



## Lake ice cover and its influence on lake ecology in a Finnish lake district

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A wintertime research program on the physics and biology of lakes in Häme lake district in Finland has been performed in the last five years. The set of study lakes contains a wide spectrum in size, depth and trophic status. In this region the lakes freeze over annually for 4-6 months and the mean ice thickness is around 0.5 m. The ice sheet consists of congelation ice and snow-ice. The snow-ice fraction ranges from 0 to 90 per cent depending on the snow fall history and its magnitude makes a major contribution to the ice properties and conditions in the water body beneath the ice, in particular the mechanical strength and optical thickness are much less than for congelation ice. The e-folding depth of light intensity was 50–100 cm for congelation ice and 5–10 cm for snow. A numerical model has been developed to simulate the annual cycle of ice stratigraphy, temperature and thickness. The water bodies had a 1-4 m thick upper mixed layer thick thermocline, and in deeper lakes a lower homogeneous layer. Fall cooling process was crucial to determine the temperature of the lower layer at freeze-up, anything within 0–4°C.

Oxygen concentration decreased in winter, especially close to the bottom sediments, and carbon dioxide concentration increased due to respiration activity. Phytoplankton production and biomass level were low or very low and, therefore, heterotrophic and mixotrophic species were abundant. Oxygen depletion in the hypolimnium had several chemical and ecological consequences, such as release of phosphorus from the bottom sediments. In spring, just before the ice-out, photosynthesis was at a high level beneath the ice due to improved light conditions and started to elevate the oxygen concentration in the topmost water layer. Primary production under the ice is limited or prohibited by low level of available light.