

## Finland and ICES: K. M. Levander and the origins of hydrobiological studies

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The history of marine science in the Baltic Sea region is a new and little-studied field. There are hardly any international or national presentations of even the main branches of marine studies. The most neglected approach, however, is the study of science in the context of society. Therefore, it is difficult to provide answers concerning the history of ICES and its Member Countries. Due to the lack of historical research, critical questions concerning the relationship between Finland and ICES also remain to be answered. Why did Finland, a semi-autonomous part of Imperial Russia in 1809–1917, join ICES? What were the aims and interest of the local government? How was the scientific base enabling the development of later marine studies created? How did marine science develop in comparison with other relevant fields of science? What benefits did cooperation with ICES bring to Finland? Owing to the lack of previous studies, the paper focuses on one person, Professor K. M. Levander, who participated in Finnish marine studies from the very beginning in 1898 until World War II. The development of hydrobiological studies of open sea areas is compared with the development of other fields of biological study of water courses. It is suggested that, in order to explain the development of marine science, their history should be studied in the context of society, for example, from the point of view of national strategic interests.

Keywords: Finland, history, hydrobiology, ICES, plankton, society.

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### Introduction

When the International Council for the Exploration of the Sea (ICES) was founded in 1902, the launching of common biological studies was one of its main aims. At that time, Finland was, in many senses, in a peripheral situation. The country was a semi-autonomous part of Imperial Russia called the Grand Duchy of Finland (1809–1917). The resources provided for science were scarce, and biological studies of water courses were in their initial stages. Nevertheless, Finland participated in international hydrobiological studies of the Baltic Sea from the very beginning. In order to understand how this was possible, it is necessary to study the state of biological investigations of water in general in Finland at the end of the 19th century and at the beginning of the 20th century. This is best done by concentrating on the activities of one scientist, Professor K. M. Levander, who participated in the biological studies of ICES in the period 1902–1918.

### K. M. Levander, a plankton specialist

Kaarlo Mainio Levander (Figure 1) was born in a small town on the coast of the Gulf of Finland in 1867. He entered the University of Helsinki in 1886 and, being an efficient and talented person, published his first article when he was 19 years old. He graduated at the age of 22 and earned his PhD in 1894 at the age of 27 (Carpelan and Tudeer, 1925). He was Professor of Zoology at the University of Helsinki during the period 1910–1935 and concentrated on two themes: 1) phyto- and zooplankton and 2) fish, both of which were of importance to the activities of ICES as well. Five different aspects of biological studies, which were, in many ways, separated yet interconnected, defined Levander's world and show the specific themes and areas of interest and worries of a pioneering Finnish zoologist one century ago.

## Biological studies of freshwater bodies

At the end of the 19th century, Finland was already known as the country of thousands of lakes. From the point of view of biology, it was rather a country of thousands of unknown lakes. Freshwater bodies in general had not really been studied at this time. According to Professor Alex Luther (1982), "the first real contribution to limnology in Finland" was the study published by Levander on the interaction of abiotic and biotic factors in freshwater rock pools (Levander, 1900). Later, he expanded his work and investigated especially plankton in several ponds, rivers, and lakes.

It was only natural for him to study freshwater bodies because he had spent his childhood in a small town in the Lake District. In 1891, he visited several research institutes in Prussia, including the recently established station of limnological studies on Lake Plön situated in the lake area of Holstein in northern Germany (Levander, 1893). Later, he studied lakes, for example, in Estonia. Levander attempted to create the first general picture of the different types of lakes in Finland by gathering information with the help of students and local



Figure 1. K. M. Levander as a young researcher. He was interested in open sea studies, coastal hydrobiology, limnology, pollution studies, and social questions. The breadth of knowledge of natural scientists in the 19th century was, in general, astonishing. Source: the archives of the Tvärminne Zoological Station.

