F I S H E R I E S R E S E A R C H B O A R D

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Title

ABSTRACTS OF RESEARCHES

Author

John P. Tully

OCEANOGRAPHY

A. Methods and procedure.

1. A procedure for increasing the accuracy of surface current charts based on hydrodynamic observations.

The surface densities of the sea are observed at small intervals while proceeding between the stations of a hydrodynamic survey. The movement of the surface waters may then be calculated separately in detail and superimposed on the deep currents as observed, permitting the preparation of surface current charts on a much larger scale than is normally permissable.
Journ. Biol. Bd. Can. 3 (2) 1937.

2. A graphical method for the conversion of chlorinity per litre to chlorinity per kilogram (Cl^{o}/oo) in sea water analyses.

In Association with Dr. N. M. Carter.

The paper shows a graphical method for making the above conversion taking into account the temperature of the sea water and the silver nitrate solution during the titration.
Journ. du Cons. 12 (1) 1937.

3. A graphical method for calculating the corrections on deep sea reversing thermometers.

The paper describes the construction and use of a nomograph for the calculation, the tedious process is simplified to a single addition.
Journ. du Cons. 12 (1) 1937

4. A simplified procedure for the colorimetric analyses of sea water.

In association with Dr. N.M. Carter.

A simple colorimeter is described, utilizing an electric lamp as a source of light, a Dubosq eyepiece, and long comparison tubes. The instrument can be used to determine natural colour and turbidity, as well

as for the routine colorimetric analyses. A simple field procedure in which the concentration of the sought substance is determined from a scale, is discussed.

Submitted, Journ. du Cons. September, 1937.

5. The standardization of sea water standards in the colorimetric analyses of sea water.

In association with Dr. N.M. Carter

A procedure is described for colorimetrically determining the concentration of a constituent of sea water by the proportional increment of the original concentration effected by the addition of a known amount of that constituent to the sea water sample.

Submitted, Journ. du Conseil. September, 1937.

6. The expression of sea water analyses as milligram atoms per litre.

In association with Dr. N.M. Carter.

A table and nomograph are given for converting the concentrations of Oxygen, Phosphorus, Nitrogen, Silicon, and Carbon, as usually determined in sea water analyses in metric units, to the milligram-atom system as recommended by the 1936 meeting of the International Association of Physical Oceanography.

Submitted, Journ. du Conseil, September, 1937.

7. A photoelectric colorimeter for use on board ship.

The eye strain caused by the constant use of the visual type of colorimeter has necessitated the construction of this photoelectric instrument which requires only one photronic cell and reduces the error of observation from 5% to 1%. The instrument has been built but not described.

8. A nomograph for ascertaining the value of "D" in the expression t : o = D (Knudsen 1901) in oceanographic calculation.

With this nomograph, one of the most tedious interpolations of hydrodynamic calculation is made simple and accurate to the extent that unskilled help can be entrusted with routine calculation.

9. A table and nomograph showing the solubility of oxygen in sea water at atmospheric pressure and temperature 0 to 30°C and chlorinity 0 to 20°/oo in milligram atoms per litre.

Both table and nomograph are in use but have not been described.

10. Several methods for the graphical presentation of oceanographic data

In association with Dr. N.M. Carter

The fact that nearly three quarters of the variation in the properties of sea water occurs in the surface ten meters, and that as a general rule it is desirable to express three factors simultaneously on a diagram, has led to the use of some ingenious devices. The discussion requires review before publication.

11. An efficient small scale blue-printing outfit for laboratory use.

A large number of copies of charts are required in oceanographic work, and their cost is often a factor in operation. These can be prepared cheaply and rapidly with the apparatus in use at this laboratory which has not yet been described.

B. General.

12. The physical attributes of the waters of the Straits of Georgia.

13. The chemical attributes of the waters of the Strait of Georgia.

14. The relation of the physical and chemical attributes of the Strait of Georgia to the production of plankton.

15. Physical and chemical oceanography of some British Columbia fiords.

In Association with Dr. N.M. Carter.

