LEVEL A (1)

WOODS HOLE OCEANOGRAPHIC INSTITUTION

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED

WOODS HOLE, MASSACHUSETTS

80 1 28 1

(1)

WOODS HOLE OCEANOGRAPHIC INSTITUTION

Woods Hole, Massachusetts

(14) WHOI-REF-

Reference No. 50-53

(6) Research in Relations between the North Atlantic Sea Ice and Arctic Weather,

conducted during the period May 15, 1950 to November 15, 1950.

(9) Periodic Status Report.

Submitted to the Office of Naval Research
Under Contract N6onr-27705

(15)

(11) December 1950 (12) 9

APPROVED FOR DISTRIBUTION

Director

381 CCO

1 p

According to the terms of Contract N6onr-277, Task Order No. V, the work to be performed by the Contractor shall consist of the following:

1. Select monthly and seasonal ice data beginning approximately with this century, prepared by the Danish Meteorological Institute and the International Ice Patrol, and which were treated for individual regions in a recent investigation by L. Koch (9, Koch, 1945).

2. From the available historical series of the mean monthly northern hemisphere sea-level and regional upper-air pressure charts, and also from the seasonal charts which are to be prepared, compute zonal, meridianal, and other significant indices of the large-scale atmospheric circulation contemporary with and preceding various ice conditions in the several regions investigated.

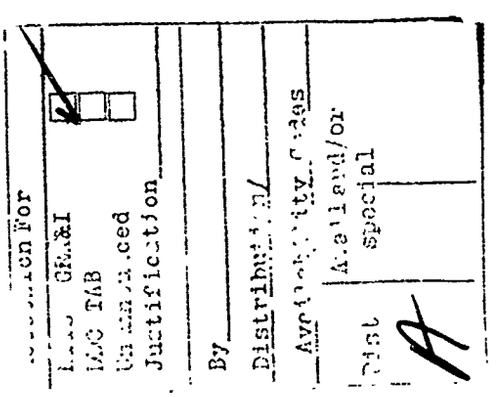
3. Prepare mean monthly and seasonal series of North Atlantic sea temperatures from data collected by the International Council for the Exploration of the Sea and the Hydrographic Offices of the United States and British Navies.

4. Compute mean monthly and seasonal series of water transports in regions that have possible bearings on the ice conditions.

5. Obtain from the wind velocities to be derived from the mean monthly and seasonal sea-level pressure charts estimates of the water-transport in the trade and other North Atlantic areas for which no direct determinations can be had.

6. Develop methods for estimating the extent and mechanism of ice melting and young-ice formation.

7. Investigate possible relations between the critically evaluated dynamic and thermal circulation indices and contemporary and following ice conditions.



Visit to England

During the period covered by this report, the writer spent some time in England surveying activities in Polar oceanography and meteorology, particularly as related to the ice in the North Atlantic-Arctic. Conversations were held with Drs. G. E. R. Deacon and N. A. MacIntosh of the National Oceanographic Institute, Dr. J. N. Carruthers, Hydrographic Department, Admiralty, Commander C. E. N. Francom, Marine Branch, Meteorological Office, Commander J. R. Lumby and Mr. A. J. Lee, Fisheries Laboratory, Lowestoft, Dr. C. E. P. Brooks and others.

The oceanographic research program of the Fisheries Laboratory is most interesting and holds, it is thought, considerable promise. The Laboratory operates the oceanographic research vessel ERNEST HOLT, a converted fishing trawler of some 1,500 tons, which makes four regular hydrographic sections a year from Bear Island some eighty miles westward to Jan Mayen and another section south-southeastward to Norway (see map). In addition, six other sections in the waters off Bear Island are made each year with the "runs of the fish". The sections are quite regularly spaced in time, the ship operating in winter as well.

The data obtained by the ERNEST HOLT are being analyzed together with previously obtained sections in the same general area by other ships to study the shorter- and longer-period changes in the North Atlantic warm water sweeping around northern Norway and in the cold waters flowing southward past Bear Island. The investigation is under A. J. Lee's direction and follows the general plans published in a recent paper (Lee, 1949).

While in Lowestoft, it was also learned of the large collection of unpublished hydrographic sections from Svalbard waters mainly, covering the period 1919-1940, which has been gathered by Professor H. Mosby of Bergen. An attempt is being made to secure this information for our own investigations.

