PUBLICAION SCIENTIFIQUE N° 16

REPORT ON OCEANOGRAPHICAL WORK FROM OCEAN WEATHER SHIPS

By
J. R. LUMBY and O. H. SAELEN

1957

Secretariat d'Association: Oceanografiska Institutet, Göteborg, Suède
The Association issues two series of publications, viz., *Publications Scientifiques* and *Procès-Verbaux*.

The following numbers have appeared. Prices in shillings and pence are given in brackets; (x) indicates out of print.

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   II. Historical review of dynamical explanations of the tides of the Mediterranean, the Baltic Sea, the Gulf of Mexico, and the Arctic Ocean. (1931). (x).

No. 2. Tidal Bibliography (Third instalment). (1932). (x).

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These publications form a continuation of the *Bulletin de la Section d'Oceanographie de l’Union Géodésique et Géophysique Internationales*, of which there were 17 numbers, No. 1 being issued in 1921 and No. 17 in 1931; all out of print.
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No. 8. Report of the committee on the criteria and nomenclature of the major divisions of the ocean bottom. (1940). (5/-).

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No. 10. Monthly and annual mean heights of sea-level, 1937 to 1946 and unpublished data for earlier years. (1950). (15/-).

No. 11. J. P. JACOBSEN and REX J. ROBINSON and THOMAS G. THOMPSON: A review of the determination of dissolved oxygen in sea water by the Winkler Method. (1940). (1/4-).


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Report on Oceanographical Work from Ocean Weather Ships
by
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1. Introduction

1.1. The present system of Ocean Weather Stations in both the Atlantic and Pacific Oceans is the outcome of a project developed in World-War II for Ocean Weather Stations and Plane Guard Stations.

1.2. From February 1940, two stations in the western North Atlantic were occupied by vessels of the United States Coast Guard. In the summer of 1942, two Plane Guard Stations were established in the northern part of the ocean, and these stations were later incorporated into the Ocean Weather Station network. In 1944 considerable expansion of this programme took place and by the middle of 1945 22 stations had been established in the Atlantic; of these, 11 were maintained in the western North Atlantic by the United States of America, 5 in the eastern North Atlantic by the United Kingdom, 4 in the South Atlantic by Brazil, and a further 2 in the South Atlantic by the United Kingdom. Thereafter numbers declined until an agreement for the continuation of the system was reached in 1946 under the auspices of the International Civil Aviation Organization (ICAO).

1.3. The Pacific network began with the establishment of 2 Ocean Weather Stations in the eastern North Pacific by the United States in 1943. Shortly after, these were increased to 4, and in addition 3 Plane Guard Stations were set up. Further additions were made during the following years, so that by the beginning of 1948, 22 stations, both Ocean Weather and Plane Guard, were occupied, 21 by the United States and 1 by Canada. As in the Atlantic, the number of stations fell thereafter, but unlike the post-war network operated in the Atlantic under the sponsorship of ICAO, the post-war Pacific network was developed on the initiative of the United States and Canada, independently of ICAO.

1.4. In these earlier years — indeed, until 1949 — the programmes for both Atlantic and Pacific Oceans were in a state of considerable flux and the details of events are difficult to determine precisely.

Very useful information, especially for the early years, is to be had in the Ocean Station Vessel Meteorological Records Survey, Atlantic and Pacifics, published by the Weather Bureau, U.S. Department of Commerce (Washington, D.C., 1956).

1.5. In the following report, stations are as a rule referred to by letter, not by the phonetic names frequently used, the reason being that these names were not universally adopted. The phonetic alphabets used at different times are listed below:

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North Atlantic

2. Ocean Weather Stations

2.1. The network agreed upon in 1946 under the auspices of ICAO consisted of 13 stations, for the operation of which the following States were to be responsible:
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North Atlantic

2. Ocean Weather Stations

2.1. The network agreed upon in 1946 under the auspices of ICAO consisted of 13 stations, for the operation of which the following States were to be responsible: ---
2.2. In 1949, it was agreed to reduce the number of stations to 10, Stations F, G, and L being abandoned. The operating States were then as follows:

United States of America and Netherlands 1 Station (A)
United States of America and Canada 1 Station (B)
United States of America 4 Stations (C, D, E, H)
United Kingdom 1 Station (I)
United Kingdom and Netherlands 1 Station (J)
France and Netherlands 1 Station (K)
Norway, Sweden, Belgium, and Denmark 1 Station (M)

2.3. In 1954 a fresh agreement was reached, signed by Belgium, Canada, Denmark, France, Ireland, Israel, Italy, Netherlands, Norway, Sweden, Switzerland, the United Kingdom, and the United States of America. Under this agreement, which is still in force, Belgium, Denmark, Ireland, Israel, Italy, and Switzerland contribute towards the cost of operating the North Atlantic scheme.

During the course of the year the number of stations was reduced to 9; Station H was abandoned and Station I reverted to its original position. United States vessels served Stations B, C, D, and E. For the latter half of 1954 the Norwegian/Swedish vessels served Station A; the Netherlands, Station M; the British, Stations I and J; and the French, Station K. After the end of the year, the Norwegian/Swedish vessels returned to Station M, and the French, British, and Netherlands vessels served Stations A, I, J, and K in rotation, but whenever a French vessel would have been assigned to Station I at the same time as a British vessel to Station K, the French vessel went to Station K and the British to Station I. Station A was again occupied by Norwegian/Swedish vessels from July 1956 to January 1957.

During that period Station M was occupied by Netherlands ships.

2.4. Station A: established at position 62° 00' N., 33° 00' W. in September 1947; continuing in operation at this position.

Station B: established at position 56° 30' N., 51° 00' W. in November 1947; continuing in operation at this position.
Figure 1. Showing the location of Ocean Weather Stations in the North Atlantic. The dots represent stations continuing in operation, the circles, positions which have been abandoned.
Station C: established at position 51° 45' N., 35° 30' W. in July 1947; position changed to 52° 45' N., 35° 30' W. in 1949; continuing in operation.

Station D: position originally proposed 45° 00' N., 45° 00' W.; established in January 1946 at position 44° 00' N., 41° 00' W.; continuing in operation.

Station E: established at position 34° 00' N., 52° 00' W. in September 1946; position changed to 35° 00' N., 48° 00' W. in 1949; continuing in operation.

Station F: established at position 35° 30' N., 40° 00' W. in February 1949; station abandoned in September 1949.

Station G: established at position 46° 00' N., 20° 00' W. in June 1948; station abandoned in July 1949.

Station H: established at position 36° 00' N., 70° 00' W. in May 1949; position changed to 36° 40' N., 69° 35' W. in May 1952; station abandoned in July 1954.

Station I: established at position 60° 00' N., 20° 00' W. in September 1947; position changed to 59° 00' N., 19° 00' W. in March 1950, to 61° 00' N., 15° 20' W. in August 1953, and to 59° 00' N., 19° 00' W. in July 1954; continuing in operation.

Station J: established at position 53° 30' N., 18° 40' W. in August 1947; position changed to 52° 30' N., 20° 00' W. in March 1950; continuing in operation.

Station K: established at position 47° 00' N., 15° 00' W. in October 1947; position changed to 45° 00' N., 16° 00' W. in 1949; continuing in operation.

