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Icepack 8/68 — Oceanographic and Biological Observations

by R. H. Herlinveaux

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TECHNICAL REPORT NO. 159

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FISHERIES RESEARCH BOARD OF CANADA

TECHNICAL REPORT NO. 159

ICEPACK 8/68 -
OCEANOGRAPHIC AND BIOLOGICAL OBSERVATIONS

by

R. H. Herlinveaux

FISHERIES RESEARCH BOARD OF CANADA
Biological Station, Nanaimo, B. C.

January 1970

INTRODUCTION

During a six-week period in August and September 1968, a cooperative program to study the marine environment in the Canadian Arctic Archipelago was carried out by personnel - based on CCGS LABRADOR - from Defence Research Establishment Pacific (DRB), Bedford Institute (DEMR), and the Pacific Oceanographic Group (FRB). The principal objectives of the program were: (1) to retrieve from the ocean floor, five Recording Instrument Packages (RIP) which had been installed at five locations in the Canadian Arctic by Defence Research Establishment Pacific during Icepack 8/67; (2) to make biological and physical oceanographic observations in selected areas of the Arctic; and (3) to assess the potential of the submersible PISCES I as a vehicle for carrying out studies in various disciplines and under varying conditions of ice cover. Item 3 has been reported on by Milne, Pelletier and Herlinveaux (1969). In this report, the biological and physical oceanographic observations made during Icepack 8/68 are presented.

Program

The equipment, including the submersible PISCES, was loaded in Vancouver onto a Canadian Armed Forces aircraft (C130) (Fig. 1). The equipment was then flown to Thule, Greenland, where it was offloaded onto the icebreaker CCGS LABRADOR: Figure 2 shows PISCES housed on board CCGS LABRADOR

1. Oceanographic observations

The CCGS LABRADOR occupied oceanographic stations in the Arctic Archipelago at the positions shown in Fig. 3. Each station comprised a sampling for serial temperature, salinity and dissolved oxygen data. These were obtained using reversing water bottles and thermometers.

The bottle cast at each station was followed by a lowering of a bathythermograph. After the auxiliary thermometers had reached equilibrium the reversing thermometer temperatures were read and recorded. Samples for salinity determination were drawn into 5-ounce citrate bottles and stored on board ship. Subsequently duplicate samples were analyzed at the Pacific Oceanographic Group laboratory with a conductivity salinometer (Strickland, MS; 1958). The Winkler determination for dissolved oxygen content was carried out on samples obtained from the reversing water bottles (Strickland and Parsons, 1968). The data are presented in Section I, with explanations of headings.

The machine-computed data were supplied by the Marine Sciences Branch contingent at the Biological Station, Nanaimo. The program for the computations is on file at the Pacific Oceanographic Group.

The bathythermograms are presented in Section II. The material was prepared from hand-drawn reproductions of the slides.

2. Biological observations

Biological samples of both flora and fauna were obtained, by use of PISCES, from several areas (Fig. 4) both along the beach and on the bottom. Some samples were also collected accidentally by the RIP units when they were being dragged over the bottom during retrieval, and by the PISCES bottom sled, which at times dug into the bottom while travelling over the uneven terrain.

In Table 1 the various specimens collected in the several areas are listed. Figures 5-11 are copies of photographs of some of the organisms listed in Table 1. Figures 12-18 are copies of pictures taken from the PISCES showing the bottom features with the organisms that were identified.

While in Milne Inlet in the Koluktoo Bay area several Arctic char were taken, and examined for internal and external parasites. These samples were brought back to the Biological Station at Nanaimo and identified; the results are presented in Table 2. These parasites are not harmful to humans, except the tapeworm Diphyllobothrium, which can live in humans.

While at Grise Fjord, in Pond Inlet, and on Beechey Island, the beach was travelled and numerous seaweeds were collected. Some were dried, others frozen and brought back for identification. These are presented in Table 3. These were identified by Dr. Louis Druehl, Department of Biological Sciences, Simon Fraser University, who also made the following comments which might be of interest to those travelling in the Arctic:

"Laminaria - eaten by Chinese and Japanese; also known as Hombu and Wakame.

Rhodomenia palmata - eaten in Canadian Maritimes, Western Europe; also known as Dulse, Dillick, Sol.

Ulva - eaten in Asia.

I know of no seaweeds from temperate or Arctic waters that are poisonous. Of the species listed in Table 3, Desmarestia aculeata, a fern-like seaweed, may be harmful. The plant produces free sulphuric acid and has a pH of approximately 1.0."

In some areas, seaweeds were found in a good state of preservation in snow-banks above the high tide mark. These seaweeds had presumably been thrown above the high tide mark by wave action.

3. Visual observations from PISCES

A log was kept of some of the various plankton noted during three dives in PISCES on ascent and descent. A summation of these notes follows.

Milne Inlet - depth 261 m (2100 Aug. 23/68)

- (a) High concentration of gelatinous forms, ctenophores between 2 m and 13 m.
- (b) Scattered gelatinous forms with annelids, beroe and copepoda observed on occasion from 13-19 m.
- (c) Surface light at 213 m - possible to see apparatus on outside of PISCES:
- (d) Amphipods, copepods, chaetognath (arrow worm) in abundance at 232 m.
- (e) Pteropod (Clione), copepods, amphipods, ctenophores (Pleurobrachia) at 244 m.
- (f) Amphipods, copepods, chaetognath at 259 m near the bottom.

Gelatinous forms (ctenophores) were evident throughout the water column in various states of decomposition, all settling to the bottom.

Photographs of the bottom are shown in Fig. 12 and 13.

Resolute Bay - depth 104 m (1450 Aug. 28/68)

- (a) Surface water crystal clear.
- (b) Phytoplankton in abundance from 3-30 m.
- (c) Ctenophores from 43-61 m.
- (d) Gravel bottom at 104 m - predominance of brittle stars and sea urchins interspersed with sea anemones, gorgonocephalus (gorgons' heads). Several small fish (3"-4"), looking like sculpin, and eels (3"-4"), and a small octopus were noted swimming over the bottom. Figures 14 and 15 are copies of photographs taken in this area.

This dive was originally planned as a search for shrimp with the idea that if these were abundant, traps might be used through the ice during the winter and the catch might supplement the native diet. Unfortunately the dive had to be terminated after only 30 minutes on the bottom because the ship was given a change in sailing orders. However, only a few of what appeared to be similar to a "glass" shrimp (Pasiphaea pacifica) were noted on the sloping gravel beach.

Pond Inlet - depth 61 m (1330 Sept. 14/68)

The purpose of this dive was to navigate along the bottom around a large anchored iceberg, and to describe the different types of bottom and associated life.

- (a) Kelp laminaria extended from about 3-20 m - clam and mussel were also at this level - photography possible at 20 m using

available light - sand - fine gravel bottom with shells (Fig. 16).

(b) Brittle stars, crinoid, and ophiroids (fern-like) scattered about from 20-55 m - sand and gravel with a few boulders. (Fig. 17 and 18).

(c) Greenland sharks, shrimp (similar to Pasiphaea pacifica) and soft coral observed at 37 m - bottom scouring by icebergs (plough-like furrows), sand and gravel.

(d) Ophiroids and brittle stars in evidence at 55 m.

(e) At 61 m large boulders on the flats just before drop-off. Boulders had similar groups of organisms as shown in Fig. 18.

Prior to this dive a scattering layer was recorded on the Edo echo sounder (12 kc) as shown in Fig. 19. On diving down to this layer a large school of herring was observed. The fish were about 17.5 cm in length.

In this area at 73 m, a large sponge (Halichondria) was observed and parts retrieved for identification. Approximately 10 shrimp were gathered around the sponge, which was about 25-30 cm high.

SCIENTIFIC PARTY

Mr. A. R. Milne	Defence Research Board
Mr. T. Hughes	" " "
Dr. B. R. Pelletier	Department of Energy, Mines and Resources
Dr. C. Ray	Johns Hopkins University
Mr. R. Harmans	" " "
Mr. A. Trice	International Hydrodynamics Ltd.
Mr. J. MacDonald	" " "
Mr. M. Wilson	" " "
Mr. R. H. Herlinveaux	Fisheries Research Board of Canada

ACKNOWLEDGEMENTS

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The cooperation of Capt. P. Tooke, his officers and crew is greatly appreciated.

