

Orthocladius (Orthocladius) johannseni Sublette 1967: 504 (male, female), new species for 0. nivoriundus Joh. nec Fitch

Trissocladius domus (Subl.) Sæther 1969: 42 (generic placement), syn.n. Trissocladius hamiltoni Sæther 1969: 42 (male, pupa, larva), syn.n. nec Orthocladius nivoriundus Fitch Malloch 1915: 525 (see Sublette 1967: 504) nec Dactylocladius nivoriundus Kieffer 1917: 359 nec Fitch, probably a synonym of H. pilipes Mall.

nec Spaniotoma (Orthocladius) nivoriunda Joh. nec Fitch Johannsen 1937: 64 (pupa, larva). At least the pupae belong to H. pilipes (see p.115)

nec Trissocladius johannseni Sæther 1969: 45 (generic placement) synonym of H. pilipes Mall. (see p.115)

The imagines are characterized by having 14-28 setae on the clypeus, 3-13 Ac starting at anterior 1/3-1/2 of the scutum, a squama with 26-57 setae, and T IX with 20-35 setae in males and 20-30 setae in females. The male has an AR of 2.0-2.6, BR₁ 3.8-5.0, BR₂ 3.6-4.7, BR₃ 4.0-5.9, HV 4.3-4.9, Gc with double basal lobe, and Pha with apical annulations. The female has 10-16 setae on the Gc; 17-25 SCh; SDu with bulbs before a common opening; and Csa with a sharp anterior angle and with small, fine spinules on the inside of the angle.

The pupa has no filamentous L-setae on V and VI, 4 on VII, and usually 5 on VIII. The anterior 2 PcS are about the same thickness with the median slightly longer, the tip of the anal lobe has rugulosity of small papillae.

The larva has a postmentum length of 205-230 μ , AR 1.9-2.0, V/M 1.4-1.6, Sa/An 0.4-0.5, a mandible twice as long as the premandible, and a RO 5-10 μ from the base of the basal antennal segment.

MALE IMAGO (n = 10-11, EXCEPT WHEN OTHERWISE STATED)

TL 4.15-6.07, 5.04 mm. WL 2.20-3.15, 2.87 mm (22). TL/WL 1.75-1.93, 1.83. WL/Pfe 2.69-2.93, 2.80.

Antenna - Pedicel L/W (microns): 100-138, 119 (7)/164-200, 187 (8). Flagellomeres L/W (microns, n = 9): 72-92, 82/49-66, 58; 20-34, 28/47-76, 57; 24-28, 26/44-71, 55; 23-28, 25/43-72, 55; 24-28, 26/44-71, 55; 24-28, 26/43-72, 55; 24-28, 26/44-71, 55; 25-29, 27/43-69, 54; 25-30, 28/43-64, 54; 27-32, 29/45-62, 53; 26-32, 29/42-61, 52; 27-34, 30/40-61, 52; 745-1055, 908/40-61, 51. AR 2.01-2.56, 2.34 (26).

Head - Temporal setae 10-16, 13 (12); Po 5-8, 6; OV 1-8, 4; IV 2-4, 3. Clypeus with 14-21, 17 (12) setae. Te 216-250, 232 μ (6) long; 52-60, 56 μ (6) wide; width anterior of PTP 12-16, 14 μ (6); distance from apex to PTP 42-58, 51 μ (6). St 198-220, 206 μ (6) long; 70-82, 74 μ (6) wide. Ocelli present in 1 of 10 specimens, 11 μ apart. Palp lengths (microns): 40-74, 51; 67-166, 93; 111-195, 159; 126-178, 154; 195-222, 211.

Thorax - Ap 4-9, 7 (13); median lobes joined along a broad suture anterior of scutal projection. Dc 6-9, 8 (13); Ac 3-12, 6 (28) starting at anterior 1/3-1/2; Pa 4-8, 6 (16). Scu 9-15, 12 (14).

Wing - Anal lobe well developed, strongly protruding. C-extension 30-75, 51 (9). VR 1.04-1.10, 1.08. B with 1-3, 2 (8); R with 3-6, 5; R₁ without; R_{4+5} with 0-4, 0.8 setae. Squama with 28-57, 37 (27) setae.

Legs - Sp₁ 78-106, 88 μ ; Sp₂ 26-44, 35 μ and 24-36, 28 μ ; Sp₃ 70-98, 83 μ and 28-38, 32 μ . Wti₁ 46-68, 58 μ ; Wti₂ 46-63, 54 μ ; Wti₃ 57-71, 64 μ . Sp₁/Wti₁ 1.36-1.77, 1.54. Comb with ll-14, l2 setae; shortest seta 22-32, 26 μ ; longest 48-74, 57 μ . Ps 26-40, 32 μ long; 2 on ta₁ of p₂ and p₃, 0-2, 0.5 on ta₂ of p₂ and p₃. Sch 4-10, 7 on ta₁ of p₃. Lengths (microns) and proportions of legs:

	fe	ti		tal		ta ₂	
p_1	785-1153,1004	957-1379,120)5	687-1006	,875	393-558,4	ŧ98
P2	828-1178,1059	859-1276,112	23	429-644,	561	239-337,3	803
РЗ	920-1349,1179	1037-1515,13	346	595-858,762		343-485,4	+28
	ta ₃	taų		ta ₅		LR	
pl	282-423,368	200-276,244	106-	148,127	0.69-	0.76,0.72	(21)
P2	172-251,227	126-178,160	94-	116,109	0.49-	0.51,0.50	
P3	263-368,331	162-215,192	106-	142,124	0.54-	0.58,0.56	
	BV	sv		BR			
pl	2.32-2.63,2.49	2.37-2.65,2	2.53	3.75-5.	00,4.33	(19)	
P2	3.19-3.63,3.44	3.49-4.07,3	8.87	3.63-4.	67,4.16	(22)	
P3	2.71-3.94.3.15	3.20-3.61.3	3.32	4.00-5.	94.4.72	(24)	

Hypopygium (Fig. 41) - Anal point triangular, parallel sided, or spatulate. T IX with 20-35, 24 (28) setae. Laterosternite IX with 7-11, 9 setae; often with anteriolateral spine. Pha (Fig. 13E) 129-144, 137 μ long; with apical annulations. TSa 138-172, 155 μ long. Gc 244-330, 290 μ long; basal lobe more or less distinctly double. Gs 90-126, 110 μ long; rounded on outer margin. HR 2.51-2.77, 2.65; HV 4.25-4.93, 4.57.

FEMALE IMAGO (n = 8, EXCEPT WHEN OTHERWISE STATED)

TL 3.65-5.43, 4.16 mm. WL 2.48-3.49, 2.85 mm. TL/WL 1.38-1.55, 1.45. WL/Pfe 3.20-3.47, 3.35.

Antenna - Pedicel length/width (microns): 50-78, 62/80-96, 87. Flagellomeres 5 or 6, usually 5; when 5 flagellomeres first is constricted or not constricted about two thirds from base. Flagellomere 1 when 5 flagellomeres or 1 plus 2 when 6 flagellomeres length/width (microns): 39-136, 102/35-55, 44. Last 4 flagellomeres length/ width (microns): 42-58, 50/33-42, 38; 46-61, 53/29-41, 36; 50-67, 57/32-37, 34; 154-186, 167/24-34, 29. AR 0.61-0.72, 0.66.

Head - Temporal setae 8-14, 11; Po 2-6, 4; OV 3-7, 5; IV 0-3, 3. Clypeus with 14-28, 21 setae. Te 170-220, 190 μ long; 34-44, 39 μ wide; width anterior of PTP 8-14, 11 μ ; distance from apex to PTP 15-48, 32 μ (7). St 180-205, 193 μ (7) long; 50-82, 71 μ (7) wide. 1 or 2 ocelli, 36-62, 45 μ apart. Coronal suture nearly



FIG. 41. *Hydrobaenus johannseni* (Subl.) comb.n., male hypopygium. A) paratype; B) holotype of *Orthocladius domus* Subl.; C) paratype of *Trissocladius homiltoni* Sæth.; D) specimen from Mississippi River north of Winona, Minn.

complete 100-160, 129 μ long. Palp lengths (microns): 42-51, 47; 66-84, 74; 112-146, 125; 90-140, 117; 190-232, 210.

Thorax - Ap 5-14, 9 (7). Dc 5-12, 8; Ac 5-13, 8 (7), starting at anterior 1/3-1/2 of scutum; Pa 5-8, 6 (7). Scu 11-16, 13 (7).

Wing - C-extension 75-100, 85 μ . VR 1.06-1.10, 1.08 (6). B with 1 or 2, 2 (6); R with 8-14, 11; R₁ with 1-7, 5 (7); R₄₊₅ with 1-11, 5 setae. Squama with 26-39, 35 setae.

Legs - Sp₁ 55-69, 61 (7); Sp₂ 30-46, 36 and 23-38, 30 (7); Sp₃ 70-97, 80 and 20-40, 30 (5). Wti₁ 52-64, 56; Wti₂ 51-66, 56; Wti₃ 56-76, 63. Sp₁/Wti₁ 1.03-1.13, 1.07 (7). Comb with 10-12, 11 (6) setae; shortest seta 22-30, 26 μ (6); longest 36-66, 51 μ (6). Ps 20-42, 32 μ long; 2 on ta₁ of p₂ and p₃; 0-2, 0.4 on ta₂ of p₂. Sch 17-25, 21 (10) on ta₁ of p₃. Lengths (microns) and proportions of legs:

	fe	ti	tal	ta ₂
Pl	754-1006,850	957-1221,1069	632-816,715	331-423,378
P2	882-1067,913	920-1147,1025	429-570,482	221-270,239
P3	932-1178,1021	1043-1429,1216	551-711,662	264-411,352
	tag	ta4	ta ₅	LR
p_1	239-307,265	153-196,173	90-123,105	0.63-0.71,0.67
P2	147-196,165	91-120,107	82-105,94	0.45-0.50,0.47
РЗ	233-312,260	106-162,143	29-41,34	0.51-0.57,0.55
	BV	SV	BR (7)	
Pl	2.76-2.96,2.86	2.50-2.84,2.70	1.94-2.33,2.1	7
P2	3.81-4.18,3.99	3.86-4.18,4.03	1.76-2.67,2.2	2
P3	3.15-3.77,3.37	3.24-3.64,3.39	2.68-3.71,3.2	0

Abdomen - Number of setae on T I-VIII as: 44-85, 62 (7); 35-64, 47; 26-52, 37 (7); 18-47, 29; 19-54, 30; 18-50, 31; 20-48, 28; 16-49, 26. Number of setae on S I-VIII as:0-2, 0.3; 3-11, 5; 5-19, 11; 7-19, 13; 12-31, 18; 13-35, 23; 15-37, 28; 20-43, 32.

Genitalia (Fig. 14B, N; 15D, E; 37C-D) - Gc with 10-16, 13 setae. T IX divided, with 20-30, 25 setae. Cercus 154-199, 172 μ long. SCa 160-222, 188 μ (7) long; 84-110, 95 μ (7) wide; sclerotized in oral 101-160, 123 μ (7); ovoid, with microtrichia. SDu with bulbs before common opening. Csa (Fig. 14B; 15D, E) with anterior sharp angle and with fine spinules on the median side of the angle. Lobes of Gp VIII (Fig. 14N) normal.

PUPA (n = 10, EXCEPT WHEN OTHERWISE STATED)

TL 5.00-7.37, 6.33 mm. TH/AM 1.00-1.20, 1.09.

Cephalothorax - TH (Fig. 16M) 319-454, 406 μ long; 66-97, 78 μ (9) wide; 4.83-6.13, 5.30 (9) times as long as wide. Anterior PcS 85-125, 111 μ long; located 4-30, 10 μ (9) from median PcS and 15-41, 23 μ (9) from posterior PcS. Median PcS 100-164, 130 μ long; located 8-15, 12 μ (9) from posterior PcS; about as strong as anterior PcS. Posterior PcS 38-78, 53 μ long; located 106-140, 121 μ (9) from TH. FS (Fig. 16D) 69-124, 108 μ (7) long; frontal warts distinct.

Abdomen (Fig. 18D, L) - PSA on IV-VIII; longest spinules on IV 7-12, 10 μ ; on V 8-11, 9 μ ; on VI 6-10, 8 μ ; on VII 4-10, 7 μ ; on VIII 2-6, 4 μ long. I with 3;

II-VII with 4; VIII with 4 or 5, 5 L-setae; all on VII and VIII filamentous. Anal lobe with 319-405, 376 μ long AM and 16-31, 22 setae in fringe; longest seta in fringe 120-205, 173 μ (9); shortest 16-42, 29 μ (9); distance from fringe to nearest AM 55-110, 75 μ .

FOURTH INSTAR LARVA (n = 4, EXCEPT WHEN OTHERWISE STATED)

TL 4.90-6.70, 5.98 mm. Head capsule length 0.52-0.55, 0.54 mm.

Head - Antenna as in Fig. 19R. Lengths of antennal segments (microns, n = 3): 82-96, 21-25, 10-12, 8-9, 6, 2. AR 1.87-2.02 (3). Basal antennal segment 24-28, 26 μ wide; 2.93-4.00 (3) times as long as wide; distance from base to RO 5-10, 8 μ ; to basal mark of seta 25-30, 28 μ ; to distal mark of seta 42-45, 44 μ ; Bl 40-44, 42 μ long; accessory blade 17-27 μ (3) long. LO 8-10, 9 μ long. S I (Fig. 21B) with 7-10 branches. Premandible (Fig. 19K) 90-100, 95 μ (5) long; with weak inner accessory tooth. Mandible (Fig. 19C) 180-188, 184 μ (5) long. Maxilla (Fig. 23B) with serrated posterior LG. Width of 1 median tooth of mentum (Fig. 24G) 10-13, 11 μ (5); ventromental plate 14-19, 17 μ (5) wide; V/M 1.40-1.57, 1.51 (5). Postmentum 205-230, 217 μ (5) long.

Abdomen - Pc 72-80, 76 μ high; 50-56, 53 μ wide. Sa 405-454, 427 μ (5) long. An 871-925, 911 μ (5) long. Sa/An 0.44-0.52, 0.47 (5). TA 170-200, 185 μ long; 110 μ (1) wide.

Remarks

Hydrobaenus johannseni appears to be, next to H. pilipes, the most common species in temperate North America. It also shows a great deal of variation, particularly in the male hypopygium. Trissocladius domus (Subl.), synonymized here with H. johannseni, is well within the variation of the other specimens.

Material Examined

Holotype of Orthocladius johannseni Subl.: male, CUC No. 2356, Ithaca, N.Y., April 1902, lot 2582, subslide, male genitalia, O. A. Johannsen. Paratypes: 2 males, 1 female, CUC No. 2356, 1-3; other data as for holotype. Holotype of Orthocladius domus Subl.: male, USNM No. 68170, Cabin John Run, Md., 16/2/13, W. D. Amel, USNM No. 68897.

Holotype of *Trissocladius hamiltoni* Sæth.: male reared from larva, near shore, 0.6 m, Falcon Lake, Man., 16/4/67, A. L. Hamilton (CNC No. 9977). Paratype: male with pupal and larval exuvia, Rideau River near Manotick, Ont., 3/4/66, A. L. Hamilton. Specimens from type locality: 1 male, female, both reared from larvae, same data as for paratype (FWI).

Other material: male, Toxawanda Creek, Ionawanda Indian Reservation, Genesee Co., N.Y., 25/3/61, L. L. Pechuman; 15 males, Hart Memorial Woods, Champaign Co., Mahomet,

Ill., ll-l3/4/64 and 20-25/3/66, M. W. Saunderson; 2 males, on bridge, White River, Benton Co., Ark., 14/2/60, O. A. Hite and L. R. Aggus; 3 males, 2 females, 19 exuvia, 1 larva, Mississippi River south of Winona, Minn., 1/4/70, S. C. Mozley; 2 males, Missouri River, Clay County Park, Vermillion, S.D., 2/4/72, P. L. Hudson; 2 males, bog area, State Lake, S.D., 5/4/73, P. L. Hudson; 117 males, 3 females, Brittannia Filtration Plant, Ottawa River, Ottawa, Ont., 12/5/71, D. R. Oliver; 2 males, 1/4 mile offshore George Island, Lake Winnipeg, Man., 6/6/69, S. S. Chang; 4 males, 7 females, 1 mile off Horse Island, Lake Winnipeg, Man., 7/7/69, S. S. Chang; 1 mature male pupa, 2 larvae, Red River, near Winnipeg, Man., 28/3-7/4/75, E. Elders (All).

Ecology and Distribution

The species is found in the littoral zone of lakes and ponds, and in streams and rivers. It has one generation a year with an early spring emergence.

Distribution - New York (Johannsen 1905: 274, as Orthocladius nivoriundus in part; Sublette 1967: 504 as Orthocladius johannseni), Maryland (Malloch 1915: 525 as Orthocladius nigritus in part; Sublette 1966: 594 as Orthocladius domus), Pennsylvania? (Roback 1957: 81 as Hydrobaenus nivoriundus), Illinois, Arkansas, Minnesota, South Dakota, Ontario, and Manitoba (Sæther 1969: 42 as Trissocladius hqmiltoni).

Hydrobaenus pilipodex sp.n.

(Fig. 13F; 16C, L; 18C, J; 19E, N; 21D; 23D; 24D; 42)

The male imago is characterized by an AR of 1.6-1.9, Ac ll-18 starting at anterior 1/5-1/4 of the scutum, a squama with 16-23 setae, BR₁ 2.4-3.3, BR₂ 2.3-3.8, BR₃ 2.6-4.5, and T IX with 38-70 setae.

The pupa has no filamentous L-setae on VI, 3 of 4 filamentous on VII, and all 5 filamentous on VIII. The anterior PcS is slightly thicker and longer than median PcS, and the anal lobe has setae dorsad of the genital sheath.

The larva has a postmentum length of 196 μ , AR 1.8, VM 1.16, Sa/An 0.6, RO 22 μ from base, and median mental teeth much higher than the first laterals.

MALE IMAGO

TL 3.71-4.59, 4.32 mm (10). WL 1.92-2.51, 2.34 mm (10). TL/WL 1.73-1.94, 1.83 (8). WL/Pfe 2.57-2.83, 2.70 (9).

Antenna - Pedicel L/W (microns): 102-130, 115 (8)/147-176, 163 (9). Flagellomeres L/W (microns, n = 9): 60-72,66/41-59, 48; 21-32, 26/42-53, 47; 22-31, 27/40-50, 46; 23-32, 28/40-50, 45; 25-30, 28/39-51, 45; 26-30, 28/38-50, 44; 26-32, 29/36-50, 43;

27-32, 30/33-48, 42; 30-33, 33/33-45, 40; 30-34, 33/32-44, 39; 30-38, 34/32-43, 38; 33-42, 37/30-41, 36; 570-705, 656/34-41, 38. AR 1.59-1.87, 1.71 (11).

Head - Temporal setae 9-17, 12 (9); Po 3-6, 4 (9); OV 2-7, 4 (10); IV 2-5, 4 (10). Clypeus with 8-17, 13 (10) setae. Te 180-238, 201 μ (8) long; 39-54, 46 μ (8) wide; width anterior of PTP 10-14, 11 μ (8); distance from apex to PTP 34-46, 41 μ (8). St 164-190, 178 μ (6) long; 50-70, 60 μ (6) wide. Ocelli present or absent, when present 6-10 μ (3) apart. Palp lengths (microns, n = 10): 37-49, 41; 56-80, 62; 114-142, 129; 102-136, 122; 140-184, 168.

Thorax - Ap 5-9, 7(12), median lobes in contact anterior of scutal projection. Dc 6-9, 8(13); Ac 11-18, 14(11) starting at anterior 1/5-1/4 of scutum; Pa 4-6, 5(12). Scu 8-13, 10(13).

Wing - Anal lobe well developed, protruding. C-extension 20-40, 29 (11) long. VR 1.08-1.18, 1.12(12). B with 1 or 2, 1(8); R with 4-10, 7(12); R_1 and R_{4+5} without setae. Squama with 16-23, 18(10) setae.

Legs - Sp₁ 68-83, 77 μ (10); Sp₂ 40-50, 46 μ (11) and 24-36, 30 μ (7); Sp₃ 62-88, 75 μ (11) and 24-33, 29 μ (10). Wti₁ 48-70, 56 μ (10); Wti₂ 50-64, 56 μ (8); Wti₃ 54-71, 61 μ (10). Sp₁/Wti₁ 1.19-1.54, 1.39(9). Comb with 8-10, 10(7) setae; shortest seta 24-32, 29 μ (7); longest 40-64, 53 μ (7). Ps 25-34, 29 μ long; 2 on ta₁ of p₂; 1 or 2, 2 on ta₁ of p₃; 0-2, 0.6 on ta₂ of p₂. SCh 3-10, 5(4) on ta₁ of p₃. Lengths (microns) and proportions of legs (n = 10-11):

	fe	ti	tal	ta ₂
Pl	748-1000,878	877-1206,1068	601-846,743	318-442,406
p ₂	810-1030,902	767-1166,992	399-552,488	221-276,255
P3	895-1178,1009	1006-1410,1212	527-687,624	294-362,330
	ta ₃	ta ₄	ta ₅	LR
\mathbf{p}_1	258-325,291	182-215,197	110-135,122	0.67-0.73,0.70
p2	172-196,188	108-153,127	90-117,104	0.48-0.51,0.49
P3	227-276,247	129-159,144	110-129,117	0.51-0.55,0.52
	BV	SV	BR	
p_1	2.44-3.00,2.65	2.50-2.70,2.61	2.37-3.33-2	.66
p ₂	3.36-3.77,3.53	3.74-4.03,3.89	2.50-3.84-2	.87 (8)
P3	3.18-3.57.3.38	3.38-3.61,3.54	3.25-4.53-3	.86 (8)

Hypopygium (Fig. 42) - Anal point triangular to parallel sided. T IX with 38-70, 53 (12) setae. Laterosternite IX with 6-10, 7 (12) setae. Pha (Fig. 13F) 140-184, 155 μ (13) long. TSa 98-134, 114 μ (12) long. Gc 248-355, 304 μ (12) long. Gs 118-149, 132 μ (12) long, with rounded outer margin or sometimes with indication of rounded outer angle. HR 2.10-2.40, 2.28 (12); HV 3.07-3.45, 3.24 (10).

PUPA (n = 1)

TL 4.75. TH/AM 1.35.



FIG. 42. *Hydrobaenus pilipodex* sp.n., male hypopygium. A-C) specimens from Prairie Creek, Benton Co., Ark.; D) holotype from St. Phillips Bay, Pickstown, S.Dak.

Cephalothorax - TH (Fig. 16L) 356 μ long, 73 μ wide, 4.68 times as long as wide. Anterior PcS 102 μ long, located 34 μ from median PcS. Median PcS slightly thinner, 90 μ long, located 18 μ from posterior PcS. Posterior PcS 42 μ long, located 93 μ from TH. FS (Fig. 16C) 110 μ long, frontal warts present.

Abdomen (Fig. 18C, J) - PSA on IV-VIII, longest spinules (microns) as: 12, 12, 8, 3, 2. I and II with 3, III-VII with 4, VIII with 5 L-setae; 3 on VII and all on VIII filamentous. Anal lobe with 264 μ long AM and 20 or 21 setae in fringe, setae 22-150 μ long.

FOURTH INSTAR LARVA (n = 2)

TL 4.67-4.93 mm. Head capsule length 0.47-0.55 mm.

Head - Antenna as in Fig. 19N. Lengths of antennal segments (microns): 70-103, 18-20, 7-12, 9-10, 5, 2. AR 1.75-2.02. Basal antennal segment 20-30 μ wide, 3.43-3.50 times as long as wide, distance from base to RO 22 μ , Bl 30-40 μ long, LO 8-10 μ long. S I (Fig. 21D) with 9-10 branches. Premandible 84-101 μ long. Mandible (Fig. 19E) 157-190 μ long. Maxilla (Fig. 23D) apparently with all LG simple. Width of 1 median tooth of mentum (Fig. 24D) 9.5-14 μ , ventromental plate 11-16 μ wide, V/M 1.14-1.16. Postmentum 196-260 μ long.

Abdomen - Pc 60-82 μ high, 40-70 μ wide. Sa 330-430 μ long. An 515-780 μ long. Sa/An 0.55-0.64.

Remarks

The specimens from Arkansas had debris attached to their bodies, particularly the legs. The BR and the SCh on these specimens, therefore, may be inaccurate. The larger larva (from Decatur, Alabama) is not reared, but is from the same locality as the adults and the association is as good as certain. However, an additional larva from the same locality with a V/M of 1.62 and a total length of 8.97 mm will key out to H. pilipes. If this larva also belongs to H. pilipodex, some larvae of this species are not separable from H. pilipes.

Material Examined

Holotype: male reared from larva, flooded terrestrial vegetation, St. Phillips Bay, Pickstown, S.D., 29/2/69, P. L. Hudson (CNC No. 13482). Paratypes: 10 males, on bridge, Prairie Creek, Benton Co., Ark., 5/2/63, O. A. Hite and L. R. Aggus; 2 males, 1 larva, Experimental Channels, Browns Ferry Nuclear Plant, Tennessee River, Decatur, Ala., 10/3/76, P. L. Hudson (ANS, CUC, FWI, INHSC, JES, USNM).

Ecology and Distribution

The species appears to be a very early spring form from lakes and streams; it is presently known only from South Dakota, Arkansas, and Alabama.

Hydrobaenus distylus (Kieffer) comb.n.

(Fig. 17C, F, J; 20A, D, G; 22A-C; 43)

Dacty locladius disty lus Kieffer 1915: 85 (male); Goetghebuer 1925: 275 (male, female, pupa, larva)

Orthocladius distylus (Kieff.) Potthast 1915: 371 (pupa, larva)

Orthocladius (Orthocladius) distylus (Kieff.) Goetghebuer 1932: 86, 97 (male, female, pupa, larva), 1940-50: 43 (male, female)

Trissocladius distylus (Kieff.) Thienemann 1935: 215 (pupa, larva), 1944: 588, 634 (pupa, larva); Zavřel 1937b: 4, 9 (pupa, larva), 1942: 17 (PSA); Mozley 1970: 446 (larva); Lehmann 1971: 490 (male)

nec Trissocladius distylus. Ertlová 1970: 292 (= H. lugubris Fries)

Imagines have 10-18 Ac starting at anterior 1/4-1/3 of the scutum, a squama with 16-26 setae, LR₁ of 0.70-0.74, WL/Pfe 2.4 in males and 3.0 in females, and T IX with 29-46 setae in males and 20-28 in females. Male has an AR of 1.7-1.9, 12-17 setae on R, BR₁ of 2.0, BR₂ of 2.7, BR₃ of 2.1-3.0, and Gs with rounded outer margin. Female has 5 flagellomeres, nearly complete coronal suture, 34-39 SCh, 13-19 setae on Gc, S VII with 25 or 26 setae, and SDu without bulbs before common opening.

Pupa has 4 filamentous L-setae on VII and VIII; TH 0.37-0.47 mm long, ending in l or more strong spines and a TH/AM of 1.3-1.5.

The larva has the first lateral teeth of the mentum nearly as long as the medians, AR 1.6-1.9, V/M 1.3-1.6 and Sa/An 0.4-0.5.

MALE IMAGO

WL 2.76-3.02, 2.89 mm (4). WL/Pfe 2.44 (1).

Antenna - AR 1.67-1.93 (3).

Head - Temporal setae 6-16, 13 (4); Po 2-6 (2); OV 2-4 (2); IV 2 or 3 (2). Clypeus with 10-13, 12 (4) setae. Te 200-230, 213 μ (4) long; 40-60, 53 μ (4) wide; width anterior of PTP 13-18, 15 μ (4); distance from apex to PTP 15-50, 38 μ (4). St 170 μ long, 80 μ (1) wide. Palp lengths (microns, n = 4): 30-52, 43; 48-86, 73; 126-202, 171; 98-160, 135; 94-186, 153.

Thorax - Ap 9-15(3), median lobes in contact anterior of scutal projection. Dc 8 or 9, 9(4); Ac 10-18(3) starting at anterior 1/4-1/3 of scutum; Pa 6-11, 7(4). Scu 8-18, 12(5).

Wing (Fig. 43A) - Anal lobe well developed, very strongly protruding. C-extension 6-70 μ (2). VR 1.12 (1). B with 2 (1); R with 12-17, 14 (4); R₁ and R₄₊₅ without setae. Squama with 16-26, 21 (4) setae.

Legs - Sp₁ 87 μ (1), Sp₂ 44-52 μ (3) and 36-38 μ (3), Sp₃ 70-90 μ (2) and 26 μ (1). Wti₁ 63 μ (1), Wti₂ 52-68 μ (3), Wti₃ 66-76 μ (3). Sp₁/Wti₁ 1.18-1.45 (2). Comb with 9 or 10(3) setae, 28-54 μ (1) long. Ps 26-37, 30 μ (4) long; 2 on ta₁ of p₂ and p₃, 0 or 1 on ta₂ of p₂. SCh 7-10(3) on ta₁ of p₃. Lengths (microns) and proportions of legs:

	fe	ti		ta	1	ta ₂	
P1	895-1129 (3)	1294-1300 (2	2)	957 (1)		491 (1)	
P2	908-1178,1095 (4)	957-1239,11	52 (4)	448-60	1,560 (4)	258-319,302	(4)
P3	994-1300 (3)	1116-1929 (3)	577-81	0 (3)	325-442 (2)	
	tag	ta ₄	ta ₅		LR		
P1	356 (1)	129 (1)	129		0.74 (1)		
P2	196-233,222 (4)	159-172 (3)	116-123	(3)	0.47-0.51	,0.49 (4)	
P3	227-319 (2)	135-184 (2)	104-135	(2)	0.52-0.55	(3)	
	BV	SV		BR			
Pl	2.83 (1)	2.54 (1)		2.00-2	.50 (2)		
P2	3.47-3.67 (3)	3.85-4.16,4.02 (4)		2.59-2.67 (2)			
P3	3.35-3.40 (2)	3.45-3.66 (3)		2.08-3	1.59 (3)		

Hypopygium (Fig. 43B) - T IX with 29-46, 40 (5) setae. Laterosternite IX with 10-17, 13 (6) setae. Pha 142-156 μ (3) long. TSa 110-140 μ (2) long. Gc 250-370, 326 μ (5) long. Gs 122-164, 147 μ (5) long, with rounded outer margin. HR 2.05-2.43, 2.21(5).

FEMALE IMAGO (n = 2, EXCEPT WHEN OTHERWISE STATED)

TL 3.65-4.14 mm. WL 2.31-2.76 mm. TL/WL 1.50-1.58. WL/Pfe 3.03 (1).

Antenna - Pedicel L/W (microns): 50-60/60-80. Flagellomeres L/W (microns): 90-101/30-37, 36-46/26-30, 40-50/26-30, 40-51/24-26, 98-120/18-26. AR 0.49-0.52.

Head - Temporal setae 6-10, Po 2-4, OV 2 or 3, IV 2 or 3. Clypeus with 9 or 10 setae. Te 110-180 μ long, 20-32 μ wide, width anterior of PTP 9-10 μ , distance from apex to PTP 10-18 μ . St 122-170 μ long, 60 μ (1) wide. 2 ocelli, 30-44 μ apart. Coronal suture nearly complete, 70-115 μ long. Palp lengths (microns, n = 1): 38, 52, 113, 105, 146.

Thorax - Ap 10-12. Dc 7-10, Ac 10-13 starting at anterior 1/4-1/3 of scutum, Pa 6. Scu 8-10.

Wing - R with 9-11, R_1 and R_{4+5} with 6 (1) setae. Squama with 20-22 setae.



FIG. 43. *Hydrobaenus distylus* (Kieff.) comb.n. (A-B) male: A) wing; B) hypopygium. (C-F) female genitalia: C) Gp VIII; D) Gp IX, Csa, labia and opening SDu; E) genitalia, dorsal view; F) genitalia, ventral view.

Legs - Sp₁ 56 μ (1), Sp₂ 40 μ (1) and 38 μ (1), Sp₃ 71-74 μ and 30 μ (1). Wti₁ 51 μ (1), Wti₂ 60 μ (1), Wti₃ 56-62 μ . Sp₁/Wti₁ 1.10(1). Comb with 10 setae, shortest seta 22 μ , longest 41-49 μ . Ps 26-34 μ long, 2 on ta₁ of p₂ and p₃. SCh 34-39 on ta₁ of p₃. Lengths (microns) and proportions of legs (n = 1 on p₁ and p₂):

	fe	ti	tal	ta ₂	tag	ta ₄
\mathbf{p}_1	761	895	626	343	233	135
p2	834	938	442	233	159	110
p3	846-908	1030-1067	552	294-307	209	110-129
	ta ₅	LR	BV	SV		BR
pı	86	0.70	2.86	2.65		2.73
p2	80	0.47	3.80	4.01		2.47
РЗ	86-98	0.52-0.54	3.40-3.47	3.40-	3.58	2.00-2.81

Abdomen - Number of setae on T I-VIII as: 38-43, 27-44, 21-32, 16-22, 14-22, 15-22, 18-26, 24-29. Number of setae on S I-VIII as: 0, 7-12, 10-16, 15-18, 18-21, 20-24, 25-26, 36.

Genitalia (Fig. 43C-F) - Gc with 13-19 setae. T IX divided, with 20-28 setae. Cercus 130-170 µ long. SCa 126-140 µ long, 82-84 µ wide, sclerotized in oral 72-80 µ, ovoiđ. SDu without bulbs before common opening. Csa (Fig. 43D) broad. Gp VIII normal.

PUPA (n = 5, EXCEPT WHEN OTHERWISE STATED)

TL 5.12-6.31, 5.94 mm. TH/AM 1.26-1.47 (3).

Cephalothorax - TH (Fig. 17J) 362-466, 433 µ long; 80-112, 97 µ (4) wide; 4.45-4.66, 4.57 (4) times as long as wide. FS (Fig. 17F) 90-120, 106 μ long.

Abdomen (Fig. 17C) - PSA on IV-VIII; longest spinules on IV-VI 8-12, 10 µ long; on VII 6-10, 8 µ; on VIII 2-6,5 µ. I and II with 3, III-VIII with 4 L-setae, all filamentous on VII and VIII. Anal lobe with 288-331, 308 μ (4) long AM, and 28-36, 33 setae in fringe; longest fringe setae 130-160, 148 μ ; shortest 14-60, 35 μ ; distance from fringe to nearest AM 0-22, 8 $\mu.$

FOURTH INSTAR LARVA (n = 3, EXCEPT WHEN OTHERWISE STATED)

Head - Antenna as in Fig. 22D. Lengths of antennal segments (microns): 72-76, 15-19, 8-9, 7-8, 4-5, 1-2. AR 1.64-1.90. Basal antennal segment 20-22 µ wide, 3.30-3.60 times as long as wide; distance from base to RO 14-16 $\mu,$ to basal mark of seta 11-12 μ (2), to distal mark of seta 32-42 μ , Bl 30-36 μ long, accessory blade 14-16 μ long. Subapical style of second segment 10-11 μ long, LO 8-10 μ long. S I (Fig. 22A) with 7-10 branches. Premandible (Fig. 22B) 94-104 µ long. Mandible (Fig. 22C) 178-192 μ long. Maxilla (Fig. 20A) with all LG simple. Width of 1 median tooth of mentum (Fig. 20G) 10.5-12 µ, ventromental plate 16-18 µ wide, V/M 1.33-1.62. Postmentum 248 μ (1) long.

Abdomen - Pc 76 µ (1) high, 38 µ (1) wide. Sa 280 µ (1) long. An 613 µ (1) long. Sa/An 0.46 (1). TA 152 μ (1) long, 98 μ (1) wide.

Material Examined

Male reared from pupa, 3 males, 6 exuvia, 6 larvae, Nienbergr, Germany, collection of A. Thienemann; male reared from pupa, 2 females, Sendlebach See, Rhein, Germany, 4/3/53, E. J. Fittkau (CNC, FWI, ZSBS).

Ecology and Distribution

Larva lives in ditches, streams, rivers, pools, and the littoral zone in lakes. It has a very early spring emergence.

Distribution - Germany (Kieffer 1915: 85; Potthast 1915: 371; Thienemann 1935: 216; Lehmann 1971: 490), Belgium (Goetghebuer 1925: 275), Hungary (Berczik 1962: 64).

Hydrobaenus spinnatis sp.n.

(Fig. 13H; 14C, K; 15H; 16E, O; 18E, K; 44; 45)

Imagines are characterized by 6-15 Ac starting at anterior 1/6-1/3 of the scutum, a squama with 14-25 setae, and T IX with 14-22 setae in males and 11-19 setae in females. Male has an AR of 1.5-2.0, BR₁ 2.4-3.1, BR₂ 2.7-3.9, BR₃ 3.8-4.6, anal point thin and parallel sided, laterosternite IX with pronounced anteriolateral spine in all Nearctic specimens, and spines of penis cavity conspicuously small. The female usually lacks a coronal suture (suture 0-80 μ long), has a WL/Pfe of 3.3-3.5, 35-49 SCh, and SDu lack bulbs before the common opening.

The pupa has 4 filamentous L-setae on VII and VIII, the TH is 0.37-0.47 mm long and ends in 1 or more strong spines, and the TH/AM is 1.26-1.47.

MALE IMAGO (n = 10-11, EXCEPT WHEN OTHERWISE STATED)

TL 3.21-4.12, 3.62 mm. WL 1.70-2.21, 2.02 mm. TL/WL 1.68-1.87, 1.78(9). WL/Pfe 2.61-2.89, 2.75.

Antenna - Pedicel L/W (microns, n = 9): 80-122, 107/114-189, 163. Flagellomeres L/W (microns): 56-72, 64/34-50, 44; 22-36, 30/38-51, 45; 23-34, 28/38-49, 43; 23-36, 28/34-49, 42; 25-34, 28/30-47, 40; 25-30, 28/27-47, 39; 26-31, 29/25-46, 38; 26-32, 29/25-46, 37; 28-34, 31/23-45, 36; 30-34, 31/24-45, 35; 28-38, 32/24-45, 35; 28-35, 32/23-45, 34; 540-724, 641/23-45, 34. AR 1.49-1.97, 1.71.

Head - Temporal setae 8-16, 10; Po 2-6, 4; OV 2-6, 3; IV 2-4, 3. Clypeus with 6-13, 9 setae. Te 160-180, 169 μ (7) long; 38-50, 42 μ (8) wide; width anterior of PTP 10-15, 12 μ (8); distance from apex to PTP 21-32, 28 μ (8). St 150-175, 160 μ (8) long; 50-70, 57 μ (8) wide. Ocelli present on 1 side in 1 of 10 specimens. Palp lengths (microns): 29-42, 32; 50-62, 58; 94-133, 122; 82-118, 101; 100-144, 136.

Thorax - Ap 6-10, 9(9); median lobes apparently not in contact anterior of scutal projection. Dc 7-15, 10; Ac 6-12, 10(8) starting at anterior 1/6-1/3 of scutum; Pa 5-8, 6(9). Scu 6-11, 9.

Wing - Anal lobe well developed, protruding. C-extension 24-54, 40 μ long. VR l.ll-l.18, l.l4. B with l or 2, l(9); R with 6-8, 7; R₁ with 0 or l, 0.l; R₄₊₅ without setae. Squama with 14-24, 20 setae.

