Acta Zoologica Lituanica, 2002, Volumen 12, Numerus 3
ISSN 1392-1657

THE SPECIES COMPOSITION OF MACROZOOBENTHOS IN SMALL LITHUANIAN RIVERS

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Abstract. This article is the study of the species composition of macrozoobenthos in 12 small Lithuanian rivers with different thermal conditions during the period 1996–2001. The results of the research have revealed that small rivers differ in the number of species of macrozoobenthic organisms. The data obtained are compared with the results of research carried out in small rivers of the Kaliningrad region of Russia.
Key words: macrozoobenthos, species composition, Sørensen coefficient

Introduction

In Lithuania, there are about 29,900 small rivers and streams longer than 0.5 km, with the total length of 63,700 km. About 97.5% of all the rivers or 77% of the total length of the riverbeds fall into the category of small rivers measuring up to 10 km long (Kilkus 1998).
The published data available on the species composition of the macrozoobenthos of small Lithuanian rivers are scarce.
Kazlauskas (1959, 1960, 1962) investigated Trichoptera and Ephemeroptera and Plecoptera in the Lithuanian rivers of different types (in small rivers as well). In his study, he described their species and pointed out their localities.
A very important factor determining the qualitative composition of hydrobionts in rivers is their thermal conditions. The temperature of water determines physical, chemical, biochemical and biological processes taking place in rivers. The temperature of water determines the rate of self-cleaning processes, oxygenation and other factors determining water quality. According to the mean water temperature, Lithuanian rivers can be divided into cold-water (<17°C) and warm-water (>17°C) rivers.
The range of the fluctuations of water temperatures in small rivers is wider than in large ones. The sources of most of brooks and small streams flowing in the wooded landscape of Lithuania are springs and groundwater. Thus, their temperature in summer is relatively low (13–16°C). The highest temperature of water of most brooks, streams and average-sized rivers in summer is 25°C, and the mean temperature rarely exceeds 20°C. In winter, the mean temperature of water in small Lithuanian rivers is about 0°C. Some small rivers of Lithuania freeze to their bottom.
The current paper analyses the species composition of macrozoobenthos in small Lithuanian rivers with different thermal conditions.

Material and methods

The research into the taxonomic composition of macrozoobenthos of small Lithuanian rivers was carried out in 1996–2001. We investigated eight cold-water streams (Beržupis, Derežna, Pazgrinda, Punelė, Saria, Samė, Strūzda, and Viešetė Rivers), three warm-water streams (Baltoji Ančia, Vilkvedis, and Voverkis) and one stream of mixed thermal conditions (Bražuolė River). Altogether, 12 small rivers were investigated.
The samples of macrozoobenthos were taken with stovepipe sampler in the ground of gravel. In the stations with the sandy ground and stones having a diameter of 2–10 cm, the samples were collected by means of kick-sampling method in three 0.1-m² areas (EDC 1993). In the phytorheophilic communities, the samples were taken by means of the frame for limitation of the vegetation sample. The vegetation was weighed after sorting out the fauna (phytorheophilous fauna). The macrozoobenthos was fixed in formalin solution, mollusca in 70% alcohol. In total, 76 samples were collected and lab-analysed according to the generally accepted hydrobiological methods. The organisms were defined according to the species. Benthic fauna was weighed using WT – 100 mg and VLKT – 500 g scales.

According to the formula developed by Sørensen (1948), the coefficient of similarity (K) of the species content in the investigated rivers was calculated.
In order to determine the zoobenthos, the following publications have been applied: Šivickis (1960), Lipin (1950), Tsalolikhin (1994, 1995, 1997, 1999, 2001), Pankratova (1970, 1983), Kutikova & Starobogatov (1977).

