

Marine Environmental Data Service

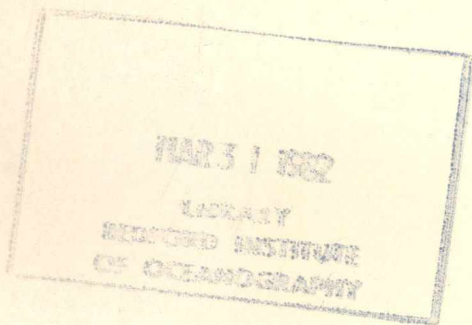
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Oceanographic Atlases of Canadian Waters: A Bibliography

L. SansCartier and J.R. Keeley



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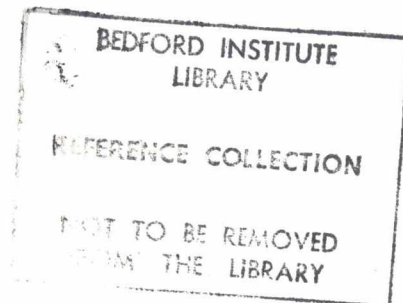
Canada

MARINE ENVIRONMENTAL DATA SERVICE

TECHNICAL REPORT NO. 10

Oceanographic Atlases of Canadian Waters: A Bibliography

L. SansCartier and J.R. Keeley



DEPARTMENT OF FISHERIES AND OCEANS
OTTAWA, CANADA

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Ottawa, 1981

MEDS8101602KE

ABSTRACT

This report extends the work carried out by Acres Consulting Co. to compile a bibliography of atlases containing information about the waters around Canada. The goal is to identify, as completely as possible, all material relating to physical oceanography only. Other material, relating to biology, has also been included but the coverage of this is not complete. The information is arranged in alphabetical order by author. A geographical breakdown of the contents of the atlases is given in a series of maps. Where possible, an abstract has been included to describe the contents of each atlas listed.

RÉSUMÉ

Ce rapport est un prolongement du travail fait par Acres Consulting Co. en vue d'établir une bibliographie des atlas contenant de l'information sur les eaux canadiennes. Son but est d'identifier aussi complètement que possible toute la documentation relative à l'océanographie physique. Certains ouvrages de biologie sont aussi inclus. Les documents sont classifiés par ordre alphabétique des auteurs. Une subdivision géographique du contenu des atlas est présentée sous forme de cartes et, dans la mesure du possible, un résumé décrit le contenu de chaque atlas.

CONTENTS

	Page
Abstract	iii
Résumé	iii
Introduction	1
Acknowledgements	3
References	3
Parameter Maps	5
Author Index	21
Addenda	84

INTRODUCTION

In the spring of 1980, an interdepartmental study team was organized to investigate the problems with present ocean information services (reference 1). One of the recommendations from this group reads: "It is recommended that OAS and AES prepare reports on the usefulness, feasibility and resources needed to prepare a Canadian marine science atlas and climatologies from available data holdings". Before a complete response can be made to this recommendation, there is a need to be aware of the kind of atlas information which is already available for Canadian areas. With this information in hand, the suitability of previous work, and therefore, the guidelines for the production of future atlases may be judged. For these reasons, the Marine Environmental Data Services awarded a contract to Acres Consulting Services Limited in March 1981 to prepare a bibliography of oceanographic atlases containing information from Canadian waters. The final report from Acres was presented in June 1981 (reference 2). The bibliography presented here is an extension of the consultant's report.

The task of compiling a bibliography of atlases is not simple. First of all, a working definition of what constitutes an atlas must be made. After this has been decided, the many sources where such material may be located must be searched. Although there are a number of computerized bibliographic data bases available, they do not make the search a great deal easier. Indeed, a substantial number of the entries recorded in this report were not found in the data bases searched. In addition, for those documents found in the data bases, it was important to see as many of them as possible in order to judge their suitability for inclusion in this bibliography. In the end, it was discovered that the best way to identify suitable material was to visit various libraries and search the card catalogues of their holdings.

The definition of what constitutes an atlas was difficult. The Ocean Information Study Group's recommendation was vague as to what was meant by an atlas; also, the description of an atlas differs from one individual to another. In general terms, however, an atlas usually portrays average conditions in some pictorial fashion for large areas. This does not serve as a working definition because it is too loosely defined. To sharpen what is meant to be an atlas for this report, the following criteria were established. If the word "atlas" appears in the title; or if the information was collected over a large geographic area (large meaning on the scale of 1000 km.); or if the information was obtained from a small number of sites but over time scales of years; or if the material was presented for smaller space or time scales than above but was presented as being in some way representative of average conditions, then the material was included in this bibliography. On the other hand, if the publication only contained data listings; or if the presentations were the result of analytical models; or if the publication was not an original source; or if the material was not publically available, then no bibliographic listing was made. The material usually found in textbooks and journals was normally excluded because it either failed the time or space requirements or was not an original source. In all cases, a candidate atlas must present information from Canadian waters. For this purpose, Canadian waters were considered to be the same as the area over which the Marine Environmental Data Service strives to obtain all physical oceanographic data collected, i.e. 35° to 90°N and 40° to 180°W.

With the areal coverage and definition of an atlas decided, it was now necessary to establish what type of information, of the myriad oceanic collections, should be included. Because the background of the people preparing the bibliography was in physical oceanography and because this was the first attempt, it was decided to restrict the content. As complete a coverage as possible was attempted for physical oceanographic parameters and for sea ice only. A few other parameters were admitted simply because only a small number of references were found and this made them easy to include. In some cases where the atlas was not seen, but from the title appeared to be suitable, the parameter "Undetermined" was often used. It was considered useful to include these in order to err

on the side of including unsuitable material. Indeed, even with the set of criteria to judge material, there was some which was still questionable. This material was included for the same reasons as given above.

The body of the bibliography has been organized in alphabetical order by author or agency. For each entry, standard referencing was used. Where possible, an abstract was included as well as physical dimensions and price.

In addition to the author index, it was thought that some way of finding information quickly for a particular parameter and area would be an advantage. This was provided by assigning a number to each entry, and by a series of codes indicating whether information for a particular parameter was presented. Maps were then produced for each parameter with the appropriate atlas number in the general ocean area for which information was available. The list of parameters and codes is as follows:

PARAMETER	CODE
Waves	W
Currents	Cu
Temperature	Te
Salinity	S
Density	D
Sea Ice	I
Tides	T
Tsunamis and storm surges	Ts
Turbidity	Tu
Chemicals-silicates, phosphates, nitrates and dissolved oxygen	Ch
Plankton	P
Biology	B
Undetermined	G

The general term "Biology" was used as a catchall for any atlas presenting biological material other than plankton. The category "Undetermined" was used for an atlas which appeared to be suitable but was not seen and whose contents were not known.

A final code was also used in the author index. After the list of parameter codes, some of the entries also have an "*". This indicates that the material was not seen; but, from the information available, was judged to be appropriate for this bibliography.

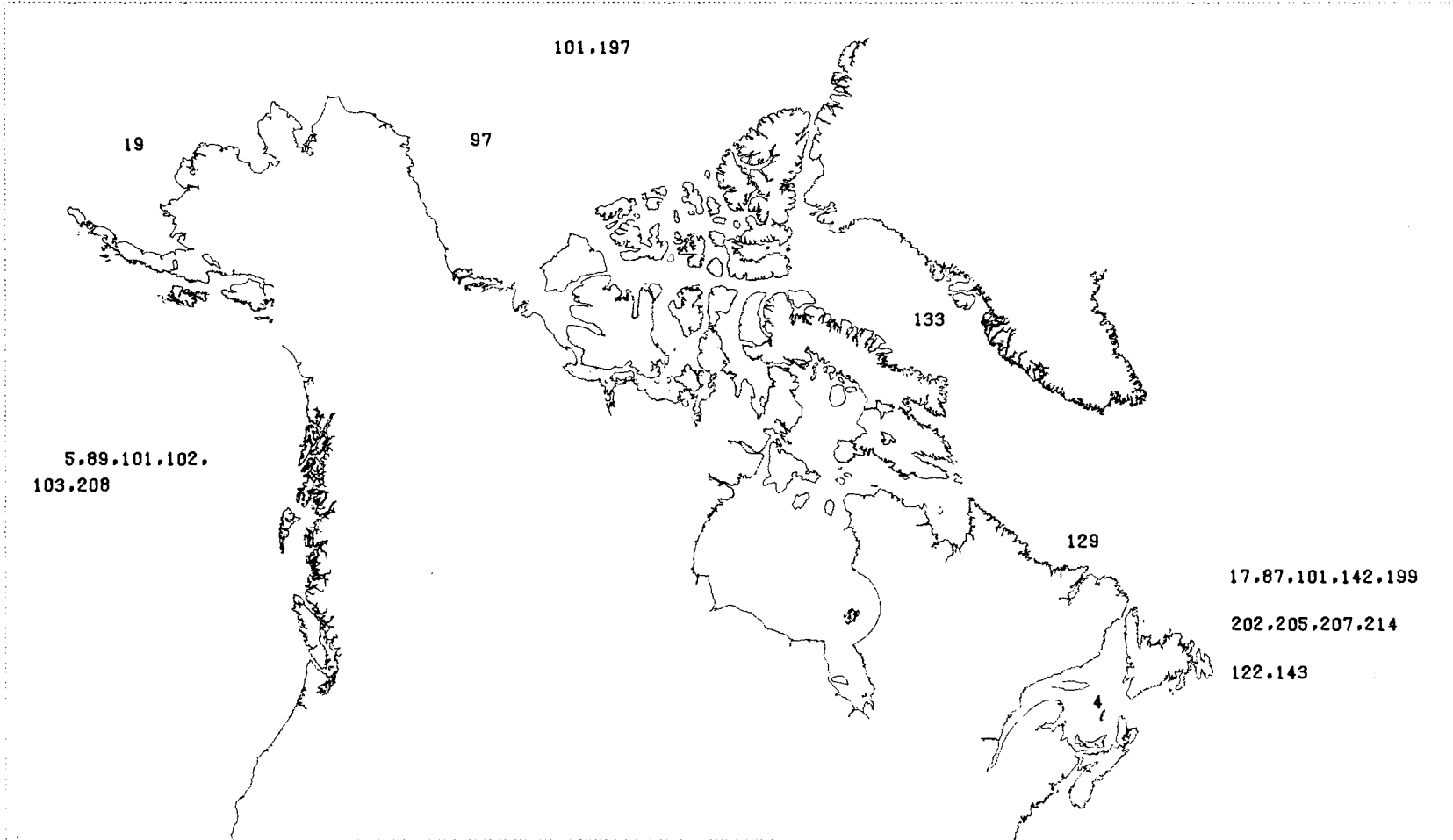
ACKNOWLEDGEMENTS

The authors wish to thank Ciineas Boyle for her invaluable help in the literature searches. They would also like to thank all those who commented on the original report by Acres, in particular, the librarians of the Bedford Institute of Oceanography and the Institute of Ocean Sciences.

REFERENCES

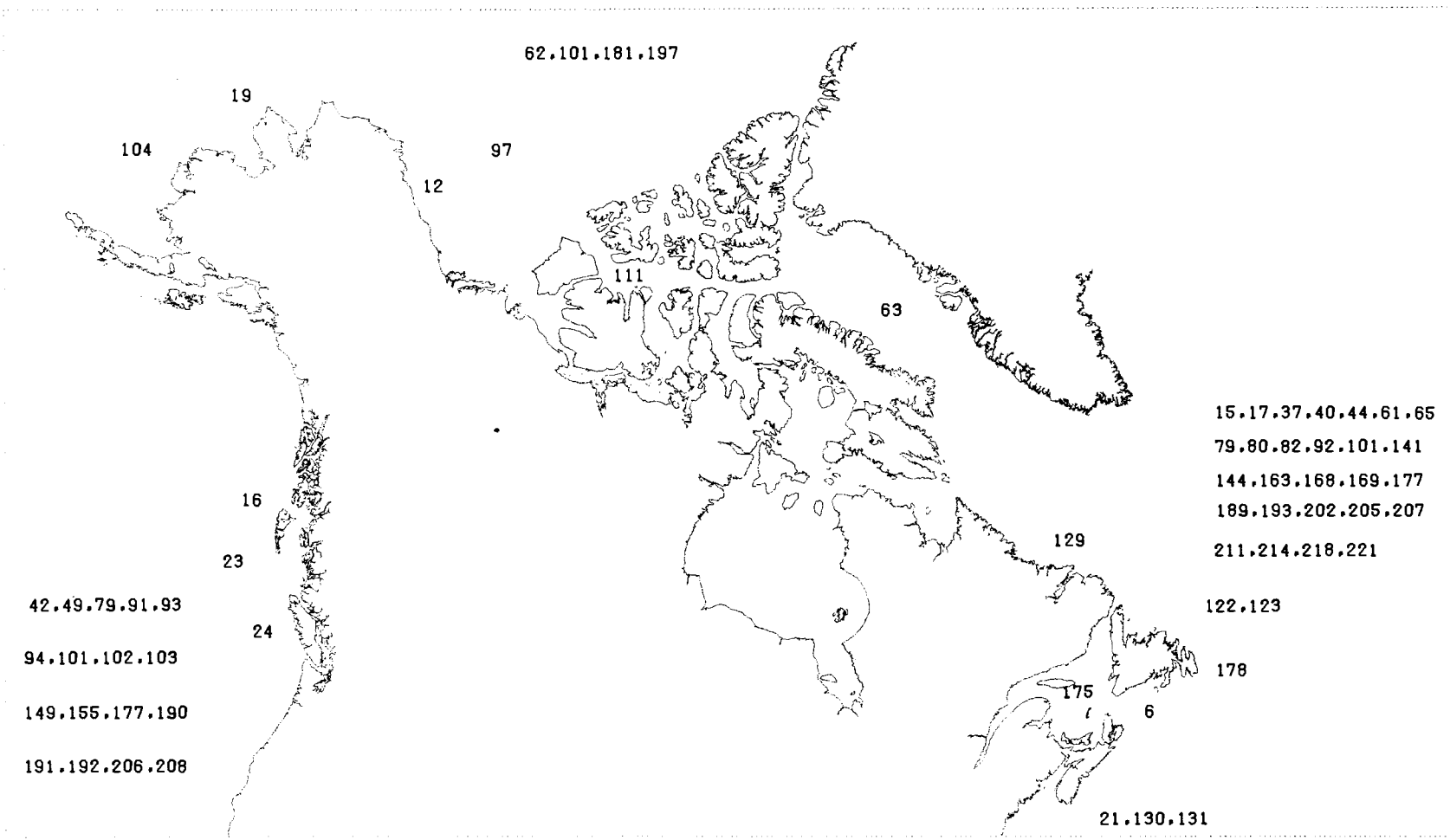
1. Department of Fisheries and Oceans. 1980. Ocean Information Services. Can. Spec. Publ. Fish. Aquat. Sci. 53:67p.
2. Acres Consulting Services Limited. 1981. Bibliography of oceanographic atlases covering Canadian ocean waters. Mar. Environ. Data Serv. Contract. Rep. Ser. 6:99p.

