The *Blue Dolphin* at anchor in Seaplane Cove, northern Labrador. This was the base of the Grenfell-Forbes Expedition of 1931.

THE *BLUE DOLPHIN* LABRADOR EXPEDITIONS, 1949 and 1950

By David C. Nutt*

DURING the summers of 1949 and 1950 a party of scientists in the *Blue Dolphin*, a schooner of fisherman-type construction, carried out oceanographic and biological research along the coast of the Labrador. The general specifications of the schooner, which was acquired in 1948, were as follows:

Length over-all	100 ft.
Beam	22 ft.
Draft	12 ft.
Registered gross tonnage	91
Engine	140 H.P. Wolverine Diesel
Cruising speed	7 knots
Maximum speed	8 knots
Year built	1926
Place of origin	Shelburne, N.S.
Designer	W. J. Roue

In fitting the vessel for northern research work, certain alterations were necessary: the fuel capacity was increased to give a cruising range of 4,000 miles; accommodation was refitted to give berthing and messing facilities for a total party of eighteen to twenty; the bowsprit and main boom were cut down for ice navigation with proportionate reduction of the sail area; and the electrical plant was refitted to provide 110 volts (D.C. or A.C.) for operating equipment and scientific instruments.

With the cooperation of the U.S. Office of Naval Research, the U.S. Coast and Geodetic Survey, the Smithsonian Institution, the Woods Hole Oceanographic Institution, and Dartmouth College, the following principal items of scientific and navigational equipment were acquired:

1 Type NJ/9 recording fathometer
1 Type NK/7 portable recording fathometer
1 Bathythermograph winch, boom and gear
1 Hydrographic winch (with capacity for 2,000 metres of 5/32-inch wire) and gallows frame
Trawling gear
Phleger core sampler
Clarke-Bumpus plankton sampler
Radio receiving and transmitting equipment
Navigational loran
Mark VII binnacle with magnetic compass
Oceanographic and biological laboratory
Portable recording gauge

The *Blue Dolphin* expeditions have been supported by the Arctic Institute, with funds provided by the U.S. Government, the Canadian Government (1949), and private sources. The scientific program is carried out in cooperation with government and private organizations,

*Dartmouth College Museum.

such as the Smithsonian Institution, Canadian Geographical Bureau, Woods Hole Oceanographic Institution, Dartmouth College, and Cornell University. The members of the ship's company in 1949 and 1950 are listed on page 11.

The investigations of the past two years have been devoted to a general study of the coastal waters of the Labrador, which oceanographically and economically form an important part of Eastern Canadian Arctic waters. The latter are generally considered to be bounded on the west by the western shore of Hudson Bay, on the east by the west coast of Greenland, on the north by the Lincoln Sea, and on the south by the Strait of Belle Isle. In this region the waters of west Greenland are best known; elsewhere, oceanographic knowledge is still very incomplete. Baffin Bay and the Labrador Sea were studied in detail for the first time between 1928 and 1935 by the U.S. Coast Guard and by Danish parties, and as a result of this work the Labrador Current was defined; in 1930 the Canadian Fisheries Expedition made some investigations in Hudson Bay; finally, between 1946 and 1949 Dr. M. J. Dunbar made a study of Ungava Bay and Hudson Strait. Much of this work now requires repetition owing to widespread and important oceanographic changes which appear to have been taking place. Moreover, a study of the physical conditions, productivity, and ecology of these waters is important because their resources are fundamental for the support of the native population and future development of the region.

Eastern Canadian Arctic waters form a series of circulations in Baffin Bay, the Labrador Sea, and Hudson Bay which are in turn part of the larger circulation of the North Atlantic Drift and the waters of the Arctic Ocean. The coastal waters of the Labrador in the southern part of this region are under the primary influence of the cold Labrador Current and its interaction with the waters of the Labrador Sea, the coastal drainage, and, in the Belle Isle area, with the Gulf of St. Lawrence water. For nearly six months of each year the Labrador Current carries southward large masses of ice which block the entire coast, and provide the whelping grounds for the seals hunted by the sealers. During the summer months, when the pack ice breaks up and moves south to melt, codfish are found in great numbers.

