

N° 4, received on 16-04-07

Gert-Jan van Duinen
Bargerveen Foundation
Dep. of Environmental Science & Dep. of Animal Ecology Faculty of
Science Radboud University Nijmegen P.O. box 9010 NL-6500 GL Nijmegen
The Netherlands

Tel: +31 24 3653296 (secretariate: +31 24 3653288)
Fax: +31 24 3653030 / +31 24 3553450
email: G.vanDuinen@science.ru.nl

Does raised bog restoration rehabilitate fauna diversity? A comparative study between intact, degraded and rewetted bogs.

Gert-Jan van Duinen, Ankie Brock, Albert Dees, Jan Kuper, Theo Peeters, Wilco Verberk, Yan Zhuge & Hans Esselink

Bargerveen Foundation / Department of Animal Ecology and Ecophysiology, Radboud University Nijmegen,
P.O. Box 9010, 6500 GL Nijmegen, The Netherlands (G.vanDuinen@science.ru.nl)

Most raised bogs remaining in Western Europe are degraded by drainage and peat extraction, as well as by increased nutrient availability due to increased deposition of atmospheric N and S. As *Sphagnum* growth is one of the prerequisites for restoration of raised bogs, restoration in degraded bogs focus on creating suitable hydrological conditions for *Sphagnum* recovery by means of retaining rain water. To study whether rewetting of raised bog remnants rehabilitates fauna diversity, we compared invertebrate species assemblages between 1.) water bodies in intact raised bog systems in Estonia, 2.) water bodies created by large-scale rewetting measures in raised bog remnants in the Netherlands five to thirty years ago and 3.) water bodies created by the former use of the bogs, like small-scale hand-peat cuttings, that have not been subject to restoration measures.

The invertebrate assemblages of the most nutrient-poor bog pools in Estonia were found to be absent in The Netherlands. Species inhabiting water bodies with a higher nutrient availability within Estonian bogs were dominant in both degraded and rewetted sites in The Netherlands. However, several species characteristic for transitions between ombrotrophic and minerotrophic parts of bog systems were lacking in Dutch bog remnants. Degradation of Dutch raised bogs has resulted in the loss of both the nutrient-poor parts and gradual transitions of bog landscapes. Both are not yet restored in bog remnants.

The microinvertebrate fauna (rotifers and microcrustaceans) was found to recover quickly after rewetting. However, this is not the case for macroinvertebrates, like non-biting midges and aquatic beetles. Until now rewetting measures, having attained varying success regarding the vegetation, resulted in a fairly similar macroinvertebrate assemblage, including only a part of the species spectrum of both intact and non-rewetted sites. This difference in response between micro- and macroinvertebrates is probably due to the less complex lifecycle of microinvertebrates and their easy dispersal by wind. Populations of microinvertebrate species, including characteristic species, can either persist in raised bog remnants during the process of rewetting or re-establish within a short period of time. Populations of rare and characteristic macroinvertebrate species (possessing traits such as low dispersal capabilities, slow growth and high tolerances to acidity and temporary drought) had been able to survive the slow process of degradation, persisting as relic populations in degraded bog remnants. However, they are unable to cope with rapid, large scale rewetting of sites during restoration and the subsequent lower habitat diversity.

Therefore, we recommend restoration strategies safeguarding relict populations of rare and characteristic species, as these are the remaining sources for colonisation of restored sites. Furthermore, retaining rain water generally results in similar changes at a large scale, leading to a loss of environmental heterogeneity. Restoration of the regional hydrological system may rehabilitate the

heterogeneity in both ombrotrophic and more minerotrophic parts of bog landscapes, required to rehabilitate the invertebrate diversity of raised bogs.