CURRENT RESEARCH

THE DIVERSITY OF CHIRONOMIDAE IN LOTHIC AND LENTHIC ECOSYSTEMS IN PRYBAIKALIYE

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Abstract

Taxonomic diversity of chironomid larvae in Prybaikaliye water bodies (creeks, rivers and lakes) have been studied. It is shown that Lake Baikal is a buffer zone between water catchment basin and water body. Habitat conditions in the Lake Baikal littoral promote formation of a limno-rheophilic complex of chironomid species.

Introduction

More than 300 rivers and creeks flow into Lake Baikal. Terrigenous material and allochtonous organic material, plants and animals flow into Lake Baikal via the inflow waters. The interaction of water catchment basin with the water body can be a mechanism for the formation of faunal diversity in aquatic ecosystems. From this point of view we believed that it would be reasonable to characterise taxonomic diversity of invertebrates, in particular of chironomid larvae inhabiting both stagnant (lakes), and flowing (creeks, rivers) pre-Baikalian waters.

Materials and methods

The samples used in this study were collected by researchers of Limnological Institute of RAS SB, Institute of Biology and Zoology chair of the Department for Biology and Soils of Irikutsk State University during 1975-2000. Species composition of chironomid larvae is determined in quantitative benthic samples from Lake Baikal (700 samples), in fish stomachs, in qualitative and quantitative benthic and drift samples from rivers, creeks (260 samples) and lakes (100 samples) in Prybaikaliye. Fauna analysis is done taking into account original and published data (VERSHININ 1964, BAZIKALOVA 1971, ERBAEVA 1976, ERBAEVA et al. 1977, LINEVICH 1981, KLISHKO 1995, Lake Baikal... 1998, BUYANTUEV 1999, PROVIZ 2000, KRAVTSOVA 2000, KOZHOVA et. al. 2000, TAKHTEEV et al. 2000, etc.) in 25 flowing waters, 41 pre-Baikalian lakes (including lakes Baikal and Khubsugul) and thermal springs of Prybaikaliye. To assess faunal similarity (by Sorensen factor) of different chironomid habitats in the „river-lake“ system, cluster analysis was used.

Results

More than 300 species and larvae of chironomids are recorded for pre-Baikalian water bodies including larvae identified up to species groups (Table).

Discussion

The Chironomidae fauna of Prybaikalie rivers, creeks and lakes is diverse. Larvae of 2 subfamilies, Chironominae and Orthocladiinae, dominate. Representatives of the subfamily Podonominae are not recorded for the lakes (see Table). 111 chironomid taxa are found both lacustrine and riverine ecosystems of Prybaikaliye.

Table: Taxonomic composition of chironomids species in Prybaikaliye water bodies

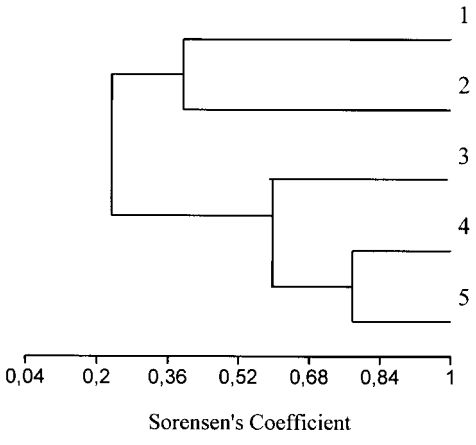
Pre-Baikal water bodies	1		2		3		4		5	
Number	genera	species	genera	species	genera	species	genera	species	genera	species
subfamilies										
Podonominae	2	3	0	0	0	0	0	0	0	0
Tanypodinae	10	13	8	12	5	7	7	11	5	7
Diamesinae	9	24	3	4	5	9	4	7	0	0
Prodiamesinae	3	4	1	1	2	2	1	1	0	0
Orthocladiinae	32	81	20	42	20	44	16	45	6	9
Chironominae	33	85	34	97	29	73	24	42	9	15
Total	89	210	64	156	61	135	52	106	20	31

Notes. 1 - The Pre-Baikalian rivers, creeks including Angara R. and reservoirs; 2 - lakes of Baikalian rift zone; 3 - Lake Baikal; 4 - Lake Khubsugul; 5 - thermal springs of Prybaikaliya.