Legs - Sp₁ 50-74, 67 μ ; Sp₂ 20-36, 26 μ and 18-26, 22 μ ; Sp₃ 46-66, 59 μ and 18-26, 21 μ (9). Wti₁ 40-50, 46 μ ; Wti₂ 35-51, 46 μ ; Wti₃ 49-57, 53 μ . Sp₁/Wti₁ 1.25-1.56, 1.45. Comb with 9 or 10, 10(9) setae; shortest seta 20-30, 23 μ (9); longest 40-54, 43 μ (9). Ps 20-26, 22 μ long; 1 or 2 on ta₁ of p₂; 0-2, 1 on ta₁ of p₃. Sch 3-12, 7 on ta₁ of p₃. Lengths (microns) and proportions of legs:

	fe	ti	tal	ta ₂
P1	613-810,738	754-1006,911	515-705,635	294-417.369
P2	632-859,774	705-969,866	343-478,429	190-258,236
p3	675-926,830	846-1141,1033	454-601,554	301-337,321
	ta ₃	ta ₄	ta ₅	LR
P1	184-288,253	130-180,163	86-102,96	0.67-0.75,0.70
P2	135-184,168	94-126,116	75-96,89	0.49-0.51,0.50
p3	190-258,232	112-158,138	80-110,99	0.52-0.57,0.54
	BV	sv	BR	
\mathbf{p}_1	2.50-2.70,2.59	2.43-2.67,2	.60 2.43-3.1	2,2,71
P2	3.28-3.64,3.39	3.75-3.91,3	.80 2.65-3.8	5,3.04
P3	2.74-3.19,3.05	3.21-3.44,3	.36 3.78-4.6	4,4.11

Hypopygium (Fig. 44) - Anal point slender and thin, parallel sided. T IX with 14-22, 18 setae. Laterosternite IX with 6-12, 9 setae and with strong anteriolateral spine in the Nearctic specimens. Pha 93-112, 102 μ long. TSa 86-110, 100 μ long. Spines of penis cavity (Fig. 13H) shorter than normal, but often strong. Gc 203-277, 242 μ long; with double basal lobe. Gs 95-139, 112 μ long; slender, with indication of outer angle. HR 1.97-2.32, 2.16; HV 2.97-3.36, 3.22 (9).

FEMALE IMAGO (n = 7, EXCEPT WHEN OTHERWISE STATED)

TL 2.84-3.49, 3.23 mm. WL 1.74-2.15, 1.99. TL/WL 1.51-1.71, 1.63; WL/Pfe 3.28-3.54, 3.40.



FIG. 44. *Hydrobaenus spinnatis* sp.n., male hypopygium. A) holotype; B-D) paratypes from Quebec.

Antenna - Pedicel L/W (microns): 40-55, 44/70-78, 74. Flagellomeres L/W (microns): 73-90, 80/31-38, 34; 32-42, 37/26-32, 28; 37-50, 41/24-30, 27; 40-48, 43/ 25-28, 27; 108-136, 121/18-34, 27. AR 0.53-0.67, 0.60.

Head - Temporal setae 4-8, 6; Po 1-3, 2; OV 1 or 2, 2; IV 2 or 3, 2. Clypeus with 6-10, 9 setae. Te 150-184, 161 μ (6) long; 30-38, 33 μ (6) wide; width anterior of PTP 6-10, 8 μ (6); distance from apex to PTP 11-24, 18 μ (6). St 130-155, 142 μ (6) long; 40-50, 47 μ (5) wide. 0-2, 2 ocelli; 32-50, 41 μ (6) apart. Coronal suture absent in 5 of 7 specimens, 70-80 μ (2) long in 2 specimens. Palp lengths (microns): 30-37, 31; 50-60, 54; 85-110, 97; 78-90, 82; 100-140, 122.

Thorax - Ap 3-12, 7. Dc 7-15, 10; Ac 6-15, 10, starting at anterior 1/3 of scutum; Pa 3-7, 5. Scu 6-10, 8.

Wing - C-extension 30-70, 52 μ long. VR 1.10-1.18, 1.15. B with 1 or 2, 1(6); R with 9-13, 11; R₁ with 5-9, 6; R₄₊₅ with 5-8, 6 setae. Squama with 15-25, 19 setae.

Legs - Sp₁ 30-41, 36 μ ; Sp₂ 22-30, 26 μ and 18-24, 21 μ ; Sp₃ 50-56, 53 μ and 16-20, 19 μ . Wti₁ 37-46, 41 μ ; Wti₂ 40-51, 45 μ ; Wti₃ 45-54, 50 μ (6). Sp₁/Wti₁ 0.75-0.95, 0.86. Comb with 8-10, 9 setae; shortest seta 18-26, 22 μ ; longest 34-42, 39 μ . Ps 19-29, 21 μ long; 2 on ta₁ of p₂; 1 or 2, 2 on ta₁ of p₃. Sch 35-49, 39(8) on ta₁ of p₃. Lengths (microns) and proportions of legs (n = 6 for ta₃-ta₅ and BV₁, otherwise 7):

	fe	ti	tal	ta ₂	ta ₃
p ₁	503-626,584	626-803,744	393-521,478	239-301,274	153-190,174
p2	564-705,663	626-797,747	288-386,353	165-209,189	104-135,124
Р3	650-797,732	742-975,894	405-515,471	227-294,274	165-209,190
	ta ₄	ta ₅	LR	BV	
p1	98-127,115	68-86,78	0.63-0.66,0.64	2.63-2.93,2	.79
p ₂	72-96,87	62-82,72	0.46-0.49,0.47	3.50-4.02,3	.73
рз	88-118,105	72-90,81	0.51-0.55,0.53	3.08-3.28,3	.20
	SV	BR			
p_1	2.71-2.87,2.78	2.07-3.30	,2.16		

 P2
 3.83-4.15,4.00
 1.93-2.59,2.18

 P3
 3.26-3.61,3.46
 2.12-2.81,2.41

Abdomen - Number of setae on T I-VIII as : 20-35, 28; 24-36, 29; 16-32, 23; 14-27, 21; 16-28, 22; 7-24, 17; 5-27, 17; 10-26, 18. Setae on S I-VIII as: 0; 0-3, 2; 4-9, 6; 5-11, 8; 8-16, 11; 6-17, 13; 8-22, 16; 22-38, 32.

Genitalia (Fig. 14C, K; 15H; 45C, D) - Gc with 18-29, 25 setae. Cercus 119-156, 138 μ long. SCa 106-130, 115 μ (6) long; 62-70, 67 μ (6) wide; sclerotized in oral 64-80, 71 μ (6); with microtrichia. SDu without bulbs before common opening. Csa wide in the middle with median and lateral branches or points (Fig. 14C). Lobes of Gp VIII (Fig. 14K) normal.









FIG. 45. *Hydrobaenus spinnatis* sp.n., female. A) apex of head; B) cibarial pump, Te and St; (C-D) female genitalia, ventral C) and dorsal D) view.

PUPA (n = 11, EXCEPT WHEN OTHERWISE STATED)

TL 3.61-4.67, 4.29 mm. TH/AM 1.00-1.26, 1.16.

Cephalothorax - TH (Fig. 160) 313-380, 348 μ long; 51-70, 60 μ wide; 5.03-7.33, 5.84 times as long as wide; with few or no apical spinules. Anterior PcS 58-100, 74 μ (9) long; located 12-44, 21 μ (5) from median PcS and 14-52, 27 μ (5) from posterior PcS. Median PcS 100-130, 115 μ (8) long; located 2-12, 6 μ (5) from posterior PcS. Posterior PcS 38-88, 50 μ (5) long; located 40-50, 46 μ (5) from TH. FS (Fig. 18E) 74-110, 99 μ (9) long.

Abdomen (Fig. 18E, K) - PSA on S IV-VII or VIII; longest spinules on IV 8-11, 9 μ ; on V 6-9, 8 μ ; on VI 5-8, 6 μ ; on VII 3-6, 4 μ ; on VIII 0-3, 2 μ long. I with 3, II-VIII with 4 L-setae, all filamentous on VII and VIII. Anal lobe with 264-331, 302 μ long AM, and 20-32, 26 setae in fringe; longest setae in fringe 90-120, 107 μ (10); shortest 14-39, 23 μ (10).

Remarks

The only differences between the specimens from Quebec and the Alps are the presence of a strong anteriolateral spine on laterosternite IX of the Nearctic males, and the exuvia and the male from Chamonix are smaller than the average Quebec specimen. The spine of laterosternite IX is, in other species, present or absent even within the same population; the exuvia size in the Chamonix population falls within the range of the Quebec population. These characters are, therefore, not sufficient to separate Palaearctic and Nearctic forms.

Material Examined

Holotype and allotype: male and female, Old Chelsea, Que., 24/4/58, J. R. Vockeroth (CNC No. 13483). Paratypes: 59 males, 23 females, 39 exuvia, same data as for holotype; 1 male, 10 exuvia, Coll. des Iserau, pond, 2000 m above sea level, Chamonix, France, 24/7/57, E. J. Fittkau (CNC, BMNH, CUC, FWI, INHSC, JES, SMNH, USNM, ZMUH, ZSBS).

Ecology and Distribution

The species is known only from two localities, Quebec and the Alps.

The following two species cannot for the moment be placed in any group or in the synapomorphic diagram.

Hydrobaenus calvescens sp.n.

(Fig. 13I; 46)

This male is easily recognized by its Gs with a distinct preapical crista dorsalis, and by the very reduced inner verticals. The AR is 1.6, there are 17 Ac starting at anterior 1/6 of the scutum, and 29 setae on T IX.

MALE IMAGO (n = 1)

TL 3.84 mm. WL 1.93 mm. TL/WL 1.99. WL/Pfe 2.58.

Antenna - Pedicel L/W (microns): 120/174. Flagellomeres L/W (microns): 60/43, 24/42, 24/42, 26/45, 28/45, 27/44, 28/39, 30/36, 31/34, 32/32, 34/28, 32/26, 577/27. AR 1.61.

Head - Temporal setae (Fig. 46A) 13, Po 7, OV 1, IV 5. Clypeus with 8 setae. Te (Fig. 46B) 205 μ long, 40 μ wide, distance from apex to PTP 50 μ . St 150 μ long, 66 μ wide. Palp lengths (microns): 44, 71, 137, 100, 144.

Thorax - Ap 9, median lobes in broad contact anterior of scutal projection. Dc 10, Ac 17 starting at anterior 1/6 of scutum, Pa 6 or 7. Scu 12.

Wing - Anal lobe relatively well developed, but not protruding. C-extension 25 μ . VR l.15. B with l, R with 8, R_l with l, R₄₊₅ with l seta. Squama with 20 setae.

Legs - Sp₁ 60 μ , Sp₃ 71 μ and 26 μ . Wti₁ 50 μ , Wti₂ 50 μ , Wti₃ 59 μ . Sp₁/Wti₁ 1.20. Comb with 10 setae, 26-44 μ long. Ps 20-24 μ long, 2 on ta₁ of p₂ and p₃. Sch 7 on ta₁ of p₃. Lengths (microns) and proportion of legs:

	fe	ti	tal	ta ₂	ta ₃	ta_4	ta ₅	LR	BV	sv	BR
p_1	748	945	552	356	245	159	92	0.58	2.63	3.07	2.64
P2	797	828	399	227	159	104	86	0.48	3.51	4.07	3.07
P3	822	1024	552	319	233	135	92	0.54	3.08	3.34	3.56

Hypopygium (Fig. 46C) - Anal point parallel sided. T IX with 29 setae. Laterosternite IX with 5 setae and anteriolateral spine. Pha (Fig. 13I) 110 μ long. TSa 108 μ long. Gc 242 μ long with partially double basal lobe. Gs 110 μ long, with pronounced preapical crista dorsalis. HR 2.20, HV 3.49.

Material Examined

Holotype: male, Platte Creek, Lake Francis Case, Platte, S.D., 3/5/72, P. L. Hudson (CNC No. 13484).





FIG. 46. *Hydrobaenus calvescens* sp.n., male. A) apex of head; B) cibarial pump, St and Te; C) hypopygium.

Ecology and Distribution

The species is known only from the holotype from South Dakota.

Hydrobaenus tumidistylus sp.n.

(Fig. 47)

The male is easily recognizable by the large median crista dorsalis (?) of Gs and the AR of only 0.8. It has apparently only 2 central Ac, 24 setae on the squama, 20 setae on T IX, HR of 1.6, and HV of 2.2.

MALE IMAGO (n = 1)

TL 3.48 mm. WL 220 mm. TL/WL 1.58. WL/Pfe 2.94.

Antenna - Pedicel L/W (microns): 93/130. Flagellomeres L/W (microns): 60/37, 30/31, 36/30, 35/30, 34/26, 35/26, 38/26, 35/24, 36/23, 36/24, 36/22, 38/22, 343/22. AR 0.79.

Head - Temporal setae 6, Po 3, OV 2, IV 1. Clypeus with 10 setae. Te 160 μ long, 38 μ wide, width anterior of PTP 10 μ , distance from apex to PTP 30 μ . St 120 μ long. Palp lengths (microns): 34, 53, 108, 98, 174.

Thorax - Ap 7, median lobes in contact anterior of scutal projection. Dc 4, Ac 2 in center of scutum, Pa 5. Scu 6.

Wing - Anal lobe well developed, slightly protruding. C not extended. VR 1.14. B with 2, R with 7, R_1 with 1, R_{L+5} with 1 seta. Squama with 14 setae.

Legs - Sp₁ 65 μ , Sp₂ 40 μ and 26 μ , Sp₃ 60 μ and 24 μ . Wti₁ 50 μ , Wti₂ 50 μ , Wti₃ 55 μ . Sp₁/Wti₁ 1.30. Comb with 9 setae, 30-50 μ long. Ps 27-29 μ long, 2 on ta₁ of p₂ and p₃. SCh 3 on ta₁ of p₃. Lengths (microns) and proportions of legs:

	fe	ti	tal	ta ₂	tag	ta4	ta ₅	LR	BV	sv	BR
Pl	748	926	626	374	282	178	116	0.68	2.42	2.67	2.07
P2	779	853	417	245	172	129	110	0.49	3.12	3.91	2.33
P3	871	1043	534	313	258	135	123	0.51	2.95	3.58	3.13

Hypopygium (Fig. 47) - Anal point small, but strong. T IX with 20 setae. Laterosternite IX with 7 setae, with indication of anteriolateral spine on one side. Pha 122 μ long. TSa 130 μ long. Gc 256 μ long, with large basal lobe. Gs 160 μ long, with large median swelling. HR 1.60, HV 2.17.



FIG. 47. Hydrobaenus tumidistylus sp.n., male hypopygium.

Remarks

This species and *H. calvescens* sp.n. are the only species of *Hydrobaenus* with a crista dorsalis. As the species in both cases are based on single males the generic placement is somewhat uncertain. However, both species appear to be valid, characteristic, and easily recognizable species and not aberrant individuals.

Material Examined

Holotype: male, Clyde, Baffin Island, N.W.T., 23/7/58, J. E. H. Martin (CNC No. 13485).

Ecology and Distribution

Probably an arctic species as yet only known from Baffin Island.

Trissocladius Kieffer 1908

Trissocladius Kieffer, in Kieffer and Thienemann 1908: 3 Trissocladius Goetghebuer 1913: 154, pro parte. Trissocladius Goetghebuer 1932: 50, pro parte. Trissocladius Thienemann 1935: 216, pro parte. Hydrobaenus Edwards 1940: 154, pro parte, nec Fries. Trissocladius Goetghebuer 1940-50: 146, pro parte. Trissocladius subgen. Trissocladius Goetghebuer 1940-50: 147 Trissocladius Brundin 1956a: 73, pro parte.

Type species: Trissocladius brevipalpis Kieffer (in Kieffer and Thienemann 1908: 4).

IMAGO

Diagnosis - Eyes naked, slightly elongated dorsally. 13 flagellomeres in male, 5 or 6 in female; antennal groove in male reaching flagellomere 3; flagellomeres 1-5 (weak on 1) of male with SCh. Temporal setae (Fig. 48C) clearly divided in Po, OV, and IV; IV short. Palp (Fig. 48D) usually 4-segmented, occasionally 5-segmented (Fig. 47A); when 4-segmented, segments normal and not reduced; 2 SCh at apical sensillum coeloconicum of third segment. Antepronotum (Fig. 48A, B; 50A) well developed; median lobes gaping, not in contact anterior of scutal projection. Dc normal, Ac absent (Fig. 48A, B; 50A), Pa normal. Scu in single, transverse row. Wing membrane void of setae, with relatively strong punctation of microtrichia. Anal lobe developed, slightly protruding (Fig. 48E, 50A). C somewhat extended, R_{4+5} ends far distad of M_{3+4} , An ends distad of FCu, Cu₁ distinctly curved apically, R_1 and $R_{4,+5}$ with setae in male. Squama fringed. Sensilla campaniformes about 7-9 at base of B, about 2 or 3 below setae of B, about 7-9 at apex of B, 1 at base of Sc, 1 in basal half of R_1 , 1 on FR. Pulvilli absent. Comb vestigial or absent. Ps absent. SCh none to a few on p_2 and a few to several on p3 of male. Setae of tergites scattered without any obvious pattern. Setae of sternites in median and lateral rows. Anal point proper short, pointed, with numerous setae at base or on T IX, without microtrichia at apex. Pha normal, aedeagal lobe triangular (Fig. 51C). TSa convex on anterior margin. About 6 equally long and strong, moderately long, spines of penis cavity. Gc with basal lobe. Gs with outer corner or projection, crista dorsalis absent, apical spine long. Female genitalia not known.

PUPA (NOT EXAMINED AND NOT AVAILABLE, DIAGNOSIS BASED ON LITERATURE)

Diagnosis - TH long, about 4 times as long as wide, covered with spinules, rounded at apex (Kieffer and Thienemann 1908, fig. 9; Goetghebuer 1919, fig. 18; Pankratova 1970, fig. 73.7). Frontal warts large, smooth. T I without shagreenation; T II with posterior group of spinules and weak hooks; T III-VIII with fine, but extensive shagreenation with stronger posterior spinules (Goetghebuer 1919, fig. 19). Caudolateral

corners of segments rounded. PSB apparently absent (according to Goetghebuer 1919, fig. 19). PSA unknown. Segment I with 2 L-setae, II-V with 3, VI and VII with 4, VIII with 5 L-setae, all filamentous on VII and VIII. Anal lobe fully fringed with long setae. 3 equally long AM.

LARVA (NOT EXAMINED AND NOT AVAILABLE, DIAGNOSIS BASED ON LITERATURE)

Diagnosis - Coloration bloodred. Antenna said to be 5-segmented. (However, according to Chernovskii (1949, fig. 131) it seems possible that the antenna is 7segmented with a very short third segment and a vestigial seventh segment, i.e. of the same type as in Paratrissocladius Zavř. and Heterotrissocladius Spärck.) LO indistinct, short. Bl nearly as long as flagellum (Potthast 1915, fig. 105; Chernovskii 1949, fig. 131; Pankratova 1970, fig. 73.6) RO in basal fourth. S I (Potthast 1915, fig. 106a; Chernovskii 1949, fig. 131; Pankratova 1970, fig. 73.4) plumose at apex, S II and S III simple. Pecten epipharyngis consisting of 3 simple, smooth spines (Potthast 1915, fig. 106a). Apparently 2 pairs of chaetulae basales and about 5 or 6 pairs of simple chaetulae laterales. Premandible (Potthast 1915, fig. 106a; Chernovskii 1949, fig. 131; Pankratova 1970, fig. 73.2) with 2 apical teeth and well-developed accessory tooth. Mandible (Kieffer and Thienemann 1908, fig. 6, 8; Potthast 1915, fig. 107; Chernovskii 1949, fig. 131; Pankratova 1970, fig. 73.3) with seta interna, apical tooth shorter than width of remaining teeth, seta subdentalis apically narrowed or indented. Maxilla (Potthast 1915, fig. 107) apparently with unserrated IG. Prementohypopharyngeal complex (Potthast 1915, fig. 108) apparently with relatively large, curved, and diverging ML. Mentum (Kieffer and Thienemann 1908, fig. 7, 8; Potthast 1915, fig. 109; Chernovskii 1949, fig. 131; Pankratova 1970, fig. 73.1) with 2 low, median teeth and 6 pairs of lateral teeth. Ventromental plates wide, apparently without setae underneath. Parapods well developed. Pc sclerotized caudally (Chernovskii 1949, fig. 131; Pankratova 1970, fig. 73.5), with 6 or 7 An. TA pointed, ovoid, about half as long as PP.

Ecology and Distribution

The larvae probably live in temporary puddles. They build loose tunnels of mud and plant remains. The genus is, so far, known only from Germany, Belgium, Sweden, Finland, and USSR.

Key to known males of Trissocladius

Trissocladius brevipalpis Kieffer

(Fig. 48; 49; 50E; 51C)

Trissocladius brevipalpis Kieffer, in Kieffer and Thienemann 1908: 4 (male); Goetghebuer 1932: 50 (male, female), 52 (pupa, larva), 1940-50: 147 (male, female); Edwards 1940: 156 (male); Thienemann 1944: 588, 634 (pupa, larva); Chernovskii 1949: 142 (larva); Pankratova 1970: 136 (pupa, larva)

Trissocladius brevipalpis var. longipennis Kieffer, in Kieffer and Thienemann 1908: 4 (male, female); Thienemann in Kieffer and Thienemann 1908: 185 (pupa, larva); Potthast 1915: 327 (pupa, larva); Goetghebuer 1940-50: 147 (male, female)

Trissocladius brevipalpis var. ater Kieffer, in Kieffer and Thienemann 1908: 4 (male); Thienemann in Kieffer and Thienemann 1908: 186 (pupa); Potthast 1915: 327 (pupa); Goetghebuer 1940-50: 147 (male)

Trissocladius nigerrimus Goetghebuer 1919: 59 (pupa), 1921: 91 (male, female) Trissocladius brevipalpis var. nigerrimus Goetghebuer 1940-50: 147 (male, female) ?Trissocladius brevipalpis Kieff. Berczik 1968: 348 (larva)

The male imago is characterized by an AR of 1.0-1.5, last flagellomere with welldeveloped plume, R with 12-19, R_1 with 5-10, and squama with 10-24 setae, VR of 1.07-1.14, Dc 9-22, LR_1 0.72-0.76, and T IX including anal point with 26-38 setae.

MALE IMAGO (n = 8, EXCEPT WHEN OTHERWISE STATED)

TL 3.35-4.06, 3.88 mm (7). WL 1.85-2.35, 2.08 mm. TL/WL 1.81-1.95, 1.89 (7). WL/Pfe 2.22-2.46, 2.37. Thorax blackish brown; palp, antenna, legs, halteres, and abdomen pale brown.

Antenna - Pedicel L/W (microns, n = 5): 90-114, 104/136-148, 140. Flagellomeres L/W (microns, n = 6): 64-76, 70/42-49, 45; 26-31, 29/34-43, 41; 24-30, 28/31-42, 39;

28-34, 31/30-40, 38; 30-38, 33/30-40, 36; 32-38, 35/28-37, 34; 34-46, 39/ 27-36, 32; 34-41, 39/26-34, 30; 34-41, 39/26-35, 30; 36-42, 39/26-34, 30; 36-44, 40/ 26-32, 29; 33-45, 41/26-31, 29; 460-589, 521/24-34, 30. AR 1.00-1.35, 1.20 (6).

Head - Temporal setae (Fig. 48C) 8-10, 9 (4); Po 2 (4); OV 3 or 4 (4); IV 3 or 4 (4). Clypeus with 9-16, 12 (7) setae. Cibarial pump, Te, and St as in Fig. 48D, 49A. Te 135-200, 173 μ (7) long; 34-44, 39 μ (7) wide; width anterior of PTP 10-14, 12 μ (7); distance from apex to PTP 24-34, 28 μ (7). St 130-160, 146 μ (4) long; 66-80, 72 μ (4) wide. Palp (Fig. 46D, 47A) lengths (microns, n = 6): 32-40, 37; 50-66, 58; 84-118, 100; 66-134, 112; 0-112, present in 1 of 6 specimens.

Thorax (Fig. 48A, B) - Ap 4-8, 6(7). Dc 9-22, 15; Ac absent; Pa 4-6, 5; parascutellars 0-2, 0.4. Scu 10-12, 10(7).

Wing (Fig. 48E) - Anal lobe moderately developed, slightly protruding. Cextension 55-86, 67 μ long. VR 1.07-1.14, 1.12. R with 12-19, 15; R₁ with 5-10, 8; R_{4,15} with 1-4, 2 setae. Squama with 10-24, 15 setae.

Legs - Sp₁ 49-62, 55 μ (6); Sp₂ 26-40, 36 μ (7) and 22-30, 26 μ (6); Sp₃ 50-60, 55 μ (6) and 22-26, 23 μ (6). Wti₁ 44-57, 52 μ ; Wti₂ 45-56, 52 μ ; Wti₃ 50-66, 59 μ . Sp₁/Wti₁ 0.94-1.11, 1.02(6). Comb absent (Fig. 46F), but apical group of spiniform setae grade over into 4-8 apical setae, 22-46 μ long. Ps absent. SCh 1-3, 1.9 on p₂; 6-12, 9 on p₃ in proximal half. Lengths (microns) and proportions of legs (n = 7-8):

	fe	ti	tal	ta ₂
p_1	761-1012,873	908-1165,1010	650-871,745	343-429,379
p2	797-1079,921	908-1153,1018	472-601,512	245-294,271
рз	853-1165,983	1036-1355,1187	515-687,597	270-350,308
	ta ₃	ta ₄	ta ₅	LR
pl	227-294,256	135-196,161	86-117,102	0.72-0.76,0.74
p2	165-202,183	98-129,120	80-110,96	0.51-0.53,0.52
P3	184-258,222	110-147,133	86-110,101	0.49-0.51,0.50
	вV	sv	BR	
p_1	2.89-3.02,2.94	2.48-2.57,2.53	1.67-2.71,	2.22
p ₂	3.53-3.74,3.69	3.52-3.76,3.65	1.94-2.36	2.12
p3	3.49-3.71,3.65	3.56-3.69,3.64	2.11-2.94	2,36

Hypopygium (Fig. 49B, 50E) - T IX including anal point with 26-38, 31 setae. Laterosternite IX with 9-14, 11 setae. Pha (Fig. 51C) 96-146, 117 μ long. TSa 80-110, 97 μ long. Gc 225-300, 274 μ long. Gs 120-159, 143 μ long, with short outer projection and long apical spine. HR 1.82-2.03, 1.93; HV 2.61-2.97, 2.77 (7).



FIG. 48. *Trissocladius brevipalpis* Kieff., male. A) thorax, lateral view; B) thorax, dorsal view; C) apex of head; D) cibarial pump, Te, St and palp; E) wing; F) apex of hind tibia.

FEMALE IMAGO (NOT EXAMINED)

PUPA (NOT EXAMINED)

TL 5-7 mm. TH about 0.4 mm long, 0.08 mm wide. Otherwise as in the generic diagnosis.



FIG. 49. *Trissocladius brevipalpis* Kieff., male with 5-segmented palp. A) cibarial pump, Te, St and palp; B) hypopygium.

FOURTH INSTAR LARVA (NOT EXAMINED)

TL about 9 mm. AR about 1.3-1.8. Procercus 1.5 times as high as wide. Otherwise as in generic diagnosis.

Remarks

The population from Finland appears to differ from the Swedish population by generally fewer setae with 9 or 10 Dc as opposed to 13-22 Dc, and 10-12 setae on the squama as opposed to 13-24. However, these differences are not larger than the variation found within the Swedish population where 1 specimen had 5 palpal segments,



FIG. 50. Trissocladius spp., males. (A-D) T. heterocerus Kieff.: A) thorax; B) wing; C-D) hypopygium. E) T. brevipalpis Kieff., hypopygium of male from Finland.

22 Dc, 24 setae on the squama, an AR of 1.35, and T IX with 36 setae. In the hypopygium, and in most other measurements, this specimen, however, does not appear to differ from other members of the population. The large variation seems to result from different degrees of reduction from a "normal" type posessing a full number of palpal segments and higher chaetotaxy.

Material Examined

Two males, Riihimäki, Finland, 20/5/57, M.Hirvenoja; 6 males, Småland, Sweden, 1958, E. J. Fittkau (CNC, FWI, SMNH, ZMUH, ZSBS).

Ecology and Distribution

The species lives in puddles where it makes loose tunnels of mud and plant remains. Emergence takes place in March to April in Germany, and at the end of May in Finland.

Distribution - Germany (Kieffer and Thienemann 1908: 4, 186; Potthast 1915: 327; Thienemann 1954: 520), Belgium (Goetghebuer 1919: 59, 1921: 91), USSR including East Siberia (Chernovskii 1949: 142; Pankratova 1970: 137), Finland, Sweden. Possibly in Hungary (Berczik 1968: 348).

Trissocladius heterocerus Kieffer

(Fig. 50A-D)

Trissocladius heterocerus Kieffer, in Kieffer and Thienemann 1908: 5 (male, female); Thienemann in Kieffer and Thienemann 1908: 186 (pupa, larva, egg); Potthast 1915: 328 (pupa, larva, egg); Goetghebuer 1932: 50 (male, female), 1940-50: 147 (male, female); Thienemann 1944: 588, 634 (pupa, larva)

Male imago is characterized by an AR of about 0.6, last flagellomere with a reduced plume, R with 18-21, R_1 with 10-17, and a squama with 21-26 setae, 19-27 dorsocentrals, VR of about 1.04, LR_1 of about 0.63, and T IX plus the anal point with 46-61 setae.

MALE IMAGO

WL 2.01 mm (1).

Antenna - Not measurable. AR about 0.6 according to Kieffer and Thienemann (1908: 5).

Head - Temporal setae about 12 (1). Clypeus with 9-11 (2) setae. Te 210 μ (1) long, 36 μ (1) wide, width anterior of PTP 10 μ (1), distance from apex to PTP 16 μ (1). Palp lengths (microns, n = 1): 50, 62, 90, 120.

Thorax (Fig. 50A) - Ap 12-17 (3). Dc 19-27, 24 (4); Ac absent; Pa 9-11 (3). Scu 15-20 (3).

Wing (Fig. 50B) - C-extension 80 μ (1). VR 1.04 (1). B with 3 (2); R with 18-21, 20 (4); R₁ with 10-17, 14 (4); R₄₊₅ with 1-4 (2) setae. Squama with 21-26 (3) setae.

Legs - Sp₁ 48-54 μ (2), Sp₂ 44 μ (1) and broken or absent, Sp₃ 66-69 μ (2) and 32-33 μ (2). Wti₁ 56-64 μ (2), Wti₂ 64 μ (1), Wti₃ 67-69 μ (2). Sp₁/Wti₁ 0.84-0.86 (2). Comb absent, but apical group of spiniform setae ends in a row of 2-4, 30-36 μ (2) long setae. Ps absent. SCh not observed on p₂, 3(1) on p₃. Lengths (microns) and proportions of legs (n = 1 or 2):

	fe	ti	taı	ta ₂	ta3	ta4	ta_5	LR	BV	sv
\mathbf{p}_1	871-895	981-1018	613	307	184	110	116	0.63	3.47	3.04
p2	908	1006	442	233	147	98	110	0.44	4.01	4.33
P3	994-1030	1141-1202	552	307	190	104	123	0.46	3.85	4.04

Hypopygium (Fig. 50C, D) - T IX plus anal point with 46-61, 56 (5) setae. Laterosternite IX with 11-13, 12 (5) setae. Pha 140-155, 150 μ (4) long. TSa 130-160, 139 μ (5) long. Gc 340-360, 349 μ (5) long. Gs 154-160, 158 μ (5) long; with short, pointed, outer projection and long apical spine. HR 2.18-2.28, 2.22 (5).

FEMALE IMAGO (NOT EXAMINED)

PUPA (NOT EXAMINED)

TH about 0.45 mm long, 0.10 mm wide.

FOURTH INSTAR LARVA (NOT EXAMINED)

Material Examined

Four damaged males, 1 male hypopygium, Greifswald, Germany, A. Thienemann (ZSBS).

Ecology and Distribution

The species has been found in temporary ponds that hold water only in spring. As in *T. brevipalpis*, the larvae build loose tunnels of plant remains. Emergence takes place early in April (Kieffer and Thienemann 1908: 186). This species is presently known only from Germany (Kieffer and Thienemann 1908: 186).

Zalutschia Lipina 1939

Zalutschia Lipina 1939: 106 (in English summary) Trissocladius Thienemann 1941: 211, pro parte, nec Kieffer in Kieffer and Thienemann 1908: 3 Trissocladius Brundin 1956a: 73, pro parte, nec Kieffer.

Type species: Zalutschia zalutschicola Lipina 1939: 96, 106 (syn. Orthocladius naumanni Brundin 1949: 825, according to Pankratova 1970: 138).

IMAGO

Diagnosis - Eyes naked, slightly elongated dorsally. 13 flagellomeres in male, 4 or 5 (usually 5) in female; antennal groove in male reaching flagellomere 3 or 4, flagellomeres 2 or 3 or 2-4 in male with SCh. Temporal setae often reduced in number; IV, OV, and Po well separated at least by size. Palp 5-segmented, normal, with 2 or 3 SCh at apical sensillum coeloconicum of third segment. Antepronotum normally developed; median lobes widely gaping, not in contact anterior of scutal projection. Dc normal; Ac reduced, located 1/6-1/2 the length of scutum from scutal projection; Pa normal. Scu in single transverse row. Wing membrane void of setae, with very fine punctation of microtrichia. Anal lobe relatively well developed to absent. C barely to strongly extended, R_{4+5} ends distad of M_{3+4} , An ends distad of FCu, Cu_1 slightly curved apically, R_1 and R_{4+5} usually without setae in male. Squama fringed. Sensilla campaniformes 9-12 at base of B, 3 or 4 below seta of B, 9-12 at apex of B, 1 at base of Sc, 1 at base of R_1 , and 1 on or near FR. Pulvilli absent. Ps nearly always present at apex of ta_1 of p_2 and p_3 and occasionally on ta_2 of p_2 and p_3 . Sch low in number, usually present on ta_1 of p_2 and p_3 in both sexes. Setae of tergites scattered without any obvious pattern. Setae of sternites in median and lateral rows. Anal point minute to long, with setae on anal point proper, without microtrichia at extreme apex. Pha and aedeagal lobe normal. Anterior margin of TSa straight or concave, oral projections of Sa thickened, prominent. Spines of penis cavity long and thin (Fig. 51D-N). Gc with basal lobe. Gs with long outer projection, or with sharp or rounded outer corner; crista dorsalis absent. Gc of female normal, with several setae. T IX of female not or very faintly divided into 2 setigerous protrusions (Fig. 63C; 70B, D, E, F, H). Ventrolateral lobe of Gp VIII small, smaller than dorsomesal lobe (Fig. 52G-K); apodeme lobe indistinct, but visible in ventral view. Labia small, apically rounded. Csa with sharp curves or bends at least indicated by heavier sclerotization (Fig. 52A-F, 53). SCa ovoid with well-developed neck. SDu mostly with common opening, occasionally joined for a short distance. Cerci normal.

Description - Small to medium large species, WL 1.3-3.1 mm. Coloration uniformly brown to black. AR 0.5-2.5 in male, 0.5-0.8 in female. Male flagellomeres 2-6 (in Z. vockerothi and Z. mucronata) to 2-12 (in Z. lingulata) wider than long. Coronal suture mostly absent in female, nearly complete only in Z. obsepta. Temporals 2-13.


FIG. 51. Apodemes of male hypopygium. A) Baeoctenus bicolor gen.n. sp.n. B) Oliveria tricornis (Ol.) gen.n. comb.n. C) Trissocladius brevipalpis Kieff. (D-N) Zalutschia spp.: D) Z. zalutschicola Lip.; E) Z. furcarca sp.n.; F) Z. tornetraeskensis (Edw.) comb.n.; G) Z. lingulata pauca subsp.n.; H) Z. trigonacies sp.n.; I) Z. lingulata lingulata sp.n.; J) Z. lingulata f. teres f.n.; K) Z. vockerothi sp.n.; L) Z. tatrica sp.n.; M) Z. mucronata (Brund.) comb.n.; N) Z. obsepta (Webb) comb.n.



FIG. 52. Zalutschia spp., female genitalia. (A-F) Gp IX, Csa, labia, and spermathecal eminence, ventral view: A) Z. tornetraeskensis (Edw.) comb.n., with variation of Csa (a); B) Z. trigonacies sp.n.; C) Z. lingulata pauca subsp.n., with variation of Csa (a-c); D) Z. pusa sp.n.; E) Z. lingulata lingulata sp.n. with variation of Csa (a-b); F) Z. obsepta (Webb) comb.n. from Kenora, Ont., with Csa of paratype from Costello Lake, Ont. (a). (G-K) Gp VIII: G) Z. tornetraeskensis (Edw.) comb.n.; H) Z. lingulata pauca subsp.n.; I) Z. lingulata lingulata sp.n.; J) Z. pusa sp.n.; K) Z. obsepta (Webb) comb.n.



FIG. 53. Zalutschia spp., female genitalia. A) Z. trigonacies sp.n., lateral view. (B-E) Gp IX and Csa, lateral view: B) Z. trigonacies sp.n.; C) Z. tornetraeskensis (Edw.) comb.n.; D) Z. lingulata pauca subsp.n.; E) Z. obsepta (Webb) comb.n.

Clypeus with 2-22 setae. Ap 4-11. Dc 5-18; Pa 2-9, usually 3-5; Ac 1-13, usually about 3-8; anepisternum II and in some specimens preepisternum of Z. obsepta with a few setae (Fig. 61A). Scu 4-13, most numerous in Z. lingulata lingulata. Anal lobe of wing usually well developed (Fig. 67E) but reduced in Z. vockerothi (Fig. 68B). VR 1.10-1.34, thus mostly higher than in Hydrobaenus. R1 of male void of setae, except in Z. megastylus and in some specimens of Z. tatrica; R4+5 void of setae except in some specimens of Z. vockerothi and Z. obsepta. Squama with 7-45 setae. LR1 0.60-0.74 except in Z. furcarca where it reaches about 0.83. Ps present except in Z. vockerothi. Hind tarsi with at least some indications of a beard except in Z. vockerothi. SCh of male apparently absent on tal of p2 in Z. obsepta, Z. lingulata, and some specimens of Z. furcarca and of Z. mucronata, 1-5 in other species; present on tal of p3 in all species, except some specimens of Z. mucronata and Z. lingulata pauca. SCh of female present on ta_1 of p_2 and p_3 in all species, except on p_2 in some specimens of Z. zalutschicola and Z. lingulata pauca; 0-11 on ta₁ of p_2 ; 0-10 on ta1 of p3. T IX with 8-57 setae in male (8-17 in Z. lingulata pauca, 41-57 in Z. obsepta), 10-29 in female. Shape and length of anal point varies from nearly absent in Z. tormetraeskensis to long and apically widened in Z. obsepta. Basal lobe weak in Z. zalutschicola, well developed in the other species. Female genitalia primarily vary in shape of Csa (Fig. 52A-F, 53), and in SDu which may be joined short distance before common opening (Z. trigonacies, Fig. 52B), apparently open fully or partially separately (Z. obsepta, Fig. 52F) or, in remaining species, have common opening, but otherwise not joined. SDu may also have small bulb anterior to common opening (Fig. 52C-E).

Pupa

Diagnosis - FS present, usually on tubercles, no additional tubercles or "warts" on frontal plate. TH (Fig. 54G-N) long, covered with spinules, more sparse toward base and usually near apex. 3 PcS in triangle. Thorax and wing sheaths more or less rugulose. T II-VIII, S II-VIII, and sometimes part of T I and IX with fine shagreenation covering whole segment except lateral margins. T II with caudal protrusion covered with curved hooks. T III-VI with elevated caudal patches of spinules (weak on VI in some species, Fig. 55). Caudolateral corners of VII and VIII (or VI-VIII) rounded, pointed, or with imbedded spines (Fig. 55). PSB absent. PSA absent or present on IV and V, IV-VI, or IV-VII. Segment I with 3 L-setae; II-VI with 4, occasionally 3 or 5, L-setae; VII with 4, occasionally 5 L-setae, 4, occasionally 3 or 5 filamentous; VIII with 4, occasionally 3 or 5 filamentous. Genital sac of male not or only slightly overreaching anal lobe, with short apicolateral projection. Anal lobe fully fringed with long setae. 3 equally long AM.