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- Milne, A. R., B. R. Pelletier and R. H. Herlinveaux. 1969. A research submersible in the Arctic - PISCES I. Defence Research Board of Canada. Report 69-1. 27 p.
- Strickland, J. D. H. MS, 1958. Standard method of seawater analyses. Volume II. Fish. Res. Bd. Canada, MS Rept. Oceanogr. and Limnol. 19. 78 p.
- Strickland, J. D. H., and T. R. Parsons. 1968. Manual of seawater analyses. Bull. Fish. Res. Bd. Canada 167. 311 p.

CAPTIONS OF FIGURES

- Fig. 1 PISCES being loaded on a Canadian Air Transport Command C-130.
- Fig. 2 PISCES housed on board CCGS LABRADOR.
- Fig. 3 Positions of oceanographic stations occupied from CCGS LABRADOR during Icepack 8/68.
- Fig. 4 The cross-hatching designates the areas from which biological samples were obtained.
- Fig. 5 Sea anemones and snails collected in Norwegian Bay from 332 m depth.
- Fig. 6 Snail egg capsules from Pond Inlet and fern-like hydroid taken from a RIP which had been at 396 m depth for one year in Lancaster Sound.
- Fig. 7 Soft coral taken at Pond Inlet from 37 m depth. Soft coral taken near southern entrance to Hell's Gate at 128 m depth.
- Fig. 8 Collection of beach shells from:
1. Beechey Island
 2. Staaten Inlet
 3. Milne Inlet
- Fig. 9 Collection of clam shells from the beach at the mouth of Grise Fjord.
- Fig. 10 Collection of beach shells from Pond Inlet.
- Fig. 11 Sea urchins and brittle stars from Resolute Bay area taken at 104 m depth.
- Fig. 12 Bottom life in Milne Inlet at 259 m depth.
- Fig. 13 Bottom life in Milne Inlet at 259 m depth.
- Fig. 14 Bottom life in Resolute Bay at 104 m depth.
- Fig. 15 Bottom life in Resolute Bay at 104 m depth.
- Fig. 16 Bottom life in Pond Inlet at 20 m depth.
- Fig. 17 Bottom life in Pond Inlet at 37 m depth.
- Fig. 18 Bottom life in Pond Inlet at 61 m depth.
- Fig. 19 Scattering layer identified as herring in Pond Inlet.

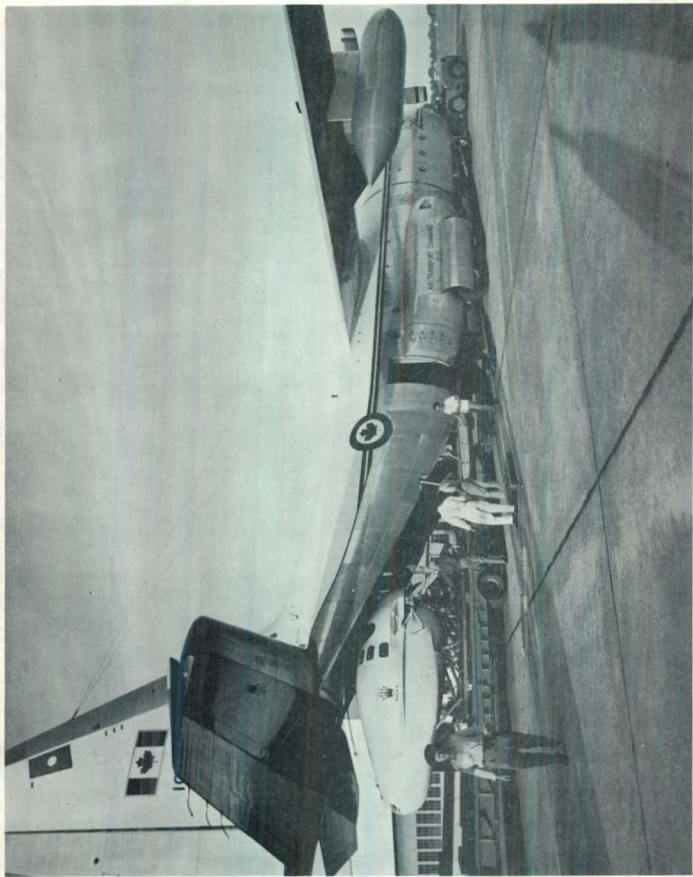


Fig. 1. PISCES being loaded on a Canadian Air Transport Command C-130.

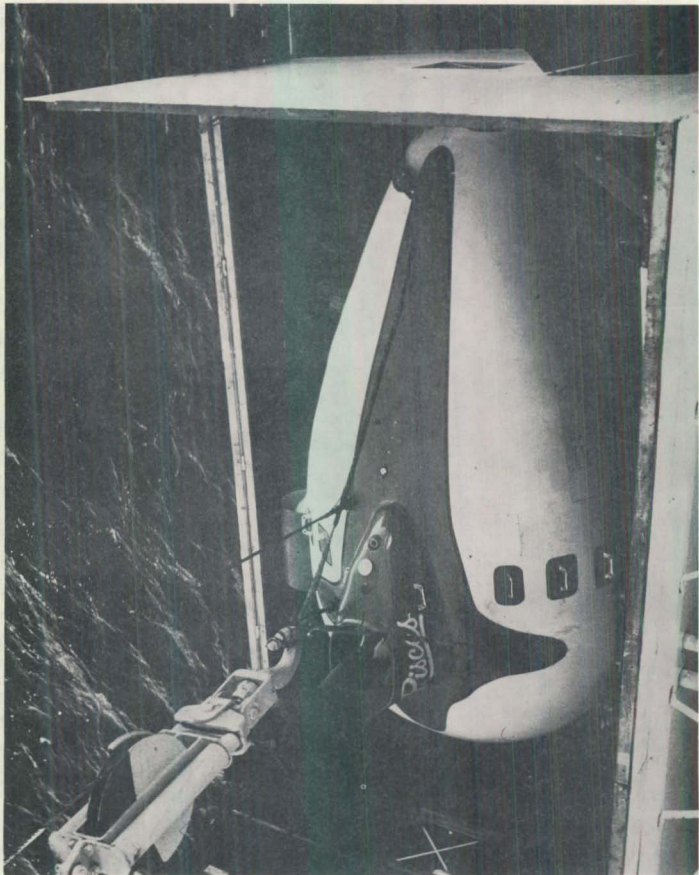


Fig. 2. PISCES hoisted on board CCGS LABRADOR.

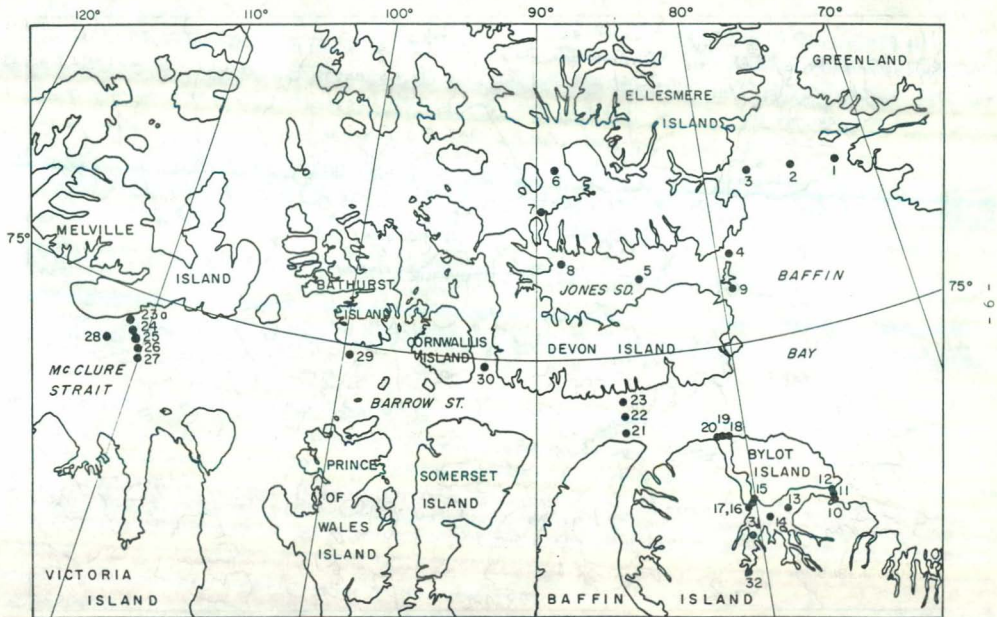


Fig. 3. Positions of oceanographic stations occupied from CCGS LABRADOR during Icepack 8/68.

