

RESEARCH PAPER

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Distributions of pH and chemical components in Mizorogaike, a pond with a floating-mat bog

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Abstract Distribution patterns of pH and concentrations of chemical components were studied in Mizorogaike, a pond with a floating-mat bog, which is naturally acidified by the *Sphagnum* community. Considering the distribution of pH, sampling sites were selected on the floating mat (two sites), beneath the floating mat (one site), in the open water around the floating mat (two sites), and at the mouths of inflows (two sites). Monthly observations from April 1994 through March 1995 revealed that the distribution patterns of chemical components could be classified into three groups according to their pH dependence: (1) concentrations of dissolved organic carbon, organic phosphorus, aluminum, iron, and manganese increase with decrease in pH; (2) concentrations of dissolved orthophosphate and silicon increase with increase in pH; (3) concentrations of suspended particulate aluminum, iron, manganese, phosphorus, and silicon do not depend on the pH. Thus in Mizorogaike, the distribution of dissolved components depends on the pH.

Key words Aluminum · Iron · Manganese · Phosphorus · Silicon · pH

Introduction

Acidification of wetlands by anthropogenic acid deposition is of widespread concern and has led to changes in the

chemical composition of natural waters, a process that has been intensively studied (Urban et al. 1990; Brezonik et al. 2003). Natural acidification also occurs as the ecological succession of the vegetation proceeds from fens, which are dominated by reeds and sedges, to bogs, which are dominated by *Sphagnum* moss species (Gorham et al. 1985). Clear relationships between pH, alkalinity, and the concentrations of basic cations (Na^+ , K^+ , Ca^{2+} , and Mg^{2+}) are observed in bogs and fens, and it is well established that the succession from fen to bog is accompanied by a decrease in alkalinity and in concentrations of basic cations (Gorham et al. 1985; Wheeler and Proctor 2000). However, the distribution patterns of trace elements in bogs and fens have not been investigated thoroughly enough to establish general relationships between trace elements and pH (Urban et al. 1987; Helmer et al. 1990; Vitt et al. 1995).

To examine the influence of natural acidification on trace elements, we selected Mizorogaike, a pond containing a floating-mat bog, as an observation site for this study and compared the distribution patterns of pH, dissolved components (organic carbon, organic phosphorus, aluminum, iron, manganese, $\text{PO}_4\text{-P}$, and silicon), and particulate components (aluminum, iron, manganese, phosphorus, and silicon).

Methods

Observation site

Mizorogaike is a small pond (area 0.08 km²; maximum water depth 2 m) having protected status located in an urban area on the northern margin of Kyoto Basin, Japan (lat 35°04'N, long 135°45'E, 75 m above sea level). Although the floating-mat bog in Mizorogaike has been present for an unusually long period compared with other nonalpine bogs in warm-temperate zones, rapid changes in its vegetation and water chemistry in the past 30 years have been reported (Mizorogaike Research Group 1976; Scientific Research Group of Mizorogaike Pond 1981).

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