

REMEMBERING THE MARINE ECOLOGY LABORATORY, BEDFORD INSTITUTE OF OCEANOGRAPHY, 1965-1987: AN HISTORICAL AND PERSONAL PERSPECTIVE

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ABSTRACT

The Marine Ecology Laboratory (MEL) was one of the principal federal scientific laboratories at the Bedford Institute of Oceanography (BIO) in Dartmouth, NS. Created in 1965 as an independent laboratory under the Fisheries Research Board of Canada, it grew out of the previous Atlantic Oceanographic Group with the broad mandate to study the structure and dynamics of marine ecosystems supporting marine fisheries. With time, it developed a well-rounded program of basic and applied ecological research and earned an international reputation for excellence. In 1987, it fell victim to a major reorganization of the Department of Fisheries and Oceans, driven by Ottawa managers, and was closed despite widespread protest from the scientific community. However, once the dust had settled from this unfortunate incident and, despite declining resources, ecological research at BIO continued to flourish under a new organizational structure.

INTRODUCTION

This account presents a brief history of the Marine Ecology Laboratory (MEL), one of the principal components of the Bedford Institute of Oceanography from 1965 to 1987. It is condensed from a more detailed history of the laboratory prepared by Gordon (2020) using information from a wide variety of sources including annual reports, published accounts, newspaper articles and personal files. It begins by reviewing the origin of MEL and then describes its evolution over twenty-two years as a federal research laboratory

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under the leadership of three directors who were all prominent scientists and elected to the Royal Society of Canada: Lloyd M. Dickie, Alan R. Longhurst and Kenneth H. Mann. Some of the important scientific accomplishments in the field of marine ecology are briefly summarized. Events leading up to the demise of MEL by the Department of Fisheries and Oceans in 1987 are then briefly reviewed. Fortunately, this highly controversial event did not mark the end of ecological research at BIO and the legacy of MEL is briefly discussed.

ROOTS

The origins of the Marine Ecology Laboratory (MEL) can be traced back to 1898 when a Board of Management composed of Canadian university and government scientists was established (Mills 2014). This Board was the first research organization in Canada financed by the federal government whose direction was primarily the responsibility of academic scientists. One of its first accomplishments was to construct and operate a moveable floating research station on the Atlantic coast. Building on the success of this venture, in 1908 the Board created two biological stations, one in St. Andrews, NB, and one in Nanaimo, BC, to provide research facilities for academic scientists and their students. In 1912, the Board of Management became the Biological Board of Canada and its membership expanded to include the fishing industry. Then, in 1937, this Board became the Fisheries Research Board of Canada (FRB).

The FRB was organized as an autonomous scientific institution reporting directly to the federal Minister of Fisheries and administered by a Board which included representatives from universities, government and industry. FRB proceeded to develop an expanded network of fishery research stations across the country to conduct investigations of practical and economic problems connected with marine and freshwater fisheries, flora and fauna. With time, FRB earned an international reputation for excellence in aquatic science (Johnstone 1977).

While the focus of FRB was on fisheries, from the very beginning it recognized the importance of understanding the physical, chemical, geological and biological properties of the

supporting ecosystems. In 1944, FRB established two new organizations to conduct oceanographic research, one on each coast. The Atlantic Oceanographic Group (AOG) was established at the St. Andrews Biological Station in New Brunswick under the direction of Harry Hachey, while the Pacific Oceanographic Group (POG) was situated at the Pacific Biological Station in Nanaimo, BC, and headed by Jack Tully.

In 1960, now headed by Neil Campbell, AOG moved from St. Andrews to Halifax and occupied a group of single story wooden buildings on Terminal Road between Hollis and Water Streets across from the Nova Scotian Hotel. Two years later, along with the Canadian Hydrographic Service, AOG with its staff of about twenty moved into the new Bedford Institute of Oceanography (BIO) in Dartmouth when it opened in 1962 (Gordon *et al.* 2014a). This new facility was built specifically for oceanographic research and equipped with the necessary scientific support facilities, including a fleet of research vessels. By 1965, AOG with its broad oceanographic research program was well established as a major component of BIO under the direction of Ron Trites. However, more major changes were just around the corner.