In order to obtain a more complete and detailed knowledge of the effect of the general circulation on local conditions along the Labrador, studies were carried out at various points between the Strait of Belle Isle and Seven Islands Bay. In 1949 St. Lewis Inlet, Kaipokok Bay, and Hebron Fiord were examined with a brief reconnaissance of Hamilton Inlet and Lake Melville. In 1950 work was centred on the Hamilton Inlet-Lake Melville area; but also included an examination of Seven Islands Bay. Figure 1 shows the principal areas studied.

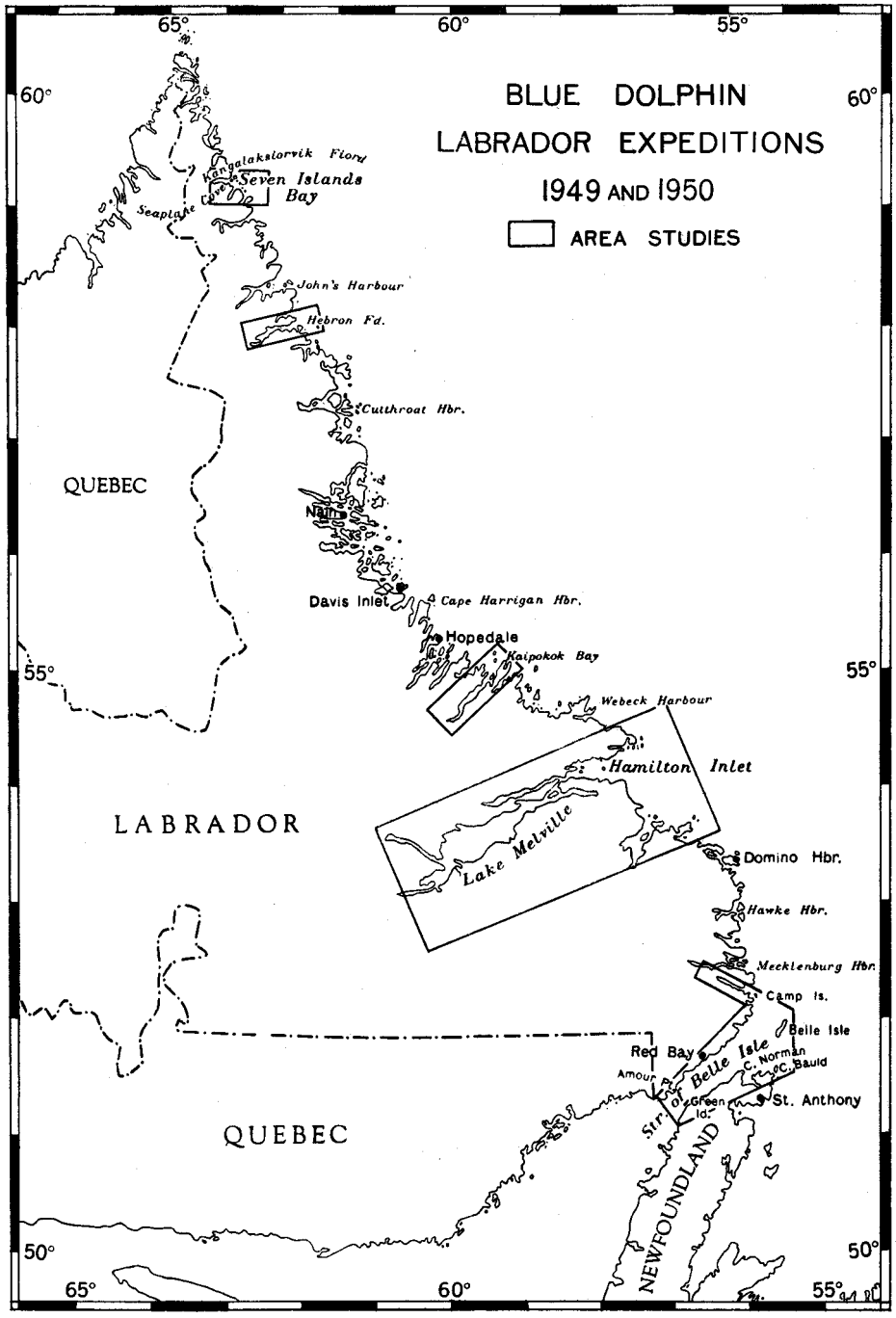
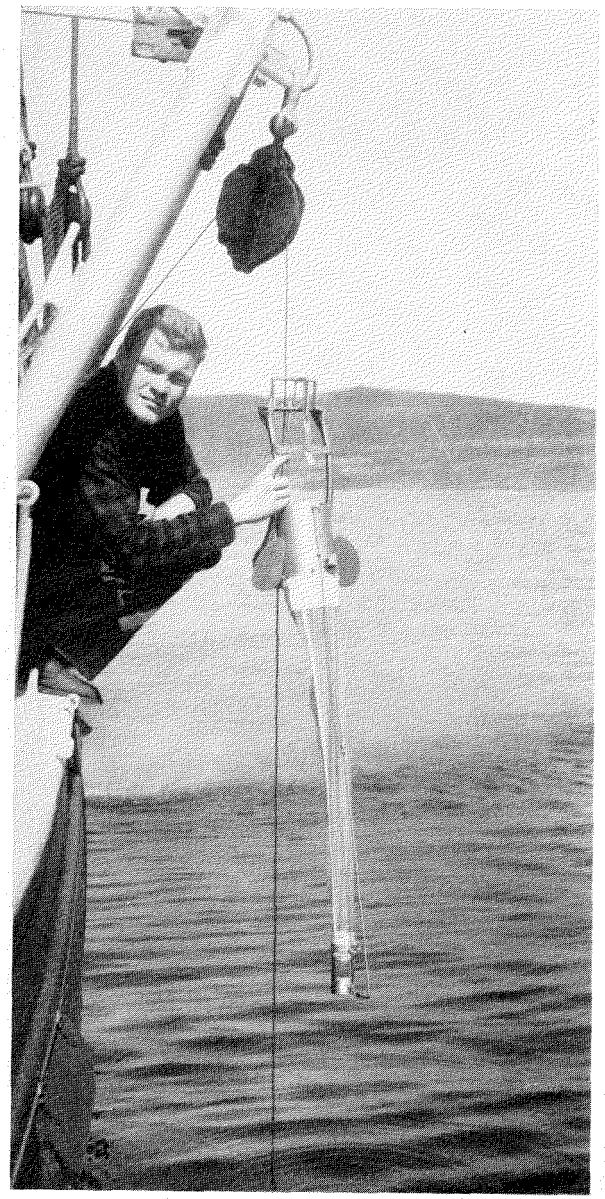


