Freshwater biodiversity in human-dominated landscapes: Introduction

doi: 10.1007/s10201-014-0439-y

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Worldwide, humans have converted natural wetlands into agricultural areas because of increasing demands for food. Rice paddy fields, farm ponds, fish ponds and irrigation and drainage ditches are typical landscape sectors in rural areas of Monsoon Asia and some parts of Europe and the Americas. Such habitats provide surrogate habitats for a range of aquatic wildlife that once inhabited natural wetlands (Elphick 2000; Lawler 2001).

Traditionally, scientists and policy makers have largely focused on designating relatively pristine areas as protected areas for biodiversity conservation. Although zoning or land sparing may be effective especially where large areas of natural habitats remain, in recent decades equal attention has been given to land sharing, in which biodiversity conservation and human use of natural resources are simultaneously promoted in the same area (Fischer et al. 2008). Both land sharing and land sparing have complementary roles in maintaining biodiversity and ecosystem services.

The concept of land sharing is not new, because all over the world people in rural areas have maintained and utilized natural resources for centuries. Specifically, human-dominated landscapes in rural areas, also known as Satoyama, are characterized by a long history of human intervention with farmland, farm ponds, streams/ditches, grassland, secondary forests and villages (Katoh et al. 2009). Many organisms in Satoyama exhibit life history adaptations to moderate anthropogenic disturbances (e.g., Mukai et al. 2005). Therefore, traditional farming and forestry activities are keys to maintaining the biodiversity of Satoyama. However, biodiversity in Satoyama is threatened mainly by agricultural intensification and abandonment. Typical drivers of loss of Satoyama biodiversity include the use of strong agrochemicals, non-point

pollution from farmland, land consolidation, invasion by nonnative species and farmland or forest abandonment as a result of depopulation and aging in rural communities (Natuhara 2013).

This special feature introduces biodiversity patterns in rice paddy fields, fish ponds and drainages, which have important biodiversity conservation functions beyond their roles of producing food or irrigation water. We begin with recovery patterns of macroinvertebrate diversity in Japanese paddy fields inundated by the tsunami from the Tohoku Earthquake in 2011 (Mukai et al. 2014). The next article by Wezel et al. (2014) introduces α- (single pond), β- (between ponds) and γ- (regional pond network) biodiversity patterns in nutrient-rich fish ponds in France. The subsequent article by Verdonschot and Verdonschot (2014) shows how aquatic macroinvertebrate diversity is influenced by shading effects of free-floating macrophytes in Dutch agricultural drainages. Finally, Negishi et al. (2014) model the distributions of imperiled bivalves in relation to landscape structure and fish diversity in Japanese agricultural ditches.

This special feature was written to provide case studies of freshwater biodiversity in Satoyama in Japan and their European counterparts, which have largely been ignored to date. The research papers published here cover various aspects of freshwater biodiversity, from biodiversity patterns to threats through recovery in three different countries, but do not provide a thorough account of the topic. We hope that this collection of work will stimulate further research in the field, especially where degradation of Satoyama habitats is of major concern.

We thank the editorial board members of *Limnology* for providing us the opportunity to publish this special feature, the authors for submitting their manuscripts and anonymous reviewers for reviewing the manuscripts.

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