EVOLUTION

In 1965, the Atlantic Oceanographic Group (AOG) was elevated to the status of an independent laboratory of the Fisheries Research Board (FRB) and began reporting directly to the Chairman of FRB, F. Ronald Hayes, in Ottawa (Fig 1). Hayes, a native of Parrsboro, NS, had previously served as chairman of the Dalhousie University Department of Biology and as the founding director of Dalhousie's Institute of Oceanography. Soon after, Lloyd M. Dickie was appointed as Director (Fig 2). Hailing from Kingsport, NS, he was the son of a commercial fisherman and had previously worked on scallop biology at the St. Andrew's Biological Station and fish population dynamics at the University of Toronto. The same year also marked the arrival in Halifax of Gordon A. Riley to become the new Director of the Institute of Oceanography (Gordon 2019) and William L. Ford to become the new Director of BIO (Gordon 2016).

Oceanography was a high federal priority at that time and resources for research were plentiful. Under the direction of Lloyd Dickie,

the AOG program continued to expand with focus on studying the oceanographic processes underlying marine production with special reference to fisheries. This ecosystem focus was a somewhat different approach from that taken by other FRB labs across the country whose programs were more focused on fisheries and technology. At the time, commercial fisheries stocks were managed primarily on a single species basis, with little consideration of multispecies interactions and ecosystem factors. A formal start to using an ecosystem approach to fisheries management did not begin until the mid-1980s (O'Boyle *et al.* 2014).

Like other FRB laboratories across the country, AOG was responsible for deciding and directing its own research program within its general mandate. Directors of FRB laboratories had full control over all support functions. A-Base funding, an annual allotment provided by Ottawa with few restrictions, was abundant and distributed to projects at the discretion of directors. These funds were quite stable from year to year, which aided the planning of multiyear research programs, and salaries were secure. Hence, there was no need for staff to compete for external funding as university colleagues had to do. Being an integral part of BIO, AOG had full access to the various oceanographic support services available at the institute.

Lloyd Dickie had a free hand in recruiting the new staff. Most recruits were recent graduates who were able to address important questions in their fields of expertise with a minimum of direction. He took great pains to protect them from government administration and his office door was always open for discussion. This approach created a very stimulating and productive research environment that paid handsome dividends. Scientists became leaders in their fields of study and were actively involved in international scientific activities.

In 1966, AOG was renamed the Dartmouth Laboratory of the Fisheries Research Board and by now the staff had increased to 37. Then, in 1968, the lab was renamed the Marine Ecology Laboratory (MEL). The 1960s had been a period of growing public concern about the environment, stimulated by events such as the publication of *Silent Spring* (Carson 1962) and the 1967 *Torrey Canyon* oil spill off Cornwall, UK, and the need for Canadian research programs to investigate the effects of human activities on marine ecosystems was clearly recognized. Accordingly, in 1970, the mandate of MEL was expanded to include the ecosystem effects of pollutants.

The following year, MEL was incorporated into the newly created federal Department of the Environment (DOE).

In 1973, after a 75-year history of excellence in fisheries research, the Fisheries Research Board (FRB) was relieved of direct control over its research programs and facilities and demoted to an advisory body (Anderson 1984). Six years later, the Fisheries Research Board of Canada was formally disbanded marking the end of a highly respected and productive Canadian scientific organization (Johnstone 1977). These changes, while regretted by staff, did not have much of an immediate impact on MEL and by and large its research programs continued as usual.

After nine years at the helm and building MEL into a major marine ecological laboratory with an international reputation for excellence, Lloyd Dickie stepped down as Director in 1974. He moved across the harbour to Dalhousie to replace Gordon Riley as Chair of the Department of Oceanography and to become the Director of the newly created School of Resource and Environmental Studies.

By now, the years of expansion were largely over and MEL had developed a broad ecological program that covered all parts of the marine food web ranging from phytoplankton to marine mammals, including physical oceanographic processes and chemical contaminants. Field programs were being carried out in a variety of environments ranging from coastal waters to the open ocean. The staff, now about 85, worked in close collaboration with other BIO laboratories and university scientists, in particularly Dalhousie where numerous staff served as instructors and research associates. By and large funding was adequate, ship time was easy to get and staff were able to participate actively in numerous international scientific activities. Morale was high. These were indeed exciting and productive times.