Results

In small Lithuanian rivers, in addition to oligochaetes and nematodes, 152 species and forms of macrozoobenthic organisms belonging to 64 families (Table 1) have been found. In small cold-water rivers 90 species of macrozoobenthos have been found, whereas in small warm-water rivers, this number was equal to 104. In the rivers with mixed thermal conditions, 30 species of macrozoobenthos have been found. Some benthic organisms found in the above-mentioned small Lithuanian rivers have also been found in the small rivers of Latvia (Spriņģe 1999) and the Kaliningrad region of Russia (Shibaeva 2000). The number of macrozoobenthic species common to Lithuania and Latvia was 51, whereas the number of the species common to the Kaliningrad region and Lithuania was 68.
In all the investigated rivers, the number of identified species varied from 19 to 59 (Table 2). The least variety of species was found in the cold-water Pazgrinda and Samė Rivers (19 species in each), whereas the greatest variety of species was found in the following warm-water rivers of Lithuania: Baltoji Ančia (57), Voverkis (59) and Vilkvedis (48). The greater number of species found in the small warm-water rivers can be related to the fact that the samples in the Voverkis and Vilkvedis Rivers were taken seasonally, i.e. three times a year. In addition, some cold-water species are also found together with warm-water species in warm-water rivers.
In small rivers of Lithuania, Diptera species prevailed. The total number of identified Diptera species and forms was 52. This makes about 34.2% of all species found in the macrozoobenthos of these rivers. The most abundant was the Chironomidae family (43 species). They made 28.3% of the total number of species. In the small rivers of the Kaliningrad region of Russia, chironomids are also the most abundant with respect to the species composition (out of 82 species found, 20 are common for Lithuania and the Kaliningrad region; Shibaeva 2000).
In the macrozoobenthos of small rivers, larvae of *Cricotopus algarum*, *Paratanytarsus lauterborni* and *Prodiamesa olivacea* are the most abundant. They were found correspondingly in 75.0%, 66.7% and 58.3% of the investigated rivers. In addition to other Diptera species, *Dicranota bimaculata* and blackflies (*Simulium* sp.) larvae are also quite frequent. They occurred in 75% of the investigated rivers. *Atherix* sp. occurred in 58.3% of the investigated rivers.
Among other benthic organisms having high variety of species are molluscs (27 species and 17.8 % of the total number of species), caddisflies (26 species and 17.1% of the investigated rivers) and mayflies (16 species in 10.5% of the total number of species).
The most abundant mollusc species in small Lithuanian rivers are *Pisidium nitidum* (66.7% of the investigated rivers), *Hippeutis complanatus* (41.7%), *Ancylus fluviatilis* (33.3%), *Bithynia tentaculata* (33.3%) and *Lymnaea auricularia* (33.3%).
The most frequently found caddisflies were *Hydropsyche* sp. (58.3% of the investigated rivers), *Hydropsyche angustipenis* (58.3%), *Anabolia soror* (66.7%), *Nemotaulius punctatolineatus* (41.7%), *Lepidostoma hirtum* (41.7%), *Cyrnus flavidus* (41.7%), and *Rhyacophyla nubila* (41.7%). The most abundant mayfly species were *Baetis pumilus* (91.7% of the investigated rivers), *Ephemera danica* (66.7%), and *Ephemerella ignita* (66.7%).
The species content of other groups of benthic organisms was not very rich. However, the Coleoptera larvae of some species (e.g. *Riolus cupreus* (66.7% of the investigated rivers) and *Spercheus emarginatus* (58.3%)) are quite abundant, especially in the biotope of the stony ground.
It has been established that 65 (42.8 %) species from the benthic fauna of small rivers are found only in one of the investigated rivers, and 27 species (17.8% of the total number of species) are found only in two rivers. These species were not abundant in the investigated rivers. The most abundant species in the benthic fauna of small rivers were chironomids (17 species or 11.2% of the total number of species) and molluscs (16 species, or 10.5% of the total number of species). However, the above-mentioned 65 species of macrozoobenthic organisms are not rare in the Lithuanian rivers at all. Their limited distribution and small amount can be explained by a too small number of samples, inability of these species to adapt in the above-mentioned rivers, or by their attachment to the ground of some particular type. Five species found only in one of the investigated rivers were very rare. They were the larvae of Odonata *Ephitheca bimaculata* (the Bražuolė River), stoneflies *Nephelopteryx* sp. (the Beržupis River), caddisflies *Microspectra sequax* (the Samė River) and *Limnephilus flavicornis* (the Voverkis River), chironomids *Epoicocladius flavens* (*ephemerae*) (the Vilkvedis River), and molluscs *Planorbis carinatus* (the Bražuolė River). Ac-

Table 1. Species composition of macrozoobenthos in small Lithuanian rivers.