Description - TL 2.9-5.4 mm long (smallest in Z. megastylus, longest in some specimens of Z. tornetraeskensis). TH/AM 0.8-1.2. FS 35-240 μ long (35-66 μ in Z. sp.A, about 240 μ in Z. zalutschicola). TH 0.32-0.45 mm long, terminating in distinct apicolateral point in Z. zalutschicola, Z. lingulata pauca, and Z. vockerothi, with indications of such point in some other species. Z. zalutschicola and Z. obsepta with rounded caudolateral corners of VII and VIII, sharply pointed corners in Z. mucronata and Z. megastylus and imbedded spines in remaining species. PSA absent in Z. mucronata and Z. tornetraeskensis, present on IV and V in Z. trigonacies, on IV-VII











E

FIG. 54. Zalutschia spp., pupa. (A-F) frontal plate: A) Z. tornetraeskensis (Edw.) comb.n.; B) Z. mucronata (Brund.) comb.n.; C) Z. obsepta (Webb) comb.n.; D) Z. pusa sp.n.; E) Z. tatrica (Pag.) comb.n.; F) Z. trigonacies sp.n. (G-N) TH and PcS: G) Z. tornetraeskensis (Edw.) comb.n.; H) Z. trigonacies sp.n.; I) Z. lingulata pauca subsp.n.; J) Z. pusa sp.n.; K) Z. vockerothi sp.n.; L) Z. tatrica (Pag.) comb.n.; M) Z. mucronata (Brund.) comb.n.; N) Z. obsepta (Webb) comb.n.



FIG. 55. Zalutschia spp., pupa, abdomen. (A-C) T I-IX: A) Z. tornetraeskensis (Edw.) comb.n.; B) Z. mucronata (Brund.) comb.n.; C) Z. obsepta (Webb) comb.n. (D-H) T VI-VIII: D) Z. tatrica (Pag.) comb.n.; E) Z. trigonacies sp.n.; F) Z. lingulata pauca subsp.n.; G) Z. pusa sp.n.; H) Z. vockerothi sp.n. (I-J) S IV: I) Z. tornetraeskensis (Edw.) comb.n.; J) Z. pusa sp.n.

in Z. *tatrica*, and on IV-VI in remaining species. Segments VII and VIII with 4 filamentous L-setae except in some specimens of Z. *tatrica* where there may be only 3 on both segments, and in Z. *pusa* sp.n. and Z. sp.A where there may be 5 filamentous L-setae. Anal lobe with 18-44 setae in fringe.

LARVA

Diagnosis - Antenna (Fig. 56E-J) 6-segmented, segments consecutively smaller, segment 6 vestigial; LO distinct, shorter than segment 3; Bl longer than segments 2-6 combined or longer than segments 2-4 combined; RO in basal third. S I finely or more coarsely plumose, S II and S III simple. Labral lamella (IL in Fig. 57A) simple, triangular. Pecten epipharyngis consisting of 3 simple, sclerotized, smooth spines. 2 pairs of chaetulae basales; 6 pairs of chaetulae laterales, 1-3 apically serrated. Premandible with 2 apical teeth and 1 low inner accessory tooth (Fig. 56K-P). Mandible with seta interna, apical tooth shorter than combined width of remaining teeth, seta subdentalis apically serrated or indented. Maxilla (Fig. 58) with broad, flat, apically pointed ACh. LG simple or serrated. Mentum usually dark colored with double median tooth and 6 pairs of lateral teeth with first lateral teeth reduced (Fig. 59B-F), occasionally with 2 or 3 light colored median teeth and first and sixth lateral teeth reduced (Fig. 59A); ventromentum extended laterally of dorsomentum, with setae underneath (Fig. 59A-F). Parapods well developed. Pc well developed, sclerotized caudally, with 7 apical setae. An more than 3 times as long as Sa. TA as long as, to much longer than, PP (Fig. 56A-D).

Description - TL of fourth instar 4.2-7.1 mm. Head capsule length 0.35-0.58 mm (largest in Z. trigonacies with 0.53-0.58 mm). AR 1.3-2.1 (lowest in Z. pusa with 1.3, highest in Z. zalutschicola with 1.8-2.1). Basal antennal segment 59-82 μ long, 2.6-4.0 times as long as wide (2.6-3.3 in Z. zalutschicola and Z. tatrica, 3.5-4.0 in other described species). Premandible 60-98 μ long. Mandible 135-184 μ long. V/M 0.6-1.0, or apparently higher in Z. megastylus. Ventromentum with 4-9 fine setae underneath. Postmentum 167-226 μ long. Sa/An 0.10-0.30. TA 105-420 μ long, longest in Z. tatrica (Fig. 56C) with 350-420 μ , shortest in Z. zalutschicola (Fig. 56C) with 105-130 μ .

Ecology and Distribution

Larvae of *Zalutschia* live primarily in lakes, but are also found in ponds, puddles, ditches, and occasionally in streams. All known species are primarily northern, and prefer oligotrophic and dystrophic lakes. The most southerly record from Europe is the Tatra Mountains for *Z. tatrica* (Zavřel 1935: 445), and from North America, Florida for the larva mentioned in footnote⁷ p. 191, about *Z. zalutschicola*; and *Z. sp. B* (which may be the pupa of *Z. lingulata lingulata*) occurs in South Carolina.

The only other species recorded from the U.S.A. is *Z. lingulata lingulata* from Crooked Lake and Myers Lake, northern Indiana; the latter constitutes the only record from a eutrophic lake (Stahl 1959). *Zalutschia tornetraeskensis*, *Z. trigonacies*, and



FIG. 56. Zalutschia spp., larva. (A-D) posterior abdominal segments: A) Z. zalutschicola Lip.; B) Z. trigonacies sp.n.; C) Z. tatrica (Pag.) comb.n.; D) Z. lingulata pauca subsp.n. (E-J) antenna: E) Z. tatrica (Pag.) comb.n.; F) Z. zalutschicola Lip.; G) Z. trigonacies sp.n.; H) Z. lingulata pauca subsp.n.; I) Z. pusa sp.n.; J) Z. obsepta (Webb) comb.n. (K-P) premandible: K) Z. tatrica (Pag.) comb.n.; L) Z. zalutschicola Lip.; M) Z. trigonacies sp.n.; N) Z. lingulata pauca subsp.n.; O) Z. pusa sp.n.; P) Z. obsepta (Webb) comb.n.



FIG. 57. Zalutschia spp., larva. (A-B) Z. zalutschicola Lip., A) labrum and palatum, and B) palatum with some chaetulae laterales turned inwards. (C-F) spinulae and S I: C) Z. tatrica (Pag.) comb.n.; D) Z. trigonacies sp.n.; E) Z. lingulata pauca subsp.n.;
F) Z. pusa sp.n. (G-I) median and paramedian lamellae of prementum: G) Z. trigonacies sp.n.; H) Z. tatrica (Pag.) comb.n.; I) Z. zalutschicola Lip.



FIG. 58. Zalutschia spp., larva, maxilla or part of maxilla, ventral view (A-C) and dorsal view (D-I). A, F) Z. zalutschicola Lip.; B, E) Z. pusa sp.n.; C, D) Z. trigonacies sp.n.; G) Z. tatrica (Pag.) comb.n.; H) Z. lingulata pauca subsp.n.; I) Z. obsepta (Webb) comb.n.



FIG. 59. Zalutschia spp., larva. (A-F) mentum: A) Z. zalutschicola Lip., with variation of median teeth; B) Z. tatrica (Pag.) comb.n.; C) Z. pusa sp.n.; D) Z. lingulata pauca subsp.n.; E) Z. trigonacies sp.n. (ventromental plates bent inwards); F) Z. obsepta (Webb) comb.n. (G-L) mandible: G) Z. zalutschicola Lip.; H) Z. tatrica (Pag.) comb.n.; I) Z. pusa sp.n.; J) Z. lingulata pauca subsp.n.; K) Z. trigonacies sp.n.; L) Z. obsepta (Webb) comb.n.

2. furcarca appear to be purely arctic and subarctic species and strongly coldstenothermous. Zalutschia salutschicola, Z. mucronata, Z. obsepta, and Z. tatrica appear to be typical in mesohumic and polyhumic lakes. All species appear to have a 1-year life cycle, and most have an extremely early emergence period, many emerging when the lakes are still partially ice covered. However, Z. tatrica emerges in July in the Tatra Mountains and in Swedish Lapland, and Z. zalutschicola emerges in September to October in southern Sweden and the end of July in the MacKenzie Delta, N.W.T.

Key to known males of Zalutschia

1 Anal point long, parallel-sided, or wider at apex than in middle (Fig. 62A, C; 64B); Gs apically narrow, elongated, with longer or shorter outer projection; AR 0.5-1.4 2 Anal point short or moderately long, roughly triangular, always with narrowest point at apex; Gs usually triangular with or without outer projection or pointed corner; AR 0.9-2.5 4 2 Outer projection of Gs short and stout (Fig. 64B); posterior part of scutum with shallow impression (Fig. 64A); Dc 5-7; T IX including anal point with 21-30 setae Outer projection of Gs conspicuously long (Fig. 62A, C); posterior part of scutum without shallow impression; Dc 8-16; T IX and anal point with less than 20 or with 41-57 setae 3 3 AR 1.2-1.4; squama with 15-20 setae; R1 without setae; R4+5 with 0-2 setae; clypeus with 2-8 setae; a few setae sometimes present on preepisternum and/or anepisternum II; T IX and anal point with 41-57 setae

5 AR about 0.9; WL/Pfe about 2.4; squama with 7 setae; no Ps; BR lower than 2.8 on all legs; Gs apically elongate and narrow, without outer pointed corner or projection (Fig. 68D); about 1 or 2 SCh on ta_1 of p_2 and about 3 on tal of p3 Z. vockerothi sp.n. (Nearctic) (p. 220) AR 1.3-2.5; WL/Pfe 2.7-3.4; squama with 15-36 setae; Ps present; BR higher than 3.0, at least on p3; Gs not apically elongate and narrow; 6 Gs rounded without any indication of outer point or projection (Fig. 65E), frontal tubercles occasionally present; R1 with 0-10 setae; VR 1.27-1.34; AR 1.3-1.4; 1 or 2 SCh on p_2 and 1-5 on p_3 Z. tatrica (Pag.) comb.n. (Palaearctic) (p. 207) Gs approximately triangular, usually with outer corner or strong projection; R1 without setae; VR 1.15-1.28; AR 1.3-2.5; 0-11 SCh on p2 7 Gs with long outer projection; Gc with large, projecting basal lobe; AR 1.8-2.0 Zalutschia sp. Ireland (DOWLING 1975) Gs at most with small outer projection; Gc with small or large basal lobe; 8 Frontal tubercles present (Fig. 66A); AR 1.3-1.7; WL 2.8-3.1 mm; oral projections of Sa pointed (Fig. 51D); about 1 SCh on p_2 and 3 on p_3 Frontal tubercles absent; AR 1.6-2.5; WL 1.7-2.8 mm; oral projections 9 7-11 SCh on p_2 and p_3 ; Gs angulated at outer corner, but not with sharply pointed projection; anal point minute (Fig. 72); C-extension 90-100 μ ; AR 1.7-1.9 Z. tornetraeskensis (Edw.) comb.n. (Palaearctic) (p. 237) 5 or less SCh on p_2 , 6 or less on p_3 ; Gs with or without sharply pointed projection; anal point relatively large, triangular, or tongue-shaped; C-extension 42-88 µ; AR 1.6-2.5 10 10 Anal point triangular (Fig. 73); Gs with small, sharply pointed, outer projection; T IX and anal point with 21-36 setae; AR 1.6-1.9; LR1 0.64-0.67, LR₂ 0.42-0.44, LR₃ 0.47-0.51; SV₂ 4.37-4.57 Z. trigonacies sp.n. (Nearctic) (p. 242)

11 Anal point triangular; outer angle of Gs rounded (Fig. 69F); T IX and anal point with about 24 setae; longest spine of penis cavity about 80 μ long Z. l. f. teres f.n. (p. 233)

Anal point tongue-shaped; Gs with small, rounded, outer projection (Fig. 69A-E, 71); T IX and anal point with 8-21 setae; longest spine of penis cavity 49-68 µ 12

12 SCh absent on p₂, 0-2 on p₃; T IX and anal point with 8-17, 11 setae (Fig. 21); longest spine of penis cavity 49-56 μ; western subspecies ... Z. *l. pauca* subsp.n. (p. 228) SCh 1-5 on p₂, 2-6 on p₃; T IX and anal point with 15-21, 18 setae (Fig. 69A-E); longest spine of penis cavity 56-68 μ..... Z. *l. lingulata* subsp.n. (p. 223)

Key to known females of Zalutschia

1	Frontal tubercles present; WL 1.6-1.9; TL/WL about 1.9; BV ₂ about 2.8; Gc with about 9 setae; T IX with about 15 setae
	Frontal tubercles absent (or perhaps occasionally present in Z. <i>tatrica</i>); WL 1.7-2.5; TL/WL 1.2-1.7; BV ₂ 2.9-3.9 2
2	Csa with 1 sharp bend (Fig. 52F); SDu without small bulbs before common opening; BR ₃ 2.2-2.8; S VIII with 22-29 setae
	Csa with 1 to several less sharp bends, or with the bends only suggested by heavier sclerotization; SDu with or without bulbs; BR ₃ 2.5-4.7; S VIII with 3-26 setae (more than 20 setae only in some Z. <i>lingulata lingulata</i> subsp.n.)
3	SDu without bulbs near opening (Fig. 52A; B); T IX with 15-29 setae 4
	SDu with bulbs near opening (Fig. 52C, D, E); T IX with 10-18 or 17-27 setae

4	SDu joined for short distance before opening on spermathecal eminence (Fig. 52B); Gc with 12-19 setae; T IX with 24-29 setae; S VIII with 3-10 setae; S VII with 19-23 setae
	Z. tornetraeskensis (Edw.) comb.n. (Palaearctic) (p.238)
	SDu not joined, but with common opening (Fig. 52A); Gc with 8-12 setae; T IX with 15-23 setae; S VIII with 10-19 setae; S VII with 7-14 setae
5	WL/Pfe 3.2-3.5; T IX with 17-27 setae; BR ₃ 2.5-3.5; 5 or occasionally 6 (in l of 10 specimens) flagellomeres
	WL/Pfe 3.6-4.1; T IX with 10-18 setae; BR ₃ 3.3-4.7; 5 or occasionally 4 flagellomeres 6
6	Csa with médiolateral branch (Fig. 52D) or with reduced sclerotization; WL/Pfe about 3.6; BR ₃ 4.0-4.7; 4 (in 1 of 2 specimens) or 5 flagellomeres
	Csa without distinct mediolateral branch (Fig. 52C, E), never with reduced sclerotization; WL/Pfe 3.7-4.1; BR ₃ 3.3-3.6; always 5 flagellomeres
7	Bulb on SDu with a small spine (Fig. 52E) (always ?); AR 0.47-0.57; coronal suture 0-50 µ long; Gc with 12-18 setae; S VIII with 10-26 setae
	Bulb on SDu without spines (Fig. 52C): AR 0.58-0.66; coronal suture

Key to known pupae of Zalutschia

1	Caudolateral corners of segments VII and VIII pointed and darkened, with or without imbedded spines (Fig. 55A, B, D-H)	3
	Caudolateral corners of segments VII and VIII rounded, not darkened, without imbedded spines (Fig. 55C)	2

.

2	TH with very strong apicolateral spine (Brundin 1949, fig. 195); FS about 240 μ long, standing on tubercle about 66 μ high; segment VI with 1 filamentous and 3 hairlike setae
	TH without apicolateral spine (Fig. 54N); FS about 150-155 μ long, on tubercle about 25 μ high; segment VI with 4 hairlike setae
3	PSA absent; 26-44, means 36 or 37, setae in fringe of each anal lobe 4
	PSA present at least on S IV and V; 22-44, means 23-34, setae in fringe of each anal lobe
4	Caudolateral corners of segments VII and VIII with weak imbedded spines; FS 105-220 µ long Z. tornetraeskensis (Edw.) comb.n. (Palaearctic) (p.240)
	Caudolateral corners of segments VII and VIII usually only pointed with darkened area, sometimes looks like imbedded spines; FS about 220 μ long
5	TL 2.9-3.0 mm; 22-25 setae on each anal lobe; caudolateral corners pointed with slightly darkened indications of imbedded spines
	TL 3.8-5.2 mm; 25-42 setae on each anal lobe; caudolateral corners with distinctly imbedded spines at least on segment VIII
6	PSA present on S IV-VII (very weak on VII); imbedded spines only on segments VII and VIII (sometimes weak indications also on VI); segments VII and VIII occasionally with only 3 filamentous L-setae (in 2 of 10 specimens) Z. tatrica (Pag.) comb.n. (Palaearctic) (p. 210)
	PSA present on S IV and V or IV-VI; imbedded spines on VI-VIII or VII and VIII; segments VII and VIII always with 4 (-5) filamentous L-setae 7
7	Imbedded spines absent on segment VI, strong on VII and VIII: PSA on IV-VI; FS 160-260 μ long
	Imbedded spines distinct or indicated on VI; PSA on IV and V or IV-VI; FS 35-184 μ long
8	Imbedded spines strong on VI; PSA on IV and V or IV-VI; FS 35-80 μ long

Imbedded spines weak or indicated only on VI or when relatively strong FS about 300 μ long; PSA on IV-VI; FS 130-184 μ or about 300 μ long 10

- 9 PSA on IV and V; FS about 80 μ long Z. trigonacies sp.n. (Nearctic) (p. 245)
 PSA on IV and V; FS 35-66 μ long Z. sp. A⁶ (Palaearctic) (p. 247)
- 10 Th at most with low rounded apical projection; imbedded spines on VI well developed; FS about 300 µ long Zalutschia sp. Ireland (DOWLING 1975).

TH with pointed apical projection; imbedded spines on VI weakly or faintly indicated; FS 130-184 μ long ll

Key to known larvae of Zalutschia

⁶ A badly damaged exuvium from Castor Creek, S. C., *Zalutschia* sp. *B* (p. 249), keys out either to Z.sp. *A* or to Z. *lingulata*. The FS, however, are lost and the species cannot be incorporated into the key. It may possibly represent the unknown pupa of Z. *lingulata lingulata* subsp.n.

 $^{^{7}}$ A larva from Black Creek at Hwy 373, Wakulla Co., Fla., representing an undescribed species of Zalutschia has Bl about as long as flagellum, at most 1 or 2 LG serrated, central 2 teeth of mentum light colored, and TA tapering and longer than PP.

(DOWLING 1975)

- 3 Mentum with small median tooth, 3 median teeth much lighter than lateral teeth (Fig. 59A) Z. zalutschicola Lip. (Holarctic) (p. 215) Mentum without small median tooth, 2 median teeth slightly lighter than lateral teeth Zalutschia sp. Ireland

All teeth dark, or, at most median 2 teeth slightly lighter than lateral teeth; first lateral tooth of mentum small 6

7 TA about as long as PP, elongate ovoid; Pc strongly sclerotized caudally Z. potamophilus (Chern.) comb.n. (Palaearctic, possibly synonym of Z. mucronata Brund.) (p. 205)

TA longer than PP, slender, pointed, and with or without constrictions (Fig. 56B-D); Pc not strongly sclerotized 8

8 AR about 1.3; about 5 serrated LG, some with 4 or 5 serrations (Fig. 58E); shorter TA only about 1/3 as long as longer TA Z. pusa sp.n. (Nearctic) (p. 235)

AR 1.4-2.0; when only about 5 serrated LG, these with 2 or 3 serrations and weaker than above; shorter TA only slightly shorter than longer TA 9

9	AR about 1.8-2.0, Palaearctic species
	AR about 1.4-1.8, Nearctic species 10
10	Head capsule 0.53-0.58 mm long; B1 47-49 μ long; V/M 0.80-1.00; more than 10 serrated LG (Fig. 58D) Z. trigonacies sp.n. (p. 246)

Head capsule 0.38-0.43 mm long; Bl 36-42 µ long; V/M 0.63-0.85; about 5 or 6 serrated LG (Fig. 58H) Z. *lingulata pauca* subsp.n. (p. 231)

Z. mucronata group

Imagines with WL less than 2.1 mm; male AR lower than 1.5; coronal suture of female complete or nearly so; SCh usually absent on p_2 of male; anal point relatively long and parallel-sided; Gs with short or long outer heel; and SDu opening separately on spermathecal eminence.

Pupa with caudolateral corners of segments VII and VIII pointed or rounded, but never with clear imbedded spines; with filamentous L-setae on VII and VIII only.

Larva with S I finely plumose; Bl shorter than flagellum; at most l or 2 LG serrated; setae underneath ventromental plates very weak; and TA about as long as PP.

Zalutschia obsepta (Webb) comb.n.

(Fig. 51N; 52F, K; 53E; 54C, N; 55C; 56J, P; 58I; 59L; 60; 61; 62; 63)

Orthocladius obseptus Webb 1969: 91 (male, female) Trissocladius obseptus (Webb) Sæther 1971b, fig. 1, 9 (male)

Male imago is easily recognizable by its characteristic hypopygium with a long anal point, narrow at the base, then widened, pointed at the apex, and a long Gs, narrow apically with a long outer projection. Other characteristics include an AR of 1.2-1.4, flagellomeres 2-8 to 2-10 wider than long, anepisternum II and occasionally the preepisternum with a few setae, R_{4+5} occasionally with up to 2 setae, a clypeus with 2-8 setae, Sp_1/Wti_1 0.9-1.3, a weak hind tibial comb, T IX including the anal point with 41-57 setae, HR 1.4-1.7, and HV 1.9-2.2. The female has an AR of about 0.8, a nearly complete (110 μ long) coronal suture, about 18 setae on R_1 , and SV_2 of about 4.7, BR_3 of about 2.3, S VIII with more than twice as many setae (28) as S VII (13), a Csa with 1 sharp and distinct bend, and SDu opening separately but very close together on the spermathecal eminence.

The pupa has rounded caudolateral corners of VI-VIII, PSA with strong spinules present on IV-VI, a genital sac overreaching the anal lobe, and a fringe with 20-25 setae.

The larva has a Bl shorter than the flagellum, antennal segment 5 about 0.7 times as long as 4, apparently no serrated LG, and apical tooth of mandible as long as combined width of the 3 inner teeth and much paler.

MALE IMAGO

TL 3.02-3.91, 3.41 mm (14). WL 1.74-2.07, 1.92 mm (12). TL/WL 1.63-1.94, 1.74 (12). WL/Pfe 2.71-3.07, 2.81 (11).

Antenna - Pedicel L/W (microns, n = 9) 22-66, 59/38-43, 40. Flagellomeres L/W (microns, n = 9): 52-66, 59/38-43, 40; 21-26, 24/32-41, 37; 22-26, 24/30-40, 36; 22-30, 26/30-40, 35; 24-28, 27/29-41, 35; 24-31, 28/29-42, 33; 26-31, 29/27-40, 32; 28-34, 30/26-42, 32; 28-36, 32/26-40, 30; 30-36, 32/25-39, 29; 29-38, 33/ 24-35,28; 30-40, 34/23-34, 27; 420-552, 470/26-44, 34. AR 1.20-1.41, 1.27 (13).

Head (Fig. 60A) - Temporal setae 4-9, 6 (12); Po 1-4, 2 (12); OV 1-4, 3 (12); IV Oor 1, 0.9 (12). Clypeus with 2-8, 5 (13) setae. Te 136-200, 161 μ (10) long; 27-40, 30 μ (12) wide; width anterior of PTP 10-13, 11 μ (12); distance from apex to PTP 14-32, 24 μ (12). St 120-160, 146 μ (7) long; 25-65, 42 μ (6) wide. Ocelli observed in 1 of 14 specimens. Palp lengths (microns, n = 11): 34-40, 38; 54-75, 62; 86-108, 98; 75-103, 91; 110-142, 130.

Thorax (Fig. 61) - Ap 4-8, 6 (13). Dc 8-16, 12 (15); Ac 2-5, 3 (8), in center of scutum; Pa 3-5, 4 (13); anterior anepisternum II with 0-2, 0.5 (13) setae; preepisternum with 0-5, 1 (15) setae. Scu 5-11, 7 (15).

Wing - Anal lobe developed, barely protruding. C-extension 10-40, 22 μ (10) long. VR 1.16-1.26, 1.21(11). B with 1 or 2, 1.3(9) setae; R with 3-6, 4(12); R₄₊₅ with 0-2, 0.6(8) setae. Squama with 15-20, 17(12) setae.

Legs - Sp₁ 39-55, 46 μ (12); Sp₂ 22-36, 29 μ (12) and 14-28, 23 μ (11); Sp₃ (Fig. 60C) 50-63, 55 μ (12) and 19-30, 23 μ (11). Wti₁ 37-44, 42 μ (12); Wti₂ 39-46, 41 μ (12); Wti₃ 45-55, 50 μ (12). Sp₁/Wti₁ 0.95-1.25, 1.09(11). Comb (Fig. 60C) feeble, with 8-13, 11(10) setae; shortest seta 16-20, 19 μ (7); longest 30-56, 40 μ (7). Ps 20-26, 22 μ (12) long; 2 on ta₁ of p₂; 0-2, usually 1 on ta₁ of p₃. SCh absent on p₂; 1-6, 3(10) on p₃. Lengths (microns) and proportions of legs (n = 11-12, except for BR where 5-8):

	fe	ti	tal	ta ₂	tag
p_1	626-736,681	711-846,774	478-564,526	270-356,327	221-245,231
P2	613-724,686	662-788,729	343-393,372	209-301,233	147-221,162
Рз	675-791,748	779-957,875	429-540,464	239-282,253	165-190,178
	ta ₄	ta ₅	LR	BV	
p1	136-162,151	102-119,111	0.64-0.74,0.68	2.24-2.63	2.41
P2	90-110,98	90-112,99	0.48-0.54,0.51	2.86-3.35	3.02
\mathbf{p}_{3}	94-108,102	100-114,108	0.50-0.59,0.53	3.08-3.39	,3.25
	sv	BR			
\mathbf{p}_1	2.64-2.95,2.	73 2.14-3.33	2.68		
p ₂	3.64-4.03,3.	81 2.00-3.00	,2.15		
\mathbf{p}_3	3.17-3.68.3.	50 3.65-4.87	.4.40		

Hypopygium (Fig. 62) - Anal point 62-76, 71 μ (11) long; 20-30, 27 μ (10) wide at base; 9-14, 12 μ (10) wide about 1/3 from base; 18-26,21 μ (6) about 2/3 from base. T IX and anal point with 41-57, 48 (15) setae; 11-18, 16 (15) on anal point proper. Laterosternite IX with 6-9, 7 (16) setae; sometimes with anterior weak spine. Pha 100-124, 114 μ (14) long; aedeagal lobe large. TSa concave on anterior margin 100-120, 109 μ (14) long. Spines of penis cavity (Fig. 51N) shorter than oral



FIG. 60. Zalutschia obsepta (Webb) comb.n., male. A) head; B) apex of p_3 with tip of claw (a); C) apex of hind tibia.



FIG. 61. Zalutschia obsepta (Webb) comb.n., male thorax. A) thorax of specimen from Kenora with preepisternal setae of male from Schefferville, Que., indicated by broken lines; B) antepronotum, dorsal view.

projections of Sa (shorter than in other species of the genus). Gc 267-297, 281 μ (12) long; basal lobe semicircular with weak secondary lobe (Fig. 60A, D, E). Gs 170-198, 180 μ (12) long; apically narrowed, with long, triangular outer projection. HR 1.46-1.65, 1.57 (14); HV 1.86-2.17, 1.99 (9).



FIG. 62. Zalutschia obsepta (Webb) comb.n., male hypopygium. A) male from Kenora; B) Gs of paratype; C) anal point, lateral view; D, E) basal lobe of Gc of paratype, dorsal and ventral view.

FEMALE IMAGO (n = 9, EXCEPT WHEN OTHERWISE STATED)

TL 2.76-3.36, 3.04 mm. WL 1.89-2.70, 2.01 mm (6). TL/WL 1.47-1.62, 1.54 (6). WL/Pfe 3.67-3.91, 3.82 (6).

Antenna (n = 7) - Pedicel L/W (microns): 50-54, 51/64-72, 68. Flagellomeres L/W (microns): 60-81, 70/30-40, 34; 30-44, 36/23-34, 28; 28-38, 34/23-30, 26; 26-36, 33/21-30, 25; 126-140, 134/21-32, 27. AR 0.73-0.88, 0.78.

Head - Temporal setae 1-4, 2; Po 0-2, 0; OV 0 or 1, 1; IV 1 or 2, 1. Clypeus with 6-10, 8 setae. Te 130-170, 152 μ long; 21-32, 26 μ wide; width anterior of PTP 8-11, 9 μ ; distance from apex to PTP 2-8, 4 μ . St 120-144, 130 μ long; 11-26, 17 μ wide. Coronal suture present in 4 of 9 specimens, 30-110, 58 μ long. Ocelli present; 60-74, 68 μ apart. Palp lengths (microns, n = 7): 30-34, 32; 34-54, 46; 58-82, 71; 66-84, 77; 100-138, 124.

Thorax - Ap 4-8, 7. Dc 8-12, 11; Ac 1 or 2, 1.4; Pa 3-5, 4; anepisternum and preepisternum void of setae. Scu 6-10, 8.

Wing - C-extension 30, 43 μ (6) long. VR 1.16-1.23, 1.19 (5). B with 1 or 2, 1; R with 10-18, 14; R₁ with 1-6, 4; R₄₊₅ with 4-10, 8 setae. Squama with 16-24, 19 (8) setae.

Legs - Sp₁ 32-40, 36 μ ; Sp₂ 20-30, 25 μ and 20-26, 22 μ ; Sp₃ 45-59, 52 μ and 20-27, 23 μ . Wti₁ 32-40, 36 μ ; Wti₂ 36-48, 41 μ ; Wti₃ 41-50, 46 μ . Sp₁/Wti₁ 0.83-1.03, 0.91. Comb with 5-8, 6 setae; shortest seta 10-20, 16 μ ; longest seta 26-36, 30 μ . Ps 1 or 2, 2 on ta₁ of p₂; 0-2, 1 on ta₁ of p₃; all 19-22, 20 μ long. Sch 2(8) on p₂; 4-7, 6 on p₃. Lengths (microns) and proportions of legs (n = 6):

	fe	ti	tal	ta ₂
P1	503-564,525	644-692,661	393-429,412	202-221,212
P2	546-626,586	626-662,641	288-319,310	165-184,177
P3	607-675,630	767-803,786	374-423,393	209-239,218
	tag	ta4	ta ₅	LR
\mathbf{p}_1	129-147,137	86-92,88	80-100,87	0.61-0.64,0.63
p2	110-127,118	67-80,73	76-92,82	0.46-0.52,0.48
P3	141-161,149	76-86,82	80-94,87	0.48-0.52,0.50

	BV	sv	BR
\mathbf{p}_1	3.00-3.12,3.06	2.80-2.97,2.87	2.07-2.33,2.22
P2	3.26-3.65,3.43	3.75-4.34,3.97	1.96-2.40,2.16
РЗ	3.28-3.46,3.39	3.49-3.71,3.61	2.18-2.81,2.56

Abdomen - Number of setae on T I-VIII as: 25-35, 30 (7); 19-39, 28; 18-31, 25; 17-32, 23; 18-30, 23; 15-29, 22; 13-20, 17; 15-20, 17. Number of setae on S I-VIII as: 0-2, 0; 2-8, 4; 4-10, 8; 8-13, 11; 10-19, 14; 10-18, 12; 8-16, 12; 22-29, 27.

Genitalia (Fig. 52F, K; 63) - Gc with 13-16, 15 setae. T IX with 19-28, 23 setae. Cercus 94-112, 104 μ long. SCa 99-130, 109 μ long; darkly sclerotized in



FIG. 63. Zalutschia obsepta (Webb) comb.n., female genitalia. A) lateral view; B) ventral view; C) dorsal view.

apical 70-90, 82 μ ; 64-75, 70 μ wide. SDu open separately, without bulbs before opening. Csa with 1 sharp and sometimes 1 weaker bend. Dorsomesal lobe of Gp VIII (Fig. 52K) slightly larger than in other members of the genus (Fig. 52G-J).

PUPA (n = 10, EXCEPT WHEN OTHERWISE STATED)

TL 3.94-4.53, 4.12 mm. TH/AM 0.88-1.03, 0.96.

Cephalothorax - TH (Fig. 54N) 300-356, 321 μ (11) long; 48-74, 60 μ wide; apically rounded. Anterior PcS 60-110, 92 μ long; located 12-22, 16 μ from median setae and 17-28, 23 μ from posterior seta. Median PcS 42-85, 60 μ long; located 12-22, 16 μ from posterior seta. Posterior PcS 110-210, 144 μ long; located 61-96, 78 μ from TH. FS (Fig. 54C) 101-159, 126 μ long; on 14-25, 21 μ high, 12-18, 15 μ wide tubercles.

Abdomen (Fig. 55C) - PSA on IV-VI; 8-18, 12 μ long. Elevated patches of spinules present also on VI. Caudolateral corners of VI-VIII rounded. Segment I with 3 L-setae; II-VI with 4 hairlike L-setae; VII and VIII with 4 filamentous L-setae. Anal lobe with 310-356, 331 μ long AM and 20-27, 23 (17) setae in fringe.

FOURTH INSTAR LARVA (n = 1)

Head capsule length 0.45 mm.

Head - Antenna as in Fig. 56J. Length of antennal segments (microns): 84, 18, 12, 13, 9, 1. AR 1.56. Basal antennal segment 21 μ wide, 4 times as long as wide; distance from base to RO 7 μ , to basal mark of seta 19 μ , to distal mark 25 μ ; Bl 44 μ long. LO prominent, 8 μ long. S I coarsely plumose. Premandible (Fig. 56P) 84 μ long. Mandible (Fig. 59L) 170 μ long, apical tooth exactly as long as combined width of 3 lateral teeth and clearly lighter than these. Maxilla (Fig. 58I) without serrated LG and ACh unserrated. About 4 very weak setae at base of maxilla underneath ventromental plates. Width of 1 median tooth of mentum 13 μ (Fig. 59F), ventromental plate 11 μ wide, V/M 0.85. Postmentum 216 μ long.

Abdomen - Posterior segments lost.

Remarks

The specimens from Schefferville, Que., differ from other populations by setae on the preepisternum and usually on anepisternum II. However, in most other details they fall within the ranges of the other populations which sometimes also have setae on anepisternum II.

Material Examined

Paratypes of Orthocladius obseptus Webb: male, female, Costello Lake, Algonquin Park, Ont., 18/5/65, D. W. Webb (INHSC). Other material: 1 male with associated pupa, 2 females with associated pupae, 6 males, 5 females, 11 pupal exuvia, 1 larval exuvium, Lake 226, east basin, Experimental Lakes Area (ELA), Kenora, Ont., 17-19/ 5/74, I. Davies and R. Watson; 1 male, 1 female, 1 mature male pupa, 2 exuvia, Lake 122, ELA, Kenora, Ont., 5-14/5/68, S. S. Chang; 1 exuvium, Lake 240, depth 8 m, ELA, Kenora, Ont., 1/5/69, A. L. Hamilton and G. P. McRae; 14 males, Sunny Mountain Road, Schefferville, Que., 25/6/57, D. R. Oliver (All).

Ecology and Distribution

Although the species has been found in only 5 localities, these indicate that the species prefers oligotrophic lakes and tolerates at least moderately polyhumic waters. It probably corresponds ecologically to the Palaearctic Z. *mucronata* (Brund.) which is assumed by Brundin (1949: 734) to be characteristic of polyhumic lakes. The records also indicate that the species has one generation a year (Lake 122 was sampled throughout the open-water season) and that emergence takes place as soon as the ice cover disappears.

Distribution - Ontario (Webb 1969: 91), Quebec.

Zalutschia megastyla (Shilova) comb.n.

Trissocladius megastylus Shilova 1971: 123.

No specimens of this species were examined. However, the description by Shilova is quite sufficient to separate it from its closest relatives, Z. mucronata and Z. obsepta. The male hypopygium (Shilova 1971, fig. 15) is somewhat intermediate between Z. mucronata and Z. obsepta, with an anal point close to that of Z. mucronata and a Gs close to that of Z. obsepta. The male is also characterized by an AR of only 0.5-0.6, reduced setae on the last flagellomere, many setae on R_1 and R_{4+5} , and about 11 setae on the squama.

The pupa has pointed and darkened caudolateral corners of VII and VIII as in Z. mucronata. However, it also has PSA on IV-VI and 22-25 setae in the fringe of the anal lobe.

The larva has an AR of 1.4-1.5, and the median teeth of the mentum (Shilova 1971, fig. 4) are light brown while the remaining teeth are almost black.

The species has been found in temporary ponds in the USSR.

Zalutschia mucronata (Brundin) comb.n.

(Fig. 51M; 54B, M; 55B; 64)

Trissocladius mucronatus Brundin 1949: 819 (male, pupa), 1956a: 76 (male in key) (Possible synonym Orthocladius potamophilus Chernovskii 1949: 49, see p.205)

The male is easily recognizable by its characteristic hypopygium with a relatively long, parallel sided anal point, and long, apically narrow Gs with a short, pointed outer projection. Other characteristics consist of an AR of 1.1-1.4, flagellomeres 2-6 wider than long, a scutum with a shallow impression just anterior to the scutellum, a squama with 17-22 setae, LR₂ 0.43-0.45, BR₃ 3.0-3.2, HR 1.5-1.7, and HV 2.2-2.5.

The pupe has pointed and darkened posteriolateral corners, but no distinctly imbedded spines; it lacks PSA; and its genital sac does not overreach the anal lobe which has 34-42 setae in the fringe.

MALE IMAGO

TL 2.62-3.19, 2.94 mm (4). WL 1.81-1.99, 1.88 mm (5). TL/WL 1.45-1.71, 1.59 (4). WL/Pfe 2.72-2.82, 2.76 (5).

Antenna - Flagellomeres L/W (microns, n = 1): 62/42, 28/40, 28/39, 30/38, 30/36, 30/34, 34/33, 33/31, 34/30, 32/30, 32/30, 36/30, 552/32. AR 1.14-1.40, 1.25 (4).

Head - Temporal setae 5 (2), Po 2 (2), OV 1 (2), IV 2 (2). Clypeus with ll-l6, 13 (4) setae. Te 152-155 μ (3) long, 30-34 μ (3) wide, width anterior of PTP 9 μ (3), distance from apex to PTP 30 μ (2). St 155 μ (1) long. Ocelli not observed. Palp lengths (microns, n = 4): 30; 47-60, 52; 84-102, 96; 84-85, 84; 100-114, 107.

Thorax - Ap 4 or 5 (2). Dc 5-7 (2), Ac 4-10 (2) starting at about anterior third of scutum, Pa 3 (1). Scu 8 or 9 (2). Prescutellar area (Fig. 64A) with shallow impression.

Wing - Anal lobe well developed, protruding. C-extension 42-72, 62 μ (4) long. VR 1.17-1.19 (3). B with 1 or 2 (3), R with 5 or 6, 6 (4) setae. Squama with 17-22, 19 (5) setae.

