# RIVERS FRAGMENTATION AND FISH BIODIVERSITY: CASE STUDY OF THE RIVER SALACA BASIN STREAMS

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Rivers are one of the most anthropogenically disturbed ecosystems. They are used for transport, water supply, electricity, food production and wastewater discharge. The most common forms of anthropogenic effects in rivers are river hydromorphological alteration, fragmentation, chemical pollution and increased nutrient load. These effects generally leads to degradation of river ecosystems by reducing of water quality and causing changes in the biota (Poff et al., 1997).

Similar processes occurred in Latvia. Impact of dams on fish distribution referred to the early 1930s (Cukurs, 1930). In watercourses of Latvia today more than 700 artificial obstacles are listed (Birzaks et al., 2011). Approximately 60% of the national territory is not currently available for migratory fish species. Construction of hydroelectric power plant cascade in the largest river of Latvia, the river Daugava, is the most important factor that affecting not only the species distribution (Birzaks and Aleksejevs, 2012), but also fish resources in the Gulf of Riga (Ojaveer and Gaumiga, 1995).

All together 26 rivers in total of 59 sites have been surveyed in the rivers of Salaca basin using electrofishing. Fish biodiversity have been calculated: 1) by the number of species per 100 $m^2$ area surveyed in separate fish sampling site, 2) by the number of species per 100 $m^2$ combining sampling sites of each river. Fish diversity calculated using Shannon index $H'$ $\log_e$. Fish sampling sites and rivers divided into groups: 1) accessible to diadromous fish species; 2) partially accessible to diadromous fish species (rivers with dams and rivers located upstream of Staicele); 3) not accessible to diadromous fish species (rivers blocked by dams downstream in basin).

The normality of data was assessed by Kolmogorov-Smirnov test. Comparison of diversity was performed using one- way ANOVA, significances were evaluated post hoc Tukey test. Tests of significance were evaluated at a 95% level of confidence.

In total 38 fish and two species of lampreys were found in the sampled rivers. The highest biodiversity is characteristic to river sections that are accessible or partially accessible to diadromous fish species, H' values, accordingly, 1.92 and 1.13. In the rivers that are not accessible to diadromous species, it was only 0.89. However, data analysis shows that these values do not differ significantly ($F = 2.71$, $p = 0.08$, $n = 58$).

Similar results were obtained by analyzing $H'$ differences per river. The biodiversity increases with increasing of accessibility of the river - 1.47 and 1.51. In the rivers, which are not accessible to diadromous species biodiversity is the lowest H' = 1.33. However, they do not differ significantly ($F = 0.21$, $p = 0.81$, $n = 26$).

It is known that anthropogenic barriers in rivers reduce distribution of diadromous fish species, thereby reducing the number of species in the river. In the rivers blocked by dams number and species of potadromous fishes increases. The relative number of fish and fish biomass increases in rivers with artificial reservoirs (Virbickas, 1998). Reservoirs affect river temperature regime, while providing suitable conditions to euritermic species which are not usually recorded in small and medium cold-water rivers (Birzaks, 2012). Our results demonstrating, that fish diversity in small and medium-size watercourses does not differ

significantly in rivers with different accessibility. Similarly, fish biodiversity increases in small and medium size rivers connected or running trough the lakes.

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