PARAMETER MAPS



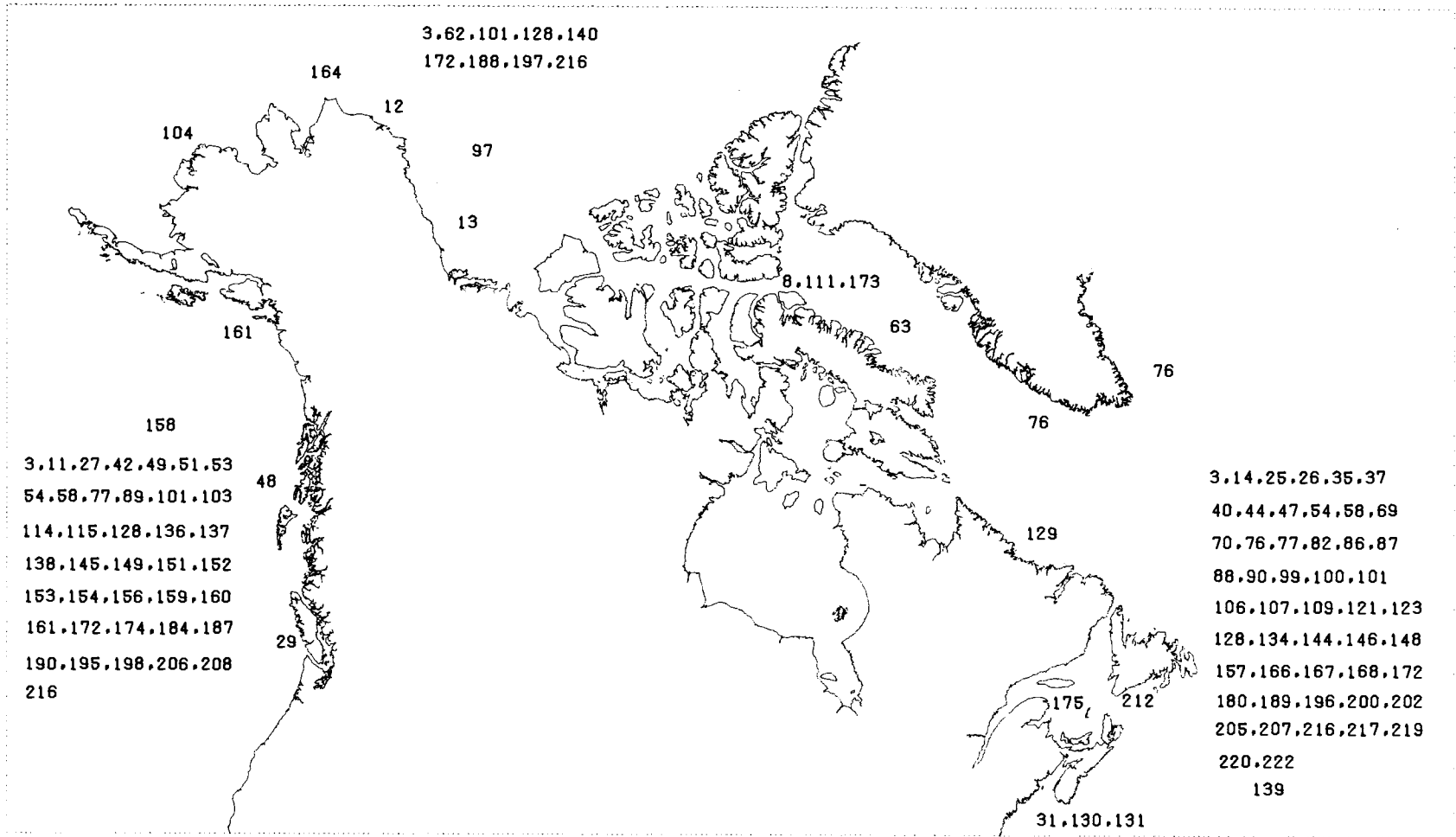
PARAMETER MAP 1 - WAVES

LOCATION UNSPECIFIED - 7.46



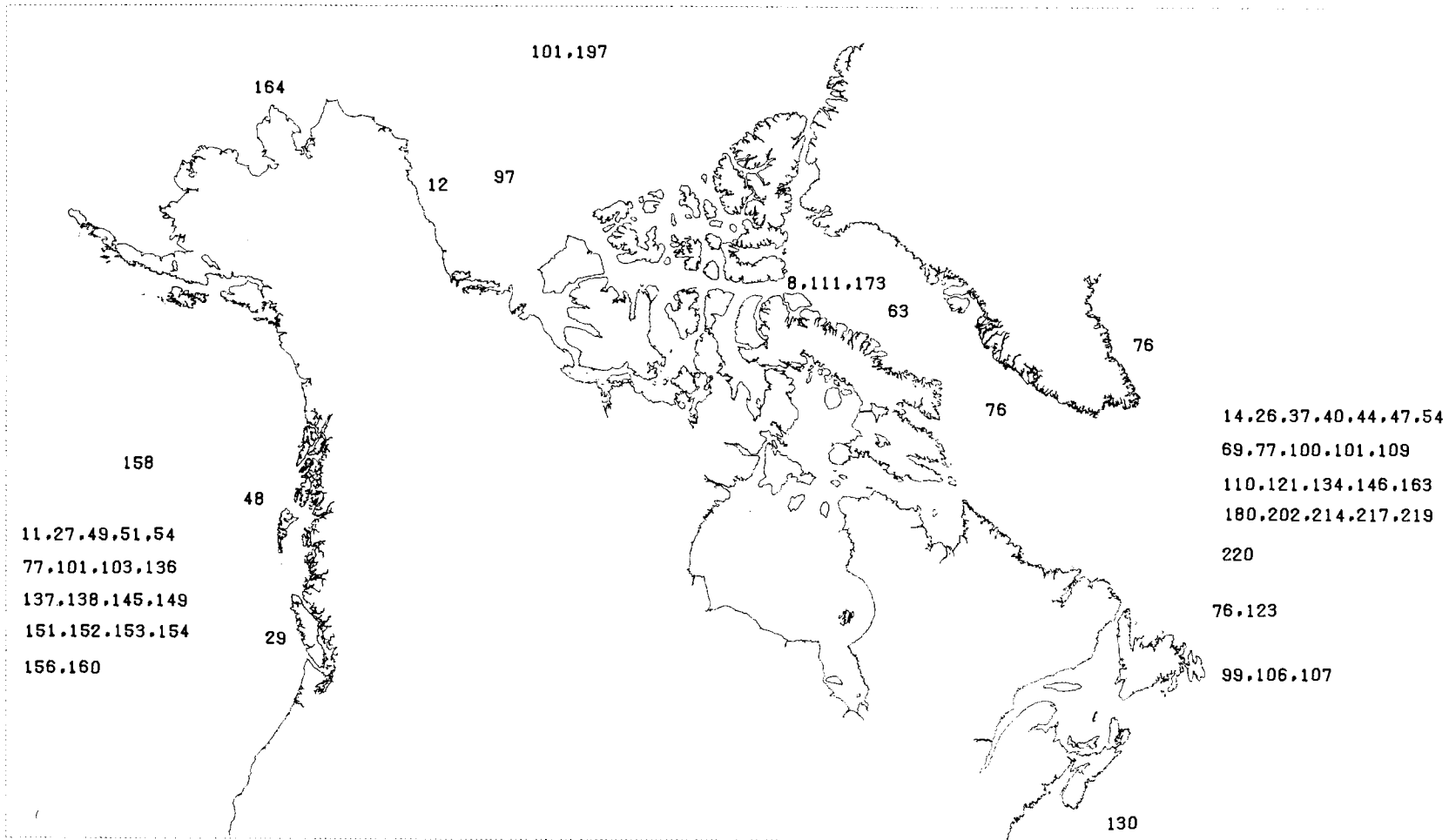
PARAMETER MAP 2 - CURRENTS

LOCATION UNSPECIFIED - 7.46.64

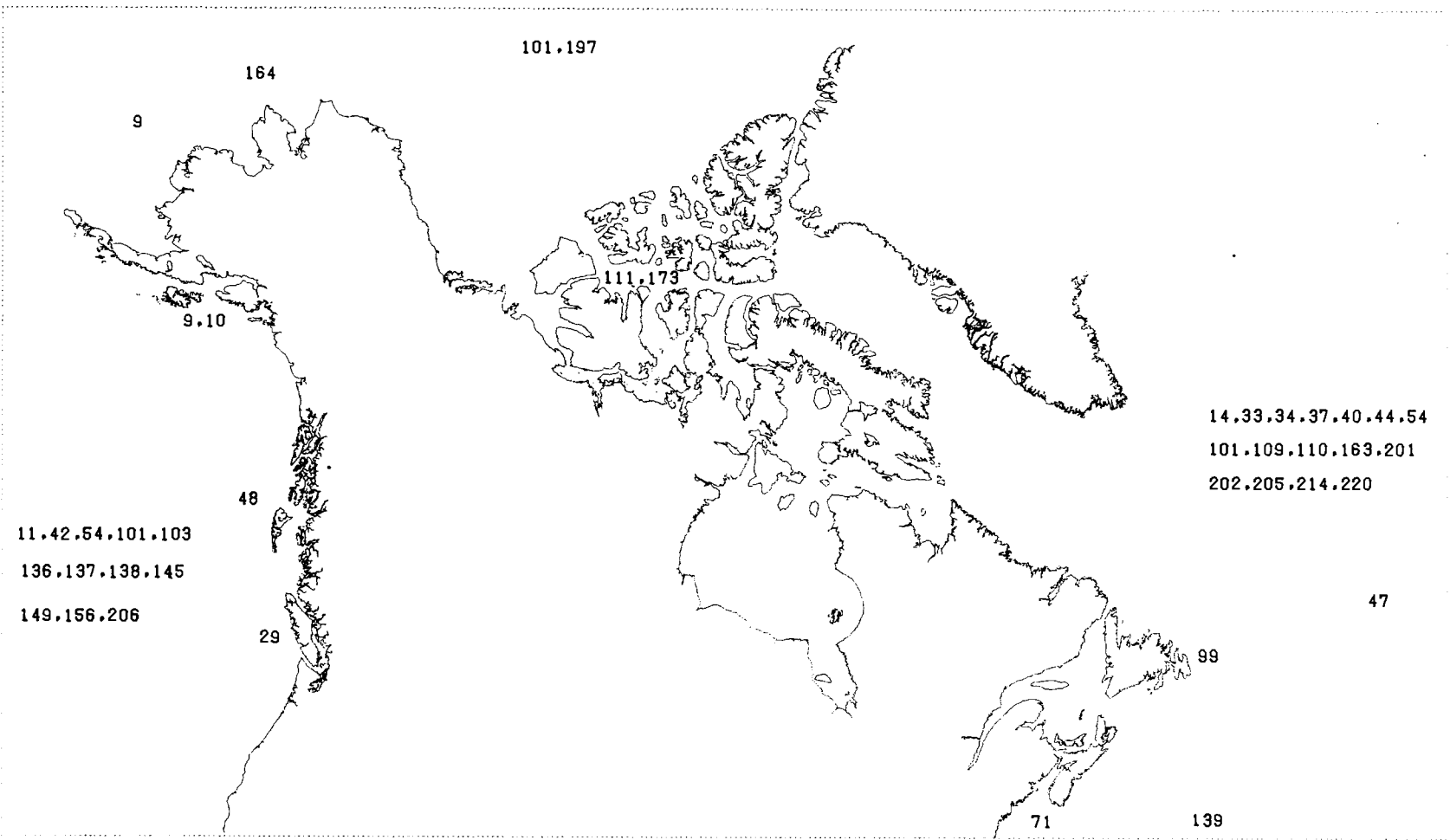


PARAMETER MAP 3 - TEMPERATURE

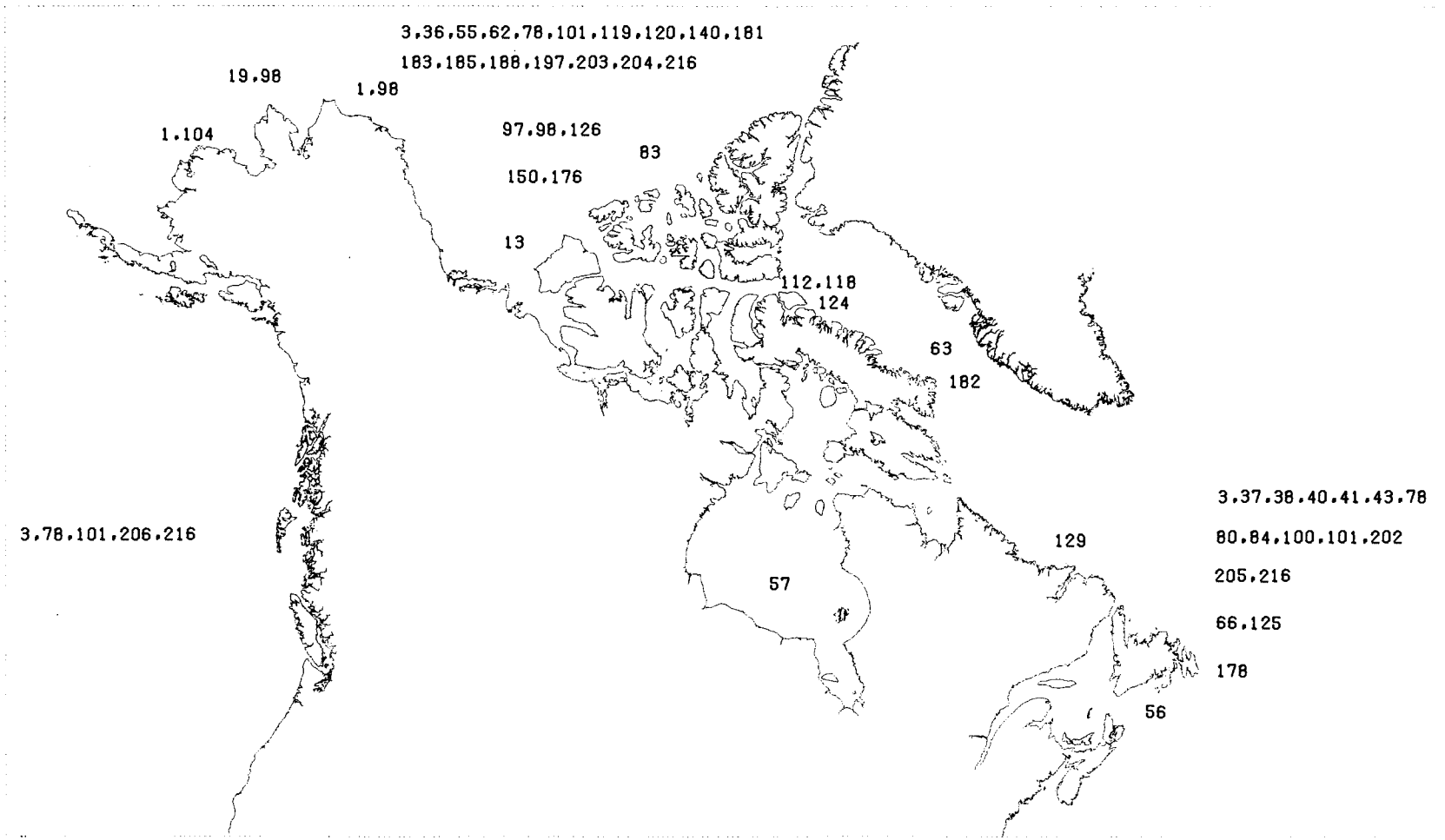
LOCATION UNSPECIFIED - 46.64



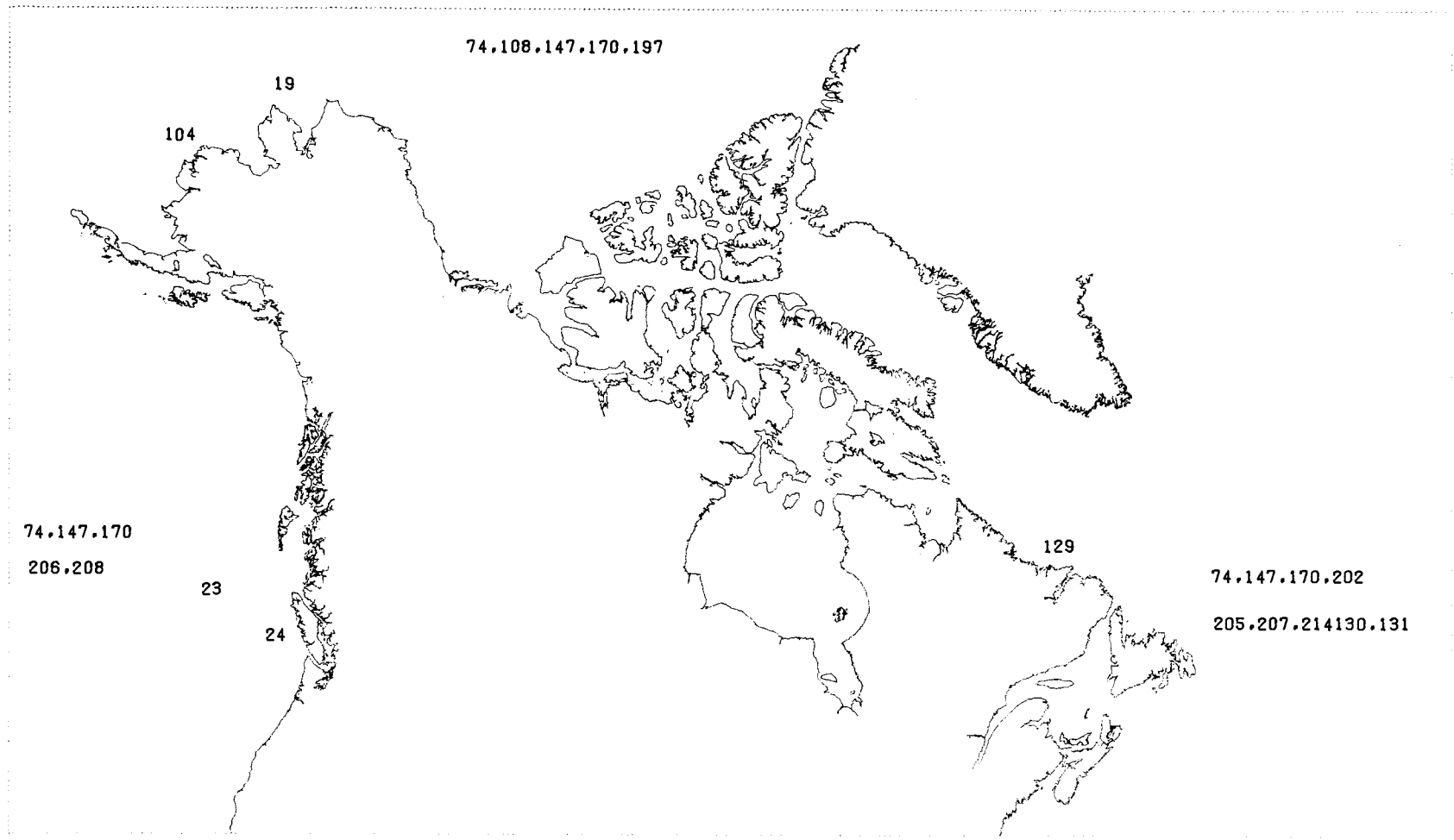
PARAMETER MAP 4 - SALINITY



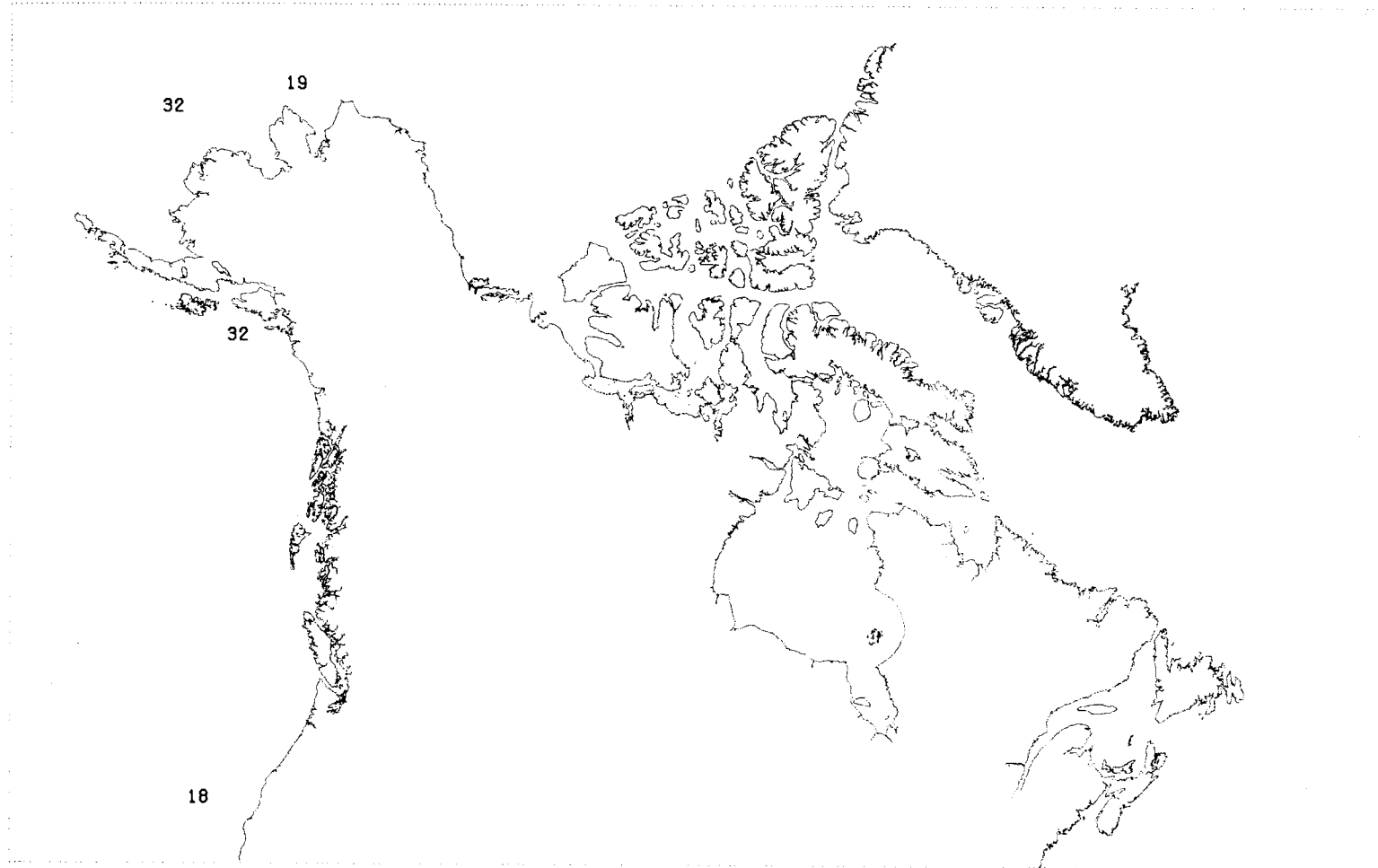
PARAMETER MAP 5 - DENSITY



PARAMETER MAP 6 - SEA ICE

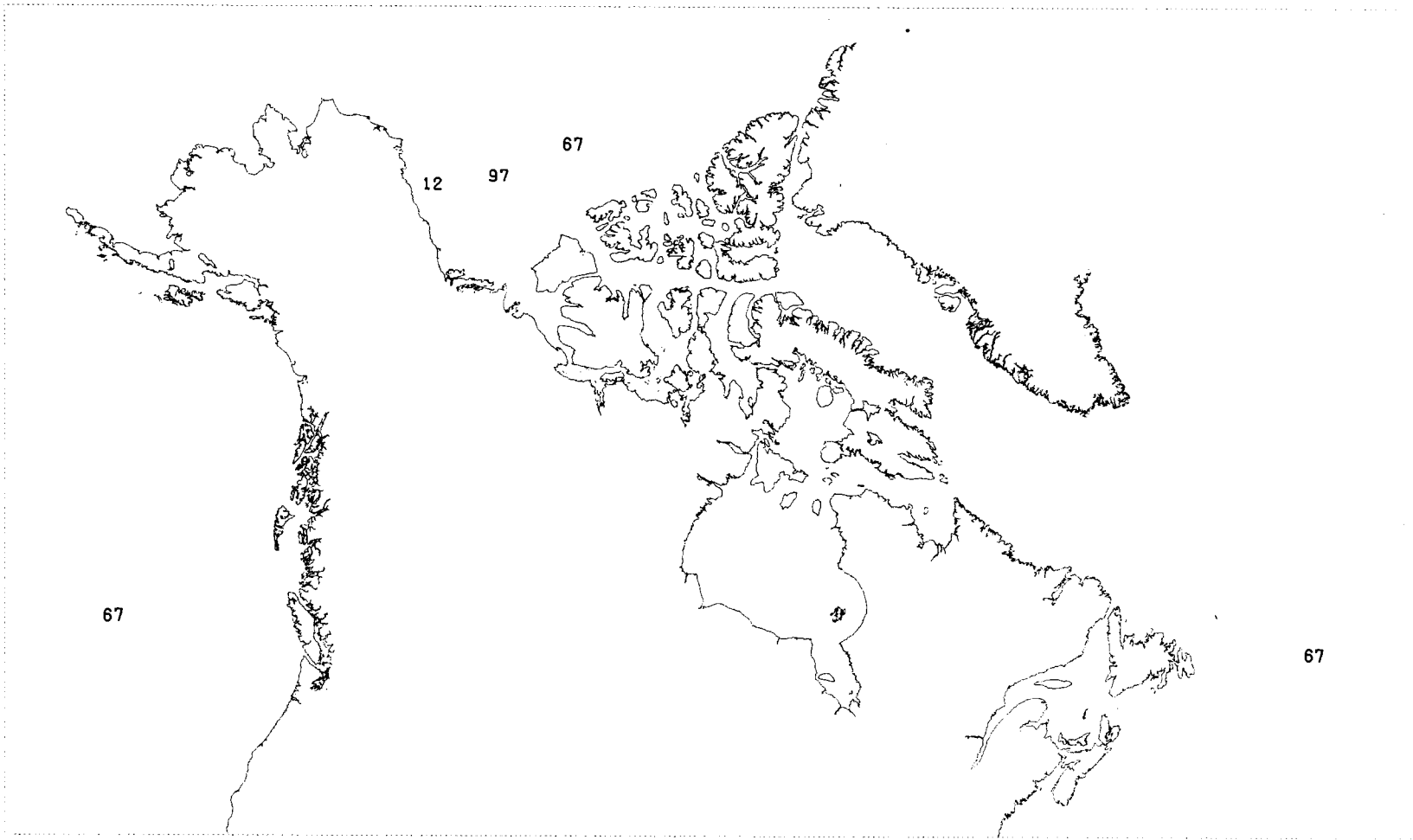


PARAMETER MAP 7 - TIDES

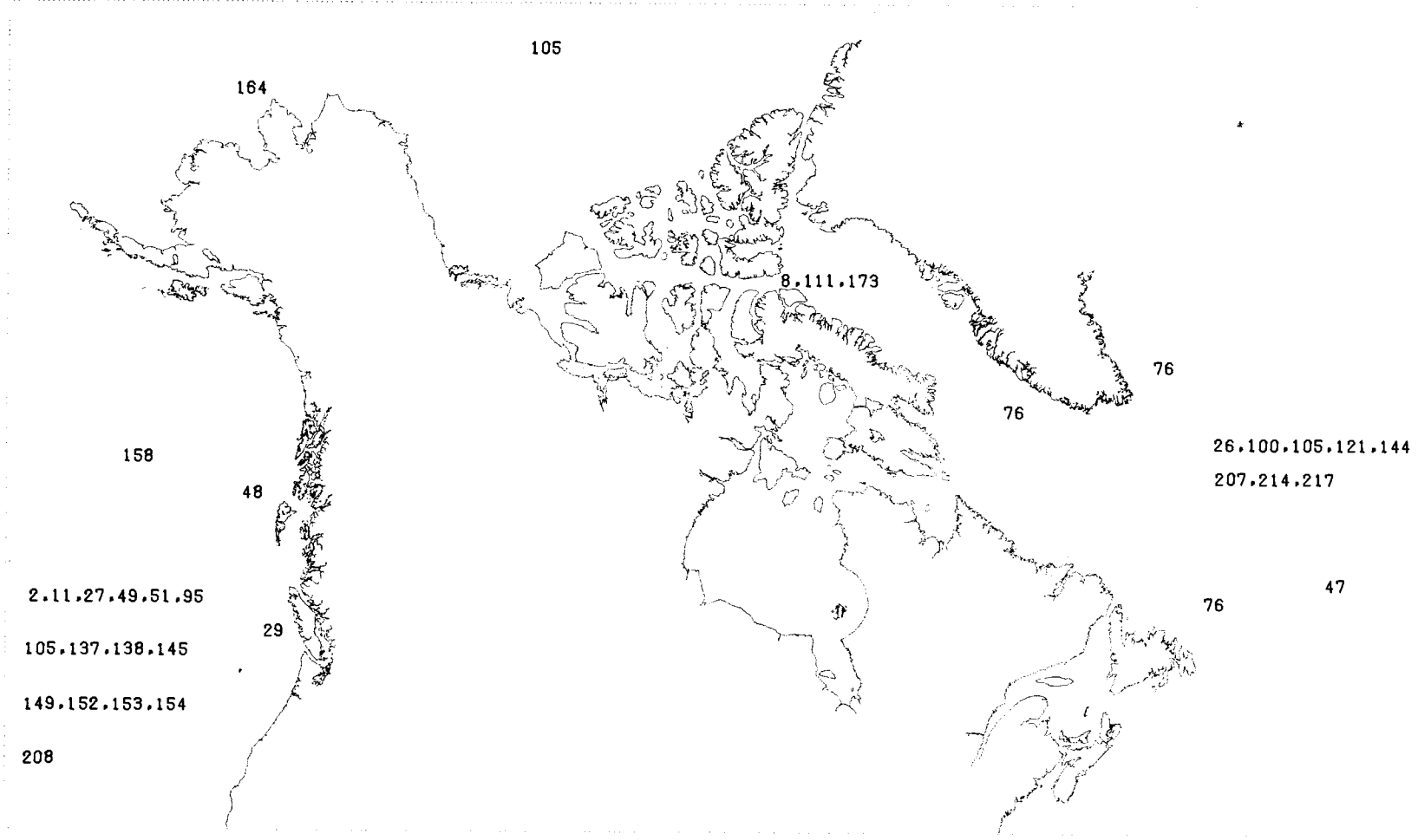


PARAMETER MAP 8 - TSUNAMIS, STORM SURGES

LOCATION UNSPECIFIED - 46

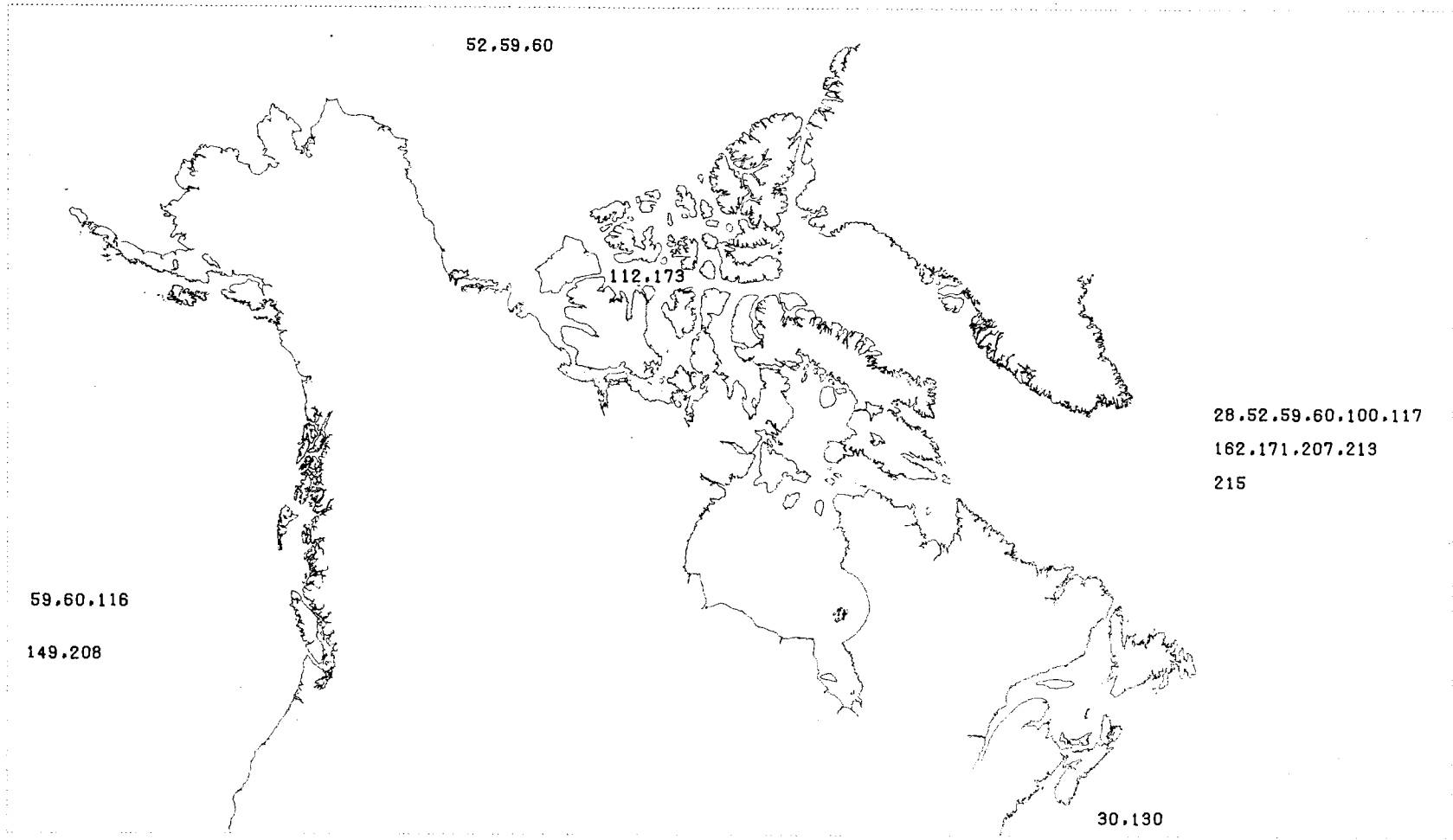


PARAMETER MAP 9 - TURBIDITY

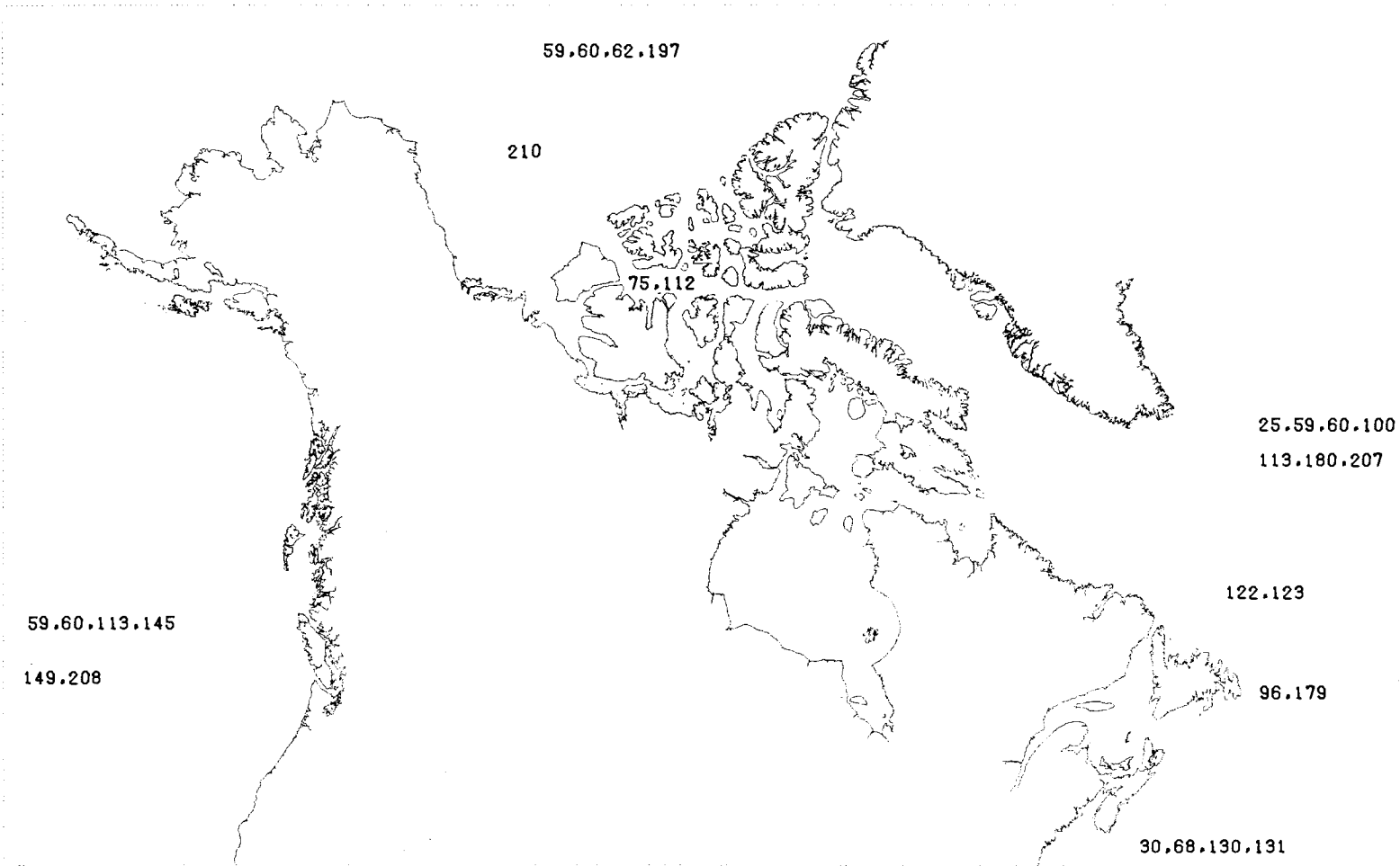


PARAMETER MAP 10 - CHEMICAL NUTRIENTS

LOCATION UNSPECIFIED - 46

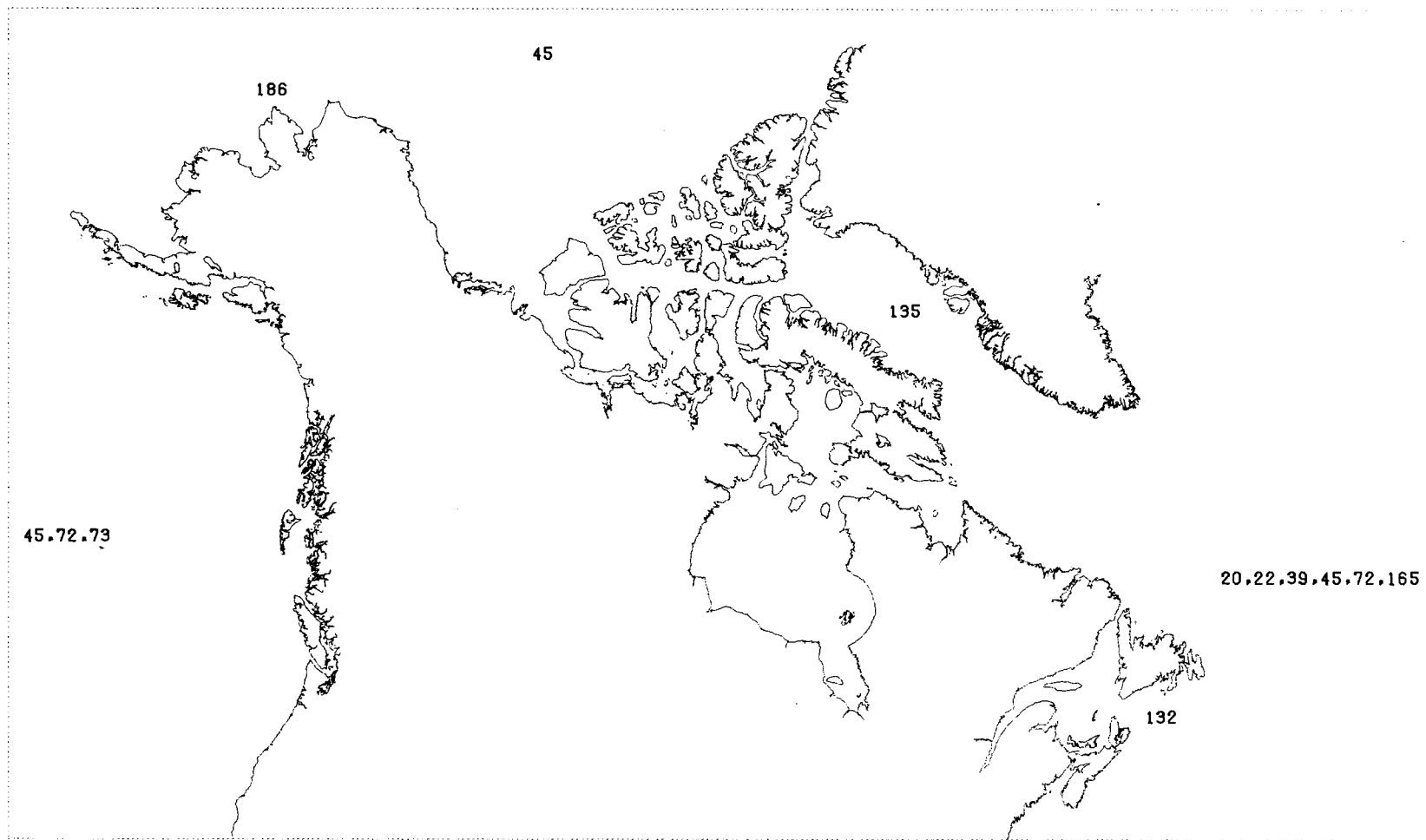


PARAMETER MAP 11 - PLANKTON



PARAMETER MAP 12 - BIOLOGY

LOCATION UNSPECIFIED - 46.127



PARAMETER MAP 13 - UNDETERMINED

LOCATION UNSPECIFIED - 209



AUTHOR INDEX



1. I

Ahlnäs, K. and G. Wendler, "Sea ice conditions in the Chukchi, Beaufort, East Siberian and Northern Bering Seas during March 1973, 1974, and 1975 as seen from the NOAA 2, 3, and 4 satellites." International Conference on Port, and Ocean Engineering Under Arctic Conditions, 3rd, Aug. 11-15, 1975, Vol. 1, University of Alaska, Fairbanks, 1976, pp. 83-104, 28 refs.

A detailed analysis was made of satellite imagery, mainly from the NOAA-VHRR (National Oceanic and Atmospheric Administration-Very High Resolution Radiometer) in the visible and infrared range, to produce maps of mean monthly ice concentration of the western Arctic Ocean for March of 1973 and 1974. Thanks to the multi-daily coverage of the satellite, a total of 2552 data points divided into 47 sub-sections of the Arctic Ocean were analyzed. In both years an average of 75% of usable observations were obtained while the cloudy observations constituted 25%. The highest ice concentrations were found in the Beaufort Sea and East Siberian Sea, 85% and 81% respectively for March of 1973. For March of 1974, the ice concentration was on an average 10% higher due to a greater frequency in onshore wind components as deduced from 5-day means of surface pressure differences between selected stations in the Beaufort Sea. Areas of low ice concentration were found in parts of the Northern Bering Sea, along the NW coast of Alaska and NW of Wrangel Island in both years. In 1973 low ice concentrations were also observed north of the New Siberian Islands and west of Banks Island. Preferred lead directions were recorded for each subsection. The directions of ice drift appear to be connected with the winds and the general surface water circulation centered around a large anticyclonic gyre in the Beaufort Sea. For March of 1975 it was possible to enhance the IR band for comparative temperature readout. For the 17th and 28th of March the 32-tone gray scale was expanded so that the entire white to black scale covered the temperature range -43°C to -3°C . A 10°C temperature increase was noticed between the two dates. No temperatures close to the freezing temperature of ocean water were observed. This might be due to the limitations imposed by the 1 km resolution of the satellite and atmospheric interference of fog above leads.

2. Ch*

Akademiia Nauk SSSR: Institut Okeanologii, Pacific Ocean. Vol. 3: Chemistry of the Pacific Ocean, Moscow: "Nauka", 1966, 358 p. 141 figs., 62 tables, bibliog, pp. 342-358.

A review and results from processing numerous data obtained by the Soviet and foreign expeditions through 1961 on the chemistry of the water and bottom solutions of the Pacific Ocean. Data collected by the Soviet expeditions of the R/V Vityaz', Ob' and other vessels predominate. The book is meant for researchers and practical workers in the fields of marine chemistry,

hydrology, biology, geology and sea fisheries.

3. **Te I**

Alexander, R.C. and R.L. Mobley, Monthly Average Sea- Surface Temperatures and Ice-Pack Limits on a 1 deg. Global Grid, Rand report R-1310-ARPA, Rand Corporation, Santa Monica, Ca., December 1974, ix + 30 p. + 14 charts, 10 refs., 8½"x11".

Climatological monthly ocean-surface temperatures obtained from the National Center for Atmospheric Research and from Fleet Numerical Weather Central are merged and interpolated onto a 1 degree global grid. Monthly distributions of the main ice packs of the Arctic and Antarctic are digitized from Fleet Weather Facility ice charts and Navy atlases, and are incorporated into the global arrays. Machine-analyzed maps of the 12 monthly distributions are presented, together with maps and tabulations of averages of these data on a global grid of 4 degrees latitude x 5 degrees longitude for the months of February and August.

4. **W**

Ashe, G.W.T. and J. Ploeg, Wave Climate Study, Great Lakes and Gulf of St-Lawrence, Volume 2, Mechanical engineering report MH-107A, National Research Council of Canada, Ottawa, March, 1971, v+253 p., diagrams, figs., 8½"x11".

This report (with vol.1) presents the results of a wave climate study of the Great Lakes and the Gulf of St. Lawrence. Over a period of three years, waves were recorded at 14 locations in these areas and a total of approximately 18,000 usable wave records were collected.

Appendix B contains a pictorial presentation (bargraphs) of the two wave parameters of main interest, the significant wave height and the wave length, corresponding to the period of the spectral peak. In appendix C, the frequency curves of significant wave heights and peak periods presented here have been calculated for a relatively short period of time. They are only given as a qualitative indication of the differences in the wave climate of the Great Lakes area and the Gulf of St. Lawrence.

Appendix C also contains a number of samples of acceleration and displacement spectra.

5. **W**

Atlas of Wind and Waves for the Pacific Ocean (Russian), State Oceanographic Institute, Hydrometeorological Publishing House, Leningrad, 1968, 12 pages, 26 plates, graphs, 25x35 cm.

The atlas contains 26 plates depicting the climatic regions of the Pacific Ocean, quarterly and yearly average amplitudes and periods of waves, and quarterly average wind direction and speed (wind roses).

There are accompanying curves of average wave amplitudes, average wave periods, and average wind velocities for 67 different stations throughout the Pacific Ocean.

6. **Cu***
Baird, W., Strait of Canso - Ocean Currents, Public Works Canada, Ottawa, 1976.
7. **W Cu***
Bales, Susan Lee and Edward Foley, Atlas of Naval Operational Environments; the Natural Marine Environment, David W. Taylor Naval Ship Research and Development Centre, Ship Performance Dept., Bethesda, Md., 1979, 342 p.
8. **S Te Ch**
Barber, F.G. and A. Huyer, On the Water of the Canadian Arctic Archipelago, an Atlas Presentation of 1961 and 1962 Data, Manuscript Report Series No. 21, Department of Energy, Mines and Resources, for Marine Sciences Branch, Ottawa, 1971, i + 76p., 15 figs., 32 refs., 8½"x11".

This work represents a step in the development of those oceanographic data observed in and near the Canadian Arctic archipelago during the years 1960, 1961 and 1962.

The atlas is composed of charts of temperature, salinity and distribution of dissolved oxygen for a variety of locations and from a variety of sources.

The distributions of the amount of freshwater, precipitation and temperature on selected σ_t surfaces are also depicted. Methods and data are discussed.
9. **D**
Barber, F.G. and R.L. Johnson, Atlas of Distribution of Speed of Sound, Gulf of Alaska, Bering Sea and Western Aleutians, Pacific Naval Laboratory Technical Memorandum 59-12, Defense Research Board, Canada, November, 1959, 7p. + 60 figs., 6 refs., 8½" x 11".

The distribution of the speed of sound was obtained from serial oceanographic data observed in winter and summer surveys of the Gulf of Alaska area, and a summer survey of Western Aleutian and Bering Sea areas as carried out by the Pacific Oceanographic Group. There are three sections to this report, one for each survey. Each section contains both vertical and horizontal distribution of the speed of sound.
10. **D**
Barber, F.G. and R.L. Johnson, Atlas of Distribution of Speed of Sound, North Pacific Surveys, January 20 to February 15, 1959, Pacific Naval Laboratory Technical Memorandum 59-10, Defense Research Board, Canada, November, 1959, 4p. + 18 figs., 3 refs., 8½"x11".