Legs - Sp₁ 60-70, 64 μ (5); Sp₂ 29-33 μ (3) and 22-26, 25 μ (4); Sp₃ 55-64, 60 μ (4) and 20-24 μ (2). Wti₁ 42-49, 46 μ (5); Wti₂ 42-49, 46 μ (5); Wti₃ 48-53 μ (3). Sp₁/Wti₁ 1.35-1.52, 1.42(5). Comb with 9 or 10(2) setae, 26-50 μ long. Ps 22-29, 25 μ (5) long; 2 on ta₁ of p₂ and p₃; 0-2 on ta₂ of p₂ and p₃. SCh 0-2, 1.2(5) on p₂; 0-2, 1.0(5) on p₃. Lengths (microns) and proportions of legs (n = 4-5):



FIG. 64. Zalutschia mucronata (Brund.) comb.n., male. A) posterior part of scutum; B) hypopygium.

	fe	ti	tal	ta ₂
p ₁	656-705,680	767-822,795	521-564,53	7 282-343,314
P2	687-748,704	742-834,780	319-368,34	5 190-227,202
P3	724-797,759	895-975,932	448-485,460	233-264,245
	ta ₃	ta ₄	ta ₅	LR
P1	221-245,233	130-156,143	94-118,10	5 0.66-0.69,0.67
P2	135-153,143	95-112,103	95-104,99	0.43-0.45,0.44
P3	147-196,178	110-122,118	106-116,113	8 0.43-0.51,0.50
	BV	sv		BR
p ₁	2.44-2.64,2.53	2.68-2.85	,2.75 2.2	21-2.50,2.43
P2	3.23-3.44,3.34	4.10-4.54	,4.31 2.4	+6-2.82,2.67
P3	3.14-3.46,3.31	3.57-3.69	,3.64 3.0	0-3.23,3.14

Hypopygium (Fig. 64B) - Anal point 44-76, 58 μ (6) long; 8-14, ll μ (5) wide at apex. T IX and anal point with 21-30, 27(7) setae; 16-22, 19(7) on anal point proper. Laterosternite IX with 9-11, 10(4) setae. Pha 102-116 μ (3) long. TSa straight or slightly concave on anterior margin; 90-104, 94 μ (4) long. Oral projections of Sa

large. Gc 190-226, 199 μ (5) long, with double basal lobe. Gs 114-130, 122 μ (5) long; apically narrowed, with short, pointed outer projection. HR 1.54-1.74, 1.63 (5); HV 2.22-2.47(3).

PUPA

TL 4.53-4.73 mm (3). TH/AM 0.95-1.05, 1.01 (5).

Cephalothorax - TH (Fig. 32M) 380-429, 412 μ (8) long; 85-115, 100 μ (7) wide. Median PcS 140 μ (1) long. FS (Fig. 54B) 220 μ (1) long.

Abdomen (Fig. 55B) - PSA apparently absent (poor specimens). Elevated patches of spinules vestigial on VI. Caudolateral corners of VII and VIII pointed, darkened, but without distinct imbedded spines. Segment I with 3 L-setae, II-VIII with 4 L-setae, all filamentous on VII and VIII. Anal lobe with 399-430, 414 μ (5) long AM, and 34-42, 36(7) setae in fringe. Genital sac does not reach posterior apex of anal lobe.

Material Examined

Lectotype: male, L. Grimsgöl, Småland, Sweden, 6-12/5/47, L. Brundin (Brundin 1949: 734) (SMNH). Paralectotypes: 7 males, 8 exuvia, otherwise as lectotype. Other material: 1 male, Småland, Sweden, 1958, E. J. Fittkau (ZSBS).

Ecology and Distribution

The species is probably characteristic of polyhumic lakes (Brundin 1949: 734). It is presently known only from Sweden (Brundin 1949: 734; Thienemann 1954: 562), but the following species from eastern Europe may be a synonym.

Zalutschia potamophilus (Chernovskii) comb.n.

Orthocladius potamophilus Chernovskii 1949: 49 (larva) Orthocladius potamophilus Chern. Ertlová 1963: 615 (larva) Trissocladius potamophilus Chern. Pankratova 1970: 142

Only the larva of this species is known. TA are ovoid and almost equal in length to the PP, i.e. different from the larvae of Z. tatrica and the Z. torne traceskensis group. Also the V/M, according to Chernovskii (1949, fig. 138) and

Pankratova (1970, fig. 78) appear to be clearly higher than 1. Both characters, although plesiomorphous, indicate the species belongs to the Z. *mucronata* group and it may even be a synonym of Z. *mucronata*.

The species has been found in rivers, streams, and northern lakes in USSR, Czechoslovakia, and Romania.

Z. tatrica group

Imagines with frontal tubercles in some specimens of all 3 species described; male flagellomeres 2-6 or 2-9 wider than long; anal point prominent and triangular (or smaller and rounded, but broad at base if Z. *furcarca* is included), with micro-trichia and setae in apical half; SDu straight.

Pupa with caudolateral corners of segments VII and VIII rounded or with imbedded spines; when rounded, filamentous L-setae present on segment VI in addition to those on VII and VIII; when with imbedded spines, PSA present on IV-VII.

Larva with relatively coarsely plumose S I, Bl longer than flagellum, at most l or 2 LG serrated, and TA shorter or longer than PP.

Zalutschia tatrica (Pagast) comb.n.

(Fig. 51L; 54E, L; 55D; 56C, E, K; 57C, H; 58G; 59B, H; 65)

Spaniotoma tatrica Pagast, in Zavřel and Pagast 1935: 156 (male, female, pupa, larva); Zavřel 1942: 11, 17 (PSA, PSB of pupa); Thienemann 1944: 585, 638 (pupa, larva) Orthocladius (Orthocladius) tatricus (Pag.) Goetghebuer 1940-50: 55 (male) Orthocladius ex. gr. tatricus (Pag.) Chernovskii 1949: 144 (larva) Trissocladius tatricus (Pag.) Brundin 1956a: 76 (male); Pankratova 1970: 140 (pupa, larva)

The combination of triangular anal point, prominent double basal lobe, and Gs wide near apex, but without an outer projection or pointed corner, will separate this species from other males of the genus. Other characteristics in the male are: flagellomeres 2-6 or 2-8 wider than long, a VR of 1.26-1.34, R_1 often with setae (0-10), LR_2 0.42-0.45, and T IX including the anal point with 18-27 setae. The female has a WL/Pfe of 3.2-3.5, an AR of 0.5-0.6, coronal suture 0-72 μ long, 5 or 6 flagellomeres, 12-21 setae on squama, a BV₂ of 2.9-3.4, SV₂ of 4.0-4.6, BR₃ of 2.5-3.5, Csa with several curves, SDu with bulbs prior to a common opening, 11-14 setae on the Gc of which only 3-6 are strong, and 17-27 setae on T IX.

The pupa has PSA on IV-VII, imbedded spines on VII and VIII, and a quite welldeveloped caudal patch of spinules also on VI. The number of filamentous L-setae on VII and VIII varies from 3-5, although 4 is normal.

The larva is easily recognizable by the Bl which overreaches the antenna; coarsely plumose S I with only 2-5 long, and several short teeth; and by only 1 or 2 serrated LG.

MALE IMAGO (n = 10, EXCEPT WHEN OTHERWISE STATED)

TL 3.15-3.71, 3.51 mm. WL 1.86-2.12, 2.02 mm. TL/WL 1.69-1.86, 1.74. WL/Pfe 2.81-2.99, 2.88.

Antenna - Pedicel L/W (microns): 96-120, 111/142-160, 151. Flagellomeres L/W (microns): 54-66, 62/39-52, 44; 23-29, 27/37-42, 40; 23-29, 26/36-44, 39; 26-34, 31/ 36-44, 39; 29-34, 33/32-44, 37; 30-37, 32/30-44, 35; 30-38, 33/26-44, 34; 30-39, 34/ 26-40, 32; 32-40, 35/27-39, 32; 32-40, 36/26-36, 30; 34-40, 37/23-34, 29; 35-40, 38/ 22-34, 28; 491-577, 542/22-32, 28. AR = 1.27-1.36, 1.32 (17).

Head - Temporal setae 2-8, 5; Po 1-3, 2; OV 1-4, 3; IV 0-2, 0.4. Clypeus with 10-21, 16 (22) setae. Te 145-190, 165 μ long; 30-40, 34 μ wide; width anterior of PTP 9-16, 12 μ ; distance from apex to PTP 24-40, 33 μ . St 140-180, 162 μ long; 40-62, 50 μ (5) wide. Ocelli present in 8 of 13 specimens; 10-30, 19 μ apart; 1 specimen with well-developed frontal tubercles on both sides, 1 with tubercles only on one side; tubercles 4-8 μ high, 6 μ wide. Palp occasionally 4-segmented or deformed with a large lateral projection on segment 4, usually normal. Palp lengths (microns): 40-46, 43; 50-59, 57; 80-120, 103; 80-120, 98; 85-144, 106.

Thorax - Ap 5-10, 7 (19). Dc 5-14, 10 (20); Ac 4-9, 7 (19), starting at anterior 1/4-1/3 of scutum; Pa 3-6, 4(20). Scu 7-10, 8(20).

Wing - Anal lobe well developed, slightly protruding. C-extension 25-45, 31 μ . VR 1.26-1.34, 1.30(13). B with 1 seta; R with 4-12, 6; R₁ with 0-10, 3(15) setae. Squama with 15-23, 18(21) setae.

Legs - Sp_1 60-67, 62 μ ; Sp_2 30-38, 35 μ and 23-32, 26 μ ; Sp_3 66-74, 71 μ and 20-33, 26 μ . Wti₁ 40-46, 44 μ ; Wti₂ 42-48, 45 μ ; Wti₃ 48-58, 53 μ . Sp_1/Wti_1 1.30-1.57, 1.44. Comb with 9-13, 11 setae; shortest seta 24-36, 27 μ ; longest 45-62, 54 μ . Ps 23-29, 27 μ long; 2 on ta₁ of p₂ and p₃, 1 or 2 on ta₂ of p₂, absent on ta₂ of p₃. Sch 1 or 2, 1.4 on p₂; 1-5, 2.8 on p₃. Lengths (microns) and proportions of legs:

	fe	ti	tal	ta ₂	tag
P1	650-724,696	761-883 , 831	478-564,523	282-380,340	215-270,246
p2	687-791 , 735	736-846,800	325-368,348	196-239,220	147-172,160
P3	705-816,771	883-1012,959	478-540,505	233-319,291	209-251,229
	ta4	ta5	LR	BV	
P1	150-178,164	104-122,112	0.60-0.66,0.63	2.25-2.54,2	.35
P2	110-126,118	100-118,106	0.42-0.45,0.43	3.03-3.30,3	.14
P3	123-150,136	98-128,116	0.50-0.54,0.53	2.61-3.13,2	.89
	sv	BR			
Pl	2.76-3.04,2.92	2.50-3.04	,2.75		
P2	4.26-4.58,4.42	3.20-4.00,4.42			
P3	3.33-3.58,3.41	3.87-4.53	,4.08		

Hypopygium (Fig. 51L, 65C-E) - Anal point relatively prominent, triangular. T IX and anal point with 18-27, 23 (21) setae. Laterosternite IX often with weak anteriolateral spine; with 8-11, 9 setae. Pha 85-100, 92 μ long. TSa (Fig. 51L) slightly concave at anterior margin; 80-92, 86 μ long. Oral projections of Sa prominent, rounded. Gc 194-240, 227 μ long; basal lobe rounded, double. Gs 102-114, 108 μ long; without outer projection or pointed corner. HR 1.85-2.33, 2.11; HV 2.98-3.44, 3.24.

FEMALE (n = 10, EXCEPT WHEN OTHERWISE STATED)

TL 2.86-3.41, 3.06 mm (9). WL 1.72-2.09, 1.91 mm. TL/WL 1.53-1.67, 1.61 (9). WL/Pfe 3.18-3.46, 3.33.

Antenna - Pedicel L/W (microns): 48-60, 55/70-86, 79. Flagellomeres L/W (microns; flagellomere 1 and 2 combined in 1 specimen with 6 flagellomeres, where first flagellomere about twice as long as second): 70-88, 81/31-40, 36; 32-48, 39/26-30, 27; 34-48, 40/24-30, 27; 40-46, 43/27-29, 28; 113-132, 120/23-30, 27. AR 0.52-0.64, 0.59.

Head - Temporal setae 1-5, 2; Po 0-3, 0.9; OV 0-2, 0.9; IV 0-2, 0.4. Clypeus with 10-19, 16 setae. Te 134-154, 145 μ (6) long; 29-36, 32 μ (7) wide; width anterior of PTP 8-11, 10 μ ; distance from apex to PTP 12-24, 18 μ . St 120-160, 141 μ (7) long; 50-66, 55 μ (7) wide. Coronal suture 0-72, 39 μ long. Ocelli 40-70, 61 μ apart. Palp lengths (microns): 35-44, 38; 46-51, 48; 82-104, 95; 80-94, 86; 100-120, 113.

Thorax - Ap 5-8, 6. Dc 8-13, 11; Ac 2-7, 6; Pa 4 or 5, 4; anepisternum and preepisternum void of setae. Scu 5-8, 7.

Wing - C-extension 30-70, 50 μ long. VR 1.23-1.32, 1.28(8). B with 1; R with 7-11, 9; R₁ with 7-13, 9(9); R₄₊₅ with 10-17, 14(9) setae. Squama with 12-21, 15 setae.

Legs - Sp₁ 35-42, 38 μ ; Sp₂ 30-38, 34 μ and 22-31, 26 μ ; Sp₃ 54-70, 66 μ and 18-26, 22 μ . Wti₁ 36-44, 40 μ ; Wti₂ 39-51, 45 μ ; Wti₃ 44-60, 50 μ . Sp₁/Wti₁ 0.88-1.05, 0.97. Comb with 10-12, 10 setae; shortest seta 24-36, 28 μ ; longest 40-60, 49 μ . Ps 20-32, 27 μ long; 2 on ta₁ of p₂; 0-2, 1 on ta₂ of p₂; 0-2, 0.8 on ta₁ of p₃; 0 or 1, 0.1 on ta₂ of p₃. SCh 3-6, 4 (9) on p₂; 5-10, 7 on p₃. Lengths (microns) and proportions of legs:

	fe	ti	tal	ta ₂	tag
p1	503-638,575	619-767,697	411-527,452	245-313,270	147-196,178
P2	564-687,629	613-785,697	258-368,301	165-215,192	123-153,138
P3	559-736,661	736-957,830	356-491,415	233-307,257	165-221,194
	ta_4	ta ₅	LR	BV	
p1	98-135,114	86-104,94	0.63-0.69,0.65	2.46-2.77	,2.63
P2	86-104,93	86-98,91	0.42-0.47,0.43	2.93-3.43	,3.16
P3	92-123,109	86-117,101	0.47-0.51,0.50	2.79-2.99	,2.89



FIG. 65. Zalutschia tatrica (Pag.) comb.n. (A-B) female genitalia, ventral A), and dorsal B) view; (C-E) male hypopygium, and C-D) variation of anal point.
	SV	BR	
\mathbf{p}_1	2.67-2.96,2.82	2.42-2.80,2.58	(8)
p ₂	4.00-4.58,4.41	2.07-2.78,2.53	(8)
p3	3.45-3.86,3.60	2.50-3.50,3.06	(6)

Abdomen - Number of setae of T I-VIII as: 32-40, 36; 34-53, 41; 22-45, 30; 20-32, 25; 18-31, 24; 19-27, 24; 16-23, 20; 14-27, 19. Number of setae on S I-VIII as: 0; 2-6, 5; 5-14, 9; 7-16, 13; 11-23, 16; 8-21, 16; 11-20, 14; 3-17, 9.

Genitalia (Fig. 65A-B) - Gc with 11-14, 13 setae; 3-6, 4 strong. T IX with 17-27, 22 setae. Cercus 92-122, 106 μ long. SCa 62-96, 79 μ long, including 12-22, 16 μ long neck; 46-57, 53 μ wide. SDu with bulbs prior to common opening. Csa with several bends.

PUPA

TL 3.84-4.93, 4.34 mm (9). TH/AM 0.81-0.98, 0.91 (9).

Cephalothorax - TH (Fig. 54L) 270-386, 319 μ (9) long; 50-80, 66 μ (8) wide; with apical spinules weak. Anterior PcS 50-80, 66 μ (8) long; located 10-50, 20 μ (5) from median PcS and 10-16, 12 μ (5) from posterior PcS. Median PcS 110-150, 135 μ (8) long; located 9-50, 18 μ (5) from posterior PcS. Posterior PcS 40-50, 45 μ (8) long; located 55-80, 63 μ (5) from TH. FS 100-140, 119 μ (7) long; on tubercle 12-24, 19 μ (7) high, 12-20, 15 μ (7) wide (Fig. 54E).

Abdomen (Fig. 55D) - PSA on IV-VII; longest spinules 10-18, 13 μ (10) on IV; 8-14, 10 μ (10) on V; 4-10, 7 μ (10) on VI; 2-6, 3 μ (8) on VII. Elevated patches of spinules well developed, distinct also on VI. Caudolateral corners of VII and VIII (sometimes faintly indicated also on VI) with imbedded spines. I with 3, II-VI with 4 hairlike Lsetae; VII with 3 or 4, 3.8 (10) filamentous L-setae and 0 or 1 additional hairlike L-setae; VIII with 3-5, 4 (10) filamentous L-setae. Anal lobe with 301-399, 350 μ (9) long AM; and 25-31, 29 (10) setae in fringe.

FOURTH INSTAR LARVA

TL 4.26-5.22, 4.70 mm (10). Head capsule length 0.37-0.43, 0.40 mm (11).

Head - Antenna as in Fig. 56E. Length of antennal segments (microns, n = 10-11): 60-66, 62; 13-16, 15; 5.5-7.5, 7; 7.5-10, 8.3; 4-5, 4.8; 1-1.5, 1.1. AR 1.61-1.83, 1.73 (10). Basal antennal segment 20-24, 22 μ (11) wide; 2.58-3.30, 2.87 (10) times as long as wide; distance from base to RO 10-16, 13 μ (7); to basal mark of seta 10-16, 13 μ (5); to distal mark of seta 26-30, 28 μ (7); B1 43-50, 45 μ (8) long. LO prominent, 6-8, 7 μ (7) long. S I (Fig. 57C) coarsely plumose with 2-6 longer branches and several shorter. Premandible (Fig. 56K) 60-84, 74 μ (9) long. Mandible (Fig. 59H) 135-158, 144 μ (9) long. Maxilla (Fig. 58G) with only 1 or 2 LG serrated and ACh unserrated. 4-6, 5 (11) setae at base of maxilla underneath ventromental plates

(Fig. 59B). Width of 1 median tooth (not including accessory tooth) of mentum (Fig. 59B) 16-17, 16 μ (9); ventromental plate 10-13, 12 μ (9) wide; V/M 0.61-0.81, 0.74 (9). Postmentum 167-195, 185 μ (10) long.

Abdomen (Fig. 56C) - Pc 48-61, 53 μ (9) high; 24-30, 28 μ (9) wide. Sa 60-72, 64 μ (8) long. An 550-620, 583 μ (10) long. Sa/An 0.10-0.12, 0.11 (8). TA 350-420, 384 μ (7) long. PP 135-160, 146 μ (8) long.

Material Examined

One male with pupal exuvium, 20 males, 30 exuvia, Swedish Lapland, L. Brundin; 1 male with pupal exuvium, 25 exuvia, 2 larvae, Swedish Lapland 1936-37, A. Thienemann; 3 larvae, High Tatra Mountains, Poland, A. Thienemann; 4 exuvia, 4 larvae, High Tatra Mountains? 1933-34, A. Thienemann; 20 larvae, Stawki Mnichowe pools, High Tatra Mountains, 12/9/63, M. Kownacka and A. Kownacki; 7 males, 10 females, 2 mature female pupae, 10 exuvia, Stawki Mnichowe pools, High Tatra Mountains, 20/9-15/10/73, A. Kownacki (BMNH, CNC, FWI, SMNH, ZMUH, ZSBS).

Ecology and Distribution

The species has been found in lakes, ponds, and pools. It is most common in ponds and pools, and is found in oligohumic as well as polyhumic waters. The emergence period is at the beginning of July in the Tatra Mountains, from the middle to end of July in Swedish Lapland.

Distribution - High Tatra Mountains (Czechoslovakia and Poland) (Zavřel and Pagast 1935: 159; Zavřel 1935: 445, 1937a: 491; Hrabě 1942: 151; Kownacka and Kownacki 1965: 85), Swedish Lapland (Thienemann 1941: 184; Brundin 1949: 714), and the Kola Peninsula (USSR) (Chernovskii 1949: 145; Pankratova 1970: 141).

Zalutschia paratatrica (Chernovskii) comb.n.

Orthocladius paratatricus Chernovskii 1949: 145 (larva) Trissocladius paratatricus (Chern.) Pankratova 1970: 141 (larva)

The species is closely related to Z. *tatrica* from which it differs by TA only 3/4 as long as PP, a slightly lower AR, and differently shaped eye spots. The species is known from European parts of USSR and Siberia, and has been found

in large, deep oligotrophic lakes.

Zalutschia zalutschicola Lipina

(Fig. 51D; 56A, F, L; 57A, B, I; 58A, F; 59A, G; 66)

Zalutschia zalutschicola Lipina 1939: 96 (larva) Orthocladiinae gen ? zalutschicola (Lip.) Chernovskii 1949: 128 (larva) Orthocladius naumanni Brundin 1949: 823 (male, pupa, larva); Dahl 1954: 617 (female); Berg and Petersen 1956: 205 (larva, female) Trissocladius naumanni (Brund.) Brundin 1956a: 76 (male)

Imago is characterized by pronounced frontal tubercles (ocelli). Male has a WL of 2.8-3.1 mm; AR of 1.3-1.7; flagellomeres 2-9 wider than long; 10-13 temporals; 13-22 setae on clypeus; relatively large, triangular anal point with 10-24 setae on T IX and the anal point combined; somewhat reduced basal lobe of the Gc; and Gs with short, pointed outer projection. Female has WL of only 1.6-1.9 mm, TL/WL about 1.9, AR of 0.7-0.8, 5 flagellomeres, no coronal suture, BV₂ of about 2.8, and Gc with about 9 setae.

Pupa has strong FS (about 240 μ long) on a strong tubercle, Ps on a tubercle; TH with apicolateral point, caudolateral corners of segments rounded, PSA on IV-VI, 1 filamentous L-seta in addition to 3 hairlike setae on VI, and 18-21 setae in fringe of the anal lobe.

Larva is characterized by AR of 1.8-2.1; Bl much longer than segments 2-6 combined; S I coarsely plumose, split in only 10-15 branches; all LG apparently unserrated; mentum with median portion (2-4 teeth) light, transparent, first and sixth lateral teeth reduced; ventromentum with 4-7 weak setae underneath; and TA shorter than PP.

MALE IMAGO

TL 3.25-3.96, 3.55 mm (12). WL 1.90-2.10, 1.99 mm (13). TL/WL 1.71-1.89, 1.78 (12). WL/Pfe 2.81-3.09, 2.96 (12).

Antenna (n = 10) - Pedicel L/W (microns): 100-118, 111/140-160, 150. Flagellomeres L/W (microns): 62-77, 67/41-50, 45; 20-30, 27/38-42, 40; 22-31, 27/38-41, 39; 25-32, 29/33-40, 37; 24-33, 30/ 33-40, 36; 29-33, 31/32-40, 36; 26-37, 32/30-40, 34; 23-35, 32/30-40, 34; 25-36, 33/28-40, 33; 31-27, 33/27-39, 32; 30-37, 34/26-40, 31; 31-35, 33/26-40, 31; 534-632, 582/27-40, 31. AR 1.28-1.67, 1.48.

Head - Temporal setae (Fig. 66A) 10-13, 11 (10); Po 4 or 5, 4 (10); OV 2-4, 3 (10); IV 3-6, 4 (10). Clypeus with 13-22, 17 (11) setae. Cibarial pump, Te, and St as in Fig. 66B. Te 160-190, 170 μ (8) long; 30-40, 36 μ (10) wide; width anterior of PTP 11-15, 13 μ (10); distance from apex to PTP 28-40, 33 μ (10). St 134-160, 147 μ (7) long; 48-64, 56 μ (7) wide. Ocelli formed as frontal tubercles (Fig. 66A); 10-20, 17 μ (8) apart; 13-16, 15 μ (4) high; 8-10, 9 μ (4) wide. Palp lengths (microns): 27-38, 33(9); 37-52, 45(8); 82-110, 97(9); 84-104, 96(10); 86-148, 117(10).

Thorax - Ap 7-11, 9 (11). Dc 6-12, 9 (11); Ac 2-7, 4 (6), in centre of scutum; Pa 2-5, 4 (11).



FIG. 66. Zalutschia zalutschicola Lip., male. A) apex of head; B) cibarial pump, Te, and St; (C-E) hypopygium, and D, E) variation of Gs.

Wing - Anal lobe well developed, protruding. C-extension 35-62, 45μ (12). VR 1.15-1.23, 1.19 (12). B with 1 (12) seta; R with 4-7, 5 (12) setae. Squama with 17-28, 21 (11) setae.

Legs - Sp₁ 60-78, 71 μ (10); Sp₂ 27-36, 32 μ (10) and 20-30, 25 μ (7); Sp₃ 56-70, 65 μ (11) and 22-32, 27 μ (9). Wti₁ 38-42, 40 μ (10); Wti₂ 39-43, 41 μ (7); Wti₃ 42-50, 46 μ (10). Sp₁/Wti₁ 1.58-2.00, 1.79 (10). Comb with 8-12, 9 (10) setae; shortest seta 20-22, 21 μ (8); longest 42-55, 49 μ (8). Ps 20-36, 26 μ (17) long on ta₁; 20-35, 23 μ (14) on ta₂; 2 on ta₁ of p₂ and p₃; 1 or 2 on ta₂ of p₂; 0 or 1 on ta₂ of p₃. Sch 0 or 1, 0.2(6) on p₂; 1-3, 2(6) on p₃. Lengths (microns) and proportions of legs (n = 5-9):

fe	ti	ta <u>l</u>	ta ₂	tag
626-748,674	761-871,808	564-613,581	393-429,409	233-270,245
668-773,714	730-797,759	368-405,379	221-258,238	153-221,170
699-810,735	853-981,895	466-527,486	270-319,258	196-227,206
ta4	ta5	LR	BV	
136-180,165	96-108,101	0.69-0.73,0.71	2.24-2.37,	2.29
112-132,120	93-105,100	0.48-0.52,0.50	2.81-3.05,	2.96
121-133,127	94-109,102	0.53-0.55,0.54	2.87-2.98,	2.93
sv	BR			
2.51-2.70,2.60	3.18-3.27	,3.22		
3.80-4.09,3.91	2.73-3.10	,2.88		
3.23-3.40,3.35	4.27-6.00	,5.18		
	fe 626-748,674 668-773,714 699-810,735 ta4 136-180,165 112-132,120 121-133,127 SV 2.51-2.70,2.60 3.80-4.09,3.91 3.23-3.40,3.35	fe ti 626-748,674 761-871,808 668-773,714 730-797,759 699-810,735 853-981,895 ta4 ta5 136-180,165 96-108,101 112-132,120 93-105,100 121-133,127 94-109,102 SV BR 2.51-2.70,2.60 3.18-3.27 3.80-4.09,3.91 2.73-3.10 3.23-3.40,3.35 4.27-6.00	fe ti ta1 626-748,674 761-871,808 564-613,581 668-773,714 730-797,759 368-405,379 699-810,735 853-981,895 466-527,486 ta4 ta5 LR 136-180,165 96-108,101 0.69-0.73,0.71 112-132,120 93-105,100 0.48-0.52,0.50 121-133,127 94-109,102 0.53-0.55,0.54 SV BR 2.51-2.70,2.60 3.18-3.27,3.22 3.80-4.09,3.91 2.73-3.10,2.88 3.23-3.40,3.35 4.27-6.00,5.18	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$

Hypopygium (Fig. 51D; 66C, D, E) - Anal point relatively prominent, triangular; about 36-65, 49 μ (6) long; 36-70, 51 μ (5) wide at base; 3-4, 4 μ (5) wide at apex. T IX including anal point with 10-24, 16 (14) setae; 2-14, 9 (14) on anal point proper. Laterosternite IX with 7-11, 9 (10) setae. Pha 88-108, 97 μ (9) long. TSa straight or slightly concave at anterior margin; 76-94, 85 μ (9) long. Oral projection of Sa prominent, somewhat pointed (Fig. 51D). Gc 225-260, 243 μ (12) long; basal lobe weak. Gs 104-114, 109 μ (12) long; with short, pointed outer projection. HR 2.11-2.39, 2.24 (12); HV 3.01-3.48, 3.26 (12).

FEMALE IMAGO (n = 1, EXCEPT WHEN OTHERWISE STATED)

TL 3.35. WL 1.60-1.86 mm (2). TL/WL 1.90. WL/Pfe 3.41.

Antenna - Pedicel L/W (microns, n = 3): 44-50/62-68. Flagellomeres L/W (microns, n = 3): 72-76/30-34, 31-34/25-27, 33-36/23-26, 40-42/24, 130-138/21-22. AR 0.71-0.81 (3).

Head - Coronal suture absent. Frontal tubercles as in male.

Thorax - Ap 10. Scu 5.

Wing - C-extension 45-50 μ (2). VR 1.22-1.23 (2). B with 1 seta, R with 4-10 (2), R₁ with 4, R₄₊₅ with 5 setae. Squama with 22 or 23 (2) setae.

Legs - Sp₁ 32-33 μ (2), Sp₂ 25-30 μ (2) and 22-25 μ (2), Sp₃ 58-60 μ (2) and 20-25 μ (2). Wti₁ 29-39 μ (2), Wti₂ 37-39 μ (2), Wti₃ 44-47 μ (2). Sp₁/Wti₁ 0.82-1.14(2). Comb with 9 setae, 20-54 μ long. Ps 22-26 μ long, 2 on ta₁ of p₂ and p₃, and on ta₂ of p₂. SCh 1 on p₂, 3 on p₃. Lengths (microns) and proportions of legs:

	fe	ti	tal	ta ₂	tag	ta4	ta ₅	LR	BV	SV	BR
\mathbf{p}_1	546	698	429	270	147	106	75	0.62	2.70	2.76	3.14
p2	595	619	313	184	123	86	83	0.50	3.21	3.88	2.91
P3	626	761	399	233	165	100	88	0.52	3.05	3.48	4.27

Genitalia - Gc with 9 setae. T IX with 15 setae. Cercus 105 μ long. SCa 134 μ long, 80 μ wide, with neck 22 μ long and 10 μ wide. Shape of Csa not discernible on rather bad slides.

PUPA (n = 1)

TL 4.53 mm. TH/AM 1.10

Cephalothorax - TH (Brundin 1949, fig. 195) 344 μ long, 54 μ wide, with strong apicolateral spine or point. PcS on tubercle (Brundin 1949, fig. 194); anterior PcS 224 μ long, located 16 μ from median PcS and 28 μ from posterior PcS; posterior PcS 150 μ long, located 77 μ from TH. FS 240 μ long; on strong tubercle 66 μ high, 38 μ wide (Brundin 1949, fig. 194).

Abdomen - PSA on IV-VI, longest spinules 14 μ long on IV, 8 μ long on V and VI. Elevated patches of spinules well developed on III-V, absent or weak on VI. Caudolateral corners of VI-VIII rounded. V with 4 fine L-setae, VI with 1 filamentous and 3 fine L-setae, VII and VIII with 4 filamentous L-setae. Anal lobe with 310 μ long AM and 21 setae in fringe.

FOURTH INSTAR LARVA

TL 4.65-5.91, 5.11 mm (11). Head capsule length 0.36-0.43, 0.40 mm (11).

Head - Antenna as in Fig. 56F. Lengths of antennal segments (microns, n = 8-10): 59-70, 64; 12-16, 13; 6-9, 7; 5.5-7.5, 6; 3.5-5, 4.5; 1-2, 1.4. AR 1.83-2.10, 1.93 (8). Basal antennal segment 19-24, 21 μ (11) wide; 2.79-3.18, 2.98 (11) times as long as wide; distance from base to RO 9-20, 14 μ (10); to basal mark of seta 12-20, 15 μ (5); to distal mark of seta 30-38, 34 μ (5); Bl 42-54, 48 μ (6) long. Apical style of second segment 5.0-7.5, 6 μ (6) long; LO 4-5 μ (3) long. Labrum and palatum as in Fig. 57A, B. S I coarsely plumose with only about 10-15 branches. Premandible (Fig. 56L) 70-85, 81 μ (11) long; lateral tooth longer than apical tooth. Mandible (Fig. 59G) 140-166, 156 μ (11) long. Maxilla (Fig. 58A, F) with all LG simple and ACh serrated near apex. 4-7, 5 (10) setae at base of maxilla underneath ventromental plates (Fig. 58A, 59A). Mentum (Fig. 59A) with 2 or 3 median teeth variable, pale; lateral teeth dark, first and sixth lateral teeth reduced. Light median portion of mentum 40-45, 42 μ (11) wide; ventromental plate 15-23, 17 μ (11) wide; V/M 0.68-1.04, 0.80 (9). Postmentum 200-226, 215 μ (11) long.

Abdomen (Fig. 56A) - Pc 40-50, 46 μ (11) high; 25-33, 28 μ (11) wide. Sa 80-116, 102 μ (7) long. An 356-527, 429 μ (10) long. Sa/An 0.22-0.30, 0.25 (7). TA 105-130, 117 μ (6) long; 26-36, 30 μ (6) wide at base. PP 150-170, 162 μ (5) long.

THIRD INSTAR LARVA

TL 2.72-3.57, 3.23 mm (7). Head capsule length 0.22-0.28, 0.25 mm (7).

Head - Lengths of antennal segments (microns, n = 4-5): 30-33, 31; 9-12, 11; 4-5.5, 5; 4-5, 4.2; 4; 1. AR 1.07-1.29, 1.20(5). Basal antennal segment 11-13, 12 μ (4) wide; 2.30-2.73, 2.59 (4) times as long as wide; distance from base to RO 5-10, 7 μ (4); to basal mark of seta 10 μ (3); to distal mark of seta 19-20 μ (2); B1 26-38, 32 μ (4). Premandible 44-54, 50 μ (4) long.

Mandible 92-110, 102 μ (6) long. Light median portion of mentum 21-28, 24 μ (7) wide; ventromental plates 10-12, 11 μ (7) wide, with 2 or 3 (3) setae underneath; V/M 0.79-1.09, 0.92(6). Postmentum 116-140, 127 μ (7) long.

Abdomen - Pc 22-30, 26 μ (5) high; 13-18, 16 μ (5) wide. Sa/An 0.21-0.23(2). TA 80 μ (1) long. PP 90 μ (1) long.

Material Examined

Syntypes of Orthocladius naumanni Brund.: 5 males, 1 female, 6 larvae, Sweden, L. Brundin (see Brundin 1949: 713) (SMNH). Other material: parts of 4 males on slides, parts of 3 females on slides, 1 pupa, 2 larvae, Lake Gripsö, Denmark, 10/8/45, K. Berg; 7 males, Shell Lake, MacKenzie Delta, N.W.T., 23-30/7/72, S. S. Chang; 20 larvae, Shell Lake, McKenzie Delta, N.W.T., 13/3/72, N. B. Snow; 3 larvae, depth 3-7 m, Parsons Lake, 23 miles southwest of Tuktoyaktuk, N.W.T., 10/9/73, D. Wright; 45 larvae, depth 3-9 m, South Indian Lake, Man., 6/7-4/8/72, T. Cleugh; 2 larvae, Little River and Crow Creek arms of Keowee Reservoir, Oconee Co., S.C., 26/4 and 13/5/74, M. Forsyth (All).

Ecology and Distribution

Zalutschia zalutschicola is a typical lake dwelling species, characteristic of mesohumic and polyhumic lakes, but also present in oligohumic, oligotrophic lakes particularly in subarctic areas. In southern Sweden species has two emergence periods, one in June and the main one in September-October (Brundin 1949: 713-714). In Shell Lake (N.W.T.) there appears to be only one emergence period, at the end of July.

Distribution - Sweden (Brundin 1949: 713), Finland (Armitage 1974: 16), Denmark (Berg and Petersen 1956: 205; Dahl 1954: 617), northern USSR including Siberia (Pankratova 1970: 138), Northwest Territories, Manitoba, South Carolina.

Zalutschia furcarca sp.n.

(Fig. 51E; 67)

The imago is characterized by the weak frontal tubercles (ocelli); flagellomeres 2-4 with SCh; Ac absent or only 1; AR of about 1.8-1.9; LR_1 of about 0.83; SV_1 of about 2.2; BR_2 of 4.3-4.7; broad, short, apically rounded anal point; bifid oral projections of the Sa; and Gs with a rounded outer corner.

MALE IMAGO (n = 2, EXCEPT WHEN OTHERWISE STATED)

TL 4.53-4.69 mm. WL 2.78-3.11 mm. TL/WL 1.51-1.63. WL/Pfe 2.92-3.17.

Antenna - Pedicel L/W (microns): 110/190 (1). Last flagellomere 816 μ (1) long, flagellomeres 2-4 with SCh. AR 1.82-1.85.

Head - Temporal setae 7-12 (Fig. 67D), Po 3 or 4, OV 3-5, IV 1-3. Clypeus with 8-19 setae. Cibarial pump, Te, and St as in Fig. 67C. Te 200-220 μ long, 56-62 μ wide, width anterior of PTP 10-12 μ , distance from apex to PTP 28-46 μ . St 210 μ long. Frontal tubercles 51-74 μ apart. Palp lengths (microns): 44-50, 64-66, 173-182, 142-147, 184 (1).

Thorax (Fig. 67A) - Ap 7 (1). Dc 10-13, Ac absent or 1 or 2 at anterior third of scutum (?), Pa 4 or 5. Scu 8-10.

Wing (Fig. 67E) - Anal lobe well developed, slightly protruding. C-extension $84-90 \mu$. VR 1.13-1.16. B with 1, R with 4 or 5 setae. Squama with 26-32 setae.

Legs - Sp₁ 90 μ (1), Sp₂ 30-45 μ and 30-40 μ , Sp₃ 84-86 μ and 30-33 μ . Wti₁ 58 μ (1), Wti₂ 58-60 μ , Wti₃ 67-68 μ . Sp₁/Wti₁ 1.55 (1). Comb with 13 setae, shortest seta 25-29 μ , longest 52-60 μ . Ps 28-34 μ long, 2 on ta₁ of p₂ and p₃, 1 on ta₂ of p₂ and 2 on ta₂ of p₃. Sch 0-2 on p₂, 2-8 on p₃. Lengths (microns) and proportions of legs:

	fe	ti	tal	ta ₂	ta ₃	ta ₄ (1)	ta ₅ (1)
p1	951-981	1116-1178	975 (1)	558 (1)	362 (1)	233	141
P2	1043	1079-1159	557-626	331-374	221-258	159	135
p3	1104-1214	1389-1472	773-810	491 (1)	356 (1)	190	141



FIG. 67. Zalutschia furcarca sp.n., male. A) thorax; B) hypopygium; C) cibarial pump, Te, and St; D) apex of head; E) wing.

	LR	BV (l)	sv	BR
p_1	0.83 (1)	2.43	2.22 (1)	3.00 (1)
P2	0.52-0.54	3.12	3.62-3.81	4.26-4.74
P3	0.55-0.57	2.97	3.23-3.32	4.44-5.33

Hypopygium (Fig. 67B) - Anal point short, bluntly rounded apically, about 14-28 μ long. T IX and anal point with 35-43 setae. Laterosternite IX with 10 (1) setae. TSa nearly straight, 120-121 μ long. Oral projections of Sa biforked (Fig. 51E, 67B). Gc 256-274 μ long, basal lobe distinctly double. Gs 117-122 μ long, with rounded outer corner. HR 2.18-2.25; HV 3.85-3.87.

Remarks

The placement of *furcarca* in *Zalutschia* can only be regarded as preliminary. It differs from the other species by SCh on flagellomeres 2-4 (2 and 3 in others), perhaps lacks acrostichals, has a higher LR, and an atypical hypopygium for the genus with an anal point differing from the other species. However, in most other details the species fits *Zalutschia*, and the only other Orthocladiinae known to have frontal tubercles are *Z. zalutschicola* and some *Z. tatrica*. Discovery of the immatures is necessary to ascertain the generic placement of this species

Material Examined

Holotype: male, Lake Shore, Clyde, Baffin Island, N.W.T., 25/7/58, G. E. Shewell (CNC No. 13486). Paratype: male, Ennadei Lake, N.W.T., 28/8/52, A. B. Klotz (CNC).

Ecology and Distribution

The species has only been found in the Canadian Arctic.

The following species can be treated either as a member of an enlarged Z. tornetraeskensis group, or as a separate group. For the moment is seems better not to include the species in the Z. tornetraeskensis group because the female and the larva are not known.

