ANIMAL HUSBANDRY

DOI: https:/doi.org/10.23649/jae.2019.4.12.9

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Received: 28.10.2019; Accepted: 06.11.2019; Published: 16.12.2019

INFLUENCE OF ACTIVITY OF COMMON BEAVER (*CASTOR FIBER L.*) ON ZOOBENTHOS OF SMALL SUB-MOUNTAIN RIVERS IN ABSENCE OF LARGE DAMS, ON EXAMPLE OF RIVER KUZHA

Research article

Abstract

Collection of samples was carried near river Kuzha in nature reserve Shulgan-Tash by Laboratory of animal ecology and biomonitoring «EFA» in year 2017. In course of research, 20 taxons of macroinvertebrates of river Kuzha were determined: *Ephemeroptera* (dayfly), *Plecoptera* (stonefly) both in larval stage, which are the significant indicators of eutrophication level. Preliminary conclusion was made: life-sustaining activity of European beaver is making noticeable difference in life-sustaining activity of zoobenthos, even though beaver's habitat development is low in this area, thus increasing percent of nonrheophilic species.

Keywords: beaver, zoobenthos, eutrophication, damless beaver colonies, sub-mountain rivers.

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Получена: 28.10.2019; Доработана: 06.11.2019; Опубликована: 16.12.2019

ВЛИЯНИЕ ДЕЯТЕЛЬНОСТИ БОБРА ОБЫКНОВЕННОГО (*CASTOR FIBER L.*) НА БЕНТОФАУНУ МАЛЫХ ПРЕДГОРНЫХ РЕК НА ПРИМЕРЕ Р.КУЖА В УСЛОВИЯХ ОТСУТСТВИЯ КРУПНЫХ ПЛОТИН

Научная статья

Аннотация

В 2017 году Лабораторией экологии животных и биомониторинга «ЭФА» проводился сбор материалов в районе р. Кужа государственного природного заповедника Шульган-Таш. В ходе проведения работы было определено 20 таксонов макробеспозвоночных реки Кужа, относящихся к отрядам *Ephemeroptera* (подёнки) и *Plecoptera* (веснянки) на стадии личинки, являющихся надёжными индикаторами степени эвтрофирования. Получены предварительные выводы о том, что жизнедеятельность бобра европейского на р. Кужа действительно вносит некоторые изменения в жизнедеятельность зообентосных организмов, несмотря на слабую строительную активность бобра на данном участке, увеличивая процент нереофильных видов.

Ключевые слова: бобр, зообентос, эвтрофирование, бесплотинные поселения бобров, предгорные реки.

1. Introduction

Headwaters are the least studied and most numerous class of water objects, so attention to problems of this type of water sources has increased. As a result of such zoogenic factor as life sustaining activity of a beaver, changes appear of hydrological and hydrochemical regime of a water objects. Communities of hydrobionts undergo massive changes as well [1] [2].

Beavers transform surface patterns of river valleys, change drain mode and hydrochemical regimes in rivers by forming large landscape unities – beaver's ponds [3] [4]. At present time, beaver's impact on benthic fauna of sub-mountain rivers is

not studied enough, existing data on beaver's impact on benthic fauna is insufficient and contradictory, there are different assessment of this impact [1] [2] [3] [5]. There was no research on benthic fauna in damless beaver colonies in Russia.

Collection of samples was carried near river Kuzha in nature reserve Shulgan-Tash by Laboratory of animal ecology and biomonitoring «EFA» in year 2017. 19 samples of macrofauna were taken from different stream segments, of which 7 were used in this study. Samples of invertebrates were taken using qualitative method, with net, driftwood and stones were examined closely. On sites with sandy and muddy bottoms, soil sampling was carried, using rinsing method (soil sieve with 0,5 mm diameter openings). Measurements have been made of depth, width of water passageway, temperature, pH and total hardness of water. Hydrochemical indicators were determined using test-packages made by SPA «Christmas +» and «AquaMerck» routinely. pH level was determined using multipurpose liquid indicator, total hardness of water – by means of titrimetry. Area of section of outfall's open marks was determined to estimate streamflow of rivers and brooks. Section was divided into several segments, for each of them stream velocity was determined by using surface-float method. After primary identification, organisms were fixated using 70% ethanol and labeled [6].

Further identification was carried in laboratory conditions (partially at the premises of Institute of lake hydrology RAS), using binocular MBS-10 and microscope Biolam P-16 and field guide edited by S.Ya. Tsalolikhin [7]. Stoneflies were partially identified using Lillehammer's field guide [8]. Identification was carried down to the species, in complicated cases – down to genus.