Arrangements were also made with Lloyds of London for possible information on ice observations by ships sailing from British to Barents Sea and White Sea ports prior to 1895, the year with which the Barents Sea ice series, as published by the Danish Meteorological Institute, begin.

GREEN L A N D

70°

10° E.

W V U T S R Q P N

SEA

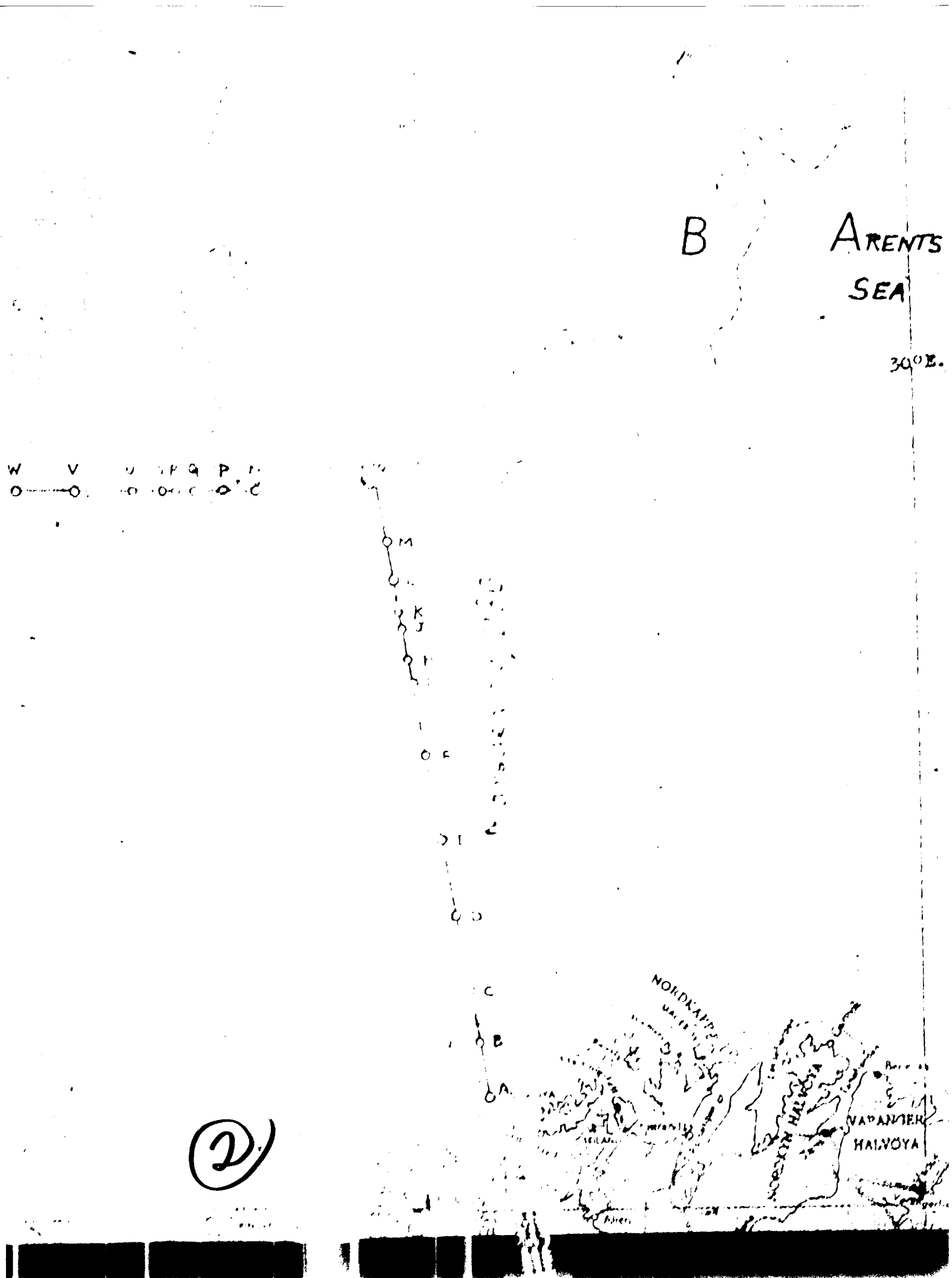
Fisheries Laboratory,

Lowestoft.

GREAT BRITAIN

Sections.