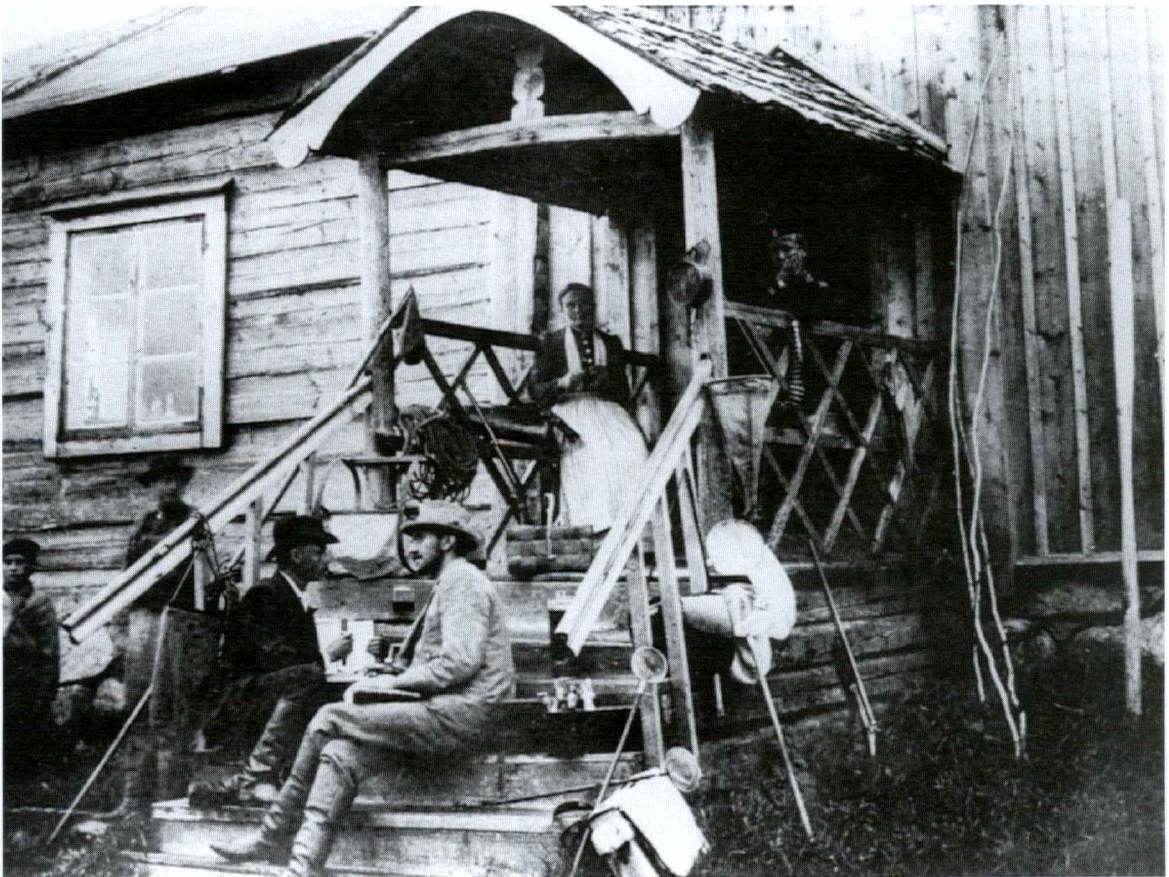


Figure 2. The first zoological summer laboratory in Finland was founded in fishermen's houses made of logs. K. M. Levander (sitting on the left) was responsible for running the station on the island of Lövö in 1889–1899. Source: the archives of the Museum of the University of Helsinki.



inhabitants (Levander, 1907, 1914; Saalas, 1946). His plan of producing a survey of the regional typology of lakes was realized by his student Heikki Järnefelt, who studied, described, and classified hundreds of lakes between the 1920s and the 1960s (Järnefelt, 1925–1934, 1936–1963). The first biological station for limnological studies of lakes was established in 1942 in Lake Kentjärvi in eastern Carelia during World War II. However, at the end of the war, this area was occupied by the Soviet Union (Uusi Suomi, 1942).

Despite the efforts of Levander and Järnefelt, the institutional base for limnology, the study of freshwater bodies, remained weak. In 1939, Järnefelt was appointed to an "Extraordinary Professorship" in Applied Limnology at the University of Helsinki. The Department of Limnology was not founded until 1945, and the position became a Full Professorship in Limnology in 1961 (Luther, 1982; Eloranta 2000). A biological station was established in the interior of the country in 1954 (Lammi, 2002).

## Hydrobiological studies of the coastal sea area

At the end of the 19th century, researchers from the University of Helsinki conducted the first planktological studies in the Stockholm region. Foreign scientists, on the other hand, studied plankton in the Gulf of Finland. Local scientists were not involved in either of these cases. J. A. Palmén, who served as Professor of Zoology before Levander, decided that hydrobiological studies of the coastal area should be pursued (Palmén, 1910, 1919; Luther 1957). He discovered a practical model for these studies in Naples where a zoological station had been established in 1872. Palmén rented some fishermen's houses made of logs, and the first Finnish zoological station was a summer laboratory which operated in 1889–1899 on the island of Lövö (Lehtisaari), 12 km southeast of Helsinki (Luther, 1957).

