



MARINE SCIENCES BRANCH

ANNUAL REPORT

1967-68

Department of Energy, Mines and Resources

Ottawa, Canada, 1969

MARINE SCIENCES BRANCH

ANNUAL REPORT

1967-68

The Marine Sciences Branch of the Department of Energy, Mines and Resources carries out federal research and survey programmes to assure safe navigation and to support development of natural resources in Canada's inshore and coastal waters.

The Branch is organized upon lines of regional responsibility with offices in Dartmouth, Nova Scotia at the Bedford Institute, in Victoria, British Columbia, and in Ottawa. The Headquarters is situated in the Department of Energy, Mines and Resources complex in Ottawa.

The Branch is responsible for the production and distribution of all Canadian navigational charts and tidal information. Its surveys of geological and geophysical characteristics of the ocean floor provide basic information for mineral exploration. Its studies of oceanographic phenomena are directed to support fisheries, transportation, coastal engineering and defence.

In 1967 the Branch fleet totalled twelve ships supported by seventy-five sounding launches and ninety-five smaller craft.

The modernization of the fleet continued with the commissioning of three new vessels, the Parizeau, Vector and Dawson, for continental shelf studies. They have replaced the Ehkoli, Parry and Cartier which were retired from service. In

addition, three charter vessels were employed during the year to meet the continued high demands for oceanic research and to support pollution studies in the Great Lakes.

Continued emphasis has been placed on the design and construction of specialized vehicles for research activities. The first of these vessels the CSS Limnos built for pollution investigations will be in service in 1968 on the Great Lakes. Designs and modelling of a catamaran type vessel are well underway in anticipation of adding another special research vessel to the Great Lakes programme.

Design studies have also been completed for a fast (25 knot) 80 foot cutter for the Great Lakes for high speed synoptic surveys. This craft will be powered with gas turbine engines and will be specially fitted out with laboratories and all-weather capabilities.

Plans for expansion of facilities at the Bedford Institute are progressing and it is expected that the end of 1968 will see the completion of the extension of the laboratory wing to provide a 50% increase in lab accommodation and the provision of a breakwater and floats for mooring of smaller craft.

Although the overall programme of the Branch is designed to insure coordination and integration of the efforts of its two specialties of hydrography and oceanography, it is instructive to report its accomplishments under these two main headings.

HYDROGRAPHY

In 1967, the Canadian Hydrographic Service began a systematic programme of field revisory surveys directed at the maintenance of the 900 Canadian navigation charts. During the year, 59 charts have been revised and material is now being prepared for an extensive revision programme for 1968 in both the Central and Atlantic Regions.

The demand for charts by Canadian and American pleasure craft operators cruising to Expo '67 raised the 1967 chart distribution totals to an all-time-high of 285,000 charts.

During the year, the Canadian Hydrographic Service published 193 navigation charts. This total included 27 new charts, 52 new editions, 57 corrected reprints, 15 reprints, 2 supplementary prints and 30 special charts. In addition, 54 Catalogue Index pages, 9 Information Bulletins and 7 Pilot Index maps were published. New editions of the Great Lakes Pilot Volume 1 and the Pilot of Arctic Canada Volume 3 were published. Eight Supplements to existing Pilot editions also were issued.

It is interesting to note that for the first time metres were used to portray soundings and depth contours in Canadian charts: two Bathymetric charts of the Arctic ocean, two charts of the Continental Shelf off Nova Scotia and southern Newfoundland, and four charts of the waters off the Labrador Coast, the latter being derived from charts compiled by the Federal Republic of Germany.

The Canadian Hydrographic Service is putting substantial effort into the application of automated techniques in hydrographic surveying and chart production. The work is being carried out by Work Groups in Ottawa, Saskatoon, Dartmouth and a Work Group in Victoria will join the Project in 1968. At the same time increased effort is being directed toward the training of new hydrographic survey staff. A record class of 23 began instruction in Ottawa this year.

PACIFIC REGION

The hydrographic surveys in the Pacific Region ranged along the entire coast and into the Western Arctic during 1967, with the work being done by the field parties on the Wm. J. Stewart, Marabell and Richardson. Tidal, current and scientific investigations were carried out from the Parry and Parizeau. The Ehkoli was also operated in support of scientific studies.

CSS Wm. J. Stewart completed the survey of the approaches to Burrard Inlet and made a reconnaissance for Mini-Fix station sites in the Strait of Georgia for 1968 surveys. The control for the re-survey of Prince Rupert Harbour was completed and the general charting programme in the Chatham Sound area, using both conventional and Mini-Fix survey equipment, was continued.

