Hydro-hygrophilous vegetation diversity and distribution patterns in riverine wetlands in an agricultural landscape: a case study from the Oglio River (Po Plain, Northern Italy)

Rossano Bolpagni* & Andrea Piotti

Abstract: In the European plains, up to eighty percent of riverine wetlands have been lost due to alteration of hydrological regime and catchment exploitation. This condition is expected to be further negatively exacerbated by climate change. To better understand the observed change in distribution patterns of hydro-hygrophilous vegetation in temperate and Mediterranean floodplains, a vegetation survey was conducted within the lower Oglio River reach in Northern Italy. This river is a mid-size, altered and nutrient-rich left tributary of the Po River. During the 2008 growing season, a total of 60 marginal aquatic habitats were investigated. Overall, 37 vegetation communities were detected, showing a clear predominance of hygrophilous herbaceous plant communities both in terms of representativeness (55.1%) and diversity (54.1%) with respect to woody (22.9% and 10.8%, respectively), and obligate aquatic vegetation (22.0% and 35.1%, respectively). Our main findings were (1) the widespread presence of highly opportunistic, non-native and invasive hygrophilous plant communities (largely dominated by *Amorpha fruticosa*, *Phragmites australis* s.l., *Amaranthus* spp., *Bidens* spp., and *Cyperus* spp.), and (2) the limited distribution of hydrophyte vegetation usually dominated by pleustophytes (e.g., *Spirodela polyrhiza* and *Lemna* spp.). The present study confirms the dominance of secondary plant communities characterized by the widespread presence of alien species in lowland over-exploited riverscapes, coupled with a low local representativeness of native willow (*Salix alba*, *S. cinerea*) communities and anchored macrophyte (batrachid, ceratophyllid, elodeid, myriophyllid) meadows. Total vegetation diversity is consistent with previous studies in similar ecological contexts; on the other hand, at the site scale, the diversity values were extremely low. This is especially true for the aquatic vegetation, and can be related to the high water turbidity and chlorophyll-a concentrations that prevent the establishment and colonization of submerged and rooted hydrophytes. Consequently, we stress the need for metabolic and biogeochemical indicators to assess the actual trophic status of lowland wetlands in order to clarify their potential to be restored.

Keywords: alien species; hydrophyte community; marginal water body; regulated river; riparian vegetation; Southern Europe.

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Introduction

Rivers, streams and connected wetlands are among the world’s most threatened ecosystems (Cushing & Allan 2001). Water use and abuse, and anthropogenic impacts, are the major causes for both geomorphologic and hydrologic alterations of lowland aquatic environments (Kristensen & Hansen 1994; Riis & Sand-Jensen 2001). Dams and levees are primary causes of reduction of both longitudinal and lateral connectivity (Nilsson et al. 1997; Richards et al. 2002; Bissels et al. 2005). In addition, changes in the pattern and magnitude of natural water-level fluctuations are detrimental for seed germination and, in general, for adaptative strategies of hydro-hygrophilous plant species (Riis & Hawes 2002; Correa-Araneda et al. 2012). Rapid water level fluctuations and sudden modifications in seasonal discharge trends depress the establishment and development of anchored aquatic and helophyte plant species favouring opportunistic ones (e.g., aggressive native or alien taxa). Aquatic and semi-aquatic riverine wetlands are also affected by an excessive nutrients and pollutants from farmlands and...