The material contained in this Atlas concerns the distribution of the speed of sound in the waters off the Gulf of Alaska as obtained from serial data observed in January and February 1959. The Atlas presents both horizontal and vertical distributions of the speed of sound on charts and sections.

11. **Te S Ch D**

Barkley, R.A., Oceanographic Atlas of the Pacific Ocean, University of Hawaii Press, Honolulu, 1968, 20 p. + 156 figs., 31x45 cm, 247 refs.

"This atlas summarizes the results of observations made throughout the Pacific Ocean during a period of over fifty years. It is primarily concerned with conditions in the uppermost mile of water". The 156 figures include 122 maps (23x35 cm) with many cross-sections and histograms. They were based on more than 50,000 oceanographic stations, representing some 3 million observations of temperature, salinity, dissolved oxygen and depth of sampling. In many areas conditions are represented for each of the four quarters of the year. Extensive use is made of density (σ_t) as the independent variable in the analysis and representation of the data.

12. **Cu Te S Tu**

Barnes, Peter et al., "Some coastal oceanographic observations", Environmental Assessment of the Alaskan Continental Shelf, Annual Reports of Principal Investigators for the Year Ending March 1977, Vol. XVII. Hazards. U.S. Department of Commerce - U.S. Department of Interior; Outer Continental Shelf Environmental Assessment Program, Boulder, Colorado, March, 1977, pp. 27-45, 12 refs., 8½"x11".

Observations of temperature, salinity, water turbidity and occasional surface currents were made in two climatically different years, 1972 and 1975.

The information is presented on small charts of temperature, salinity and water transmissivity along with vertical profiles of temperature and salinity.

The area of coverage is approximately bounded by latitudes 70°N and 71°30' N and longitudes 147°W and 154°W.

The article contains written discussions of earlier work, data gathering methods, water characteristics, transmissivity and draws conclusions on the work.

13. **I Te**

Berry, M.O., et al., A Study of Weather, Waves and Icing in the Beaufort Sea, Part IV: Superstructure Icing, Beaufort Sea Technical Report No. 21, Dept. of the Environment, Victoria, B.C., December, 1975, pp. IV-1-IV-25, 5 tables, 6 figs., 16 refs., 8½"x11".

"The effects of icing on ships and the hydro-meteorological variables conducive to its formation are presented.

Empirical relationships developed by Dr. H.O. Mertins to relate ice accretion rates to wind speed, air and sea temperatures are applied to Cape Parry and Sachs Harbour data to estimate superstructure icing and its severity in the Beaufort Sea.

The total number of selected ice accretion rates, and their maximum and average durations are displayed in tabular form. An extreme Gumbel distribution analysis is performed, and ice accumulations for selected return periods are derived".

14. **Te S D**

Böhnecke, G., Atlas zu: Temperatur, Salzgehalt und Dichte an der Oberfläche des Atlantischen Ozeans METEOR Expedition 1925-27, Verlag Walter de Gruyter & Co., Berlin and Leipzig, 1936, 7 pp. + 74 plates.

The atlas contains colored charts depicting mean annual and mean monthly surface temperature and salinity for the whole Atlantic. Sigma-t is shown only for the North Atlantic. The book also has charts of mean annual, mean monthly, and/or mean seasonal surface temperature, salinity and sigma-t anomalies. The months of maximum and minimum surface temperature, salinity and sigma-t are also presented. The scale of the plates is 1:55,000,000. Temperature measurements were made with reversing thermometers to an accuracy of $\pm 0.01^{\circ}\text{C}$.

15. **Cu**

Boisvert, William E., Major Currents in the North and South Atlantic Oceans Between 64°N and 60°S, U.S. Naval Oceanographic Office, Washington, D.C., September 1967, x+92 pages, 25 refs., 15 tables, 31 figs., 20x26 cm., Price: \$1.35.

This publication depicts the location, direction of flow speed and other characteristics of the major currents in the North and South Atlantic Oceans.

The report contains written discussions for each major current. The figures include profiles, vertical sections, boundaries, current roses, and other features.

16. **Cu**

Boisvert, William E., Major Currents off the West Coasts of North and South America, U.S. Naval Oceanographic Office, Washington, D.C., October, 1969, vi + 34 pages, 11 refs., 5 tables, 10 figs., 20x26 cm., Price: \$0.60.

This publication depicts the location, direction of flow speed and other characteristics of the major currents off the west coasts of North and South America.

The report contains written discussions for each major current. The figures include profiles, vertical sections, boundaries, and other features.

17. **W Cu***
 Boris, L.I., Atlas of Variations in the Ocean-Atmosphere System in the North Atlantic. Issue 6: Seasonal Variations in Tidal Phenomena and Internal Waves, Translation Consultants Ltd., Arlington, Va., 1972, 133 p.
18. **Ts***
 Brandsma M., D. Divoky, and L. Hwang, Tsunami Atlas for the Coasts of the United States, Tetra Tech, Inc., Pasadena, Calif., 1979, 255p.
19. **I Ts Cu T W**
 Brower, William A., Harold W. Searby and James L. Wise, Climatic Atlas of the Outer Continental Shelf Waters and Coastal Regions of Alaska, Arctic Environmental Information and Data Center, Anchorage, Alaska, 1977, 29x29 cm.
 Vol. I: Gulf of Alaska (439 p., 50 refs.)
 Vol. II: Bering Sea (443 p., 50 refs.)
 Vol. III: Chukchi-Beaufort Sea (409 p., 50 refs.)

This project attempts to establish the present knowledge of climatological conditions in three Alaskan marine and near coastal areas that are important to resource development of the outer continental shelf.

The maps, graphs, and tables in the atlas present a detailed climatic profile of the marine and coastal regions of Alaska. Statistics detail means, extremes, and percent frequency of occurrence of threshold values for these elements: wind, visibility, present weather, sea level pressure, temperature, clouds, and waves and such supplemental information as storm surges, tides, sea ice, surface currents, bathymetry, detailed weather and aviation weather. Data came from 600,000 surface marine observations and 2 million observations for 49 coastal land stations.

20. **G***
 Bruckner, Isaak, First Prussian Marine Atlas 1749. New Marine Atlas Composed of a General Chart and 12 Special Charts Representing the Globe From 82° N. Lat. to 60° S. Lat., Based on the newest observations arranged and edited by Isaak Bruckner, approved by the Royal Academy of Sciences, Berlin, 1749. (London, J. Rocque, 1749) 13 fold. col. maps.
21. **Cu**
 Bumpus, Dean F. and Louis M. Lauzier, Surface Circulation on the Continental Shelf off Eastern North America Between Newfoundland and Florida, American Geographical Society, N.Y., Serial atlas of the marine environment, Folio 7, 1965, 4 p. of text, 8 double plates and 3 p. of tables, 20 refs.

The brief introduction discusses the data, the charts, and the surface circulation. The non-tidal drift at the surface of the Continental Shelf off eastern North America between Newfoundland and Florida, as inferred from the results of all available drift-bottle data between 1948 and 1962 inclusive,

is presented in 12 charts, one for each month, exhibiting the annual cycle of the circulation. The charts show, on the basis of a 30' rectangular grid, where drift bottles were released, the percent recovery on the North American seaboard from each rectangle, and the velocity (direction and speed) of the drift through those rectangles from which the bottles originated. Four summary charts portray the surface circulation pattern on a seasonal basis.

22. **G***
Canada, Atlantic Oceanographic Group, Oceanographic Atlas, Fisheries Research Board, Ottawa, 1961.
23. **Cu T***
Canada, Hydrographic Service, Tidal and Current Survey Pacific Coast (Canada), Fisheries & Oceans, Ottawa, 1952.
24. **T Cu**
Canada, Marine Sciences Branch, Tidal Current Charts, Vancouver Harbour, British Columbia, Hydrographic Service Tidal Pub. No. 22, Ottawa, 1952, 12 p. of col. maps, 29x57 cm.
25. **B Te**
Chamberlin, J. Lockwood and Franklin Stearns, A Geographic Study of the Clam, Spisula Polynyma (Stimpson), Serial atlas of the marine environment, Folio 3, American Geographical Society, New York, 1963, 12p., 6 col. plates, 146 refs., 31x41 cm.\$8.00.

The introduction discusses evidence that the two widely separated major geographic populations of *Spisula polynyma* are due to a migration of the animals from the northern North Pacific to the northern North Atlantic during the upper Pliocene. The study emphasizes the Atlantic population.

