

SUMMARY OF FINDINGS

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Freshwater Biodiversity in the Irish Agricultural Landscape: The Significance of Ponds

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Brief Abstract

Conserving freshwater biodiversity is a top priority of the United Nations International Decade for Action 'Water for Life' (2005-2015). Ponds, particularly those in the agricultural landscape, may play a major role in supporting freshwater biodiversity at the local, regional, and also at the national level. A survey of vascular plants and water beetles (Coleoptera) was conducted at over 100 farmland ponds and chemical data was collected. A statistical protocol to analyse the relationship between biological and environmental data in ponds was developed. A statistical protocol to analyse the relationship between multiple taxonomic groups was also developed. This allowed identifying the best predictors of pond biodiversity. It also allowed evaluating the effectiveness of the use of information on the composition of the vegetation in ponds as a surrogate for pond biodiversity in preliminary and cost-effective biodiversity assessments.

Key Words

Biodiversity; freshwater; ponds; ecological quality; surrogate taxa; plants; water beetles

Background

Fresh water is one of the most diverse and yet threatened components of global biodiversity. In Ireland, structural changes in the agricultural sector have resulted in a long-term decline in water quality, in the eutrophication of surface waters, and in the drainage and reclamation of non-farmed freshwater habitats, with likely detrimental losses of biodiversity that yet have to be assessed. Despite agriculture being the predominant land use, Ireland does not have yet in place a systematic programme to monitor changes in freshwater biodiversity associated with agricultural activities. The achievement of biodiversity and water quality objectives requires investigations on the distribution of freshwater habitats and their diversity, focusing in particular on those systems whose biodiversity potential is high and whose study has been largely neglected, such as ponds. Among freshwater ecosystems, the capacity of ponds to support more species, as well as more uncommon, rare, and threatened species compared to other freshwater ecosystems such as lakes and rivers has been highlighted in many studies. The conservation of ponds represents a major opportunity to maintain and even enhance biodiversity, due to their large number and the relatively small size of their catchments areas. Their conservation requires improving our understanding of the factors that are most important in determining pond biodiversity.

Key points

- The ecological quality and potential conservation value of 54 ponds in two regions in Ireland was investigated. Water beetles (Coleoptera) and wetland plants were used as indicators of pond biodiversity and a number of local environmental and management variables were measured.
- Water beetles (Coleoptera) and wetland plants were used as indicators of pond biodiversity and a number of local environmental and management variables were measured.
- To identify the main drivers of pond biodiversity, an assessment of the relationship between plants and beetles and between each taxonomic group with a range of environmental variables was made.
- Since the heterogeneity of the local and regional conditions characterizing ponds may hamper the identification and proper quantification of biotic-abiotic relationships, an analytical framework that allows the identification of the main drivers of pond biodiversity was developed and a number of recommendations were made.
- To address issues associated with the collection of extensive pond biodiversity data, including temporal and financial constraints, a quantitative assessment of the potential use of vegetation data as a surrogate for pond biodiversity was made.

Findings/Recommendations

- This study showed that farmland ponds contribute substantially to the maintenance of freshwater biodiversity in Ireland. A large number of water beetle and plant species were recorded from 54 farmland ponds. Of the 76 beetle species collected from the study ponds and representing over 30% of the Irish water beetle fauna, four species are included in the Red List of Irish Water Beetles.
- Grazing intensity and nutrient enrichment had a detrimental effect on the diversity of plant and beetle assemblages, whilst the presence of a buffer zone of marginal vegetation as well as that of a fence system improved the overall ecological quality of ponds.
- The diversity of the study ponds was only moderately correlated with pond surface area, indicating that the maintenance or the creation of small ponds characterized by a shallow zone may play a central role in the conservation of biodiversity.
- These findings provide a robust justification for the use of wetland plants as a surrogate group in the identification of ponds of conservation-priority. The similarity in the response of plants and beetles to the same environmental variables confirms that information on plant species composition is a useful indicator of disturbance in ponds.
- A recording scheme aimed at evaluating the distribution of freshwater biodiversity should be initiated and this should include plant and animal groups.
- Patterns of freshwater biodiversity should be regularly monitored, to assess the effect of environmental changes on biodiversity and to identify areas/systems where biodiversity is decreasing.

- A classification system of Irish ponds based on their ecological quality and biodiversity value should be developed. A ‘pond creation’ incentive should be developed with the aim of maintaining or even increasing freshwater biodiversity via the creation of good quality habitats for pond life.
- Financial benefits should also be created to promote the conservation of existing ponds, which are currently under the threat of degradation from the use of nitrates and phosphates, pesticides, herbicides, and from direct grazing.
- To improve the ecological quality of existing ponds, incentives should be provided as compensation for a decrease in the use of fertilizers herbicides and pesticides. Incentives should be offered for the creation of fences aimed at preventing direct grazing by cattle.

For Further Information

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Publications connected to this work (References)

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