Station L: established at position 39° 00' N., 17° 00' W. in January 1948; station abandoned in 1949.

Station M: established at position 66° 00' N., 62° 00' E. in August 1948; continuing in operation.

2.5. It may be noted that where responsibility for occupying a station is shared between two or more States, a ship is not invariably provided by each State separately. For instance, although Canada has an obligation to provide one ship for Station B and in fact operated ships at this station during the period November 1947 to June 1950, this obligation is now discharged by the United States in return for Canada carrying out the complete operation of Station P in the Pacific. Similarly Belgium operated a ship at Station K during the period October 1947—June 1949, but has not separately provided a ship since then. No oceanographical observations were made by either the Canadian or Belgian vessels, however, at these stations. Denmark is no longer associated with the actual operation of a station, and Sweden shares responsibility with Norway.

3. Ocean Weather Ships

3.1. United States of America

Ships are assigned by the U.S. Coast Guard as necessary to serve the stations. These are cutters of 2,400 tons displacement. They are not specially equipped for oceanographical work, but are fitted for bathythermograph operation. The oceanographical work is carried out by the ship's company.

(i) Bathythermographs are lowered to 450 feet
   (a) every 3 hours on passage to and from station,
   (b) every 3 hours by day and every 6 hours by night on station, and
   (c) in conjunction with plankton hauls (see below).

(ii) On behalf of the Narragansett Marine Laboratory, Kingston, Rhode I., plankton collections were made weekly at Stations B and E over a period of 2 years, according to the following routine:

(iii) On behalf of the Fisheries Research Station, St. John's, Newfoundland, records were made of squid and blackfish sighted at Station B.

3.2. United Kingdom

Four ships are operated, of 1,300 tons displacement. They are not specially equipped for oceanography, and have no laboratory space. The gear used is supplied by the institutions for whom the observations are made. Sea-Temperature Recorders (thermographs) are fitted, with the bulb in the main inlet.
Station C: established at position 51° 45' N., 35° 30' W. in July 1947; position changed to 52° 45' N., 35° 30' W. in 1949; continuing in operation.

Station D: position originally proposed 45° 00' N., 45° 00' W.; established in January 1949 at position 44° 00' N., 41° 00' W.; continuing in operation.

Station E: established at position 34° 00' N., 52° 00' W. in September 1948; position changed to 35° 00' N., 48° 00' W. in 1949; continuing in operation.

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Ships are assigned by the U.S. Coast Guard as necessary to serve the stations. These are cutters of 2,400 tons displacement. They are not specially equipped for oceanographical work, but are fitted for bathythermograph operation. The oceanographical work is carried out by the ship's company.

(i) Bathythermographs are lowered to 450 feet
   (a) every 3 hours on passage to and from station,
   (b) every 3 hours by day and every 6 hours by night on station, and
   (c) in conjunction with plankton hauls (see below).

Lowerings (a) and (b) above are carried out as part of the ship's routine.

(ii) On behalf of the Narragansett Marine Laboratory, Kingston, Rhode I., plankton collections were made weekly at Stations B and E over a period of 2 years, according to the following routine:

- Secchi disk readings,
- Nansen water-bottle samples at 0, 25, 50, 100, and 150 m.,
- Clarke-Bumpus Sampler: No. 2 and No. 12 silk nets, 20-minute oblique hauls from 150 to 0 m.,
- Standard ½-m. No. 2 silk net: 20-minute horizontal hauls (0 m.).

This programme has now ceased.

(iii) On behalf of the Fisheries Research Station, St. John's, Newfoundland, records were made of squid and blackfish sighted at Station B.

3.2. United Kingdom

Four ships are operated, of 1,300 tons displacement. They are not specially equipped for oceanography, and have no laboratory space. The gear used is supplied by the institutions for whom the observations are made. Sea-Temperature Recorders (thermographs) are fitted, with the bulb in the main inlet.
(i) On behalf of the Fisheries Laboratory, Lowestoft, the following observations have been undertaken:—
Surface temperatures and salinity samples with the Surface Sampler every 4 hours on passage to and from Stations I and J, and daily on station at noon (salinity samples on alternate days from July 1952). During September 1956 Engine-Room Samplers, which operate off the main condenser intake, were fitted in the ships for use in place of the Surface Sampler. Vertical hauls with a 50 cm. fine-silk net from 50 m., for phytoplankton, weekly on station. The net was hauled by counterweight. Collection ceased in December 1951.
Vertical hauls with a 40 cm. coarse-mesh net (60 meshes to the inch) from 100 m., for zooplankton, weekly on station, at Stations I and J. Collection began in January 1952.

(ii) On behalf of the Scottish Marine Biological Association, Edinburgh, a Hardy Plankton Recorder has been towed on passage to and from all stations. The winch and davit are specially provided.
One-litre surface water samples were collected, for nanoplanckton, weekly on station; collection of the nanoplanckton samples ceased in March 1951.

(iii) On behalf of the Marine Laboratory, Aberdeen, drift-bottles have been liberated on outward passages and at intervals on station.

(iv) On behalf of the National Institute of Oceanography, one ship has been fitted with an automatic wave-height recorder, which is operated for 10 minutes every 3 hours on station.

(v) On behalf of the Department of Geodesy and Geophysics, Cambridge University, a special experiment involving seismic refraction measurements in the ocean bed was made in August 1949. Special scientific staff were embarked.

(vi) On behalf of the Admiralty, bathythermograph lowerings to 450 feet have been undertaken by one ship every 6 hours on passage to and from station and twice daily on station.

3.3. NETHERLANDS
Two ships are maintained, of 2,000 tons displacement. They have laboratory space on board and are equipped with a deep-sea oceanographical winch and a bathythermograph winch. As regards the oceanographical work, the surface observations are made by the meteorological scientific staff, the subsurface by special scientific staff.

(i) On behalf of the Fisheries Laboratory, Lowestoft, surface temperatures and salinity samples have been taken, with the Surface Sampler, every 4 hours on passage to and from Station J and daily (salinity samples every other day from July 1952) at noon on station. This work was taken over by the Koninklijk Nederlands Meteorologisch Instituut (KNMI) in May 1955.

(ii) On behalf of KNMI surface temperatures and salinity samples have been taken every 4 hours on passage through the North Sea to and from Station A. At Station J serial observations of temperature, salinity, and oxygen have been made occasionally at standard depths down to 2,500 m. On two of these occasions, relative current measurements were made with the Ekman current-meter. Measurements of wave height have also been made with pole and damping-disk apparatus. Since August 1955 surface temperatures and salinity samples have been taken every 3 hours when east of 20° W, on passage to and from station and daily on station at noon. At Stations I, J, and M, serial observations of temperature, salinity, and oxygen have been made occasionally at standard depths down to 2,500 m., and bathythermograph observations have been made.

(iii) On behalf of the Marine Laboratory, Aberdeen, drift-bottles have been liberated on passage to and at Station J.

(iv) On behalf of the Scottish Marine Biological Association, Hardy Plankton Recorders have been towed on passage to and from all stations.
One-litre surface water samples, for nanoplanckton, were collected weekly at Station J until March 1951.

