

Organization of fisheries, environmental and ocean science in Canada

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Dr. John Davis is the Regional Director of Science, Pacific Region, for Canada's Department of Fisheries and Oceans. He is responsible for biological, oceanographic, environmental, aquaculture and hydrographic programs run by the Department on the west coast of Canada and in the western Arctic. This work is delivered through three major research centers – the Institute of Ocean Sciences (Sidney, B.C.), the Pacific Biological Station (Nanaimo, B.C.) and the West Vancouver Laboratory. Since 1992 Dr. Davis has been Canadian delegate to PICES. He also serves as Chairman of the Asia Pacific Economic Cooperation (APEC) Working Group on Marine Resources Conservation, Co-chairman of the Canada-Japan Environmental Panel on the North Pacific and Canadian negotiator or delegate for bilateral and multi-lateral fisheries issues in the Pacific. Dr. Davis received his B.Sc. (1966) in biology from the University of Victoria, and M.Sc. (1969) and Ph.D. (1971) in zoology from the University of British Columbia

In Canada, under constitutional arrangements, responsibility for the sea coast and inland fisheries rests with the Federal Government, centered in Ottawa, Ontario, the nation's capital. In practice, most of the administrative responsibility for the inland freshwater fisheries of the country have been delegated to the Provinces who manage those resources on behalf of the federal government. Therefore, the federal government is responsible for management of the marine fisheries and also retains direct responsibility for anadromous species such as salmon which migrate from freshwater to the sea and return to freshwater rivers and lakes to reproduce.

Canadian legislation important to management of fisheries, habitats and the oceans includes the Fisheries Act, the Canada Oceans Act and other related legislation and regulations under the Acts to provide for an enforcement function. Both the Fisheries Act and the Canada Oceans Act are the responsibility of the Minister of Fisheries and Oceans. The Fisheries Act provides for the direct management and protection of fisheries with appropriate regulations and includes provisions to protect fish and fish habitat against damage and loss. A fish habitat policy of the Department provides for no net loss of productive fish habitat in the case of man-made developments. The Canada Oceans Act extends Canada's jurisdiction to the full 200 mile limit, describes the ocean science and Coast Guard

responsibilities of the Department and sets out an ocean strategy on behalf of the Minister of Fisheries and Oceans. Under this provision, the Minister is accountable for coordinating the responsibilities of other parties involved in the ocean, for provision of marine protected areas and for integrated coastal resource planning. The Oceans Act is somewhat unique, in that it provides for an ecosystem approach to ocean management.

The Department of Fisheries and Oceans, since its recent merger with the Canadian Coast Guard, is now one of Canada's larger federal departments with headquarters in Ottawa and a five regional divisions across the country- Pacific Region, Central and Arctic Region, Maritimes Region, Laurentian Region and Newfoundland Region. The Department has approximately 12,000 staff, mostly located in decentralized regional locations where services are needed, and a budget in excess of \$CDN 1.0 billion. Functions of the Department include conservation, protection and management of fisheries resources and their habitats, science, hydrography, provision of vessel harbor support to the fishing industry, navigational aides and vessel traffic control, search and rescue and maritime safety, pollution response to marine spills, and a variety of related programs. In Canada, the Department of Environment, another federal department, also has a major role to play in the setting of environmental standards and guidelines

and regulation of industrial and other forms of pollution.

In Canada provincial governments also have responsibilities for natural resource management and environmental protection through their delegated responsibilities as described above but also due to their regulatory powers over industry and commerce in their respective jurisdictions. Thus the provinces have regulations with respect to pollution control, aquaculture licensing, water and land use activities, and the shoreline and shoreline resources.

With respect to fisheries, habitat and ocean science in Canada, many of the universities have major programs in these areas, particularly those in coastal provinces. Technical institutions and colleges offer courses in applied environmental and resource management and some also provide training in aquaculture techniques. The Department of Fisheries and Oceans has the largest scientific infrastructure in the country with major laboratories in all of its regions. These laboratories have significant programs in fish and invertebrate stock assessment in support of the management function, habitat and environmental science including contaminants studies, aquaculture and resource enhancement science, ocean science and hydrography, including the production of navigational charts and tide and current study and prediction. Provincial governments have wildlife resource management expertise and the federal departments of Environment and Natural Resources have expertise in environmental science and geoscience respectively, the latter including undersea geoscience.

Research expenditures in Canada on fisheries, habitat and ocean related work are largely by the federal government through the programs of departments such as Fisheries and Oceans, Environment, and to a smaller extent, Natural Resources. Much of the spending supports the programs conducted directly by the departments themselves through their own research institutions and projects, and through support of infrastructure such as laboratories and vessels. From time to time, special federal programs become available, such as the Program on Energy Research and Development (PERD) which provides special funding for directed research which meets the objectives of the PERD Program.