The geological history, biology, ecology and economic use of *S. polynyma* are discussed as well as locality records. The plates (31x62 cm) represent locality records, temperature, and sediment regions as well as regions postulated for *S. polynyma*.

26. **Te S Ch**
Churgin, James and Sylvester J. Halminski, Key to Oceanographic Records Documentation No. 2: Temperature, Salinity, Oxygen, and Phosphate in Waters off United States, Volume I-Western North Atlantic, National Oceanic and Atmospheric Administration, Washington D.C., March 1974, 166 pages, 4 refs., 39x60 cm.

The introduction states that the volume provides a general picture of the variability of temperature, salinity, oxygen, and phosphates over large oceanic areas surrounding the United States. Area summaries and data formats, quality control and the data deletion process as well as the limitations of the data are discussed.

The data summaries (chiefly histograms, graphs) are divided into 10 areas: Argentia, Boston, Quonset Point, New York, Atlantic City, Norfolk, Cape Hatteras, Charleston, Jacksonville, and Miami.

27. **Te S Ch**

Churgin, James and Sylvester J. Halminski, Key to Oceanographic Records Documentation No. 2: Temperature, Salinity, Oxygen, and Phosphate in Waters off United States, Vol. III-Eastern North Pacific, National Oceanic and Atmospheric Administration Washington D.C., March 1974, 260 p., 4 refs., 39x60 cm.

Divided into 12 areas:

Baja, San Diego (200 SW), San Diego, Santa Rosa, Point Muga, San Francisco, Point Arena, Eureka, North Bend, Newport, Astoria, and Seattle.

28. **P**

Colebrook, J.M., R.S. Glover and G.A. Robinson, "Continuous plankton records: contribution towards a plankton atlas of the North-Eastern Atlantic and the North Sea." Bulletin of Marine Ecology, Vol. V, No. 42, February, 1961, pp. 65-III, Plates XV-XXXII, 121 refs., 21x27 cm.

The Continuous Plankton Recorder Survey, operated from the Oceanographic Laboratory Edinburgh, is used to provide charts of the distribution and abundance of seventy-nine species and groups of species. The charts show the "average" distributions obtained from nine years' sampling (1948-1956) in the north-eastern Atlantic and the North Sea.

In the General Introduction a continuous biogeographic series is presented in which the species are listed in order from extreme oceanic to extreme neritic forms: there is appreciable overlapping of different types of distribution. The problems of nomenclature and classification of pelagic organisms are discussed. It is suggested that the species-composition of the whole plankton "community" can be used to provide indications of hydrographic and other environmental changes. Notes on the distribution of some of the species are provided in Parts I-V. This Plankton Atlas is intended to provide a background for subsequent studies of fluctuations in the abundance, distribution, and species-composition of the plankton.

29. **Te S D Ch**

Collias, Eugene E. et. al, Atlas of Physical and Chemical Properties of Puget Sound and its Approaches, University of Washington Press, Seattle, Wash., 1974, xii + 235 p., 9 refs., 22x28 cm.

"In this atlas, water properties along eight longitudinal profiles are presented for varying time intervals over a span of 14 years from 1952 through 1966. From October 1952

through September 1954, monthly surveys were made throughout Puget Sound to determine the annual variations in these properties. From 1955 to 1966 intensive studies were made at various times in selected portions of Puget Sound."

30. **B P**

Colton, John B. and Jeanne M. St-Onge, Distribution of Fish Eggs and Larvae in Continental Shelf Waters, Nova Scotia to Long Island, Serial atlas of the marine environment, Folio 23, American Geographical Society, New York, 1974, 11 plates, unpagued, 16 refs., 31x41 cm.

The maps of this folio summarize by month the distribution of the common planktonic fish eggs and larvae in continental shelf waters between Cape Sable and Long Island. The ichthyoplankton collections forming the basis for this study were obtained on 46 cruises during 1953-1971.

Methods of collection and analysis, limitations and treatment of data as well as the construction of distribution maps are discussed. These are 11 colored plates (folded) including 129 maps.

31. **Te**

Colton, John B. and Ruth R. Stoddard, Average Monthly Sea-Water Temperatures, Nova Scotia to Long Island 1940-1959, Serial atlas of the marine environment, Folio 21, American Geographical Society, New York, 1972, unpagued, 10 refs., 31x41 cm. \$12.00.

"This folio provides a monthly summary of the major temperature features by means of maps of horizontal distribution and vertical profiles. It establishes temperature norms to which individual cruise data may be compared. The area of coverage is bounded by latitudes 39° 00' N and 45° 30' N and longitudes 64° 00' W and 72° 00' W".

The sources of the temperature data as well as the horizontal and vertical temperature distributions are discussed. Ten folded plates are included.

32. **Ts***

Cox, Doak C. and George Pararas-Carayannis, Catalog of Tsunamis in Alaska, Revised 1976, National Oceanic and Atmospheric Administration, Environmental Data Service, Washington, D.C., 1976.

33. **D**

Defant, A., Die Absolute Topographie des Physikalischen Meeresniveaus und der Druckflächen sowie die wasserbewegungen im Raum des Atlantischen Ozeans METEOR Exp. 1925-27, Band VI, 2, Verlag Walter de Gruyter and Co., 1941, pp. 191-260 + 11 plates.

The atlas contains charts of surface dynamic topography, dynamic topography at 100 db, 1400 db, and 2000 db, and 100 db currents, 20°S to 20°N.

The book also contains plates of dynamic topography at sea surface and absolute topography at 100, 200, 500, 800, 1400 and at 2000 db.

The charts and plates were based on data collected from METEOR and 14 other ships involving 629 stations over the period 1910-1935.

34. D

Defant, A., Die Relative Topographie Einzelner Drückflächcn im Atlantischen Ozean. DAE METEOR 1925 - 1927, Band VI/2, Verlag Walter de Gruyter & Co., Berlin and Leipzig, 1941, 183-190 pp. plus 9 plates.

35. Te*

Denmark, Meteorologisk Institut, Monthly Surface Temperatures of the Northern Atlantic: 50-80°N, 0-60°W, 1961-1970, Meteorologisk Institut, Publikationer, Arbogter, 1975, 28p., (In Danish and English.)

36. I*

Denmark, Meteorologisk Institut, State of Ice in the Arctic Seas. 1900-1939; 1946-1950, Nautisk-Meteorologisk Arbog, Tillaeg (Appendix), 1900-1950, charts. In English.

Reports on the state of the ice in the Arctic seas were published by the Danish Meteorological Institute for each of the years 1901-1939 and 1946-1949. For the intervening years, 1940-1945, the Institute is endeavoring to collect data which will make possible a later publication of reports from these years. North Atlantic sea surface temperature charts were included through the 1939 issue. Annual reports (currently prepared by Helge Thomsen, Chief of the Nautical Section) consist of discussion of the annual seasonal ice characteristics and of monthly details by region plus color charts showing ice types and extent for that particular year as contrasted with average conditions for 1898-1922. When publication resumed in 1946 data from the Soviet and part of the American Arctic were no longer available.

37. Te Cu S I D*

Deutsche Seewarte, Atlantischer Ozean. Ein Atlas die Physikalischen Verhältnisse und die Verkehrsstrassen Darstellend, Hamburg, 1882, 1902, 11 p. 9 p., 36, 39 charts, 33x44 cm.

Monthly charts of the Atlantic Ocean indicating direction of flow of sea surface currents in northern winter, areas of drift ice, sea swell, specific gravity, salinity, mean sea temperature, distribution of seasonal rainfall, mean cloudiness and duration of fog. It includes four synoptic maps of the North Atlantic and 21 small charts showing weather conditions.

38. **I***
 Deutsche Seewarte, Atlas of Ice Conditions in the North Atlantic, Oberkommando der Kriegsmarine, Feb., 1944, almost entirely charts.
39. **G***
 Deutsche Seewarte, Monthly Charts for 50° to 70° N. Lat. in the North Atlantic Ocean, Oberkommando der Kriegsmarine, 1940, unpagged, almost entirely charts.
40. **I CU Te S D***
 Deutsche Seewarte, Monthly Charts for the North Atlantic, Revised by the Deutsche Seewarte. 1939-1940, Oberkommando der Kriegsmarine, Hamburg, 1940, 48 p.
- Monthly charts for the Atlantic, 60 degrees N - 6 degrees S and 10 degrees N - 5 degrees S, compiled by the Deutsche Seewarte from British, Dutch and German ship reports with variable but substantial periods of record for different elements. Recorded on charts are wind roses for 5-degree squares, limits of drifting ice, limits of sand and dust, fog frequencies, ocean currents, sea surface temperature, salinity and density, air pressure and prevailing wind direction, wind speed, storm frequencies (Beaufort force 8), air temperature, precipitation and frozen precipitation frequencies. Selected synoptic situations shown.
41. **I***
 Deutsche Seewarte, Monthly Charts of Ice Conditions in the North Atlantic Ocean, Oberkommando der Kriegsmarine, Nov., 1940, 10 p. text, almost entirely charts.
42. **Te Cu D***
 Deutsche Seewarte, Pacific Ocean. An Atlas of 31 Charts, Showing the Physical Characteristics and the Trade Routes...Supplement to Sailing Handbook for the Pacific Ocean, L. Friederichsen & Co., Hamburg, 1896, 14 p. + 31 charts.
- The 31 large colored charts cover ocean depth, temperature distribution, currents, density; air temperature, pressure and movement; synoptic weather charts and charts of magnetic variations.
43. **I***
 Deutsches Hydrographisches Institut, Atlas of Ice Conditions in the North Atlantic Ocean and General Charts of the Ice Conditions of the North and South Polar Regions. Hamburg, 1950, 24 p. 34 col. charts, bibliog. p. 24.
- Monthly charts show mean (1919-1943) ice characteristics and extent in the North Atlantic, Arctic and Antarctic (1929-1939) oceans. Text devoted to a discussion of the geographical distribution of ice and to the definition of the various types of ice.

44. **Cu Te D S**

Deutsches Hydrographisches Institut, Monatskarten für den Nordatlantischen Ozean (Monthly charts of the North Atlantic Ocean) 4th ed., Hamburg, 1967, unpagged, 44x68 cm.

The atlas contains monthly charts of currents, winds, density, atmospheric pressure, sea surface temperature, air temperature, salinity as well as frequency of precipitation, gales and fog. Written descriptions accompany the charts.

The area of coverage is bounded by latitudes 5°S and 60°N and longitudes 10°E and 100°W.

45. **G***

Die Weltmeere-Taschenatlas mit den Wichtigsten Tatsachen aus Meteorologie und Nautik (3 Neubearb. und erw. Ausg. Gotha, Haack) 1962, 172 p.

It has c. 30 maps of oceans and seas plus plans of ports. It shows directions of currents, winds and fathom lines.

46. **W Cu Te S Ts Ch B**

Dietrich, G. and J. Ulrich, Atlas zur Ozeanographie, Bibliographisches Institut, Mannheim, 1968, xv + 76 p., 21x30 cm (in German).

The atlas contains charts and sections depicting: land-water distribution; sea-bottom and substrate; morphology of shelves, continental slopes, and oceanic basins; deep-sea grabens and ridges; heat balance of oceanic waters; stratification of the ocean waters; ocean currents; sea waves including tsunamis; and life in the sea.

There is worldwide coverage, however only some of these topics are covered for any particular ocean or sea.

47. **Te S D Ch**

Dietrich, G., Atlas of the Hydrography of the Northern North Atlantic Ocean (Winter and Summer 1958), Conseil International pour l'Exploration de la Mer, Service Hydrographique, Charlottenlund, Denmark, 1969, 144 pp. incl. 213 plates.

The Atlas contains charts of temperature, salinity, and density at various depths for winter and summer along with 2 charts of bottom temperature. Dissolved oxygen is charted for winter and summer at 200m and at 1000m. The book also contains 16 sections for each of the four parameters for winter and summer.

Maps of stations and sections are presented. The scale of the charts is 1:14,000,000, in sections the scale is 1:10,000,000 with vertical exaggerations of 500 and 2000.

The temperature measurements were made by reversing thermometers to an accuracy of $\pm 0.01^{\circ}\text{C}$, those of salinity were made by titration to an accuracy of ± 0.02 ‰. Oxygen concentration was measured by the modified Winkler method. The data were obtained from 3444 stations from 28 ships in 1958.

48. **Te Ch S D**

Dodimead, A.J., A General Review of the Oceanography of Queen Charlotte Sound - Hecate Strait - Dixon Entrance Region, Canadian Manuscript Report of Fisheries and Aquatic Sciences No. 1574; Resource Services Branch, Department of Fisheries and Oceans, Nanaimo, B.C., July, 1980, 248 p. + 77 figs., 64 refs., $8\frac{1}{2}'' \times 11''$.

Oceanographic cruises and sources of serial physical-chemical and tidal current data, primarily for the period 1934-71, and the results of past research for the Queen Charlotte Sound-Hecate Strait-Dixon Entrance region are reviewed. The results of further analysis of these data, mainly of those for Queen Charlotte Sound and Hecate Strait, are presented. Other relevant information such as average wind conditions, monthly means of the sea level (1944-73) and of zonal Ekman transport (1946-73), and annual and monthly means and anomalies of sea surface temperature and salinity (1934-73) for several light stations located in the region, are also discussed.

49. **S Te Cu Ch**

Dodimead, A.J., F. Favorite and T. Hirano, Review of Oceanography of the Subarctic Pacific Region, International North Pacific Fisheries Commission: Bulletin No. 13, Vancouver, Canada, 1963, 195 p. incl. 233 figs., 128 refs., $8\frac{1}{2}'' \times 11''$.

This review includes descriptions of the salinity structure, surface heating and cooling, circulation system and the concept of domains of the Subarctic.

Included in the report are charts of monthly mean sea surface temperature, major current systems, dynamic height anomaly, features of the thermocline, temperature and salinity at various depths and vertical sections of salinity, temperature, and dissolved oxygen.

The area of coverage is bounded by latitudes 33°N and 67°N and longitudes 120°W and 140°E .

50. **Te D S**

Dodimead, Allan J., and F. Favorite, Oceanographic Atlas of the Pacific Subarctic Region, Summer 1958, Fisheries Research Board manuscript report series (oceanographic and limnological) No. 92, April 10, 1961, 6 p. + 40 figs.

Data from 588 oceanographic stations north of 35°N lat. obtained by members of the Commission and other agencies during the summer of 1958 were collected and are presented on

horizontal and vertical charts showing the distribution of temperature, salinity, density and anomaly of dynamic height. The depth levels selected provide a maximum amount of information concerning sub-surface distribution of properties. Data sources are given.

51. Te S Ch

Dodimead, Allan J., Oceanographic Atlas of the Subarctic Pacific Region, Summer 1961, Fisheries Research Board manuscript report series (oceanographic and limnological) No. 186, Canada, Jan. 16, 1965, 8p. + 25 figs., table, 7 refs.

Dodimead, Favorite and Hirano (1963) published Review of Oceanography of the Subarctic Pacific Region, in which features of the water structure and circulation are reviewed; regions, water masses and domains are identified; seasonal and yearly variations of temperature, salinity and dissolved oxygen for the years 1955 through 1959 are discussed. During the subsequent years, oceanographic agencies of Japan, the U.S. and Canada have gathered data in the Subarctic Pacific Region; but as yet, no one has presented composite synoptic pictures from these data. Such pictures are necessary in order to have an appreciation of the continuity or lack of continuity of properties throughout the region in any one period. Further, they facilitate comparison of oceanographic features and extent of domains with those in other years; all of which are needed in order to study the oceanic distribution and migration of various stocks of salmon in relation to oceanographic features and their variations. This work is presently being done under the research program of the International North Pacific Fisheries Commission (INPFC). This report presents the published data for the Subarctic Pacific Region for the summer 1961 in the same format used in the above review and in other manuscript reports (Pacific Oceanographic Group, 1959; Dodimead, 1950). Portions of these data have been presented and discussed elsewhere (INPFC, 1963, Favorite and Morse, 1964).

52. P

Dunbar, Maxwell J., Euphausiids and Pelagic Amphipods; Distribution in North Atlantic and Arctic Waters, Serial atlas of the marine environment, Folio 6, American Geographical Society, New York, 1964, unpagged, 8 col. plates, 57 refs., 31x41 cm. \$7.00.

"This Folio presents existing information concerning geographic distributions of eight examples of northern and arctic plankton crustaceans. Interpretation of the distributions and discussion of their similarities and differences are included."

Four species each of Euphasiacea and Amphipoda thought to be the most representative of each group in the area of study, are included and each species is briefly described. Each plate shows the distribution of one species.

53. Te

Eber, L.E., J.F.T. Saur and O.E. Sette, Monthly Mean Charts of Sea Surface Temperature: North Pacific Ocean 1949-1962, U.S. Bureau of Commercial Fisheries Circular 258, Washington, D.C., June 1968, vi p., 4 refs., 36x57 cm.

This atlas contains 168 monthly sea surface temperature charts for the Pacific Ocean north of lat. 20° S. The series extends from January 1949 through December 1962. Each monthly chart contains isotherms for intervals of 1° C. and plotted values representing the density of observations by grid "squares" (about 86 nautical miles to a side). The data were taken from the marine weather observations stored in Punched Card Deck 116 at the National Weather Records Center, Asheville, N.C. The amount of data available per chart ranged from about 5,000 observations at the start of the series to 15,000 at the end. The observations were distributed more abundantly along trade routes and were generally sparse in tropical regions.

Editing procedures exercised for quality control included rejection of erroneous values and the application of corrections to temperature values reported by ships which were determined to be systematically biased, relative to other ships. A numerical analysis technique, based on Carstensen's Relaxation Method, was used to obtain digital representation of the temperature fields. The isotherms were smoothed to reduce small-scale irregularities.

54. Te S D*

Emery, William, (Temperature, salinity, density: Atlantic and Pacific Ocean), Vancouver, B.C.: University of British Columbia. (Forthcoming publication; complete information not available April 28, 1981.)

55. I

Environment Canada, Ice Observations: Canadian Arctic, Atmospheric Environment, Toronto, 1964-1971, various prices, 21x28 cm.

A series of reports on the general ice conditions in the Canadian Arctic. Previous reports in these areas are listed in the references.

The ice charts (19x25 cm) in these reports are based upon the aerial ice reconnaissance flight observations provided by ice observers of the Atmospheric Environment Service. The charts describe observed ice conditions with regard to ice coverage, age, topography, puddling, snow cover and water features.

This publication and the following two were issued annually.

56. I

Environment Canada, Ice Observations: Eastern Canadian Seaboard, Atmospheric Environment, Toronto, 1964-71, various prices, 21x28 cm.

57. I
Environment Canada, Ice Observations: Hudson Bay & Approaches, Atmospheric Environment, Toronto, 1964-71, various prices, 21x28 cm.
58. Te*
Everson, C.E. and D.T. Brissett, Climatic Atlas of North America Mean Sea and Lake Surface Temperatures, 4th Weather Wing technical paper 70-3, 1970, 27p.

The purpose of this technical paper is to provide a reference on mean sea and lake surface temperatures for North America for use in operational planning by organizations in North American Air Defence Command and Aerospace Defense Command. Monthly charts for the Pacific (to 170 degrees east) the Atlantic (to 30 degrees west) and the Great Lakes are included. This paper is strictly a climatic atlas.

59. P B
FAO Department of Fisheries Atlas of the Living Resources of the Seas, 3rd edition, Rome, 1972, vii + 12 pages, 62 col. maps. (English, French, Spanish) 29x35 cm.

60. P B
FAO Department of Fisheries, Atlas of the Living Resources of the Seas. (Atlas des Ressources Biologiques des Mers. Atlas de los Recursos Vivos del Mar). FAO Fisheries Circular No. 126-Rev. 1, Rome, 1972, ix+14 pages, 62 col. maps. (English, French, Spanish) 28x34 cm.

The series of maps was prepared for the Committee on the Peaceful Uses of the Sea-Bed and the Ocean Floor Beyond the Limits of National Jurisdiction. The maps are of three types; the geographical distribution and present state of exploitation of living marine resources, some characteristic examples of migration in fish, and the geographical and vertical distribution, as well as the abundance, of the main stocks in each ocean.

Productivity of the seas, exploitation and utilization, movements and migrations as well as topography and nomenclature are all discussed.

61. Cu*
Felber, Otto-Heinrich, "Surface currents of the North Atlantic Ocean between 15° and 50° N. Lat." Aus dem Archiv der Deutschen Seewarte, 53(1), Hamburg, 1934, 18 p., table, 6 plates, 46 refs.

62. I B Te Cu
Fenco Consultants Ltd. and F.F. Slaney and Co. Ltd., An Arctic Atlas: Background Information for Developing Marine Oilspill Countermeasures, Arctic Marine Oilspill Program Report EPS-9-EC-78-1, Fisheries and Environment Canada, Environment Emergencies Branch, Environmental Protection Service, Ottawa, 1978, Approx. 450 refs., 29x49 cm.

This project has been undertaken as part of the Arctic Marine Oilspill Program (AMOP) with the objective of providing a baseline document, prepared from existing information, to assist in the development of an oilspill countermeasures capability for the marine areas of the Canadian arctic and subarctic. An atlas format has been selected with information mapped at two scales. For data of a general nature, keymaps are presented at a scale of 1 to 15,282,000. For more detailed information, basemaps are presented at a scale of 1 to 2,817,000. A series of 22 basemaps spans the area of interest covered by a single keymap. Five principal categories of information relevant to oilspill countermeasures have been treated, these being: Geology and Petroleum Development, Meteorology and Oceanography, Ice, Biology, and Social. Generally a mapped format has been employed, with explanatory graphs and tables inserted where necessary. Graphs, maps tables, refs.

63. **I Cu S Te**

Fenco Consultants Ltd., Davis Strait Ice and Oceanographic Investigations, Winter 1976-1977, submitted to Imperial Oil Ltd. by Fenco Consultants Ltd., June, 1977, x+ 96 pages, 20 tables, 90 figures, 8½"x11".

"The report describes the ice and oceanographic investigations carried out in the Davis Strait area off the Canadian East Coast during the November-December 1976 and February 1977 ship surveys. The results include the documentation of sea ice characteristics, surface current and ice motion studies, salinity and temperature profiling of the surface waters and meteorological observations".

64. **Te Cu***

France, Bureau Central Meteorologique, Atlas of Marine Meteorology Published on the Occasion of the International Maritime Exposition at Le Havre, Gauthier-Villars, Paris, 1887, 35 p., 7 figures, tables, 35 plates.

Introductory notes by Leon Teisserence de Bort precede ocean charts showing pressure, wind, storms, currents, temperature and magnetic declination.

65. **Cu***

France, Bureau Central Meteorologique, Atlas of Winds and Currents in the Atlantic Ocean, Paris, 1870.

66. **I**

Fraser, J.E., Some Sea Ice Cover Statistics For the Canadian East Coast, Report IPRT-37ME-75, Imperial Oil Limited, Production Research and Technical Service Laboratory, Calgary, Alberta, October, 1975, iii + 28 pages, 7 tables, 6 figs., 8½"x11".

This report sets out the results of a study of sea ice cover on the Canadian east coast. The study area lies along the

coasts of Newfoundland and Labrador to about 300 miles offshore, between 45°N and 70°N. The study is based on historical ice charts obtained from Ice Forecasting Central, Department of the Environment, Ottawa.

The statistics generated include average, maximum and minimum open water season lengths, and average, earliest and latest break-up and freeze-up dates. All these lengths and dates are relative to 1/10 or greater concentration of sea ice, with the exclusion of new ice or nilas, which is ignored.

Also generated are statistics of gross season length for ice concentrations less than or equal to 6/10. These statistics are calculated for the area south of 55°N only.

67. **Tu***

Frederick, Margaret Anne, An Atlas of Secchi Disk Transparency Measurements and Forel-Ule Color Codes for the Oceans of the World, Naval Postgraduate School, Monterey, Calif., 1970.

68. **B**

Fritz, Raymond L., Autumn Distribution of Groundfish Species in the Gulf of Maine and Adjacent Water, 1955-1961, Serial atlas of the marine environment, Folio 10, American Geographical Society, New York, 1965, unpagged, 2 figs., 22 plates, template (laid in back pocket), 3 refs., 32x41 cm.