K. M. Levander was responsible for running the station (Figure 2). To learn more about plankton studies, he visited the zoological institutes of Kiel, Rostock, and Heidelberg in 1891 (Levander, 1893). Kiel was the leading center and Professor Hensen had indeed there invented the term "plankton" only two years prior to Levander's visit (Lohff, 1994). After returning to Finland, Levander began his plankton studies, spending most of his summers in the 1890s at the Lövö Station. The main feature of the Lövö work was morphology. No ground-breaking discoveries were made, but the work done was, however, of crucial importance in applying foreign ideas to local conditions and in providing knowledge of the hydrobiology of the coastal areas of the Gulf of Finland.

Work at the Lövö Station gradually proved to be difficult for practical reasons, and a new station was founded by Palmén in 1902 on the mainland in the peninsula

of Tvärminne where the zoological station currently exists. This decision provided a firm foundation for developing hydrobiology in Finland (Luther, 1957). Another important decision for institutionalizing hydrobiology was made in 1910 when Levander was appointed as the new Professor of Zoology at the University of Helsinki. The position of hydrobiology was further consolidated in 1920 when the Finnish Society of Sciences founded a special "Unit of Biological Water Studies" that was led by Levander (Elfving, 1938).

## Biological studies of the open sea areas

Levander also conducted studies outside the Baltic Sea region. In 1894, he visited the Mediterranean and did some hydrobiological studies in Italy. He also visited Aden in the Red Sea region, and made several study trips to the White Sea coast where he became familiar with the explorations of Russian scientists led by

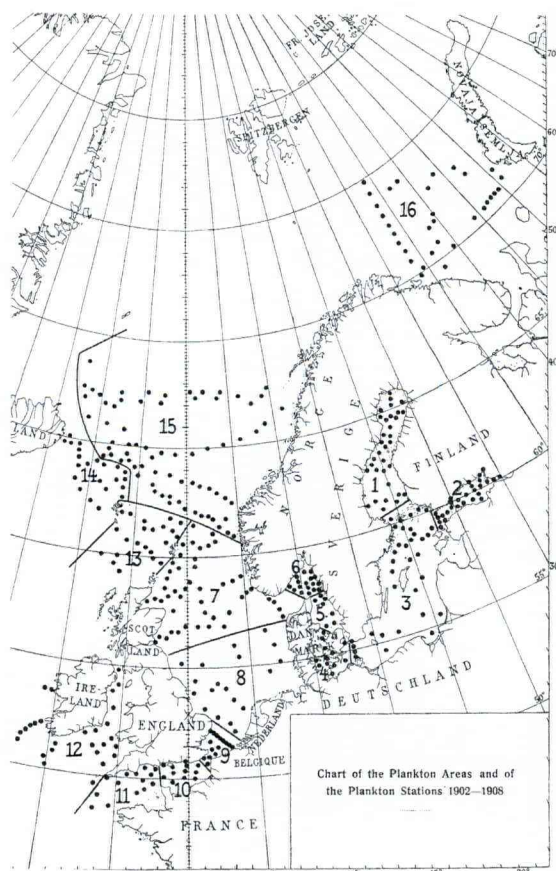


Figure 3. Finland and ICES. K. M. Levander was responsible for the plankton studies in the Finnish zone. Finland is presented on the map as if it were a sovereign state, and Russia is not included. Source: ICES. Résumé des observations sur le plankton des mers explorées par le conseil pendant les années 1902–1908. Copenhagen, 1931.





Figure 4. Science has always been part of society. What was the place of hydrobiology in the early 20th century when poverty and undernourishment were still widespread? This fisherman's family of nine persons on the island of Lövö probably rented the huts to scientists. Source: the archives of the Museum of the University of Helsinki.

Professor Knipovitch (Levander, 1894a, 1895, 1918a). Hence, Levander was, to some extent, familiar with four seas, but primarily with coastal sea areas.

In Finland itself, interest in oceanography also emerged at the end of the 19th century. In 1897–1898, Theodor Homén, Professor of Applied Physics at the University of Helsinki, and Oscar Nordqvist, Inspector of Fisheries, organized the first Finnish pilot studies of open sea areas and of Lake Ladoga in order to prepare for Finnish participation in the international sphere (Elfving, 1938).

A new field of science must normally struggle for a long time before it is officially recognized, but the Finnish Senate very quickly granted funding for Finnish participation in the international scheme (Figure 3), including construction of a research vessel. These decisions were remarkable because the authorities granted funding for a field of science which, in practice, did not yet exist. The exact reasons for these decisions are not known. It would seem that Finnish scientists skillfully utilized the marginal position of open sea studies, the call for international cooperation, and the Russification campaign which started in 1898.