CSS Marabell completed surveys of the approaches to Nanaimo Harbour, the popular small-craft harbour of Prideaux Haven and the harbour and dock area of Gold River on

Muchalat Inlet. A survey of Portland Inlet and approaches and a survey of Meyers Passage for the Royal Canadian Navy was also completed. In addition, surveys of Seymour and Belize Inlets and of Departure Bay north of Nanaimo were started.

After spending the winter in Victoria undergoing her quadrennial refit, CSS Richardson revised 25 charts around Vancouver Island before returning to the Western Arctic. While rounding Cape Barrow, she was trapped in the Arctic pack ice until freed by USCGC Northwind and CCGS Camsell.

CENTRAL REGION

The most significant activities of the Region were concentrated in obtaining field information for the production of nautical charts. A major hydrographic survey using advanced survey techniques was completed in the Arctic Archipelago and support was provided to field activities in Great Lakes research conducted from the Canada Centre for Inland Waters at Burlington, Ontario. Important developments in semi-automated methods of processing field data were developed and field tested.

Because the majority of field operations within the Region are conducted by shore-based surveys, the emphasis on mobility and flexibility was continued. Throughout the survey season hydrographic operations were supported by one helicopter which moved between the various field parties as required.

Small boat charting along the Trent-Severn Waterway, commenced in 1965, was continued. In an endeavour to expedite

the charting of this significant small-craft route, two parties were assigned to the project and successfully completed the sections Bobcaygeon to Stoney Lake and Bay of Quinte, Murray Canal.

An excellent start was made on the systematic survey of Lake-of-the-Woods, required for the production of a new series of charts which will be of considerable importance to all users of the lake, and particularly to the pleasure boat operators. Data were obtained for the production of the first chart depicting Kenora and approaches.

In the entrance to Georgian Bay a major survey was completed using electronic position fixing equipment and high-speed sounding launches. A sub-unit of this establishment commenced a detailed survey of the main pleasure boat routes between Port Severn and Parry Sound on the eastern side of Georgian Bay.

A new survey party was established and commenced charting of the complex Upper-Ottawa River. It is anticipated that new charts in this area will not only encourage tourism but will also expedite engineering studies. Field surveys were completed from Chats Falls to Bryson during the 1967 season.

Studies directed towards the automation of field data processing were continued. Sounding records can now be successfully digitized in the office using semi-automatic techniques and field data plotted centrally using departmental computer facilities.

ATLANTIC REGION

The hydrographic survey of the Grand Banks was continued during 1967, with geophysical coverage throughout the survey. Decca Lambda was used to position the ship, as in previous years, but during much of the survey, the Kapuskasing surveyed along parallel lines to the Baffin, in an evaluation of the potential of multi-ship survey operations. Considerable interest has already been expressed by commercial organizations in the results from the survey.

Off Newfoundland's northeast coast, CSS Acadia continued the survey of Sir Charles Hamilton Sound after surveying Petit-de-Grat Harbour on Cape Breton Island, the site of a large fish-processing plant.

A team of hydrographers sailed to the Eastern Arctic on CCGS Sir John A. MacDonald, transferring later to CCGS d'Iberville. A survey of the entrance to Resolute Bay was completed and an extensive reconnaissance of the fiords on the northeast coast of Baffin Island was undertaken.

The magnitude of the surveying task which still lies ahead, has been realized for many years. The hydrographic development group established to devise and implement methods for improving the speed and accuracy of surveys was very active during the year in obtaining and evaluating equipment to be used in the automation of many facets of hydrography. Electronic positioning equipment was tested aboard CSS Baffin and CSS Hudson during the summer, and the work on semi-automatic

chart scalers progressed favourably. The Gerber Plotting Table was made operational and a series of programmes were devised for its operation. Orders were placed for two satellite navigation receivers to be delivered during 1968, and evaluation will be made during a cruise of investigations of the Mid-Atlantic Ridge.

OCEANOGRAPHY

Under this broad classification is included the wide range of marine investigations which primarily are not intended to insure safety to navigation. These studies include geophysical and geological investigations of the deep structure of the continental shelves and of the floors of the open ocean. The importance of these studies is being emphasized by a growing interest in the potential mineral resources of the extensive shelves under Canadian jurisdiction, and by increasing international concern over the control and disposition of mineral resources on the deep ocean floor.