"This folio summarizes and illustrates the autumn distribution of 20 common groundfish species in the Gulf of Maine, on Georges Bank, and in the adjacent waters, and describes these distributions in relation to depth and bottom water temperatures." Collection techniques and reduction of data are described briefly and the results are discussed.

Plates are 27x37 cm in size.

69. **Te S**

Fuglister, F.C., Atlantic Ocean Atlas of Temperature and Salinity Profiles and Data from the International Geophysical Year of 1957-1958, Woods Hole Oceanographic Institution, Woods Hole, Mass., 1960, 209 p. incl. 42 plates in color, 15 refs., 32x44 cm.

The atlas consists of a series of profiles of temperature and salinity as functions of depth and ship track position. Station and bathythermograph data are included. The surveys relevant to this atlas occurred between September, 1954, and July, 1959. The classical oceanographic station, involving serial observations from surface to bottom with reversing thermometers and Nansen bottles, was the principal source of thermohaline information.

70. **Te**

Fuglister, F.C., Average Monthly Sea Surface Temperatures of the Western North Atlantic Ocean - Papers in Physical Oceanography and Meteorology, Vol. X, No. 2, M.I.T., Cambridge, and WHOI, Woods Hole, Mass., May, 1947, 25 pp. incl. 16 plates.

The report includes charts of average monthly sea surface temperatures as well as plates of maximum and minimum average sea surface temperatures for the year. A map of temperature differences between warmest and coldest months is also presented. The final plate shows average depth of isothermal layer (winter and summer) with a contour interval of 10m.

The data were obtained from the Hydrographic Office, Woods Hole Oceanographic Institution Files, up to 1946, based on 1 degree quadrangle averages.

71. **D***
Germany, Kriegsmarine Obercommando, East Coast United States (Northern Part) - Tidal Streams, Depth, Bottom Densities, Berlin, 1943.
72. **G***
Germany, Marineobservatorium, Klimadienst, Pacific Ocean Climatic Charts, 1940. Also: ATLANTIC Ocean Climatic Charts, 1940. (charts and tables)
73. **G***
Giovando, L.F. and Margaret K. Robinson, Characteristics of the Surface Layer in the Northeast Pacific Ocean. Scripps Institution of Oceanography, La Jolla, Calif., 1969.
74. **T**
Godin, G., Cotidal Charts for Canada, Manuscript report series no. 55, Dept. of Fisheries and Oceans; Marine Sciences and Information Directorate, Ottawa, Ontario, 1980, 93 p., charts, tables, 23 refs., 8½"x11".
- "Tidal information about Canadian waters has been accumulated systematically since the establishment of the Tidal Survey with W.B. Dawson in 1894". Since then the information has been scrutinized and compiled to become the source material for numerous scientific and practical investigations.
- Cotidal charts for the constituents M₂, S₂, N₂, K₁ and O₁ as well as tidal pattern charts in waters adjacent to Canada are presented. They represent a distillation and interpretation of the very extensive material now available.
75. **B**
Grainger, Edward H., North American Sea Stars (Echinodermata Asteroidea) From North Alaska to the Strait of Belle Isle, Serial atlas of the marine environment, Folio 5, American Geographical Society, New York, 1964, unpagged, 5 col. plates, 24 refs., 31x41 cm, \$6.50.

"This Folio presents available distribution data on the sea stars recorded from northern North American waters between Cape Lisburne, Alaska, and the Strait of Belle Isle."

The horizontal and vertical distribution of 26 species of sea stars is discussed as well as the substrate of sea-star localities. A list of the sources of data is given. There are five colored plates (32x62 cm) representing these data.

76. **Te Ch S**

Grant, A.B., Atlas of Oceanographic Sections: Temperature Salinity - Dissolved Oxygen - Silica 1965-67. Davis Strait - Labrador Basin - Denmark Strait - Newfoundland Basin 1965 - 1967, Atlantic Oceanography Laboratory Report A.O.L. 68-5, Bedford Institute of Oceanography, Dartmouth, N.S., 1968, 80 pages, 5 refs., 32x42 cm.

Numerous observations of temperature, salinity, oxygen and silica were made in areas from the Grand Banks to the Denmark Strait during cruises in the Northwest Atlantic Ocean, by staff of the Atlantic Oceanography Laboratory between March 1966 and April 1967. The data have been compiled in this Atlas in the form of sections.

77. **Te S***

Great Britain, Hydrographic Dept., Salinity and Quarterly Centigrade Temperature Charts of the Surface Waters of the Atlantic, Pacific, and Indian Oceans with nomograms for Determining the Speed of Travel of Sound in Surface Sea-water and Graphs Showing how the Freezing Point, the Maximum Density Point, and the Electrical Conductivity of Sea-Water Vary with Salinity and Temperature, May 29, 1942, 6 charts (dol.), 2 nomograms (fold.), graphs.

78. **I**

Great Britain, Hydrographic Office, Ice Charts of the Northern Hemisphere, Hydrographer of the Navy, Admiralty, London, 1938, 12 col. maps, 68cm.

79. **Cu***

Great Britain, Hydrographic Office, Wind and Current Charts for the Pacific, Atlantic and Indian Oceans, 1872, unpagged, 5 charts.

80. **Cu I***

Great Britain, Meteorological Office, Climatological and Sea-Surface Current Charts of the North Atlantic Ocean, January-December, Issued 1957-1958, Meteorological Office Pub. No. 615. (3 sh. each.)

Content of the charts is based upon observations received from selected British ships between 1855 and 1939. The charts represent one of a series based on observations received from selected British ships between 1855 and 1939, the series is to be prepared for the North Atlantic, South Atlantic, Indian, North Pacific and South Pacific Oceans. The climatic and sea surface current charts show the currents during the quarter beginning with the respective month, the wind roses for the months, and approximate mean (1920-1939) limit for pack ice.

Maps consisting of isopleths for scarce observations are included. Normal steamer tracks are also shown on the maps.

81. **Te Cu***

Great Britain, Meteorological Office, Currents and Surface Temperature of the North Atlantic Ocean from the Equator to Latitude 40°N, London, 1872, M.O. Official Pub. No. 12, 47 p.

Monthly and annual charts of the North Atlantic Ocean by 2-1/2-degree squares. Arrows show the direction of the surface currents, mean rate of current in miles per day, and number of observations. The mean temperature of the sea surface is shown in the square, also the number of observations on which the mean is based.

82. **Te, Cu***

Great Britain, Meteorological Office, Monthly Current Charts for the Atlantic Ocean, Hydrographic Office, London, 1897 12 p.

83. **I**

Great Britain, Meteorological Office, Monthly Ice Charts: Arctic Seas, Hudson Bay to Kara Sea, Marine Branch, Meteorological Office, Air Ministry, London, 1942, 43, 44, unpagged, illus., col. charts, 17x30 cm.

The Atlas contains monthly ice charts (shaded) showing heavy polar ice, probable mean position of sea ice in the middle of the month, probable extreme limit of sea ice, probable extreme limit of icebergs, and textural description of ice conditions.

84. **I***

Great Britain, Meteorological Office, Monthly Ice Charts: Western North Atlantic: Lat 37°N to 53°N, Long. 37°W to 72°W, Marine Branch of the Meteorological Office, Air Ministry, London, 1944, 29 p.

85. **Cu**

Great Britain, Meteorological Office, Monthly Meteorological Charts and Ocean Current Chart of the Greenland and Barents Seas, M.O.M. Pub. No. 402B, Air Ministry, London, unpagged, charts, 52 cm.

86. **Te***

Great Britain, Meteorological Office, Monthly Meteorological Charts. Mean Wind, Weather, Pressure, Sea and Air Temperature and Humidity. Western North Atlantic 10° to 70°N., 40° to 100°W, Meteorological Office Pub. No. 394, London, 1942, unpagged, figs., charts.

87. **Te W***

Great Britain, Meteorological Office, Monthly Meteorological Charts of the Atlantic Ocean, London, 1941, unpagged, charts 52 x 62 cm.

The Atlas contains monthly wind roses, frequency of winds, predominant direction, constancy and force of surface winds, air temperature, mean cloudiness, sea swells, sea temperature, difference between mean air and mean sea temperature, precipitation, snow alone, fog, mist, haze and lightning.

88. **Te***

Great Britain, Meteorological Office Monthly Meteorological Charts of the Atlantic Ocean, M.O. Pub. No. 483, H.M. Stationary Office, London, 1948, 122 p., charts.

Four large atlases which deal comprehensively with the climatology of the oceans month by month prepared during war primarily for operational purposes. All data shown on charts of the oceans by isopleths except wind and swell data which, being vector quantities, do not lend themselves to such representation. Observations are generally grouped in 5° squares. Monthly mean, maximum and minimum sea and air temperatures and range between maximum and mean are plotted as well as isotherms of the mean monthly differences between sea and air temperatures. Cloud data are represented by four charts for each month. Other weather factors represented include fog, mist, haze, lightning, and precipitation. Wind roses constructed for each 5° square. "Swell" roses showing direction and intensity, typical monthly cyclonic storm tracks and correction and conversion tables are also included.

89. **Te W***

Great Britain, Meteorological Office, Monthly Meteorological Charts of the Eastern Pacific Ocean, Meteorological Office, No. 518, Marine Branch, 1950, 122 p., 320 charts.

The Atlas contains charts of area 60°N to 60°S, 160°W to the coast of America. It includes for each month, charts of resultant winds or vector means, barometric pressure and resultant winds, frequency of winds of gale force (Beaufort 7 or higher), predominant direction, constancy and force of surface winds, wind roses for each 5° square, frequency, amount and direction of swell (swell roses), percentage frequency of fog, fog mist and haze, snow, precipitation, lightning, mean cloud amount and percentage frequency of clear, fair and cloudy or overcast skies, mean maximum, minimum and range of air and sea temperature and difference air-sea, and typical tracks of tropical cyclones. The introduction includes tables of diurnal variation of barometric pressure in 10° zones, 20°N-20°S.

90. **Te***

Great Britain, Meteorological Office, Monthly Sea Surface Temperatures of the North Atlantic Ocean, M.O. Pub. No. 527, London, 1949, 12 p. (chiefly maps), 49 x 31 cm.

The Atlas contains monthly maps of the mean sea surface temperature for the North Atlantic Ocean.

91. **Cu***
Great Britain, Meteorological Office, Quarterly Current Charts - Pacific Ocean, Hydrographic Office, London, 1897, 5 leaves.
92. **Cu***
Great Britain, Meteorological Office, Quarterly Surface Current Charts of the Atlantic Ocean, Meteorological Committee, London 1945, 26 p.
93. **Cu***
Great Britain, Meteorological Office, Quarterly Surface Current Charts of the Eastern North Pacific Ocean Eastward of Longitude 160°W, H.M.S.O., London, 1945, 14 p.
94. **Cu***
Great Britain, Meteorological Office, Quarterly Surface Current Charts of the Eastern North Pacific Ocean Eastward of Longitude 160°W, M.O. Pub. No. 655, Prepared in the Marine Div., London, 1959, 14 p., 43 x 55 cm, price: 15 sh.

...A large format atlas consisting of 12 seasonal current charts for the northeast Pacific from 0° to 60°N and from 80° to 160°W. The charts are compiled from data observed by British merchant and naval ships from 1855-1952 and computed by 2° lat. and 4° long. rectangles. However, the representation of data on the wind-rose, predominant current and vector mean current charts is by rectangles of varying size, depending on the nature of the currents. The 3 basic chart types (4 charts for each type) are: 1) surface current roses to 16 directions and 5 speed rates; 2) predominant current directions indicated and average speeds according to 3 visual categories but with actual speeds indicated and with rather extensive remarks on currents shown and 3) surface current vector mean charts for the 3 month period showing the general oceanic circulation over a long period. Notes regarding the preparation and use of these charts, effects of winds on currents at any given time, etc., are included.

95. **Ch***
Gusarova, A.N., V.A. Konnov and V.V. Sapazhnikov, Basic Distribution Patterns of Biogenic Elements in The Pacific Ocean, Akademiia nauk, Khimicheskie protsessy v moriakh i okeanakh (Chemical processes in seas and oceans), Moscow: Nauka, 1966, pp. 119-129, in Russian, 8 refs.
96. **B**
Hare, G.M., Atlas of the Major Atlantic Coast Fish and Invertebrate Resources in the Canada - United States Boundary Areas, Department of the Environment, Fisheries and Marine Service, St. Andrews, Canada, 1976, 123 p., 25 refs., 2 tables, 55 figures.

The Atlas provides information on the distributions, stock structures, species compositions, locations and landings of the major Atlantic coast fish and invertebrate resources in the Canada-United States boundary areas.

"The following species are considered - cod, haddock, redfish, pollock, silver hake, red and white hake, flounder, argentine, herring, mackerel, swordfish, bluefin tuna, squid, scallop, and lobster. Information on these species is provided in sections as follows: (1) distributions and stock structures; (2) species distributions and locations of fisheries; (3) landings; and (4) Canadian groundfish fisheries in ICNAF Div. 5Ze.

97. **Te Tu Cu S I W**

Herlinveaux, R.H. and B.R. DeLange Boom, The Physical Oceanography of the South-Eastern Beaufort Sea, Beaufort Sea Technical Report No. 18, Victoria, B.C., December 1975, (Reprinted February, 1978), viii + 97 p., 56 figs., 34 refs., \$1.50, 8½"x11".

In the Beaufort Sea meteorological and ice conditions play a major role in the distribution of oceanographic properties. Field studies were conducted during the summer of 1974 ("worst ice conditions on record") as well as during the spring and summer of 1975 ("good ice conditions"). The discharge from the Mackenzie River dominates the surface waters of the southern Beaufort Sea, especially during bad ice years. The density distribution is salinity dominated throughout the system. The vertical profiles of salinity, temperature, turbidity and currents are described for summer and spring conditions. In both space and time the distribution of water properties is better known than the currents, although a qualitative description of the surface currents can be given for conditions of westerly or easterly winds together with the resulting temperature and salinity distribution. During the spring, tidally induced movements of the water column were observed only at mid-depth off Kugmallit Bay, and these movements are not considered to be a major factor in the study area. The movement of Mackenzie River water in the Beaufort Sea is predictable to some degree and can be followed by satellite imagery.

98. **I***

Hunt, W.R. and C.M. Naske, "Baseline study of historic ice conditions in the Beaufort Sea, Chukchi Sea, and Bering Strait". Environmental Assessment of the Alaskan Continental Shelf. Vol. 1: Physical Science Studies. Principal Investigators' Final Project Reports, p.122-534, Outer Continental Shelf Environmental Assessment Program, Boulder, Colorado, March 1979.

99. **Te S D**

Huyer, Adriana and Andrew Verney, Temperature, Salinity and Sigma-t at Station 27 (47° 33' N, 52° 35' W); 1950-1959, Marine Environmental Data Service Technical report no. 3, Dept. of the Environment, Ottawa, 1975, x+45 pages, 3 refs., 8½"x11".

Temperature, salinity and sigma-t observations at Station 27 for the period 1950-1959 are presented graphically, relative to the time-depth plane, as well as individual functions of time at each depth. Their ten-year seasonal means are similarly displayed, and these could serve as base period values at Station 27.

100. **I P B Te S Ch D**

International Commission for the Northwest Atlantic Fisheries, Environmental Surveys - NORWESTLANT 1-3, 1963, Part II. Atlas, Special Publication No. 7., Headquarters of the Commission, Dartmouth, N.S., 1968, 286 pages. 8½"x11".

The NORWESTLANT Surveys took place during April-July 1963 and involved 11 ships on three cruises. In addition, other vessels provided relevant data. The area of coverage is bounded by latitudes 48°N and 68°N and longitudes 20°W and 60°W to the south.

The report includes a chart of bottom topography, charts of meteorology, ice, physical and chemical oceanography, plankton, eggs and larvae, and sightings of marine mammals.

The parameters covered in the oceanography charts and sections include dynamic topography, potential energy anomaly, GEK observations, temperature, salinity, silicates, phosphates, dissolved oxygen, and nitrates.

101. **Te S D I Cu W***

Isakov, I.S., V.V. Sjulekin and L.A. Demin, ed. Marine atlas. Vol. 2: Physic-geographical part. Morskoi Atlas. Vol 2: Fiziko-geografissheskii). Moscow: Glavnyi Shtab Voenno - Morskikh Sil, 1953, unpagged, 52 cm, 76 charts (colored).

Vol. 1 of the 3-volume Marine Atlas is devoted entirely to geographic and bathymetric charts of all the world's oceans, seas, bays and harbours. Vol. II contains most of the physical, geodetic, astronomical and environmental charts (expeditions, meteorology, climate, oceanography, ice); Vol. III is devoted to the political aspects of world geography; wars from the earliest time to the 20th century, etc. In Vol. II of this marine atlas there are several hundred separate but well-integrated climatic or oceanographic, not to mention geomagnetic, charts, maps, diagrams, etc., covering the physical conditions over the major and minor oceans and seas. Oceanographic charts include charts of oceanographic expeditions from 1800 to 1950, of temperature, salinity and density, cross sections of each separate ocean and strait, polar ice, currents, tides, and waves.

102. **W Cu**

Japan, Hydrographic Dept., Hoppo Kaimen Suiro Shiryo, (Hydrographic Data for the Northern Part of the North Pacific), Hydrographic Dept. Pub. No. 1, 1941, 40 p., 69 maps (fold), in Japanese.

A series of medium scale folded maps of the Okhotsk Sea and Bering Sea and Gulf of Alaska, with isopleths of data, storm tracks or other presentation of data on: cyclone trajectories (Chart 3); monthly cyclone frequencies (Charts 4-15); pressure and wind, cloudy days, days with fog, description of fog regimes (Charts 16-39); ocean currents (Charts 40-41); waves (Charts 42-45); relation between wave height, period, and wind length and height, and wind speed (Chart 47).

103. **W Cu Te S D**

Japan, National Department of Oceans, Atlas of the Oceans: North Pacific Ocean, December, 1975, 95 plates, 46x54 cm.

The Atlas shows bathymetry and sea bottom type of the North Pacific Ocean and gives monthly current and wave information.

The temperature (T), salinity (S) and density (D) parameters are represented for each of four seasons in the following manner:

- T, S and D vertical profiles
- T, S and D anomalies
- T and S at different depths to 200 m
- Sound velocity vertical profile and anomalies

There are a total of 95 colored charts (approx. 42x97 cm).

104. **Cu Te I T**

Johnson, Philip R. and Charles W. Hartman, Environmental Atlas of Alaska, Institute of Arctic Environmental Engineering, University of Alaska, College, Alaska, September, 1969, iii+111 pages, 39 refs., 31x25 cm.

This atlas gives an overall picture of many aspects of physical Alaska. In particular, maps are used to present information on summer and winter currents, summer and winter sea temperatures, sea ice distribution, and extreme tides of Alaskan coastal waters.

105. **Ch**

Johnston, Robert, The Trace Elements, Serial atlas of the marine environment, Folio 8, American Geographical Society, New York, 1965, 16p., 2 charts, 144 refs, 31x41 cm.

This atlas consists of 2 plates (28x37cm) showing the accepted representative values of the concentrations of 34 trace elements both worldwide and centered about Western Europe (Eastern North Atlantic, North Sea, Baltic Sea, Mediterranean Sea). It also includes a detailed listing of the most recent determinations for each element (to 1963).

106. **Te S**

Keeley, J.R., Mean Conditions of Potential Temperature and Salinity along the Flemish Cap Section, Marine Environmental Data Service, Technical Report no. 9, Dept. of Fisheries and Oceans, Ottawa.

This report contains analyses of all observations of potential temperature and salinity along the Flemish Cap section held by the Marine Environmental Data Service. Computations of mean conditions were made using some of the ideas of optimum interpolation. It was found that the variability in the observations were larger between the same months in different years than within the month. This resulted in a simplification of the procedure to calculate means. The values of potential temperature, salinity, and σ_t are presented for each month. A volumetric analysis of the potential temperature and salinity by month has also been performed and is presented.

107. Te S

Keeley, J.R., Temperature, Salinity and Sigma-t at Station 27 (47°33'N, 52°35'W) an Analysis of Historical Data, Marine Environmental Data Service Technical Report no. 8, Dept. of Fisheries and Oceans, Ottawa, 1981.

This report is an extension of a report of 10 years of data from Station 27. Here, 32 years of temperature and salinity data have been treated. Results show contours of temperature, salinity and sigma-t over depth and time for each year, and for the 32 year averages. The data set was filtered to show the interannual variation in the three parameters over the record length. Finally, anomalies of the three parameters were calculated and displayed at selected depths.

108. T

Kowalik, Z. and N. Untersteiner, "A study of the M2 tide in the Arctic Ocean." Deutsche Hydrographische Zeitschrift, v.315 no. 6, 1978, pp. 216-229, (illus. refs Some in Ger.; Russ.)

Numerical schemes for 1st and 2nd order approximation on a 75-km grid are used to calculate amplitudes and phases of the M2 tide in the Arctic Basin. Assuming that all tidal energy enters from the Atlantic Ocean across a line approximately Tromsø-Jan Mayen-Scoresby Sound, the computations yield a main amphidromic point off Prince Patrick Island at 81 deg 30' N, 133 deg W, confirming earlier assumptions. Several additional amphidromies apparently exist on the Eurasian Shelf. Frictional energy dissipation is assumed to be proportional to the square of horizontal velocity and the inverse square of water depth. Except for the region of Novaya Zemlya, observed and computed amplitudes and phases at points on the Eurasian and North American coast are in good agreement with observations. The results are shown on cotidal and corange maps, and a distribution of current ellipses. A distribution of the maximum horizontal velocity divergence due to the M2 tide is also shown. Significant divergences, which are likely to affect the compactness of sea ice, are limited to the Greenland Sea, and the shallow waters of the Eurasian Shelf. From the computed velocity field, the amount of energy dissipated by bottom friction in the Arctic Basin averaged over one tidal period is 5.1017 erg/sec. (MS)

109. Te D S

Krauss, W., Temperatur, Salzgehalt and Dichte an der Oberflache des Atlantischen Ozeans. Deutsche. Atlantische Expedition "METEOR" 1925-27, Wissenschaftliche Ergebnisse Dr. A. Defant, Band V/3., Verlag Walter de Gruyter & Co., Berlin, 1958, 410 pages incl. 41 plates.

This publication contains monthly charts of sea-surface temperature, surface salinity, and sigma-t density. The Atlas also includes two plates of density of observations, one of temperature variations, and two of temperature anomaly in May and in August.

The scale of the maps is 1:23,000,000 and they are based on all available data from the period 1868-1953. The data are tabulated.

110. S D

Kuhn, R., Atlas, Water Masses and Density Stratification, Vol. 1: Western North Atlantic, U.S. National Geographic Data Centre, General Series pub. G-9, Washington, D.C., 1967, 165 p. incl. 165 plates, 3 refs., 41x48 cm.

This automatically plotted atlas is intended to present the information in the portion of the water column between 300 m and 3,000 m, and to serve as a new kind of inventory of the 350,000 oceanographic stations currently held in the archives of NODC. The atlas area, divided into 2-degree rectangles in regions with complex water mass-density structures and into 5-degree rectangles in more uniform regions, is shown on a map of Marsden squares. The 163 plots are prefaced by one page of text describing the source data and the method of presentation (Klein's) in which the conventional temperature-salinity plot is replaced by a salinity-density plot. Simultaneously, density is plotted against depth. Explanations of symbols and entries are given on a sample sheet. A temperature overlay for use in obtaining rough approximation of the temperature for the salinity-density curves on the plots and a very generalized North Atlantic Ocean water mass diagram are included (in pocket).

111. Cu Te S D Ch

Lake, Robert A., An Oceanographic Study of Bridport Inlet, Melville Island, N.W.T., Institute of Ocean Sciences, Sidney, B.C., 8½"x11".

Part II, March 1979: v + 288 pages, 9 refs.

This portion contains 18 figures showing temperature, salinity, dissolved oxygen and waves among other parameters. The appendix contains 45 temperature, salinity and sigma-t profiles.

Part III, March to August 1979: v + 59 pages, 14 refs.

This portion contains 36 figures showing current, salinity, and temperature parameters in the form of frequency distributions, current roses, time series, and others.

112. I B P

Lancaster Sound and Regional Study Working Group, Department of Indian and Northern Development and James Dobbin Associates Ltd., Coastal and Ocean Planners, Preliminary Data Atlas, N.D.