(v) On behalf of the Fisheries Laboratory, Lowestoft, vertical hauls with a 50 cm. fine-silk net were made, for phytoplankton, from 50 m., weekly at Station J until December 1951. The net was hauled by counterweight. Since January 1952, vertical hauls with a 40 cm. coarse-mesh net (60 meshes per inch) have been made, for zooplankton, from 100 m., weekly at Station J.
(i) On behalf of the Fisheries Laboratory, Lowestoft, the following observations have been undertaken:—
Surface temperatures and salinity samples with the Surface Sampler every 4 hours on passage to and from Stations I and J, and daily on station at noon (salinity samples on alternate days from July 1952). During September 1950 Engine-Room Samplers, which operate off the main condenser intake, were fitted in the ships for use in place of the Surface Sampler. Vertical hauls with a 50 cm. fine-silk net from 50 m., for phytoplankton, weekly on station. The net was hauled by counterweight. Collection ceased in December 1951.
Vertical hauls with a 40 cm. coarse-mesh net (60 meshes to the inch) from 100 m., for zooplankton, weekly on station, at Stations I and J. Collection began in January 1952.

(ii) On behalf of the Scottish Marine Biological Association, Edinburgh, a Hardy Plankton Recorder has been towed on passage to and from all stations. The winch and davit are specially provided.
One-litre surface water samples were collected, for nanoplanckton, weekly on station; collection of the nanoplanckton samples ceased in March 1951.

(iii) On behalf of the Marine Laboratory, Aberdeen, drift-bottles have been liberated on outward passages and at intervals on station.

(iv) On behalf of the National Institute of Oceanography, one ship has been fitted with an automatic wave-height recorder, which is operated for 10 minutes every 3 hours on station.

(v) On behalf of the Department of Geodesy and Geophysics, Cambridge University, a special experiment involving seismic refraction measurements in the ocean bed was made in August 1949. Special scientific staff were embarked.

(vi) On behalf of the Admiralty, bathythermograph lowerings to 450 feet have been undertaken by one ship every 6 hours on passage to and from station and twice daily on station.

3.3. NETHERLANDS
Two ships are maintained, of 2,000 tons displacement. They have laboratory space on board and are equipped with a deep-sea oceanographic winch and a bathythermograph winch. As regards the oceanographical work, the surface observations are made by the meteorological scientific staff, the subsurface by special scientific staff.

(i) On behalf of the Fisheries Laboratory, Lowestoft, surface temperatures and salinity samples have been taken, with the Surface Sampler, every 4 hours on passage to and from Station J and daily (salinity samples every other day from July 1952) at noon on station. This work was taken over by the Koninklijk Nederlands Meteorologisch Instituut (KNMI) in May 1955.

(ii) On behalf of KNMI surface temperatures and salinity samples have been taken every 4 hours on passage through the North Sea to and from Station A. At Station J serial observations of temperature, salinity, and oxygen have been made occasionally at standard depths down to 2,500 m. On two of these occasions, relative current measurements were made with the Ekman current-meter. Measurements of wave height have also been made with pole and damping-disk apparatus. Since August 1955 surface temperatures and salinity samples have been taken every 3 hours when east of 20° W. on passage to and from station and daily on station at noon. At Stations I, J, and M, serial observations of temperature, salinity, and oxygen have been made occasionally at standard depths down to 2,500 m., and bathythermograph observations have been made.

(iii) On behalf of the Marine Laboratory, Aberdeen, drift-bottles have been liberated on passage to and at Station J.

(iv) On behalf of the Scottish Marine Biological Association, Hardy Plankton Recorders have been towed on passage to and from all stations.
One-litre surface water samples, for nanoplanckton, were collected weekly at Station J until March 1951.

(v) On behalf of the Fisheries Laboratory, Lowestoft, vertical hauls with a 50 cm. fine-silk net were made, for phytoplankton, from 50 m., weekly at Station J until December 1951. The net was hauled by counterweight. Since January 1952, vertical hauls with a 40 cm. coarse-mesh net (60 meshes per inch) have been made, for zooplankton, from 100 m., weekly at Station J.
3.4. FRANCE

Two ships are operated, of 2,000 tons displacement. For oceanographical work, they are equipped with a deep-sea winch (3,500 m. of 4.5 mm. diameter wire) and a smaller winch (500 m. of 1.8 mm. diameter wire). M'écablier-type reversing water-bottles, and protected and unprotected reversing thermometers are carried. A recording thermometer is fitted, with the bulb in the main inlet. Standard plankton nets, of 35 cm. diameter and 1 m. length, are carried. There is no laboratory space on board. The surface observations are carried out by the meteorological staff; other observations are made by the ship's company with the assistance of the ship's surgeon. The following observations have been undertaken, as far as opportunity has permitted:

(i) Surface temperatures and salinity samples every 3 hours on passage to and from station, and daily on station at noon.
(ii) Serial observations of temperature and salinity on station every week at standard depths down to about 3,500 m.
(iii) Surface hauls with the plankton net, for 15 minutes, every 5 days, immediately before the serial hydrographic observations. These are now discontinued temporarily.
(iv) Visual observations of sea and swell.

Until the end of 1952 the observations were undertaken for the Service Hydrographique de la Marine. From then until 1956, the observations were undertaken for the Service Hydrographique de la Marine, the Institut Scientifique et Technique des Pêches Maritimes, and the Centre de Recherches et d'Études Oceanographiques (CREO). The salinity analyses were made by Knudsen's method, at the CREO laboratory, La Rochelle. Since September 1956, the physical observations have been made on behalf of the Service Hydrographique de la Marine; the salinities have been determined by Knudsen's method in the French naval chemical laboratories. The biological collections will be dealt with by the Muséum d'Histoire Naturelle.

Towards the end of 1955, Engine-Room Samplers were fitted in the French vessels, which have participated in the programme of surface salinity and temperature observations at Station J and on passage to and fro.

3.5. NORWAY AND SWEDEN

Two ships are operated, of 1,300 tons displacement. They are specially equipped for oceanographical work, and are provided with an electric hydrographic winch, and an oceanographical laboratory. The observations are carried out by the meteorological scientific staff and the ship's company, with additional scientific staff on occasion.

(i) On behalf of the Geophysical Institute, Bergen, the following observations have been made at Station M:

- Surface salinity samples (8 or 9) on passage to and from station.
- Serial observations of temperature, salinity, and (since 1953) oxygen, weekly, at standard depths to 2,500 m.
- Serial observations of temperature and salinity at a number of depths down to 1,000 m. 3 or 4 times a week, with thermo-sonde lowerings to 1,000 m.
- Thermo-sonde lowerings to 150 m. 2 or 3 times a week.

In July 1949, 155 additional series of observations were made, as part of a special survey in which the ships Nansen and Hansena took part. In connexion with a study of the representativeness of surface temperature observations, about 230 series of observations of temperature and salinity were made at 0, 1, 2, 5, and 10 m. depth, during the period February 1952—January 1953.

For a special investigation, in the neighbourhood of an anchored buoy, 27 additional series of temperature and salinity observations were made at depths down to 400 m. during June and July 1952.

Measurements of radiation and light penetration were made in May and July 1951 and in February, April, and June 1952. Measurements of the wind drift were made during the period April 1952—May 1953.

