Summary

According to classical theories of population dynamics and the significance of the habitat to this process, the lifetime of a population depends on there being a highly variable distribution of resources within its habitat. Most classic works examining individuals' responses to variable habitat quality relate to vertebrates or easily dispersing species; just a few apply to invertebrates with relatively poor locomotive abilities such as land snails.

This PhD thesis covers three publications describing research conducted between 2008-2010 at the site of Desmoulin's whorl snail (Vertigo moulinsiana) situated in the Nida Valley (Świętokrzyskie province, south-eastern Poland). Desmoulin's whorl snail is a small land snail of the genus Vertigo. The IUCN Red List classifies it as "vulnerable" throughout Europe; it is also listed in Annex II of the Habitats Directive. At the study site, which is frequently inundated, and is characterized by a dynamic hydrology and varied topography, the vegetation is highly variable in time and space.

The thesis addresses three questions: 1) How does a very poorly mobile invertebrate species manage to survive in such a dynamic, ephemeral habitat? 2) How do these habitat changes affect the spatial and temporal dynamics of its population? 3) Are there any mechanisms regulating / stabilizing this habitat-species system?

In the first paper (I), I describe the distribution of V. moulinsiana in the study area. I show that V. moulinsiana occurs significantly more often and in greater numbers in locations supporting sweet grass and sedges, preferring places defined as "wet" in the sweet grass, and avoiding sites defined as "dry" in the sedges. The interaction between vegetation and humidity on the density of V. moulinsiana has turned out to be statistically significant. The presence of Desmoulin's whorl snail is therefore related to the spatial structure of the vegetation: it exhibits a preference for patches of sweet grass and sedges growing in an area governed by a particular set of hydrological conditions (mainly "wet" places) that in turn give rise to a specific microclimate (a high level of air humidity).

The second paper (II) looks at the microhabitat preferences of V. moulinsiana. Within its preferred habitat, I investigated the species' occurrence in relation to habitat and climate differences on a very small spatial scale, again finding that the type of vegetation and soil moisture had a significant influence on its occurrence. I recorded the highest densities of snails in the ecotone habitat between the sweet grass and sedge patches, and within the sweet grass itself; the lowest densities were in the sedge. I also found that the leaf litter thickness

had a significant influence on the population density. The distribution of V. moulinsiana may therefore be irregular, with greater densities in wet places supporting vegetation including sweet grass (or among sweet grass alone), which have a thick layer of leaf litter.

I continue this topic in the third paper (III), which describes my investigations of the influence of a diverse habitat on the population dynamics and distribution of V. moulinsiana. I found that the abundance dynamics of this species was characterized by a gradual increase in the period from spring to summer, a rapid increase and a clear peak in numbers in summer that, with the onset of autumn, dropped equally rapidly to the pre-peak level, and finally a gradual decrease. I confirmed that this species preferred humid habitats with sweet grass: only there was I able to observe the rapid summer population growth, due probably to the sudden appearance of a large number of juveniles in the population. Only in this habitat, therefore, can the snails reproduce effectively enough to affect the dynamics of its population(s). The coupling of elements of life history features with habitat parameters probably creates a mechanism for regulating the numbers and distributions of individuals in space. The IFD model does not work for V. moulinsiana, so this species requires a special approach. The rapid summer increase in abundance in the sweet grass (source) should allow the production of surplus specimens, which, without impairing the stability of the population in the source habitat, could migrate to less favourable habitats (sink). Although the populations in the latter habitats would be unlikely to persist there, they could provide, in periods of great abundance, sufficient numbers of snails capable of colonizing fresh patches of source habitats. This would occur with greater frequency in the system of spatially and temporally dynamic habitats present at the study site. This can be regarded as another model of the spatial functioning of a population, based on the metapopulation system.