Families and species	Vilkvedis	Voverkis	Pazgrinda	Beržupis	Derežna	Punelė	B. Ančia	Viešetė	Saria	Strūzda	Bražuolė	Samė
Oligochaeta	+	+	+	+	+	+	+	+	+	+	+	+
Hirudinea												
Glossiphonidae												
Glossiphonia complanata (Linnaeus)	+	+							+			
Helobdella stagnalis (Linnaeus)		+										
Erpobdellidae												
Erpobdella octoculata (Linnaeus)	+	+					+		+	+	+	
Pisciolidae												
Piscicola geometra (Linnaeus)				+								
Isopoda												
Asellus aquaticus (Linnaeus)	+	+					+			+		
Amphipoda												
Gammarus pulex (Linnaeus)	+	+			+		+		+			
Odonata												
Calopterygidae												
Calopteryx (*Agrion*) *splendens* (Harris)		+					+	+				
Gomphidae												
Gomphus vulgatissimus (Linnaeus)							+				+	
Corduliidae												
Ephitheca bimaculata Charpentier											+	
Libellulidae												
Libellula quadrimaculata (Linnaeus)	+											
Ephemeroptera												
Baetidae												
Baetis vernus Curtis										+	+	+
Baetis pumilus Burmeister	+	+	+	+	+	+	+	+	+	+	+	
Baetis rhodani (Pictet)		+	+		+		+				+	+
Cloeon (*Centroptilum*) *luteolum* (Müller)				+		+						
Cloeon dipterum (Linnaeus)								+				
Caenidae												
Caenis macrura Stephens	+						+	+				
Heptageniidae												
Ecdyonurus venosus (Fabricius)	+	+				+						
Heptagenia coerulans Rostock						+			+			
Heptagenia sulphurea (Müller)						+			+			
Ephemeridae												
Ephemera danica Müller	+		+		+	+		+	+	+	+	
Ephemera vulgata Linnaeus									+			
Ephemerellidae												
Ephemerella (*Serratella*) *ignita* (Poda)	+	+	+	+	+	+	+		+			
Leptophlebiidae												
Habrophlebia fusca (Curtis)	+	+										
Lepthoplebia (*Paralephtoplebia*) *cincta* (Retzius)	+					+	+	+				
Potamanthidae												
Potamanthus luteus (Linnaeus)								+				
Siphlonuridae												
Siphlonurus sp.									+		+	
Plecoptera												
Chloroperlidae												
Chloroperla sp.				+								
Nemouridae												
Amphinemura sp.			+	+								
Nemoura sp.	+	+									+	
Leuctridae												

Table 1 continued

Families and species	Vilkvedis	Voverkis	Pazgrinda	Beržupis	Derežna	Punelė	B. Ančia	Viešetė	Saria	Strūzda	Bražuolė	Samė
Leuctra sp.		+				+	+	+	+	+		+
Perlidae												
Perla sp.				+								
Perlodidae												
Isogenus nubecula Newman	+											
Taeniopterygidae												
Nephelopteryx sp.				+								
Megaloptera												
Sialidae												
Sialis lutaria Linnaeus		+							+			
Heteroptera												
Aphelocheiridae												
Aphelocheirus aestivalis (Fabricius)							+		+		+	
Corixidae												
Corixa sp.							+					
Coleoptera larvae												
Gyrinidae												
Aulonagyrus concinnus (Klug)						+	+	+				
Dytiscidae												
Laccophilus hyalinus (De Geer)	+											
Platambus maculatus Linnaeus								+				
Elmidae												
Donacia sp.	+											
Riolus cupreus (Müller)	+	+			+	+	+	+	+		+	
Spercheidae												
Sphercheus emarginatus (Shaller)	+			+	+	+	+	+	+			+
Coleoptera imago												
Dytiscidae												
Dytiscus sp.						+						
Hydaticus sp.			+		+							
Hydrobiidae												
Hydrobia tarda Herbst	+						+					
Hydrochus sp.	+		+		+	+			+			
Trichoptera												
Microspectra sequax MacLachlan												+
Brachycentridae												
Brachycentrus subnubilis Curtis					+		+					
Hydropsychidae												
Hydropsyche angustipennis Curtis	+	+			+	+	+	+		+		
Hydropsyche pellucidula Curtis	+						+	+		+		
Hydropsyche sp.	+	+				+	+	+	+	+		
Hydroptilidae												
Ithytrichia lamellaris Eaton									+			
Goeridae												
Goera pilosa (Fabricius)	+	+				+		+				
Lepidostomatidae												
Lepidostoma hirtum (Fabricius)	+	+	+								+	+
Leptoceridae												
Leptocerus (Ceraclea) annulicornis (Stephens)				+				+	+	+		+
Leptocerus(Athripsodes) cinereus (Curtis)			+									
Mystacides azureus (Linnaeus)	+	+			+							
Apataniidae												
Apatania fimbriata (Smidt)	+									+		
Limnephilidae												
Anabolia soror MacLachlan	+	+	+	+	+			+		+		+

