Fauna and Flora of Lake Biwa

Chapter 2 Introduction

Biodiversity of Lake Biwa

Keywords: Species diversity, Red List, Invasive alien fish, Water level control

1. Species Diversity in Lake Biwa

A total of around 1,700 aquatic protist, plant and animal taxa have so far been reported from Lake Biwa, comprising more than 600 phytoplanktonic, about 700 benthic, 60 nektonic (fish) and 60 submerged plant taxa.

Among the Japanese freshwater biota so far reported, two-thirds of the freshwater fish, about a half of the submerged and floating water plants, 40% of the freshwater mollusk taxa, and about 10% of mayfly, caddisfly and chironomid species have been observed in Lake Biwa (Nishino, 2009).

Mollusk and fish taxa comprise more than 70% of the endemic taxa (see Chapter 2-1) and can be regarded as the representative groups of Lake Biwa biota.

2. Threats to the Biodiversity in Lake Biwa

The Red List of Japan has classified 24 out of 46 indigenous fish taxa and 32 out of 56 indigenous mollusk taxa in Lake Biwa as critically endangered, endangered, vulnerable or near threatened (Ministry of Environment, 2012).

In terms of Japanese freshwater biota, this means that about 60% of the endemic taxa (see Chapter 2-1), as well as more than half the indigenous fish and mollusk taxa in the lake are at risk.

According to the Red Data Book 2010 of Shiga Prefecture, alien fish present the greatest threat to the numerous indigenous fish taxa, specifically, the largemouth bass *Micropterus salmoides* and the bluegill *Lepomis macrochirus* from the U.S.A. (Fig. 2-1). Both species are designated as Invasive Alien Species (hereafter "IAS") by the Japanese Ministry of the Environment, and the transfer and breeding of these species are prohibited by the IAS Act in 2005.

The next most serious threat is river improvements (e.g. construction of artificial dams, enclosing bands) followed by lake shore improvements (e.g. construction of dikes along the lake shore to prevent floods), restructuring of paddy fields and, finally, changes in lake water level management rules implemented since 1992 (Fig. 2-1). These threats have resulted in the deterioration of indigenous fish habitats and the segmentation of their migration from the lake to lagoons, attached lakes or paddy fields around the lake for spawning.

Likewise, the primary threat to the most numerous indigenous mollusk taxa is changes in lake water level management rules followed by lake shore improvements, water pollution by toxins such as chemical herbicides, river improvements and restructuring of the paddy fields around the lake (Fig. 2-2).

It is worth noting that eutrophication, or organic pollution, of the lake and the rivers that flow into or out of the lake, are not regarded as threats to any of the indigenous fish and mollusks except to the sand lamprey *Lethenteron reissneri,* that mainly inhabits rivers and cold springs.

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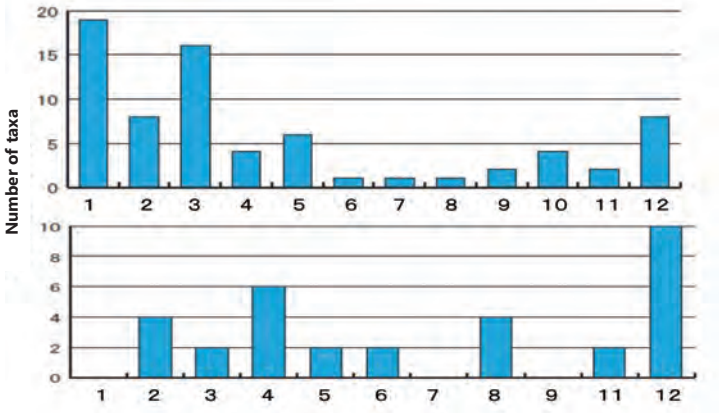

Fig. 2-1 Threats to respective indigenous fish taxa

Fig. 2-2 Threats to respective mollusk taxa

Figs. 2-1 and 2-2 Threats to respective indigenous fish (Fig. 2-1: upper) and mollusk (Fig. 2-2: lower) taxa of Shiga Prefecture or Lake Biwa, designated as critically endangered, endangered or vulnerable in the Red Data Book of Shiga Prefecture (2010). Threats comprise: 1. Alien fish, 2. Construction of artificial dikes along the shoreline, 3. River Improvements, 4. Artificial control of the lake water levels, 5. Improvements to paddy fields around the lake, 6. Soil inflow into the rivers and the lake, 7. Organic pollution or eutrophication of the rivers in the prefecture and the lake, 8. Chemical pollution of the rivers in the prefecture and the lake, 9. Destruction or loss of cold springs due to human development, 10. Decrease in the numbers of unionid mussels resulting in a decrease in the number of female bitterlings that lay their eggs into the mussel's mantle cavities, 11. Overfishing, 12. Other threats or unknown threats. A single taxon may be affected by multiple threats.

Fig. 2-3 Red Data Book of Shiga Prefecture (2010)

Taxon (pl. taxa): A taxonomic group of any rank, such as a species, family, or class. In this section, the term "taxa" refers to species, subspecies and variants, as well as families or genera whose specific names have not yet been identified.