

## Cold tolerance of phytoplankton living in rivers, ponds and lakes

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Phytoplankton sustains the aquatic ecosystems in the oceans, terrestrial ponds and lakes as well, as the main primary producers. In some terrestrial water environments, especially ponds and lakes, the water sometimes freezes in winter seasons in Japan. It is thought that the phytoplankton that lives in those environments may survive those rough conditions, which are repeatedly freeze and thaw in a cold climate. There are few studies on the morphological and growth properties in a natural harsh environment. Therefore, we conducted incubation experiments under similar natural cold environments to obtain basic data on the responsiveness and productivities of phytoplankton. Phytoplankton species are obtained from the familiar ponds, rivers and lakes, i.e., 10 species of phytoplankton observed in rivers of the Konanmizube Park in Ishikawa Pref., 5 species in the Senshin Pond in KUAS, 7 species in the Katsura River in Kyoto, and 13 species in Biwa Lake. We froze them at -20°C for 2 days, and as a result of culturing for 20 days after thawing, the fluorescence intensity of phytoplankton, which obtained from 3 areas except Biwa Lake, decreased. Focusing on the changes in the cell numbers of each phytoplankton, there were species of which increased, decreased and dead after 20 days, as well. The cell numbers of chlorophytes *Ankistrodesmus* spp. and diatoms *Synedra* spp. increased when they were placed under the 20°C condition ever after incubations under -20°C. This indicates that some phytoplankton can maintain their vitality even in the harsh conditions of nature. The fluorescence intensity of some species from Lake Biwa increased after thawing from -20°C, relative to the never freeze. Biwa Lake is an old lake with a history of 4 million years, and it is thought that there are species that have adapted to its long history and geographical peculiarities of Biwa Lake. We also report the habitat-specific differences in cold responsiveness of phytoplankton between Biwa Lake and other water environments.