The departure of Lloyd Dickie marked the beginning of a four-year period during which MEL had four successive acting directors: Barry S. Muir, Donald C. Gordon, Trevor C. Platt and Richard F. Addison. Fortunately, the general working environment remained relatively stable during this period and most programs continued as usual. In 1977, Alan R. Longhurst arrived as the new director (Fig 3). He came with extensive experience having previously worked at the West African Fisheries Research Institute, the

New Zealand Department of Fisheries, the US Southwest Fisheries Science Center and the UK Institute for Marine Environmental Research in Plymouth. Soon after, in 1979, MEL became part of the newly created Department of Fisheries and Oceans (DFO). That year, Alan Longhurst became the Director General of Ocean Science and Surveys (OSS) Atlantic, and Director of BIO. Hence, another search began for a new director of MEL and Kenneth H. Mann was appointed (Fig 4). Mann had previously joined MEL as a research scientist in 1967, coming from Reading University in the UK where he had worked extensively on the River Thames ecosystem, but in 1972 had moved over to Dalhousie to become the Chairman of the Department of Biology.

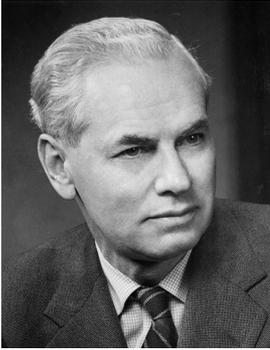


Fig 1 F. Ronald Hayes
(Chairman, Fisheries
Research Board, 1964-1969)



Fig 2 Lloyd M. Dickie
(MEL Director, 1965-1974)



Fig 3 Alan R. Longhurst
(MEL Director, 1977-1979)



Fig 4 Kenneth H. Mann
(MEL Director, 1980-1987)

The late 1970s and early 1980s were ‘golden years’ for all components of BIO. Organizational and policy changes at the Ottawa level up to that time had had limited impact on regional research programs and resources continued to be stable. All components of BIO were thriving and morale was high. By this time, BIO had become one of the major oceanographic institutes around the world, on par with the Woods Hole Oceanographic Institution and Scripps Institute of Oceanography, and functioned very much like a federal university.

RESEARCH HIGHLIGHTS

Over its history, MEL scientists made many contributions to the field of marine ecology ranging in scale from local coastal areas to the global ocean. Some selected highlights are presented. Pertinent review articles in *Voyage of Discovery*, the book commemorating the 50th anniversary of BIO in 2012, are cited (Nettleship *et al.* 2014).

New Sampling Tools

Quite often, the tools needed for sampling marine ecosystems in support of MEL projects were not available off the shelf but had to be designed and fabricated in house with the assistance of BIO mechanical and electronic engineers. These included various pumping systems, particle counters, zooplankton samplers, incubation chambers, sediment traps and acoustic fish detection systems (Li 2014). Many of these were copied by other laboratories and some were transferred to industry for manufacturing and sale.

Physical Oceanography

Physical oceanographic studies were carried out in a large number of key Maritime regions including coastal areas such as Margaree Harbour, Pictou Harbour, St. Margaret’s Bay, Halifax Harbour, Bedford Basin and St. George’s Bay, as well as the Gulf of St. Lawrence and the Cabot Strait (Smith *et al.* 2014). These provided the necessary foundation for understanding ecosystem properties and processes.

Non-living Organic Carbon

A wide variety of projects were conducted on the properties and dynamics of the huge reservoir of non-living organic carbon in the sea, including both dissolved and particulate components.

These included determining the concentrations and vertical profiles in the Atlantic, Pacific and Arctic oceans, studying the transformation processes between dissolved and particulate forms, investigating sedimentation rates and pelagic and benthic exchanges, and exploring its role as a food source for marine organisms (Li 2014, Gordon *et al.* 2014b).