Zalutschia vockerothi sp.n.

(Fig. 51K, 54K, 55H, 68)

The male imago is characterized by an AR of only about 0.9; a reduced anal lobe; only about 7 setae on the squama; R_{4+5} occasionally with setae; the fifth palpal segment 0.8-0.9 times as long as the third; no Ps; a BR₃ about 2.6-2.8; a triangular anal point; a basal lobe occupying about half the length of the Gc, but not much projecting; and the Gs apically narrowed, without an outer projection or corner.

The pupe has Fs about 130 μ long, PSA on IV-VI, imbedded spines in the caudo-lateral corners of VII and VIII, and an indication of such a spine on VI, and a few weak spines at L₃ on VII.

MALE IMAGO (n = 2, EXCEPT WHEN OTHERWISE STATED)

TL 3.04-3.27 mm. WL 1.55-1.69. TL/WL 1.94-1.96. WL/Pfe 2.43-2.46.

Antenna - Pedicel L/W (microns): 90 (1)/122 (1). Flagellomeres L/W (microns, n = 1): 56/36, 28/36, 28/38, 32/38, 33/33, 33/35, 37/34, 40/33, 42/55, 40/33, 42/32, 52/31, 386-399 (2)/34. AR 0.89-0.90.

Head - Temporal setae 8 or 9, Po 2 or 3, OV 3, IV 3. Clypeus with 10 setae. Cibarial pump, Te, and St as in Fig. 68A. Te 120-150 μ long, 25-32 μ wide, width anterior of PTP 11-12 μ , distance from apex to PTP 20-28 μ . St 110-136 μ long, 40 μ wide. Two ocelli 25-30 μ apart. Palp lengths (microns): 34-36, 40-46, 102-104, 66-68, 86-89.

Thorax (Fig. 68C) - Ap 6 (1). Dc 7-13; Ac 3-5, at anterior 1/5-1/3 of scutum. Scu 4-6.

Wing (Fig. 68B) - Anal lobe reduced. C-extension 72-76. VR l.10-l.17. B with l, R with 8-ll, R_{4+5} with 0-6 setae. Squama with 7 setae.

Legs - Sp₁ 50-60 μ , Sp₂ 18-30 μ and 17-28 μ , Sp₃ 58-60 μ and 26-34 μ . Wti₁ 43-44 μ , Wti₂ 44 μ (1), Wti₃ 50 μ . Sp₁/Wti₁ 1.14-1.40. Comb with 8 setae, 16-38 μ long. Ps absent. SCh l or 2 on p₂, 3 on p₃. Lengths (microns) and proportions of legs:

	fe	ti	ta_1	ta ₂	ta 3	ta4	ta ₅
Pl	638-687	767-797	485-534	307-350	215-227	144-146	80-90
P2	692-748	699-761	337-362	202-215	150-160	104-110	80-82
P3	711-773	822-902	423-460	233-258	203-209	117-120	76-88
	LR	BV	S	SV	BR		
Pl	0.63-0.67	2.40-2.63	2 2.78	3-2.90	2.27-2.38		
P2	0.48	3.22-3.3	0 4.13	3-4.17	2.40		
P3	0.51	3.11-3.10	5 3.62	2-3.64	2.59-2.79		

Hypopygium (Fig. 68D) - Anal point $30-45 \mu \log$, $30-50 \mu$ wide at base. T IX plus anal point with 24-27 setae, 13-20 on anal point proper. Laterosternite IX with 8-10 setae. Pha 96-98 μ long. TSa 85-96 μ long, straight on anterior margin. Gc 228 μ long; with long, but little projecting basal lobe. Gs 117 μ long, apically narrowed, without outer corner or projection. HR 1.95, HV 2.69.



FIG. 68. Zalutschia vockerothi sp.n., male. A) Cibarial pump, Te, and St; B) wing; C) thorax, dorsal view; D) hypopygium.

PUPA (n = 2, EXCEPT WHEN OTHERWISE STATED)

TL 3.80-3.98 mm. TH/AM 1.10-1.14.

Cephalothorax - TH (Fig. 54K) 331-350 μ long, 60-70 μ wide, with low apicolateral projection. Anterior PcS 60 μ long, median 90 μ long, posterior 50 μ long. FS 130 μ (1) long.

222

Abdomen (Fig. 55H) - PSA present on IV-VI, longest spinules 8-10 μ on IV, 5-9 μ on V, 4-9 μ on VI. Elevated patches of spinules vestigial or absent on VI. Caudolateral corners of VI-VIII with imbedded spines, very weak or only indicated on VI. Segment I with 3 L-setae, II-VIII with 4 L-setae, all filamentous on VII and VIII. Anal lobe with 300-307 μ long AM and 33-42 setae in fringe.

Material Examined

Holotype: male with pupal exuvium, Old Chelsea, Que., 25/4/58, J. R. Vockeroth (CNC No. 13487). Paratype: male with pupal exuvium, same data as holotype (FWI).

Ecology and Distribution

The species is known only from the type locality in Quebec.

Z. tornetraeskensis group

Imagines without frontal tubercles; male flagellomeres 2-10 or 2-12 wider than long; anal point small, without microtrichia in apical half; SDu with curve(s) or loop(s).

Pupa with imbedded spines in caudolateral corners of segments VI-VIII or VII and VIII, PSA absent or present only on IV and V or IV-VI, filamentous L-setae on VII and VIII only.

Larva with S I finely plumose, Bl shorter than flagellum, several LG serrated, and TA much longer than PP.

Zalutschia lingulata sp.n.

(Fig. 51G, I, J; 52 C, E, H, I; 53D; 54I; 55F; 56D, H, N; 57E; 58H; 59D, J; 69; 70F, G; 71)

Male imago is characterized by an AR of 2.0-2.5; flagellomeres 2-10 or 2-12 wider than long; a LR₁ of 0.69-0.74; LR₂ of 0.44-0.51; LR₃ of 0.50-0.57; SV₂ of 3.8-4.4; SV₃ of 3.1-3.6; T IX plus anal point with 8-24 setae (8-17 in Z. *l. lingulata* subsp.n., about 24 in forma *teres* forma n.); an anal point tongue-shaped in Z. *l. lingulata* and Z. *l. pauca*, triangular in forma *teres*; and a triangular Gs, with a rounded outer projection or without the projection (in Z. *l. teres*). Female has 7-16 setae on clypeus; LR₁ of 0.62-0.70, LR₂ of 0.41-0.50, LR₃ of 0.49-0.54; 10-18 setae on T IX; 8-18 setae on Gc; SDu with bulbs before a common opening; and Csa with 2-4 strong curves or bends.

Pupa (of Z. 1. pauca) has PSA on IV-VI, caudolateral corners of VI-VIII (weak on VI) with imbedded spines, relatively long FS (about 185 μ), and TH with an apicolateral projection.

Larva (of Z. 1. pauca) has head capsule length of 0.35-0.43 mm, relatively finely plumose S I, about 5 or 6 serrated LG, about 5-7 setae underneath the ventromental plates, and V/M of 0.6-0.9.

The species has been divided into 2 subspecies and 1 form which eventually, when all stages of all 3 are known, may each prove to be valid species; they are, therefore, described separately.

Zalutschia lingulata lingulata subsp.n.

(Fig. 51I; 52E, I; 69A-E; 70G, H)

Male imago primarily differs from Z. l. *pauca* subsp.n. by 15-21 setae on T IX including anal point, and from Z. l. forma *teres* f.n. by tongue-shaped rather than a triangular anal point.

The female Z. 1. *lingulata* sometimes possesses a coronal suture lacking in Z. 1. *pauca*; there are 12-18 setae on Gc opposed to 8-12 in Z. 1. *pauca*; S VIII has 10-26 setae in Z. 1. *lingulata*, 6-12 in Z. 1. *pauca*; bulbs on the SDu possess a small spine in Z. 1. *lingulata*; and there are minor differences between the 3 taxa in the Csa, labia, and lobes of Gp VIII.

MALE IMAGO

TL 3.23-4.81, 4.25 mm (14). WL 2.00-2.79, 2.53 mm (32). TL/WL 1.55-1.84, 1.70 (14). WL/Pfe 2.86-3.17, 2.99 (14).

Antenna - Pedicel L/W (microns, n = 11): 90-126, 109/148-190, 178. Flagellomeres L/W (microns, n = 10-11): 60-79, 70/48-62, 56; 22-36, 26/46-60, 53; 20-28, 24/44-56, 51; 20-28, 24/40-55, 49; 22-28, 25/40-55, 47; 22-29, 26/39-52, 45; 20-32, 27/38-49, 44; 20-35, 29/33-37, 42; 22-36, 31/33-44, 40; 23-36, 31/31-42, 38; 20-36, 32/30-40, 33; 20-35, 32/30-40, 37; 618-865, 804/32-42, 37. AR 2.00-2.33, 2.20 (28).

Head - Temporal setae 7-11, 10 (12); Po 2-6, 4 (12); OV 2-5, 4 (13); IV 2-4, 3 (13). Clypeus with 8-17, 13 (13) setae. Te 156-200, 182 μ (4) long; 31-40, 37 μ (4) wide; width anterior of PTP 11-12, 12 μ (4); distance from apex to PTP 25-30, 28 μ (4). St 150-170 μ (3) long, 55-76 μ (3) wide. Vestigial ocelli observed in 1 specimen, 48 μ apart. Palp lengths (microns, n = 12-14): 26-38, 33; 54-80, 65; 93-134, 116; 96-123, 110; 122-184, 155. *Thorax* - Ap 6-9, 7 (11). Dc 9-18, 12 (32); Ac 3-13, 9 (28) starting at anterior 1/7-1/3; Pa 4-7, 5 (15). Scu 8-13, 10 (12).

Wing - Anal lobe well developed, protruding. C-extension 40-72, 49 µ (15) long. VR 1.13-1.25, 1.18 (32). B with 1 (11); R with 3-7, 5 (15) setae. Squama with 18-36, 26 (31) setae.

Legs (n = 13-15, except when otherwise stated) - Sp₁ 68-106, 85 μ ; Sp₂ 26-40, 32 μ and 20-30, 24 μ ; Sp₃ 56-81, 72 μ and 20-30, 25 μ . Wti₁ 44-54, 48 μ ; Wti₂ 41-53, 47 μ ; Wti₃ 47-62, 55 μ . Sp₁/Wti₁ 1.43-2.00, 1.77. Comb with 10-12, 11 setae; shortest seta 18-24, 21 μ ; longest 40-56, 48 μ . Ps 16-28, 23 μ long; 2 on ta₁ of p₂, 0-2 on ta₂ of p₂, 0-2 on ta₁ of p₃. SCh absent on p₂; 1-3, 1.6 (10) on p₃. Lengths (microns) and proportions of legs:

	fe	ti	tal	ta ₂	ta ₃
P1	705-908,837	773-1067,985	540-761,698	343-478,428	251-350,306
P2	761-1006,902	834-1073,972	380-509,449	227-343,277	172-239,205
Рз	810-1104,988	981-1337,1203	468-711,624	301-460,371	245-319,285
	ta_4	ta ₅	LR	В	I
\mathbf{p}_1	153-227,199	86-129,114	0.63-0.74,0.71	(29) 2.25-2	2.80,2.42
P2	116-159,139	80-116,102	0.44-0.49,0.46	2.90-3	3.40,3.22
Рз	123-184,162	74-129,114	0.50-0.56,0.53	2.84-3	3.34,3.04
	sv	BR			
P1	2.51-2.98,2.62	2.50-4.23,	3.38 (25)		
P2	3.96-4.37,4.17	3.00-4.69,	3.98 (23)		
Рз	3.28-3.58,3.44	5.50-7.50,	6.16 (28)		

Hypopygium (Fig. 51I, 69A-E) - Anal point tongue-shaped, about 30-54, 39 μ (11) long. T IX including anal point with 15-21, 18 (14) setae, usually all on anal point. Laterosternite IX with 9-14, 11 (10) setae. Pha 86-120, 106 μ (13) long. TSa 90-120, 105 μ (12) long. Longest spine of penis cavity 56-68, 62 μ (10). Gc 190-271, 247 μ (15) long; basal lobe slightly double, inclining caudally from widest point. Gs 94-128, 114 μ (15) long; with short, bluntly rounded outer projection or corner. HR 2.04-2.26, 2.18 (15); HV 3.30-4.01, 3.68 (14).

FEMALE IMAGO (n = 9-10, EXCEPT WHEN OTHERWISE STATED)

TL 3.15-4.18, 3.62 mm. WL 2.22-2.95, 2.55 mm (13). TL/WL 1.34-1.50, 1.41. WL/Pfe 3.75-3.92, 3.82.

Antenna - Pedicel L/W (microns): 44-60, 52 (7)/80-98,87. Flagellomeres L/W (microns): 76-90, 82/41-51, 47; 45-54, 50/31-46, 37; 44-60, 53/30-37, 32; 46-60, 52/29-36, 32; 95-147, 118/24-32, 29. AR 0.47-0.57, 0.52.

Head - Temporal setae 4-10, 7; Po 2-5, 3; OV 1-3, 2; IV 0-3, 2. Clypeus with 7-16, 13 setae. Te 130-182, 161 µ long, 26-36, 30 µ wide; width anterior of PTP 9-12,



FIG. 69. Zalutschia lingulata lingulata subsp.n., male hypopygium and Gs. A) specimen from Otter Lake, Ont.; B) from Knob Lake, Que.; C) from Crooked Lake, Ind.; D) from Myers Lake, Ind.; E) from Hanas Lake, Que.; F) Z. l. f. teres f.n. from Norman Wells, N.W.T.

10 μ ; distance from apex to PTP 5-20, 13 μ . St 130-160, 149 μ long; 42-68, 54 μ wide. Ocelli 60-106, 87 μ apart. Coronal suture present in 4 of 10 specimens, 10-50 μ long, divided in 1 to 3 parts. Palp lengths (microns): 28-40, 32; 52-71, 60; 74-112, 88; 74-109, 89; 112-184, 145.

Thorax - Ap 6-10, 8. Dc 8-18, 13 (13); Ac 3-11, 7 (12), starting at anterior 1/6-1/2 of scutum; Pa 4-9, 6. Scu 10-12, 11.

Wing - C-extension 58-110, 85 μ . VR 1.13-1.21, 1.17 (13). B with 1; R with 6-14, 10; R₁ with 3-12, 7; R₄₊₅ with 3-12, 9 setae; C with setae in addition to the marginal fringe 4-17, 9 between R₁ and R₄₊₅, and 1-3, 2 on extension. Squama with 18-45, 26 (13) setae.

Legs - Sp₁ 35-48, 42 μ ; Sp₂ 20-36, 28 μ and 16-30, 23 μ (8); Sp₃ 61-77, 68 μ and 21-28, 25 μ (8). Wti₁ 40-51, 46 μ ; Wti₂ 42-50, 47 μ ; Wti₃ 46-66, 55 μ . Sp₁/Wti₁ 0.76-1.04, 0.91. Comb with 9-12, 10 setae; shortest seta 20-26, 23 μ ; longest 40-59, 48 μ . Ps 20-29, 24 μ long; l or 2 on ta₁ of p₂, 0 or 1 on ta₂ of p₂, 0 or 1 on ta₁ of p₃. Sch 1-5, 3.2 on p₂; 2-6, 4.2 on p₃. Lengths (microns) and proportions of legs:

	fe	ti	tal	ta ₂	ta ₃
$\mathbf{p_1}$	589-785,670	742-1043,86	2 509-607,551	264-331,300	147-190,170
P2	699-920,788	767-1024,88	2 326-423,392	202-264,228	135-178,148
рз	761-1006,864	932-1300,10	98 497-644,571	264-343,311	196-251,219
	ta_4	ta ₅	LR	BV	
p_1	98-110,106	86-98,89	0.62 - 0.69.0.65 (12)	2.91-3.29.3	. 09
p2	92-110,99	86-104,92	0.41-0.46,0.44	3.44-3.85,3	.64
рз	106-135,118	86-110,97	0.49-0.54,0.52	3.21-3.58,3	. 4 0
	C17	ממ			

	54	MC .	
\mathbf{p}_1	2.58-2.83,2.72	2.36-2.92,2.50	(7)
P2	4.10-4.60,4.25	2.43-2.87,2.65	(7)
рз	3.27-3.61,3.44	4.14-5.00,4.48	(8)

Abdomen - Number of setae on T I-VIII as: 31-58, 47; 32-54, 41; 18-42, 32; 18-38, 27; 18-31, 24; 15-30, 22; 14-23, 18; 13-23, 18. Number on S I-VIII as: 0; 2-6, 4; 3-7, 5; 5-9, 7; 7-14, 11; 9-19, 14; 11-17, 13; 10-26, 17.

Genitalia (Fig. 52E, I; 70G, H) - Gc with 12-18, 14 (13) setae. T IX with 11-18, 15 (13) setae. Cercus 110-140, 129 μ long. SCa 92-114, 105 μ long; 67-96, 78 μ wide; with 10-30, 19 μ (8) long and 8 μ (3) wide neck. SDu with bulbs with small spine before common opening. Csa with 3 or 4 curves or bends.

Material Examined

Holotype: male, swarming above cedars, Otter Lake, Lanark Co., Ont., 6/5/71, A. R. Soponis (CNC No. 13488). Allotype: female, same data as holotype (CNC).



FIG. 70. Zalutschia spp., female genitalia, ventral (A, C, G) and dorsal (B, D, E, F, H) view. A, B) Z. tornetraeskensis (Edw.) comb.n.; C, D) Z. pusa sp.n.; E) Z. trigonacies sp.n.; F) Z. lingulata pauca subsp.n.; G, H) Z. lingulata lingulata sp.n.

Paratypes: 163 males, 71 females in grass and cedars, and swarming above cedars, otherwise as holotype; 1 male, 1 female, Hanas Lake, Sunny Mountain Road, Que., 21/6/57, D. R. Oliver; 3 males, Knob Lake, Sunny Mountain Road, Que., 25/7/57, D. R. Oliver; 16 males, Crooked Lake, Ind., 8/4/61, J. B. Stahl; 6 males, Myers Lake, Ind., 7/4/61, J. B. Stahl (All).

Ecology and Distribution

This species and subspecies has the second southernmost record of all Zalutschia, Crooked Lake, Ind., a moderately oligotrophic to mesotrophic lake (Stahl 1966). However, the lakes on the Labrador Peninsula in Quebec are in a subarctic area. The climatic differences are reflected in the different emergence periods, early April in Indiana, to late July in Quebec.

Distribution - Quebec, Ontario, Indiana.

Zalutschia lingulata pauca subsp.n.

(Fig. 51G; 52C, H; 53D; 54I; 55F; 56D, H, N; 57E; 58H; 59D, J; 70F; 71)

Trissocladius sp.A Hamilton 1965: 56 (male, pupa, larva)

The differences between this subspecies and the other subspecies are discussed on p. 223.

MALE IMAGO (n = 10)

TL 3.11-3.99, 3.59 mm. WL 1.98-2.57, 2.30 mm. TL/WL 1.40-1.70, 1.57. WL/Pfe 2.95-3.30, 3.16.

Antenna - Pedicel L/W (microns): 95-120, 111/134-168, 151. Flagellomeres L/W (microns): 60-72, 64/35-49, 40; 16-24, 20/28-46, 38; 13-20, 17/26-46, 37; 16-25, 21/26-47, 36; 18-25, 23/26-45, 35; 21-29, 24/24-46, 34; 23-28, 24/26-42, 34; 24-31, 26/26-41, 33; 23-30, 26/26-37, 31; 23-30, 26/24-38, 31; 24-31, 25/21-33, 28; 23-29, 25/21-32, 28; 647-838, 749/16-36, 24. AR 2.03-2.49, 2.22.

Head - Ap 5-9, 7. Dc 7-11, 9; Ac 8-13, 10, starting at anterior 1/6-1/3 of scutum; Pa 3-6, 4. Scu 5-9, 6.

Wing - Anal lobe well developed, protruding. C-extension 42-80, 54 μ long. VR 1.16-1.28, 1.21. B with 1 or 2, 1; R with 1-6, 3 setae. Squama with 25-32, 29 setae.

Legs - Sp₁ 69-82, 76 μ ; Sp₂ 20-32, 27 μ and 20-30, 24 μ ; Sp₃ 61-76, 67 μ and 22-26, 24 μ . Wti₁ 40-49, 43 μ ; Wti₂ 38-49, 42 μ ; Wti₃ 41-50, 46 μ long; comb with 7-10, 8 setae; shortest seta 13-21, 17 μ ; longest 26-42, 35 μ . Ps 13-24, 21 μ long; 1 or 2 on ta₁ and on ta₂ of p₂, 1 on ta₁ of p₃, occasionally 1 on ta₃ of p₃. Sch absent on p₂; 0-2, 1 on p₃. Lengths (microns) and proportions of legs:

	fe	ti	tal	ta ₂	tag
$\mathbf{p_1}$	667-825,726	772-1001,866	561-706,621	370-455,408	251-317,282
P2	693-891,787	739-977,849	356-455,410	224-284,260	158-211,184
P3	752-983,850	928-1221,1053	515-653,578	297-376,336	211-284,244
	ta4	ta ₅	LR	BV	
\mathbf{p}_1	165-218,189	86-125,108	0.69-0.74,0.72	2.18-2.45,2.2	2 8
p2	92-139,118	79-119,105	0.46-0.51,0.48	2.89-3.24,3.	06
P3	112-172,146	99-125,113	0.53-0.57,0.55	2.76-3.16,2.9	95
	SV	BR			
p_1	2.48-2.67,2.56	3.20-3.76	,3.46		
P2	3.82-4.16,3.98	4.00-5.45	,4.63		
P3	3.14-3.40,3.30	5.19-6.36	,5.58		

Hypopygium (Fig. 71) - Anal point tongue-shaped; about 26-37, 31 μ long. T IX plus anal point with 8-17, 11 setae; 6-11, 9 on anal point proper. Laterosternite IX with 7-11, 9 setae; usually with apicolateral spine. Pha 80-106, 92 μ long. TSa 80-105, 90 μ long. Longest spine of penis cavity 49-56, 52 μ . Gc 176-216, 195 μ long. Gs 85-104, 92 μ long. HR 2.00-2.27, 2.13; HV 3.36-3.99, 3.66.

FEMALE IMAGO (n = 10)

TL 2.63-3.17, 2.89 mm. WL 2.02-2.49, 2.27 mm. TL/WL 1.23-1.36, 1.28. WL/Pfe 3.73-4.05, 3.87.

Antenna - Pedicel L/W (microns): 44-53, 49/54-70, 66. Flagellomeres L/W (microns): 62-81, 70/24-38, 32; 34-44, 38/24-31, 27; 34-41, 38/23-31, 28; 39-52, 46/25-28, 27; 105-136, 119/18-31, 25. AR 0.58-0.66, 0.63.

Head - Temporal setae 2-7, 4; Po 0-2, 1; OV 1-5, 2; IV 0-3, 1. Clypeus with 9-16, 11 setae. Te 99-120, 100 μ long; 18-34, 23 μ wide; width anterior of PTP 5-8, 7 μ; distance from apex to PTP 6-13, 9 μ. St 104-150, 125 μ long; 19-42, 34 μ wide. Ocelli 65-90, 80 μ apart. Coronal suture absent. Palp lengths (microns): 24-31, 26; 34-53, 47; 62-79, 75; 66-83, 74; 86-128, 117.

Thorax - Ap 5-8, 6. Dc 8-11, 9; Ac 8-12, 10; Pa 4-6, 5. Scu 4-10, 8.

Wing - C-extension 44-75, 58 μ long. VR 1.15-1.20, 1.18. B with 1; R with 4-10, 8; R₁ with 1-5, 3; R₄₊₅ with 2-8, 5 setae. Squama with 20-26, 24 setae.

Legs - Sp₁ 30-44, 38 μ ; Sp₂ 21-28, 24 μ and 18-23, 21 μ ; Sp₃ 48-64, 59 μ and 17-22, 21 μ . Wti₁ 35-42, 39 μ ; Wti₂ 36-44, 39 μ ; Wti₃ 38-48, 43 μ . Sp₁/Wti₁ 0.86-1.08, 0.98.



FIG. 71. Zalutschia lingulata pauca subsp.n., male hypopygium. A) holotype.

Comb with 7-10, 9 setae; shortest seta 13-21, 17 μ ; longest 28-36, 32 μ . Ps 11-24, 19 μ long; 1 or 2 on ta₁ of p₂ and ta₂ of p₂, 1 on ta₁ of p₃, occasionally 1 on ta₃ of p₂. Sch 0-5, 2.8 on p₂; 3-8, 5.2 on p₃. Lengths (microns) and proportions of legs:

	fe	ti	tal	ta ₂
Pl	541-653,587	660-826,729	436-541,487	257-318,289
P2	607-739,671	634-792,707	317-396,345	5 191-224,209
P3	647-812,718	792-1016,903	409-521,463	238-297,269
	ta ₃	ta ₄	ta ₅	LR
\mathbf{p}_1	152-191,171	92-127,108	79-99,87	0.64-0.70,0.67
P2	119-158,136	73-112,88	66-99,80	0.46-0.50,0.49
P3	172-224,191	86-125,106	79-99,91	0.50-0.54,0.52
	BV	sv	BI	ર
P1	2.66-2.88,2.75	2.57-2.78,2	.69 2.17-2.	.83,2.58
P2	3.14-3.51,3.36	3.82-4.18,4.	.00 2.64-3.	.08,2.90
P3	3.03-3.98,3.17	3.32-3.60,3.	47 3.28-4	10,3.62

Abdomen - Number of setae on T I-VIII as: 20-45, 33; 23-36, 30; 15-27, 22; 14-25, 19; 12-25, 18; 8-24, 17; 13-28, 17; 7-19, 11. Number of setae on S I-VIII as: 0 or 1, 0.1; 0-10, 5; 2-7, 5; 4-9, 6; 5-11, 9; 7-19, 12; 3-17, 10; 6-12, 9.

Genitalia (Fig. 52C, H; 53D; 70F) - Gc with 8-12, 9 setae. T IX with 10-16, 12 setae. Cercus 76-109, 96 μ long. SCa 71-86, 78 μ long; 45-63, 56 μ wide.

PUPA

TL 4.14-4.93, 4.62 mm (4). TH/AM 1.19 (1).

Cephalothorax - TH (Fig. 54I) 331-399, 367 μ (5) long; 60-80, 71 μ (6) wide; with apicolateral projection. Anterior PcS 76-90 μ (2) long, located 98 μ (2) from median PcS and 20-30 μ (2) from posterior PcS. Median PcS 154-180, 165 μ (5) long; located 20 μ (2) from posterior PcS. Posterior PcS 50-52 μ (2) long, located 90 μ (1) from TH. FS 184 μ (1) long; on tubercle 16-20 μ (2) high, and 14 μ (2) wide.

Abdomen (Fig. 55F) - PSA present on IV-VI; longest spinules 8-12, 10 μ (5) on IV; 8-11, 9 μ (5) on V; 6-8, 7 μ (5) on VI. Caudolateral corners of VI-VIII (weak on VI) with imbedded spines. Segment I with 3 L-setae, II-VIII with 4 L-setae, all filamentous on VII and VIII. Anal lobe with 331 μ (1) long AM; and 26-35, 30 (5) setae in fringe.

FOURTH INSTAR LARVA

TL 5.62-7.10, 6.35 mm (10). Head capsule length 0.38-0.43, 0.41 mm (10).

Head - Antenna as in Fig. 56H. Lengths of antennal segments (microns): 73-80, 77 (10); 17-20, 18 (10); 10-13, 12 (9); 10-12, 11 (7); 4.5-6.5, 5.5 (7); 1-1.5, 1.3 (7). AR 1.49-1.65, 1.58 (7). Basal antennal segment 19-23, 21 μ (10) wide; 3.48-4.00, 3.65 (10) times as long as wide; distance from base to RO 10-14, 12 μ (6); to basal mark of seta 12-18, 14 μ (4); to distal mark of seta 47-56, 52 μ (9); Bl 36-42, 40 μ (4) long. Apical style of second segment 9-11, 10 μ (9) long; LO 7-8, 7 μ (8) long. S I (Fig. 57E) relatively finely plumose. Premandible (Fig. 56N) 80-91, 87 μ (9) long. Mandible (Fig. 59J) 143-158, 149 μ (9) long. Maxilla (Fig. 58H) with 5 or 6 serrated LG. 5-7, 6 (10) setae at base of maxilla underneath ventromental plate (Fig. 56D). Width of 1 median tooth of mentum (Fig. 56D) 14.5-17.0, 16 μ (10); ventromental plate 10-14, 12 μ (10) wide; V/M 0.63-0.85, 0.74 (10). Postmentum 195-221, 205 μ (10) long.

Abdomen (Fig. 56D) - Pc 64-70, 67 μ (10) high; 31-40, 35 μ (10) wide. Sa 90-140, 126 μ (8) long. An 736-865, 817 μ (6) long. Sa/An 0.11-0.16, 0.14 (5). TA 200-316, 272 μ (4) long; 30-35 μ (2) wide at base; 10-18 μ (2) wide in the middle; 3-4 μ (2) wide at apex. PP 282-294 μ (2) long.

Remarks

This is the only subspecies of Z. *lingulata* where the immatures are known. It is not unlikely that the immatures of the other subspecies and the female of forma *teres* will indicate they all deserve specific status. Based on present knowledge, at least Z. *l. lingulata* and Z. *l. pauca* seem to be geographically separated subspecies. The differences between the males are not great enough to call them species. On the other hand, the differences between the males of Z. *trigonacies* sp.n. and Z. *lingulata lingulata* are not great enough to separate them without the evidence of the females.

Material Examined

Types for subspecies: male, female, Marion Lake, B. C., 10/4/65, A. L. Hamilton (CNC No. 13489). Paratypes: 33 males, 20 females, 6 pupae, 11 larvae, Marion Lake, B. C., 12/2/64 (larvae only), 1/4-13/5/64, 10-11/4/65, A. L. Hamilton (All).

Ecology and Distribution

Hamilton (1965) found this species in Marion Lake, B. C., a small oligotrophic lake. The densities ranged from $2218/m^2$ at depths of 0-2 m to $67/m^2$ at 4.5 m (Hamilton 1965, part I, table 5). Although the species was not the most numerous in the lake, it was by far the most numerous species taken as adults in emergence traps (Hamilton 1965, part I, table 6). Both early and fourth instar larvae migrate

vertically. Their gut contents consisted of detritus and plant particles with phytoplankton contributing less than 5% of the volume (Hamilton 1965, part 1, table 7). The species was the first chironomid to emerge from the lake (Hamilton 1965, part 1, fig. 9, part II, p. 58).

Distribution - British Columbia (Hamilton 1965: 56 as Trissocladius sp. A).

Zalutschia lingulata forma teres f.n.

(Fig. 51J, 69F)

Although this form probably represents a subspecies or even a full species it is regarded here as merely a form because the description is based on a single damaged specimen.

The male has a triangular anal point, LR_1 of 0.72, the outer angle of the Gs rounded, T IX and anal point combined with about 24 setae, and the longest spine of the penis cavity about 80 μ .

MALE IMAGO

TL 3.94 mm. WL 2.31 mm. TL/WL 1.71. WL/Pfe 2.83.

Antenna - AR 2.00.

Head - Temporal setael0, Po 3, OV 4, IV 3. Clypeus with 15 setae. Te 105μ long, 40 μ wide, width anterior of PTP 13 μ , distance from apex to PTP 32 μ . St 180 μ long, 60 μ wide. Ocelli 32 μ apart. Palp lengths (microns): 38, 64, 106, 104, 140.

Thorax - Ap 7. Dc 9, Ac 3, Pa 5.

 Wing - C-extension 85 $\mu.$ VR 1.17. B with 1, R with 5 setae. Squama with 23 setae.

Legs - Sp₁ 78 μ , Sp₂ 30 μ and 22 μ , Sp₃ 66 μ and 22 μ . Wti₁ 46 μ , Wti₂ 46 μ , Wti₃ 56 μ . Sp₁/Wti₁ 1.70. Comb with 10 setae 22-50 μ long. LR 0.72.

Hypopygium (Fig. 69F) - Anal point triangular, about 30 μ long. T IX plus anal point with 17 setae, about 7 on anal point. Pha ll0 μ long. TSa 95 μ long. Longest spine of penis cavity 80 μ . Gc 231 μ long. Gs 99 μ long, rounded on outer margin, without outer projection or angular corner. HR 2.34, HV 4.00.

Material Examined

Male, Norman Wells, N.W.T., 16-19/5/53, J. S. W. (CNC).

Ecology and Distribution

The form is at present known only from the Northwest Territories.

Zalutschia pusa sp.n.

(Fig. 52D, J; 54D, J; 55G, J; 56I, O; 57F; 58B, E; 59C, I; 70C, D)

This species appears to be parthenogenetic. Female occasionally has only 4 flagellomeres; WL/Pfe of about 3.6; BR_3 of 4.0-4.7; SDu with bulbs before a common opening; and Csa, when not reduced, with a mediolateral branch.

Pupa is characterized by the presence of PSA on segments IV-VI; strong imbedded spines in the caudolateral corners of segments VII and VIII, and absence of these on segment VI.

Larva has an AR of about 1.3; only about 5 serrated LG, some with 4 or 5 serrations; and TA of 2 sizes, one pair less than one third as long as the longest pair.

FEMALE IMAGO (n = 2, EXCEPT WHEN OTHERWISE STATED)

TL 3.37-3.45 mm. WL 1.97-2.21 mm. TL/WL 1.56-1.71. WL/Pfe 3.61.

Antenna - Pedicel L/W (microns, n = 3): 47-56/74-78, 4 or 5 flagellomeres. Flagellomeres 1 and 2 L/W (microns, n = 3): 64-80/34-42; 36-51/26-31; flagellomere 3 40-49 μ (2) long in specimen with 4 flagellomeres, 22-32 μ wide; flagellomere 4 40-49 (2) long in specimens with 5 flagellomeres; last flagellomere 102-122 μ (3) long, 25-30 μ (3) wide. AR 0.57-0.59 (3).

Head - Temporal setae 3-6, Po 3, OV 0 or 1, IV 0-2. Clypeus with 9-11,11 (4) setae. Te 130-132 μ long, 28 μ wide, width anterior of PTP 10 μ , distance from apex to PTP 12-14 μ . St 112-140 μ long, 26-42 μ wide. Ocelli 55-78 μ apart. Coronal suture absent or 20 μ long. Palp lengths (microns): 30, 60-70, 73-82, 74-86, 122-130.

Thorax - Ap 6-8 (3). Dc 10-15, 12 (4); Ac 8-10 (3), starting at anterior third of scutum; Pa 4-7 (3). Scu with 6-13, 9 (4) setae.

Wing - Anal lobe well developed, not or slightly protruding. C-extension 70-90 μ long. VR 1.17-1.19. B with 1 (3), R with 7-10, R₁ with 4-7, R₄₊₅ with 8 setae. Squama with 18-21 (3) setae.

Legs - Sp₁ 40 μ , Sp₂ 22 μ and 16-20 μ , Sp₃ 57-60 μ and 18-20 μ . Wti₁ 40 μ , Wti₂ 43-45 μ , Wti₃ 50-53 μ . Sp₁/Wti₁ 0.95-1.05. Comb with 8-10 setae, shortest seta 16-20 μ , longest 38-42 μ . Ps 20-25 μ long; 2 on ta₁ of p₂, 0 or 1 on ta₁ of p₃. Sch 2-5 on p₂, 4-6 on p₃. Lengths (microns) and proportions of legs:

	fe	ti	ta _l	ta ₂	ta ₃	ta ₄
p_1	546-613	699-736	478	258-270	153-15	4 92-96
p2	613-692	724-742	343-350	200-209	129-13	5 91-98
P3	711-761	902-957	491-497	270-282	190-20	0 98-120
	ta ₅	LR	BV	sv		BR
p_1	86-95	0.65-0.68	2.86-3.0	3 2.60-	2 • 82	2.36-3.48
p2	86-90	0.47	3.22-3.4	6 3.89-	4.10	3.00-3.04
P3	92-106	0.52-0.54	3.18	3.29-	3.46	4.00-4.69

Abdomen - Number of setae on T I-VIII (n = 3-4) as: 19-40; 12-41, 28; 15-30, 22; 12-23, 18; 9-20, 15; 7-22, 14; 8-19, 13; 12-16, 14. Number of setae on S I-VIII (n = 3-4): 0; 0-5; 2-6; 4-6, 5; 4-13, 7; 2-18, 11; 6-16, 11; 7-17, 12.

Genitalia (Fig. 52D, J; 70C, D; n = 4) - Gc with 10-12, 12 setae. T IX with 10-14, 12 setae. Cercus 95-116, 104 μ long. SCa 100-114, 106 μ long; 70-77, 72 μ wide; with 20-40, 28 μ long and 20-22, 20 μ wide neck. SDu with bulbs before common opening. Csa with mediolateral branch or with reduced sclerotization.

Pupa

TL 3.74-4.65, 4.33 mm (4). TH/AM 0.92-0.98 (3).

Cephalothorax - TH (Fig. 54J) 340-390, 364 μ (4) long; 70-80 μ (2) wide. Anterior PcS 100 μ (1) long, located 18 μ (1) from both median and posterior PcS. Median PcS 220-230 μ (2) long (very strong), located 18 μ from posterior PcS. Posterior PcS 60 μ (1) long, located 50 μ (1) from TH. FS (Fig. 54D) 160-260 μ (3) long, on tubercle 5-6 μ (2) high and 14-18 μ wide.

Abdomen (Fig. 55G, J) - PSA present on S IV-VI; longest spinules 10-12, 11 μ (4) long on S IV; 10-13, 11 μ (4) long on S V; 6-7, 6 μ (4) long on S VI. Caudolateral corners of VII and VIII with strong imbedded spines, segment VI without any indication of caudolateral spines. Segments II-V with 3 L-setae, VI-VIII with 4 L-setae, all filamentous on VII and VIII. Anal lobe with 370-400 μ (3) long AM, and 27-32, 31 (4) setae in fringe.

FOURTH INSTAR LARVA (n = 1)

Head capsule length 0.48 mm.

Head - Antenna as in Fig. 56I. Lengths of antennal segments in microns: 70, 17, 11, 10, 6, 1.5. AR 1.30. Basal antennal segment 18 μ wide, 3.89 times as long as wide, distance from base to RO 8 μ , to basal mark of seta 8 μ , to distal mark of seta 44 μ , Bl 39 μ long, accessory blade 16 μ long. LO 6.5 μ long. S I (Fig. 57F) relatively coarsely plumose. Premandible (Fig. 56O) 72 μ long. Mandible (Fig. 59I) 153 μ long. Maxilla (Fig. 58B, E) with 5 LG each with 3-5 serrations, and ACh with a few mediolateral serrations. 7 setae at base of maxilla underneath ventromental plates (Fig. 57C). Width of 1 median tooth of mentum (Fig. 59C) 12 μ wide, ventromental plate 10 μ wide, V/M 0.83. Postmentum 190 μ long.

Abdomen - Pc 70 μ high, 36 μ wide. An 736 μ long. 2 TA 190 μ long, 2 TA 60 μ long, 20 μ wide at base, 12 μ wide in middle and 4 μ wide at apex.

Remarks

Two females reared, and 1 of the 3 mature female pupae collected, showed some reduction of the genitalia particularly the Csa. It, therefore, seems most likely that at least the population sampled is parthenogenetic. The immatures differ in several details from Z. *lingulata pauca*. However, the immatures of Z. *l. lingulata* are not known. The possibility that Z. *pusa* represents a facultative parthenogenetic population of Z. *l. lingulata* with slightly changed female genitalia cannot be completely excluded.

Material Examined

Holotype: female reared from larva, ditch with *Chara* bottom, 1 mile west of Whiteshell Provincial Park, Man., on TransCanada highway, collected 16/4, emerged 25/4/67, A. L. Hamilton (CNC No. 13490). Paratypes: female reared from pupa, 3 mature female pupae, same locality as holotype, collected 13/4, emerged 16/4/73, M. P. McLean and O. A. Sæther (FWI).