Fig. 1.

The work in short has consisted of a comprehensive ecological study of the coastal waters. In conjunction with the oceanographic observations, the following biological collections have been made: qualitative and quantitative plankton collections by means of Stramin nets and a Clarke-Bumpus plankton sampler; benthic faunal collections by means of trawls



L. Coachman attaching the Clarke-Bumpus plankton sampler. The low freeboard of the *Blue Dolphin* is a great asset in handling instruments and nets alongside.

and dredges, and fish collections from both salt and fresh water.

In addition to work in selected areas along the coast of the Labrador a study was also carried out in 1949 of the Strait of Belle Isle, where three oceanographic sections were made: Amour Point to Green Island, Red Bay to Cape Norman, and Camp Islands to Belle Isle to Cape Bauld.

The Hamilton Inlet-Lake Melville area investigated in 1950 will be described in some detail as this study forms one of the most important parts of the *Blue Dolphin* program. Hamilton Inlet has a very irregular bottom with shoals between 3 and 10 fathoms and general depths of between 20 and 40 fathoms. The inlet stretches inland from the coast in latitude 54°N. for some fifty miles to Rigolet, where the channel narrows to a width of one mile with depths of 14 to 15 fathoms on the "sill". Beyond this point, called The Narrows, lies Lake Melville, a tidal lake, which stretches eighty miles westwards, becoming nearly twenty miles wide at the western end, with depths of over 100 fathoms in the northeastern half. Goose Bay extends fifteen miles west of Lake Melville, the entrance being restricted by sand flats, with depths of one to two feet, and a channel less than half a mile

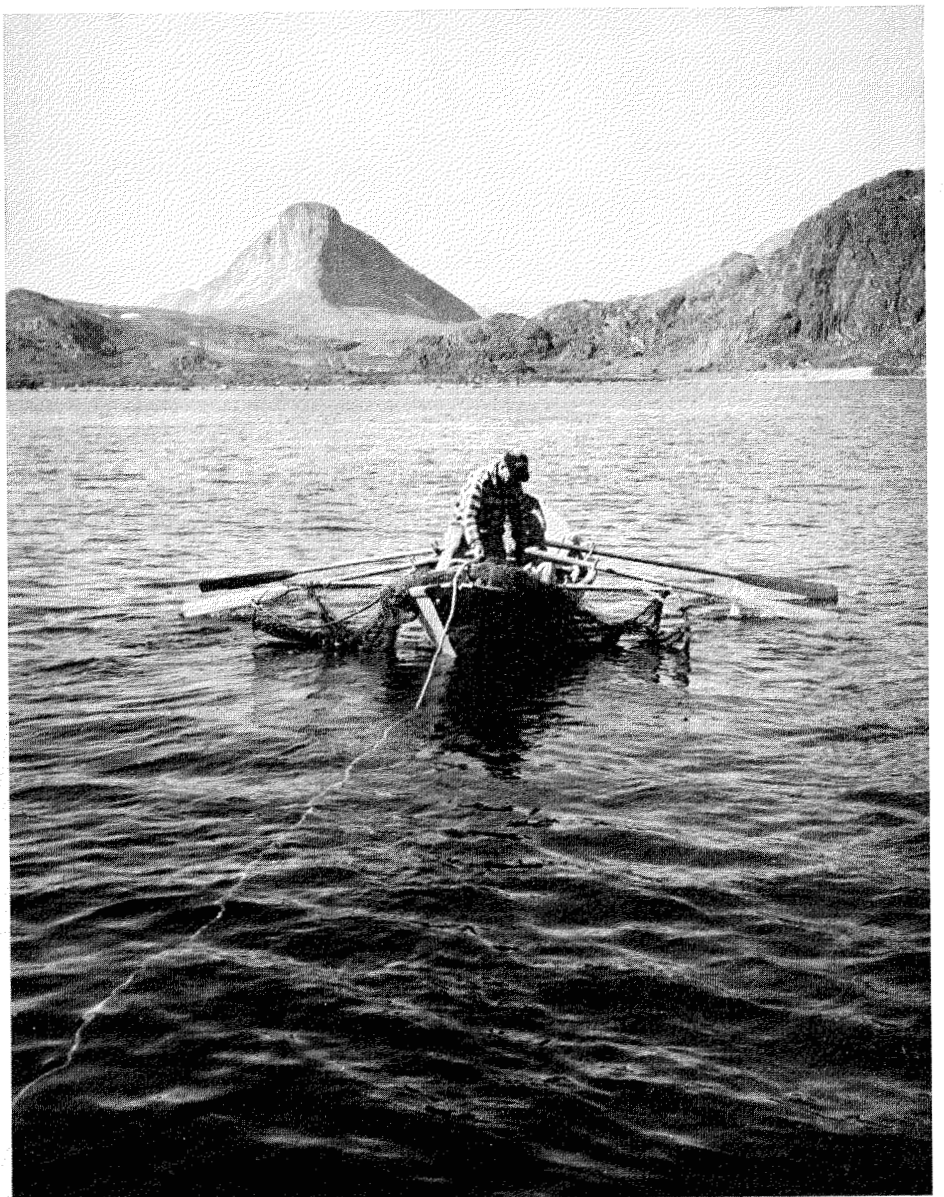


Photo: N. B. Dean

Dory carrying out beam trawl at the head of Kangalaksiorvik Fiord. This technique of taking the trawl off by dory or launch and hauling it back on board is used in waters where the vessel cannot be manoeuvred.

wide, with 21 feet on the "bar"; in Goose Bay itself depths increase again to 30 fathoms. Terrington Basin, an arm of Goose Bay, has depths of 10 to 12 fathoms, but is separated from Goose Bay by a 6-fathom channel, only fifty yards wide. The general picture is that of a series of basins separated at various points by constrictions and sills (*see* Figs. 2 and 3).