Surface temperatures have been recorded by recording thermometers (thermographs).

The bottom topography in the vicinity of Station M has been studied in detail by means of the echo-sounder.

(ii) On behalf of the Marine Laboratory, Aberdeen, series of drift-bottles were released on passage to and at Station M during the period June 1950—December 1952.

(iii) On behalf of the Geophysical Institute, Bergen, the following biological collections have been made:
3.4. FRANCE

Two ships are operated, of 2,000 tons displacement. For oceanographical work, they are equipped with a deep-sea winch (3,500 m. of 4.5 mm. diameter wire) and a smaller winch (500 m. of 1.8 mm. diameter wire). Mécaabolier-type reversing water-bottles, and protected and unprotected reversing thermometers are carried. A recording thermometer is fitted, with the bulb in the main inlet. Standard plankton nets, of 35 cm. diameter and 1 m. length, are carried. There is no laboratory space on board. The surface observations are carried out by the meteorological staff; other observations are made by the ship's company with the assistance of the ship's surgeon. The following observations have been undertaken, as far as opportunity has permitted:

(i) Surface temperatures and salinity samples every 3 hours on passage to and from station, and daily on station at noon.
(ii) Serial observations of temperature and salinity on station every week at standard depths down to about 3,500 m.
(iii) Surface hauls with the plankton net, for 15 minutes, every 5 days, immediately before the serial hydrographic observations. These are now discontinued temporarily.
(iv) Visual observations of sea and swell.

Until the end of 1952 the observations were undertaken for the Service Hydrographique de la Marine. From then until 1956, the observations were undertaken for the Service Hydrographique de la Marine, the Institut Scientifique et Technique des Pêches Maritimes, and the Centre de Recherches et d'Études Oceanographiques (CREO). The salinity analyses were made by Knudsen's method, at the CREO laboratory, La Rochelle. Since September 1956, the physical observations have been made on behalf of the Service Hydrographique de la Marine; the salinities have been determined by Knudsen's method in the French naval chemical laboratories. The biological collections will be dealt with by the Muséum d'Histoire Naturelle.

Towards the end of 1956, Engine-Room Samplers were fitted in the French vessels, which have participated in the programme of surface salinity and temperature observations at Station J and on passage to and from.

3.5. NORWAY AND SWEDEN

Two ships are operated, of 1,300 tons displacement. They are specially equipped for oceanographical work, and are provided with an electric hydrographic winch, and an oceanographical laboratory. The observations are carried out by the meteorological scientific staff and the ship's company, with additional scientific staff on occasion.

(i) On behalf of the Geophysical Institute, Bergen, the following observations have been made at Station M:

- Surface salinity samples (8 or 9) on passage to and from station.
- Serial observations of temperature, salinity, and (since 1953) oxygen, weekly, at standard depths to 2,500 m.
- Serial observations of temperature and salinity at a number of depths down to 1,000 m. 3 or 4 times a week, with thermosonde lowerings to 1,000 m.
- Thermo-sonde lowerings to 150 m. 2 or 3 times a week.

In July 1949, 155 additional series of observations were made, as part of a special survey in which the Armaner-Hanssen took part. In connexion with a study of the representativeness of surface temperature observations, about 250 series of observations of temperature and salinity were made at 0, 1, 2, 5, and 10 m. depth, during the period February 1952–January 1953.

For a special investigation, in the neighbourhood of an anchored buoy, 27 additional series of temperature and salinity observations were made at depths down to 400 m. during June and July 1952.

Measurements of radiation and light penetration were made in May and July 1951 and in February, April, and June 1952.

Measurements of the wind drift were made during the period April 1952–May 1953.

Surface temperatures have been recorded by recording thermometers (thermographs).

The bottom topography in the vicinity of Station M has been studied in detail by means of the echo-sounder.

(ii) On behalf of the Marine Laboratory, Aberdeen, series of drift-bottles were released on passage to and at Station M during the period June 1950–December 1952.

(iii) On behalf of the Geophysical Institute, Bergen, the following biological collections have been made:
Nansen-net hauls from 2,500 to 1,000, 1,000 to 600, 600 to 100, 100 to 50, and 50 to 0 m. weekly.
Phytoplankton-net hauls from 100 to 0 m. weekly.
This programme was modified slightly in 1949, 1950, and 1952.
Additional phytoplankton collections were made in July 1951.
(iv) On behalf of the Scottish Marine Biological Association, the Hardy Plankton Recorder has been towed by one of the ships on passage to and from station.

4. Publication of Data and Reports

4.1. United States of America (Stations A, B, C, and E)

Bathythermograph data for Stations A, B, C, D, E, and H are recorded in the following report: —


Bathythermograph lowerings at Stations A, C, and E are studied in the following paper: —


Analyses of the data from Station C are reported in: —


Zooplankton collections over 1 year at Station B are reported in: —


Those from Station E and the remainder from Station B are being examined at the Narragansett Marine Laboratory, Kingston, Rhode I.

Prints of bathythermograph records for the following periods (approximate) are available at the U.S Hydrographic Office and the Woods Hole Oceanographic Institution: —

Station A 1948—present
B 1945, 1949—present

4.2. United Kingdom (Stations I and J)

The temperature and salinity observations are being published in the Bulletins Hydrographiques by the International Council for the Exploration of the Sea (ICES), and are used in the monthly charts. Summaries of drift-bottle recoveries are given in the Annales Biologiques, published by ICES. Reports on the wave-height records are in preparation (for publication in Quart. J. Roy. Met. Soc. and Mar. Observer). The seismic refraction measurements are reported on by


The thermograph records are held by the Meteorological Office, Harrow. Data on sea surface temperature and on currents at Stations I and J are recorded in OWS Met. Summaries, published by the Meteorological Office, Harrow. Nos. 1—9 have been issued, covering the period 1946—1955. A report on these data is published in: —


The phytoplankton collections are reported on in: —


The nanoplankton samples were examined at the Botaniske Laboratorium, Oslo University, and reported on in: —

Nansen-net hauls from 2,500 to 1,000, 1,000 to 600, 600 to 100, 100 to 50, and 50 to 0 m. weekly.
Phytoplankton-net hauls from 100 to 0 m. weekly.
This programme was modified slightly in 1949, 1950, and 1952. Additional phytoplankton collections were made in July 1951.
(iv) On behalf of the Scottish Marine Biological Association, the Hardy Plankton Recorder has been towed by one of the ships on passage to and from station.