This atlas of 83 maps, 24x46 cm, together with the accompanying map descriptions, summarizes most of the data that formed the information base for the draft green paper of 1980 intended to stimulate public discussion of the issues affecting Lancaster Sound. It uses data sources that were available to the Working Group up until March 1980.

The maps illustrate aspects of the physical environment of the Lancaster Sound region, vegetation, animal distributions, regional infrastructure, present resource use and potentials, proposals for the protection of sensitive ecological sites, and potential national parks.

113. B

L'Atlas National du Canada, 4e edition, MacMillan Company, Ottawa, 1974, pp.169-172, 27x38 cm.

The important characteristics of the Pacific and Atlantic fisheries are described with the use of figures and graphs.

The mean annual production of the major commercial species in the years 1959-1963 are represented on 6 colored plates (17x23 cm).

An english edition is also available.

114. Te

Laviolette, Paul E. and Sandra E. Seim, Monthly Charts of Mean, Minimum, and Maximum Sea Surface Temperature of the North Pacific Ocean, U.S. Naval Oceanographic Office, special publication SP-123, Washington D.C., 1969, iv + 58 p., 40 figs., \$1.50, 32x41 cm.

These charts, based primarily on ship injection temperature data, show the monthly mean, minimum, and maximum sea surface temperatures for the Pacific Ocean from 20°S. (except east of 170°W. where temperatures begin at 10°S.) to 66°N. The data are numerous in all but the equatorial portion of the area, and during the winter in the Bering Sea and Sea of Okhotsk.

The minimum and maximum sea surface charts, as well as variability graphs, show the range of temperatures possible in this ocean. Large temperature variations on the mean charts in places are masked by the 1° quadrangle averaging. This is most evident in large current systems such as the North Pacific gyre. For example, while the mean temperatures in the Philippine Sea may be warmer than 80°F., the maximum charts show that temperatures here sometimes exceed 90°F.

Upwelling along the coast of the continents is also evident from the charts. The cold waters indicative of such action are graphically displayed along the coasts of California and South America. Because of the large quantity of data involved, these charts, in general, are more definitive than charts of other parameters such as salinity, except where the analysis was based on fewer than 10 observations per 1° quadrangle or in regions where averaging disguises more complex thermal structure.

115. Te*

Laviolette, Paul E., "A preview of newly constructed sea surface temperature charts of the Pacific, Atlantic and Indian Oceans." Pacific Science Congress Proceedings, V. 1-4 p.268, 11th Congress. Held Aug.23-Sept.2, 1966, at Tokyo, Japan, 1968, abstract only.

116. P

Lebrasseur, R.J., Biomass Atlas of Net Zooplankton in the Northeastern Pacific Ocean, 1956-1964, Manuscript report series (oceanographic and limnological), No. 201, Fisheries Research Board, Ottawa, 14 p., 247 figs., 1 ref., 17x19 cm.

During the period 1956-1964, the collection of zooplankton samples in the northeast Pacific Ocean has been carried out during oceanographic and exploratory fishing surveys. Samples have been collected from vertical hauls and horizontal tows with a NORPAC net; other samples were collected with an Isaac-Kidd midwater trawl. In this report, the survey data for all vertical hauls from 1956 to 1964 have been brought together in Atlas form.

The immediate objective of this study has been to accumulate data on the extent of the standing crop of net zooplankton and further to examine changes in the standing crop of zooplankton in relation to accompanying oceanographic and fishing observations. The first part of the objective is met by this Atlas, which presents all data collected from standard net hauls in a common format. (247 charts, 17x19 cm).

117. P

Lindley, J.A., "Continuous Plankton Records: A plankton atlas of the North Atlantic and North Sea: Supplement 3--Tintinnida (Protozoa, Ciliophora) in 1965." Bulletins of Marine Ecology, v. 8 no.3, July 1975, pp. 201-213 and fol. plates (28-40), 29 refs.

"This paper describes the geographical distributions of 38 species or higher taxa of tintinnids found in the Continuous Plankton Records in 1965. The seasonal cycles of the more abundant species are described and analyzed."

118. I*

Lindsay, D.G., Patterns of Break-up, Freeze-up and Surface Roughness of Sea Ice in Selected Channels in the Canadian Arctic, Energy, Mines and Resources, Ottawa, Canada, 1977, iii+45 p., 5 tables, 35 figs., 8½"x11".

This brief description of the patterns of ice break-up, freeze-up and surface roughness for selected channels in the Canadian Arctic was prepared for the Polar Continental Shelf Project. It is not intended to be a definitive report. Its purpose is to generalize and indicate the typical trends. The Polar Continental Shelf Project has collected a large quantity of detailed information on sea ice conditions during consecutive seasons from 1961 through 1976 and this program is continuing. These records can provide the conscientious user with a great deal of information that, for simplicity, is not included in this summary.

The area considered for this study was selected because of the current interest in these channels. Similar information is available for all channels in the Canadian Arctic.

119. I

Lindsay, D.G., Sea-Ice Atlas of Arctic Canada, 1969-74, Polar Continental Shelf project report, SMP-1231E, Surveys and Mapping Branch; Energy Mines and Resources, Ottawa, Canada, 1977, 217 pages.

Aerial surveys of sea-ice in the Canadian Arctic Archipelago and adjacent waters have been made by the Polar Continental Shelf Project since 1961. During these years, at various intervals between March and November, successive sets of observations have been made of distributions of sea-ice types and features, progression of break-up, advance of ablation, patterns of movement and the sequence of freeze-up. These observations are presented on 104 col. maps (28x38 cm) accompanied by written descriptions and seasonal summaries.

A previous report published in 1976 entitled "Sea-Ice of Arctic Canada 1961-1968" precedes this volume.

120. I

Lindsay, D.G., Sea-Ice Atlas of Canada, 1961-68, Polar Continental Shelf Project, Department of Energy Mines and Resources, Ottawa, 1975, viii+213 p., 28x38 cm, (Available by mail from Information Canada, Ottawa K1A 0S9, Price: \$20.00).

"Aerial surveys of the sea ice in the Canadian Arctic Archipelago and adjacent waters have been made by the Polar Continental Shelf Project from 1961 to 1968. During these years successive observations have been made at various intervals between March and November of the distributions of sea-ice types and features, the progression of break-up, the advance of ablation, the patterns of movement and the sequence of freeze-up. These observations are presented on maps accompanied by written descriptions and seasonal summaries.

The atlas comprises 120 coloured maps (28x38 cm).

121. **Te Ch S**

Mann, C.R., A.B. Grant and T.R. Foote, Atlas of Oceanographic Sections - Temperature, Salinity and Dissolved Oxygen - Northwest Atlantic Ocean, Newfoundland Basin and Gulf Stream Feb. 1962 - July 1964, Bedford Institute of Oceanography Report B.I.O. 65-16, Dartmouth, N.S., November 1965, iv+51 p., 32x41 cm.

This publication contains sections of temperature, salinity and dissolved oxygen content, which were prepared from data collected on several cruises by the Bedford Institute of Oceanography between March 1962 and July 1964. There are accompanying written notes on the general layout of the sections and discussions of temperature, salinity, oxygen, and bottom profiles.

122. **Cu W B**

Marine Research Associates Ltd., Canadian Atlantic Offshore Fishery Atlas, Special Publication #47, Fisheries and Aquatic Sciences, Department of Fisheries and Oceans, St. Andrews, N.B., December 1980, iii+89 p., 28 refs., 26x36 cm.

"The Atlas comprises a series of maps showing the distribution of various Canadian Atlantic commercial fishery species and other important marine resources, together with written descriptions of life history and biology appropriate to an understanding of their environmental sensitivity. Additional information is presented in graphical and written form on the prevailing winds, surface currents, and wave climate of the North West Atlantic. (Revision in preparation).

123. **Cu Te S B**

Marine Research Associates Ltd., Sensitivity Maps for the Canadian Offshore Fishery, "Prepared by Marine Research Associates Ltd. Lord's Cove, Deer Island, N.B., from data supplied by staff of the department of Fisheries and Oceans, Canada." January, 1980, 15 refs., 25x35 cm.

Most of the charts in the atlas indicate the general distribution or heavy commercial fishing areas of 27 commercial species along with various other topics of interest (for example: seasonal distribution, migration routes). The atlas also includes charts of currents, temperature, salinity, and waves along with written descriptions of all the maps.

The area of coverage is bounded by latitudes 39°00'N and 62°00'N and longitudes 44°00'W and 68°00'W.

124. **I**

Markham, W.E., Ice Atlas, Canadian Arctic Waterway, Minister of Supply and Services Canada, Hull, Québec, 1981, 35 pages + 198 col. maps, 42 refs., 31x50 cm, \$120.00 in Canada.

The atlas contains ice charts of Eastern and Western Arctic waters, far Northern waters, and winter ice conditions (monthly November to April). The ice charts show the median

amount of all ice (weekly May 21 to October 29), median amounts of old ice (weekly), maximum and minimum reported conditions (weekly), and median amount of young ice present for the three regions mentioned.

There is also a collection of charts dealing with various seasonal characteristics (eg. average seasonal accumulation of melting degree days).

There are written discussions of ice regimes, break-up and freeze-up patterns, occurrence of old ice, general patterns of ice movements, icebergs and ice islands, and climatic changes.

125. I*

Markham, W.E., Ice Atlas: Eastern Canadian Seaboard, Minister of Supply and Services, Hull, Quebec, 1981, \$7.50 in Canada

Covers 20 years, black and white, 96 pages 8-1/2" x 11".

126. I

Markham, W.E., Ice Climatology of the Beaufort Sea, Beaufort Sea Project, Technical report no. 26, Institute of Ocean Sciences, Sydney, B.C., December 1975., 87 p, 7 refs., 8½"x11".

This report consists of four separate studies concerned mainly with ice climatology in the southern Beaufort Sea. The first, based on a study of twenty years of historical ice charts, describes the variation of ice concentration with the time of year for six regions with different ice regimes. The second describes the motion of individual ice floes relative to the wind. The third describes a reasonably accurate method for predicting the gross features of the northward retreat of the polar pack ice in the Beaufort Sea and the fourth is an examination of the size of ice floes within various ice concentration ranges near the edge of the polar pack.

The appendices contain details of ice beacon drifts and 22 weekly charts (17x23 cm) of median ice conditions.

127. B

Mauchline, John and Leonard R. Fisher, Distribution of the Euphasiid Crustacean *Meganyctiphanes Norvegica* (M. Sars), Serial atlas of the marine environment, Folio 13, American Geographical Society, New York, 1967, unpagged, 58 refs., 31x41 cm.

The Folio correlates the existing knowledge on the geographical range of *M. norvegica*, taking into account breeding area and periods, larval and adult distribution. The areas where surface swarming has been observed are also indicated. The distribution and relevant aspects of the biology of *M. norvegica* are discussed and relevant generalized conclusions are drawn. There are three (3) colored plates (35X61 cm).

128. **Te***

McDonald, Willard F., Atlas of Climatic Charts of the Oceans, Pub. no. 1247, U.S. Weather Bureau, Washington, D.C., 1938, 130 charts.

The presented charts are derived from approximately 5-1/2 million observations taken on ships at sea during a period of more than 50 years. Data from islands and continents were not introduced in order that the material may be truly representative of conditions on the open sea. The charts include winds, visibility, cloudiness, rainfall, thunderstorms and temperature for all oceans.

129. **Cu Te W I T**

McGuire, B.E., Environmental Atlas of Coastal Labrador, Environment Canada: Environmental Protection Service: Environmental Emergencies Branch, Atlantic Region, Hull, Québec, March, 1978, 12 maps + 36 overlays, 94 refs., 29x46 cm.

Biological, oceanographic, meteorological and socio-economic data for this atlas have been compiled from existing sources for the entire coast of Labrador.

The Labrador Coast has been subdivided into six sections:

- I - Blanc Sablon to Square Island
- II - Groswater Bay to Hawke Harbour
- III - Davis Inlet to Groswater Bay
- IV - Okak Islands to Davis Strait
- V - Nachvak Bay to Okak Islands
- VI - Cape Chidley to Nachvak

Each section of the atlas contains two base maps and six transparent overlays.

Wind and visibility data, by month, are presented in a series of 12 tables. The information is for one coastal community (Hopedale) and an offshore station, (OSV) Bravo. In addition, tables giving tidal ranges, drafts of major ports, and fish processing plants, has also been included.

The plastic overlays present information on the following parameters: topography, bathymetry, climate, currents, sea-surface temperature, waves, sea-ice, icebergs, and water-fowl.

130. **Cu Te S T B P**

McGuire, B.E., Environmental Atlas of Eastern Nova Scotia, Environment Canada: Environmental Protection Service: Environmental Emergencies Branch, Atlantic Region, Hull, Québec, March, 1980, 12 maps + 30 overlays, 167 refs., 29x46 cm.

Biological, oceanographic, meteorological and socio-economic data for this atlas have been compiled from literature and unpublished government sources for the coastal zone of Eastern Nova Scotia, including Sable Island.

Eastern Nova Scotia has been subdivided into six sections:

- I - Brier Island to Sable River
- II - Sable River to Halifax
- III - Halifax to Moser River
- IV - Liscomb Point to Chedabucto Bay
- V - Sable Island
- VI - Southeastern Cape Breton Island

Each section of the atlas contains two base maps, one depicting shoreline types and the other showing features such as access roads, lighthouses and bathymetric contours. Biological and physical environmental parameters are described by means of transparent acrylic overlays.

The appendix contains monthly wind and visibility data presented in a series of twelve tables. The overlays present information on the following parameters: topography, bathymetry, currents, tides, climate, winds, salinity, temperature, plankton, commercial fish species, waterfowl, shorebirds, seal herds, whales, dolphins, and porpoises.

131. **Cu Te T B**

McGuire, B.E., Environmental Atlas of the Bay of Fundy, Environment Canada: Environmental Protection Service: Environmental Emergencies Branch, Atlantic Region, Hull, Québec, March, 1977, 8 maps + 32 overlays, 67 refs., 30x46 cm.

Biological, oceanographic, meteorological and socio-economic data for this atlas have been compiled for the entire Bay.

The Bay has been subdivided into four segments:

- I - Eastern
- II - Central
- III - Northwestern
- IV - Southwestern

Each section of the atlas contains two basic maps and eight transparent acrylic overlays.

Wind data, by month, have been presented in a series of 12 tables. This represents a compilation of ship reports from the entire Bay over the period 1921 to 1971. In addition, tables listing the names and locations of federal fisheries, protection officers, fish processing plants and lobster pounds have been provided.

The overlays present information on the following parameters: topography, bathymetry, currents, sea-surface temperature, tides, waterfowl, seal herds, fish harvesting, and habitats.

132. **G***
 McGuire, B.E., Environmental Atlas of the Southern Gulf of St. Lawrence, Environment Canada: Environmental Protection Service: Marine Environment Branch, Atlantic Region, Hull, Québec, March, 1979, maps + appendix.
133. **W**
 McKay, W.N., Davis Strait Wave Climate Study Using the 1970 through 1977 Meteorological and Oceanographic Synoptic Significant Wave Charts, APOA Project 138 IPRT - IOME-78, Imperial Oil Ltd., Calgary, Alberta, March, 1978, vi+260 pages, 8½"x11".
- "This report deals with an investigation of the wave climates at sites 63°N, 59°W and 60°N, 60°W. Using wave data from the Meteorological and Oceanographic Centre at Halifax; from the Marine Environmental Data Service as well as the Sea Surface Marine Observations; percent exceedance, durations, and return intervals of significant wave heights have been determined for these two sites
134. **Te S***
 Moore, Carl T., Temperature and Salinity Values Below 2,000 Meters in the North Atlantic Ocean, Informal Manuscript Report No. O-51-65, U.S. Naval Oceanographic Office, Nov. 1965, 12 p., 2 tables, charts (fold.).
- A study of the relationship between temperature and salinity in 4 major water masses is presented for 11 deepwater basins in the North Atlantic Ocean. The data used constitute 7,030 paired temperature and salinity observations distributed from 2,000 meters to the bottom at 500-meter intervals.
- Characteristics of North Polar Water, North Atlantic Deep Water, North Atlantic Bottom Water, South Atlantic Deep Water, and the influence of Subarctic Water and Mediterranean Water result in significant spatial differences in the temperature and salinity values.
135. **G***
 Muench, R.D., The Physical Oceanography of the Northern Baffin Bay Region, Arctic Institute of North America, Baffin Bay-North Water Project Sc. Report, No. 1, Calgary, 1971, 150 p.
136. **Te D S**
 Muromtsev, A.M., Atlas of Temperature, Salinity, and Density of Water in the Pacific Ocean, Akademiia Nauk SSSR, Moscow, 1963, 120 p., Ed. by Iu. V. Makerov, added title page in English. Table of contents and pref. in Russian and in English. Almost entirely tables.
- ...This Atlas, compiled by the State Oceanographic Institute (GOIN) of the Main Administration of the Hydrometeorological Service of the USSR contains profiles of vertical distribution of temperature, salinity, and density of water for the

eastern, central and western parts of the Pacific Ocean and maps of horizontal distribution of these elements for standard levels from 0 to 5000 m. The data of about 30,000 deep water stations used in compiling the Atlas include the copious materials collected by the IGY World Data Center B (Moscow) from many countries. The maps of temperatures for the surface of the ocean, and the bathymetric map of the Pacific, published in the Morskoi Atlas were used in the preparation of this atlas.

137. **Te S D Ch**

Muromtsev, A.M., "Atlas of vertical sections and charts of temperature, salinity and oxygen content." The Principal Hydrological Features of the Pacific Ocean, Published for the National Science Foundation, Washington, D.C., by the Israel Program for Scientific Translations, Jerusalem, 1963, pp. 297-417 incl. 177 figs.

The Atlas consists of two parts:

- 1) Vertical sections of temperature, salinity, density, and oxygen content,
- 2) Charts of temperature, salinity and density.

The horizontal scale of the sections and charts is 1:100,000,000.

To construct the sections and charts use was made of observations carried out in the Pacific in the years 1873-1954.

The vertical sections were plotted from the average values of temperature, salinity, density and oxygen content calculated for standard horizons of 10-degree squares. The maps of temperature, salinity and density are constructed for standard horizons from the surface to 5,000 m from the same observations as were averaged together for the construction of vertical sections.

The maps constructed for the horizons 0 to 500 m represent the distribution of the hydrological factors in the summer season of the Northern and Southern Hemispheres. Maps of the surface temperature are presented for the summer and winter seasons.

138. **Te S D Ch**

Muromtsev, A.M., The Principal Hydrological Features of the Pacific Ocean, National Science Foundation, Washington, 1963, 417 pp.incl. 177 fig.

This publication contains 110 sections of temperature, salinity, density, and dissolved oxygen throughout the Pacific Ocean. Charts of temperature, salinity, and density are presented for various depths up to 5000m.

The charts and sections are based on all available records of data from the period 1873-1954, based on 10 degree square averages. The scale of the maps is 1:100,000,000.

139. **Te D**

National Ocean Survey, Surface Water Temperature and Density; Atlantic Coast: North and South America, N.O.S. Publication 31-1, fourth edition, Rockville, Md., March, 1973, iii+109p., 18x25 cm (for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price: \$1.25)

The summaries of sea water temperatures and densities presented in this publication are based on observations made at locations along the Atlantic coast of North and South America and adjacent islands throughout the year 1971.

The data are presented mainly in the form of tables as well as a number of mean temperature and density curves for certain locations.

140. **Te I**

Netherlands, Meteorologisch Instituut, Arctic Atlas of Mean Air and Sea Surface Temperature and Sea Ice Conditions, Pub. No. 5/3, 1952.

141. **Cur***

Netherlands, Meteorologisch Instituut, Oceanographic and Meteorological Observations in the Atlantic Ocean, June to August 1870 - 1922, Dec.-Feb. 1870-1914, Sept.-Nov. 1870 - 1925, March to May 1856 - 1920.

Ocean current roses (16 points of the compass) for 5-degree squares in the Atlantic Ocean, 50 degrees N - 50 degrees S are presented. Vectors indicate frequency of direction and speed of the currents in nautical miles in 24 hours. Vectors are also shown (10-degree squares) of the general circulation of sea surface, direction frequency and speed in nautical miles in 24 hours. The atlas shows mean isotherms (degrees C) air and sea surface, tabular means for each 2 degrees with few exceptions and a map showing limits of drift ice.

142. **W**

Neu, H.J.A., Wave Climate of the North Atlantic - 1970, Bedford Institute of Oceanography, Report series BI-R-75-, Dartmouth, Nova Scotia, March, 1975, v + 57 pages, 32 refs., 8½"x11".

Based on the synoptic wave charts issued twice daily by the Meteorological and Oceanographic Weather Centre, Halifax, the wave climate of the North Atlantic was established for the year 1970. The criteria and concepts for developing such a climate are critically reviewed. Representative parameters and statistical terms are used to characterize the sea state.

The report contains figures of various wave characteristics including wave charts, directional wave statistics, extreme wave heights and wave periods, 100-year extreme wave heights, etc.

143. W

Neu, H.J.A., Wave Climate of the Canadian Atlantic Coast and Continental Shelf-1970, Atlantic Oceanographic Laboratory, Report 1971-10, Bedford Institute of Oceanography, Dartmouth, N.S., December, 1971, 28 p. + 144 figs., 8½"x11".

Based on the synoptic wave charts issued twice daily by the Maritime Forces Weather Centre, Halifax, the wave climate of the Canadian Atlantic Coast and Continental Shelf was established for the year 1970. The criteria and concepts for developing such a climate are critically reviewed.

This volume contains an unusual and concise form of presenting wave data, showing frequency and direction distribution by month and by 2-½ degree squares for the area (42-½ degrees N - 57-½ degrees N) (70 degrees W - 45 degrees W). The climatic data presented is based on only 1-year of observations from all shipping reports and the wave height analyses of the CFMETOC Centre, Halifax.

144. Cu Te Ch*

Newton, J.L. et al, Atlantic Water Circulation in the Canadian Basin, Technical report, TR-9, Washington (State) University, Seattle, Wash., Department of Oceanography. Dec. 1974, 16 p.

145. Te S D Ch B

Owen, R.W., Jr., Atlas of July Oceanographic Conditions in the Northeast Pacific Ocean, 1961-64, Special scientific Report - Fisheries No 549, U.S. Fish and Wildlife Service, Washington, D.C., January 1967, vi+85 p., 82 figs., 6 refs., 20x26 cm.

An atlas of July oceanographic conditions in 1961-64 is presented for the region bounded by the coast of Oregon-Washington and long. 132°W. The atlas consists of charts that show distributions of temperature, salinity, density, oxygen concentration, thickness of mixed layer, dynamic height, chlorophyll a concentration, and catch of albacore, Thunnus alalunga (Bonaterre), at the time of year when albacore first become available to the commercial fishery of the region. Some remarks on the albacore catch and the environment are included.

146. Te S

Patterson, V., Cartes Synoptiques Trimestrielles Donnant la Temperature et la Salinite de l'Eau de Surface de l'Ocean Atlantique Nord, Bureau Central du Conseil International pour l'exploration de la mer, 1930, 4 pp. + 7 plates.

The atlas contains 4 plates of mean surface temperature for Feb., May, Aug., and Nov. There are 2 additional plates of mean surface temperature for Nov. 1928 and 1929 and a final one for Feb. 1930. These last three are in color. The plates were compiled from all available data from the period 1895-1930. The contour interval was 1°C.

147. T

Patullo, June et. al., "The seasonal oscillation in sea level (recorded and steric fluctuations). Journal of Marine Research, vol. 14 (1955), pp. 88-156, 69p. + 3 plates, 45 refs.

Monthly departures of recorded and steric sea levels from their annual means were compiled on the basis of all available tide gauge records, bathythermograms, and Nansen bottle casts, on a global scale. The steric fluctuation is defined in terms of the seasonal fluctuation in specific volume. The results are given in the appendices and in three charts (36x63 cm), together with error estimates. In general, the departures are comfortably above the uncertainties introduced by year to year variations and by the effects of local topography.

Recorded and steric departures agree remarkably well in low and temperate latitudes (conditions are isostatic). In these regions the steric levels are associated largely with temperature fluctuations in the upper 100 m. In high latitudes conditions are indeterminate.