Plankton

MEL was perhaps best known for its many fundamental contributions to understanding marine plankton (Li 2014). These included determining many of the major factors controlling primary production by phytoplankton, examining how its distribution is affected by physical oceanographic properties, discovering the great importance of picoplankton in the transformation of energy in the sea, unravelling many of the details of secondary production by zooplankton, and assessing the ecological geography of the world ocean. Field studies ranged from local waters to the global ocean, including working under ice in the Arctic Ocean.

Benthos

MEL also made important contributions to benthic ecology (Gordon *et al.* 2014b). These included determining the primary production of seaweeds, benthic algae and saltmarshes in local coastal environments and elucidating the composition of benthic communities, and in some cases their secondary production, in numerous locations ranging from the intertidal zone to the continental shelf.

Fish

While not directly engaged in providing advice for the management of fisheries, many fundamental studies were conducted that addressed fish metabolism, feeding dynamics, energetics, larval stages, recruitment, population dynamics and predator-prey relationships. In addition, MEL initiated studies of the effects of environmental factors such as freshwater runoff and seawater temperature on fisheries (O'Boyle *et al.* 2014).

Ecosystems

MEL was one of the first laboratories in the world to conduct studies of whole ecosystems in which emphasis was placed on understanding the interactions between the physical environment and different trophic levels. The first was carried out in

St. Margaret's Bay, followed soon after by similar studies in Halifax Harbour/Bedford Basin and Petpeswick Inlet. These in turn were followed by much more detailed studies in St. Georges's Bay (Lambert *et al.* 2014) and the upper reaches of the Bay of Fundy (Gordon *et al.* 2014c).

Beginning with measurements of the size distribution of particles in surface waters on the Hudson-70 Expedition and later calculations of the biomass of zooplankton, fish and mammals from the scientific literature, MEL scientists observed that, to a first approximation, when plotted on a logarithmic scale there was roughly an equal concentration of pelagic biomass over the whole size range from bacteria to whales. This unexpected observation led to the development of the biomass spectrum theory, another unique MEL contribution to understanding marine ecosystems in the world ocean (Duplisea *et al.* 2014). Given information on the abundance and size distribution of plankton, the theory could predict the equilibrium biomass of fish that a body of water can support. This size-structured view of marine ecosystems provided an effective theoretical and empirical basis for understanding and managing aquatic ecosystems.

Using information from field studies and gleaned from the scientific literature, MEL undertook several projects to develop detailed quantitative numerical models describing the flow of energy through ecosystems of particular interest. These projects included scientists from all oceanographic disciplines and much of the work was done in a workshop environment, often involving international collaborators. One project developed a model of the pelagic ecosystem on the Grand Banks in order to better understand the potential impacts of a major oil spill at the Hibernia development site. Another project developed a model of the Cumberland Basin pelagic and benthic ecosystem in the upper reaches of the Bay of Fundy, which was a site under consideration for tidal power development (Gordon *et al.* 2014c). These models could be used to run simulations to predict the ecosystem impacts of changing important physical and chemical properties.

Contaminants

MEL made many major contributions to understanding the distribution, pathways and effects of chemical contaminants on marine ecosystems. Considerable emphasis was devoted to chlorinated hydrocarbons, including DDT (and its derivatives) and

PCBs (Addison *et al.* 2014). Transfer pathways and bioaccumulation in marine food webs were measured in different regions including St. Georges Bay, Sable Island and the Arctic Ocean. In addition, major contributions were made to understanding the fate and effect of oil spills, especially in cold-water environments (Gordon *et al.* 2014d). Scientists were also involved in examining the feasibility of disposing of radioactive waste in deep sea sediments. As well as studying the impacts of contaminants, MEL scientists also studied the effects of physical habitat disturbance on marine ecosystems. These included studies of the impacts of causeway construction, as well as the proposed construction of barrages for tidal power development in the Bay of Fundy (Gordon *et al.* 2014c).

Scientific Advice

As civil servants, MEL provided objective scientific advice on environmental issues as requested. This often included responding to environmental emergencies such as toxic algal blooms, fish kills and oil spills.