The major eastward drainage of the Ungava Peninsula into Goose Bay and the western part of Lake Melville flows through four main channels: the North West, Hamilton, Goose, and Kenamu rivers. Of

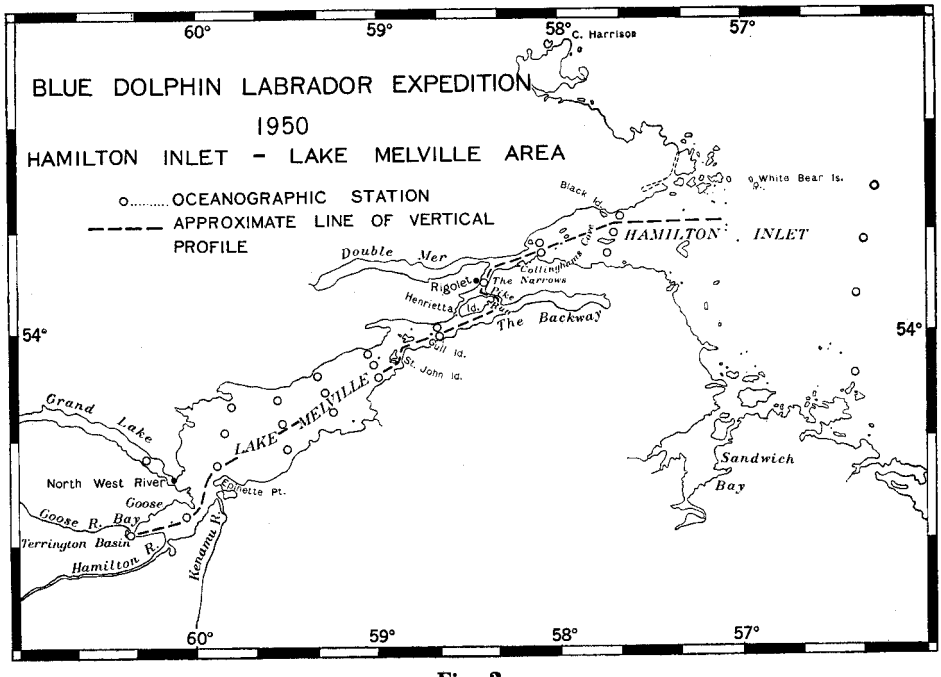


Fig. 2.

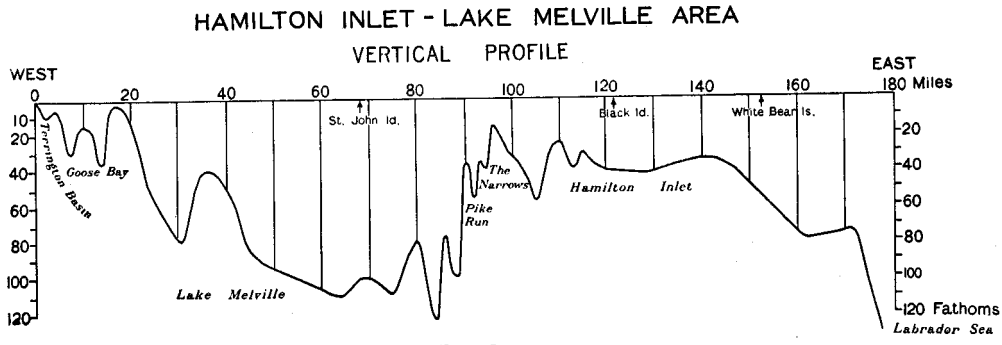


Fig. 3.

these the Hamilton is by far the largest both in the volume of water carried and in the extent of the area drained.