Table 1 continued

Families and species	Vilkvedis	Voverkis	Pazgrinda	Beržupis	Derežna	Punelė	B. Ančia	Viešetė	Saria	Strūzda	Bražuolė	Samė
Chaetopteryx villosa Fabricius	+	+		+								
Grammotaulius atomarius Fabricius	+	+			+			+				
Nemotaulius punctatolineatus (Retzius)	+	+					+		+		+	
Limnephilus flavicornis (Fabricius)		+										
Limnephilus politus MacLachlan		+										
Limnephilus vittatus (Fabricius)					+	+		+	+			
Stenophylax sp.	+	+		+	+	+						
Odontoceridae												
Odontocerum albicorne (Scopoli)		+								+		
Philopotamidae												
Philopotamus montanus (Donovan)									+			
Polycentropodidae												
Cyrnus flavidus MacLachlan			+	+	+		+			+		
Polycentropus flavomaculatus Pictet							+	+				
Rhyacophilidae												
Rhyacophila nubila Zetterstedt				+	+	+			+	+		
Sericostomatidae												
Sericostoma personatum (Kirby et Spence)		+										
Lepidoptera												
Pyraustidae												
Paraponyx stratiotata Linnaeus						+						
Diptera												
Limoniidae												
Dicranota bimaculata (Schummel)	+	+		+	+	+	+	+	+			+
Empididae												
Hemerodromia sp.				+	+		+		+	+		+
Itonidae												
Retinodiplosis sp		+										
Athericidae												
Atherix sp.		+			+	+		+	+	+		+
Sciomyzidae												
Tetanocera sp.										+		+
Simuliidae												
Simulium sp.	+	+	+	+	+	+	+		+		+	
Tabanidae												
Tabanus sp.		+	+	+						+		+
Tipulidae												
Tipula sp.						+	+	+	+			
Cylindrotomidae												
Triogma sp.									+			
Chironomidae												
Chironominae												
Chironomus plumous Linnaeus		+										
Cladotanytarsus mancus (Walker)		+			+							
Cladotanytarsus sp.		+										
Cryptochironomus defectus Kieffer	+	+										
Cryptochironomus macropodus Ljachov		+								+		
Demicryptochironomus vulneratus (Zetterstedt)							+					
Glyptotendipes gripekoveni (Kieffer)										+		
Endochironomus impar (Walker)								+				
Micropsectra (praecox) junci Meigen		+					+			+		
Microtendipes tarsalis (Walker)							+					
Paratanytarsus lauterborni (Kieffer)	+	+	+		+	+	+		+	+		
Paratendipes 'connectens N 3' (Linnaeus)												+

Table 1 continued

Families and species	Vilkvedis	Voverkis	Pazgrinda	Beržupis	Derežna	Punelė	B. Ančia	Viešetė	Saria	Strūzda	Bražuolė	Samė
Paratendipes intermedius Tshernovskij	+											
Polypedilum exsectum (Kieffer)		+										
Polypedilum bicrenatum Kieffer						+						
Polypedilum nubeculosum (Meigen)										+		
Polypedilum scalaenum (Schrank)											+	
Polypedilum sp.							+				+	
Sergentia coracina (Zetterstedt)							+					
Stempelina bausei (Kieffer)										+		
Stichtochironomus 'connectens' N2 (Lipina)					+	+						
Stichtochironomus psammophilus Tshernovskij		+			+		+				+	
Tanytarsus mendax Kieffer		+										
Orthocladiinae												
Brillia sp.			+		+							
Cricotopus algarum Kieffer	+	+			+	+	+		+	+	+	+
Cricotopus latidentatus Tschernovskij										+		
Cricotopus sylvestris (Fabricius)		+			+	+	+					
Diamesa insignipes Kieffer		+					+	+	+			
Diamesa sp.	+											
Epoicocladius (ephemerae) flavens (Malloch)	+											
Eukiefferiella coerulescens Kieffer	+	+					+				+	
Eukiefferiella lauterborni Kieffer			+									
Orthocladiinae gen? 1. macrocera Tschern.		+			+					+		
Orthocladius gr. bathophilus Kieffer		+										
Orthocladius gr. saxicola Kieffer		+					+			+	+	
Prodiamesa (*Monodiamesa*) *bathyphila* Kieffer		+						+				
Prodiamesa olivacea (Meigen)		+		+	+	+	+			+		+
Psectrocladius psilopterus Kieffer			+									
Thienemanniella sp.			+									
Pelopiinae												
Ablabesmyia gr. lentiginosa Fries							+					
Ablabesmyia gr. tetrasticta Kieffer										+		
Pelopia (*Tanypus*) *punctipennis* Meigen										+		
Procladius Skuse		+	+				+	+		+		
Mollusca												
Dreissenidae												
Dreissena polymorpha (Pallas)							+					
Unionidae												
Anadonta piscinalis Nilsson							+				+	
Unio pictorum (Linnaeus)											+	
Unio tumidus Retzius											+	
Succinidae												
Ancylus fluviatilis Müller				+	+	+		+				
Planorbidae												
Coretus (*Planorbius*) *corneus* (Linnaeus)		+										
Gyraulus (*Anisus*) *albus* Müller							+					+
Hippeutis complanatus (Linnaeus)	+	+						+		+		+
Planorbis carinatus (Müller)											+	
Planorbis planorbis (Linnaeus)	+										+	
Bithynidae												
Bithynia leachi (Sheppard)		+										
Bithynia tentaculata (Linnaeus)	+	+					+	+				
Limnaeidae												
Galba (*Lymnaea*) *palustris* Müller							+					