DEMISE

Unfortunately, in the mid-1980s, dark clouds began to appear on the horizon. A-Base funding began to dwindle and MEL had to start looking for other sources of funding to support its research, from both government and industry. For the first time, staff had to invest time in preparing and defending research proposals. These external funding sources came with specific objectives, often quite applied, over which directors had little control. This made it more difficult to pursue research of a more basic nature to address fundamental ecological questions. Then, in 1986, a major national reorganization of DFO driven by Ottawa began which had a huge impact on MEL and ultimately led to its demise. Ken Mann was interviewed by senior officials from Ottawa about the process of scientific research and the role of MEL in the federal service. The concept of the federal government supporting a world-class oceanographic institute such as BIO which focused on long-term research addressing important scientific questions cut little ice. It was clear that the Ottawa mandarins saw that the primary role of MEL should be to provide scientific advice to fisheries and habitat managers and that

the government, not scientists, must determine the fields of study that would be of most benefit to Canada. It soon became clear which direction the wind was now blowing.

In early 1986, the DFO Deputy Minister, Peter Meyboom, announced that Ocean Science and Surveys (OSS), which contained all the federal oceanography programs including MEL and the Canadian Hydrographic Service, was being disbanded and merged with the Fisheries Resource Branch. The reason given for this drastic action was that DFO fisheries managers had complained that they were not getting the information from OSS that they needed to manage their fisheries. However, this reason was not actually valid. OSS, including MEL, had always recognized its responsibility to provide oceanographic information for fisheries management and was always open to requests for advice. Over the years, various mechanisms had been set up to facilitate this process and encourage collaboration with the Fisheries Resource Branch. It appeared that the senior managers in Ottawa, mostly with a background in fisheries, were either unaware of these initiatives or deliberately chose to ignore them. Since MEL was the only federal laboratory of its kind in the country, it was seen as an anomaly and scheduled for closure. At the same time, major cuts in funding for all of DFO were announced.

In April 1986, Barry Muir was appointed as acting Regional Director of Science for the Scotia-Fundy Region. This new position reported to the Regional Director-General of the newly established Scotia-Fundy Region in Halifax, J.-E. Haché, not to a senior official in Ottawa. This marked the end of direct reporting by BIO oceanography programs to Ottawa as had long been the practice since it was founded in 1962. As result of this change, there was no longer a strong voice for oceanography around the table in the nation's capital.

Soon after, Peter Meyboom announced the new policy priorities of DFO. These were defined to shape the direction that the department would take in carrying out its mandate to manage fisheries resources, with greater emphasis on conservation and enforcement and on improving the consultative and regulatory process. The new policies also addressed the need to consolidate DFO science activities and ensure that they respond more closely to the needs of clients. Oceanography was no longer recognized as a national priority.

As a result of these actions, several MEL staff began to make sure that word of what was happening got out to university colleagues, other oceanographic institutes and the media. Eric Mills in the Dalhousie Department of Oceanography subsequently played a leading role in spreading the word and raising concerns. He argued that basic oceanographic science was being hit hard and brought firmly under the control of fisheries administrators and that the pending closure of MEL represented a significant step backward for Canadian oceanography (Mills 1986). Letters protesting the federal science resource cuts and the pending dismantling of MEL were written to the Minister of DFO, Tim Siddon, senior DFO managers and key MPs. They were also sent to provincial MLAs. In addition, letters protesting the funding cuts and pending demise of MEL were solicited from scientific colleagues around the world. Also, wilfully breaking departmental communication guidelines, several MEL scientists vented their frustration by conducting interviews that questioned the wisdom behind Ottawa's decision to disband MEL without consulting the scientists involved. These protests were widely reported by the media. As expected, the widespread objections to the planned decisions were not well received by DFO bureaucrats.

All of the protesting actions taken by MEL staff, Dalhousie colleagues and prominent marine scientists from around the world had no impact on the decision-makers and MEL was formally closed on 1 April, 1987. Over 100 staff, including non-MEL scientists, gathered at the main door of BIO wearing black armbands to stage a 'wake for marine science' (Fig 5) (Charbonneau 1987). They wanted to show that MEL's demise was not opposed by just a small band of malcontents, as Minister Siddon had stated several days before in the House of Commons, but also by much of the scientific community in Atlantic Canada and marine scientists around the world. This act of mourning was a symbolic expression of the concern that the need for Canadian oceanographic research was not understood or supported by the senior managers of DFO. It was indeed a dark day for Canadian marine science.