Imperial Russia, however, disliked Finnish participation in the work of ICES as if Finland were a sovereign state. Nordqvist was dismissed from office, and Homén

was expelled for a time to Novgorod in Russia. These measures were directed towards the organizers of Finnish work in ICES. Researchers like Levander, however, were not affected. Finally, ICES was forced to accept the Russian demand that the independent position of the Finnish delegation should not be recognized (Elfving, 1938; Mälkki, 1990).

Levander was particularly worried about the impact of the Russification campaign on the autonomy of the University, but, as it turned out, the campaign had hardly any impact on everyday scientific life. He was made responsible in 1898 for the biological studies of the open sea. After the formation of ICES, he participated in its work almost annually without any political problems, and his studies (published from 1903 to 1911) provided the first scientific description of the plankton in the pelagic sea areas around Finland.

As a result of the work carried out from 1897, the Finnish Institute of Marine Research (FIMR) was founded after Finland became independent in 1918. The focal point of the new institute was, however, on physical-chemical research. Biological studies remained the responsibility of the special "Unit of Biological Water Studies" founded by the Finnish Society of Sciences. Biological studies were brought into the remit of FIMR in institutional terms only in the 1950s (Hela, 1969; Lisitzin 1968).



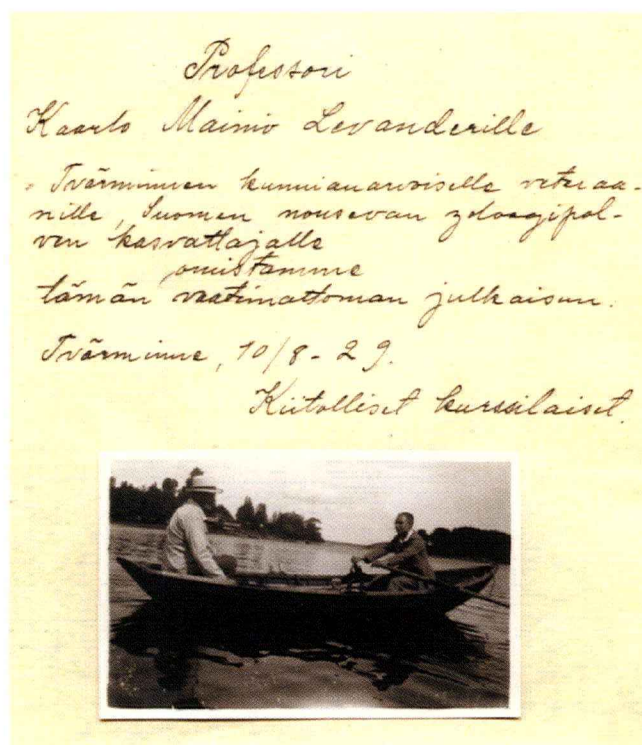


Figure 5. "We dedicate this humble publication to Professor K. M. Levander, to the distinguished veteran of Tvärminne and teacher of the rising generation of zoologists in Finland." Finnish-speaking students participating in a field course in 1929 included this tribute to Professor K. M. Levander (sitting on the left in the boat) in their course publication. In the picture, a new generation starts symbolically to row the boat of zoology in Finland. Source: the archives of the Tvärminne Zoological Station.

## Biological studies of pollution

The most marginal sector of biological research in the University was pollution studies. Pollution was a problem at this time mainly in the urban sea areas (The Sea and the Cities, 2000). The facilities of the University's Department of Zoology were situated near the polluted inner bays of Helsinki. Its researchers did not, however, study these bays. On the contrary, the zoological station was founded on an island (Lövö) situated 12 km away from the city.

Levander was one of the few persons at the University who studied urban sea areas. In the early 1890s, he sampled the plankton, but because of the pure ideals of natural science common at the time, he did not pay any attention to the pollution aspects, but only to the taxonomy (Levander, 1894b).

In 1908, Levander, however, made another study of a bay situated in the very centre of Helsinki. He wanted to know the reason for the strong, green colour of the bay, and found that it was caused by a bloom of the algal species *Anabaena spiroides* and *Oscillatoria agardhii*. This time, Levander also paid attention to the question of how algal species indicate pollution (Levander, 1908). This simple pilot study was significant because it

was probably the first study of the pollution of the urban sea area of Helsinki made by a University researcher.