Table 1 continued

Families and species	Vilkvedis	Voverkis	Pazgrinda	Beržupis	Derežna	Punelė	B. Ančia	Viešetė	Saria	Strūzda	Bražuolė	Samė
Lymnaea (*Radix*) *auricularia* Linnaeus	+				+		+			+		
Lymnaea (*Radix*) *ovata* Draparnaud		+							+			
Lymnaea (*Radix*) *pereger* Müller						+	+	+			+	
Physidae												
Physa fontinalis (Linnaeus)		+										
Sphaeriidae												
Pisidium (*Euglesa*) *nitidum* Jenyns	+				+	+	+	+	+		+	+
Pisidium (*Euglesa*) *supinum* Schmidt							+					
Sphaerium corneum (Linnaeus)							+					
Sphaerium rivicola Lamarck	+										+	
Sphaerium solidum (Normand)											+	
Neritidae												
Theodoxus fluviatilis (Linnaeus)							+	+			+	
Valvatidae												
Valvata cristata Müller						+						
Valvata naticina Menke							+					
Valvata (*Cincina*) *piscinalis* (Müller)							+					
Viviparidae												
Viviparus viviparus Linnaeus							+					

cording to the published data, the larvae of chironomids *Epoicocladius ephemerae* are found in the Salacas River in Latvia (Parele & Kachalova 1989).

For comparison, we present the data on the distribution of some macrozoobenthic species in small rivers of Lithuania and the Kaliningrad region of Russia (Shibaeva 2000; Fig. 1).

In small Lithuanian rivers, the most frequently found chironomid species is *Cricotopus algarum* (75%); in the rivers of the Kaliningrad region, this species is also frequently found (52.6 %).

Some species of zoobenthos, such as caddisflies (*Hydropsyche* sp.), molluscs (*Bithynia tentaculata* and *Sphaerium rivicola*) and mayflies (*Caenis macrura*) were distributed almost equally in Lithuania and the Kaliningrad region.

In small Lithuanian rivers, such Diptera species as *Dicranota bimaculata* (75% of the investigated rivers), *Simulium* sp. (75% of the investigated rivers), *Tipula* sp. (33.33% of the investigated rivers), caddisflies *Rhyacophila nubila* (41.67% of the investigated rivers), molluscs *Ancylus fluviatilis* (33.33% of the investigated rivers) are frequent, whereas in the Kaliningrad region, they make only 10.5, 5.3, 5.3, 10.5, 5.3% respectively of the investigated rivers (Fig. 1).

Mayflies of the genus *Baetis* were identified in all the investigated small rivers of Lithuania, whereas in the small rivers of the Kaliningrad region they were not found at all. In small Lithuanian rivers, such mollusc species as *Pisidium nitidum*, *Hippeutis complanatus* and *Lymnaea auricularia* were quite frequent, whereas in the Kaliningrad region they were not found. The larvae of Coleoptera *Riolus cupreus* and *Spercheus emarginatus* are frequent in small rivers of Lithuania, whereas in small rivers of the Kaliningrad region they have not been found. In small Lithuanian rivers, caddisflies *Anabolia soror*, *Apatania fimbriata*, *Stenophylax* sp., water bug *Aphelocheirus aestivalis*, Odonata *Calopteryx splendens*, molluscs *Theodoxus fluviatilis*, stoneflies *Leuctra* sp., chironomids *Cricotopus sylvestris* and *Orthocladius saxicola* are quite frequent, whereas in the rivers of the Kaliningrad region, such mayfly species as *Centroptilum luteolum*, crustaceans *Gammarus pulex* and *Asellus aquaticus*, leech *Erpobdella octoculata* and *Glossiphonia complanata*, chironomids *Cryptochironomus defectus, Micropsectra junci*, molluscs *Sphaerium solidum* and *Physa fontinalis* are more abundant.

The lowest Sørensen coefficient of similarity was determined between the cold-water Beržupis River and the Bražuolė River (it made 0.078 or 7.8%). The Beržupis and Bražuolė Rivers are rivers of different thermal conditions and they belong to different basins. These are the main reasons for the differences in species composition in these two streams. The small values of this coefficient were also determined between the Pazgrinda and Saria Rivers, Pazgrinda and Viešetė Rivers, and between the Punelė and Bražuolė Rivers (Table 3). The Beržupis, Pazgrinda, Saria, Viešetė and

Table 2. The number of macrozoobenthic species in the taxonomic groups in small Lithuanian rivers (1996–2001).