Ecology and Distribution

This species which may be parthenogenetic, has been found only from the type locality, a ditch with *Chara* bottom near the Manitoba/Ontario border.

Zalutschia tometraeskensis (Edwards) comb.n. (Fig. 51F; 52A, G; 53C; 54A, G; 55A, I; 70A, B; 72)

Orthocladius torneträskensis Edwards, in Thienemann 1941: 211 (male, female) Trissocladius torneträskensis (Edw.) Thienemann 1941: 213 (pupa); Brundin 1956a: 76 (male)

(Probable synonyms: Z. fontinalis (Chern.) comb.n. (see p. 241), Z. korosiensis (Chern.) comb.n. (see p. 241))

The male is easily recognized by the hypopygium with its minute anal point, and Gs with an outer angle but no projection and usually without a sharp corner. Another characteristic is that flagellomeres 2-11 or 2-12 are wider than long. Female has 7-11 SCh on p_2 and 7-10 on p_3 ; 24-29 setae on T IX; 19-23 setae on S VIII, 3-10 on S VII; SDu without bulbs before the opening; and Csa with 3 or 4 sharp bends.

Pupa is characterized by the absence of PSA and the presence of imbedded spines in the caudolateral corners of VII and VIII. There are 26-44 setae in the fringe of the anal lobe.

MALE IMAGO

TL 2.96-4.32, 3.78 mm (8). WL 1.70-2.37, 2.09 mm (9). TL/WL 1.74-1.84, 1.79 (8). WL/Pfe 2.70-2.98, 2.85 (8).

Antenna - Pedicel L/W (microns, n = 6): 90-110, 97/150-176, 157. Flagellomeres L/W (microns, n = 5-6): 50-70, 60/38-50, 41; 20-40, 26/38-42, 40; 18-32, 23/35-42, 39; 19-28, 24/35-42, 38; 22-28, 25/32-42, 36; 26-29, 27/35-38, 37; 25-33, 28/34-37, 35; 27-32, 29/34-36, 35; 26-33, 29/32-36, 34; 29-35, 30/32-36, 34; 28-35, 30/32-36, 33; 28-36, 31/30-34, 31; 577-754, 650/30-32, 31. AR 1.74-1.94, 1.86 (8).

Head - Temporal setae 7-10, 8(7); Po 3-5, 4(7); OV 1-3, 2(7); IV 2-4, 3(7). Clypeus with 7-12, 9(11) setae. Te 155-205, 182 μ (6) long; 34-46, 39 μ (6) wide; width anterior of PTP 10-18, 14 μ (6); distance from apex to PTP 30-38, 33 μ (6). St 170-185 μ (2) long, 70-80 μ (2) wide. Ocelli usually present 40-55, 48 μ (4) apart. Palp lengths (microns, n = 9-10): 30-40, 37; 40-69, 56; 70-125, 95; 76-124, 95; 105-142, 127.

Thorax - Ap 4-6, 5(8). Dc 7-11, 9(10); Ac 4-8, 6(5), starting at anterior 1/3-1/2 of scutum; Pa 3 or 4, 4(9). Scu 5-9, 7(6).

Wing - Anal lobe well developed, protruding. C-extension 90-100, 98 μ (5) long. VR 1.16-1.18, 1.17(4). B with 1(6), R with 3-8, 5(7) setae. Squama with 21-35, 27(10) setae.

Legs (n = 7-8) - Sp₁ 62-80, 71 μ ; Sp₂ 22-34, 28 μ and 14-28, 22 μ ; Sp₃ 59-73, 65 μ and 20-34, 24 μ . Wti₁ 62-80, 71 μ ; Wti₂ 40-50, 44 μ ; Wti₃ 44-56, 50 μ . Sp₁/Wti₁ 1.27-2.00, 1.60. Comb with 9-11, 10 setae; shortest seta 19-26, 23 μ ; longest 44-54, 48 μ . Ps 23-32, 26 μ long; 2 on ta₁ of p₂ and p₃, 0-2 on ta₂ of p₂, 1 specimen with 1 on ta₃ of p₂. Sch 1-4, 2.9(9) on p₂; 1-3, 2.7 (9) on p₃. Lengths (microns) and proportions of legs:

238

	fe	ti	tal	ta ₂	tag
\mathbf{p}_1	656-871,756	767-1006,861	546-740,616	350-503,414	239-343,285
P_2	687-883,789	754-994,860	362-491,418	221-313,255	159-221,184
Рз	717-969,831	883-1221,1048	435-662,554	264-374,315	209-301,253
	ta ₄	ta ₅	LR	BV	
\mathbf{p}_1	158-210,187	102-136,116	0.70-0.74,0.71	2.17-2.53,2.27	
P2	108-138,123	92-118,106	0.48-0.50,0.49	3.02-3.11,3	•08
P3	115-162,139	102-126,111	0.49-0.54,0.53	2.89-3.02,2	• 96
	sv	BR			
p_1	2.51-2.89,2.63	2.87-3.57,3.08			
P2	3.82-4.09,3.93	3.33-4.09,	3.73		
Рз	3.01-3.68,3.34	4.55-5.04,	4.84		

Hypopygium (Fig. 51F, 72) - Anal point minute. T IX including anal point with 18-27, 22 (10) setae. Laterosternite IX with 7-19, 11 (5) setae. Pha 80-114, 106 μ (8) long. TSa straight or concave on anterior margin; 80-114, 105 μ (8) long. Gc 190-269, 229 μ (10) long; basal lobe nearly right-angled. Gs 86-105, 96 μ (10) long; with outer angle, but without outer projection and usually without sharply pointed corner. HR 2.18-2.60, 2.37 (10); HV 3.44-4.18, 3.89 (8).

FEMALE IMAGO

TL 3.18-3.55, 3.38 mm (5). WL 2.33-2.38, 2.36 mm (6). TL/WL 1.36-1.51, 1.44 (5). WL/Pfe 3.30-3.47, 3.38 (6).

Antenna (n = 6) - Pedicel L/W (microns): 48-60, 55/80-87, 83. Flagellomeres L/W (microns): 78-85, 81/40-44, 42; 41-50, 44/32-35, 33; 45-50, 48/31-36, 33; 45-56, 49/31-35, 33; 124-151, 137/25-33, 30. AR 0.53-0.73, 0.62(6).

Head - Temporal setae 4-7, 6(6); Po 3 or 4, 3(6); OV 0 or 1, 0.7(6); IV 1 or 2, 1.5(6). Clypeus with 9-17, 12(8) setae. Te 120-150, 133 μ (4) long; 25-30, 28 μ (4) wide; width anterior of PTP 11-16, 13 μ (5); distance from apex to PTP 14-15 μ (3). St 136-180 μ (3) long, 60 μ wide. Two ocelli present; 85-106, 98 μ (6) apart. Coronal suture absent. Palp lengths (microns, n = 5-6): 38-40, 39; 48-60, 53; 93-106, 100; 90-102, 98; 120-160, 141.

Thorax - Ap 5-9, 7(7). Dc 7-11, 9(7); Ac 6-8, 7(5), starting at anterior 1/5-1/3 of scutum; Pa 3-5, 4(7). Scu 7-10, 8(7).

Wing - C-extension 90-120, 102 μ (5). VR 1.15-1.22, 1.19 (5). B with 1 or 2, 1.2 (5) setae; R with 6-11, 9(4); R₁ with 4-7, 5(6); R₄₊₅ with 4-7, 6(4) setae. Squama with 24-31, 28(7) setae.

Legs (n = 6) - Sp₁ 33-38, 35 μ ; Sp₂ 27-31, 30 μ and 22-27, 25 μ ; Sp₃ 60-68, 64 μ and 22-28, 24 μ . Wti₁ 40-46, 43 μ ; Wti₂ 44-47, 45 μ ; Wti₃ 52-54, 52 μ . Sp₁/Wti₁ 0.76-0.90, 0.81. Comb with 8-11, 10 setae; shortest seta 22-30, 27 μ ; longest



FIG. 72. Zalutschia tornetraeskensis (Edw.) comb.n., male hypopygium. A-C) specimens from Finland; D) from Sweden.

48-60, 53 μ . Ps 26-30, 28 μ long; 2 on ta₁ of p₂ and p₃, 0 or 1 on ta₂ of p₂. SCh 7-11, 8 on p₂; 7-10, 8 on p₃. Lengths (microns) and proportions of legs:

	fe	ti	tal	ta ₂	tag
P1	675-711,696	785-859,823	546-589,560	307-356,323	153-190,177
P2	724-785,747	810-877,834	380-405,389	209-239,228	147-159,150
P3	761-810,771	975-1018,1006	515-546,530	282-307,299	196-233,215
	taų	ta ₅	LR	BV	
\mathbf{p}_1	109-120,116	80-100,90	0.67-0.70,0.68	2.69-3.06,2.	92
P2	94-108,101	88-96,92	0.45-0.47,0.47	3.37-3.89,3.	54
P3	112-127,123	96-112,104	0.51-0.54,0.53	3.01-3.28,3.	12
	SV	BR			
p 1	2.62-2.76,2.71	1.78-2.92,2.54			
P2	3.99-4.17,4.07	2.21-2.86,2.58			
P3	3.25-3.45,3.35	4.00-4.27,4.15			

Abdomen - Number of setae on T I-VIII (n = 4-5) as: 33-49, 42; 25-55, 41; 29-41, 33; 20-33, 29; 20-32, 27; 18-31, 25; 13-26, 20; 15-19, 17. Number of setae on S I-VIII (n = 4-5) as: 0; 3-5, 4; 4-7, 6; 5-9, 7; 7-11, 9; 13-15, 14; 19-23, 22; 3-10, 6.

Genitalia (Fig. 52A, 53C, 70A, B) - Gc with 12-19, 16 (6) setae. T IX with 24-29, 26 (5) setae. Cercus 100-110, 106μ (5) long. SCa 100-120, 112μ (7) long; 38-80, 69 μ (7) wide; length includes neck 20-32, 28 μ (6) long; 14-17, 15 μ (6) wide. SDu without bulbs before common opening. Csa with about 4 sharp curves or bends.

PUPA

TL 3.86-5.38, 4.60 mm (11). TH/AM 0.88-1.18, 1.02 (11).

Cephalothorax - TH (Fig. 54G) 319-454, 384 μ (11) long; 76-120, 94 μ (11) wide. Anterior PcS 50-70, 60 μ (4) long; located 12-18 μ (3) from median PcS and 18-20 μ from posterior PcS. Median PcS 80-130, 108 μ (6) long; located 8-14 μ (3) from posterior PcS. Posterior PcS 30-40, 38 μ (4) long; located 55-80 μ (3) from TH. FS (Fig. 54A) 105-200, 145 μ (9) long; on tubercle 10-16, 14 μ (6) high, 12-16, 15 μ (5) wide.

Abdomen (Fig. 55A) - PSA absent. Elevated patches of spinules distinct also on VI. Caudolateral corners of VII and VIII with weak imbedded spines. Segment I with 3 L-setae, II-VIII with 4(l2) L-setae, all filamentous on VII and VIII. Anal lobe with 307-466, 387 μ (l2) long AM; and 26-44, 37(l4) setae in fringe.

Material Examined

Three males with pupal exuvia, 7 males, 6 females with exuvia, 5 pupae, 6 exuvia, Lake Torneträsk, Swedish Lapland, L. Brundin; 2 exuvia, Swedish Lapland, 1936, A. Thienemann; 2 males with pupal exuvia, 2 males, 2 females with exuvia, 4 females, 1 mature male pupa, 6 exuvia, Lake Kemijärvi, Sodenkylä, Finnish Lapland, 28/5/59, M. Hirvenoja (CNC, FWI, SMNH, ZMUH).

Ecology and Distribution

The species has only been found in lakes Torneträsk and Kemijärvi where it is among the first species to emerge in the spring, often when the lakes are still partially ice covered (Thienemann 1941: 214). However, judging by the larvae of the closely related species Z. trigonacies and Z. lingulata, the unknown larva of Z. tornetraeskensis is likely to have been described already under fontinalis (Chern.) and/or korosiensis (Chern.) both found in Karelia, USSR (see below).

Distribution - Swedish Lapland (Thienemann 1941: 174, 1954: 482; Brundin 1956a: 76), Finnish Lapland.

Zalutschia korosiensis (Chernovskii) comb.n.

Orthocladius korosiensis Chernovskii 1949: 144 (larva) Trissocladius korosiensis (Chern.) Pankratova 1970: 145 (larva)

This species is probably a synonym of Z. tornetraeskensis. It was found in streams near Leningrad, USSR.

Zalutschia fontinalis (Chernovskii) comb.n.

Orthocladius fontinalis Chernovskii 1949: 148 (larva) Trissocladius fontinalis (Chern.) Pankratova 1970: 149 (larva)

This species is also probably a synonym of Z. tornetraeskensis. It was found in Fontinalis growths of a dystrophic lake in Karelia, USSR.

Zalutschia trigonacies sp.n.

(Fig. 51H; 52B; 53A, B; 54F, H; 55E; 56B, G, M; 57D, G; 58C, D; 59E, K; 70E; 73)

Trissocladius torne träskensis Oliver 1963: 177, 1968: 116 (records) nec Edwards.

Male imago is characterized by an AR of 1.6-1.9; flagellomeres 2-10 or 2-11 wider than long; LR_1 of 0.64-0.67, LR_2 of 0.42-0.44, LR_3 of 0.47-0.51, SV_2 of 4.4-4.6, SV_3 of 3.5-4.0; T IX plus the anal point with 21-36 setae; a short, triangular anal point; and a triangular Gs with a sharply pointed outer corner or short projection. The female has 14-21 setae on the clypeus; LR_1 of 0.62-0.67, LR_2 of 0.42-0.44, LR_3 of 0.48-0.51; 15-23 setae on T IX; 8-12 setae on Gc; SDu without bulbs and joined for a short distance before opening; and Csa with weak curves or bends.

Pupa is characterized by the presence of PSA only on IV and V, the caudolateral corners of VI-VIII with imbedded spines and short FS (about 180 μ long).

Larva has a head capsule length of 0.53-0.58 mm, finely plumose S I, more than 10 serrated LG, 8 or 9 setae underneath ventromental plates, and V/M of 0.8-1.0.

MALE IMAGO

TL 3.15-4.10, 3.65 mm (8). WL 1.89-2.34, 2.12 (9). TL/WL 1.65-1.80, 1.73 (7). WL/Pfe 2.79-3.09, 2.93 (8).

Antenna - Pedicel L/W (microns): 90-100, 95 (5)/138-170, 151 (7). Flagellomeres L/W (microns, n = 6-7): 54-64, 59/42-51, 45; 20-30, 25/39-52, 44; 22-26, 24/37-51, 43; 23-28, 26/36-55, 43; 25-32, 28/36-50, 42; 26-33, 28/32-50, 41; 27-32, 30/32-50, 40; 29-32, 31/32-49, 40; 29-36, 31/30-47, 39; 29-32, 31/30-48, 38; 30-33, 31/30-46, 37; 30-34, 32/28-45, 35; 550-662, 623/30-44, 37. AR 1.60-1.86, 1.74 (13).

Head - Temporal setae 7-12, 10(10); Po 2-5, 4(10); OV 1-4, 3(10); IV 2-4, 3(10). Clypeus with 14-20, 16(11) setae. Te 160-190, 177 μ (8) long; 31-39, 34 μ (8) wide; width anterior of PTP 11-15, 12 μ (8); distance from apex to PTP 25-34, 30 μ (7). St 154-190, 168 μ (8) long; 50-70, 61 μ (6) wide. Vestigial ocelli not observed. Palp lengths (microns, n = 8-9): 30-39, 35; 58-76, 63; 102-120, 111; 94-130, 106; 115-154, 132.

Thorax - Ap 5-11, 8(13). Dc 9-15, 12(13); Ac 3-8, 6(10), starting at anterior 1/4-1/2 of scutum; Pa 4-6, 5(13). Scu 7-11, 9(13).

Wing - Anal lobe well developed, protruding. C-extension 58-88, $73.\mu$ (8) long. VR 1.21-1.27, 1.24 (8). B with 1(7); R with 5-8, 6(7) setae. Squama with 18-24, 21(13) setae.

Legs (n = 7-8) - Sp₁ 60-78, 70 μ ; Sp₂ 26-36, 31 μ ; Sp₃ 22-28, 25 μ . Wti₁ 38-49, 44 μ ; Wti₂ 40-52, 44 μ ; Wti₃ 47-58, 52 μ . Sp₁/Wti₁ 1.33-1.86, 1.61. Comb with 10-12, 11(7) setae; shortest seta 22-32, 26 μ (5); longest 33-52, 45 μ (5). Ps 18-30, 24 μ long; 1-4 on ta₁ of p₂, 0-2 on ta₂ of p₂, 0-2 on ta₁ of p₃, 0 or 1 on ta₂ of p₃. Sch 1 or 2, 1.5(8) on p₂; 0-3, 1.3(8) on p₃. Lengths (microns) and proportions of legs:

	fe	ti	tal	ta ₂	ta ₃
\mathbf{p}_1	613-785,716	730-932,840	478-619,555	319-399,361	221-264,243
P2	662-834,754	736-895,828	307-393,354	209-258,232	147-196,168
РЗ	736-895,804	757-1055,944	399-540,487	258-319,286	190-239,218
	ta4	ta ₅	LR	BV	
p_1	138-170,153	98-118,107	0.64-0.67,0.66	2.13-2.67	2.40
P2	86-130,116	80-112,101	0.42-0.44,0.43	2.96-3.27	,3.13
P3	98-154,128	98-122,113	0.47-0.51,0.50	2.42-3.09	,2.96
	sv	BR			
\mathbf{p}_1	2.76-2.86,2.80	2.33-2.92,2.65			
P2	4.37-4.57,4.47	3.20-4.80,4.01			
P3	3.53-3.98,3.65	3.75-6.00,5.09			

Hypopygium (Fig. 73) - Anal point triangular; about 20-40, 31 μ (10) long; and 30-60, 42 μ (10) wide at base. T IX plus anal point with 21-36, 27(13) setae; about 17-28, 20 (13) on anal point. Laterosternite IX with 9-18, 12 (11) setae. Pha 92-116, 102 μ (12) long. TSa slightly concave on anterior margin; 82-114, 95 μ (12) long. Gc 216-286, 232 μ (13) long; basal lobe double, angular. Gs 94-138, 106 μ (13) long; triangular, with short outer projection or sharp point. HR 1.94-2.43, 2.21(13); HV 3.39-3.82, 3.63(8).

FEMALE IMAGO

TL 3.00-3.55, 3.25 mm (8). WL 2.05-2.25, 2.16 mm (8). TL/WL 1.45-1.58, 1.50(8). WL/Pfe 3.65-3.88, 3.75(8).

Antenna (n = 7) - Pedicel L/W (microns): 40-55, 48/66-75, 71. Flagellomeres L/W (microns): 60-70, 66/34-41, 37; 26-37, 32/26-31, 28; 33-45, 40/25-30, 28; 44-50, 48/26-33, 28; 124-140, 132/25-31, 29. AR 0.65-0.76, 0.72.

Head - Temporal setae 5-8, 6(9); Po 2-4, 3(9); OV 1-3, 2(9); IV 0-2, 1(9). Clypeus with 14-21, 18(9) setae. Te 130-166, 153 μ (4) long; 20-29, 26 μ (5) wide; width anterior of PTP 10-13, 12 μ (4); distance from apex to PTP 10-13 μ (2). St 144-165, 151 μ (4) long; 40-60, 54 μ (4) wide. Ocelli 68-94, 81 μ (8) apart. Coronal suture absent. Palp lengths (microns, n = 6-8): 30-38, 34; 50-56, 53; 80-90, 86; 78-90, 82; 114-137, 130.

Thorax - Ap 6-8, 7(8). Dc 8-13, 11(9); Ac 2-7, 5(6); Pa 4-6, 5(9). Scu 7-11, 9(8).



FIG. 73. Zalutschia trigonacies sp.n., male hypopygium. A) holotype from Lake Hazen, Ellesmere Island; B) male from Skeleton Lake, Ellesmere Island; C) from Chesterfield Inlet, N.W.T.; D, E) anal points and Gs of males from Alaska.

Wing - C-extension 90-120, 100 μ (8) long. VR 1.21-1.28, 1.24(8). B with 1(7); R with 7-16, 11(8); R₁ with 1-9, 4(8); R₄₊₅ with 3-6, 5(8) setae. Squama with 19-31, 24(8) setae.

Legs (n = 7-8) - Sp₁ 37-50, 42 μ ; Sp₂ 26-30, 27 μ and 22-24, 23 μ ; Sp₃ 59-70, 63 μ and 21-26, 23 μ . Wti₁ 39-49, 42 μ ; Wti₂ 41-45, 43 μ ; Wti₃ 45-51, 49 μ . Sp₁/Wti₁ 0.76-1.14, 1.00. Comb with 8-10, 9 setae; shortest seta 19-28, 24 μ ; longest 40-56, 50 μ . Ps 22-30, 25 μ long; 2 on ta₁ of p₂, 0-2 on ta₂ of p₂, 0-2 on ta₁ of p₃, 0 or 1 on ta₂ of p₃. Sch 2-5, 3.6 on p₂; 2-4, 2.9 on p₃. Lengths (microns) and proportions of legs:

	fe	ti	tal	ta ₂	ta ₃
pl	552-601,572	681-736,704	423-478,451	207-294,264	82-100,91
p2	626-711,659	699-803,744	301-343,320	190-221,202	110-147,130
P3	675-773,705	853-969,897	411-491,447	239-288,258	172-196,181
	ta4	ta5	LR	BV	
p_1	123-153,137	76-84,81	0.62-0.67,0.64	2.80-3.07	,2.95
p2	76-103,89	75-94,85	0.42-0.44,0.43	3.29-3.62	3.41
P3	96-116,103	90-100,93	0.48-0.51,0.50	3.14-3.30	3.23
	SV	BR			
p_1	2.71-2.96,2.83	2.24-2.6	4,2.53		
P2	4.24-4.47,4.39	2.44-2.9	3,2.69		
P3	3.38-3.75,3.58	3.71-4.2	3,4.04		

Abdomen - Number of setae on T I-VIII (n = 7-9) as: 26-42, 33; 22-46, 34; 18-30, 23; 15-25, 20; 15-26, 18; 16-31, 21; 15-26, 19; 18-26, 21. Number on S I-VIII (n = 8-9) as: 0; 1-3, 2; 2-5, 3; 2-6, 4; 1-5, 7; 7-12, 9; 7-14, 9; 10-19, 14.

Genitalia (Fig. 52B, 53B, 70E) - Gc with 8-12, 10 (9) setae. T IX small, rounded; with 15-23, 20 (9) setae. Cercus 94-116, 106 μ (6) long. SCa 100-120, 112 μ (9) long; 60-82, 74 μ (7) wide; with 20-32, 26 μ (8) long and 10-18, 13 μ (8) wide neck. SDu joined for short distance before common opening, without bulbs. Csa with weak curves or bends.

Pupa

TL 4.63-4.73 mm (2). TH/AM 0.94-1.14, 1.06 (4).

Cephalothorax - TH (Fig. 54H) 362-423, 398 μ (5) long; 80-120, 105 μ (5) wide. Anterior PcS 60 μ (1) long, median 85 μ (1), posterior 20 μ (1) long. FS (Fig. 54F) 80 μ (1) long.

Abdomen (Fig. 55E) - PSA present on S IV and V, longest spinules 6-10 μ (3) on both segments. Caudolateral corners of VI-VIII with imbedded spines. Segment I with 3 L-setae, II-VIII with 4 L-setae, all filamentous on VII and VIII. Anal lobe with 356-386, 377 μ (4) long AM and 31-37, 34(9) setae in fringe.
FOURTH INSTAR LARVA

TL 6.41 mm (1). Head capsule length 0.53-0.58 mm (3).

Head - Antenna as in Fig. 56G. Lengths of antennal segments (microns, n = 2): 77-82, 21-22, 11-13, 10-11, 6-7, 1.5. AR 1.44-1.75(2). Basal antennal segment 20-23 μ (2) wide, 3.57-3.85 times as long as wide; distance from base to RO 10 μ (2), to distal mark of seta 46-52 μ (2); Bl 47-49 μ (2). Apical style of second segment 7 μ (1) long, LO 7.5 μ (1) long. S I (Fig. 57D) finely plumose. Premandible (Fig. 56M) 95-98 μ (3) long. Mandible (Fig. 59K) 170-184 μ (3) long. Maxilla (Fig. 58C, D) with more than 10 LG serrated and ACh unserrated. 8 or 9(3) setae at base of maxilla underneath ventromental plates (Fig. 59E). Width of 1 median tooth of mentum (Fig. 59E) 10-13 μ (3); ventromental plate 10-12 μ (3) wide; V/M 0.80-1.00(3). Postmentum 200-220 μ (3) long.

Abdomen (Fig. 56B) - Pc 75-100 μ (2) high, 45-60 μ (2) wide. Sa 70 μ (1) long. An 675-797 μ (2) long. Sa/An 0.10 (1). TA 245-280 μ (3) long, 66-76 μ (2) wide at base, 30-34 μ (2) wide in the middle, 7-8 μ (2) wide at apex. PP 180-200 μ (2) long.

Remarks

Differences between males of Z. trigonacies and Z. lingulata are very small. The anal point is usually triangular in Z. trigonacies but more tongue-shaped in Z. lingulata, except in the form Z. l. teres f.n. Gs has a sharp outer corner or projection in Z. trigonacies but is rounded in Z. lingulata. Other minor differences, such as slightly lower AR and LR in Z. trigonacies, make it possible to separate the two species. It would probably be more correct, judged from the males, to regard the 2 species as mere forms. The female of Z. trigonacies, however, differs from all other species of Zalutschia by the SDu joined for a short distance, and resembles Z. tornetraeskensis in lacking bulbs on the SDu. The pupa has PSA only on IV and V and thus differs from both Z. lingulata, which has them on IV-VI, and Z. tornetraeskensis, which is lacking PSA. The larva has a higher head capsule length (0.53-0.58 mm) than in Z. lingulata pauca (0.35-0.43 mm), and more than 10 serrated LG whereas there are only about 5 or 6 in Z. l. pauca. In this group of species the female genitalia and the corroborative evidence of the immatures are thus of greater importance than any known characteristics of the male. In fact, the main reason for treating Z. 1. pauca as a subspecies rather than a full species is because of the similarity between the female genitalia.

Material Examined

Holotype: male, Hazen Camp, Ellesmere Island, N.W.T., 21/7/61, D. R. Oliver, (CNC No. 13491). Allotype: female, as holotype. Paratypes: 1 male with pupal

exuvium, 4 males, 3 mature male pupae reared from larvae, 7 females, 1 exuvium, Hazen Camp, Ellesmere Island, N.W.T., 20/7-21/8/61, 5-6/7/63, 1/7/65, D. R. Oliver; mature male pupa, mature female pupa, Skeleton Lake, Ellesmere Island, N.W.T., 3-5/8/58, I. McLaren; 3 males, Chesterfield Inlet, N.W.T., 15/7/50, J. G. Chillcot; 1 male, 1 male hypopygium, Ogotoruk Creek, Cape Thompson, Alaska, 3/8/60, H. E. Erdman (CNC, FWI, JES, USNM).

Ecology and Distribution

The species is apparently confined to the Arctic. Information on egg maturation and sex ratio is given by Oliver (1968, table 1) and Oliver and Danks (1972, table 2). The species is known from the Northwest Territories (Oliver 1963: 177, 1968: 116 as *Trissocladius tormeträskensis*) and Alaska.

Zalutschia sp. A

(Fig. 74A-C)

This species, known only from the pupa, is characterized by the short FS (35-66 μ long); PSA on IV-VI; and imbedded spines in caudolateral corners of VI-VIII.

PUPA

TL 4.27-5.22, 4.94 mm (8). TH/AM 1.05-1.23, 1.14 (7).

Cephalothorax - TH (Fig. 74B) 368-454, 418 μ (7) long; 108-130, 114 μ (6) wide. Anterior PcS 50-70 μ (2) long, located 12-17 μ (3) from median PcS and 12-13 μ from posterior PcS. Median PcS 40-60 μ (2) long, located 9-11 μ (3) from posterior PcS. Posterior PcS 20 μ (2) long, located 80-96 μ (3) from TH. FS (Fig. 74A) only 35-66, 54 μ (4) long, not on distinct tubercles.

Abdomen (Fig. 74C) - PSA present on IV-VI; longest spinules 6-12, 10μ (8) long on IV; 4-8, 7 μ (8) long on V; 2-3, 3 μ (8) long on VI. Caudolateral corners of VI-VIII with imbedded spines. Segments II-IV with 3 L-setae; V with 3 or 4, 3.1(8); VI with 4 or 5, 4.1(8); VII and VIII with 4 or 5, 4.1(8) L-setae; all filamentous on VII and VIII. Anal lobe with 319-380, 364 μ (8) long AM and 28-36, 33(8) setae in fringe.



FIG. 74. Zalutschia sp.A, pupa. A) frontal plate; B) TH and PcS; C) abdomen.

Remarks

This pupa appears to represent the Palaearctic sister species of the Nearctic Z. trigonacies. Differences between the 2 species can be found in the even shorter FS in Z. sp. A and in the presence of PSA on S VI in Z. sp. A. However, the PSA on S VI are more reduced than in any other species with PSA on this segment, and, thus, Z. sp. A is intermediate between Z. trigonacies and Z. lingulata pauca. It is not unlikely that these pupae may represent a European form of Z. trigonacies.

Material Examined

Eight pupal exuvia, Swedish Lapland, 1936, (as *Spaniotoma tatrica* Pag.), A. Thienemann (ZSBS).

Ecology and Distribution

Thienemann (1941: 184) gives the collecting sites for Z. *tatrica* (Pag.). Of these, only 2 collections from 1936 contain exclusively pupal exuvia: a small deep pond at Kopparåsen (18/6/1936) and Lake Abiskojaure (23/6/1936). These exuvia, all on one slide, most likely come from one of these localities.

Distribution - Swedish Lapland (Thienemann 1941: 184 as Spaniotoma tatrica in part).

Zalutschia sp. B

A damaged exuvium from South Carolina will key out to Zalutschia sp. A or to Z. *lingulata pauca* subsp.n. in the pupal key (p. 191). Although it has PSA on IV-VI and imbedded spines in the caudolateral corners of VI-VIII, the TH is only 313 μ long and 62 μ wide, and there are only 22 setae in the fringe of the anal lobe. The frontal plate and the FS are lost.

Material Examined

One pupal exuvium, Castor Creek, SREL, S.C., 15/3/74, W. P. Coffman (FWI).

Freemaniella gen.n.

Type species: Freemaniella eastopi (Freeman) comb.n. by original designation.

IMAGO

Diagnosis - 13 flagellomeres in male. Antepronotum normally developed; median lobes in contact anterior of scutal projection, widely gaping; antepronotals few. Dc normal, Ac long, starting close to antepronotum, strongly decumbent. Scu in single, transverse row. Wing membrane void of setae and microtrichia. Anal lobe well developed, slightly protruding. C strongly extended, R_{4+5} ends slightly proximal to $M_{3,4}$, An ends proximal to FCu, Cu₁ very slightly curved, R_1 and R_{4+5} void of setae. Squama fringed. Sensilla campaniformes about 8 at base of B_1 , about 2 below setae of B_1 , about 7 at apex of B_1 , 1 at base of Sc, 1 near FR, and 1 at base of R_1 . Pulvilli absent. Comb present. Tibial spurs nearly straight, normal, without any stronger lateral denticles. Setae of tergites scattered, without any obvious pattern. Anal point very long and strongly sclerotized, without setae or microtrichia. Pha and TSa normal, aedeagal lobe pointed. Gc without basal lobe. Gs triangular, with sharply pointed outer corner.

Systematics

The genus shows similarities to Bryophaenocladius Thien., Trissocladius Kieff., and Zalutschia Lip. Ac are long and decumbent as in Bryophaenocladius and in Paratrissocladius Zavř. However, similar Ac may occasionally be found in species of other genera such as Orthocladius curtiseta Sæth., Rheocricoptopus pauciseta Sæth., and Heterotrissocladius maeaeri Brund. The genus differs from both Bryophaenocladius and Trissocladius in lacking the strong punctation of microtrichia on the wing membrane. It has a well-developed anal lobe as in most Trissocladius and Zalutschia, and different from most Bryophaenocladius. R_{4+5} ends proximal to M_{4+5} , i.e. different from all 3 genera compared with it. Spurs of the hind tibia show no sign of slightly stronger apical denticles which are usually present in Bryophaenocladius (Brundin 1956a, fig. 19). The long anal point is unique; the closest anal point among any Orthocladinae can be found in Zalutschia. Also the Gs is of a typical and common Zalutschia type. The Pha, the aedeagal lobe, and the basal lobe (reduced to a sclerotized ring), are also unique.

Without the immatures the relative placement of this new genus cannot be stated with any degree of certainty. However, it does not seem unlikely that it represents the sister group of Zalutschia Lip. plus Trissocladius Kieff.

Freemaniella eastopi (Freeman) comb.n.

(Fig. 75)

Chaetocladius eastopi Freeman 1956: 330 (male)

MALE IMAGO (n = 1)

TL 2.13 mm. WL 1.09 mm. TL/WL 1.95. WL/Pfe 2.51.

Head - Lost on examined specimen. According to Freeman (1956: 330) about as in *Bryophaenocladius productus* (Freem.) and *B. brincki* (Freem.) i.e. AR higher than 1, 13 flagellomeres and Po, OV, and IV present.

Thorax (Fig. 75A) - Ap 6. Dc 10, Ac about 10, Pa 6, Scu 7.

Wing (Fig. 75B) - C-extension 80 μ long. VR 1.33. R with 1 seta. Squama with 5 or 6 setae.

Legs - Sp₁ 54 μ , Sp₂ 34 μ and 24 μ , Sp₃ 55 μ and 28 μ . Wti₁ 29 μ , Wti₂ 28 μ , Wti₃ 36 μ . Sp₁/Wti₁ 1.86. Comb (Fig. 75C) with 9 setae, 18-32 μ long. Front, middle, and hind femur 435, 460, and 491 μ long, respectively. Front, middle, and hind tibia 503, 497, and 570 μ long, respectively.

Hypopygium (Fig. 75D) - Anal point strongly sclerotized, with apical indentations, 84 μ long, 30 μ wide at base, 6 μ wide 1/4 from base, 12 μ wide at apex. T IX with 11 setae. Pha 84 μ long, aedeagal lobe pointed. TSa 100 μ long. Gs 168 μ long, basal lobe represented by a sclerotized ring. Gs 72 μ long. HR 2.33, HV 2.96.

Material Examined

Paratype: male, Nachingwea, Kenya, 11/53, V. F. Eastop (BMNH).

Ecology and Distribution

The species is at present known only from Kenya (Freeman 1956: 330) and Senegal (Dejoux 1974: 73).



FIG. 75. Freemaniella eastopi (Freem.) gen.n., comb.n., male. A) thorax; B) wing; C) apex of hind tibia; D) hypopygium.

Paratrissocladius Zavřel 1937

Spaniotoma subgen. Orthocladius Group A. Edwards 1929: 337, pro parte, nec van der Wulp
Orthocladius subgen. Chaetocladius Goetghebuer 1940-50: 57, pro parte, nec Kieffer 1911: 182
Trissocladius Zavřel 1937b: 10, pro parte, nec Kieffer in Kieffer and Thienemann 1908: 3
Trissocladius subgen. Paratrissocladius Zavřel 1937b: 10
Paratrissocladius Zavř. Zavřel 1942: 11
Chaetocladius Freeman 1956: 325, pro parte, nec Kieffer 1911:182
Parachaetocladius Freeman 1964: 150 syn.n., nec Wülker 1959
Type-species: Chironomus excerptus Walker 1856: 179

(syn. P. fluviatilis (Goetgh.) Goetghebuer in Zavřel 1937b: 10, syn.n.)

IMAGO

Diagnosis - Eyes naked, elongated dorsally. 13 flagellomeres in male, 5 in female; antennal groove in male reaching flagellomere 3; flagellomeres 2 and 3 with SCh. Temporal setae numerous to normal; Po longer than verticals; preoculars usually present (Fig. 76C, F). Palp 5-segmented, last segment usually more than twice as long as third segment; 2 SCh at apical sensillum coeloconicum. Coronal suture in female complete. Antepronotum normally developed; median lobes not in contact anterior of scutal projection, widely gaping. Dc including humerals numerous, in single to double row; Ac well developed, numerous, starting in front at antepronotum; Pa numerous (Fig. 76A). Scu in single transverse row. Wing membrane with very heavy microtrichia, but void of setae; pits of microtrichia nearly as strong as in Chaetocladius Kieff. Anal lobe well developed, slightly protruding (Fig. 76B). C not or barely extended; $R_{\rm 4+5}$ ends distad of $M_{\rm 3+4},$ An ends distad of FCu, Cu_l slightly curved apically, R_1 and R_{4+5} with setae also in male. Squama fully fringed. Sensilla campaniformes about 9-12 at base of B_1 , 2 or 3 below setae of B, 9-12 at apex of B, 1 at base of Sc, 1 at base of R_1 , and 1 on FR. Pulvilli absent. Ps absent. SCh absent from p_2 of both sexes, 1 or 2 on p_3 of male, about 7 on p_3 of female; SCh distinct. LR1 high, about 0.77-0.82. Setae of tergites numerous, scattered without any obvious pattern. Setae of sternites numerous, in median and lateral groups. Anal point relatively long, conical; with short, reduced setae on anal point proper; without microtrichia at apex. Pha normal, aedeagal lobe very weakly sclerotized. Anterior margin of TSa convex; oral projections of Sa pointed, small (Fig. 77A). Spines of penis cavity apparently very small. Gc with fingerlike basal lobe (Fig. 77). Gs rounded on outer margin; crista dorsalis present (Fig. 77). Gc of female normal, with several setae. T IX of female strongly divided into 2 setigerous protrusions (Fig. 78A). Ventrolateral lobe of Gp VIII well developed, about as large as dorsomesal lobe (Fig. 78B); apodeme lobe well sclerotized, distinct, but partly covered by lobes of Gp VIII. Csa without bends or curves. SCa ovoid with short neck. SDu with common opening, without bulbs before opening in the known species. Cerci normal, but relatively small.



FIG. 76. Paratrissocladius spp., male. (A-D) P. excerptus (Walk.) comb.n.: A) thorax; B) wing; C) apex of head; D) cibarial pump, Te and St. (E-F) P. natalensis (Freem.) comb.n.: E) cibarial pump, Te, and St; F) apex of head.

PUPA

Diagnosis - FS present, not on tubercles, small rugulose "warts" present (Fig. 79A). TH (Fig. 79B) long, with minute spinules. '3 PcS in triangle. Thorax rugulose. Wing sheaths smooth. T II-VI with median band of shagreenation grading over into posterior stronger spinules, band broad on III-V, narrow on VI; T VII and VIII with posteriomedian shagreenation (Fig. 79C); S II-VIII with a few, very weak rows of anteriolateral group shagreenation, otherwise completely void of spinules. PSB well developed, normal (Fig. 79C). PSA present on IV-VIII. Segment II with 2, III-VI with 3, VII with 4, VIII with 5 L-setae. All L-setae on VII and VIII filamentous. Genital sac of male (Fig. 79D) reaching apex of anal lobe. Anal lobe fully fringed with long setae, 3 equally long AM.



FIG. 77. Paratrissocladius spp., male hypopygium. A) P. excerptus (Walk.) comb.n.; B) P. natalensis (Freem.) comb.n.



FIG. 78. *Paratrissociadius excerptus* (Walk.) comb.n. (A-B) female genitalia, A) dorsal, and B) ventral view; C) larval antenna.



FIG. 79. Paratrissocladius excerptus (Walk.) comb.n., pupa. A) frontal plate; B) TH; C) abdomen; D) male genital sac.