16. Oceanographic study of the seasonal cycle in the waters of the Strait of Georgia.

These are based on the oceanographic program at this station during 1931 and 1932. In the first there was a fairly intensive investigation of several of the inlets around the Strait of Georgia, observations being taken at strategic points several times during the year. Dr. Carter presented a short geological summary of some of this material at the Fifth Pacific Science Congress. In 1932 the chemical and physical characteristics of the sea water and the numbers of the various species of phyto-planktonts were determined from observations made in the Strait. Twenty stations were selected at strategic points and observed at each of four slack waters in twenty-four hours, to determine the variations due to tidal flow. The whole program was repeated three times during the year to determine the seasonal variations.

These data have been prepared in graphical form, but no studies of the material have been made to date.

17. Oceanography of Nootka Sound.

Characteristic tidal circulation in a canal, a fiard, and a fiord is shown and it is indicated that the depth of tidal circulation in those inlets having a threshold probably varies inversely as the temperature of the circulating waters. A series of tidal observations indicated the presence of the semi-daily tide cycle in the deep waters of the sea adjacent to the sound. Evidence of the up-welling of deep ocean water along the coast is shown by the oxygen content. A

zone of photosynthetic activity between three and six metres depth is outlined by the occurrence of chemical anomalies.

Journ. Biol. Bd. Can. 3, (1) 1937.

18. The variations of the physical and chemical attributes of the sea water with tide phase in Nootka Sound.

This investigation was carried out from the "Catalyst", the research vessel of the University of Washington, in 1934 and consists of observations at the same station at two-hour intervals for fifty-two hours. Twelve properties of the water were determined and their variations indicate the differential character of tidal flow in this place. The data are at present in the preliminary graphical form.

19. The chemical and physical attributes of the sea water off the west coast of Vancouver island. (Wm. J. Stewart expedition 1934).

This work consists of a large number of unrelated observations over the whole area, and from April to August. Seven properties of the water were analyzed and the material defines the fundamental characteristics of the water in this area. The data have not been developed.

20. The physical and chemical attributes of the sea water off the West Coast of the Queen Charlotte islands (Wm. J. Stewart expedition 1935).

The field work consists of a small number of unrelated observations throughout the summer and over the whole area. No development of the data has been made.

21. A contour chart of the sea bottom off the west coast of Vancouver island from Cape Flattery to Nuchatlitz inlet.

The contours were interpreted from the original field sheets of the Canadian hydrographic survey. The chart is on a scale of one inch to the mile.

Copies of parts of this chart on reduced scale have been made, one of which is submitted herewith.

22. Oceanography of Ladysmith harbour

Since the Japanese oyster, Ostrea gigas, has been induced to spawn and set in this harbour it has become necessary to investigate the oceanographical variations during a complete spring and neap tide cycle. This was done in July, 1937. The data has not been studied.

C. Hydrodynamics

23. Gradient currents off the west coast of Vancouver island (1936)

This report describes the procedure and the gradient current surveys made during the year. Besides the observations for tidal distortion, eight dynamic sections over a hundred miles in length were observed off the island and series of dynamic topographical charts prepared.

The report and the charts are included herewith.

24. Report on Dynamic studies off the Canadian Pacific coast (1936).

This report describes briefly the dynamic and the meteorological program of this department and was prepared for the April meeting of the American Geophysical Union, where it was presented.

Proceed. Amer. Geophys. Union, 1937.

25. Tidal distortion in a gradient current field.

The great tidal range off the Pacific coast of Canada necessitated a preliminary study of the effect of the tides on gradient current field in the coastal waters. Two parallel dynamic sections of five stations each were observed on the flood and ebb of the spring and neap tides. Four sets of observations in all. These are being interpreted in the light of Marmer's tidal current information and the observed distortions of the gradient field.

This paper is in preparation.

26. The relation of meteorology to the coastal gradient current system off the west coast of Vancouver island.

The two factors of temperature and salinity that determine the density of sea water are considered separately. It is shown that the normal temperature gradient at right angles to the general coast line induces a southward flowing current, and that, disregarding the temperature, the salinity induces a northward coastal flow. The direction and force of the resultant coastal gradient current is dependent on the balance of these two factors, which are themselves dependent on local meteorology.

Prepared for publication, and read before the June meeting of the American Association for the Advancement of Science, Denver, June, 1937.

Gradient current surveys have been continued in the Swiftsure banks area off the entrance to Juan de Fuca strait, during February and June, 1937. It is planned to extend this survey northward along the whole British Columbia coast during September. Some of these data are being calculated and charts and cross sections will be prepared.