Taxons	The basin of the Žeimena River		The basin of the Venta River		The basin of the Merkys River					
	Saria		Viešetė		Beržupis		Derežna		Pazgrinda	
	n	%	n	%	n	%	n	%	n	%
Hirudinea	2	5.88			1	4.76				
Isopoda										
Amphipoda	1	2.94					1	2.94		
Odonata			1	2.94						
Ephemeroptera	7	20.59	6	17.65	3	14.29	4	11.76	4	21.05
Plecoptera	1	2.94	1	2.94	4	19.05			1	5.26
Megaloptera	1	2.94								
Heteroptera	1	2.94								
Coleoptera larvae	2	5.88	4	11.76	1	4.76	2	5.88		
Coleoptera imago	1	2.94					2	5.88	2	10.53
Trichoptera	6	17.65	9	26.47	6	28.57	9	26.47	4	21.05
Lepidoptera										
Other Diptera	7	20.59	3	8.82	4	19.05	4	11.76	2	10.53
Chironomidae	3	8.82	4	11.76	1	4.76	9	26.47	6	31.58
Mollusca	2	5.88	6	17.65	1	4.76	3	8.82		
Total	34	99.99	34	99.99	21	100.00	34	99.98	19	100.00

Table 2 continued

Taxons	The basin of the Nemunas River				The basin of the Verknė River				The basin of the Mūša River				The basin of the Neris River	
	Baltoji Ančia		Punelė		Samė		Strūzda		Vilkvedis		Voverkis		Bražuolė	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Hirudinea	1	1.75					1	2.86	2	4.17	3	5.08	1	3.33
Isopoda	1	1.75					1	2.86	1	2.08	1	1.69		
Amphipoda	1	1.75							1	2.08	1	1.69		
Odonata	2	3.51							1	2.08	1	1.69	2	6.67
Ephemeroptera	5	8.77	8	22.86	2	10.53	3	8.57	7	14.58	5	8.47	5	16.67
Plecoptera	1	1.75	1	2.86	1	5.26	1	2.86	2	4.17	2	3.39	1	3.33
Megaloptera											1	1.69		
Heteroptera	2	3.51											1	3.33
Coleoptera larvae	3	5.26	3	8.57	1	5.26			4	8.33	1	1.69	1	3.33
Coleoptera imago	1	1.75	2	5.71					2	4.17				
Trichoptera	7	12.28	6	17.14	4	21.05	9	25.71	12	25.00	14	23.73	2	6.67
Lepidoptera			1	2.86										
Other Diptera	4	7.02	4	11.43	5	26.32	4	11.43	3	6.25	5	8.47	1	3.33
Chironomidae	15	26.32	6	17.14	3	15.79	14	40.00	7	14.58	19	32.20	6	20.00
Mollusca	14	24.56	4	11.43	3	15.79	2	5.71	6	12.50	6	10.17	10	33.33
Total	57	99.98	35	100.00	19	100.00	35	100.00	48	99.99	59	99.96	30	99.99