Evaluation of saprobity was carried using Pantle-Bukk method in M.V.Chertoprud modification [9] for different sites of Kuzha river and some of its tributaries. 20 taxons of Kuzhas river macrovertebrates, ordinal to *Ephemeroptera* (dayfly), *Plecoptera* (stonefly) both in larval stage, which are the significant indicators of eutrophication level, were determined in course of research [5]. *F. Baetidae* and *F.Heptageniidae* were encountered in the water course the most. The most present were *F.Heptageniidae* larvae. In general, spreading of macrofauna was heterogenic (Tab. 1). Highest species diversity was discovered in samples taken from sites of Kuzha river which were located upstream to beaver dams. Saprobity index for samples from sites regulated by beaver was 1.54, for samples from sites, which were not regulated by beaver – 1.6. These values are extremely low and in general are typical for mountain and sub-mountain brooks. Thus, usage of this method discovered no difference in saprobity of sites regulated and non-regulated by beaver. This is consistent with of author of the method, M.V.Chertoprud, recommendations to use at least 5 and better 10 taxones of invertebrates in calculations [9]. In our case, we only used 2 taxons and didn't get conclusive results. Least amount of varieties of stoneflies and dayflies (2 minimally detected taxons) was discovered in deep sandy paddy pond of beaver's brook, in mudflat with slow streamflow above the dam and also on site outside of beaver's activity. The cause of such elimination of group of organisms is that many dayflies and stoneflies are classify as typical rheophils. Their high sensitivity to eutrophication, including zoogenic eutrophication, makes them susceptible to changes in outside environment. However, we cannot exclude such factor as increasing amount of carnivorous bugs (*Coleoptera*) typical for beaver ponds, mentioned in preliminary sample review [10].

Table 1 – Species composition of stoneflies and dayflies larvae in researched site of Kuzha river

	Sample 1	**Sample 2**	**Sample 3**	**Sample 4**	**Sample 5**	**Sample 6**	**Sample 7**
Ord. Ephemeroptera							
Fam. Baetidae		+					
Ameletus inopinatus	+						
Baetis lapponica		+					
Baetis vernus						+	
Baetis sp.	+				+		
Cloeon sp.		+		+			
Fam. Caenidae							
Caenis horaria	+	+			+	+	
Caenis rivulorum		+			+		
Fam. Heptageniidae							
Heptagenia sulphurea		+			+		
Heptagenia sp.	+	+	+		+	+	
Fam. Ephemerellidae							
Ephemerella ignita		+					
Fam. Leptophlebiidae							
Leptophlebia marginata			+				
Ord. Plecoptera							
Fam. Leuctridae		+					+
Leuctra digitata	+				+		
Fam. Nemouridae							
Amphinemura sp.				+			
Fam. Perlodidae					+		
Scwala sp.		+					
Arcynopterix sp.		+					
Isogenus nubecula							+
Isoperla obscura	+				+		
Fam.Taeniopterygidae							
Brachyptera braueri	+						
Number of taxons:	***7***	***11***	***2***	***2***	***8***	***3***	***2***

Obtained data confirms previously known, and described in literature, regulations about lowering amount of reophilic species in paddy ponds located right ahead of dams because of high level of eutrophication in this sites [1] [2] [3] [5] [10].

Initial observations and preliminary sample review allowed to assume that amount of non-rheophilic species increased (this data is not included in present paper). However, tumbledown and lengthwise dams effect is much weaker, than such in crossover dams bridging over the river. Thus, beaver's edification impact in colonies where burrows is prevalent to lodges is weaker than such in colonies, where beavers construct cascades of dams. In summary, we can make initial conclusions, that life-sustaining activity of European beaver is making noticeable difference in life-sustaining activity of zoobenthos, even though beaver's habitat development is low in this area, thus increasing percent of nonrheophilic species.

Authors are expressing gratitude for cooperation to staff members of Shulgan-Tash nature reserve, colleagues Nikolay Aleksandrovich Zavialov, Ivan Viktorovich Bashinskiy. Aleksander Vitalyevich Krylov, Aleksander Aleksandrovich Prokin, Aleksey Sergeyevich Sazhnev, Dmitriy Vladimirovich Kulakov, Iraida Aleksandrovna Skalskaya, Mikhail Vitalyevich Chertoprud, member of the Institute of Biology of Karelian science center RAS Igor Aleksandrovich Baryshev and member of the Institute of lake hydrology RAS Natalya Vladimirovna Rodionova.

Conflict of Interest

None declared.

Конфликт интересов

Не указан.

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