LARVA

Diagnosis - Antenna (Fig. 78C) 7-segmented, shorter than mandible; third segment much smaller than fourth; seventh segment hairlike, vestigial; LO apparently absent; Bl about as long as segments 2-5 or 2-6 combined; RO just below middle of basal antennal segment; subapical style of second antennal segment longer than third segment. S I (Fig. 80D) apically split, but apparently not with lateral branches; S II and S III simple. Labral lamella simple, undivided. Pecten epipharyngis consisting of 3 simple sclerotized spines. Chaetulae laterales simple. Premandible (Fig. 80H) with 1 tooth and a low inner accessory tooth. Mandible (Fig. 80G) with seta interna, apical tooth shorter than combined width of remaining teeth, seta subdentalis simple without apical indentation. Maxilla (Fig. 80A, B) with relatively broad, flat ACh; all LG simple. Mentum (Fig. 80F) darkly colored with 2 median and 4 (5 in abnormal specimens) lateral teeth; ventromentum barely extending laterally of dorsomentum, with 0-2 vestigial and indistinct setae of maxilla underneath. Parapods well developed. Pc sclerotized with 7 apical and 2 lateral setae and with caudally directed preapical tooth. Sa well developed, about a third as long as An. TA about half as long as PP.

Systematics and Phylogeny

This genus forms the sister group of *Heterotrissocladius* Spärck (Sæther 1975c). *Heterotrissocladius* and *Paratrissocladius* combined appear to form the sister group of *Parametriocnemus* Goetgh. and *Paraphaenocladius* Thien. combined. This group may include other genera such as *Psilometriocnemus* Sæth. Its sister group is somewhat uncertain, but all the preceeding genera combined, or *Trissocladius* plus *Zalutschia*, appear to be the most likely candidates (See Sæther 1975c and p. 23).

Ecology and Distribution

Larvae live in sand and mud in streams and rivers where they build long tubes of sand and detritus. The genus is known from England, Sweden, Germany, Belgium, Austria, Russia, South Africa, and possibly Senegal.



FIG. 80. *Paratrissocladius excerptus* (Walk.) comb.n., larva. A) maxilla, ventral view; B) part of maxilla, dorsal view; C) apex of prementohypopharyngeal complex; D) S I; E) spinulae; F) mentum; G) mandible; H) premandible.

Key to known males of Paratrissocladius

1

AR 1.1-1.3; anal lobe of wing well developed (Fig. 76B); Dc 25-34; Ac 23-30 P. excerptus (Walk.) comb.n. (Palaearctic) (p. 260)

AR about 0.6; anal lobe of wing slightly reduced (Freeman 1956, fig. 8i); Dc about 20-22; Ac about 16 ... P. natalensis (Freem.) comb.n. (Ethiopian) (p. 264)

Paratrissocladius excerptus (Walker) comb.n.

(Fig. 76A-D; 77A; 78; 79; 80)

Chironomus excerptus Walker 1856: 179 (male)

Spaniotoma (Orthocladius) excerptus (Walk.) Edwards 1929: 338 (male, female) Orthocladius (Chaetocladius) excerptus (Walk.) Goetghebuer 1932: 77 (male, female) Trissocladius (Paratrissocladius) fluviatilis Goetghebuer in Zavřel 1937b: 10 (male, female); Zavřel 1937b: 9 (pupa, larva); Brundin 1956a: 76 (male), syn.n. Paratrissocladius fluviatilis (Goetgh.) Zavřel 1942: 11, 17 (PSA, PSB of pupa);

Thienemann 1944: 587, 634 (pupa, larva) Chaetocladius excerptus (Walk.) Freeman 1956: 328, pro parte (male) Parachaetocladius excerptus (Walk.) Freeman 1964: 150, pro parte (male, female) Trissocladius fluviatilis Goetgh. Pankratova 1970: 140 (pupa, larva); Lehmann 1971, fig. 18 (male)

Chaetocladius excerptus (Walk.) Dejoux 1974: 80 (male)

Imago is characterized by AR of 1.1-1.3 in the male, about 0.4 in the female; 13-19 temporals; 25-34 Dc including 4-11 humerals; 23-30 Ac; a well-developed, protruding anal lobe; LR of 0.77-0.83; and T IX including the anal point with 24-30 setae in males, 34-44 setae in females.

MALE IMAGO (n = 7-8, EXCEPT WHEN OTHERWISE STATED)

TL 3.21-4.22, 3.58 mm. WL 1.76-2.35, 2.01 mm (9). TL/WL 1.80-1.89, 1.84. WL/ Pfe 2.37-2.60, 2.47. Coloration blackish brown.

Antenna - Pedicel L/W (microns, n = 6): 100-125, 107/138-174, 154. Flagellomeres L/W (microns, n = 4 for 1-12, 8 for 13): 66-76, 72/34-52, 42; 28-32, 30/36-43, 40; 30-34, 32/34-41, 39; 34-40, 37/34-38, 36; 36-40, 38/29-36, 32; 36-40, 38/28-35, 32;

38-40, 40/27-36, 32; 40-42, 40/25-35, 30; 40-44, 42/26-34, 30; 40-43, 41/26-30, 29; 40-44, 42/25-29, 27; 40-44, 42/24-29, 27; 315-626, 452/24-30, 28. AR 1.08-1.31, 1.21.

Head - Temporal setae (Fig. 76C) 13-18, 15; Po 2-4, 3; OV 3-8, 5; IV 5-8, 6; preoculars 0-2, 1. Clypeus with 12-18, 15 (5) setae. Cibarial pump, Te, and St as in Fig. 76D. Te 160-196, 179 μ (5) long; 42-64, 51 μ (5) wide; width anterior of PTP 9-16, 12 μ (5); distance from apex to PTP 23-40, 29 μ (5). St 150-208 μ (3) long, 80-92 μ (3) wide. Palp lengths (microns): 42-56, 48(6); 60-75, 66(6); 104-152, 127(6); 108-161, 125(5); 210-316, 242(5).

Thorax (Fig. 76A) - Ap 11-14, 12. Dc 25-34, 30(10) including 4-11, 8(10) humerals; Ac 23-30, 27; Pa 6-12, 8(9); preepisternals 0 or 1, 0.2(10). Scu 10-16, 14(9).

Wing (Fig. 76B) - Anal lobe well developed. C-extension 5-60, 16 μ (9) long. VR 1.15-1.28, 1.22. B with 1 or 2, 1(9); R with 13-20, 15(9); R₁ with 1-8, 5(9); R₄₊₅ with 0-2, 0.6(9) setae. Squama with 16-26, 20(9) setae.

Legs - Sp₁ 56-82, 69 μ ; Sp₂ 26-36, 31 μ and 12-31, 24 μ ; Sp₃ 64-85, 71 μ and 18-38, 24 μ . Sp₁/Wti₁ 1.16-1.33, 1.26. Comb with 11-13, 12 setae; shortest seta 26-40, 33 μ ; longest 56-70, 63 μ . SCh l or 2, 1(5) on ta₁ of p₃. Lengths (microns) and proportions of legs:

	fe	ti	tal	ta ₂	ta ₃	
p1	736-920,824	945-1227,1086	6 785-994,868	374-478,423	307-368,333	
P2	742-957,821	761-1055,920	399-527,459	209-270,242	172-215,192	
P3	761-1006,866	1024-1284,1127	7 589-761,655	307-399,343	251-337,281	
	ta ₄	ta ₅	LR	BV		
P1	233-270,247	116-141,126	0.78-0.83,0.81	2.39-2.49,2.44		
P2	116-160,135	86-114,100	0.47-0.53,0.50	3.24-3.44,3.34		
P3	141-202,166	104-129,114	0.57-0.60,0.58	2.85-3.01,2.94		
	SV	BR				
\mathbf{p}_1	2.12-2.23,2.17	1.46-2.41,2	2.14			
P2	3.71-4.15,3.85	1.56-2.50,2	2.16			
РЗ	2.96-3.10,3.04	2.15-3.23,2	2.82			

Hypopygium (Fig. 77A) - T IX including anal point with 24-30, 27 setae. Laterosternite IX with 8-12 (3) setae. Pha 65-82, 76 μ (5) long. TSa 56-70, 65 μ (5) long. Gc 216-332, 254 μ (9) long. Gs 106-130, 116 μ (9) long. HR 1.98-2.55, 2.18 (9); HV 2.89-3.24, 3.11.

FEMALE IMAGO (n = 3, EXCEPT WHEN OTHERWISE STATED)

TL 3.07 mm (1). WL 1.78-1.82 mm. TL/WL 1.72. WL/Pfe 2.46-2.64.

Antenna (n = 1) - Pedicel L/W (microns): 58/80. Flagellomeres L/W (microns): 92/32, 46/27, 50/28, 55/30, 100/32. AR 0.41.

Head - Temporal setae 19 (1), Po 2 (1), OV 1 (1), IV 7 or 8 (2), preoculars 1 (1). Clypeus with 13-18 setae. Te 110-165 μ long, 20-21 μ wide, width anterior of PTP 6-8 μ , distance from apex to PTP 22-30 μ . St 122-156 μ (2) long, 46 μ (1) wide. Ocelli 30 μ (1) apart. Coronal suture complete. Palp lengths (microns, n = 1): 50, 54, 110, 98, 244.

Thorax - Ap 8 or 9 (2). Dc 25-30 inlcuding 8-10 humerals, Ac 24 (1), Pa 11 or 12 (2). Scu 17 or 18 (2).

Wing - C-extension 10-28 μ long. VR 1.14-1.20 (2). B with 1 or 2 (2), R with 18 or 19, R₁ with 15-17, R₄₊₅ with 18-22 setae. Squama with 17-24 setae.

Legs - Sp₁ 33-40 μ , Sp₂ 22-36 μ and 20-22 μ , Sp₃ 66-72 μ and 18-20 μ . Wti₁ 50-51 μ , Wti₂ 56 μ , Wti₃ 58-64 μ . Sp₁/Wt₁ 0.66-0.80. Comb with 12 setae, shortest seta 29-32 μ (2), longest 55-62 μ (2). SCh 7 or 8(2) on ta₁ of p₃. Lengths (microns) and proportions of legs:

	fe	ti	tal	ta ₂	tag	ta ₄	ta ₅
$\mathbf{p_l}$	675-742	859-932	687-724	350-374	270-282	184-209	104-110
P2	675-748	761-810	380-405	190-202	159-165	104-110	80-92
P3	711-761	883-981	491-552	270-307	209-239	129-141	86-98
	LR	BV	SV	7	BR		
$\mathbf{p_1}$	0.77-0.80	2 • 45 - 2 • 49	2 • 31 •	-2 • 33	1.67-2.12		
P2	0.50	3.40-3.48	3 .77	-3•86	1.71-1.86		
рз	0.56	2.90-3.01	3.16	-3.25	1.84-2.47		

Abdomen - Number of setae on T I-VIII (n = 1) as: 58, 80, 64, 55, 53, 45, 33, 32. Number on S I-VIII (n = 1) as: 0, 9, 18, 21, 23, 32, 33, 70.

Genitalia (Fig. 78A, B) - Gc with 15-18 setae. T IX with 34-44 setae. Cercus 74-100 μ long. SCa 82-90 μ long including 14-17 μ long and 10-12 μ wide neck, width 54-66 μ . SDu apparently without bulbs before common opening. Csa simple, without curves or bends.

PUPA

TL 3.84-5.22, 4.53 mm (9). TH/AM 1.01-1.29, 1.14 (7).

Cephalothorax - TH (Fig. 79B) 411-515, 446 μ (8) long; 100-148, 120 μ (7) wide. Anterior PcS 220-290, 254 μ (5) long; located 12-21, 16 μ (7) from median PcS and 16-25, 21 μ (7) from posterior PcS. Median PcS 210-320, 271 μ (5) long; located 12-20, 15 μ (7) from posterior PcS. Posterior PcS 80-140, 105 μ (6) long; located 60-110, 86 μ (6) from TH. FS (Fig. 79A) 90-140, 110 μ (6) long, not on tubercles. Frontal plate rugulose with low anteriomedian "warts."

Abdomen (Fig. 79C) - PSA on IV-VIII; longest spinules on IV 15-30, 20 μ (7) long; on V 15-30, 19 μ (7) long; on VI 7-18, 12 μ (7) long; on VII 8-20, 14 μ (7) long; on VIII 3-6, 5 μ (7) long. Anal lobe with 356-442, 395 μ (9) long AM and 35-46, 40(10) setae in fringe.

FOURTH INSTAR LARVA

TL 4.53-6.20, 5.20 mm (4). Head capsule length 0.36-0.40, 0.38 mm (5).

Head - Antenna as in Fig. 78C. Length of antennal segments (microns, n = 8-10): 72-86, 77; 32-40, 36; 4-7, 5; 16-20, 18; 4-6, 5; 4-6, 5; 1-3, 2. AR 1.03-1.11, 1.06 (7). Basal antennal segment 22-26, 23 μ (10) wide; 3.04-3.58, 3.31 (10) times as long as wide; distance from base to RO 28-42, 34 μ (10); to basal mark of seta 6-13, 10 μ (8); to distal mark of seta 33-46, 38 μ (9); Bl 66-74, 70 μ (8) long; accessory blade 11-14, 12 μ (6) long. Subapical style of second segment 6-10, 9 μ (8). S I (Fig. 80D) apically split, but not with lateral plumosity. Spines of pecten epipharyngis triangularly pointed at apex. Premandible (Fig. 80H) 84-97, 90 μ (7) long. Mandible (Fig. 80G) 169-190, 177 μ (9) long. ACh of maxilla (Fig. 80A) with a preapical indentation. Often 1 or 2 vestigial and very indistinct setae at base of maxilla underneath ventromental plates. Width of 1 median tooth of mentum (Fig. 80F) 17-25, 22 μ (9); ventromental plate 5-12, 10 μ (6) wide; V/M 0.30-0.50, 0.43 (5). Postmentum 210-240, 233 μ (9) long.

Abdomen - Pc 42-62, 55 μ (8) high; 28-41, 35 μ (8) wide. Sa 200-250, 227 μ (8) long. An 580-736, 657 μ (8) long. Sa/An 0.30-0.38, 0.35 (8). TA 137-182, 161 μ (6) long; 46-68, 57 μ (6) wide at the middle. PP 190-270, 224 μ (6) long.

THIRD INSTAR LARVA (n = 2, EXCEPT WHEN OTHERWISE STATED)

TL 2.56 mm (1). Head capsule length 0.22-0.25 mm.

Head - Length of antennal segments (microns): 38-41, 22, 4, 13-14, 4-5, 4-5, 1. AR 0.76-0.80. Basal antennal segment 12-13 μ wide, 2.92-3.42 times as long as wide, distance from base to RO 16 μ (1), B1 48-54 μ long, accessory blade 8-9 μ long, sub-apical style of second segment 6 μ long. Premandible 52 μ (1) long. Mandible 98-100 μ long. Width of 1 median tooth of mentum 12 μ . Postmentum 120-136 μ long.

Abdomen - Pc 30 μ (1) high, 20 μ (1) wide. Sa 120 μ (1) long. An 350 μ (1) long. Sa/An 0.34 (1). TA 83 μ (1) long, 30 μ (1) wide at the middle.

Material Examined

One male, Dovedale, Derbyshire, England, 8/6/1888, G. H. Verall (as Orthocladius flavibasis Verall MS); 1 male, South Devon, Sidmouth, England, 10/5/36, F. W. Edwards (as Spaniotoma (Orthocladius) excerpta (Walk.)); 1 male, 1 pupal exuvium, rivers in Skåne, Sweden, 9/6/55, L. Brundin (as Trissocladius (Paratrissocladius) fluviatilis Goetgh., Brundin 1956a: 79); 5 males, 3 females, 4 pupae, 5 pupal exuvia, 73 larvae, Die Kossau, stream, Holstein, Germany, G. Nietzke (as Trissocladius (Paratrissocladius) fluviatilis Goetgh., locus typicus, det. A. Thienemann); 1 pupa, 5 larvae, possibly also Kossau, 15-30/5/35, det. A. Thienemann; 1 pupa, Die Pläne, stream, Fläming, Germany,

M. L. Albrecht (as *Paratrichocladius fluviatilis*, misprint in Albrecht 1953: 423); 1 female with pupal exuvium, Die Mölle, stream, Lipper Bergland, Mittelgebirge, Germany, J. Illies (Illies 1952: 539); 2 males, pupa reared from larva, 2 exuvia, River Fulda, Germany, 25/6/52, 28/5, 22/9 and 21/10/53, E. J. Fittkau; pupal exuvium, Seefelder Aach at Bodensee, 13/6/62, F. Reiss; 2 exuvia, Lunzer Untersee, Austria, 20/8/40, A. Thienemann; 3 larvae, Lunz, Austria, 1943, A. Thienemann (BMNH, CNC, FWI, SMNH, ZSBS).

Ecology and Distribution

The species seems restricted to streams and rivers (Nietzke 1938: 24; Illies 1952: 539; Albrecht 1953: 423; Lehmann 1971: 490; Ringe 1974: 254). It lives in sand and mud where it builds long cases of sand and detritus. Its main emergence period is apparently in May and the first half of June, but at least in the River Fulda it has a second emergence period in September-October; in the small chalk stream in southern England studied by Pinder (1974: 198) the emergence period was from the beginning of July to the end of October without any early emergence. In the two streams studied by Ringe (1974: 268) there is a very weak early emergence and a strong fall emergence.

Distribution - England (Edwards 1929: 338; Pinder 1974: 198), Belgium (Goetghebuer 1940-50: 60), Sweden (Brundin 1956a: 76), Russia (Goetghebuer 1940-50: 60), Germany (Zavřel 1937b: 9; Nietzke 1938: 24, 39; Illies 1952: 539; Albrecht 1953: 423; Thienemann 1954: 350, 361; Lehmann 1971: 490; Ringe 1974: 254), Austria, and possibly Senegal (Dejoux 1974: 80).

Paratrissocladius natalensis (Freeman) comb.n.

(Fig. 76E, F; 77B)

Chaetocladius excerptus natalensis Freeman 1956: 328 (male) Parachaetocladius excerpta natalensis Freeman 1964: 150 (male)

Male imago is characterized by AR of about 0.6, about 13 temporals, about 20-22 Dc, about 16 Ac, slightly reduced anal lobe, LR of about 0.77, and T IX plus the anal point with about 20 setae.

MALE IMAGO (n = 1)

TL 3.21 mm. WL 1.77 mm. TL/WL 1.81. WL/Pfe 2.41. Ground color of thorax yellowish; vittae, postnotum, preepisternum, antenna, and palp blackish; prescutellar area, haltere knobs, and legs brown; abdomen dark brown.

Antenna - Pedicel L/W (microns): 92/124. Flagellomeres L/W (microns): 60/36, 28/32, 25/30, 30/31, 33/30, 34/30, 38/26, 40/24, 42/25, 40/25, 38/23, 42/22, 245/30. AR 0.56.

Head - Temporal setae (Fig. 76F) 13, Po 3, OV 5, IV 4, preoculars 1. Clypeus with 17 setae. Cibarial pump, Te, and St as in Fig. 76E. Te 162 μ long, 30 μ wide, width anterior of PTP 11 μ , distance from apex to PTP 24 μ . St 158 μ long, 60 μ wide. Palp lengths (microns): 44, 58, 112, 136, 228.

Thorax - Ap 11. Dc 20-22, including 2 or 3 humerals; Ac 16; Pa 8. Scu 14.

Wing (Freeman 1956, fig. 8i) - Anal lobe slightly reduced. No C-extension. VR 1.24. B with 1, R with 16, R_1 with 7, R_{4+5} with 2 setae. Squama with 21 setae.

Legs - Sp₁ 58 μ , Sp₂ 28 μ and 26 μ , Sp₃ 65 μ and 26 μ . Wti₁ 50 μ , Wti₂ 52 μ , Wti₃ 58 μ . Sp₁/Wti₁ 1.16. SCh not observed. Lengths (microns) and proportions of legs:

	fe	ti	tal	ta ₂	tag	ta_4	ta ₅	LR
Pl	736	926	711	350	270	202	116	0.77
P2	724	773	980	190	147	98	80	0.49
P3	767	987	540	274	233	135	92	0.55
	BV	sv	E	R				
P1	2.53	2.31	+ 2	.31				
P2	3.64	3.91	+ 2	•13				
P3	3.12	3.25	52	.25				

Hypopygium (Fig. 77B, Freeman 1956, fig. 8c) - T IX plus anal point with 20 short and weak setae. Pha 70 μ long. TSa 50 μ long. Gc 229 μ long. Gs 96 μ long. HR 2.39; HV 3.35.

Material Examined

Paratype: male, Lydenburg Distr., Waterwal, Mount Rang Rang, Transvaal, South Africa, 4/55, A. D. Harrison (BMNH 1955-800).

Ecology and Distribution

The species is known only from the holotype male from the Kamberg Game Reserve, Mooi River, 1850 m above sea level in Natal, and from the paratype from Transvaal (Freeman 1956: 328).

Some species previously placed in or resembling *Trissocladius* Kieffer sensu Brundin

Eukiefferiella scanica (Brundin) comb.n.

(Fig. 81)

Trissocladius scanicus Brundin 1956a: 78 (male)

This species was placed in Trissocladius (sensu Brundin) apparently because of the vein R_{4+5} ending slightly distad of M_{3+4} and because of the weak acrostichals observed by Brundin. Although both Brundin (1956a: 82) and Lehmann (1972: 353) in their generic diagnosis of Eukiefferiella state that R_{4+5} always ends proximal of M3+4 (Cu1 in their terminology), Brundin states in his key that R4+5 sometimes ends above M_{3+4} and Lehmann (1972, fig. 80) in his figure of Eukiefferiella veralli Edw. shows that R_{4+5} in fact can end distad to M_{3+4} . In the 2 males examined no acrostichals were present. However, most species of Eukiefferiella may sometimes have weak acrostichals (Sæther 1973a: 56) and this is not a distinguishing feature. In all other aspects E. scanica fits as well as, or better, in Eukiefferiella than in any other genus. The SCh of the last flagellomere are arranged as in *E. veralli* Edw. (Lehmann 1972, fig. 81). The cibarial pump, Te, and St (Fig. 81C) are identical to those observed in several species of *Eukiefferiella* and appear to be slightly different from Hydrobaenus, Zalutschia, or Trissocladius. The thorax is of a type common to Zalutschia, Trissocladius, and Eukiefferiella. The wing is almost identical to that of E. veralli (Lehmann 1972, fig. 80), although R45 probably ends slightly more distad in *E. scanica*. The legs lack Ps, and no SCh were observed. Apparently all *Eukiefferiella* lack Ps and at least many lack SCh, while among the species treated here only Zalutschia vockerothi, Trissocladius brevipalpis, T. heterocerus, and Paratrissocladius lack Ps and all usually have at least 1 or 2 SCh on p3. The hypopygium of E. scanica is nearly identical to that of E. veralli (Brundin 1956a, fig. 56; Lehmann 1972, fig. 78, 79). The presence of a sharply pointed crista dorsalis separates E. scanica from the species treated here except those of Paratrissocladius. The Pha is of the same type as in most Eukiefferiella and different from that of the genera treated here except Trissocladius. The species most closely related to E. scanica is E. veralli Edw. (Edwards 1929: 348 (as Spaniotoma (Orthocladius) veralli); Goetghebuer 1932: 91 (as Orthocladius (Dactylocladius) veralli), 1938: 461 (as Eukiefferiella nigrofasciata), 1940-50: 56, 120 (as Orthocladius (Orthocladius) veralli and Eukiefferiella nigrofasciata); Brundin 1956a: 91; Lehmann 1972: 392).

MALE IMAGO (n = 3, EXCEPT WHEN OTHERWISE STATED)

TL 3.82-4.02 mm (2). WL 2.27-2.59 mm. TL/WL 1.55-1.57. WL/Pfe 2.55-2.85.

Antenna - Pedicel L/W (microns): 120-132/168-170. Flagellomeres L/W (microns): 58-84/52-54, 25-34/47-54, 32-34/48-50, 33-36/44-46, 35-38/40-42, 34-37/39-42, 35-40/36-38, 39-40/34-37, 41-44/31-34, 41-44/29-34, 40-47/28-34, 44-45/29-34, 607-692/30-38. AR 1.27-1.43. Antennal groove reaching flagellomere 4. Flagellomeres 2 and 3 with SCh. Apical SCh of last flagellomere starts at apex as in *E. veralli* (Lehmann 1972, fig. 81).

Head - Temporal setae (Fig. 81D) 14-17, Po 5-9, OV 4, IV 4-6, IV smaller than OV. Clypeus with 11-14 setae. Cibarial pump, Te, and St as in Fig. 81C. Te 170 μ (2) long, 40-50 μ wide, width anterior of PTP 12-14 μ , distance from apex to PTP 32-44 μ . St 150-172 μ (2) long, 62 μ (1) wide. Palp lengths (microns, n = 2): 48-50, 62, 135-138, 156-176, 180-224. Two SCh at apical sensillum coeloconicum of third segment.

Thorax (Fig. 81A) - Ap 5-7. Dc 13-18, Ac absent, Pa 4-6. Scu 14.

Wing (Fig. 81B) - Anal lobe developed. C-extension 40-78 μ . VR 1.21-1.23. B with 1, R with 9-16, R₁ with 6-9, R₄₊₅ with 6-11 setae. Squama with 17-22 setae. Sensilla campaniformis about 10 at base of B, 3 below seta of B₁, 10 at apex of B₁, 3 at base of Sc, 1 at base of R₁, and 1 on FR.

Legs - Sp₁ 69-84 μ , Sp₂ 45-55 μ and 24-27 μ , Sp₃ 76-90 μ and 30-38 μ . Wti₁ 50-56 μ , Wti₂ 54-57 μ , Wti₃ 62-66 μ . Sp₁/Wti₁ 1.32-1.38. Comb with 13-16 setae, shortest seta 30-34 μ , longest 70-82 μ . Ps and SCh absent. Lengths (microns) and proportions of legs:

	fe	ti	tal	ta ₂	tag	ta_4	ta ₅
p 1	889-908	1018-1079	638-711	466-497	343-374	202-215	104-116
P2	920-1000	981-1049	435-472	239-258	196-215	123-153	92-110
P3	969-1043	1116-1233	613-638	343-386	258-350	159-190	110-116
	LR	BV	sv	BR			
P 1	0.63-0.66	2.24-2.27	2.79-2.99	2.73-	3-00		
P2	0.44-0.45	3.43-3.65	4.34-4.39	4.29-	4.84		
P3	0.54-0.55	2.83-3.13	3.37-3.45	6.00-	7.06		

Hypopygium (Fig. 81E) - Anal point long, triangular, weakly sclerotized. T IX plus base of anal point with 9 or 10 (2) setae. Laterosternite IX with 9-14 (2) setae. Pha 100 μ (1) long. TSa 110 μ (1) long. Gc 256-277 μ (2) long, with broad basal lobe. Gs 122-132 μ (2) long, with pointed crista dorsalis. HR 2.09-2.10 (2), HV 3.04-3.14 (2).



FIG. 81. *Eukiefferiella scanica* (Brund.) comb.n., male. A) thorax, dorsal view; B) wing; C) cibarial pump, Te, St, torma, labial lonchus, and lacinia; D) apex of head; E) hypopygium.

Material Examined

Lectotype: male, stream Sösdala, Skåne, Sweden, 6/5/55, L. Brundin (SMNH). Paralectotype: male, lacking hypopygium, otherwise as lectotype (SMNH). Other material: male, River Fulda, Germany, 1/4/68, J. Lehmann (ZSBS).

Ecology and Distribution

Probably an exclusively lotic spring form, known from Sweden (Brundin 1956a: 78), and Germany (Lehmann 1971: 490).

"Orthocladius" nudisquama Chernovskii

Orthocladius nudisquama Chernovskii 1949: 142 (larva) Trissocladius nudisquama (Chern.) Pankratova 1970: 141 (larva)

According to the description, this larva has only 4 or 5 lobes on S I and 6 pairs of lateral teeth on the mentum. The species is thus unlikely to belong to any genera treated in this monograph.

Gen.near Zalutschia Lipina or Chaetocladius Kieffer

(Fig. 82)

A pupa from Swedish Lapland with abdominal segments exactly as in the Zalutschia tornetraeskensis type, but with anal lobe as in Chaetocladius Kieff. appears in Fig. 82. The species will key out to Chaetocladius in Thienemann (1944). However, it is probably more closely related to Zalutschia and may even belong to this genus.

Material Examined

Eight pupal exuvia collected by Thienemann in 1936 in Swedish Lapland and identified as *Spaniotoma tatrica* (FWI, SMNH).



FIG. 82. Genus near Zalutschia Lip. or Chaetocladius Kieff., pupa. A) frontal plate; B) TH and PcS; C) abdomen.

Bryophaenocladius Thienemann

Bryophaenocladius Thienemann 1934: 36 Clinocladius Sublette 1970: 50, syn.n. Cantomyia Roback 1962: 5, syn.n.

Three species are mentioned here; *B. subparallelus* (Mall.) comb.n., because of its resemblance to *Trissocladius* Kieff. sensu Brundin (Sublette 1970: 51); *B. impectinus* sp.n., and *B. carus* (Rob.) comb.n. because of their similarities with *Trissocladius* Kieff. in the sense used here. All deviate slightly from the generic diagnosis given by Brundin (1956a: 128), but not more so than the species described by Sæther (1973a). Brundin's diagnosis can be emended with the following characteristics: squama with 15 or less setae, C barely to strongly extended, palp with 4 or 5 segments, tibial comb present or absent, Ps absent or present, SCh mostly (always?) absent in the male, and spurs of the tibiae with an apical row of denticles slightly stronger than the more basal denticles.

Bryophaenocladius subparallelus (Malloch) comb.n.

(Fig. 83)

Orthocladius (Orthocladius) subparallelus Malloch 1915: 522 (male); Frison 1927: 174 (designation of lectotype)

Hydrobaenus (Hydrobaenus) subparallelus (Mall.), Johannsen 1952: 23 (generic position)

Orthocladius subparallelus Mall., Sublette and Sublette 1965: 157 Clinocladius subparallelus (Mall.), Sublette 1970: 51 (male)

The description by Sublette (1970: 51-53) is incomplete in some details. He overlooked the 6-9 very long and strongly decumbent acrostichals (Fig. 53C). The wing punctation by microtrichia is of the type typical for *Chaetocladius*, *Bryophaenocladius*, and *Trissocladius*, i.e. stronger than "fine" as mentioned by Sublette. There are about 10-13 setae on the squama. Legs have Ps as in *B. laticaudus* S_{ac} ther (1973a: 55) and are lacking SCh. Tibial spurs (Fig. 83B) have apical rows of denticles of typical *Bryophaenocladius* type (see Brundin 1956a, fig. 19). The aedeagal lobes are said to be setose by Sublette (1970: 53, fig. 7). In the examined specimens these "setae" are, at least in part, sclerotized ridges not setae (Fig. 83A).

Material Examined

Five males, Missouri River, Clay County Park, Vermillion, S.D., 18/6-14/7/71, 4/10/72, P. L. Hudson (FWI).



FIG. 83. Bryophaenocladius subparallelus (Mall.) comb.n., male. A) hypopygium; B) Sp_{1-3} ; C) thorax; D) cibarial pump, St, and Te.

Ecology and Distribution

The species has so far been reported from large rivers only.

Distribution - Illinois (Malloch 1915: 552; Sublette 1970: 51), Ohio (Mason and Sublette 1971: 401), South Dakota.

Bryophaenocladius impectinus sp.n.

(Fig. 84)

This species is described here because its deviations from the normal condition in *Bryophaenocladius* Thien. gives it some affinity with *Trissocladius* Kieff. Together with *Freemaniella* gen.n. and the described pupa of a genus presumed near *Zalutschia* or *Chaetocladius*, it indicates a close relationship between the *Chaetocladius* group in the sense of Brundin, and *Zalutschia* Lip. and *Trissocladius* Kieff.

The species shares the absence of a tibial comb and the somewhat reduced palp with *Trissocladius*. The anal lobe is well developed and protruding as in *Trissocladius* (the anal lobe normally is reduced in *Bryophaenocladius*). The wing is heavily punctated by microtrichia as in both *Bryophaenocladius* and *Trissocladius*, and the C is barely extended (i.e. different from normal *Bryophaenocladius*). However, the Ac are relatively long and decumbent as in typical *Bryophaenocladius*.

MALE IMAGO (n = 1)

TL 2.42 mm. WL 1.24 mm. TL/WL 1.95. WL/Pfe 2.70.

Antenna - Flagellomeres L/W (microns): 56/34, 20/40, 21/40, 20/40, 20/39, 20/37, 19/36, 19/36, 19/35, 18/34, 19/34, 19/32, 524/32. AR 1.98.

Head - Temporal setae 8, Po 4, OV 2, IV 2 reduced. Clypeus with 2 setae. Te 140 μ long, 30 μ wide, width anterior of PTP 12 μ , distance from apex to PTP 10 μ . Palp lengths (microns): 34, 36, 60, 51, 58. 3 SCh at apical sensillum coeloconicum of third segment.

Thorax (Fig. 84C) - Ap 7, median lobes not in contact at scutal projection, widely gaping. Dc 15; Ac 7 starting at anterior 1/10 of scutum, relatively long and strongly decumbent; Pa 4. Scu 5.

Wing (Fig. 84A) - Anal lobe well developed, protruding. C-extension about 5 μ long. VR 1.13. B with 1, R with 5, R₁ and R₄₊₅ without setae. Squama with 5 setae.



FIG. 84. Bryophaenocladius impectinus sp.n., male. A) wing; B) apex of hind tibia; C) thorax; D) hypopygium.

Legs - Sp₁ 80 μ , Sp₂ 45 μ and 24 μ , Sp₃ 54 μ and 26 μ . Wti₁ 40 μ , Wti₂ 38 μ , Wti₃ 46 μ . Sp₁/Wti₁ 2.00. Comb absent (Fig. 84B). Ps and SCh absent on tarsi. Lengths (microns) and proportions of legs:

	fe	ti	tal	ta ₂	ta ₃	ta ₄	ta5	LR	ВV	sv	BR
P1	558	736	460	245	165	104	69	0.63	3.01	2.81	2.80
p2	650	730	343	184	129	86	69	0.47	3.70	4.02	3.20
P3	681	797	442	301	184	98	76	0.55	2.93	3.35	3.33

Hypopygium (Fig. 84D) - T IX with 20 setae, reticulated. Laterosternite IX with 8 setae. Pha 90 μ long. TSa 70 μ long, nearly straight, oral projections small. Spines of penis cavity 30 μ long. Gc 206 μ long. Gs 107 μ long. HR 1.93, HV 2.27.

Material Examined

Holotype: male, Jocassee Reservoir, 335 m above sea level, Salem, S.C., 13-17/6/73, P. L. Hudson (CNC No. 13492).

Ecology and Distribution

The species is known only from the type locality (Jocassee Reservoir, S.C.)

Bryophaenocladius carus (Roback) comb.n.

Cantomyia cara Roback 1962: 5 (male, female)

This species has a reduced palp with only 4 segments. The wing venation with the barely extended C, the apex of the hind tibia without a comb, the thorax, and the hypopygium including the apodemes but excluding the basal lobe, are essentially identical to what is found in *B. impectinus*. However, the basal lobe of the Gc is smaller and of a type more typical for *Bryophaenocladius*, and the anal lobe of the wing is slightly reduced. The hypopygium also is nearly identical to that of *B. productus* (Freem.) from Africa (Sæther 1973a, fig. 1B). The apical row of denticles on the tibial spurs is very slightly stronger than the more basal denticles. The middle and hind tarsi are lost in the specimens examined, however, there are at least no Ps or SCh on the front tarsi.

Material Examined

Holotype: male, at light, Holbrook Air Force Base, Curundu, Canal Zone, Panama, 25/12/57, C. E. Smith (ANS Type No. **5834**). Allotype: female, same locality as male, 7/1/58. Paratypes: 1 male, 1 female, same data as holotype (ANS).

Ecology and Distribution

This species has been reported by Roback (1962: 5) from the Canal Zone.

Acknowledgements

I am much indebted to the late Prof K. Berg, Freshwater Biological Laboratory, University of Copenhagen, Hillerød, Denmark; Prof L. Brundin, Swedish Museum of Natural History, Stockholm, Sweden; Dr W. P. Coffman, Department of Biology, University of Pittsburgh, Pittsburgh, Penn.; Dr Eva Ertlová, Department of Hydrobiology, Slovak Academy of Science, Bratislava, Czechoslovakia; Dr E. J. Fittkau, Zoologisches Sammlung des Bayerischen Staates, München, Germany (BRD); Ms M. A. Forsyth, Department of Entomology, Clemson University, Clemson, S.C.; Dr P. Freeman, British Museum (Natural History), London, England; Dr A. L. Hamilton, Department of the Environment, Freshwater Institute, Winnipeg, Man.; Dr M. Hirvenoja, Zoological Institute, University of Helsinki, Helsinki, Finland; Mr P. L. Hudson, South Central Reservoir Investigation, Clemson, S.C.; Dr A. Kownacki, Polish Academy of Sciences, Kraków, Poland; Dr S. C. Mozley, Great Lakes Research Division, University of Michigan, Ann Arbor, Mich,; Dr D. R. Oliver, Entomology Research Institute, Ottawa, Ont.; Dr L. L. Pechuman, Department of Entomology and Limnology, Cornell University, Ithaca, N.Y.; Dr F. Reiss, Zoologisches Sammlung des Bayerischen Staates, München, Germany (BRD); Dr S. S. Roback, Department of Limnology, Academy of Natural Sciences, Philadelphia, Penn.; Dr N. B. Snow, ALUR Program, Department of Indian and Northern Affairs, Ottawa, Ont.; Dr Annelle Soponis, Entomology Research Institute, Ottawa, Ont.; Dr J. E. Sublette, School of Graduate Studies, Eastern New Mexico University, Portales, N.M.; Ms Susan Tiedy, NUS Corporation, Cyrus W. M. Rice Division, Pittsburgh, Pa.; Mr W. F. Warwick, Canada Centre for Inland Waters, Burlington, Ont.; Dr D. W. Webb, Illinois Natural History Survey, Urbana, Ill.; and to Dr W. W. Wirth, U.S. Department of Agriculture, U.S. National Museum, Washington, D.C., for making type and other material available to me; to Ms M. P. McLean for making the preparations; to Ms G. Porth for typing the manuscript; to Ms C. A. Galloway for doing some of the drawings, and to Ms C. Anderson for typing the camera-ready manuscript.