D. Meteorology

An extensive program of observation of the sea water temperature and salinity at eleven stations on the outside and inside coastal waters of British Columbia has been undertaken. As indicated in some of the papers submitted, this program forms the basis of study of the seasonal variations in the coastal current systems. The records of the observations are being kept up to date and filed.

27. Daily water temperatures and volume of flow in the mouth of the Fraser river for correlation with the meteorology in the immediate area (1927 to date).

This is an analysis of the water temperatures from Poplar island and New Westminster, which are being prepared in graphical form.

28. Daily water temperatures in the Strait of Juan de Fuca for correlation with atmospheric meteorology and fisheries (1921 to date).

This is an analysis of the data from William Head which are being prepared in graphical form.

29. Daily variations in the temperature and salinity of the water in the Strait of Georgia for correlation with the atmospheric meteorology and fisheries (1936 - 1937).

30. Daily variations in the temperature and salinity of the water off the West Coast of Vancouver island for correlation with the Atmospheric Meteorology and the Fisheries (1934 to date).

31. Daily variations in the temperature and salinity of the sea water in Hecate Straits for correlation with the atmospheric meteorology and fisheries (1934 to date).

BIOCHEMISTRY

32. A method for the routine determination of glycogen in oysters.

Pflüger's method for the digestion, precipitation, purification, and hydrolysis of glycogen is investigated as applied to the analyses of oysters. Sodium and potassium hydroxide as mediums of digestion are compared and it is shown that digestion in 10 N potassium hydroxide for 3 hours at 100°C. is the most suitable procedure. An aliquot of the digest is taken, neglecting the soaps formed, made 55-60 per cent with regard to ethyl alcohol, heated to boiling, the supernatant liquid decanted through a filter, the glycogen purified by reprecipitation, and hydrolyzed for 3 hours at 100°C with 3-4 per cent hydrochloric acid. The glucose solution is then neutralised and filtered.

It is shown that pure glucose may be used for the standardization of the Schaffer-Hartmann cuprous method for the determination of glucose.

Submitted to Analyst, September, 1937.

33. Proximate analyses of the sperm and ova of O. gigas.

Several direct analyses were made in 1935 and the difference between spawned and unspawned oysters was also determined as a check on the above work. Some further work on this problem is desirable.

34. Proximate analyses of the sperm and ova of B.C. herring

This work was done in 1935 and several interesting facts were discovered, particularly in the composition of the sperm which is made up of protein and a very high percentage of ash which is jet black, whereas the ash of the fish and the ova is white. Some further work is desirable on this problem.

35. Mineral analyses of fresh B.C. oysters

This problem arose out of a trade request for an analyses of the cause of the black mantle on O. gigas and O. lurida. Manganese analyses have been carried out and work has begun on the comparative analyses of the body and mantle of O. gigas for iron, copper and manganese.

36. The Nutritive value of marine products.

XIV. Proximate analyses of fresh British Columbia oysters.

Proximate analyses were made at bi-monthly intervals during 1933-34 on samples of Ostrea lurida, O. virginica, and O. gigas grown under identical conditions in the Strait of Georgia. The proportions of glycogen are shown to be approximately reciprocal and the greatest variation to occur during the summer. The energy content varies slightly attaining a maximum in the late fall and early winter. O. gigas having the highest and O. lurida the lowest values.

Journ. Biol. Bd. Can. 2 (5) 1936.

37. Proximate analyses of British Columbia herring.

In association with Drs. J.L. Hart, A.L. Tester and Desmond Beall.

Proximate analyses were made of the whole and part herring of different ages, taken in various localities and seasons. The analyses are being related to locality and growth of the fish.

In addition to these researches there have been a number of articles published in Progress Reports, the accredited quarterly journal of the Pacific Biological Station.

These are here listed by title in the order of their appearance.

The Small Scale Canning of Pacific Oysters	Progress Report		#19, 1934.
Oceanography	"	"	#22, 1934
Pacific Oysters are a valuable food	"	"	#23, 1935
Kurosio	"	"	#25, 1935
Weather and the Ocean	"	"	#26, 1935
Ocean Currents	"	"	#30, 1936
A Warmer Summer	"	"	#31, 1937
Gradient Currents	"	"	#32, 1937
Seasons in the Sea	"	"	#33, 1937.

N.B. This list shows that there are 15 papers published, 5 submitted for publication, 7 partly prepared for publication and data on hand for 18.

August 20, 1937.