
Session 3: Sustainable Use of Biodiversity and Land through Scientifically Integrative Approach

Integrative Research for Nature Restoration: A Case Study in Lake Mikata, Fukui, Japan

Takehito Yoshida

Associate Professor, Graduate School of Arts and Sciences,
The University of Tokyo, Japan

Building the harmonious and symbiotic relationships between nature and human society is one of the important social targets. Nature restoration is a promising approach not only for restoring deteriorated nature and declined biodiversity, but also for building a new symbiotic relationship between nature and human community in local ecosystems.

We are currently conducting an integrative, multifaceted study of a lake ecosystem using ecological, humanity and sociological approaches in order to provide a scientific basis for nature restoration of the lake (Figure 1). The studied lake is Lake Mikata (a Ramsar wetland) located in Fukui Prefecture, Japan. The lake harbors distinguished biodiversity such as Japanese eel and endemic cyprinid fish species. The recent status of biodiversity of this lake, however, has been declining. It is possibly attributed to the changes of the lake ecosystem itself and the reduced connection between the lake and its surrounding paddy fields.

Nature restoration needs active participations of local residents and stakeholders, and thus using icon species that can be commonly shared as restoration targets and also have the index property for the good conditions of the whole ecosystem should be effective for the implementation of nature restoration. In Lake Mikata, Japanese eel and endemic cyprinid fish species are suitable for icon species based on the aspects of biodiversity and healthy ecosystem as well as their importance for local fishing that has a long tradition. In order to provide a scientific basis for planning the nature restoration using the icon species, we are evaluating the current conditions of the lake and its surrounding ecosystem and clarifying what environmental conditions need to be restored primarily in this system, using extensive approaches of ecology, humanity and sociology. We are also testing some restoration measures that are considered effective and applicable, and evaluating the actual effectiveness in the studied ecosystem. By doing so, we would like to provide the start of adaptive measures for the nature restoration.

Below is the list of our research outcomes during the last one and a half years since our research project started in the summer 2009.

1) A floating-leave water plant (water chestnut, *Trapa japonica*) has massively covered the lake surface in summer since 2008, revealed by analyzing satellite images. We detected the significant changes in water quality and plankton and benthos communities, which would have subsequent effects on fish and other biodiversity. Because of the reduction of phytoplankton production due to the massive cover of water chestnut, the energy and material flows of the food web were seemingly altered as well.

2) Fish ladder is a promising measure for restoring the connection between paddy fields (where cyprinid fish spawn) and the lake (where the fish grow). We first identified the environmental conditions at which *Carassius* species (the dominant cyprinid fish) spawn.

Then, we picked up locations where the successful spawning was highly expected, and then installed eight fish ladders. We evaluated the effectiveness of each fish ladder and found large differences among them, the reason for which is currently examined.

3) We are also studying the long-term changes of the relations between the lake and the local community. We collected various types of references and interviewed local residents, which suggested the diverse relations between the lake and the community. We also developed an information platform using IT techniques that shares, manages and visualizes the information we collected.

4) We also conducted public-participation cooperative surveys in order to effectively monitor and share the current situation of the lake ecosystem with the local community.

Using the above results, we are about to start the integrative analysis of the system and develop a scientific basis for the nature restoration to be provided to the local community and the local government.

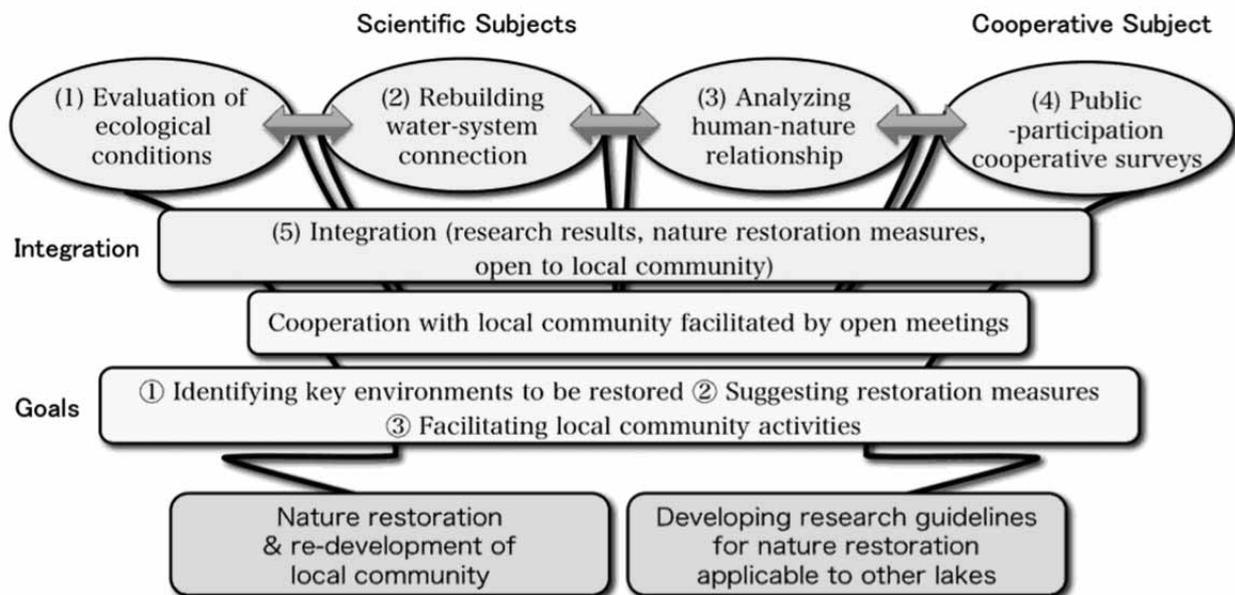


Figure 1. The whole framework of our research project showing the relationship among the five subjects (three research subjects, one cooperative subject and one integration subject).



Takehito Yoshida

Associate Professor, Graduate School of Arts and Sciences,
The University of Tokyo, Japan

Academic Degrees

2001 Doctor of Science, Kyoto University, Japan

Field of Study
Ecology, Limnology