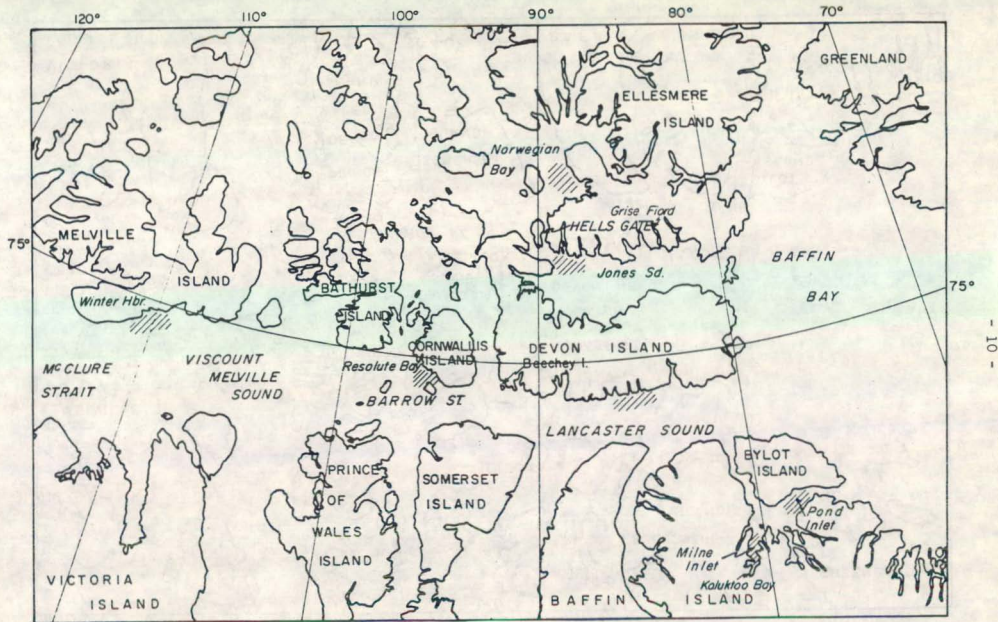


Fig. 4. The cross-hatching designates the areas from which biological samples were obtained.

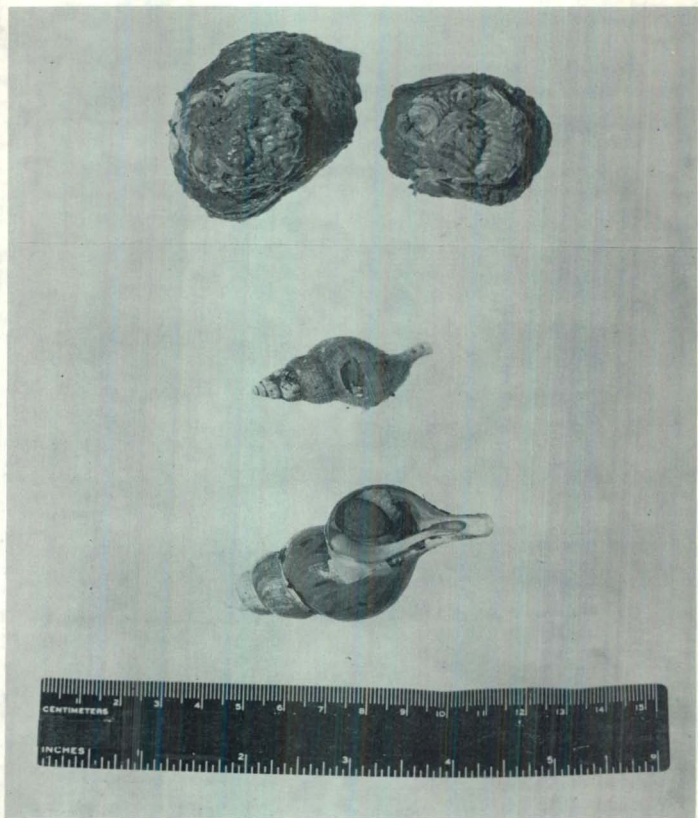


Fig. 5. Sea anemones and snails collected in Norwegian Bay from 332 m depth.

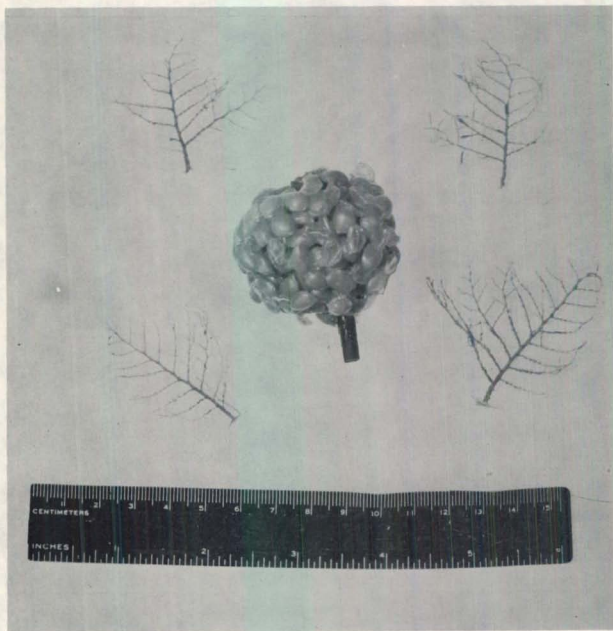


Fig. 6. Snail egg capsules from Pond Inlet and fern-like hydroid taken from a RIP which had been at 396 m depth for one year in Lancaster Sound.

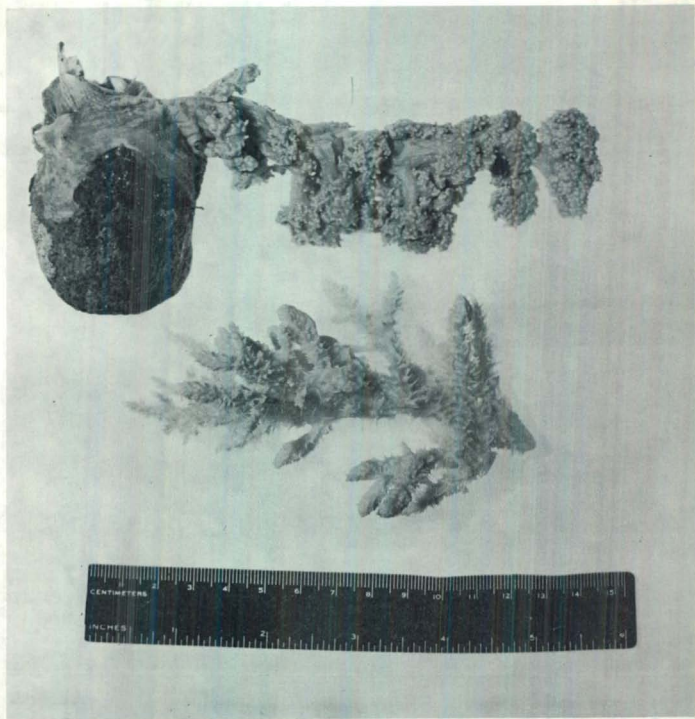


Fig. 7. Soft coral taken at Pond Inlet from 37 m depth. Soft coral taken near southern entrance to Hell's Gate at 128 m depth.

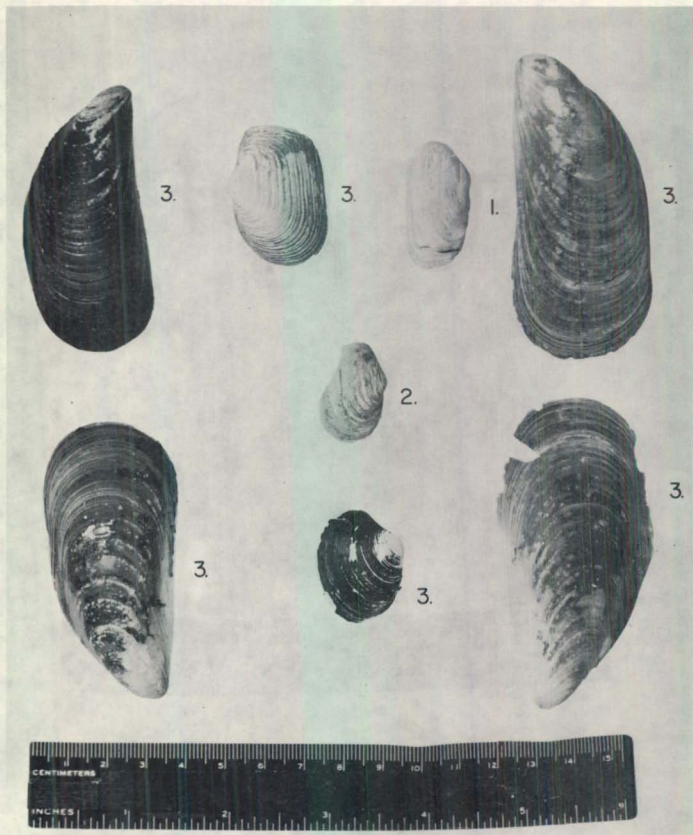


Fig. 8. Collection of beach shells from: 1. Beechey Island
2. Staaten Inlet
3. Milne Inlet