Pronounced semiannual fluctuations are found along the west coast of South Africa, in Indonesia, in corresponding regions of the Labrador and Oyashio currents, and in the Gulf of Mexico and adjoining Gulf Stream stations (but not in the Kuroshio!). Elsewhere the oscillations are largely annual in character, with low sea level in each hemisphere during its spring and with high level during the fall. Recorded amplitudes vary from a few centimeters in the tropics to a few decimeters at higher latitudes; they exceed one meter in the Bay of Bengal. Atmospheric pressure effects and long period astronomic tides account for only a small part of the recorded fluctuations.

148. Te

Pyle R., Sea Surface Temperature Regime in the Western North Atlantic 1953-1954, Serial atlas of the marine environment, Folio 1, American Geographical Society, New York, 1962, 4 p. plus 28 col. plates.

This folio consists of a set of plates with one or more maps showing the distribution of data, average surface temperature, difference in surface temperature, spring warming, autumn cooling, winter range of surface temperature, summer range of surface temperature, winter minimum surface temperature, summer maximum surface temperature, and annual range of surface temperature. Analyses of the data are provided in the text.

149. Te S Cu Ch D B P

Rakestraw, N.W. et al, Oceanic Observations of the Pacific 1955, the NORPAC Atlas, University of California Press & University of Tokyo Press, 1960, 9 pp. + 123 plates in color, 54x39 cm.

"Atlas of temperature, salinity, oxygen, phosphate, density, current measurements, geopotential anomaly and data of such of the biological materials as could be prepared for the entire area."

The Atlas contains charts of horizontal and vertical distributions of certain of the physical properties measured by the NORPAC cruises. In addition to biological data, it also includes charts of atmospheric pressure, surface temperature, and surface currents. The NORPAC expeditions included 1002 hydrographic stations surveyed by nineteen vessels representing fourteen institutions. They covered the Pacific Ocean north of 20 degrees north latitude. Most of the work was done in July, August, and September of 1955. The data from the hydrographic stations have been used to prepare maps of temperature, salinity, dissolved oxygen, inorganic phosphate-phosphorus and thermosteric anomaly at depths of 10, 50, 100, 200, 400, 600, and 1000 meters. The geopotential anomaly of the 0, 200, and 400--decibar surfaces relative to the 1000--decibar surface has been computed and mapped. The upper thousand meters of the fields of temperature, salinity, dissolved oxygen and inorganic phosphate-phosphorus, and the thermosteric anomaly are portrayed also on vertical sections along four parallels and five meridians. The maps and sections include representations of specific volume anomaly rather than of density. The field contoured is that of the pressure-independent part of the specific volume anomaly since this more nearly approximates the potential volume anomaly. Base maps, plotting sheets, common place names and charts are included. Tables of values of sigma-t corresponding to the values of thermosteric anomaly used on the maps and sections and a table explaining the nets and methods of hauling for the zooplankton and fish larvae for which data are included are provided.

150. I

Ramseier, R.O. et al., Distribution of the Ice Thickness in the Beaufort Sea, Beaufort Sea Technical Report No. 30, Department of the Environment, Victoria, B.C., 98 p. + 43 figs., 46 refs., Price: \$1.50.

Although it was not possible to measure sea ice thickness directly, monthly maps indicating the distribution of first-year and multiyear ice for the entire Beaufort Sea region were prepared from Nimbus 5 passive microwave imagery. Detailed investigation of the shear zone was performed using 13.4 GHz scatterometer and X-band SLR imagery for April 1975. A description of the various sensors employed and an outline of the development of a UHF radar for direct measurement of sea ice thickness are included.

151. Te, S*

Reed, Ronald K., Temperature Sections with Surface Salinity and Sigma-t Values for the Northeast Pacific Ocean, 1961 through 1965, Pacific Oceanographic Lab., Physical and Chemical Branch, Seattle, Wash., 1966.

Twenty-nine temperature sections drawn from bathythermograph observations by Coast and Geodetic Survey (C and GS) ships along selected tracks in the Northeast Pacific, 1961 through 1965, are presented. Surface salinity and sigma-t values are shown for 15 of the tracks.

152. **Te S Ch**

Reid, Joseph L. Jr., Intermediate Waters of the Pacific Ocean, Johns Hopkins Oceanographic Studies, No. 2, Johns Hopkins University Press, Baltimore, 1965, 85 pp. incl. 31 plates, most in color.

This publication includes sections of temperature, salinity, dissolved oxygen and phosphate anion concentration for the whole Pacific Ocean. Also included are sections and charts showing thermocline anomaly. The work also contains plates showing salinity, dissolved oxygen and phosphate.

The charts and sections are based on data from more than 30 ships, spanning the period 1875-1962 and involving 2000 stations.

153. **Te S Ch***

Reid, Joseph L., Jr., Oceanography of the Northeastern Pacific Ocean During the Last Ten Years, Marine Research Committee, California Cooperative Oceanic Fisheries Investigations Reports, Vol. 7, California, Jan. 1960, pp. 77-90, 18 figs., 4 refs.

Oceanographic data obtained during the past ten years in the northeastern Pacific Ocean are reviewed and recent deviations pointed out. Vertical profiles of temperature, salinity, and dissolved oxygen were drawn and variations indicated. By early 1957 a substantial warming of surface waters over the past eight years was noted. Salinity anomalies were also noted.

154. **Te S Ch**

Reid, Joseph L., Northwest Pacific Ocean Waters in Winter, Johns Hopkins University Press, Baltimore and London, 1973, 96 p. incl. 46 figs., 39 refs., 22x29 cm.

The Boreas expedition to the north western Pacific Ocean, Bering Sea, and Okhotsk Sea measured water characteristics in the upper 1500 m in the period from 27 January to 1 April 1976. In this publication the major purpose is to describe the winter conditions and to compare them with those observed in summer.

The Atlas contains charts and sections of temperature, salinity, thermocline anomaly, geopotential anomaly, dissolved oxygen, phosphates, silicates, and nitrates.

The area of coverage is bounded by latitudes 36°N and 63°N and longitudes 135°E and 153°W.

155. **Cu**

Reid, Joseph L., "On the geostrophic flow at the surface of the Pacific Ocean with respect to the 1000-decibar surface. Tellus, V. 13, No. 4 (1961), pp. 489-502 (incl. 1 plate), 26 refs., 18x25 cm, \$3.25.

"The geopotential anomaly at the surface of the Pacific Ocean with respect to the 1,000 - decibar surface is computed. The major gyres of the ocean are clearly shown and one new feature, a South Equatorial Countercurrent, is revealed in the Western Pacific".

Contains one chart of the anomaly of geopotential distance between the 0 and 1000-decibar surface in the Pacific Ocean in dynamic meters. The data used are listed in the appendix.

The data, reference surface, surface currents, and effect of wind stress are discussed.

156. **Te S D**

Reid, Joseph L., "Sea-surface temperature, salinity, and density of the Pacific Ocean in summer and in winter", Deep Sea Research, Supp. No. 16, 1969, pp. 215-224 incl. 6 fig., 13 refs.

New maps have been prepared from more recent data. They are made from averages of all available materials, but from selected expeditions: This may preserve some interesting patterns that disappear from averaged maps. The principal value over earlier maps is the extension to higher latitudes in the winter seasons, though this has been done by an indirect method near Antarctica.

157. **Te***

Riehl, Herbert, Sea Surface Temperatures of the North Atlantic, 1887-1936, University of Chicago, Dept. of Meteorology, Chicago, Jan. 1956, (Contract N6ori02036, Report on Research (unnumbered). 9 p., 11 figs., almost entirely charts.

Monthly charts of ocean temperatures over the N. Atlantic from Jan. 1888 to Dec. 1936 give data (for each 5° square) on the departure from "normal" to whole degrees Fahrenheit based on seasonally "smoothed" data. Long period, semiperiodic variations or trends are shown, and these trends vary with latitude and longitude. Some charts of annual anomaly are presented, showing anomaly centers that seem to be connected with general circulation anomalies and with changes in frequency and path of hurricanes as shown in a number of analytical charts.

158. **Te S Ch**

Robertson, D.G. et al, Oceanographic Atlas of Ocean Weather Station "Papa" 1956-1963, Fisheries Research Board Manuscript Report Series (Oceanographic and Limnological) No. 187, Jan. 26, 1965, Ottawa, 22 p. + 157 figs., 3 tables, 25 refs. + biblio. incl. 50 entries, 8½"x11".

This Atlas is presented as a supplement to the records of oceanographic data collected at Ocean Station "P" (lat. 50°N, long. 145°W) during the period Jan. 1, 1956 to Dec. 31, 1963. The sources of these data are listed in the references. The Atlas consists of the following: (1) a bibliography of publications in which oceanographic data from Ocean Station "P" have been used. This list was compiled from replies to a letter survey of oceanographic and related agencies; (2) tables and graphs of monthly mean values of sea-surface temperature, surface salinity and "potential layer depth" (depth of the seasonal thermocline) (Tully and Giovando, 1963); (3) graphs of surface, 100-m and 122-m temperatures obtained from bathythermograms; (4) vertical sections of temperature, salinity, dissolved oxygen, inorganic phosphate, nitrite and silicate obtained from analyses of serial samples, obtained from hydrographic casts.

159. Te

Robinson, M.K. and R.A. Bauer, Atlas of Monthly Mean Sea Surface and Subsurface Temperature and Depth of the Top of the Thermocline - North Pacific Ocean, Fleet Numerical Weather Central, Monterey, Calif., May, 1971, 24 pp., plus 72 fig., Atlas available in a computer form.

This atlas comprises monthly sea surface temperature charts of the North Pacific Ocean to the equator, along with temperature charts at depths of 100 ft, 200 ft, 300 ft and 400 ft for each month. The contour interval is 2° F. The book also includes maps of mean thermocline depth for each month.

The maps in this atlas were based on 190,304 observations made by ships from: Canada, Columbia, Ecuador, France, Japan, Mexico, Peru, Thailand and the United States, in the period 1854-1966. Data of the U.S. and Coast Guard ships, 1941-1969, Scientific Institutions, 1929-1969, NODC hydrocast files and Eastropac STD were used.

160. Te S*

Robinson, M.K., North Pacific Atlas of Surface Layer Monthly Mean Temperatures and Annual Salinities, Italy, Rome, FAO, 1976.

161. Te*

Robinson, M.K., "Sea temperature in the Gulf of Alaska and in the Northeast Pacific Ocean, 1941-1952." California. University Scripps Institution of Oceanography, Bulletin, v. 7, no.1(1957), pp. 1-98, 61 figs., 17 tables, bibliog. pp. 94-98.

The results of the analysis of 16,103 individual bathythermograph temperature observations and 129 serial reversing thermometer observations in the Gulf of Alaska and Northeast Pacific Ocean are presented in between the surface and 400 ft. In addition there are charts of average annual temperature cycles, average vertical temperature sections,

typical individual bathythermograph temperature curves, and typical T-S curves in the area. The major features in the temperature distribution are discussed. A statistical analysis of temperature variation at three locations within the area is presented.

162. P
Roskell, J., "Continuous plankton records: A plankton atlas of the North Atlantic and the North Sea. Supplement 2--The oceanic cirripede larvae, 1955-1972." Bulletins of Marine Ecology, v. 8, No. 3, July, 1975, pp. 185-199 + fol. plates (21-27), 42 refs.

"Adult lepadomorphs, commonly known as "goose barnacles", live attached to floating debris and algae, primarily in the warmer waters, and are carried into the northern parts of the Atlantic by water movements. This paper presents an analysis of the occurrence and biogeography of their larvae."

Materials and methods are discussed. The results are presented and subsequently discussed and summarized.

163. Cu D S*
Savy, Density, Salinity and Currents of the Atlantic Ocean, Annales Hydrographiques, Series I, Vol. 31, 1868, Paris, pp. 620-691, maps (fold.), charts (fold.), tables.

164. Te D S Ch
Sayles, Myron A., Knut Aagaard and L.K. Coachman, Oceanographic Atlas of the Bering Sea Basin, University of Washington Press, Seattle, 1979, xi + 158 p., bibliography: 29 entries, 24x29 cm.

Particular attention is paid to the seasonal changes in temperature, salinity, and density, from summer, through fall, to winter.

The diagrams are used to present a volumetric census of the water masses for each of the three seasons and describe the seasonal water mass characteristics. Summer and fall horizontal distributions of temperature, salinity and oxygen are presented on charts. Finally, selected vertical sections of temperature, salinity, and density are presented. The accompanying text describes these features.

The area of coverage is bounded by latitudes 40°N and 55°N and longitudes 152°W and 156°E.

165. G*
Schott, Gerhard, Geographie des Atlantischen Ozeans, Hamburg, 1926, XII, 330 p. front illus., XXVII charts (part fold) 28 cm.

The 1912 and 1926 editions are somewhat similar.

The atlas contains maps of the Atlantic Ocean depths in metres in the Azores region, and between English Channel and New York, as well as North Polar regions and northern European seas; water colour in percent of yellow (Forel scale); salt content at surface 0/00; mean sea surface temperature (°C) February, May, August, November, and annual; density of surface sea water; mean annual variation of sea surface temperatures (°C), temperature anomalies sea surface, temperature (°C) at 100, 200, 400, 1,000 metre depths, surface current flow in 24 hours (knots), stability (percent) and limits of ice for the Northern winter; warm and cold currents; air temperature (°C) February, May, August, November and annual, mean annual variation, temperature anomalies, difference between mean air and sea without gravity correction and wind arrows, direction and force for February and August; mean annual cloudiness 0 - 10; monthly and annual isopleths also cover South America, Western Europe, Africa and Eastern United States, and boundaries of regions with snowfall. Also maps of geological formation on ocean bottom, whaling grounds, etc. are provided.

166. Te

Schroeder, Elizabeth H., "Average monthly temperatures in the North Atlantic Ocean." [Woods Hole (Mass.) Oceanographic Institution, Ref. No. 65-45, Aug. 1965.] Reprint from Deep-Sea Research, Oxford, v. 12, (1965) pp. 323-343, 14 figs. (profiles), table, 12 refs.

A series of average monthly profiles showing the vertical temperature distribution between the surface and 300 m along 8 meridians in the North Atlantic, north of lat. 20°N, are presented and the major features are identified and described. On the assumption that pronounced horizontal temperature gradients are indicative of ocean currents, the circulation patterns are discussed.

167. Te

Schroeder, Elizabeth H., "Average surface temperatures of the Western North Atlantic." Bulletin of Marine Science, v. 16, no. 2, June 1966, pp. 302-323, 17 figs., 24 refs.

This paper presents 12 charts showing the average monthly surface temperatures of the Western North Atlantic. Also included are four charts showing seasonal averages and one chart which shows the average yearly range of temperature. The basic circulation pattern and the temperature regime are discussed on the basis of the surface temperature distribution. Some comparisons are made with average surface temperature charts previously published.

The area of coverage is bounded by latitudes 24°N and 45°N and longitudes 66°W and 82°W.

168. Te Cu

Schroeder, Elizabeth H., North Atlantic Temperatures at a Depth of 200 metres, Serial atlas of the marine environment, Folio 2. American Geographical Society, New York, 1963, 2 p. plus 9 col. plates, 5 refs., 31x41 cm.

This folio presents temperature conditions at a depth of 200 m in the North Atlantic. Charts showing the average temperature, the range of observed temperature, deviations from the mean, and seasonal distribution of data are included. These charts are compared with other 200 m temperature charts.

Shown in tabular form are the average, maximum and minimum temperatures, number of observations included in the average, and the seasons represented for each unit area. This series of charts illustrates that major currents are represented in the temperature distributions. On the average temperature charts, the currents coincide with the pronounced horizontal gradients. They are shown in a separate plate by zones of maximum range, and in another plate by the continuity of more than 2-degree positive anomalies. On comparison, it is seen that over most of the North Atlantic, temperature conditions are remarkably stable.

169. **Cu***
Schumacher, Arnold, "Monthly charts of surface currents in the North Atlantic Ocean (5°S to 50°N)." Annalen der Hydrographie und Maritimen Meteorologie, v. 68, No. 4(1940) pp. 109-123, 2 figs., 5 tables, foot- refs. German summary p. 109 (Berlin).

170. **T***
Schwiderski, E.W., Global Ocean Tides. Part II: The Semidiurnal Principal Lunar Tide (M2), Atlas of Tidal Charts and Maps. Naval Surface Weapons Centre, Dahlgren, Va., 1979, 90 p.

171. **P**
Scotland, Oceanographic Laboratory, 1973, "Continuous Plankton Records: A plankton Atlas of the North Atlantic and the North Sea.", Bulletins of Marine Ecology, vol. 7, The Institute for Marine Environmental Research, Plymouth, 1973, pp. 174 incl. 280 charts, 46 refs., 8½"x11".

The objective of this project has been to perform a coherent series of investigations of the distribution, abundance, and composition of the plankton of the North Atlantic and the North Sea.

This Atlas presents the distribution of 255 species or groups of organisms averaged from monthly sampling during the period of 1958 to 1968. Each species is represented on a separate chart (14x8 cm). The area of coverage is bounded by latitudes 41°N and 67°N and longitudes 11°E and 71°W.

The accompanying text discusses sampling and analysis methods and distribution of the plankton.

172. **Te I**
Scripps Oceanographic Institute, World Atlas of Sea Surface Temperatures, 2nd edition, U.S. Hydrographic Office, H.O. Pub. No. 225, Washington, D.C., 1948, 1 pp. + 48 col. plates,

41 refs., 42x55 cm. This atlas was prepared by the Scripps Institution of Oceanography, La Jolla, Calif., from all sea surface temperature information collected by the U.S. Hydrographic Office, together with all available data from other sources, 1856-1942, with special reference to regions of few observations.

The atlas contains monthly charts of sea surface temperature for the Atlantic, Eastern Pacific, Western Pacific and Indian Oceans.

Isotherms are shown for intervals of 5°F. except that in regions of small horizontal temperature gradients 2.5°F. isotherms have been entered. Information on ice limits is presented for the Atlantic Ocean.

173. **Te S Ch P D**

Sekerak, Aaron D. et. al., Biological Oceanographic Studies in Lancaster Sound, 1976, Norlands Petroleum Ltd., Calgary, Alberta, December, 1976, x+ 169 p. + 70 page appendix, 89 refs., 65 figs., 55 tables, 8½"x11".

"The present report records data concerning the marine ecology of Lancaster Sound N.W.T. The purpose of the study was to provide a broad base of information on the distribution and abundance of phytoplankton and zooplankton throughout the summer, as well as to measure some of the physical characteristics of the system that could influence marine organisms. On this basis, sampling was performed at six locations at approximately 10-13 day intervals between 22 July and 13 September 1976."

The present study is divided into major sections dealing with physical properties, phytoplankton and zooplankton. The discussion section provides a summary of general findings.

Parameters discussed include particulate hydrocarbons, temperature, salinity, dissolved oxygen, plankton and density. The area of coverage is bounded by latitudes 73°N and 77°N and longitudes 78°W and 91°W.

174. **Te**

Shishkov, Yu A., "Temperature anomalies in the North Pacific Ocean." Okeanologia, Moscow, V.6. no. 3, 1966, pp. 416-429, figs., tables, 17 refs., Transl. into English in corresponding issue of Oceanology, Wash., D.C.

The years characterized by the maximum water temperature anomalies are indicated and the distribution of anomalies in the surface layer of the Northern Pacific is shown. Charts are given of temperature anomalies in Aug. for the most anomalous years.

175. **Cu Te**

Simpson, Wendy, Gulf of St. Lawrence Water Uses and Related Activities, Geographical paper No. 53, Lands Directorate, Environment Canada, Ottawa, Canada, 1973, 22p., col. maps, 78 refs, 36 x 51 cm, Price \$3.75.

The maps illustrate only some of the many physical, climatic and social factors which influence the supply, demand and the use of the fresh and salt water within the designated study area. The texts which accompany the 14 maps present additional information including trends in resource utilization, which place the data in perspective and provide certain clues to possible future conditions.

176. **I**

Sobczak, L.W., "Ice movements in the Beaufort Sea 1973-1975: determination by ERTS imagery"., Journal of Geophysical Research, v. 82, no. 9, Mar. 20, 1977, pp 1413-1418, 7 refs.

Remote Sensing (ERTS) imagery has been used to map the distribution of leads in the sea ice over the Beaufort Sea during late February through early April in 1973, 1974 and 1975. A comparison of the bearings and speeds of ice movements obtained from ERTS-based maps with those of geostrophic winds calculated from average daily and weekly atmospheric pressure charts indicates that the ice drifts at about 1/100 of the speed of the geostrophic winds in a direction about 20° to the left of them. During early March 1973, before excessive ice break-up, the sea ice moved slowly, about 0.3 km/d, but during periods of rapid ice fracturing (March and April 1975) the sea ice moved at rates as high as 18.2 km/d.

Contains charts depicting the pattern of sea-ice leads. The area of coverage is bounded by latitudes 68°N and 75°N and longitudes 120°W and 141°W.

177. **Cu***

Somerville, Boyle T., Ocean Passages for the World. Winds and Currents, H.M. Stationery Office, London, 1923, 585 p., tables, fold. maps.

Includes sections on the winds, currents and steamship routes of the Atlantic (p. 22-186), Indian (p. 187-233) and Pacific (p. 234-424) Oceans. Large folding map entitled "Atlantic, Indian and Pacific Oceans, diagrams of oceanic winds" in cover pocket shows average wind direction for Jan.-March, April-June, July-Sept. and Oct.-Dec. for all the oceans.

178. **D**

Soule, Floyd M. The Normal Dynamic Topography of the Labrador Current and its Environs in the Vicinity of the Grand Banks of Newfoundland During the Iceberg Season, reference No. 64-36, Woods Hole Oceanographic Institution, Woods Hole, Massachusetts, 9 pages, 12 figs., 8½"x11".

The report contains figures of monthly normal dynamic topography of the sea surface relative to the 1000 decibar surface with contour interval 2 dynamic centimeters for April, May, June, and July. Also included are charts of "field of standard deviations of dynamic height" and "numerical digest of data" for each of the months mentioned above.

179. B

South, Robin G. and Robert G. Hooper, "A catalogue and atlas of the benthic marine algae of the Island of Newfoundland", Memorial University of Newfoundland Occasional Papers in Biology, Number 3, August 1980, 136 pages, 417 refs., 21x28 cm.

180. Te S B

Squires, Hubert J., Distribution of Decapod Crustacea in the North-West Atlantic, Serial atlas of the marine environment, Folio 12, American Geographical Society, New York, 1966, unpagged, 42 refs., 31x41, \$3.50.

Data is presented on the distribution in the north-west Atlantic of 51 species of decapod crustaceans, most of which commonly occur in the Newfoundland-Labrador area. Most of the present specimen records were obtained in the years 1946-1960.

The major features of temperature and salinity of bottom water in the area from Newfoundland to Baffin Bay during August are illustrated. Depth and temperature ranges of some of the common decapod species are shown. The distribution of each species is discussed. There are 4 plates (36x62 cm).

181. I Cu

Swithinbank, Charles, Ice Atlas of Arctic Canada, Prepared at the Scott Polar Research Institute, Cambridge, England, under Defence Research Board Contract No. C69-800101, Maps drawn and reproduced by the Surveys and Mapping Branch, Ottawa, 1960, 67 p., approx. 240 refs., 51x86 cm.

A compilation from 324 stations, commonly 5 to 10 yrs. observations. Includes maps of mean current, mean extent of fast ice, and ice frequency charts, up to 1957.

182. I

Trofimenkoff, P.N., Some Iceberg Statistics for the Davis Strait, APOA project 138, Report IPRT - 22ME-78, Imperial Oil Limited, Production Research Division, Calgary, Alberta, March, 1978, iii+43 pages, 5 refs., 3 tables, 6 figs., 8½"x11".

The results of a study of iceberg sizes and distributions in Davis Strait between 60°N and 67°N latitude are presented in this report. The study is based on data obtained by the International Ice Patrol on northern aerial reconnaissance flights from 1963 to 1976, inclusive. The data used in this work is a compilation of International Ice Patrol data obtained on magnetic tape from the Centre for Cold Oceans Resources Engineering (C-CORE), Memorial University of Newfoundland, St. John's, Newfoundland.

Studies of the size, distribution and drift of icebergs along the Canadian East Coast have been made by a number of authors. In this report, the area of study is restricted to the Davis Strait area. The 1963 to 1976 data represents a larger data base. In addition, iceberg sizes are included in many of the reported sightings so that an analysis by size has been possible.

