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How fluvial habitat variables shape the regional distribution of a threatened freshwater mussel

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Since decades, rivers have undergone numerous alterations that have led to disturbances in flow regimes, sediment transport, and water quality to name a few, leaving freshwater fauna facing among the highest risk of extinction. The thick shelled river mussel (*Unio crassus*) is a European endangered freshwater mussel. As an “umbrella” species, its preservation benefits the whole river ecosystem. However, it remains uneasy to establish a direct causal link between a specific factor of alteration and a decline in the mussel populations. Indeed, in Belgium, this species is unevenly distributed, and its decline is equally uneven. This study explores the link between the species and its fluvial habitat to identify which parameters of the abiotic and biotic environment are responsible for the current distribution of the thick shelled river mussel in Belgium. To test the ability of environmental variables to predict the presence of the species, hydro-geomorphological characteristics of the streams (e.g., return period of the bankfull stage, substrate grain size, land cover, local slope, stream power at bankfull stage...), physico-chemical parameters (water chemistry and pollutants), and host fishes’ abundance of the mussel were compiled. A regularized linear regression technique was used to select the relevant variables to the presence of the species. After selection, logistic regression was performed on the selected parameters to determine which variables have the greatest impact on the species distribution. Our analysis indicates local slope as the most impacting parameter for the presence-absence of the thick shelled river mussel in the studied rivers. Other parameters could be significant, especially at a more local scale. The ecological significance of river longitudinal profile in the existing distribution patterns of the species could be useful to river managers to optimise species habitat and helps establishing target actions to be undertaken to improve their conservation.