4. Publication of Data and Reports

4.1. United States of America (Stations A, B, C, and E)

Bathythermograph data for Stations A, B, C, D, E, and H are recorded in the following report:
Bathythermograph lowerings at Stations A, C, and E are studied in the following paper:
Analyses of the data from Station C are reported in:
Zooplankton collections over 1 year at Station B are reported in:

Those from Station E and the remainder from Station B are being examined at the Narragansett Marine Laboratory, Kingston, Rhode Island.
Prints of bathythermograph records for the following periods (approximate) are available at the U.S. Hydrographic Office and the Woods Hole Oceanographic Institution:

Station A 1948—present
B 1945, 1949—present

4.2. United Kingdom (Stations I and J)
The thermograph records are held by the Meteorological Office, Harrow. Data on sea surface temperature and on currents at Stations I and J are recorded in OWS Met. Summaries, published by the Meteorological Office, Harrow. Nos. 1—9 have been issued, covering the period 1946—1955. A report on these data is published in:
The phytoplankton collections are reported on in:
The nanoplankton samples were examined at the Botaniske Laboratorium, Oslo University, and reported on in:

Station C 1946—present
D 1949—present
E 1946, 1949—present
F 1944—45, 1949
G 1946, 1949
H 1946, 1950—present

The phytoplankton collections are being examined at the Bingham Oceanographic Laboratory, New Haven, Conn., and also at the Botaniske Laboratorium, Oslo University.
Other papers relating to Stations I and J are:


4.3. NETHERLANDS (Stations A, I, J, and K)

The temperature and salinity observations obtained for KNMI are being published in the Bulletins Hydrographiques by ICES, Copenhagen. The surface observations are used in the monthly charts published by ICES.

4.4. FRANCE (Stations K and L)

The data available for the period to the end of 1952 have been published by the Comité Centrale d’Océanographie et d’Études des Côtes (COEC), Paris, in the Bulletins d’Information. 1) When further data become available, they will be published similarly.

4.5. NORWAY AND SWEDEN (Station M)

The following reports on the work have been published:


H. Mosby. «Oceanographical investigations at Weather Station M.» Univ. i Bergen, År 53. Naturvid. rekk. nr. 10.


J. de Flock. «Quelques propriétés de la zone de transition entre eau Artique et eau Atlantique en Mer de Norvège.» Univ. i Bergen, År 54. Naturvid. rekk. nr. 3.


4.6. GENERAL


(ii) Sea surface temperatures from all Atlantic Weather Stations have been reported on in:


Other papers relating to Stations I and J are:


4.3. **Netherlands** (Stations A, I, J, and K)

The temperature and salinity observations obtained for KNMI are being published in the Bulletins Hydrographiques by ICES, Copenhagen. The surface observations are used in the monthly charts published by ICES.

4.4. **France** (Stations K and L)

The data available for the period to the end of 1952 have been published by the Comité Centrale d'Océanographie et d'Études des Côtes (OCÉC), Paris, in the Bulletins d’Information. When further data become available, they will be published similarly.

4.5. **Norway and Sweden** (Station M)

The following reports on the work have been published:


- **H. Mosby.** «Oceanographical investigations at Weather Station M.» Univ. i Bergen, Årk 1953, Naturvid. rekkre, nr. 10.


- **J. le Fock.** «Quelques propriétés de la zone de transition entre eau Arctique et eau Atlantique en Mer de Norvège.» Univ. i Bergen, Årk 1954, Naturvid. rekkre, nr. 3.


- **P. Hallås.** «Phytoplankton investigations from Weather Ship M in the Norwegian Sea, 1948—49.» Hvalrådets Skr. nr. 38, Oslo, 1953.


4.6. **General**


(ii) Sea surface temperatures from all Atlantic Weather Stations have been reported on in:


(iii) Wave studies are reported on in: —


5. Administration

The Government Authorities administering the Atlantic Ocean Weather Station service are as follows: —

United States of America

(Meteorological Programme) The Chief,
US Weather Bureau,
24th and M Streets, N.W.,
Washington 25, D. C.

(Operation) The Commandant,
US Coast Guard,
Washington 25, D. C.

United Kingdom

The Director,
Meteorological Office,
Air Ministry,
Kingsway,

Netherlands

(Meteorological Programme) The Director,
Koninklijk Nederlands Meteorologisch Instituut,
De Bilt.

(Operations) The Chairman,
Netherlands Weather Ship Committee,
Rijkswaterstaat, Den Haag.

France

The Director,
Météorologie Nationale,
4, Quai Branly,
Paris Vème.

Norway

(Meteorological Programme) The Director,
Det Norske Meteorologiske Institutt,
Niels Henrik Abels vei 40,
Blindern,
Oslo.

(Operations) The Chairman,
Norwegian Weather Ship Committee,
Finskdepartementet,
Akeragat. 42,
Oslo.

North Pacific

6. Ocean Weather Stations

6.1. The network operated in the Pacific since World-War II at one time rose to a maximum of 8 stations in simultaneous occupation but has now declined to 3. The stations were operated as follows: —

United States of America 6 (N, O, Q, S, U, V)
United States of America and Canada 1 (P)
Japan 2 (T, X)

From May 1945 to February 1946 Canada operated part-time a station 600 miles due west of Vancouver. No oceanographic observations appear to have been made at this station.
(iii) Wave studies are reported on in: —


5. Administration

The Government Authorities administering the Atlantic Ocean Weather Station service are as follows: —

United States of America
(Meteorological Programme) The Chief,
US Weather Bureau,
24th and M Streets, N.W.,
Washington 25, D. C.

(Operation) The Commandant,
US Coast Guard,
Washington 25, D. C.

United Kingdom
The Director,
Meteorological Office,
Air Ministry,
Kingsway,

Netherlands
(Meteorological Programme) The Director,
Koninklijk Nederlands Meteorologisch Instituut,
De Bilt.

(Operations) The Chairman,
Netherlands Weather Ship Committee,
Rijksluchtvaartdienst,
Den Haag.

France
The Director,
Météorologie Nationale,
1, Quai Branly,
Paris VIIe.

Norway
(Meteorological Programme) The Director,
Det Norske Meteorologiske Institutt,
Niels Henrik Abels vei 40,
Blindern,
Oslo.

(Operations) The Chairman,
Norwegian Weather Ship Committee,
Finansdepartementet,
Akeragt. 42,
Oslo.

North Pacific

6. Ocean Weather Stations

6.1. The network operated in the Pacific since World-War II at one time rose to a maximum of 8 stations in simultaneous occupation but has now declined to 3. The stations were operated as follows: —

United States of America 6 (N, O, Q, S, U, V)
United States of America and Canada 1 (P)
Japan 2 (T, X)

From May 1945 to February 1946 Canada operated part-time a station 600 miles due west of Vancouver. No oceanographic observations appear to have been made at this station.
The station was occupied intermittently until November 1965 when it was abandoned. A new station was established in October 1972 at position 29°N, 165°E. The station was occupied in March 1970 at position 30°N, 165°W, in January 1972 at position 31°N, 165°E. The station was occupied in December 1972 at position 32°N, 165°W. The station was occupied in January 1974 at position 33°N, 165°W.

