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The lake ecosystem of Øvre Heimdalsvatn

Petter Larsson, John E. Brittain, Leif Lien, Albert Lillehammer,
Zoological Museum, University of Oslo
Karl Tangen
Department of Marine Biology and Limnology, University of Oslo

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The Norwegian subalpine lake, Øvre Heimdalsvatn, has a surface area of 0.78 km^2 and a maximum depth of 13 m. It is ice-covered for 7.5–8 months, has a marked spring spate and a mean annual renewal period of about two months. The water is poor in electrolytes. Intensive studies have been made by an interdisciplinary team of the lake's physical and chemical properties, primary production and secondary production under the auspices of IBP/PF from 1969 to 1973. Allochthonous material accounted for 1/3 of utilized plant input. The major lake predator, the brown trout, fed largely on benthic organisms and did not exploit the zooplankton biomass. On account of the long period of ice cover and the rapid rise in temperature after ice break, many organisms (both planktonic and benthic) showed synchronous development. Abiotic conditions, such as the nature of the spring spate and the temperature rise, strongly affect species and community development.

P. Larsson, J. E. Brittain, L. Lien and A. Lillehammer, Zoological Museum, Sarsgt. 1, Oslo 5, Norway. K. Tangen, Dept of Marine Biology and Limnology, P. O. Box 1069, Blindern, Oslo 3, Norway.

Introduction

The subalpine lake Øvre Heimdalsvatn has been the subject of detailed interdisciplinary studies. This has largely been under the auspices of the freshwater production section (PF) of the IBP. A review and synthesis of the results of all the freshwater projects in this programme has been made (LeCren in press). Therefore in the present paper we will concentrate on the Norwegian project and only to a limited extent make comparisons with other IBP-projects.

With a background in the large amount of data obtained in the various fields, it is our aim in this paper to summarize our knowledge of the ecosystem to date and to attempt a synthesis, pointing out the major pathways and interrelationships. In addition to the data already presented in this volume we will draw upon earlier publications on Øvre Heimdalsvatn, interrelational aspects unsuitable for separate papers and data as yet unpublished. In this way we hope to present a synthesis of the lake as an aquatic ecosystem. Clearly we have been unable to measure all variables and indeed our idea of what constitute the most significant variables has changed as we became more aware of the functioning of the ecosystem. Nevertheless, we have sufficient information to be able to describe certain energy relationships into and within this ecosystem, which in several respects is typical of large numbers of mountain lakes, with their long period of ice cover, spring spate and the importance of allochthonous input. We are also able to pinpoint gaps in our knowledge of the ecosystem and suggest areas of research that should prove fruitful in the elucidation of such ecosystems.

The Lake Øvre Heimdalsvatn – a subalpine freshwater ecosystem.
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