

Chapter 1-5

Attached Lakes around Lake Biwa

Abstract

Attached lakes, or “naiko”s, are small and very shallow water bodies located around Lake Biwa. The area of attached lakes was 35.2 km² in the 1890s, but diminished to 5.3 km² in the 1990s. Nevertheless, 54% of the vegetated areas around Lake Biwa still remain in the areas. Attached lakes provide important habitats for rare marsh plants, indigenous fish and waterfowl.

Keywords: Attached lakes, Emergent plant, Water level, Habitat, Indigenous fish

1. What are Attached Lakes?

Attached lakes, or “naiko”s, are small and very shallow water bodies located around Lake Biwa and connected with the lake via waterways. All of these attached lakes are very shallow, mostly less than 3 m deep, surrounded by dense vegetation of comprising emerged plants such as *Phragmites* spp., and are often covered with abundant submerged macrophytes.

These areas are the habitat of rare marsh plants such as *Carex vesicaria*. Attached lakes also used to be spawning areas of the indigenous and endemic cyprinid fishes like *Carassius auratus grandoculis*, the major fish resources of Lake Biwa. Moreover, they provide important habitats for migratory waterfowls such as *Tachybaptus ruficollis* and *Fulica atra atra*.

2. Long-term Changes in Attached Lakes and Lake Biwa

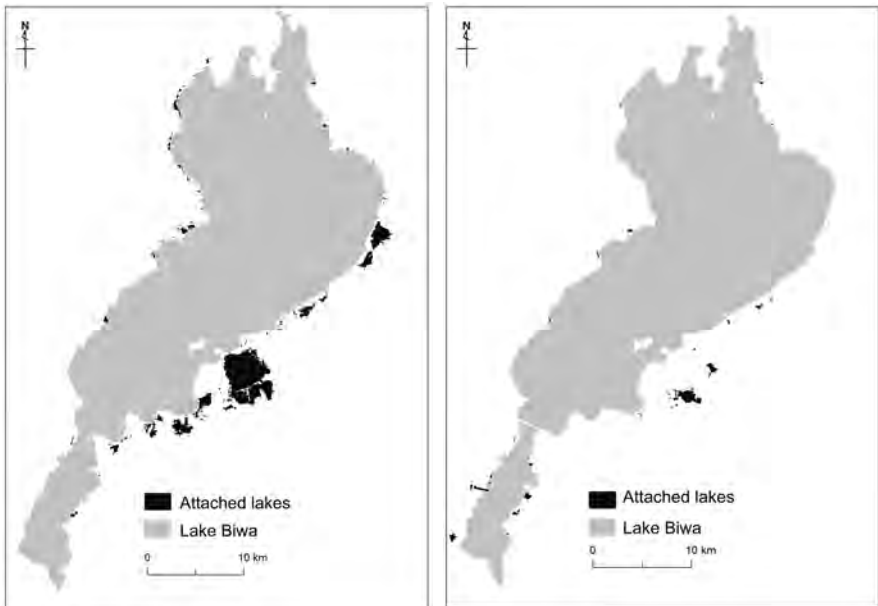
In 1890s, the area of the attached lakes was estimated at 35.2 km², more than 5% that of Lake Biwa (688.1 km²), based on geographic maps from the early days of the Meiji period (1868-1912)(Azuma and Tatsumi, 2012). At the end of the 19th Century, Lake Biwa and its surrounding attached lakes were repeatedly hit by severe floods. These events prompted the Japanese Government to construct a weir in the Seta River, the sole outlet of the lake, in 1905, to artificially control its water level. Since then, the water level has declined over the years, not only due to flood control, but also to the growing

supply of water to cities and industries downstream, i.e., Osaka, Kyoto and Kobe megalopolis, as industry and economy have grown in these areas.

The decreasing water level inevitably diminished the areas of the lake and its surrounding attached lakes. Most of the attached lakes became stagnant, resulting in diminished habitats and spawning areas for indigenous fish. Moreover, growing demand for food production after the Second World War accelerated the process of drainage of the attached lakes to convert them into agricultural land. By the late 1990s, 85% of the areas of attached lakes had been drained, and only 5.3 km² remained. (Azuma and Tatsumi, 2012).

Nevertheless, 54% of the vegetated areas around the Lake Biwa and its adjacent areas, covered with *Phragmites* emergent plants, still remain in the areas of attached lakes (Azuma, unpublished). This indicates that attached lakes still play an important role as habitats for rare marsh plants, indigenous fish and waterfowl taxa.

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Figs. 1-5-1 and 1-5-2 Distribution of Lake Biwa and its attached lakes in the late 1890s (Fig. 1-5-1: left) and late 1990s (Fig. 1-5-2: right) (Azuma and Tatsumi, 2012)