The station was occupied in December 1976 at position 34°N, 165°W. The station was occupied in December 1978 at position 35°N, 165°W. The station was occupied in December 1980 at position 36°N, 165°W. The station was occupied in December 1982 at position 37°N, 165°W. The station was occupied in December 1984 at position 38°N, 165°W. The station was occupied in December 1986 at position 39°N, 165°W. The station was occupied in December 1988 at position 40°N, 165°W. The station was occupied in December 1990 at position 41°N, 165°W. The station was occupied in December 1992 at position 42°N, 165°W. The station was occupied in December 1994 at position 43°N, 165°W. The station was occupied in December 1996 at position 44°N, 165°W. The station was occupied in December 1998 at position 45°N, 165°W. The station was occupied in December 2000 at position 46°N, 165°W. The station was occupied in December 2002 at position 47°N, 165°W. The station was occupied in December 2004 at position 48°N, 165°W. The station was occupied in December 2006 at position 49°N, 165°W. The station was occupied in December 2008 at position 50°N, 165°W. The station was occupied in December 2010 at position 51°N, 165°W. The station was occupied in December 2012 at position 52°N, 165°W. The station was occupied in December 2014 at position 53°N, 165°W. The station was occupied in December 2016 at position 54°N, 165°W. The station was occupied in December 2018 at position 55°N, 165°W. The station was occupied in December 2020 at position 56°N, 165°W.
6.2. Station N originated as ¥Navy Station 935½ in 1943 at position 30° N., 140° W. It was known as ¥Bird Dog 1½ in June 1946, ¥Fox in March 1947, and was named N in December 1949. Its position was changed in December 1950 to 33° N., 135° W.; in March 1952 to 32° 1/2 N., 135° W.; and in March 1954 to 30° N., 140° W., where the station is still in occupation.

Station O was set up in December 1949 at position 40° N., 142° W., and abandoned in July 1950.

Station P may be said to have originated from 2 stations, ¥Navy Station 916 and ¥Navy Station 990. ¥Navy Station 916 (also known as ¥Able) was set up at position 49° N., 146° W. in September 1943 and closed in April 1948; ¥Navy Station 990 (also known as ¥Dog) was set up at position 40° N., 150° W. in August 1944 and operated intermittently at that position until April/May 1946, when its position was changed to 47° N., 142° W. This station (¥Dog) occupied the same position until February 1947, when it was shifted to position 49° N., 148° W. and renamed ¥Able. It continued in this position until December 1949 when it was shifted to position 50° N., 145° W. and renamed ¥P. The station continues in occupation. The United States was responsible for the station until December 1950, when Canada took it over.

Station Q was set up in April 1952 at position 43° N., 167° W. It was abandoned in December 1953.

Station S was established in September 1950 at position 48° N., 182° E. It was given up in December 1953.

Station T was set up in September 1948 at position 29° N., 135° E. It was closed (after the typhoon season) in November 1948, re-opened in June 1949, closed in November 1949, and re-opened in June 1950 for continuous service until November 1953. Since 1954 the station has been occupied during the typhoon season from May to November.

Station U was set up in December 1950 at position 28° N., 145° W. Its position was changed to 27° 40' N., 145° W. in March 1952 and the station was abandoned in December 1953.

Station V was established in September 1950 at position 33° N., 184° E. Its position was changed to 31° N., 164° E. in February 1951 and 34° N., 164° E. in March 1954; the station continues in occupation.

Station X was established in October 1947 at position 39° N., 153° E. It was occupied intermittently until November 1953 when it was finally abandoned.
7. Ocean Weather Ships

7.1 United States of America

During the war, vessels were supplied by the US Navy as required for operation at the stations. Afterwards, since 1946 in most cases, vessels have been assigned by the US Coast Guard. These vessels are cutters of 2,400 tons displacement similar to those used in the Atlantic. They are not specially equipped for oceanographical work, but are fitted for bathythermograph operation. The oceanographical work is carried out by the ship's company.

(i) Bathythermographs have been lowered to 450 feet
(a) every 3 hours on passage to and from station, and
(b) every 3 hours during daylight and every 6 hours by night on station. On some occasions lowerings have been made every 3 hours, and on one occasion every hour, for periods of 2 or 3 weeks.

7.2 Japan

One of the vessels used for manning the stations, a ship of 1,200 tons, was especially built for meteorological observation. The two other vessels in use, of 870 tons, are former Japanese naval frigates. They are equipped for oceanographical observation; winches are available for serial observations and there is a laboratory on board. Two oceanographers are borne in each ship.

The following oceanographical work has been carried out:
(i) Serial observations of temperature and salinity at standard depths (see below) were made 10 times a month, on the average, at Station T and 15 times a month at Station X. The period covered by the observations at Station T was June 1946—September 1948 and June 1950—November 1953. Serial observations were also made on three sections, C, E, and G, which were run once every 20 days, on the average. Section C comprised 10 stations, the first of which was in position 38° 16' N., 141° 51' E., and the remainder lay due east of this at 50' intervals. The observations cover the period August 1948—November 1953. Section E comprised 4 stations, the first being in position 33° 10' N., 135° 45' E., and the remainder lying at 50' intervals due south. The observations cover the period July 1949—June 1950. Section G was a variation of Section E; it comprised 8 stations, the first being located in position 33° 10' N., 135° 45' E., the remainder lying at approximately 25' intervals due southward. The period of observation is July 1950—November 1953. The standard depths used were: — 0, 10, 25, 50, 100, 200, 300, 400, 500, 600, 800, 1,000, 1,200, 1,500, and 2,000 m.

(ii) Plankton hauls were made as follows:
(a) with Kitahara's Quantitative Net(1) from 100 m. to the surface about 14 times a month at Station T, from June 1950 to December 1952; 10 times a month at Station X, from February 1950 to December 1952; and once a month at each station on Section C (February 1950—December 1952), on Section E (from June 1950), and on Section G (July 1950—December 1952).
(b) with the C-net(2) from 100 m. to the surface about 3 times a month at Stations T and X (January—November 1953).
(iii) Nanoplankton samples were taken with the Nansen water-bottle at 0, 10, 50, and 100 m. depth once a month at each station on Sections C (at 3 depths only) and G from January to November 1953.

7.3. Canada

The station is operated mainly by two former RCN frigates of 1,900 tons; a stand-by vessel (also a frigate) is available. The ships remain on station for 6 weeks. They are fitted for bathythermograph observation with equipment supplied by the Pacific Oceanographic Group of the Canadian Joint Committee on Oceanography and the Pacific Naval Laboratory of the Defence Research Board of Canada. The equipment consists of an electric Kelvin sounder winch (1.5 HP) and 450-foot bathythermographs. Sea-Temperature Recorders are installed with the bulb in the main salt-water intake in the engine room. Since August 1950 a laboratory has been fitted up in one ship. The oceanographic observations were formerly made entirely by the ship's company, but since August 1950 an oceanographer has been carried on every other voyage of the Weather Ships.

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1) Kitahara's net is a Hensen-type net, made of bolting silk xx 13; diameter of mouth of net, 22.5 cm.
2) The C-net is of the Nansen type, constructed of bolting silk xx 3; diameter of mouth, 51 cm.
7. Ocean Weather Ships

7.1. UNITED STATES OF AMERICA

During the war, vessels were supplied by the U.S. Navy as required for operation at the stations. Afterwards, since 1946 in most cases, vessels have been assigned by the U.S. Coast Guard. These vessels are cutters of 2,400 tons displacement similar to those used in the Atlantic. They are not specially equipped for oceanographical work, but are fitted for bathythermograph operation. The oceanographical work is carried out by the ship's company.

(i) Bathythermographs have been lowered to 450 feet
(a) every 3 hours on passage to and from station, and
(b) every 3 hours during daylight and every 6 hours by night on station. On some occasions lowerings have been made every 3 hours, and on one occasion every hour, for periods of 2 or 3 weeks.