Concerned about the unrest, Peter Meyboom visited BIO a few days later and gave a presentation to all DFO staff explaining the basis for his decisions. As expected, he was coldly received, but at least he had the courage to come down from Ottawa and face an



Fig 5 Protesting the closure of MEL on 1 April 1978.

open and somewhat hostile audience. He stated that, because of the pressure to downsize, it was necessary to amalgamate oceanography and fisheries in DFO but that, while some names were disappearing from the organizational structure, functions were not, they were merely being redistributed. He felt that long-term multidisciplinary research of the type carried out by MEL was not threatened. Although this meeting helped to reduce the atmosphere of confrontation, MEL staff were still most concerned about the future.

LEGACY

Fortunately, the closure of MEL was not the end of marine ecological research at BIO as many had feared. While MEL ceased to exist on paper, after the funding cuts and some transfers of staff to other DFO laboratories, the scientific staff adapted, somewhat reluctantly, to the new working conditions. The Biological Oceanography Division, which was little affected by the organizational changes, was able to carry on much of its program of basic research on marine plankton production processes on regional, national and global scales. The newly created Habitat Ecology Division established a series of more applied projects at local and regional scales to address the expanding needs of habitat managers under the new

national DFO fish habitat policy. Most of these projects addressed understanding the impacts of human activities such as aquaculture, oil and gas development, fishing and habitat alteration on marine ecosystems. Recognizing that proper management required more information than just the internal dynamics of individual fish stocks, the Marine Fish Division gave increasing attention to ecological considerations in fisheries management and initiated a number of new ecosystem level research projects. Another factor which led to the development of new ecological programs at BIO was the passing of the Oceans Act (1997) and the Species at Risk Act (2002). As a result of these new legislative mandates, new management projects with an ecological focus were initiated which included preparing reviews, status reports and recovery plans for threatened species, as well as leading the development of integrated ocean management plans for large spatial areas and marine protected areas. With time, the importance of understanding the structure and dynamics of marine ecosystems and how they can be influenced by human activities and climate change became more widely appreciated throughout DFO. By 2012, the 50th anniversary of BIO, all of the three remaining DFO research divisions had either ‘ecosystem’ or ‘ecology’ in their names.

CONCLUSION

When the Marine Ecology Laboratory was founded, oceanography was a high priority of the Canadian federal government and well supported. MEL scientists were given a wide range of latitude in planning their programs that addressed the structure and dynamics of marine ecosystems, with projects ranging from physical oceanography to marine mammals. Its mandate later expanded to investigate the impacts of contaminants and habitat alteration on marine ecosystems. MEL was most fortunate to have been at the right place at the right time and operated under exceptional circumstances which provided an exciting and creative research environment. As a result, over its twenty-two year history, MEL developed an outstanding international reputation for excellence and made many fundamental contributions to improving the understanding of marine ecosystems and how they can be affected by human activities.

These original scientific contributions have been of great benefit to Canada.

During the lifetime of MEL, there was a pronounced change in Canadian federal government science policy and the organization of its research laboratories (Hayes 1973, Gordon 2020). There was a gradual trend in Ottawa to take authority away from the directors of the research laboratories and focus government science on more practical problems specific to Canada. Senior managers were more interested in operating a business, with specific objectives set by clients, rather than supporting research laboratories devoted to more fundamental studies. The demise of MEL was indeed a passing dark cloud for Canadian marine science. Fortunately, the scientists were able to regroup under the new organization and carry on the tradition of conducting significant ecological research at BIO.

In 2006, thirty-seven ex-MEL staff gathered for a reunion to reflect on the wonderful opportunities and experiences that they had shared together (Fig 6). Despite fewer resources and increasing government bureaucracy in recent years, the MEL legacy of ecological research at BIO has continued.



Fig 6 MEL reunion in 2006.

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