(1)


B
ARENTS
SEA
30°E.
M
K
J
I
C
B
A
NORDKAPP
VARANGER
HALVOYA
2

Foreshadowing the Severity of the Iceberg Season off Newfoundland.

The formula for forshadowing the severity of the iceberg season off Newfoundland which embodies several elements of the circulation of the northern North Atlantic (see WHOI Reference No. 50-15) was used to compute the iceberg count for the 1950 season.

The obtained departure from the long-term average of 4.8 (on scale of 10) was 1.0. The value of the actual departure was 0.4, adding one more year to the 23-year test period 1927-49 with an on the whole favorable record of foreshadowing the iceberg count. Also, of the 12 years in the last 24 when the computed departure was equal to or exceeded $\pm$ 1.0, all 12 including 1950 agreed as to sign with the actual departure.

Preparation of Basic Material for Investigation (as outlined on Page 1)

Much time during the period covered by this report had to be spent in the preparation of the basic data for analysis inasmuch as most of the material appears in very raw form only.

(a) Seasonal Limit of the Southern Boundary of the Ice in the North Atlantic-Arctic.

Work on the preparation of each season's (April-August) approximate ice limits in the North Atlantic-Arctic has been completed for the period 1932-39 and is being continued to include the larger number of earlier years and some later years that are available.

(b) Hydrographic Sections.

Sections from the northern North Atlantic, particularly from the Shetland-Faroes area, beginning with 1893, are being plotted for analysis of changes in the temperature and other characteristics of the northern North Atlantic waters for comparison with the ice.

(c) Sea Surface Temperatures.

Work has also been started on plotting and analyzing the long series of northern North Atlantic sea surface temperatures recently compiled by J. Smed (1947, 48, 49) and which begin in some instances with the year 1876.

Relations of Ice off Iceland to the Precipitation

The work on possible relations of the ice off Iceland with different elements of the northern North Atlantic circulation which was begun with a consideration of the temperature variations from 1831 to date (WHOI Reference No. 50-41) is being expanded to include the precipitation in Iceland, northern Europe, etc.

In considering the nature of the fluctuations in the air and water circulation in the northern North Atlantic and adjacent areas, we may presume that periods of increased circulation and a northerly displacement of the North Atlantic Low and, consequently, periods with more frequent moist winds, may be expected to be associated with above average precipitation over the northern North Atlantic and adjacent areas and conversely, periods with decreased circulation, etc., with below average precipitation.

Thus, an examination of the annual precipitation at Stykkisholm, beginning with the decade 1861-70, shows that two decades of severe ice off Iceland (1861-70, 1881-90) were accompanied by markedly below average precipitation and the two decades of light ice in succession (1921-40) by above average precipitation.

This work is being extended to include the variations in the precipitation of the other areas.

TABLE I

Average Annual Precipitation Departures at Stykkisholm (Iceland) from Long-Term Average (1857-1945) during Severe and Light Ice off Iceland by Decade (1861-1940)

Severe Ice	Ppt. mm	Light Ice	Ppt. mm	Average Ppt.(1857-1945) mm
1861-70	-49.4	1921-30	117.6	688.9
1881-90	-82.4	1931-40	163.1	

References

Lee, A. J., 1949: The Forecasting of Climatic Fluctuations and Its Importance to the Arctic Fishery. Contrib. to Spec. Sci. Meet. 1948. Rapp. et Proc. Verb., Cons. Perm. l'Explor. pour la Mer., v. CXXV, pp. 40-41.

Smed, J., 1947: Monthly Anomalies of the Surface Temperature in the Sea round South Greenland during the years 1876-1939. Ann. Biol., Cons. Perm. l'Explor. pour la Mer., v. 11, pp. 17-22. Copenhagen.

____ 1948: Monthly Anomalies of the Surface Temperature in some areas of the Northwestern North Atlantic in 1876-1939, 1945-1946. Ann. Biol., Cons. Perm. l'Explor. pour la Mer., v. III, pp. 17-24.

____ 1949: Monthly Anomalies of the Surface Temperature in the Northeastern North Atlantic during the years 1876-1939, 1945-1948. Ann. Biol., Cons. Perm. l'Explor. pour la Mer., v. V, pp. 10-15.

____ 1949: Monthly Anomalies of the Surface Temperature in the Sea round Iceland during the years 1876-1939, 1945-1947. Ann. Biol., Cons. Perm. l'Explor. pour la Mer., v, IV, pp. 11-26.