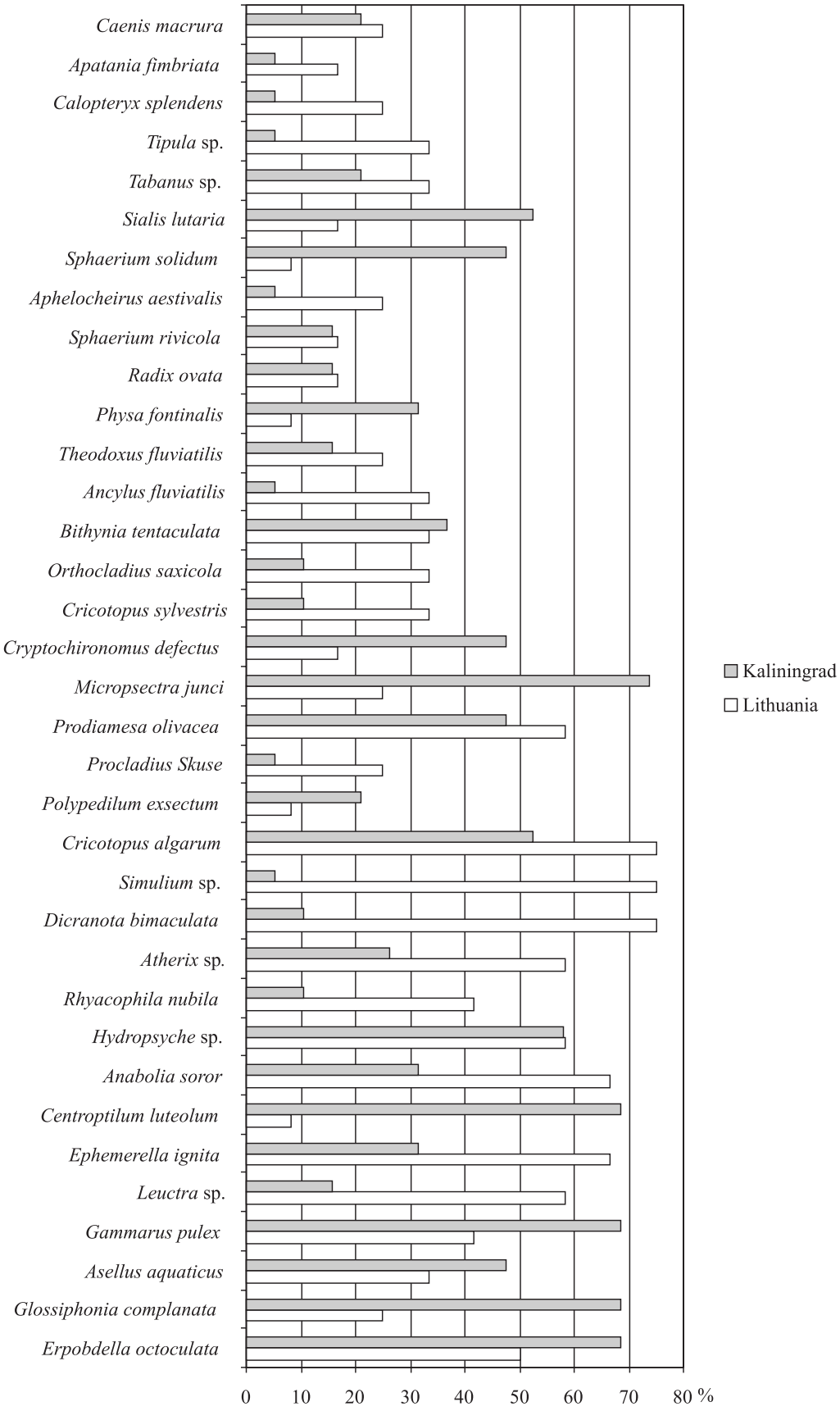

Figure 1. Occurrence of separate macrozoobenthic species in small rivers of Lithuania and the Kaliningrad region (%).

Table 3. The Sørensen coefficient of similarity in small Lithuanian rivers.

	Voverkis	Pazgrinda	Beržupis	Derežna	Punelė	Baltoji Ančia	Viešetė	Saria	Strūzda	Bražuolė	Samė
Vilkvedis	0.52	0.24	0.20	0.44	0.41	0.42	0.39	0.39	0.31	0.33	0.24
Voverkis		0.18	0.23	0.42	0.32	0.43	0.34	0.37	0.38	0.25	0.26
Pazgrinda			0.35	0.38	0.22	0.16	0.11	0.10	0.26	0.20	0.23
Beržupis				0.37	0.36	0.20	0.22	0.29	0.28	0.078	0.35
Derežna					0.55	0.42	0.29	0.44	0.38	0.25	0.34
Punelė						0.37	0.40	0.55	0.31	0.21	0.26
Baltoji Ančia							0.38	0.37	0.35	0.37	0.21
Viešetė								0.38	0.29	0.19	0.30
Saria									0.32	0.31	0.30
Strūzda										0.15	0.41
Bražuolė											0.20

Punelė Rivers are cold-water streams, but they belong to different basins. This factor, presumably, determines the above-mentioned differences. For comparison, we present the Sørensen coefficient of similarity between the small rivers of Lithuania and Latvia and Lithuania and the Kaliningrad region. Their values are correspondingly 30.91% and 20.42%.

The variation of the values of the Sørensen coefficient of similarity from 0 to 13% testifies about marked differences in species composition and strictly determined distribution in space. The fluctuation of the coefficient between 9.5 and 18.5% point to quite great differences in the qualitative structure of biocenoses (Kamenev 1987).

According to the Sørensen coefficient of similarity, the closest streams according to the species composition of macrozoobenthos are Derežna and Punelė, Punelė and Saria, Vilkvedis and Voverkis Rivers.

Derežna, Punelė and Saria Rivers are of a similar thermal type and belong to the net of cold-water rivers.

The Vilkvedis and Voverkis Rivers are cold-water rivers and belong to the Mūša River basin. This factor, presumably, determines the similarity of their benthofauna.

Acknowledgements

We thank Dr Vytautas Kesminas, Head of the Freshwater Ecology Department of the Institute of Ecology, for his help in collecting this material.

References

Environmental data centre [EDC] 1993. *Manual for integrated monitoring. Programme phase 1993–1996*. Helsinki: Environmental data centre, national board of water and the environment.

Kamenev, A.G. 1987. *Biological resources of macrozoobenthos in the Mokshi and Sura Rivers.* Saratov: Saratov University publishers (in Russian).

Kazlauskas, R. 1959. Material on the fauna of *Ephemeroptera* in the Lithuanian SSR with a description of a new species *Eurylophella lithuanica* Kazlauskas sp. n. and imago *Neoephemera maxima* (Joly). *Scientific works of Vilnius V. Kapsukas University*, XXXVI. *Biology*, *Geography*, *Geology* XXIII (VI): 157–171 (in Russian).

Kazlauskas, R. 1960. Some data on the Thrichoptera in the rivers of the Lithuanian SSR. *Scientific works of Vilnius V. Kapsukas University*, XXXVI. *Biology*, *Geography*, *Geology* XXXVI (VII): 179–193 (in Lithuanian).

Kazlauskas, R. 1962. Some data on the *Plecoptera* in the rivers of the Lithuanian SSR. *Scientific works of the Lithuanian SSR high schools*. *Biology* 11: 163–174 (in Lithuanian).