Levander (1913, 1918b) later worked to adjust the model of biological indicators of pollution provided by Kolkwitz and Marssons (1902) in brackish water areas. In the 1910s, Levander formed, at the Department of Zoology, the first group of scientists in Finland to specialize in biological studies of pollution in sea areas. His group participated from 1915 in the first research programme on the pollution of the sea area of Helsinki (Välikangas, 1926; Häyrén, 1921). This programme proved to be important as it enabled the City of Helsinki to build large, activated sludge plants to protect its sea area already in the 1930s.

## Finnish hydrobiological studies

The first article published by Levander did not deal with science, but with society. As a young student, he wrote about the downtrodden position of the unemployed (Figure 4) and of women on the one hand, and about the gap between rich and poor and about the non-national features of the ruling class in Finland on the other hand (Levander, 1886). Could any of these problems be helped by means of biological studies?

Levander decided that the last of the problems he had identified could. Finland had been under the power of Sweden for nearly 600 years. Hence, the ruling class consisted almost exclusively of Swedish-speaking men even at the end of the 19th century. This was also the case at the University of Helsinki. Despite the fact that an overwhelming majority of the people in the country spoke Finnish, it was practically impossible for any of them to study, for example, natural science because there were no lectures given in Finnish and no books or notes written in the language (Saalas, 1946).

Many of the people living along the coast of Finland were traditionally bilingual, using both Swedish and Finnish. Levander, like many other students and researchers, thought that the University should also be bilingual. In 1896, Levander, together with other natural science students, founded an association to introduce Finnish in natural science education and studies. He gave the first lectures in Finnish in zoology and translated notes and textbooks into Finnish for students (Levander, 1896, 1903b; Marshall and Hurst 1897).

In addition, it can be argued that Levander started the popularization of natural science studies in Finland. In 1897, he founded *The Friend of Nature*, one of the first Finnish popular science journals to make the new knowledge of nature provided by modern biology known to Finnish-speaking teachers, students, professionals, and interested laymen (Anon., 1897).

This work proved to be successful. At the beginning of the 20th century, the University of Helsinki gradually started to become a bilingual institution and a new Finnish-speaking generation interested in hydrobiology emerged (Figure 5).

## Conclusions: Finland and ICES

Biological studies of open sea areas were carried out by Levander in cooperation with ICES between 1902 and 1918. This was possible because of the efforts of three men. Theodor Homén and Oscar Nordqvist provided the international contacts and national initiatives for marine research, while Professor J. A. Palmén arranged for the international education of young natural scientists interested in hydrobiology and founded, at his own cost, two local zoological stations in Finland. He was also largely responsible for Levander being appointed as Professor of Zoology at the University of Helsinki.

It may be argued that Levander created hydrobiology in Finland. He struggled on five different fronts to develop new practices in science which today are called limnology, hydrobiology, oceanography, environmental studies, and science policy, meaning equal rights for academic education. There were, however, notable differences in the rate at which progress was made in formally recognizing each of these fields. Hydrobiological studies of the coastal region were institutionalized gradually from the early 1890s. However, in terms of public

funding, it can be argued that marine research was institutionalized in Finland from 1898. Limnology was accepted in academia only after 1945, and pollution studies even later. Why do different fields of science develop at such different speeds?

From the point of view of comparative history of science, it is surprising how quickly international studies of marine research were created and institutionalized in Finland. This cannot be explained by internal reasons of science as there were hardly any marine studies in Finland before 1897/1898. The history of marine science has to be studied, in fact, in the context of society. This is, however, a difficult challenge as the development of marine science in this sense has hardly been studied. Therefore, the following are presented as ideas for future studies rather than formal conclusions.

Marine science has been supported by Finnish society, but how has marine science returned the favour? The economic reason for the rapid launching of Finnish marine studies may be connected with the beginning of winter navigation at the end of the 19th century. Finland was the only country in the world to have all of its harbours closed during the winter months. The political reason may be connected with the Russification campaign and the emerging quest for political independence which required, in turn and not least for military reasons, national knowledge of the surrounding sea area. The role of science was emphasized because Finland did not have a military corps of scientists or engineers of its own. The arrival of "international oceanography" created politically neutral aims and an organization which enabled Finland to launch national and strategic maritime studies, including, as well, biological studies.

These ideas are indirectly supported by the political activism of Homén and Nordqvist. Levander, on the other hand, was politically rather neutral. The institutional separation of physical-chemical and biological marine research in 1918, when the Finnish Institute of Marine Research was founded as a governmental and not an academic institution, may also be, to some extent, explained with the thesis of the strategic importance of marine science for a newly independent nation. This raises another important question on the different roles that science plays. Were hydrobiological studies only a disguise for the development of the strategic elements of marine research and were biological studies given up immediately after the aim had been achieved?

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