The National Research Council of Canada and a system of grants administered by the federal government also supports research in the country, much of it through applications for research grant funding submitted by university faculty members for

direct research grant support or for infrastructure grants to equip and operate facilities. In British Columbia, the five western Canadian universities operate a marine station, the Bamfield Marine Station, on a cooperative basis with a combination of university funding support and federal grants. The provincial governments also support some aspects of research and development, particularly applied research. For example in British Columbia, the Provincial Government has provided considerable support for research and development expenditures related to the aquaculture industry, and is currently developing a new program for fisheries-related expenditures to address problems in the industry affecting coastal communities and habitat restoration.

The Canadian private sector is strong in a number of aspects of marine science and engineering and in many cases, is a world leader in certain types of technology. Canada has strength in submersible design and construction, innovative manned, remote and autonomous undersea vehicles, propulsion systems, diving equipment, acoustics, remote sensing technologies, survey and hydrographic systems, fuel cells and battery designs, deep sea mooring technology, ocean buoy technology, satellite and space equipment with relevance to marine applications, electronic charts and navigation systems, vessel traffic control systems, specialty solvents, contaminant ultra-trace analysis, and environmental consulting and marine engineering services. In addition, the biotechnology industry is well developed in Canada and has a number of innovative technologies for ocean-related applications. Programs are available through federal sources such as Western Economic Diversification to support R&D development involving private sector companies and partnership building is encouraged through those funding programs.

Several new developments in British Columbia are of potential interest to the PICES community as possible opportunities for partnership development or networking in the Asia-Pacific region. First, the Federal Department of Fisheries and Oceans, Pacific Region, is actively developing a new way of operating a marine laboratory, the Pacific Institute for Aquatic Biosciences (PIAB) located in West Vancouver, B.C., in partnership with the private sector, university and other partners, including international partners, such as Pukyong National University in Pusan, Korea. This laboratory, which

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In the garden (1995)

medicine. Luckily, a few summers at St. Andrews Biological Station working on Atlantic fishes changed his direction. Some of us wonder what he might have accomplished had he chosen a career in medical research.

Although it doesn't seem possible, Dick does have moments of leisure. In true fashion he fills them. He is an avid gardener and he spends hours (or his wife Ann does) tending his 100's of Rhododendrons, Dahlias and just about every other plant or tree which fill his property in Nanaimo. His knowledge on rhododendrons is renowned and even professional gardeners seek his advice. He is a gourmet chef (long-time member of *Chine de rotisseur*), and chocolate maker, which he makes for every occasion. He collects stamps, specializing in Canadian and Japanese; and art. He is a member of the Nanaimo Hornets "over-forty" rugby team and enjoys travelling with the team to tournaments to have various bones broken; most recently during a tour of Japan (April 97). Fortunately for fisheries science, Dick's energy is unabated and we can look forward to many more years of leadership both at the international level and as part of research teams "going out to see how it works".



This paper is written by Dr. Gordon McFarlane in appreciation and recognition of Dr. Richard Beamish's outstanding service to fishery science and PICES over many years.

Gordon (Sandy) McFarlane is head of the Marine Fish Population Dynamics Section at the Pacific Biological Station, Nanaimo. He has been a member and advisor to many International commissions (INPFC, PICES, Canada/U.S. Groundfish Committee) and participated in several international research programs. His personal research centers on determining and refining biological parameters used in stock assessments; examining climatic and oceanographic factors influencing the dynamics of marine fish, and the physical, biological and fisheries oceanographic linkages of large marine ecosystems. Dick and Sandy have collaborated on numerous projects over the last 3 decades.

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offers excellent water systems and live holding facilities as well as top quality research space and equipment, will be a center for collaborative work among the partners with those involved sharing the operating costs for the facility. Also affiliated with PIAB are two other initiatives, COFRI- Canada's Offshore Frontiers Initiative and ORNEP, a concept of an ocean science network linking Pacific Rim research centers. COFRI is a partnership between private sector, university and government ocean research interests on Canada's West Coast and seeks to develop innovative programs in ocean science through partnerships with the backing of loan funding from the Government of Canada. Further information

on any of these initiatives can be obtained from the author.

From the perspective of PICES and development of collaboration with the PICES community, from the above, it is clear that opportunities to work with Canadian scientists can be found by developing contracts with federal organizations, private sector companies or university faculty members engaged in fisheries, habitat or ocean science and ocean engineering or biotechnology. Those contracts provide the necessary connection into the Canadian marine science community and the funding and laboratory infrastructure that is present in Canada.