Kilkus, K. 1998. *Geography of the Lithuanian waters*. Vilnius: Apyaušris (in Lithuanian).

Kutikova, L.A. and Starobogatov, Y.I. (eds) 1977. *A guide to freshwater invertebrates in the European part of the USSR* (*plankton and benthos*). Leningrad: Gidrometeoizdat (in Russian).

Lipin, A.N. 1950. *Freshwaters and their fauna*. Moscow: State Educational Publishing House of the Ministry of Education of the Russian Federation (in Russian).

Pankratova, V.Y. 1970. *Larvae and pupae of chironomidae*, *subfamily Orthocladiinae of the USSR fauna* (*Diptera*, *Chironomidae*, *Tendipedidae*). Leningrad: Nauka.

Pankratova, V.Y. 1983. *Larvae and pupae of chironomidae*, *subfamily Chironomidae*, *of the USSR fauna*. Leningrad: Nauka.

Parele, E.A. and Kachalova, O.L. 1989. Macrozoobenthos. In: P.A. Tsimdin (ed.) *Biocenotic structure of small rivers*. *The basin of the Salaca River*, pp. 126–147. Riga: Zinatne. [Пареле, Э.А., Качалова, О.Л. 1989. Макрозообентос. В кн. П.А. Цимдиня *Биоценоти-*

ческая структура малых рек. Бассейн реки Салаца, с. 126–147. Riga: Zinatne.]

Shibaeva, M.N. 2000. Species composition of zoobenthos in small rivers of the Kaliningrad region. Hydrobiological studies in the basin of the Atlantic Ocean. (*Collection of scientific works*). *Hydrobiology of freshwaters* 1: 58–73. [Шибаева, М.Н. 2000. Видовой состав зообентоса малых рек Калининградской области. Гидробиологические исследования в бассейне Атлантического океана. (*Сб. науччных трудов*). *Пресноводная гидробиология* 1: 58–73.]

Sørensen, T. 1948. A method of establishing groups of equal amplitude in plant sociology based on similarity of species content. Det Kong. *Danske Vidensk. Selsk. Biol. Skr*. (Copenhagen) 5 (4): 1–34. [Cited in Mueller-Dombois and Ellenberg (1974:214)].

Spriņģe, G. (ed.). 1999. *Hydrobiological research in the Baltic countries*. *Part I. Rivers and Lakes*. Vilnius: Institute of Ecology.

Šivickis, P. 1960. *Lithuanian mollusca and their characteristics*. Vilnius: State Publishing House of scientific and political literature.

Tsalolikhin, S.I. (ed.) 1994. *Key to freshwater invertebrates of Russia and adjacent lands*. Vol. 1. St. Petersburg: Institute of Zoology of Academy of Sciences of the USSR (in Russian).

Tsalolikhin, S.I. (ed.) 1995. *Key to freshwater invertebrates of Russia and adjacent lands*. Vol. 2. St. Petersburg: Institute of Zoology of Academy of Sciences of the USSR (in Russian).

Tsalolikhin, S.I. (ed.) 1997. *Key to freshwater invertebrates of Russia and adjacent lands*. Vol. 3. St. Petersburg: Institute of Zoology of Academy of Sciences of the Russian Federation (in Russian).

Tsalolikhin, S.I. (ed.) 1999. *Key to freshwater invertebrates of Russia and adjacent lands*. Vol. 4. St. Petersburg: Institute of Zoology of Academy of Sciences of the Russian Federation (in Russian).

Tsalolikhin, S.I. (ed.) 2001. *Key to freshwater invertebrates of Russia and adjacent lands*. Vol. 5. St. Petersburg: Institute of Zoology of Academy of Sciences of the Russian Federation (in Russian).

Makrozoobentoso rūšinė sudėtis Lietuvos mažose upėse

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Santrauka

Straipsnyje nagrinėjama 12 skirtingo terminio režimo Lietuvos mažų upių makrozoobentoso rūšinė sudėtis 1996–2001 m. Tyrimų rezultatai parodė, kad maži upeliai tarpusavyje skiriasi pagal makrozoobentosinių organizmų rūšių skaičių. Gauti duomenys lyginami su Kaliningrado srities mažomis upėmis. Gauti rezultatai parodė, kad tik 11,33% rūšių randamos pusėje arba daugiau negu pusėje tirtų upių; t.y. tik 17 iš 152 rūšių turi platų paplitimo spektrą mažose upėse. Didžiausias zoobentocenozių panašumas pagal Sorensoną nustatytas ne tik to paties baseino mažose upėse. Skirtingų baseinų mažų upių zoobentocenozių panašumą ir skirtumą lemia ir kiti gyvenamosios aplinkos veiksniai, kaip upės terminis režimas, grunto pobūdis ir kt.

Received: 11 September 2002
Accepted: 20 September 2002