Trends in Finnish limnology during 1940–1989

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Abstract

The volume of limnological research in Finland has considerably expanded during recent decades, especially in the 1970s, with elevated funding and improved study facilities. Projects have become larger, the publication has intensified and has been increasingly directed to refereed international journals. The number of aquatic scientists has increased, new university centres have been established and old ones developed. Government research institutes dealing with aquatic resources have been founded and developed. Applied limnology developed rapidly during the 1960s, with a heavy bias towards physical and chemical limnology, as reflected in the extensive water quality monitoring programs started by the water authorities during that decade. Basic hydrobiological research was revived in the early 1970s with the first truly integrated lake ecosystem study in Finland on the energy flows in Lake Pääjärvi; several other ecosystem studies were completed later. The early work in the 1970s was largely descriptive, but later projects in the 1980s (e.g. studies on the food chains in small humic lakes and on the effect of nutrients on the pelagic carbon cycle in the Baltic Sea) have adopted a more experimental approach. Other important study fields developed during the 1970s and 1980s were paleolimnology and ecosystem modelling. Research on the effects of airborne acidification started in the 1980s. The artificial gap between applied and basic limnology is narrowing: water managers are starting to realize the importance of ecological interactions.

Introduction

As is natural for a country of nearly 200 000 lakes (Raatikainen & Kuusisto, 1990) and a long Baltic Sea coastline, limnological studies in Finland have long traditions. In his opening address to the Jubilee Symposium of the Finnish Limnological Society in 1980, Luther (1982) reviewed the first half century of Finnish limnology, stopping his general survey at the year 1940. In this paper I will review the subsequent half a century of Finnish limnology (1940–1989). The five decades following 1940 have brought tremendous changes, both in the watercourses and in the limnological activities. My presentation is based on an exhaustive survey of 5290 limnological papers published by Finnish scientists during 1940–1989. It includes brackish-water research with emphasis on the biological oceanography of the Baltic Sea. Unlike that of Luther, it includes fisheries biology, but excludes hydrology, which in Finland traditionally has a firm connection with geophysics and water resources engineering. The papers have been classified according to the type of publication, the employment of the author, and the contents of the paper.
Data sources

For older publications, useful data sources were two hydrological bibliographies (Hydrologinen ... 1960; Hydrologinen ... 1976), which also contained a wide selection of limnological papers, the hydrobiological bibliography by Artimo (1946), the fishery biological bibliography by Sundbäck & Lindholm (1972) as well as the annual bibliographies of botanical and zoological papers by Finnish writers in 1950–1962, published in Arch. Soc. 'Vanamo' in 1950–1963 (volumes 5–18). Several published bibliographies for the brackish-water research in the Baltic area (Segerstråle, 1964; 1975; Jylhä-Pyykönen, 1977; Timola, 1981) were also utilized, excluding the Baltic Marine Environment Bibliographies for 1970–1979, 1980–1985 and 1986–1987. For the 1970s and 1980s, useful sources of information were the annual reports of activities and lists of publications by government research institutes (the National Board of Waters, from 1986 the National Board of Waters and the Environment [NBW/NBWE], the Institute of Marine Research, Helsinki, now the Finnish Institute of Marine Research [FIMR], and the Game and Fisheries Research Institute, Fisheries Division [GFRI/FD]). Lists of publications were available for certain important university departments (Lammi Biological Station, University of Helsinki [Bibliography ... 1990]; unpublished bibliographies for Törmänne Zoological Station, University of Helsinki; Department of Zoology and Department of Biology, Laboratory of Ecology and Zoological Systematics, University of Turku; Department of Biology, Åbo Akademi; Departments of Zoology and Botany, University of Oulu; Department of Biology, University of Joensuu [Mälkönen et al., 1984]; Hydrobiological Research Institute [now Environmental Research Centre] of Jyväskylä), as well as for a number of individual scientists. Two special national bibliographies, on zoobenthos (Paa-sivirta, 1989) and on zooplankton research in Finland (Department of Biology, University of Turku, unpublished) were also available. In addition, I examined the most important Finnish journals publishing limnological papers during the period. Unpublished theses and several mimeographed report series of limited distribution were ignored. International limnological or ecological journals published outside Finland were not systematically examined until the 1980s, except for Verhandlungen der Internationalen Vereinigung für theoretische und angewandte Limnologie; for earlier years, the papers in foreign journals by Finnish authors (including coauthored papers) were adequately listed in the bibliographies. I do not claim that the coverage was complete; on the other hand, although multiple references to a single paper in different sources were removed, some overlaps may have remained unnoticed. However, the coverage is certainly wide enough to show the general trends.

Results and discussion

The total number of papers dealing with limnology published by Finnish scientists increased almost exponentially from the early 1950s to the early 1980s (Fig. 1). The effects of the Second World War appeared with a time lag of several years, shifting the lowest publication activity to the late 1940s. The last 5-year period exhibited only a slight increase in the total number of published papers. This might be an artefact, if cov-