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Ecosystem functions of invasive aquatic plants

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Invasive species are considered one of the major threats for worldwide biodiversity. They are linked to degradation of habitat quality, loss of species, spread of disease and economic loss. Estimated costs of maintenance, mitigation and eradication programmes related to invasive species are in the range of millions to billions of dollars. However, there are also situations known in which invasive species represent a desired part of ecosystems. For example in the IJsselmeer, exotic mussels are staple food of waterfowl. Comparing invasive species with their native counterparts will increase our knowledge of how invasive species affect ecosystem functioning.

The model system of choice are submerged aquatic plants. These have a wide range of ecosystem functions like water quality (clear macrophyte-dominated or turbid green soup), providing food for higher trophic levels, providing habitat and shelter for macrofauna and nutrient cycling. A selection of these has now been tested in experiments where we compared native and exotic species on equal terms. A large outdoor experiment using cattle tanks (Figure 1) was initiated, and is still running, in which we are comparing native and exotic submerged species and their competitive ability against a 'native plant community'. Additionally, macroinvertebrate diversity is known to be strongly affected by the vegetation composition. To compare native and exotic species, another outdoor experiment was conducted to check how an assemblage of macroinvertebrates would function in monoculture of various plant species (Figure 2). The results will be analysed during the winter. As this study does not provide insight into the palatability of exotic species, a separate lab experiment has been initiated. We are investigating how different plant species of varying origin and with different plant traits are consumed by snails of a different origin (Figure 3).



Figure 1 | Outdoor experiment to test the impact of exotic and their native counterparts on a 'standardized plant community'.



Figure 2 | Experimental design to compare macroinvertebrate assemblages on monocultures of various native versus exotic species.



Figure 3 | Snail herbivory experiment utilising lots of beakers.

Water quality is particularly important, especially in a water-rich country like the Netherlands. Therefore, a field study was conducted to gain insight into the water quality and floral diversity of peatland waters invaded by exotic plants (Figure 4).

Some results have already been presented in Poznan (Poland) and Niagara Falls (Canada) during conferences about macrophytes and invasive species respectively.



Figure 4 | Sampling during field work.