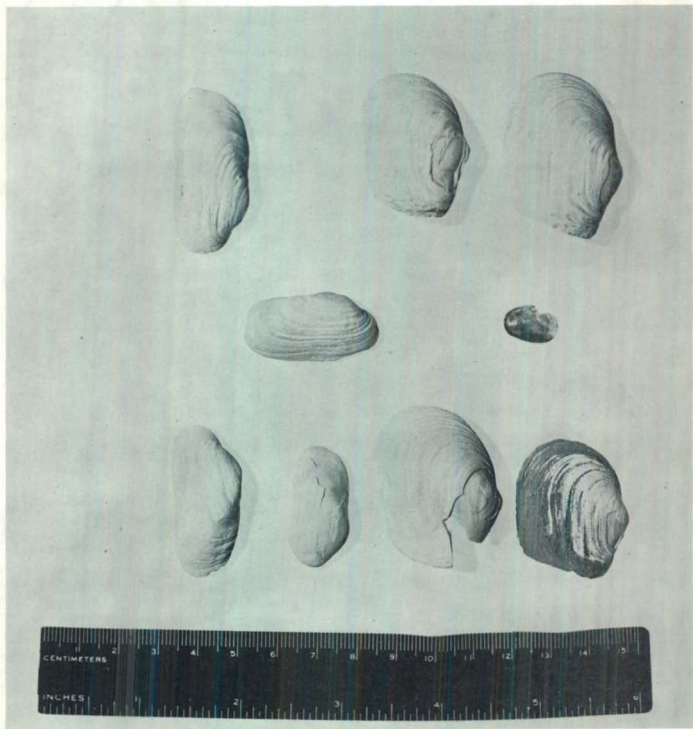


Fig. 9. Collection of clam shells from the beach at the mouth of Grise Fjord.

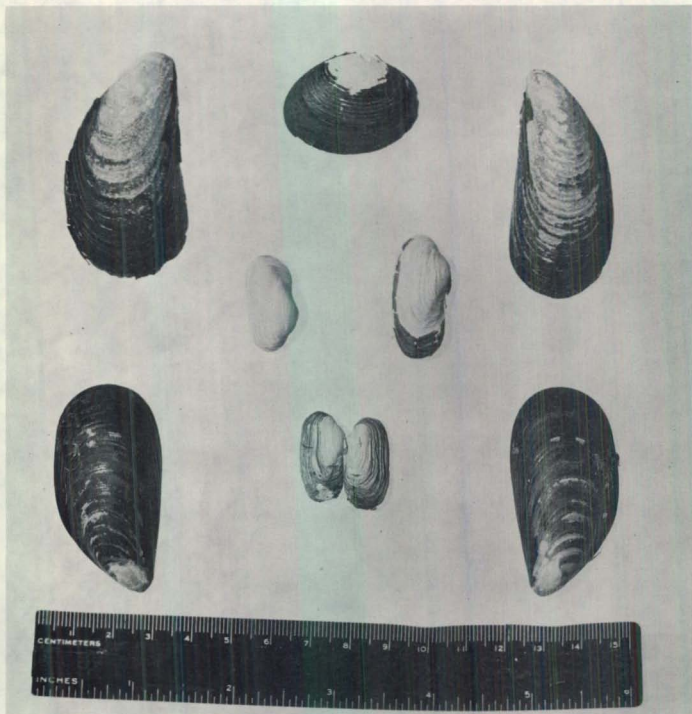


Fig. 10. Collection of beach shells from Pond Inlet.

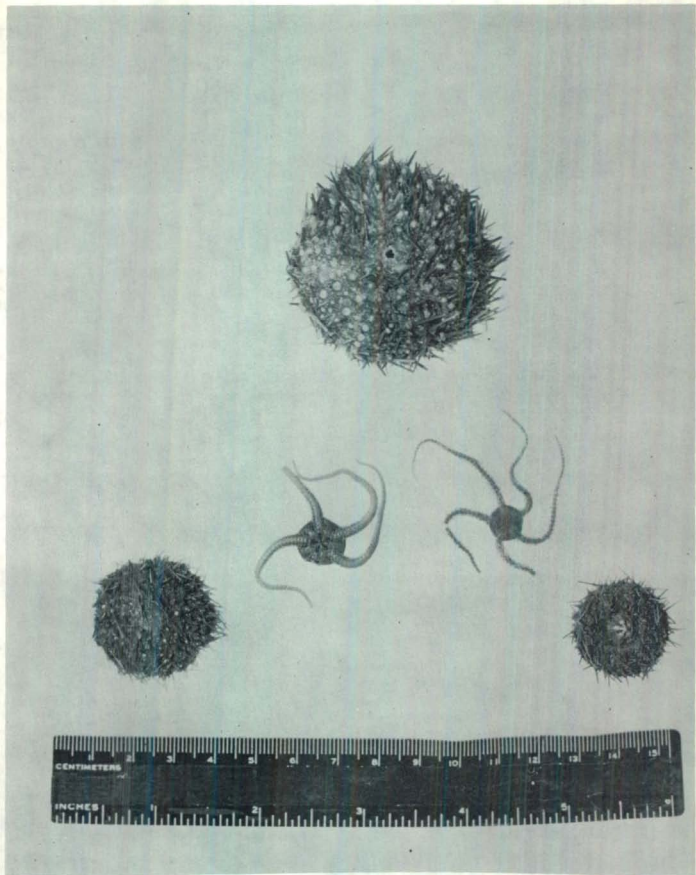


Fig. 11. Sea urchins and brittle stars from Resolute Bay area taken at 104 m depth.



Fig. 12. Bottom life in Milne Inlet at 259 m depth.

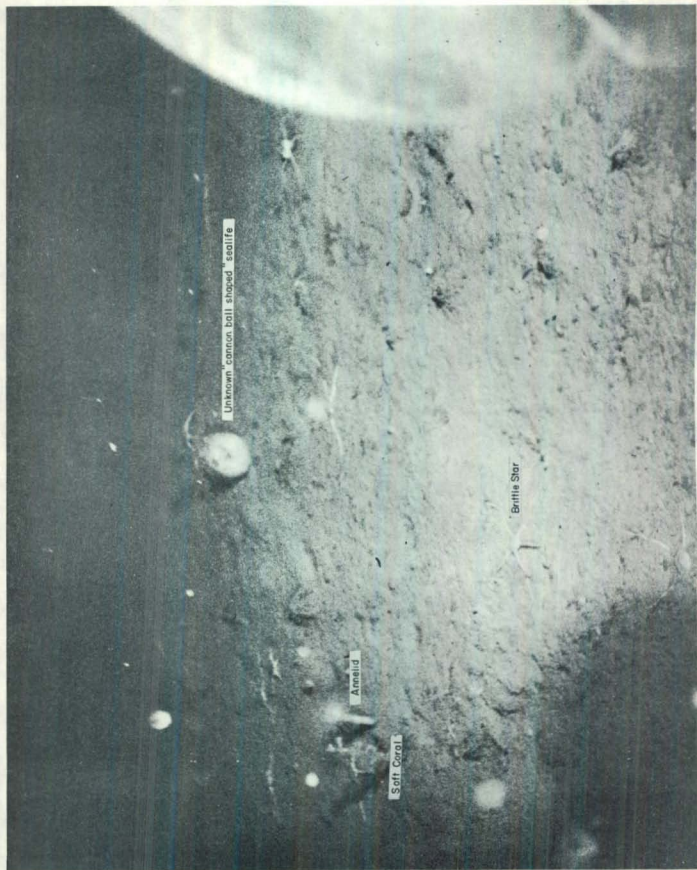


Fig. 13. Bottom life in Milne Inlet at 259 m depth.



Fig. 14. Bottom life in Resolute Bay at 104 m depth.

