Environmental factors affecting shell development and the distribution of the snail *Caucasotachea vindobonensis* in Poland

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Abstract

This dissertation presents the results of research on the environmental factors that determine shell development, occurrence and spread of *Caucasotachea vindobonensis* in Poland. The geographical range and habitat types of this species were characterised on the basis of source materials. The habitat conditions in which *C. vindobonensis* lives were determined based on field measurements of insolation, temperature and soil pH, supplemented by laboratory tests of moisture and calcium carbonate content in soil (using gravimetric and Scheibler's methods). These studies included soil samples from xerothermic habitats and riparian forest sites of the continuous range and the insular range of this species. *C. vindobonensis* shells from these habitats were used for morphometric, structural, chemical, phase and mechanical studies carried out using various analytical methods and techniques (e.g. SEM, EDS, XRD, Vickers hardness test method). The impact of substrate-related environmental factors on the characteristics of *C. vindobonensis* shells as well as the effect of diet on shell growth rate (laboratory experiment) were studied using statistical analysis of the data. The population density of *C. vindobonensis* and the qualitative and quantitative composition of the malacofauna with which this species coexists in the above habitat types were examined using the squares method. The age structure of *C. vindobonensis* population and the structure of associations of mollusc groups were described. In riparian forest habitats situated in the Vistula valley (outside the continuous range), the population density of *C. vindobonensis* was studied depending on the distance from the riverbed and the contents of the following elements in soil: Ca, Fe, Mg, Sr and Mn. The contents of these elements were determined using the ICP-OES method. The impact of substrate-related environmental factors on *C. vindobonensis* population density was investigated using a statistical analysis of the data.

The continuous range of *C. vindobonensis* in Poland covers, among others, the belt of uplands, while the insular range includes the valleys of the Vistula, the Warta, the Noteć and the Oder. The effect of the passive movement of the species through the waterway is its presence in different habitats (sufficiently rich and poor in calcium). The availability of calcium in the substrate and the thermic and humidity-related conditions of these habitats affect shell growth and *C. vindobonensis* population density. In river valleys (within the insular range), the substrate chemistry and, especially, the calcium deficit limit the spread of this species to neighbouring areas. With the impermanent nature of riverside habitats, this means that the only refuge for *C. vindobonensis* are the calcium-rich upland habitats of south-eastern Poland.