



# **Biodiversity in Aquatic Systems and Environments: Lake Biwa (SpringerBriefs in Biology)**

*Noboru Okuda, Katsutoshi Watanabe, Kayoko Fukumori, Shin-ichi Nakano, Takefumi Nakazawa*

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This book presents the latest topics in ecological and evolutionary research on aquatic biodiversity from bacteria to fishes, with special reference to Lake Biwa, an ancient lake in western Japan. With a geological history of 4 million years, Lake Biwa is the third oldest lake in the world. It is considered a biodiversity hotspot, where 1,769 aquatic species including 61 endemics are recorded, providing a rare opportunity to study the evolutionary diversification of aquatic biota and its ecological consequences. The first chapter introduces the evolutionary history of biodiversity, especially of fish in this lake. In the second chapter, some examples of trophic polymorphism in fish are described. Fish are keystone predators in lake ecosystems, and they can be a major driver for altering biological communities through their top-down trophic cascading effects. An excellent laboratory experiment is presented, demonstrating that functional diversity of fish feeding morphology alters food web properties of plankton prey communities. The third chapter focuses on aquatic microbes, whose abundance and diversity may also be influenced by the diversity of fish through top-down trophic cascades. Aquatic microbes can have a strong impact on ecosystem functioning in lakes, and in this chapter, the latest molecular techniques used to examine genetic and functional diversity of microbial communities are introduced. The final chapter presents theoretical frameworks for predicting how biodiversity has the potential to control the incidence and intensity of human-induced regime shifts. While respecting the precious nature of biodiversity in lakes, it is essential to be aware that modern human activities have brought a crisis of biodiversity loss in lakes worldwide. Throughout this book, readers will learn why biodiversity must be conserved at all levels, from genes to ecosystems.

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