Oceanographic research in the Branch includes comprehensive studies on waves of all periods from short wind waves to those of astronomical tides and longer. These studies involve theoretical, observational and experimental approaches, and findings will apply to harbour and breakwater design, to navigation, and to tidal power problems among others. An expression of these interests involves basic studies on the mechanics of air-sea interaction, a better

understanding of which will apply not only to wave prediction, but to improve weather forecasting.

Studies in oceanic and coastal circulation are carried out to better understand the means of transport of water properties and the dynamics of mixing processes in the oceans. These studies have particular application to fisheries, to defence, and to the assessment and prediction of pollution, both locally and over large areas. The increasing possibility of large scale oil pollution has demanded an accelerated study of this aspect of oceanography. In this connection, studies of the distribution of naturally occurring chemical elements in the sea and those radioactive elements recently introduced contribute to an understanding of these processes.

The Branch publishes the results of its oceanographic research in scientific journals and is developing a series of charts to display its information on bottom characteristics. The following paragraphs should serve to illustrate the variety of activities and accomplishments over the past year.

The Branch provides a centralized data centre for oceanography in Canada through the facilities of the Canadian Oceanographic Data Centre in Ottawa. It is supported by environmental and systems specialists engaged on climatological analyses and retrieval of data to meet the needs of industry and research in Canada and abroad. The Centre has steadily increased the scope of its holdings and the sophistication of its processing system over the past year.

Theoretical hydrodynamical and tidal studies continue to represent a major activity of oceanographic research in Ottawa with application to areas of particular Canadian interest and development, namely the Bay of Fundy, St. Lawrence River and Gulf.

The two regional centres which undertake oceanographic research are those on the Pacific and Atlantic coasts. In the development of an eventually well-rounded programme, attention has been focussed first on building up an adequate activity on the Atlantic coast. Up to the present the extension of the activities of the Branch on the Pacific Coast has been limited.

PACIFIC REGION

The Branch has undertaken an investigation of the tides and currents in the Strait of Georgia as a part of a cooperative programme with the Fisheries Research Board. This investigation is intended to provide information to meet the needs of fisheries, navigation and harbour developments, and pollution studies.

Support is provided to the Ocean Weathership programme. This investigation of the fluctuations in oceanic properties at Ocean Station "Papa" off the west coast represents the longest and most detailed continued study of ocean time variation anywhere in the world, and is an activity of wide international interest.

ATLANTIC REGION

The programme of basic research at the Atlantic Oceanographic Laboratory, Bedford Institute, has now been firmly established on a sound, and generally comprehensive range of activities. The year saw some expansion in areas of research which provides more immediate and practical returns, such as the study of swell in Halifax Harbour for the National Harbours Board. It is anticipated that future growth will emphasize applied investigations.

Variability in the ocean is being investigated with growing vigour; one result of such studies will be a firmer appreciation of the reliance which can be placed on synoptic oceanographic measurements. The collection of time series of observations, which form the basic data for studies in variability, cannot be made economically in the traditional manner using research ships. Moored buoys with recording oceanographic instruments are likely to be extensively used in such research, and also in research with short-term applied objectives. A project using such techniques has been in progress throughout the year, and a great deal has been learned of the value of such methods, as well as of the inherent problems and difficulties associated with them.

The comprehensive coverage of the North Atlantic in high latitudes in the winter months which was undertaken in the past two years by the cruises to the Labrador Sea and Irminger Sea represents a unique collection of data. Although the data

is not yet completely worked up, it promises to throw a significantly new light on the formation of deep water and on the deep circulation in the whole of the North Atlantic Ocean.

In Marine Geophysics, the major effort this year was devoted to continuation of the gravity and magnetic survey of the Grand Banks and off shore to Flemish Cap working jointly with the hydrographers in their programme of recharting the Banks; within an area of 33,100 square miles, 16,500 line miles of geophysical data were obtained, a significant contribution to our programme of continental shelf resource exploration and mapping. The geological aspect of this same broad programme was the focus of the Marine Geologists, who carried out their main field work along the Scotian Shelf, Grand Banks, Labrador Shelf and the associated continental slopes.

The close and satisfying working relationships between the Bedford Institute and other marine research organizations have continued to develop during the past year. CSS Hudson's cruise to Expo '67 where she was on display for a week demonstrating the methods and potential of oceanography to some 20,000 visitors, was a joint cruise with Dalhousie Institute of Oceanography; a subsequent Hudson cruise was also operated jointly between the Bedford Institute and Dalhousie, whilst visiting scientists were accommodated on many other cruises during the year.