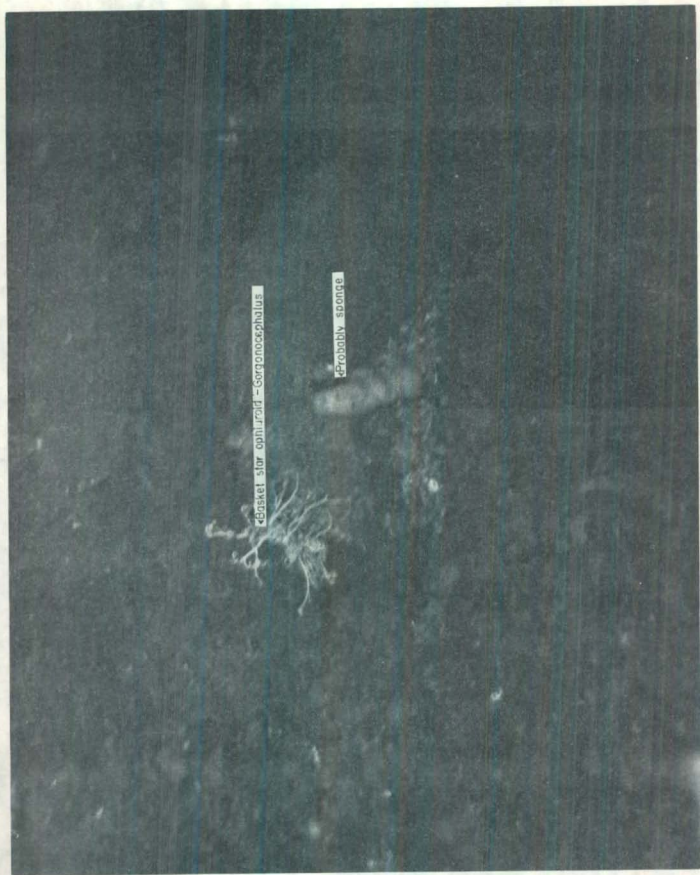
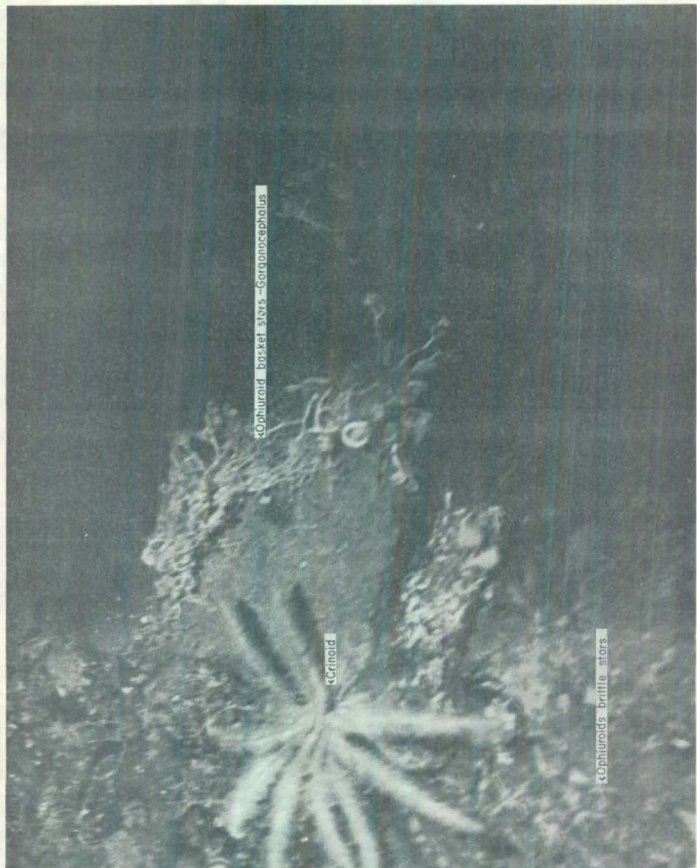


Fig. 15. Bottom life in Resolute Bay at 104 m depth.



Fig. 16. Bottom life in Pond Inlet at 20 m depth.



◀ Ophiuroid basket stars - *Gorgonocephalus*

◀ Crinoid

◀ Ophiuroids brittle stars

Fig. 17. Bottom life in Pond Inlet at 37 m depth.



Fig. 18. Bottom life in Pond Inlet at 61 m depth.

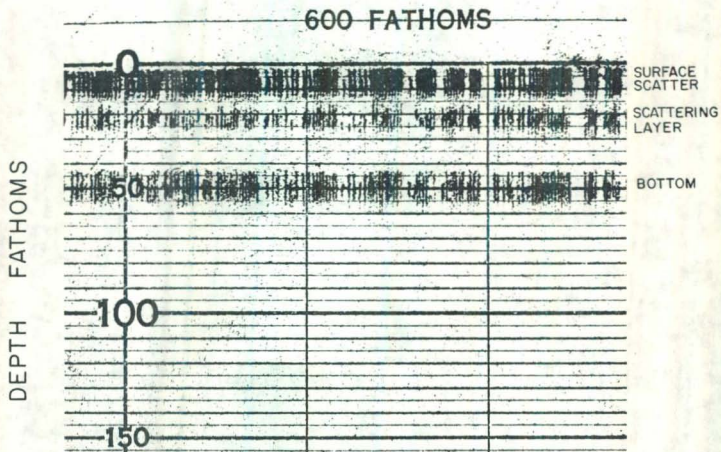


Fig. 19. Scattering layer identified as herring in Pond Inlet.

2000-01-01

1. Name of the person or organization: [Faint text]

2. Address: [Faint text]

3. City: [Faint text]

4. State: [Faint text]

5. Zip: [Faint text]

6. Telephone: [Faint text]

7. Fax: [Faint text]

8. E-mail: [Faint text]

9. Other: [Faint text]

10. Comments: [Faint text]

11. Date: [Faint text]

12. Signature: [Faint text]

13. Title: [Faint text]

14. Organization: [Faint text]

15. Contact: [Faint text]

16. Reference: [Faint text]

17. Remarks: [Faint text]

18. Date: [Faint text]

Table 1. Biological bottom samples collected from the Canadian Arctic Archipelago.

Sample	Depth (m)
A. <u>Pond Inlet</u> - 72°42'N 77°55'W	
<u>Buccinum</u> sp egg capsules (snail)	on beach
<u>Eunephthya rubiformis</u> (soft coral)	37
<u>Holichondria</u> sp (sponge)	73
<u>Paramphithoe cuspidata</u> (crustaceans)	37
<u>Duvancelia</u> sp (nudibranch)	
<u>Mytilus edulis</u> (mussel)	on beach
<u>Astarte borealis</u> (clam)	"
<u>Hiatella arctica</u> (clam)	"
<u>Musculus niger</u> (mussel)	"
B. <u>Milne Inlet</u> - 72°21.7'N 80°17'W	
<u>Mytilus edulis</u> (mussel)	"
<u>Astarte borealis</u> (clam)	"
<u>Hiatella arctica</u> (clam)	"
<u>Panomya arctica</u> (clam)	on polar ice
<u>Acmaea</u> sp (limpet)	"
C. <u>Norwegian Bay</u> - 77°28'N 89°13'W	
Two unknown anemones	332
<u>Colus</u> (snail)	332
<u>Gorgonocephalus</u>	332

Table 1 continued

Sample	Depth (m)
D. <u>Jones Sound - southern entrance to Hell's Gate - 76°26'N 89°20'W</u> <u>Neospongodesp</u> (soft coral)	128
E. <u>Lancaster Sound - 74°18'N 81°08'W</u> <u>Stegopoma plicatile</u> - hydroid (weed) on hydrophone	460
F. <u>Resolute Bay - 74°30'N 94°40'W</u> <u>Ophiocanthasp</u> sp (brittle star)	104
<u>Ophiura sausi</u> (brittle star)	104
<u>Strongylocentrotus duobachiensis</u> (sea urchin)	104
G. <u>Creek bed at Resolute Bay - 74°42'N 94°40'W</u> (subfossil) <u>Mya truncata</u> <u>Hiatella arctica</u>	
H. <u>Grise Fjord (settlement) - 82°50'W 76°23.2'N</u> <u>Hiatella arctica</u> (clam)	beach
<u>Mya truncata</u> (clam)	"
<u>Musculus niger</u> (mussel)	"

Polychaeta and other animals identified

Species	Depth (m)	Location
<u>Onuphis conchylega</u>	274	Milne Inlet
<u>Lumbrinereis hencerra</u>	274	" "
<u>Nephtys</u>	329	Norwegian Bay

Table 1 continued

Species	Depth (m)	Location
<u>Onuphis conchylega</u>	146	Winter Harbour
<u>Telepsarus costarsum</u>	146	" "
Poiapulus	146	" "

Table 2. Visible parasites taken from Arctic char

A. Intestinal cavity

Nematoda (roundworms)

2 Philonema oncorhynchi

1 as a cyst on the liver

1 free in body cavity

Cestoda (tapeworms)

1 Eubothrium sp

2 Diphyllbothrium sp larvae

cysts on liver

Trematoda (flukes)

1 Lecithaster gibbosus

B. From gills and fins

Copepoda (fish lice) lernaeopodidae

Salmincola edwardii

Salmincola carpionis

Table 3. Seaweeds collected from Grise Fjord, Pond Inlet and Beechey Island.