Four oceanographic stations made between 23 and 26 August 1949 and a series of bathythermograph observations give a general indication of some of the local conditions. At this period of the year the surface water of Goose Bay is practically fresh with a salinity of less than one

part per thousand, at a temperature of approximately 14°C. In the bottom layers, at depths from 20 to 40 metres, the temperature is less than 2°C with a salinity of 21.00-22.00 parts per thousand. In Lake Melville high surface temperatures prevail, ranging from 11.5° to 14.5°C, while surface salinity increases from about 3.00 parts off Epinette Point to about 10.00 parts per thousand to the west of St. John Island. The bottom layers of the lake present a marked contrast, with temperatures below 0°C and salinities of from 25.0 to 28.5 parts per thousand, the sharp transition taking place between the depths of 10 and 20 metres. On passing through The Narrows to Hamilton Inlet the change in the surface layers is abrupt. At a station off Black Island the surface temperature was found to have dropped to 4.9°C with a salinity of 26.50 parts per thousand, while near the bottom at 50 metres the temperature was about 2°C and salinity 31.76 parts per thousand.

Thus the surface waters of Goose Bay and the western part of Lake Melville are under the dominant influence of the great land drainage. There is, however, a definite exchange and intrusion of the more saline coastal water of Hamilton Inlet into Lake Melville and even across the 21-foot bar into Goose Bay, where it appears concentrated in dense bottom layers. The principal exchange and mixing of the waters occurs in The Narrows, with a net overflow due to the discharge of fresh water from the land drainage into Lake Melville.

In spite of the great inflow of fresh water over the surface layers of Lake Melville the fauna is predominantly marine, but both invertebrates and vertebrates are scarce. In contrast visual observations and year-round reports suggest that the waters of The Narrows, where the principal mixing takes place, are very productive. This is also indicated by the abundance in this area of the higher forms in the food chain, such as whales and seals. Immediately to seaward of The Narrows, where the influence of the coastal water becomes dominant, great numbers of codfish were noted, particularly in Collingham's Cove, where the *Blue Dolphin* occasionally anchored.

In 1950 twenty-seven oceanographic stations were established in the area: one in each of Goose Bay, Terrington Basin, and Grand Lake, fourteen in Lake Melville, one in The Narrows, and nine in Hamilton Inlet. The locations of the stations are shown in Fig. 2. The detailed observations made are still being worked up and cannot be included in this paper.

The Narrows station was perhaps the most interesting, being located on the sill between Hamilton Inlet and Lake Melville where the principal exchange of water occurs. The station was occupied continuously throughout one complete tidal cycle, during which hourly bathythermo-

graph and Nansen bottle observations were made. Position was taken at 0530 hours on 24 July 1950 at slack water. Hourly observations were begun at 0600 hours. Ebb current ran for nearly 8½ hours, slack water occurring again at approximately 1400 hours. A maximum ebb current of 5 knots occurred at 1015 hours approximately 50 minutes after low water Rigolet. The flood tide then ran from 1400 to a little after 2015 hours, a maximum of 4 knots occurring at 1645 hours, 80 minutes after high water Rigolet. The complete tidal cycle thus involved nearly 15 hours, even though high and low water as determined by tide staff reading at Rigolet occurred within 10 minutes of the predicted times. Unfortunately time did not allow us to continue the station long enough to determine how this departure from the normal twelve-hour cycle may be compensated. It is apparent that the exchange of mechanism of The Narrows, with a possible circulation around Henrietta Island, is complicated. It is hoped that the data obtained in 1950 may throw light on the problems of this interesting estuary.

While travelling coastwise in the poorly charted waters north of Hamilton Inlet reconnaissance sounding tracks were made on various inside runs, together with such navigational notes and recommended revisions of the sailing directions as were possible.