183. I

U.S. Army Air Forces, Summary of the State of the Ice in Arctic Seas During the Years 1935-1938, Publications of the Weather Research Center, Directorate of Weather, v.5, No. 2, Washington, 1942.

Maps of Arctic seas, April-August, 1935-1938, show unbroken polar ice, land floes, great ice fields, tight ice, open ice, icebergs, and "state of ice unknown" along with textual comments. The introduction states in part "The information contained herein may be considered as being of highest authority, and reports for the years 1935-1938 inc., when considered collectively, give a clear picture of the probability of ice conditions in the Arctic seas.

184. Te*

U.S. Bureau of Commercial Fisheries, Monthly Mean Charts, Sea Surface Temperature, North Pacific Ocean 1949-1962, Washington, 1968, unpagged.

185. I

U.S. Central Intelligence Agency, Polar regions - Atlas, U.S. Government Printing Office, Washington, D.C., May, 1978, reprint 1979, 66 pages, 25x37 cm.

Contains colored charts depicting historical, climatic, physical, economic and scientific features of the Arctic and Antarctic regions.

The Atlas contains, in particular, ice maps showing the extent of sea-ice coverage and variations in sea-ice concentration. The sources of information used most extensively include the American Geographical Society and the Arctic Institute of North America.

186. G*

U.S. Dept. of Commerce, Alaska Continental Shelf Environmental Assessment program: Final Report and Atlas, U.S. Dept. of Commerce, Research Unit 347, Washington, D.C., 3 vols.

Available from: Superintendent of Documents, AEIDC, 707 A Street, Anchorage, Alaska 99501. Volume II is of particular interest: Physical oceanography and meteorology.

187. Te*

U.S. Fish and Wildlife Service, Monthly Mean Charts: Sea Surface Temperature, North Pacific Ocean, U.S. Fish and Wildlife Service Circular 134, April 1962, v p. + 36 charts (in color), 40 x 56 cm.

...This is the first in a series of monthly sea surface temperature chart atlases intended to cover the period 1950-59, inc. which has been adapted for international use in studies of the oceanography and fisheries of the eastern tropical and northeast Pacific Ocean. 1956 and 1957 were chosen because in 1957 anomalous warming began along the eastern north Pacific Ocean. Earlier and later years will be covered in subsequent volumes. The data used are marine weather observations in Punched Card Deck 116 entitled U.S. Merchant Marine and Other Ship Observations, 1949--at the National Weather Records Center at Asheville, N.C. Each monthly chart contains both edited data for 2° squares of lat. and long. from 20°S to 60°N for the entire Pacific Ocean except for the bordering seas, and smoothed isotherms for each 1°C. In addition the sea surface temperature change between 1956 and 1957 is shown in separate charts for each month of 1957. Changes of more than 1°C are considered real and are shown by red hatching for warming areas and blue for cooling areas. Warming of as much as 5°C in places occurred, east of 170°W (Jan. and Aug.) and cooling of as much as -7°C (Aug.) to the west of 170°W. On the monthly charts the number of individual observations in the 2° square as well as the monthly mean temperature in degrees and tenths are given.

188. **Te I**

U.S. Hydrographic Office, Arctic Atlas of Mean Air and Sea Surface Temperatures and Sea Ice Conditions, Washington, D.C., 1952, 36 p., col. charts, 55x72 cm.

Contains maps of the Canadian Arctic, European Arctic and Siberian Arctic. The area of coverage of the Canadian Arctic is bounded by latitudes 55°N and 80°N and longitudes 25°W and 120°W.

The Atlas contains charts of sea water temperature (°F) max., min., min. mean, in 1° quadrangles with air temperature (°F) isotherms over land and sea areas. Included are limits of light and sea and landfast ice, and limits of heavy sea and landfast ice, also isolated areas of scattered occurrence of both large and small detached floes and fields of pack ice are shown.

189. **Te Cu**

U.S. Hydrographic Office, Atlas of Pilot Charts of the Atlantic Ocean, H.O. Pub. No. 576, Washington, D.C., Jan. 1, 1950, all charts.

This is a bound volume of monthly charts showing pressure, air and sea temperature, fog, storms, currents, magnetic variation, air and steamer routes and gales.

190. **Te Cu**

U.S. Hydrographic Office, Atlas of Pilot Charts of the Pacific and Indian Oceans, H.O. Pub. No. 577, Washington, D.C., Jan. 1, 1950, all charts.

This is a bound volume of monthly charts showing pressure, air and sea temperature, fog, storms, currents, magnetic variation, air and steamer routes and gales.

191. **Cu**
U.S. Hydrographic Office, Atlas of Sea and Swell Charts, N. Eastern Pacific Ocean, H.O. Pub. No. 779D, 1950.

192. **Cu**
U.S. Hydrographic Office, Atlas of Surface Currents, N.E. Pacific Ocean, 1947.

Monthly Charts.

193. **Cu**
U.S. Hydrographic Office, Atlas of Surface Currents, North Atlantic Ocean, 1st ed., reprinted, H.O. Pub. No. 571, Washington, 1947, 12 p. of charts, 66x83 cm.

194. **I**
U.S. Hydrographic Office, Ice Atlas of the Northern Hemisphere, H.O. Pub. No. 550, 1946, revised 1960, 106 p., charts, tables, 1700 refs., 36x64 cm.

Topics include annual numbers of icebergs and growlers between 1911-1940 and the number of years in the same period in which icebergs and growlers were reported and limits of ice for the years 1898-1938.

The Atlas contains monthly Northern Hemisphere charts of the distribution and character of ice, data tables, and charts of geographic regions.

195. **Te**
U.S. Hydrographic Office, Meteorological Charts of the North Pacific Ocean, Washington, D.C., 1878, unpagged, 111us., col charts, tables, 55x58 cm.

This atlas contains maps of the North Pacific (0°-45°N, American coast to 180°W). The charts for the above area (5° squares) show winds, calms, fog, rain, squalls, barometric pressure and temperature of the air, sea water, and evaporation for each month.

196. **Te***
U.S. Hydrographic Office, Monthly Surface Temperature Charts of the North Atlantic Ocean, H.O. Misc.Pub. 10555, (n.d.)(Washington).

197. **W Cu Te S D I T B**
U.S. Hydrographic Office, Oceanographic Atlas of the Polar Seas. Part 2: Arctic, H.O. Pub. No. 705, Washington, D.C., 1958, 140 pages, biblio.: 124 entries, 32x40 cm, \$5.00.

The Atlas contains charts of tides and currents, physical properties such as temperature, salinity, density, ice,

wind, seas and swell, marine geology and marine biology along with written descriptions. The distribution of oceanographic observations is also presented.

Charting has been done on a semimonthly, monthly, or annual basis. Temporal variations in most elements are shown by means of four seasonal charts. Reliability diagrams are included on many of the charts.

The publication of this atlas is aimed at summarizing the oceanographic knowledge of the Arctic available prior to the International Geophysical Year of 1957-1958.

198. **Te***

U.S. Hydrographic Office, Pilot Charts for the North Pacific. Monthly Means for October and November, 1894-1950, all charts.

... Monthly charts show North Pacific, 5°S-75°N, 115°E-80°W and include ice limits in Okhotsk and Bering Seas. Backs of charts contain extensive wind and temperature data and well illustrated articles on such subjects as sea fog, rescue work at sea, typhoons, etc.

199. **W***

U.S. Hydrographic office, Sea and Swell Charts N. Atlantic Ocean, 1943.

Wind and sea swell are shown on monthly charts.

200. **Te**

U.S. National Oceanographic Data Center, Inventory of Oceanographic Data for the Western North Atlantic Ocean and the Gulf of Mexico, U.S. Dept. of the Interior, Fish and Wildlife Service, Bureau of Commercial Fisheries, Washington, 1963, 39 maps, 41x53 cm.

This publication contains maps representing oceanographic station data, bathythermograph observations, and sea-surface temperature observations for the western North Atlantic Ocean and the Gulf of Mexico.

201. **D**

U.S. Naval Air Development Center, Sonar Processing Division, Velocity Profile Atlas of the North Atlantic, Report No. NADC-AE-6647, The Center, Johnsville, Pa, 1966, 2 vol., 41 cm.
Vol. 1: 40°N to 60°N
Vol. 2: 20°N to 40°N

202. **T Cu W I Te S D**

U.S. Naval Oceanographic Office, Oceanographic Atlas of the North Atlantic Ocean, H.O. Pub. No. 700, 6 sections, Washington, D.C., 1963-1968, 32x41 cm.

Section I - Tides and currents (1965);

Section II - Physical Properties (1967).

Horizontal charts, vertical traces and cross sections of temperature, salinity and density are presented either on a monthly, seasonal, or yearly basis. viii+300 pages, bibliography incl., 123 entries. Area of coverage: lat. 0° and 70°N, long. 40°E and 100°W.

Section III - Ice cover (1968)

Mainly charts of mean concentration of sea ice and frequency of occurrence of sea ice are presented. viii+157 pages, bibliography incl., 62 entries, area of coverage: lat. 30°N and 70°N, long. 5°W and 95°W.

Section IV - Sea and Swell (1963)

Mainly charts of surface wind roses, percent frequency of seas of various heights (indicated by isolines), swell roses, wave period-height and period-direction are presented ix+227 p. bibliography incl. 12 ent. various areas of coverage.

Section V - Sound Velocity (1967)

The sound velocity structure is analyzed on a seasonal basis in the form of vertical profiles. vii + 44 p. area of coverage: lat. 0° and 70°N, long. 40°E and 100°W.

203. I*

U.S. Navy Fleet Weather Facility, Eastern Arctic Sea Ice Analyses, 1972-1975, Suitland, Maryland, 1976, 212 p.

The principal aim of this publication is to provide operators and researchers with historical weekly hemispheric analyses of sea ice conditions derived principally from satellite imagery supplemented by conventional observations. The charts are constructed by Navy ice analysts under operational time constraints from satellite imagery and conventional data. Reanalysis with late data was not normally attempted; rather the current analysis was prepared incorporating this to the extent possible. The analysis was compared with available climatology in an attempt to eliminate gross errors.

204. I*

U.S. Navy Fleet Weather Facility, Western Arctic Sea Ice Analyses, 1972-1975, Suitland, Maryland, 1976. 212 p. See also Eastern Arctic.

205. T Cu W I Te D

U.S. Weather Bureau and U.S. Hydrographic Office, Climatological and Oceanographic Atlas for Mariners; Volume I: North Atlantic Ocean, U.S. Government Printing Office, Washington, D.C., Aug., 1959, 7 p. + 182 col. charts, 55 refs., 39x26 cm, Price: \$2.25.

As in the U.S. Navy Marine Climatic Atlas of the World, the data presented here involved several million ship observations, supplemented by records at selected coastal

stations, and reduced to several series of monthly or seasonal isopleths, bargraphs, etc., representing the long-period distribution of the elements observed. Extensive use has been made of recent Weather Bureau publications and from publications and special data files of the Hydrographic Office.

The climatological charts include data on air-sea temperature differences, sea-level pressure, storm tracks etc. The 68 oceanographic charts present data on cotidal lines and tides, surface currents, tidal currents, waves, ice concentration and extremes, icebergs, sea temperature, and density among others.

206. **T Cu I Te D**

U.S. Weather Bureau and U.S. Hydrographic Office, Climatological and Oceanographic Atlas for Mariners; Volume II: North Pacific Ocean, U.S. Government Printing Office, Washington, D.C., 1961, 6 p. + 159 col. charts, 56 refs., 39x26 cm, Price: \$4.00.

As in the U.S. Navy Marine Climatic Atlas of the World, the data presented here involved several million ship observations, supplemented by records at selected coastal stations, and reduced to several series of monthly or seasonal isopleths, bargraphs, etc., representing the long-period distribution of the elements observed. Extensive use has been made of recent Weather Bureau publications and from publications and special data files of the Hydrographic Office.

The climatological charts include data on air-sea temperature differences, sea-level pressure, storm-tracks, etc. The 45 oceanographic charts present data on cotidal lines and types of tides, surface currents, ice concentration and extremes, sea temperature and density among others.

207. **Ch Te Cu W T P B**

U.S.S.R. Navy: Ministry of Defence, World Ocean Atlas: Atlantic and Indian Oceans, Pergamon Press, Toronto, 1977, xiv+306 p. +27 p. index, 35x47 cm (in Russian) Price: 35 roubles.

The charts in the Atlas have been prepared from the scientific data assembled in the USSR from Soviet and foreign sources, collected throughout the entire history of ocean research, including the periods of the International Geophysical Year (1957-1958), the International Geophysical Cooperation Year (1959), and the International Year of the Quiet Sun (1964-1965).

The Atlas of the Atlantic and Indian Oceans is the second volume of the Atlas of the Oceans and contains seven sections: the History of the Exploration of the Oceans (Charts 2-12); The Ocean Floor (Charts 14-44); Climate (Charts 46-126); Hydrology (Charts 128-230); Hydrochemistry (Charts 232-242);

Biogeography (Charts 244-250);
Reference and Navigational-Geographical Charts (252-306).

Each section of the Atlas is preceded by text, in which there is a brief description of the methods used as a basis for constructing the charts in that section.

208. **Ch Te Cu W T P B**

U.S.S.R. Navy: Ministry of Defence, World Ocean Atlas: Pacific Ocean, Pergamon Press, Toronto, 1976, xiv + 302 p. + 20 p. Index, 34x47 cm, (in Russian).

"The charts appearing in the Atlas were prepared on the basis of assembling in the USSR scientific data from national and foreign sources, collected throughout the whole history of ocean research, including the periods of the International Geophysical Year (1957-1958). The International Geophysical Co-operation Year (1959) and the International Year of the Quiet Sun (1964-65).

The Atlas of the Pacific Ocean is the first volume of the Atlas of the Oceans and contains seven sections:

- The History of the Exploration of the Ocean (charts 2-12).
- The Ocean Bed (charts 14-44);
- Climate (charts 46-126);
- Hydrology (charts 128-230)
- Hydrochemistry (charts 232-242);
- Biogeography (charts 244-250);
- Reference and Navigational-Geographical (charts 252-302)

Each section of the Atlas is preceded by text.

Most of the charts of the Atlas are drawn on the equal-angle cylindrical projection of Mercator and the equal-area azimuth projection of Lambert.

209. **G***

United National Educational, Scientific and Cultural Organization, Oceanographic Atlas, Unesco, Paris, 1974-. (loose-leaf in binder.) (v. I: Physical oceanography (data taken during Equalant I and II). 1974)

210. **B**

Wacasey, J.W., Biological Productivity of the Southern Beaufort Sea: Zoobenthic Studies, Beaufort Sea Technical Report No. 12b, Department of the Environment, Victoria, B.C., December 1975, 39 p.+ 10 figs., 16 refs., Price: \$1.00.

Baseline data obtained from a sampling program carried out from 1971 through 1975, primarily during the open water season, demonstrate the existence of zonation of zoobenthos across the shelf of the southern Beaufort Sea. These zones, which can be characterized physically and biologically, are designated: (1) Estuarine Zone, (2) Transitional Zone, (3) Marine Zone, and (4) Continental Slope Zone.

The Estuarine Zone, which exhibits salinities under 20 ‰, is located in waters of depths up to 15 m along the shore from Herschel Island to Cape Dalhousie at the tip of the Tuktoyaktuk Peninsula. Diversity is less than 20 species per station and biomass averages 2g m⁻².

The Transitional Zone is located between the Estuarine Zone and the Marine Zone at water depths of 15-30 m, where salinities fluctuate between 20 and 30‰. Diversity is over 20 species per station and biomass averages 5g m⁻².

The Marine Zone is located in water depths from 30 to 200 m, where salinities range from 30 to 33‰ and water temperatures are negative. Diversity is over 20 species with a maximum of 81 species at stations in the eastern part. Biomass averages 34g m⁻² with maximum values of 71 g m⁻² at stations in the eastern part.

The Continental Slope Zone is located at depths of 200 to 900 m. Salinities range from 35 to 35‰ and water temperatures are slightly higher than in the Marine Zone. Diversity is over 20 species per station and biomass averages 4g m⁻².

211. Cu*

Wegemann, G., Surface Currents of the North Atlantic North of 40°N. Lat., Kiel, 1899.

212. Te

Weiler, J.D.M. and J.R. Keeley, Monthly Sea Surface Temperature for the Gulf of St. Lawrence, Marine Environmental Data Service, Technical report, no. 7, Dept. of Fisheries and Oceans, Ottawa, 1980.

This report presents the results of the analysis of about 35 years of sea surface temperature data measured by bathythermographs in the Gulf of St. Lawrence. The results are displayed as maps of monthly sea surface temperatures, and represent the average conditions to be found from the data. Optimum interpolation was used to analyze and contour the data. Use of this technique showed that yearly variations in the sea surface temperature are larger than measurement variations within a month. This fact allowed a considerable reduction in the necessary computations.

213. P

Williams R. and M.A. Wallace, "Continuous Plankton Records: A plankton atlas of the North Atlantic and North Sea: Supplement 1--The genus Clausocalanus (Crustacea: Copepoda, Calanoida) in 1965." Bulletins of Marine Ecology, v. 8 no.3 (July 1975) pp. 167-184 (incl. appendix) + fol. plates (xx), 33 refs.

"In a revision of the genus Clausocalanus Giesbrecht(1888) Frost and Fleminger (1968) described five new species and, together with the eight previously described, summarized their respective global distributions. It is the aim of this work to give additional information on the distribution of these species from the area sampled by the Continuous Plankton Recorder. The survey area in the North Atlantic is north of 40°N, a region from which Frost and Fleminger had few samples; indeed, they recorded only one species (Clausocalanus pergens) in this region, based on the work of Farran (1926) from the Bay of Biscay.

214. T S D Ch Cu W*

Williams, R.G., Frederic A. Goodshall and Eugene M. Rasmusson, Summarization and Interpretation of Historical Physical Oceanographic and Meteorological Information for the Mid-Atlantic Region : Final Report to the Bureau of Land Management U.S. Dept. of the Interior, National Oceanic and Atmospheric Administration, Environmental Data Service, Washington, D.C., 1977. (Reprint).

This report describes the results of an environmental study of the mid-Atlantic region of the Outer Continental Shelf performed under inter-agency agreement AA 550-IA6-12 between the Bureau of Land Management, U.S. Department of the Interior, and the Environmental Data Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce. The mid-Atlantic region as defined for this study is the area extending northward from 38°N to 41°N between the coast and the 2,000 m isobath.

The study consisted of three tasks:

To summarize historical meteorological and oceanographic data for the region.

To analyze the historical data summaries.

To draw conclusions from the analysis and to recommend design for future field programs to fill existing data gaps.

The meteorological data used were obtained primarily from the National Climatic Center, Asheville, North Carolina. They include National Weather Service coastal station records and standard shipboard marine surface observations, supplemented

by ocean weather station and meteorological buoy measurements. Most of the oceanographic data were obtained from the National Oceanographic Data Center, Washington, D.C., with complementary data sets provided by private institutions.

215. P

Williams, R.G., "Continuous Plankton Records: A plankton atlas of the North Atlantic and North Sea: Supplement 4--The Ostracoda in 1963." Bulletins of Marine Ecology, v. 8 no. 3, July, 1975, pp. 215-228, 8 figs., 22 refs.

"The geographical distributions and seasonal cycles of the Ostracoda are described from Continuous Plankton Recorder samples taken at a depth of 10 m in 1963. Thirteen species were found."

Materials and methods are discussed as well as geographical distributions and seasonal cycles. The results are summarized and are represented on charts and graphs.

216. Te I*

World atlas of sea surface temperatures, Second edition, U.S. Naval Oceanographic Office NSTL Station, Bay St. Louis, Miss. 1973, 200 p.

217. Te S Ch

Worthington, L.V. and W.R. Wright, North Atlantic Ocean Atlas of Temperature and Salinity in the Deep Water including Temperature, Salinity and Oxygen Profiles from the Erika Dan Cruise of 1962, Woods Hole Oceanographic Institution, Woods Hole, Mass., 1970, 24 p. + 58 col. plates, 15 refs., 32x44 cm.

This atlas is intended to complement Fuglister's "North Atlantic Ocean Atlas of Temperature and Salinity". This book consists mainly of horizontal charts of salinity at potential temperature surfaces between 1° and 4° for the North Atlantic Ocean, and accompanying charts of the depths of these surfaces. A volumetric temperature/salinity diagram along with all the station data for the cruise is also presented.

218. Cu

Worthington, L.V., On The North Atlantic Circulation, the Johns Hopkins oceanographic studies number 6, Johns Hopkins University Press, Baltimore and London, 1976, 110 p., 121 refs., 22x28 cm.

Meridional flows, to the nearest 1×10^6 m³/s, are described by box models for five layers in the North Atlantic: the deep water, the lower thermocline, the midthermocline, the upper thermocline, and the warm water layers. Anticyclonic circulation is described by circulation diagrams for each of the same five layers with flow lines to the nearest 5×10^6 m³/s. Both the box models and the circulation diagrams are wholly consistent with the water mass distribution in the North Atlantic.

219. **Te S***

Wright, W.R. and L.V. Worthington, The Water Masses of the North Atlantic Ocean: a Volumetric Census of Temperature and Salinity, Serial atlas of the marine environment, Folio 19, American Geographical Society, New York, 1970, 8p. plus 7 col.plates.

220. **Te S D**

Wust, George and A. Defant, Atlas zur Schichtung und Zirkulation des Atlantischen Ozeans, Deutsche Atlantische Expedition METEOR 1925-1927, BAND VI, Verlag Walter de Gruyter, Berlin and Leipzig, 1936, 103 plates, most is color.

The Atlas contains 15 cross-sections (60°N - 20°N) each of temperature, salinity and density. The book also has charts of these parameters at 15 different depths to 5000 m. Bottom topography is shown as well as 10 sections of temperature, salinity and density from 0 to 500 m. The data were obtained from 310 METEOR stations. The temperature measurements were made by reversing thermometers to an accuracy of $\pm 0.01^{\circ}\text{C}$ and salinity was measured to $\pm 0.020/00$ by titration. The scale of the plates is 1:50,000,000 (S. Atlantic maps) and 1:45,000,000 (whole Atlantic Ocean maps).

221. **Cu**

Wust, George, Quantitative Investigations on the Statics and Dynamics of the Atlantic Ocean (6th Installment), Current Velocities and the Magnitude of Currents in the Depths of the Atlantic Ocean. Deutsche Atlantische Expedition (METEOR), 1925-1927, Wissenschaftliche Ergebnisse, Vol. 6, Pt. 2, Walter de Gruyter, Berlin: 1957, p. 261-420, 6 figs., 37 plates, 50 refs, English summary pp. 416-418.

Several volumes of the scientific result of the "METEOR" expedition of 1925/27 have been issued between 1932 and 1939. This volume continues the analysis and presentation of the basic and derived data on: (1) the dynamics of the profiles and the deep sea current velocities, (2) the balance of net transport in the various layers on both sides of the Atlantic Central Ridge, and (3) the balance of salt transport in the two longitudinal troughs of the South Atlantic. Current velocities from 3 to 17 cm/sec are encountered along the west margin of the South Atlantic at deep levels with southerly components in the northern and northerly currents in the S. Antarctic portions. Velocities are higher than those estimated previously. The work contains extensive tables, charts, cross-sections, graphs, maps and a bibliography.

222. **Te***

Wust, George, The Stratosphere of the Atlantic Ocean: Scientific Results of the German Atlantic Expedition of the Research Vessel METEOR, 1925 - 1927, Vol. VI, Section I. English translation edited by William J. Emery. Office of the International Decade of Ocean Exploration & the National Science Foundation, Washington, D.C., 1978.

ADDENDA

Two additional atlases have been identified subsequent to the compilation of this bibliography. Neither of these has been reviewed.

Burns, B.M. (1973, 1974). The Climate of the Mackenzie Valley - Beaufort Sea. Atmospheric Environment Service, Climatological Studies No. 24, 2 Vol., Downsview, Ontario, 227, 239pp.

Maxwell, J.B. (1980). The Climate of the Canadian Islands and Adjacent Waters. Vol. 1, Atmospheric Environment Service, Climatological Studies No. 30, Downsview, Ontario, 531pp. (Vol. 2 in press).