Grise Fjord

Brown alga Fucus disticus

Pond Inlet

Brown algae Fucus disticus

Desmarestia aculeata

Laminaria saccharina

Green alga Ulothrix

Beechey Bay and Pond Inlet

Brown algae Fucus disticus

Laminaria saccharina

Laminaria groenlandica

Agarum cribrosum

Desmarestia aculeata

Red algae Rhodymenia palmata

Halosaccion ramentaceum

Green alga Ulva

SECTION I.

Oceanographic Station Data

Explanation of Data Record headings

Observed data

- REFERENCE NO. - Year - cruise number - consecutive station number.
- DATE - Day/month/year.
- POSITION - Latitude and longitude in degrees and minutes.
- GMT - Greenwich mean time when the messenger was released for the first cast.
- TEMP. - Temperature was measured with reversing thermometers which were read to 0.01°C. At the surface the temperature was measured with a surface thermometer which was read to 0.2°C.
- SAL. - Salinity values in ppt were determined using a conductivity salinometer. The salinometer has an accuracy to $\pm .02\%$.
- DEPTH - Depth is given in metres.
- OXY - Dissolved oxygen concentration in ml/l as determined by Winkler method. A value of 0.00 indicates that an oxygen sample was not obtained.

Derived quantities

- PRESS - Pressure in decibars. For these data pressure is treated as a derived quantity.
- SIGMA
T - Specific gravity anomaly.
- SVA - Specific volume anomaly.
- THETA - Potential temperature in degrees Celsius.
- SVA
(THETA) - Potential specific volume anomaly.
- DELTA
D - Geo-potential anomaly in J/kg.
- POT. EN. - The potential energy anomaly in units of $10^6/\text{cm}^2$.
- SOUND-
VELOCITY - The velocity of sound in metres/sec⁻¹, computed from Wilson's formula (1960).

PACIFIC OCEANOGRAPHIC GROUP

REFERENCE NO. 68-55- 1

DATE 15/ 8/68

POSITION 76-59.5N, 71-50.0W GMT 1.5

HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	2.50	31.160	0	24.890	307.1	2.50	307.1	0.00	0.00	9.30	1455.
10	0.87	31.830	10	25.533	246.2	0.87	246.0	0.28	0.01	9.70	1449.
20	0.32	32.250	20	25.899	211.4	0.32	211.2	0.51	0.05	9.80	1447.
30	-0.09	32.790	30	26.353	168.2	-0.09	168.0	0.70	0.10	9.00	1446.
50	-0.50	33.290	50	26.774	128.2	-0.49	128.2	0.99	0.22	7.70	1445.
76	-0.77	33.440	75	26.905	115.6	-0.76	115.7	1.30	0.41	7.89	1445.
101	-0.94	33.640	100	27.073	99.5	-0.94	99.7	1.57	0.65	7.48	1445.
126	-0.99	33.670	125	27.099	97.0	-0.99	97.3	1.82	0.94	7.30	1445.
151	-0.83	33.750	150	27.158	91.3	-0.83	91.7	2.06	1.27	7.43	1446.
177	-0.42	33.790	175	27.174	89.9	-0.42	90.2	2.29	1.65	7.20	1449.
202	-0.09	33.980	200	27.312	77.0	-0.09	77.1	2.50	2.06	6.88	1451.
303	0.72	34.190	300	27.436	65.8	0.71	65.3	3.20	3.84	6.10	1456.
505	1.08	34.250	500	27.462	64.1	1.06	62.8	4.51	9.22	5.90	1461.
1016	1.06	34.430	1004	27.608	51.3	1.01	48.8	7.46	31.17	5.45	1470.

PACIFIC OCEANOGRAPHIC GROUP

REFERENCE NO. 68-55- 2

DATE 15/ 8/68

POSITION 77- 0.0N, 74-10.0W

GMT 7.7

HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	2.20	31.980	0	25.567	242.8	2.20	242.8	0.00	0.00	9.61	1455.
10	1.30	32.620	10	26.141	188.5	1.30	188.2	0.22	0.01	0.00	1452.
20	1.30	32.610	20	26.133	189.3	1.30	189.0	0.41	0.04	0.10	1452.
30	0.07	33.170	30	26.651	139.9	0.07	139.7	0.57	0.08	0.00	1448.
50	-0.77	33.310	50	26.800	125.6	-0.77	125.6	0.84	0.19	8.04	1444.
76	-1.01	33.420	75	26.897	116.3	-1.00	116.4	1.14	0.38	0.00	1444.
101	-0.95	33.600	100	27.041	102.6	-0.95	102.8	1.42	0.63	7.55	1445.
126	-0.90	33.760	125	27.169	90.4	-0.90	90.7	1.66	0.91	0.00	1445.
151	-0.78	33.840	150	27.229	84.7	-0.78	85.0	1.88	1.22	0.00	1447.
177	-0.74	33.910	175	27.284	79.4	-0.74	79.8	2.09	1.57	7.29	1447.
202	-0.69	33.970	200	27.330	74.9	-0.69	75.4	2.29	1.94	0.00	1448.
303	-0.57	34.160	300	27.479	60.7	-0.57	61.3	2.97	3.67	0.00	1450.
505	-0.33	34.270	500	27.557	53.1	-0.35	53.8	4.12	8.33	7.10	1455.

PACIFIC OCEANOGRAPHIC GROUP

REFERENCE NO. 68-55- 3

DATE 15/ 8/68

POSITION 76-55.0N, 76- 9.0W

GMT 13.8

HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	-1.66	31.300	0	25.198	277.8	-1.65	277.8	0.00	0.00	0.00	1436.
10	-1.55	31.360	10	25.245	273.5	-1.54	273.4	0.28	0.01	0.00	1437.
20	-1.47	31.470	20	25.332	265.1	-1.46	265.1	0.55	0.06	0.00	1438.
30	-1.21	31.810	30	25.602	239.5	-1.21	239.5	0.81	0.12	0.00	1440.
50	-1.37	32.690	50	26.318	171.3	-1.37	171.4	1.22	0.28	0.00	1440.
76	-1.27	32.860	75	26.453	158.4	-1.26	158.6	1.64	0.55	0.00	1442.
101	-1.30	33.230	100	26.753	129.7	-1.30	130.1	2.00	0.87	0.00	1442.
126	-1.27	33.390	125	26.882	117.4	-1.27	117.9	2.31	1.23	0.00	1443.
151	-1.28	33.500	150	26.971	108.8	-1.27	109.5	2.60	1.63	0.00	1444.
177	-1.20	33.590	175	27.041	102.1	-1.19	102.8	2.86	2.07	0.00	1445.
202	-1.11	33.660	200	27.095	96.9	-1.11	97.6	3.12	2.56	0.00	1446.

PACIFIC OCEANOGRAPHIC GROUP

REFERENCE NO. 68-55- 4

DATE 15/ 8/68

POSITION 76-17.5N, 77-56.0W

GMT 23.9

HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	0.90	24.560	0	19.707	803.1	0.90	803.1	0.00	0.00	9.75	1439.
10	2.16	32.040	10	25.618	238.2	2.16	237.9	0.52	0.01	8.70	1455.
20	2.53	32.480	20	25.940	207.6	2.53	207.2	0.75	0.05	8.90	1457.
30	1.28	32.780	30	26.270	176.2	1.28	175.9	0.94	0.10	9.09	1453.
50	-0.43	33.080	50	26.601	144.6	-0.42	144.5	1.26	0.23	8.41	1445.
76	-1.20	33.290	75	25.798	125.6	-1.19	125.8	1.60	0.44	8.10	1443.
101	-1.32	33.370	100	26.867	118.9	-1.32	119.3	1.91	0.72	8.05	1443.
126	-1.37	33.480	125	26.957	110.2	-1.37	110.7	2.19	1.05	7.83	1443.
151	-1.47	33.550	150	27.017	104.4	-1.46	105.1	2.46	1.43	8.00	1443.
177	-1.56	33.580	175	27.043	101.7	-1.55	102.6	2.72	1.87	7.88	1443.
202	-1.43	33.610	200	27.064	99.6	-1.43	100.6	2.98	2.35	7.89	1444.
273	-1.08	33.760	270	27.175	89.0	-1.09	90.1	3.65	3.95	7.42	1447.