In addition to the main program of oceanographic and marine biological investigations certain additional projects have been undertaken. In 1949 transport and support were given to Mr. Elmer Harp, Jr. and his assistant, who spent the summer in the Strait of Belle Isle area doing archaeological work, and a party of geographers, led by Mr. W. A. Black of the Canadian Geographical Bureau, accompanied the *Blue Dolphin*. In 1950 Mr. Charles Handley, Jr. of the Smithsonian Institution made small mammal and bird collections, while Mr. James Schwedland of Yale University studied certain aspects of forest botany.

These additional projects fitted in well with the work of the expedition. It has been found that under almost all conditions except the most violent of storms some work can be done; at no time is the vessel laid up with all hands idle. During the voyages various field projects were carried out almost daily. An effort was made to reach an anchorage in time to allow traps to be set before dark and shore and hydrobiological collections to be made of birds, mammals, fish, marine invertebrates, insects, and botanical material. Shore parties were left at base camps for periods of from two days to two weeks for intensive examination of an area, while the vessel was operating in the vicinity.

The studies of the bird and mammal population in this easternmost section of the North American continent proved particularly interesting. For instance the large series of *Peromyscus maniculatus maniculatus*, the

white-footed mouse, obtained in 1950, much of which is topotypical, will make it possible to define that race properly for the first time since it was established on very few specimens.

In conclusion, the two summers' operations have shown that the *Blue Dolphin* is well suited and equipped for the type of work, which it is planned will be continued during the summer of 1951.

Members of the "Blue Dolphin" Expeditions

Scientists	1949	
Richard H. Backus	Cornell University	Oceanographer and Biologist
Gifford Beaton	Canadian Geographical Bureau	Geographer
William A. Black	Canadian Geographical Bureau	Geographer
Paul C. Cabot, Jr.	Harvard University	Student assistant
Nicholas B. Dean	St. Paul's School	Student assistant
Elmer Harp, Jr.	Dartmouth College	Archaeologist
Arthur W. Herrington, Jr.	Massachusetts Institute of Technology	Student assistant
Neil MacArthur	Canadian Geographical Bureau	Geographer
Henry P. McKean, Jr.	Dartmouth College	Oceanographer
Stearns A. Morse	Dartmouth College	Assistant Archaeologist
David C. Nutt	Dartmouth College	Master and Leader
Frederick A. Stahl	Dartmouth College	Student assistant
Anthony F. Susen	Children's Hospital, Boston, Mass.	Surgeon
Professional Crew		
Otto Halvorsen	Drammen, Norway	Boatswain
Ralph A. Haskell	Essex, Mass.	Seaman
Rowland Pearson	New Bedford, Mass.	Cook
Percy L. Poirier	Ipswich, Mass.	Seaman
Marcus Sigurjonsson	Reykjavik, Iceland	Seaman
Charles D. Spohr	Centerville, Mass.	Chief Engineer
Reginald Wilcox	Hartford, Conn.	Special assistant
Scientists	1950	
Richard H. Backus	Cornell University	Oceanographer and Biologist
Lawrence Coachman	Yale University	Assistant Hydrographer
William Butler	Johns Hopkins University	Student assistant
Jack Dailey	Dartmouth College	Communications
Nicholas B. Dean	Dartmouth College	Student assistant
Charles C. Hall	Mary Hitchcock Memorial Hospital	Surgeon and Zoologist
Charles O. Handley, Jr.	Smithsonian Institution	Zoologist
Emerson Hibbard	Cornell University	Assistant Biologist
David C. Nutt	Dartmouth College	Master and Leader
Mary L. Nutt	Hanover, N.H.	Secretary
James Schwedland	Yale University	Forest Botanist
Otto Schumacher	Dartmouth Medical School	Oceanographic Chemist
William Stubbs	Dartmouth College	Student assistant
Garry Valentine	Yale University	Student assistant
Professional Crew		
Otto Halvorsen	Drammen, Norway	Boatswain
Henry P. Holmes	Waquoit, Mass.	Chief Engineer
Marcus Sigurjonsson	Reykjavik, Iceland	Seaman
Norman Turcotte	Tiverton, R.I.	Steward
Reginald Wilcox	Hartford, Conn.	Special assistant