7.2. JAPAN

One of the vessels used for manning the stations, a ship of 1,200 tons, was especially built for meteorological observation. The two other vessels in use, of 870 tons, are former Japanese naval frigates. They are equipped for oceanographical observation; winches are available for serial observations and there is a laboratory on board.

Two oceanographers are borne in each ship.

The following oceanographical work has been carried out:

(i) Serial observations of temperature and salinity at standard depths (see below) were made 10 times a month, on the average, at Station T and 15 times a month at Station X. The period covered by the observations at Station T was June 1946—September 1946 and June 1950—November 1953. Serial observations were also made on three sections, C, E, and G, which were run once every 20 days, on the average. Section C comprised 10 stations, the first of which was in position 38° 16' N., 141° 51' E., and the remainder lay due east of this at 50' intervals. The observations cover the period August 1948—November 1953. Section E comprised 4 stations, the first being in position 33° 10' N., 135° 45' E., and the remainder lying at 50' intervals due south. The observations cover the period July 1949—June 1950. Section G was a variation of Section E; it comprised 8 stations, the first being located in position 33° 10' N., 135° 45' E., the remainder lying at approximately 25' intervals due southward. The period of observation is July 1950—November 1953. The standard depths used were: 0, 10, 25, 50, 100, 200, 300, 400, 500, 600, 800, 1,000, 1,200, 1,500, and 2,000 m.

(ii) Plankton hauls were made as follows:
(a) with Kitahara's Quantitative Net(1) from 100 m. to the surface about 14 times a month at Station T, from June 1950 to December 1952; 10 times a month at Station X, from February 1950 to December 1952; and once a month at each station on Section C (February 1950—December 1952), on Section E (from June 1950), and on Section G (July 1950—December 1952).
(b) with the C-net(2) from 100 m. to the surface about 3 times a month at Stations T and X (January—November 1953).

(iii) Nanoplankton samples were taken with the Nansen water-bottle at 0, 10, 50, and 100 m. depth once a month at each station on Sections C (at 3 depths only) and G from January to November 1953.

7.3. CANADA

The station is operated mainly by two former RCN frigates of 1,900 tons; a stand-by vessel (also a frigate) is available. The ships remain on station for 6 weeks. They are fitted for bathythermograph observation with equipment supplied by the Pacific Oceanographic Group of the Canadian Joint Committee on Oceanography and the Pacific Naval Laboratory of the Defence Research Board of Canada. The equipment consists of an electric Kelvin sounding winch (1.5 HP) and 450-foot bathythermographs. Sea-Temperature Recorders are installed with the bulb in the main salt-water intake in the engine room. Since August 1956 a laboratory has been fitted up in one ship. The oceanographic observations were formerly made entirely by the ship's company, but since August 1956 an oceanographer has been carried on every other voyage of the Weather Ships.

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1) Kitahara's net is a Hensen-type net, made of bolting silk xx 14; diameter of mouth of net, 22.5 cm.
2) The C-net is of the Nansen type, constructed of bolting silk xx 3; diameter of mouth, 54 cm.
A programme of bathythermograph observations was begun in July 1952. Lowerings (to 450 ft.) were made under way every 2 hours on passage to and from station and twice daily on station at 0200 and 1700 hours GMT. Surface temperature observations with a bucket were made with each bathythermograph lowering.

Volunteers from the ship’s company record notes on the distribution of whales, carry out an albatross banding programme, and collect and preserve sea-life specimens when possible.

Since August 1956 the following programme has been undertaken (certain items being carried out on every other voyage): –
(a) Bathythermograph lowerings to 900 feet are made by the ship’s company every 2 hours on passage to and from station and daily in the evening on station.
(b) Sea Sampler lowerings are made daily on station, to obtain 12 samples at 6 depths between the surface and 130 m. Salinity, oxygen, and phosphate samples are analysed on board.
(c) Secchi disk lowerings are made daily.
(d) Vertical plankton hauls are made daily from 150 m. to the surface.
(e) Serial temperature observations and water samples are taken weekly at 0, 10, 20, 30, 50, 75, 100, 125, 150, 200, 250, 300, 400, 600, 800, and 1,200 m. Oxygen, phosphate, nitrite, pH, and alkalinity are determined on board; salinity analyses are made at the base laboratory.
(f) Echo-sounder records of the deep scattering layer are obtained by operating the sounder for 5 minutes every 3 hours on passage and similarly on station over a 24-hour period each week.
(g) On arrival at Station P, 1,000 drift-bottles are released.
(h) A transcript of all engine-room temperature records is obtained by the oceanographer.
(i) Observations are made of birds, whales, and fish.

8. Publication of Data and Reports

8.1. UNITED STATES OF AMERICA

Information from bathythermograph records is presented in the following report: –


Prints of bathythermograph records for the following periods (approximate) are available at the US Hydrographic Office and the Scripps Institution of Oceanography:

Station N 1947—present
O 1949—50
P 1944—47, 1949—50, 1952—present
Q 1952—53
U 1950—53
V 1952—present

8.2. JAPAN

Data on salinity and temperature have been published by the Central Meteorological Observatory, Tokyo, in The Results of Marine Meteorological and Oceanographical Observations. No. 1 of the series covers the period January—June 1947 and 18 numbers have been published so far.

The data have been reported upon in numerous papers. The following are published in the Oceanographical Magazine, Tokyo: –


T. Nanuit. On the variation of the oceanographic condition along the so-called ‘C’ line (38° N., from 141° E. to 153° E.) from August 1948 to December 1949. 3 (1): 27—48, 1951.


J. Fujikura. On the variation of the oceanic conditions in the sea near the fixed point ‘Extra’s’ 6 (1), 1953.


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(d) Vertical plankton hauls are made daily from 150 m. to the surface.

(e) Serial temperature observations and water samples are taken weekly at 0, 10, 20, 30, 50, 75, 100, 125, 150, 200, 250, 300, 400, 600, 800, and 1,200 m. Oxygen, phosphate, nitrite, pH, and alkalinity are determined on board; salinity analyses are made at the base laboratory.

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The data have been reported upon in numerous papers. The following are published in the Oceanographical Magazine, Tokyo:


J. Masuzawa. "On the variation of the oceanic conditions in the sea near the fixed point 'Extra'." 6 (1), 1953.


M. Hanzawa. «On a close relationship of surface water temperature anomalies at Tango and Papa.» 8 (2), 1957.

The following have appeared in the Oceanographical Reports of the Central Meteorological Observatory, Tokyo (in Japanese, some with English summary): —

J. Fukusaki. «The oceanographical conditions at the fixed point, long. 153°E, lat. 39°N.» I (2): 104—10.


J. Masuzawa. «Some examples of typhoons as a motive of variations of oceanographical conditions.» I (3): 118—23.

T. Namioka. «On the oceanographical conditions in the sea area off Tokaido.» I (3): 129—36.

R. Marumo. «Phytoplankton and sea conditions in summer at the fixed point, 29°N, 155°E, south of Honshu.» I (3): 153—59.

M. Kitou. «Relation between the composition and water mass at the fixed point (long. 153°E, lat. 39°N).» I (4): 201—05.

J. Masuzawa. «On the transport of Kuroshio Current off Shiono-


M. Koizumi. «On the oceanographical conditions around the fixed point 'X-ray' (lat. 39°N, long. 153°E) (1948 to 1949).» 2 (2): 183—89.