PACIFIC OCEANOGRAPHIC GROUP

REFERENCE NO. 68-55- 5

DATE 16/ 8/68

POSITION 76- 7.1N, 84-54.0W

GMT 16.7

HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	0.70	23.250	0	18.663	903.6	0.70	903.6	0.00	0.00	0.45	1436.
10	-0.06	31.610	10	25.402	258.7	-0.06	258.5	0.58	0.01	2.05	1444.
20	-0.61	32.590	20	26.213	181.5	-0.61	181.3	0.79	0.05	8.53	1443.
30	-0.80	32.820	30	26.405	163.2	-0.79	163.1	0.96	0.09	7.42	1443.
50	-0.89	32.970	50	26.530	151.3	-0.89	151.3	1.28	0.22	7.59	1443.
76	-0.95	33.120	75	26.653	139.4	-0.94	139.6	1.64	0.45	9.09	1444.
101	-0.99	33.220	100	26.735	131.5	-0.99	131.8	1.99	0.76	7.89	1444.
126	-0.99	33.300	125	26.800	125.3	-0.99	125.6	2.31	1.13	7.61	1444.
151	-0.96	33.440	150	26.912	114.5	-0.96	115.0	2.61	1.56	7.19	1445.
202	-0.81	33.730	200	27.141	92.7	-0.81	93.3	3.14	2.49	6.77	1447.
303	-0.56	34.030	300	27.373	70.6	-0.56	71.3	3.94	4.55	5.92	1450.
505	-0.41	34.160	500	27.472	61.0	-0.42	61.9	5.25	9.94	5.84	1455.
708	-0.27	34.240	700	27.530	55.4	-0.29	56.4	6.43	17.15	5.18	1459.

PACIFIC OCEANOGRAPHIC GROUP

REFERENCE NO. 68-55- 6

DATE 18/ 8/68

POSITION 77-28.0N; 89-13.0W

GMT 17.0

HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	0.40	7.280	0	5.831	2156.0	0.40	2156.0	0.00	0.00	9.50	1414.
10	-0.24	31.250	10	25.119	285.6	-0.23	285.4	1.22	0.01	9.18	1443.
20	-0.77	32.120	20	25.839	217.0	-0.77	216.9	1.46	0.05	0.99	1442.
30	-1.12	32.380	30	26.060	195.9	-1.12	195.9	1.67	0.10	0.43	1441.
50	-1.45	32.670	50	26.303	172.7	-1.44	172.8	2.04	0.26	8.19	1440.
75	-1.21	33.070	75	26.621	142.4	-1.21	142.6	2.44	0.51	7.61	1442.
101	-0.97	33.420	100	26.896	116.3	-0.96	116.5	2.76	0.80	6.94	1444.
126	-0.68	33.780	125	27.176	89.8	-0.68	90.0	3.02	1.09	6.35	1447.
151	-0.43	34.010	150	27.352	73.2	-0.43	73.3	3.23	1.38	6.35	1448.
177	-0.26	34.250	175	27.538	55.6	-0.26	55.7	3.39	1.65	6.32	1450.
202	-0.19	34.380	200	27.639	46.1	-0.19	46.1	3.52	1.90	6.32	1451.
303	0.09	34.690	300	27.875	24.0	0.08	23.8	3.87	2.75	6.27	1454.

PACIFIC OCEANOGRAPHIC GROUP

REFERENCE NO. 68-55- 7

DATE 20/ 8/68

POSITION 76-53.6N, 89-49.0W GMT 0.9

HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	-1.02	28.660	0	23.052	482.4	-1.02	482.4	0.00	0.00	0.59	1436.
10	-1.18	32.070	10	25.811	219.7	-1.17	219.6	0.35	0.01	0.49	1440.
20	-1.29	32.290	20	25.992	202.5	-1.28	202.4	0.57	0.04	0.23	1440.
30	-1.24	32.520	30	26.177	184.8	-1.24	184.8	0.76	0.09	9.33	1441.
50	-1.18	32.740	50	26.353	168.0	-1.18	168.1	1.12	0.24	8.38	1441.
76	-1.09	32.970	75	26.536	150.5	-1.08	150.7	1.52	0.50	7.94	1443.
101	-0.90	33.390	100	26.870	118.8	-0.90	119.0	1.86	0.80	7.25	1445.
126	-0.71	33.690	125	27.105	96.5	-0.71	96.7	2.13	1.11	6.91	1446.

PACIFIC OCEANOGRAPHIC GROUP

REFERENCE NO. 68-55- 8

DATE 20/ 8/68

POSITION 76-23.5N, 89-12.5W

GMT 8.5

HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	-1.13	31.670	0	25.486	250.4	-1.13	250.4	0.00	0.00	9.30	1439.
9	-0.68	31.710	9	25.505	248.8	-0.68	248.6	0.23	0.01	9.52	1442.
19	-0.83	32.510	19	26.156	186.9	-0.83	186.8	0.45	0.04	8.52	1442.
39	-1.04	32.590	39	26.227	180.0	-1.03	180.0	0.81	0.15	8.68	1442.
65	-1.14	32.630	64	26.263	176.5	-1.14	176.6	1.26	0.39	8.31	1442.
90	-1.05	33.000	89	26.559	148.2	-1.05	148.5	1.67	0.71	7.71	1443.
115	-0.95	33.310	114	26.807	124.7	-0.95	125.0	2.02	1.06	7.26	1444.

PACIFIC OCEANOGRAPHIC GROUP

REFERENCE NO. 68-55- 9

DATE 21/ 8/68

POSITION 76-11.1N, 79-43.0W GMT 9.9

HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	1.20	30.810	0	24.697	325.6	1.20	325.6	0.00	0.00	9.04	1449.
10	1.00	31.370	10	25.157	282.0	1.00	281.8	0.31	0.01	9.19	1449.
20	0.90	32.450	20	26.029	199.1	0.90	198.9	0.55	0.05	9.62	1450.
30	0.88	32.710	30	26.238	179.2	0.88	178.9	0.74	0.10	9.62	1451.
50	0.50	32.950	50	26.452	158.8	0.50	158.6	1.08	0.24	8.48	1450.
76	-0.22	33.060	75	26.576	146.9	-0.22	146.9	1.46	0.48	7.97	1447.
101	-0.86	33.170	100	26.691	135.8	-0.86	136.0	1.82	0.80	7.97	1444.
126	-1.20	33.260	125	26.774	127.6	-1.19	128.1	2.15	1.18	8.36	1443.
151	-1.17	33.380	150	26.870	118.4	-1.17	119.0	2.46	1.62	7.75	1444.
177	-1.13	33.470	175	26.942	111.5	-1.13	112.2	2.75	2.11	7.43	1445.
202	-1.01	33.720	200	27.140	92.7	-1.01	93.4	3.01	2.60	6.99	1446.
303	-0.58	34.070	300	27.407	67.5	-0.58	68.1	3.77	4.55	6.10	1450.
505	0.28	34.170	500	27.446	64.5	0.26	64.4	5.11	10.00	6.10	1458.

PACIFIC OCEANOGRAPHIC GROUP

REFERENCE NO. 68-55- 10

DATE 22/ 8/68

POSITION 72-46.4N, 76-38.7W

GMT 7.5

HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	3.10	27.550	0	21.973	585.6	3.10	585.6	0.00	0.00	9.19	1453.
10	2.20	31.980	10	25.567	243.0	2.20	242.7	0.42	0.01	9.19	1455.
20	0.43	32.380	20	25.998	202.0	0.43	201.8	0.64	0.05	8.85	1448.
30	-0.64	32.540	30	26.174	185.2	-0.64	185.1	0.83	0.10	8.84	1443.
50	-0.90	32.690	50	26.304	172.7	-0.89	172.8	1.19	0.24	8.20	1443.
76	-1.05	32.810	75	26.406	162.9	-1.04	163.1	1.61	0.51	7.81	1443.
101	-1.19	32.900	100	26.493	155.4	-1.18	155.8	2.01	0.87	7.93	1442.
126	-1.30	33.110	125	26.656	138.8	-1.29	139.3	2.38	1.30	7.66	1443.
151	-1.24	33.150	150	26.686	135.7	-1.24	136.4	2.73	1.79	7.70	1443.
177	-1.21	33.370	175	26.863	118.9	-1.21	119.6	3.05	2.32	7.26	1444.
202	-1.14	33.490	200	26.958	109.8	-1.14	110.6	3.34	2.87	7.04	1445.
303	-0.48	33.840	300	27.217	85.5	-0.48	86.1	4.31	5.36	6.33	1450.
505	0.84	34.370	500	27.574	53.2	0.82	52.2	5.71	10.79	5.55	1461.