References

ALBRECHT, M. L. 1953. Die Pläne unde andere Flämingbäche. Z. Fisch. [N.F.] 1: 389-476. ANTHON, H. 1943a. Der Kopfbau der Larven einiger Nematoceren Dipterenfamilien: Rhyphidae, Trichoceridae, Psychodidae und Ptychopteridae. Spolia Zool. Mus. Hauniensis 3: 1-61. 1943b. Zum Kopfbau der primitivsten bisher bekannten Dipterenlarvae: Olbiogaster sp. (Rhyphidae). Ein Beitrag zur Phylogenie der nematoceren Dipteren. Entomol. Medd. 23: 303-320. ARMITAGE, P. D. 1974. Some aspects of the ecology of the Tanypodinae and other less common species of Chironomidae in Lake Kuusijärvi, South Finland. Entomol. Tidskr. Suppl. 95: 13-17. BERCZIK, A. 1962. Die Winter-Chironomidenfauna eines Tränk-troges. Opusc. Zool. (Budapest) 4: 63-65. 1968. Chironomidenlarven aus einer nordungarischen Tropfsteinhöhle (Biospeologica Hungarica, XXVIII). Opusc. Zool. (Budapest) 8: 347-350. BERG, K., AND I. C. PETERSEN. 1956. Studies on the humic, acid lake Gripsø. Folia Limnol. Scand. 8: 1-273. BRUNDIN, L. 1947. Zur Kenntnis der schwedischen Chironomiden. Ark. Zool. 39A(3): 1-95. 1949. Chironomiden und andere Bodentiere der süd-schwedischen Urgebirgsseen. Ein Beitrag zur Kenntnis der bodenfaunistischen Charakterzüge schwedischer oligotropher Seen. Rep. Inst. Freshwater Res. Drottningholm. 30: 1-914. 1956a. Zur Systematik der Orthocladiinae (Dipt. Chironomidae). Rep. Inst. Freshwater Res. Drottningholm. 37: 5-185. 1956b. Die bodenfaunistischen Seetypen und ihre Anwendbarkeit auf die Südhalbkugel. Zugleich eine Theorie der produktionsbiologischen Bedeutung der glazialen Erosion. Rep. Inst. Freshwater Res. Drottningholm 37: 186-235. 1962. Insects of Macquarie Island, Diptera: Chironomidae. Pac. Insects 4(4): 945-954. 1966. Transantarctic relationships and their significance, as evidenced by chironomid midges. With a monograph of the subfamilies Podonominae and Aphroteniinae and the Austral Heptagyiae. K. Sven. Vetenskapsakad. Handl. Ser. 4, 11(1): 1-472. CHERNOVSKII, A. A. 1949. Identification of larvae of midge family Tendipedidae. Opred. Faune SSR. 31: 1-186. (Transl. from Russian for Clearinghouse Fed. Sci. Tech. Infor., Springfield, Va., TT62-13587). CRAIG, D. A. 1969. The embryogenesis of the larval head of Simulium venustum Say (Diptera: Nematocera). Can. J. Zool. 47: 495-503. DAHL, J. 1954. Orthocladius naumanni Brundin (Dipt. Chiron.), new to Denmark, with description of the female. Entomol. Medd. 26: 617-622. DEJOUX, C. 1974. Contribution à la connaisance des chironomides de l'Afrique de l'Ouest. Entomol. Tidskr. Suppl. 95: 71-83. DOWNING, C. 1975. The taxonomy and ecology of the Chironomidae in two blanket bogs in Ireland. Ph.D. Thesis. National Univ. Ireland, Dublin, Ire. 143 p. EDWARDS, F. W. 1922. Results of the Oxford University expedition to Spitsbergen, 1921. - No. 14. Diptera Nematocera. Ann. Mag. Nat. Hist. Ser. 9, 10: 193-215.

1923. On the nematocerous Diptera of Jan Mayen Island. Ann. Mag. Nat. Hist. Ser. 9, 11: 235-240. 1924. Results of the Merton College expedition to Spitsbergen 1923. -Diptera Nematocera. Ann. Mag. Nat. Hist. Ser. 9, 10: 162-174. 1929. British non-biting midges (Diptera, Chironomidae). Trans. R. Entomol. Soc. London 77: 279-430. 1937a. Chironomidae (Diptera) collected by Prof. Aug. Thienemann in Swedish Lappland. Ann. Mag. Nat. Hist. Ser. 10, 20: 140-148. 1937b. Oxford University expedition to North-East Land, 1936. - Diptera. Ann. Mag. Nat. Hist. Ser. 10, 20: 360-362. 1940. On the genera Hydrobaenus Fries and Trissocladius Kieffer (Diptera, Chironomidae). Proc. R. Entomol. Soc. London (B) 9: 154-156. EHRENBERG, H. 1957. Die Steinfauna der Brandungsufer ostholsteinischer Seen. Arch. Hydrobiol. 53: 87-159. ERTLOVÁ, E. 1963. Zur Kenntnis der Zuckmücken (Chironomidae) der Donau. Biológia (Bratislava) 18: 612-620. 1970. Chironomidae (Diptera) aus Donauaufwuchs. Biológia (Bratislava) 25: 291-300. FITCH, A. 1847. Winter insects of eastern New York. Am. J. Agr. Sci. 5: 274-284. FITTKAU, E. J. 1960. Über phylogenetische Entwicklungsreihen bei Chironomiden im Metamorphose - und Imaginalstadium. Chironomidenstudien VIII. Zool. Anz. 164: 401-410. 1961. Zur gegenwärtiger Situation der Chironomidenkunde. Verh. Internat. Verein. Limnol. 14: 958-961. 1962. Die Tanypodinae (Diptera: Chironomidae) (Die Tribus Anatopyniini, Macropelopiini und Pentaneurini). Abh. Larvalsyst. Insekt. 6: 1-453. FREEMAN, P. 1955. A study of African Chironomidae. Part I. Bull. Br. Mus. (Nat. Hist.) Entomol. 4: 1-67. 1956. A study of African Chironomidae. Part II. Bull. Br. Mus. (Nat. Hist.) Entomol. 4: 287-368. 1964. Notes on Chironomidae (Diptera: Nematocera). Proc. R. Entomol. Soc. London (B). 33: 147-150. FRIES, B. F. 1830. Beskrifnig öfver et nytt slägte Hydrobaenus hörande till Tipulariae. K. Sven. Vetenskapsakad. Handl. 1829: 176-187. 1831. Beschreibung einer neuen Gattung Hydrobaenus zu Tipulariae gehörend. Isis von Oken 11: 1350-1357. FRISON, T. H. 1927. A list of the insect types in the collections of the Illinois State Natural History Survey and the University of Illinois. Nat. Hist. Surv. Bull. 16: 137-309. GIARD, A. 1904. Quelques mots sur l'Hydrobaenus lugubris Fries (Dipt.) Bull. Soc. Entomol. Fr. 9: 164-165. GOETGHEBUER, M. 1913. Description de Chironomides nouveaux récoltés en Belgique. Ann. Biol. (Lacustre) 6: 148-172. 1914. Recherches sur les larves et les nymphes des Chironomines de Belgique. Mém. Acad. R. Med. Belg. 3(7): 1-48. 1919. Observations sur les larves et les nymphes de quelque Chironomides de Belgique. Ann. Biol. (Lacustre) 9: 51-78. 1921. Chironomides de Belgique et spécialement de la zone des Flanders. Mém. Mus. R. Hist. Nat. Belg. 8 (Fasc. 4). 31: 1-208. 1925. Métamorphoses de Dactylocladius distylus Kieffer (Diptera: Chironomidae. Ann. Biol. (Lacustre). 14: 275-280.

1932. Diptères Chironomidae IV (Orthocladiinae, Corynoneurinae, Clunioninae, Diamesinae). Faune Fr. 23: 1-204.

1933. Chironomides du Groenland oriental, du Svalbard et de la Terre de François Joseph. Skr. Svalbard Ishavet. 53: 19-31.

1938. Quelques Chironomides nouveaux de l'Europe. Bull. Ann. Soc. Entomol. Belg. 78: 453-464.

1940. Chironomides de Laponie Suédoise. Bull. Ann. Soc. Entomol. Belg. 80: 55-72.

1940-50. Tendipedidae (Chironomidae) f. Subfamilie Orthocladiinae. A. Die Imagines. Fliegen Palaearktischen Reg. 3(13g): 1-208.

GOWIN, F., AND A. THIENEMANN. 1942. Zwei neue Orthocladiinen-Arten aus Lunz (Niederdonau). Chironomiden aus dem Lunzer Seengebiet VII. Zool. Anz. 140: 101-109.

HAMILTON, A. L. 1965. An analysis of a freshwater benthic community with special reference to the Chironomidae. I, II. Ph.D. Thesis. Univ. British Columbia, Vancouver, B.C. 94 p, 216 p.

HANSEN, D. 1974. Systematics and morphology of the Nearctic species of *Diamesa* Meigen 1835 (Diptera: Chironomidae). Ph.D. Thesis. Univ. Minnesota, St. Paul, Minn. 364 p.

HENNIG, W. 1950. Grundzüge einer Theorie der phylogenetischen Systematik. Dtsch. Zeutralverlag, Berlin. 370 p.

1957. Systematik und Phylogenese. Ber. Dtsch. Entomol. Ges. Berlin 1956: 50-71.

1966. Phylogenetic systematics. Univ. Illinois Press, Chicago, Ill. 263 p. HIRVENOJA, M. 1967. Chironomidae and Culicidae (Dipt.) from Spitsbergen. Ann.

Entomol. Fenn. 33: 52-61. 1973. Revision der Gattung *Cricotopus* van der Wulp und ihrer Verwandten (Diptera, Chironomidae). Ann. Zool. Fenn. 10: 1-363.

HOLMGREN, A. E. 1869. Bidrag til kännedomen om Beeren Eilands och Spetsbergens Insekt-Fauna. K. Sven. Vetenskapsakad Handl. 5: 1-55.

HRABĚ, S. 1942. O bentické zviřeně jezer ve Vysokých Tatrách. Physiogr. Slovaca 1: 124-177.

HUDSON, P. L. 1971. The Chironomidae (Diptera) of South Dakota. Proc. S.D., Acad. Sci. 50: 155-174.

HUMPHRIES, C. F. 1938. The chironomid fauna of the Grosser Plöner See, the relative density of its members and their emergence period. Arch. Hydrobiol. 33: 535-584.

ILLIES, J. 1952. Die Mölle. Faunistisch-ökologische Untersuchungen an einem Forellenbach im Lipper Bergland. Arch. Hydrobiol. 46: 424-612.

1960. Phylogenie und Verbreitungsgeschichte der Ordnung Plecoptera. Verh. Dtsch. Zool. Ges. 1960: 384-394.

JOHANNSEN, O. A. 1905. Mayflies and midges of New York. II. Aquatic Nematocerous Diptera. Bull. N.Y. State Mus. 86: 76-331.

1934. New species of North American Ceratopogonidae and Chironomidae. J. N. Y. Entomol. Soc. 42: 343-352.

1937. Aquatic Diptera. Part III. Chironomidae: Subfamilies Tanypodinae, Diamesinae, and Orthocladiinae. Mem. Cornell Univ. Agric. Exptl. Sta. 205: 1-84.

1947. A new species of *Hydrobaenus* (*Chaetocladius*) from Connecticut with notes on related forms (Diptera, Chironomidae) Entomol. News. 58: 171-174.

1952. Family Tendipedidae (= Chironomidae) except Tendipedinae, p. 3-26. In O. A. Johannsen and H. K. Townes [ed.]. Guide to the insects of Connecticut. VI. The Diptera or true flies. 5: Midges and gnats. Tendipedidae (Chironomidae). Bull. Conn. State Geol. Nat. Hist. Surv. 80: 3-147.

JOHNSON, C. W. 1900. Order Diptera. In J. B. Smith [ed.] Insects of New Jersey. A list of the species occurring in New Jersey with notes on those of economic importance. N.J. State Board Agr. Annu. Rep. (1899) Suppl. 27: 1-755. KIEFFER, J. J. 1906. Diptera. Fam. Chironomidae, p. 1-78. In P. Wytsman [ed.] Genera Insectorum, 42. Verteneuil et Desmet, Bruxelles. 1911. Nouveaux Tendipedides du groupe Orthocladius (Dipt.). (1^{re} Note) Bull. Soc. Entomol. Fr. 1911: 181-187. 1915. Neue Chironomiden aus Mitteleuropa. Broteria, Ser. Zool. 13: 65-87. 1917. Chironomidae d'Amérique conservés au musée national hongrois de Budapest. Ann. Mus. Nat. Hungarici. 15: 292-364. 1919. Chironomiden der nördlichen Polarregion, p. 40-48, 110-120. In J. J. Kieffer and A. Thienemann [ed.] Chironomiden, gesammelt von Dr. A. Koch (Münster i. W.) auf den Lofoten, der Bäreninsel und Spitzbergen (Dipt.) Entomol. Mitt. 8: 38-48, 110-124. 1921. Chironomides nouveaux ou peu connus de la région paléarctique. Bull. Soc. Hist. Nat. Moselle 29: 51-109. 1922a. Chironomides de la Nouvelle-Zemble, p. 1-24. In O. Holtedahl [ed.] Rep. Sci. Res. Norw. Exp. Novaya Zemlya 1921, 1(2). 1922b. Chironomides nouveaux ou peu connus de la région paléarctique. Ann. Soc. Sci. Bruxelles 42: 138-180. 1923. Nouvelle contribution à l'étude des chironomides de la Nouvelle-Zemble, p. 1-11. In O. Holtedahl [ed.] Rep. Sci. Res. Norw. Exp. Novaya Zemlya 1921, 1(9). 1924. Chironomides nouveaux ou rares de l'Europe Centrale. Bull. Soc. Hist. Nat. Moselle 30: 11-110. KIEFFER, J. J. AND A. THIENEMANN. 1908. Neue und bekannte Chironomiden und ihre Metamorphose. Z. Wiss. Insektenbiol. 4: 1-10, 33-37, 78-84, 124-128, 184-190, 214-219, 277-286. KOWNACKA, M. AND A. KOWNACKI. 1965. Freshwater invertebrates of Stankie Mnichowe pools in the Tatra Mountains. Limnol. Invest. Tatra Mts. and Dunajec River Basin, Komitet Zagosp. Ziem. Górskich PAN 11: 81-90. LEHMANN, J. 1971. Die Chironomiden der Fulda. (Systematische, ökologische und faunistische Untersuchungen). Arch. Hydrobiol. Suppl. 37: 466-555. 1972. Revision der europäischen Arten (Puppen od und Imagines od) der Gattung Eukiefferiella Thienemann. Beitr. Entomol. 22: 347-405. LIPINA, N. N. 1939. Novye formy molodykh stadii Chironomidae podopytnuck ozior sapropelovoy stancii v Zalutshé. [New forms of young stages of Chironomidae of investigated lakes at sapropel stations in Zalutshé.] Tr. Lab. Genezisa Sapropela A.N., SSSR 1: 89-107. LUNDSTRÖM, C. 1915. Diptera Nematocera aus dem arctischen Gegenden Sibiriens. Mém. Acad. Imp. Sci. Petrograd, Ser. 8. 29(8): 1-33. MALLOCH, J. R. 1915. The Chironomidae, or midges, of Illinois, with particular reference to the species occurring in the Illinois River. Bull. Ill. State Lab. Nat. Hist. 10: 273-543. MASON, W. T., AND J. E. SUBLETTE. 1971. Collecting Ohio River basin Chironomidae (Diptera) with a floating sticky trap. Can. Entomol. 103: 397-404. MEIGEN, J. W. 1830. Systematische Beschreibung der bekannten europäisch zweiflügeligen Insekten. 6. Schulzische Buchhandlung, Hamm. 401 p. MEUCHE, A. 1939. Die Fauna im Algenbewuchs. Nach Untersuchungen im Litoral ostholsteinischer Seen. Arch. Hydrobiol. 34: 349-520.

MOZLEY, S. C. 1970. Morphology and ecology of the larva of *Trissocladius grandis* (Kieffer) (Diptera, Chironomidae), a common species in the lakes and rivers of Northern Europe. Arch. Hydrobiol. 67: 433-451.

NIETZKE, G. 1938. Die Kossau. Hydrobiologisch-faunistische Untersuchungen an schleswig-holsteinischen Fliessgewässern. Arch. Hydrobiol. 32: 1-74.

OLIVER, D. W. 1963. Entomological studies in the Lake Hazen area, Ellesmere Island, including lists of species of Arachnida, Collembola, and Insecta. Arctic 16: 175-180.

1964. A limnological investigation of a large arctic lake, Nettiling Lake, Baffin Island. Arctic 17: 69-83.

1968. Adaptations of Arctic Chironomidae. Ann. Zool. Fenn. 5: 111-118.

1976. Chironomidae (Diptera) of Char Lake, Cornwallis Island, N.W.T., with descriptions of two new species. Can. Entomol. 108: 1053-1064.

OLIVER, D. R. AND H. V. DANKS. 1972. Sex ratios of some high arctic Chironomidae (Diptera). Can. Entomol. 104: 1413-1417.

PAGAST, F. 1947. Systematik und Verbreitung der um die Gattung *Diamesa* gruppierten Chironomiden. Arch. Hydrobiol. 41: 435-596.

PANKRATOVA, V. 1970. Ličinki i kikolki komarov podsemiectra Orthocladiinae Fauny SSSR (Diptera, Chironomidae - Tendipedidae) (Midge larvae and pupae of the subfamily Orthocladiinae of the USSR fauna). Inst. Akad. Nauk SSSR 102: 1-345.

PINDER, L. C. V. 1974. The Chironomidae of a small chalk stream in Southern England. Entomol. Tidskr. Suppl. 95: 195-202.

POTTHAST, A. 1915. Über die Metamorphose der Orthocladius-Gruppe. Ein Beitrag zur Kenntnis der Chironomiden. Arch. Hydrobiol. Suppl. 2: 243-376.

REISS, F. 1968. Ökologische und systematische Untersuchungen an Chironomiden (Diptera) des Bodensees. Ein Beitrag zur lakustrischen Chironomiden-fauna des nordlichen Alpenvorlandes. Arch. Hydrobiol. 68: 176-323.

RENSCH, B. 1947. Neuere Probleme der Abstammungslehre. Enke, Stuttgart. 407 p. 1959. Evolution above the species level. Methuen, London. 419 p.

RINGE, F. 1974. Chironomiden - Emergenz 1970 in Breitenbach und Rohrwiesenbach. Schlitzer Produktions biologische Studien (10). Arch. Hydrobiol. Suppl. 45: 212-304.

ROBACK, S. S. 1957. The immature tendipedids of the Philadelphia area. Monogr. Acad. Nat. Sci. Philadelphia 9: 1-152.

1962. Some new Tendipedidae from the Canal Zone. Not. Nat. Acad. Nat. Sci. Philadelphia 355: 1-10.

RODOVA, R. A. 1966. Razvitie *Cricotopus silvestris* (Diptera, Chironomidae) (Development of *Cricotopus silvestris*). Tr. Inst. Biol. Vnutrennikh Vod. 12: 199-213.

RUTHE, J. F. von. 1831. Einige Bemerkungen und Nachträge zur Meigen's "Systematisches Beschreibung der europäischen zweiflügeligen Insecten." Isis von Oken 1831: 1203-1222.

SAETHER, O. A. 1968. Chironomids of the Finse area, Norway, with special reference to their distribution in a glacier brook. Arch. Hydrobiol. 64: 426-483.

1969. Some Nearctic Podonominae, Diamesinae, and Orthocladiinae (Diptera: Chironomidae). Bull. Fish. Res. Board Can. 170: 154 p.

1970. Nearctic and Palaearctic *Chaoborus* (Diptera: Chaoboridae). Bull. Fish. Res. Board Can. 174: 57 p.

1971a. Nomenclature and phylogeny of the genus *Harnischia* Kieffer (Diptera: Chironomidae). Can. Entomol. 103: 347-362.
1971b. Notes on general morphology and terminology of the Chironomidae (Diptera). Can. Entomol. 103: 1237-1260.

1973a. Four species of *Bryophaenocladius* Thien. with notes on other Orthocladiinae (Diptera: Chironomidae). Can. Entomol. 105: 51-60.

1973b. Taxonomy and ecology of three new species of *Monodiamesa* Kieffer, with keys to Nearctic and Palaearctic species of the genus (Diptera: Chironomidae). J. Fish. Res. Board Can. 30: 665-679.

1974. Morphology and terminology of female genitalia in Chironomidae (Diptera). Entomol. Tidskr. Suppl. 95: 216-223.

1975a. Two new species of *Heterotanytarsus* Spärck, with keys to Nearctic and Palaearctic males and pupae of the genus (Diptera: Chironomidae). J. Fish. Res. Board Can. 32: 259-270.

1975b. Two new Nearctic species of *Protonypus* Kieffer with keys to Nearctic and Palaearctic species of the genus (Diptera: Chironomidae). J. Fish. Res. Board Can. 32: 367-388.

1975c. Nearctic and Palaearctic *Heterotrissocladius* Spärck (Diptera: Chironomidae). Bull. Fish. Res. Board Can. 193: 67 p.

1975d. Twelve new Nearctic species of *Limnophyes* Eat. (Diptera: Chironomidae). Can. Entomol. 107: 1029-1056.

1975e. Nearctic chironomids as indicators of lake typology. Verh. Internat. Ver. Limnol. 19: 3127-3133.

SCHINER, J. R. 1864. Diptera Austriaca. II. Carl Gerold's Sohn. Wien. 658 p.

SCHLEE, D. 1966. Präparation und Ermittlung von Messwerten an Chironomidae (Diptera). Gewässer Abwässer. 41/42: 169-193.

1968a. Zur Präparation von Chironomiden. II. Die Behandlung ausgeblichenen bzw. getrockneten Materials und das Reparieren schadhafter Präparate. Ann. Zool. Fenn. 5: 127-129.

1968b. Vergleichende Merkmalsanalyse zur Morphologie und Phylogenie der Corynoneura - Gruppe (Diptera, Chironomidae). Zugleich eine allgemeine Morphologie der Chironomiden - Imago (ơ). Stuttgarter Beitr. Naturk. 180: 1-150.

SERRA-TOSIO, B. 1970. Morphologie générale de l'antenna des Diamesini mâles (Diptera, Chironomidae) et localisation des unité sensorielles. Trav. Lab. Hydrobiol. 61: 147-163.

SHILOVA, A. I. 1971. Metamorfoz *Trissocladius megastylus* sp.n. (Diptera, Chironomidae). Tr. Inst. Biol. Vnutrennikh Vod. 22: 123-131.

SPARCK, R. 1922. Beiträge zur Kenntnis der Chironomidenmetamorphose II. Ueber die metamorphose der Gattung Brillia Kieffer nebst Bemerkungen über die systematishe Stellung dieser Gattung. Entomol. Medd. 14: 70-77.

STAHL, J. B. 1959. The developmental history of the chironomid and *Chaoborus* faunas of Myers Lake. Invest. Indiana Lakes Streams. 5(2): 47-102.

1966. Characteristics of a North American Sergentia lake. Gewässer Abwässer. 41/42: 95-122.

1975. Emergence, occurrence, and mating behavior of *Hydrobaenus pilipes* (Malloch) (Diptera, Chironomidae). Entomol. News. 86: 69-72.

STEFFAN, A. W. 1965. Plecopteracoluthus downesi gen. et sp.nov. (Diptera: Chironomidae), a species whose larvae live phoretically on larvae of Plecoptera. Can. Entomol. 97: 1323-1344.

STRENZKE, K. 1959. Revision der Gattung *Chironomus* Meig. I. Die Imagines von 15 norddeutschen Arten und Unterarten. Arch. Hydrobiol. 56: 1-42.

1966. Empfohlene Methoden zur Aufzucht and Präparation terrestrischer Chironomiden. Gewässer Abwässer. 41/42: 163-168.

282

SUBLETTE, J. E. 1966. Type specimens of Chironomidae (Diptera) in the U.S. National Museum. J. Kans. Entomol. Soc. 39: 580-607.

1967. Type specimens of Chironomidae (Diptera) in the Cornell University Collection. J. Kans. Entomol. Soc. 40: 477-564.

1970. Type specimens of Chironomidae (Diptera) in the Illinois Natural History Survey Collection, Urbana. J. Kans. Entomol. Soc. 43: 44-95.

SUBLETTE, J. E. AND M. S. SUBLETTE. 1965. Family Chironomidae (Tendipedidae), p. 142-181. In A. Stone et al. [ed.] A catalog of the Diptera of America north of Mexico. U.S. Dep. Agric. Agric. Handb. 276: 1-1696.

THIENEMANN, A. 1934. Chironomiden-Metamorphosen VIII. "Phaenocladius". Diptera 7: 29-46.

1935. Chironomiden-Metamorphosen. X. "Orthocladius-Dactylocladius" (Dipt.). Entomol. Z. 96: 201-224.

1937. Die Puppe von *Diplocladius* (*Orthocladius*) conformis (Holmgren). Ann. Mag. Nat. Hist. Ser. 10, 20: 362-364.

1941. Lapplandische Chironomiden und ihre Wohngewässer. Arch. Hydrobiol. Suppl. 17: 1-253.

1944. Bestimmungstabellen für die bis jetzt bekannten Larven und Puppen der Orthocladiinen (Diptera, Chironomidae). Arch. Hydrobiol. 39: 551-664.

1954. Chironomus. Leben, Verbreitung und wirtschaftliche Bedeutung der Chironomiden. Binnengewässer 20: 1-834.

TOWNES, H. K. 1945. The Nearctic species of Tendipediini [Diptera, Tendipedidae (= Chironomidae)]. Am. Midl. Nat. 34: 1-206.

WAGNER, W. 1962. Dynamische Taxionomie, angewandt auf die Delphaciden Mitteleuropas. Mitt. Zool. Mus. Hamburg. 60: 111-180.

WALKER, F. 1856. Insecta Britannica. Diptera III. London. 352 p.

WEBB, D. W. 1969. New species of chironomids from Costello Lake, Ontario (Diptera: Chironomidae). J. Kans. Entomol. Soc. 42: 91-108.

WIEDERHOLM, T. 1974a. Studier av bottenfaunan i Mälaren. Statens Naturvårdsverk PM 415. Natur. Limnol. Undersökning Rapp. 71: 1-113.

1974b. Studier av bottenfaunan i Vättern. Statens Naturvårdsverk PM 416. "Natur. Limnol. Undersökning Rapp. 72: 1-63.

WULKER, W. 1959. Drei neue Chironomiden-Arten (Dipt.) und ihre Bedeutung für das Konvergenzproblem bei Imagines und Puppen. Arch. Hydrobiol. Suppl. 25: 44-64.

WÜLKER, W., J. E. SUBLETTE, AND J. MARTIN. 1968. Zur Cytotaxionomie nord-amerikanischer Chironomus-Arten. Ann. Zool. Fenn. 5: 155-158.

WULP, F. M. van der. 1874. Dipterologische aanteekeningen. Tijdschr. Entomol. 17: 109-148.

ZAVŘEL, J. 1935. Chironomidenfauna der Hohen Tatra. Verh. Internat. Ver. Limnol. 7: 439-448.

1937a. Orthocladiinen aus der Hohen Tatra. Int. Rev. Ges. Hydrobiol. 35: 483-496.

1973b. Eine neue *Trissocladius* art. Spisy Vydávané Přirodovědeckou Fak. Masaryk. Univ. 239: 1-12.

1942. Polypodil pakomářích kukel. Polypodie der Chironomiden-Puppen. Acta Soc. Sci. Nat. Moravo-Silesiacae. 14: 1-40.

ZAVŘEL, J., AND F. PAGAST. 1935. Dva nové druhy Orthocladiin z vysokých Tater. Zwei neue Orthocladiinen-Arten ans Hoher Tatra. Čas. Česk. Spol. Entomol. 32: 156-160.

ZETTERSTEDT, J. W. 1850. Diptera Scandinaviae. Disposita et descripta. Lundae. IX: 3367-3710.

1851-52. Diptera Scandinaviae. Disposita et descripta X, XI: 3711-4090, 4091-4545.

Index

(Synonyms in parentheses)

Abiskomyia Edw. 34, 40 (aquilonaris Thien. nec Goetgh.) 83, 89 ater Kieff., var. 165 Baeoctenus gen.n. 1, 15, 18, 23, 32, 35, 37, 41-47 (barbatipes Kieff., var.) 114, 115 bicolor sp.n. 1, 18, 41, 42-47, 174 (boeimicus Kieff. var.) 105 (brevipalpis Kieff.) 13, 19, 24, 163, 165-170, 172, 174, 266 brincki (Freem.) 251 Brillia Kieff. 12, 13, 32, 38 Bryophaenocladius Thien. 1, 20, 32, 33, 36, 250, 271-276 calvescens sp.n. 1, 19, 23, 55, 57, 58, 71, 158-160 (Cantomyia Rob.) 1, 271 (carus (Rob.)) 271, 275-276 Chaetocladius Kieff. 13, 14, 15, 32, 34, 36, 253, 269-270, 271, 273 Chironomus Meig. 54 (ciliatipes Kieff., var.) 114, 115 (Clinocladius Subl.) 1, 271 conformis (Holmgr.) 1, 13, 15, 18, 28, 32, 55, 56, 57, 58, 60, 61, 69, 70, 74, 75, 77, 80, 81, 83-91, 92 consobrinus (Holmgr.) 14 Corynoneura Winn. 10 (crassistylus Brund.) 115, 124 Cricotopus v.d. Wulp 3 cultriger Kieff. 12, 15 curtiseta Sæth. 250 (Dactylocladius Kieff.) 13, 54

depectinata Sæth. 10 Diamesa Meig. 12 Diplocladius Kieff. 13, 15, 32, 54 distylus Kieff. 13, 14, 16, 18, 27, 28, 31, 32, 57, 60, 61, 64, 66, 72, 74, 76, 78, 112, 114, 138, 148-152 (domus Subl.) 1, 138, 139, 141, 143, 144 eastopi (Freem.) 20, 250, 251-252 Eukiefferiella Thien. 15, 20, 35, 266-269 (Eutrissocladius Goetgh.) 54 excerptus (Walk.) 1, 14, 20, 253, 254, 255, 256, 257, 259, 260-264 festivus (Holmgr.) 83 (flavibasis Verr.) 263 (fluviatilis (Goetgh.)) 1, 14, 253, 260, 263, 264 fontinalis (Chern.) 23, 193, 237, 241 Freemaniella gen.n. 1, 15, 20, 23, 32, 34, 36, 250-252, 273 furcarca sp.n. 1, 7, 19, 23, 174, 177, 185, 186, 206, 217-219 fusistylus (Goetgh.) 18, 27, 28, 55, 56, 57, 58, 59, 61, 62, 63, 65, 67, 68, 69, 71, 73, 76, 77, 78, 88, 93-101, 102 Gen. near Zalutschia Lip. or Chaetocladius Kieff. 269-270 (glabripennis Edw. nec Goetgh.) 14, 115, 124 glacialis Lundstr. 18, 28, 30, 71, 104-105

(grandis (Kieff.) 1, 13, 14, 114, 115 (griseipennis Goetqh.) 14, 105 (grossus Kieff., var.) 114, 115 (hamiltoni Saeth. 1, 139, 141, 143, 144 Harnischia Kieff. 12, 16 Harrisonina Freem. 13 heterocerus Kieff. 13, 19, 27, 165, 169, 170-172, 266 Heterotanytarsus Spärck 38, 40 Heterotrissocladius Spärck 3, 14, 23, 29, 32, 35, 38, 40, 164, 258 hudsoni sp.n. 1, 18, 28, 29, 32, 55, 57, 59, 61, 63, 65, 67, 68, 72, 77, 78, *131–134*, 136 Hydrobaenus Fries 1, 3, 13, 14, 15, 16, 17, 18, 19, 23, 24, 27, 28, 30, 31, 32, 35, 37, 38, 40, 52, 54-162, 163, 177, 266 impectinus sp.n. 1, 20, 271, 273-275 johannseni (Subl.) 1, 18, 27, 28, 31, 55, 56, 57, 58, 59, 61, 62, 63, 65, 67, 68, 72, 75, 76, 78, 115, 122, 124, 138-144 korosiensis (Chern.) 23, 193, 237, 241 labradorensis subsp.n. 1, 57, 69, 70, 74, 83, 86, 89-91 lapponicus Brund. 15, 16, 18, 27, 28, 30, 32, 55, 57, 59, 61, 62, 69, 71, 76, 93, 101-104

laticaudus sp.n., Hydrobaenus 1, 18, 28, 55, 57, 70, 80-82 laticaudus Sæth., Bryophaenocladius 271 Limnophyes Eat. 34, 37 lingulata sp.n. 1, 19, 24, 31, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 186, 188, 189, 191, 193, 222-234, 236, 241, 246, 249 (longipennis Kieff., var.) 165 *lugubris* Fries 3, 13, 14, 15, 16, 18, 26, 27, 28, 30, 31, 32, 54, 55, 56, 57, 58, 59, 62, 63, 65, 67, 68, 69, 71, 73, 75, 76, 78, 104, 105-112, 113, 148 lunzensis (Gow.) 13, 18, 27, 28, 57, 59, 61, 62, 63, 65, 67, 68, 69, 70, 74, 75, 77, 83, 87, 91-93 maeaeri Brund. 250 marcidus (Kieff.) 3 martini sp.n. 1, 18, 28, 29, 30, 32, 55, 57, 60, 61, 64, 66, 69, 72, 74, 77, 133, 134-138 megastylus (Shil.) 19, 24, 31, 177, 180, 184, 186, 190, 192, 202Mesocricotopus Brund. 38 Monodiamesa Kieff. 10 mucronata (Brund.) 15, 19, 24, 31, 173, 174, 177, 178, 179, 185, 186, 190, 192, 194, 202, 203-205, 206 natalensis (Freem.) 20, 254, 255, 260, 264-265 (natvigi Goetgh.) 83, 89 (naumanni Brund.) 14, 173, 212, 216 (nigerrimus Goetgh.) 165 (nigritus Mall.) 138, 144 (nigrofasciata Goetgh.) 266 (nivoriundus Joh. nec Fitch) 115, 124, 138, 139, 144 nudisquama Chern. 269

(obesus Goetgh.) 83, 89 obsepta (Webb) 3, 19, 24, 27, 31, 173, 174, 175, 176, 177, 178, 179, 181, 183, 184, 185, 186, 188, 190, 192, 194-202 (occultans Meig.) 105 octomerus var.n. 61, 71, 77, 94, 97, 99-101 Oliveria gen.n. 1, 17, 18, 23, 24, 32, 33, 35, 37, 38, 40, 48-53 Orthocladius v.d. Wulp 13, 14, 15, 34, 36, 54, 253, 269 (Parachaetocladius Freem. nec. Wülk.) 253 (paralaminatus Brund.) 83 Paralimnophyes Brund. 34, 37 Parametriocnemus Goetgh. 32, 258 Paraphaenocladius Thien. 32, 258 paratatrica (Chern.) 192, 211 Paratrissocladius Zavř. 1, 14, 15, 20, 23, 32, 33, 36, 39, 40, 164, 250, 253-265, 266 pauca subsp.n. 1, 174, 175, 176, 177, 178, 179, 181, 182, 183, 184, 186, 188, 189, 191, 193, 222, 223, 227, 228-233, 236, 246, 249 pauciseta Saeth. 250 (permixtus Kieff. var.) 114 pilipes (Mall.) 1, 3, 13, 15, 18, 28, 32, 55, 56, 57, 58, 59, 61, 62, 63, 65, 68, 69, 73, 75, 77, 79, 110, 114-124, 126, 127, 130, 132, 139, 143, 147 pilipodex sp.n. 1, 18, 27, 28, 31, 55, 57, 59, 61, 62, 63, 65, 67, 68, 69, 72, 73, 76, 78, 136, 144-148 Plecopteracoluthus Steff. 38 Podonomus Phil. 12 potamophilus (Chern.) 192-203, 205-206 (practicola Kieff.) 105, 112

productus (Freem.) 251, 275 (Psilocerus Ruthe) 13, 54 Psilometriocnemus Sæth. 258 pusa sp.n. 1, 19, 23, 24, 31, 175, 178, 179, 180, 181, 182, 183, 184, 189, 190, 192, 227, 234-236 rufus Kieff. 18, 26, 28, 30, 31, 60, 64, 66, 71, 75, 76, 78, 104, 112-114 ruwenzoriensis Freem. 12 scanica (Brund.) 15, 20, 266-269 scapulapilosus sp.n. 1, 18, 28, 55, 56, 57, 58, 59, 61, 63, 65, 67, 68, 69, 73, 75, 77, 79, 118, 120, 123, 124-128, 130 (sp. A, Trissocladius) 228, 233 sp. A, Zalutschia 19, 23, 191, 247-249 sp. B Zalutschia 138, 191, 249 Spaniotoma Phil. 13, 14, 15, 61, 62, 72, 74, 76, 114, 253 spinnatis sp.n. 1, 16, 19, 27, 28, 31, 55, 56, 57, 58, 59, 152-157 subparallelus (Mall.) 271-273 Tanypus Meig. 12 tatrica Pag. 7, 15, 16, 19, 24, 25, 31, 32, 174, 177, 178, 179, 180, 181, 182, 183, 184, 185, 187, 188, 189, 190, 192, 205, 206-211, 219, 249, 269 teres f.n. 174, 188, 222, 223, 232, 233-234, 246 tornetraeskensis (Edw.) 14, 15, 19, 23, 24, 25, 31, 32, 174, 175, 176, 177, 178, 179, 180, 187, 189, 190, 193, 205, 219, 222, 227, 236-241, 242, 246, 247, 269 tricornis (0.1) 16, 18, 48, 49-53, 174

286

trigonacies sp.n. 1, 19, 23, 24, 31, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 187, 189, 191, 193, 232, 241, 242-247, 249 Trissocladius Kieff. 1, 3, 13, 14, 15, 16, 17, 19, 23, 24, 26, 27, 30, 32, 34, 36, 39, 48, 52, 54, 163-172, 173, 250, 253, 258, 266, 271, 273, 301 (tristylus Kieff., var.) 114, 115 *tumidistylus* sp.n. 1, 19, 23, 27, 30, 31, 57, 58, 71, 160-162

veralli Edw. 266, 267

virgo sp.n. 1, 18, 28, 30, 73, 128-131 vockerothi sp.n. 1, 19, 24, 25, 31, 32, 173, 174, 177, 178, 179, 187, 191, 219-222, 266 Zalutschia Lip. 12, 15, 16, 17, 19, 23, 24, 27, 31, 32, 35, 37, 39, 40, 57, 173-249, 250, 258, 266, 269-270, 273 zalutschicola Lip. 1, 7, 9, 12, 14, 19, 24, 31, 32, 173, 174, 177, 180, 181, 182, 183, 184, 185, 187, 188, 190, 192, 212-

217, 219

287

Recent Bulletins

184	Freshwater fishes of Canada W. B. Scott and E. J. CROSSMAN
186	(Reprinted 1975, 966 p., cat. no. Fs 94-184; <i>Canada: \$12.75/Other countries: \$15.30)</i> The capelin (<i>Mallotus villosus</i>): biology, distribution, exploitation, utilization, and composition
	P. M. JANGAARD (1974, 70 p., cat. no. Fs 94-186; <i>Canada; \$3.00/Other countries: \$3.60</i>)
187	The lobster fishery of the Maritime Provinces: economic effects of regulations A. GORDON DEWOLF
	(1974, 59 p., cat. no. Fs 94-187; Canada: \$3.00/Other countries: \$3.60)
188	Aquaculture in Canada — the practice and the promise
	H. R. MACCRIMMON, J. E. STEWART, AND J. R. BRETT (Reprinted 1976, 84 p., cat. no. Fs 94-188; Canada: \$4.25/Other countries: \$5.10)
189	Treatment of fish processing plant wastewater
	F. G. CLAGGETT AND J. WONG (1974, 18 p., cat. no. Fs 94-189; <i>Canada: \$2.00/ Other countries: \$2.40</i>)
190	Hydrodynamics and energetics of fish propulsion PAUL W. WEBB
	(1975, 158 p., cat. no. Fs 94-190; Canada: \$5.00/ Other countries: \$6.00)
191	Computation and interpretation of biological statistics of fish populations W. E. RICKER
	(1975, 382 p., cat. no. Fs 94-191; Canada: \$8.00/ Other countries: \$9.60)
192	Catalogue and synopsis of <i>Caligus</i> , a genus of Copepoda (Crustacea) parasitic on fishes L. MARGOLIS, Z. KABATA, AND R. R. PARKER
	(1975, 117 p., cat. no. Fs 94-192; Canada: \$5.00/ Other countries: \$6.00)
193	Nearctic and Palaearctic Heterotrissocladius (Diptera: Chironomidae) OLE A. SÆTHER
	(1975, 67 p., cat. no. Fs 94-193; Canada: \$3.50/Other countries: \$4.20)
194	Living marine resources of Newfoundland–Labrador: status and potential A. T. PINHORN [ed.]
	(1976, 64 p., cat. no. Fs 94-194; Canada: \$4.00/ Other countries: \$4.80)

To obtain the publications listed above, at the prices indicated, write to:

Supply and Services Canada Printing and Publishing Ottawa, Canada K1 A 0S9

Please make cheques and money orders payable to the Receiver General for Canada. Advance payment is required.



and an object of the second second second

. مىلار ب