Analysis of the chironomid fauna in one of the largest lakes of the region studied, i.e. in Lake Baikal and in its largest tributary (contributing about 60 % of all the inflow volume), Selenga River, showed the following: 135 species and larval forms of chironomids are found in Lake Baikal, including 82 in the littoral of the lake (depths of 0-20 m) 12% of them endemics (PROVIZ 2000). The high species diversity of chironomids in Lake Baikal is due to the peculiar habitat conditions: heterogenous distribution of bottom sediments, high oxygen content and good light supply, promoting the development of such algae as *Ulotrixa*, *Tetraspora*, *Draparnaldiellia*. The velocities of near-bottom currents in Lake Baikal at depths of 0.6 -1.2 m can reach 5 - 7 m/sec at a wave height of 0.5-1 m, at depths up to 5 m-1 m/sec (KARABANOV, KULISHENKO 1990). Active hydro- and lythodynamic processes in the Lake Baikal littoral create conditions close to rheophilic ones. The biological inflow (active and passive drift) through the system of rivers and creeks causes penetration of rheophilic Chironomidae into Lake Baikal.

69 species and larvae forms of chironomids are found in Selenga River. The diversity of chironomid fauna along the longitudinal river profile decreases with the decrease of the height above sea level. Faunistic similarity of chironomids (by Sorensen factor) of Selenga River on Mongolian and Russian territory is not high (Fig. 1).

Fig. 1. Faunistic similarity of chironomids



Notes: Selenga River on Mongolian territory - 1 and Russian one - 2; sors - 3; pre-delta zone - 4; open Baikal - 5.

Litho- and psammophilic species dominate in the chironomid fauna of Selenga River due to widely distributed sandy pebble substrata; boulders on silty substratum in the lower currents. Maximal number of species (6) is found in the genera *Eukiefferiella* (Orthocladiinae) and *Cryptochironomus* (Chironominae). Mouth and predelta zone are characterised by low species diversity (28 chironomid species). The outflow current of Selenga River, in particular its hydrological regime and sedimentation processes, creates the conditions different from the riverine ones and from the open Baikal waters, and close to lacustrine ones. There are sandy substrata, aleuritic silts with detritus. There are no typical rheophilic species of the Diamesinae or larvae of the Chironominae characteristic of high current flows. Faunistic similarity of the chironomids in these areas and in Selenga River is weakly expressed and is from 12-26 % (See Fig. 1). In the open Baikal (near the Selenga mouth) chironomid diversity (45 species) is a little less than in Selenga River. The similarity of chironomids in open Baikal is closer to the mouth and pre-delta zone of Selenga River (64-74 %) than in Selenga River itself (24-29 %). This is due to intensive water exchange of mouth and pre-delta zone with the open Baikal, through outcome and income phenomena caused by winds from different directions. In the bottom sediments of shallow depths (up to 20 m) of the open Baikal well grained sands and aleurite predominate, while stony substrata are widespread near the northern and southern boundaries of the Selenga area. In deep-water zones (over 100 m) there is clay, silt and small vegetable detritus. Among the chironomids here are representatives of all five subfamilies, both rheo- and limnobionts.

The study of chironomid diversity in the different habitats of the „river-lake" system of Selenga River. and Selenga area of Lake Baikal showed that in spatial distribution of chironomid larvae, an „edge effect" is observed in the littoral of the open Baikal out of the direct influence of the Selenga River outflow. In other sites of the open Baikal, the rheophilic fauna part is 33 % (SAMBUROVA 1982). Probably, the littoral of the open Baikal is not to be seen from the point of view of physical contact, but from one of interaction between lotic and lentic ecosystems, which can be called an ecotone or buffer system.

The results of the chironomid studies in Prybaikaliye flowing waters have changed a little existing opinion on the endemism of this fauna. The species *D. baicalensis* TSHERN., *Paratanytarsus baikalensis* (TSHERN.), *Neozavrelia minuta* (LINEV.), in our opinion are not Baikalian endemics as they are found outside it. Previously they were considered to be restricted to Lake Baikal but that was due to an insufficient knowledge of the input river systems' fauna. At present, the first species is known also from the Amur River basin, the second from the lakes of Barguzin River basin as well as long the Selenga River and the last one fromthe Irkut River.

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