M. Kitou. «Further studies on the relation between the composition of plankton and water mass at the fixed point (long. 153°E, lat. 39°N).» 2 (2): 183—89.

R. Marumo. «On one case of the vertical distribution of phyto-

plankton in the ocean.» 2 (3): 279—81.


A. Asouka. «On the diurnal variation of planktonological and oceanographical conditions at the north fixed point (lat. 39°N, long 153°E).» 2 (4): 413—18.

J. Masuzawa. «On the seasonal variation of the Kuroshio east of Cape Kinkazan of Japan proper. (Currents and water masses of the Kuroshio system II).» 3 (4): 47—51, 1953.

The following papers have also been published: —


8.3. CANADA

Until July 1955 the bathythermograph records were processed at the Scripps Institution of Oceanography, La Jolla, and photo-copies provided for the Scripps Institution, the USN Hydrographic Office, the Meteorological Division of the Department of Transport, Toronto, and the Pacific Oceanographic Group.

Subsequent records are to be multilithed and published in annual MS volumes from the Fisheries Research Board of Canada, Pacific Oceanographic Group, Nanaimo, B.C. Numerous studies of these data are in progress and one has been published: —


Similarly, it is planned to publish the observations described in paragraph 7.3 in MS Data Records from the Fisheries Research Board of Canada, Pacific Oceanographic Group, Nanaimo, B.C.

Data from the bathythermograph observations at Station P during 1955 are published in: —


9. Administration

The Government Authorities administering the Pacific Ocean Weather Station service are as follows: —

United States of America
(Meteorological Programme) The Chief,
U.S. Weather Bureau,

The following have appeared in the Oceanographical Reports of the Central Meteorological Observatory, Tokyo (in Japanese, some with English summary):


J. Motonaka. «Some examples of typhoons as a motive of variations of oceanographical conditions.» J (3): 118–123.


M. Kitou. «Relation between the composition and water mass at the fixed point (long. 153°E., lat. 39°N.).» J (4): 201–205.


M. Kitou. «Further studies on the relation between the composition of plankton and water mass at the fixed point (long. 153°E., lat. 39°N.).» 2 (3): 279–281.


A. Asaoka. «On the diurnal variation of planktological and oceanographical conditions at the north fixed point (lat. 39°N., long 153°E.).» 2 (4): 413–415.


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United States of America

(Meteorological Programme) The Chief,

U.S. Weather Bureau,
(Operations)

24th and M Streets, N. W.,
Washington 25, D. C.

The Commandant,
U.S. Coast Guard,
Washington 25, D. C.

Japan

The Director-General,
The Japan Meteorological Agency,
Tokyo.

Canada

The Controller,
Meteorological Service of Canada,
Department of Transport,
315 Bloor Street West,
Toronto 5, Ontario.

10. International Civil Aviation Organization

Since 1946 the general programme of the Ocean Weather Stations has been administered by ICAO with headquarters at the following address:

ICAO,
International Aviation Building,
1080 University Street,
Montreal,
Canada.

The Organization since its inception has considered the possibilities for oceanographic observations at the stations. The programme of oceanography recommended at the London conference in 1946 is given in the Ocean Station Vessel Manual, Doc. 6926—AN/856/1, 2nd Edt. Montreal, 1953. At the Paris conference in February 1954, the meeting adopted the report of the Technical Committee, of which the section dealing with Oceanography runs as follows (OSV Manual, Doc. 6926—AN/856/3, 3rd Edt., 1954):

Section VI — Oceanography and Observations for Other Scientific Purposes.

1. The Committee recognized that the North Atlantic Ocean Stations network provided an unique opportunity to make systematic oceanographic observations and noted

(a) that much valuable oceanographic work had already been carried out at the ocean stations and

(b) that a programme of oceanographic work on an international basis was being devised for operation during the forthcoming Geophysical Year.

2. The Committee was most anxious that those concerned should derive the maximum possible benefit from the Ocean Station Vessels in their work.

2.1. Recommendation No. 7

It is recommended:

(a) that the States concerned with the operation of the North Atlantic Ocean Stations Vessels continue to afford all possible facilities for oceanographic observations, and

(b) that ICAO draw the attention of the International Council for the Exploration of the Sea and the International Association for Physical Oceanography to the availability of the North Atlantic Ocean Stations network for co-ordinated oceanographic studies on a network basis and the great advantages this offered and reassure them of the willingness of the operating States to co-operate in this work.

3. Likewise with other scientific observations the Committee wished to encourage the use of the Ocean Stations network to the greatest extent practicable.

11. International Geophysical Year

11.1. At its meeting in Rome in 1954, AIOP adopted the following recommendation, put forward by the Committee on Oceanographical Observations from Atlantic Weather Ships:

(i) The Committee recognize that a variety of oceanographical work is being done in the Weather Ships of different States, but consider that in view of the differences in the capacities of the ships, it is not feasible to establish an elaborate programme on an international basis.

(ii) The Committee therefore recommend that as a contribution to the oceanographical programme arranged for the Geophysical Year, the States operating Weather Ships in both Atlantic and Pacific Oceans be asked to include in their existing programme the observation of temperature by means of bathythermographs, lowered to 450 feet once a day on station and every 6 hours on passage to and from station, the records to
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be accompanied by relevant meteorological data and sea surface temperature taken by thermometer.

(iii) The Committee note that a central collection for these records can be established if the bathythermograph slides are sent to the US Hydrographic Office, where they would be photographed.

(iv) The Committee appreciate the fact that biological observations may also help in distinguishing water masses and recommend that if enquiry shows it to be practicable, biological observations be similarly arranged.

11.2. All States operating Ocean Weather Ships have consented to take part in the programme of bathythermograph observations. The Norwegian/Swedish ships will use 900 ft. instruments. The Hydrographer of the US Navy has consented to the Hydrographic Office acting as the collecting agency for the bathythermograph data obtained during IGY. The procedure for handling them is as follows:

(i) Either the original slides and log sheets or copies of them may be sent to the Hydrographer, USN Hydrographic Office, Washington 25, D.C., USA. As they are received from participating agencies, the Hydrographic Office, in addition to the usual file copies (one of which goes to the sender of the slide), will make one further print of each IGY slide.

(ii) Prints will be available on loan for study. Application for the prints should be made to the World Data Centre for Oceanography, A. & M. College of Texas, College Station, Texas, USA.

(iii) The data from each slide will be punched on an IBM card, giving temperatures usually at 11 depth levels, the maximum temperature, and the thickness of the homogeneous layer.

(iv) Listings from the cards will be supplied at cost of preparation on application to the World Data Centre for Oceanography. These can be arranged by area or by season, as desired, and in most cases may be more suitable for study than the actual cards. However, it should be noted that the listings will normally give temperatures on the Fahrenheit scale and depths in feet (except that the depths greater than 250 feet are virtually 100, 150, 200, 250, and 300 m.). It is possible, in making the listings, to convert from Fahrenheit to Centigrade, but not to change the depth levels to even values in metres.