PACIFIC OCEANOGRAPHIC GROUP

REFERENCE NO. 68-55- 11

DATE 22/ 8/68

POSITION 72-42.6N, 78-30.4W GMT 19.0

HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	3.50	23.360	0	18.621	907.6	3.50	907.6	0.00	0.00	9.15	1449.
10	2.00	31.230	10	24.982	298.6	2.00	298.4	0.61	0.02	9.59	1453.
20	0.41	32.330	20	25.959	205.7	0.41	205.5	0.84	0.05	9.35	1448.
30	-0.47	32.620	30	26.232	179.7	-0.47	179.6	1.03	0.10	8.26	1444.
50	-0.85	32.750	50	26.351	168.3	-0.84	168.3	1.38	0.24	7.16	1443.
76	-1.07	32.860	75	26.447	159.0	-1.07	159.2	1.79	0.51	7.15	1443.
101	-1.20	32.950	100	26.523	151.5	-1.20	151.9	2.19	0.86	6.99	1442.
126	-1.31	33.030	125	26.591	144.9	-1.31	145.5	2.56	1.29	7.60	1443.
151	-1.26	33.180	150	26.711	133.4	-1.25	134.1	2.91	1.79	7.02	1443.
177	-1.24	33.320	175	26.824	122.6	-1.24	123.4	3.23	2.32	6.93	1444.
202	-1.16	33.480	200	26.951	110.4	-1.17	111.3	3.53	2.89	6.82	1445.
303	-0.98	33.760	300	27.172	89.3	-0.98	90.4	4.54	5.41	6.25	1448.
505	-0.59	34.320	500	27.609	47.9	-0.61	48.9	5.92	10.68	4.74	1454.

PACIFIC OCEANOGRAPHIC GROUP

REFERENCE NO. 68-55-12

DATE 23/ 8/68

POSITION 72-49.3N, 80- 7.5W

GMT 19.5

HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	QXY	SOUND
0	3.40	31.020	0	24.706	324.7	3.40	324.7	0.00	0.00	8.41	1459.
10	2.60	31.370	10	25.050	292.2	2.60	291.9	0.31	0.02	7.26	1456.
20	1.48	32.120	20	25.729	227.6	1.48	227.4	0.57	0.05	8.80	1452.
30	0.83	32.290	30	25.904	210.9	0.83	210.7	0.79	0.11	8.95	1450.
50	0.02	32.480	50	26.098	192.3	0.02	192.2	1.20	0.28	8.54	1447.
76	-0.80	32.610	75	26.236	179.0	-0.80	179.2	1.66	0.58	7.92	1443.
101	-1.16	32.880	100	26.465	157.0	-1.15	157.4	2.09	0.95	8.00	1443.
126	-1.35	33.080	125	26.633	140.9	-1.35	141.5	2.45	1.39	7.89	1442.
151	-1.30	33.250	150	26.769	127.9	-1.30	128.6	2.80	1.86	7.92	1443.
177	-1.25	33.310	175	26.816	123.3	-1.24	124.1	3.12	2.39	7.85	1444.

PACIFIC OCEANOGRAPHIC GROUP

REFERENCE NO. 68-55-13

DATE 24/ 8/68

POSITION 73-40.0N, 81-23.0W GMT 3.5

HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	3.20	31.760	0	25.311	267.1	3.20	267.1	0.00	0.00	8.79	1459.
10	2.84	31.820	10	25.389	259.9	2.84	259.6	0.27	0.01	8.65	1458.
20	1.40	32.090	20	25.710	229.4	1.40	229.2	0.51	0.05	8.87	1452.
30	0.26	32.330	30	25.966	205.0	0.27	204.8	0.73	0.11	0.07	1447.
50	-0.79	32.570	50	26.203	182.2	-0.79	182.3	1.12	0.26	0.90	1443.
76	-0.98	32.680	75	26.298	173.1	-0.98	173.2	1.56	0.55	0.05	1443.
101	-1.21	32.900	100	26.483	155.3	-1.20	155.7	1.98	0.92	8.03	1442.
126	-1.39	33.070	125	26.626	141.6	-1.38	142.2	2.35	1.35	8.69	1442.
151	-1.29	33.150	150	26.688	135.6	-1.29	136.3	2.70	1.84	9.60	1443.
177	-1.32	33.230	175	26.753	129.2	-1.32	130.1	3.04	2.40	7.66	1444.
202	-1.33	33.320	200	26.827	122.1	-1.33	123.1	3.35	3.01	7.26	1444.
353	-1.39	33.610	350	27.063	98.8	-1.40	100.7	5.03	7.61	7.39	1447.

PACIFIC OCEANOGRAPHIC GROUP

REFERENCE NO. 68-55-14

DATE 24/ 8/68

POSITION 74-10.0N, 85-59.4W GMT 12.9

HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	2.60	30.930	0	24.699	325.3	2.60	325.3	0.00	0.00	8.99	1455.
10	0.20	31.370	10	25.197	278.2	0.20	277.9	0.30	0.01	9.74	1445.
20	-0.86	32.130	20	25.850	215.9	-0.86	215.8	0.55	0.05	0.23	1442.
30	-1.46	32.270	30	25.980	203.5	-1.46	203.5	0.76	0.10	7.03	1439.
50	-1.48	32.400	50	26.086	193.3	-1.48	193.5	1.16	0.27	8.00	1440.
76	-1.51	32.490	75	26.159	186.1	-1.50	186.5	1.64	0.57	7.59	1440.
101	-1.55	32.660	100	26.298	172.8	-1.54	173.3	2.09	0.98	7.28	1440.
126	-1.58	32.870	125	26.469	156.4	-1.58	157.1	2.51	1.46	7.05	1441.
151	-1.59	32.940	150	26.526	150.8	-1.59	151.7	2.90	2.00	6.93	1441.
177	-1.41	33.080	175	26.634	140.4	-1.41	141.3	3.27	2.62	6.93	1443.
202	-1.25	33.270	200	26.784	126.2	-1.25	127.2	3.60	3.27	7.26	1444.
303	-0.57	33.830	300	27.213	85.8	-0.58	86.5	4.65	5.91	5.96	1450.
505	0.77	34.250	500	27.482	61.8	0.75	60.9	6.15	11.80	5.15	1460.

PACIFIC OCEANOGRAPHIC GROUP

REFERENCE NO. 68-55- 15

DATE 30/ 8/68

POSITION 74-38.5N, 109-47.5W

GMT 0.0

HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	-0.40	24.060	0	19.335	838.9	-0.40	838.9	0.00	0.00	0.70	1432.
10	-0.59	31.020	10	24.946	302.0	-0.58	301.8	0.57	0.02	9.91	1441.
20	-0.96	31.880	20	25.651	234.9	-0.95	234.7	0.83	0.06	0.85	1441.
30	-1.27	31.960	30	25.724	227.8	-1.25	227.8	1.06	0.11	0.32	1440.
50	-1.58	32.120	50	25.861	214.5	-1.58	214.8	1.51	0.30	9.15	1439.
76	-1.63	32.290	75	26.000	201.2	-1.62	201.6	2.03	0.63	8.51	1439.
101	-1.39	32.580	100	26.229	179.3	-1.39	179.8	2.52	1.07	5.99	1441.
126	-1.19	33.290	125	26.798	125.3	-1.19	125.8	2.90	1.50	6.95	1443.
151	-0.96	33.720	150	27.139	93.1	-0.96	93.5	3.17	1.88	6.41	1446.
177	-0.73	34.020	175	27.373	71.0	-0.74	71.4	3.38	2.23	5.71	1447.

PACIFIC OCEANOGRAPHIC GROUP

REFERENCE NO. 68-55-16

DATE 31/ 8/68

POSITION 74-18.0N, 110- 0.0W GMT 3.5

HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	-0.38	23.440	0	18.836	887.0	-0.37	887.0	0.00	0.00	0.50	1432.
10	-0.79	31.330	10	25.202	277.6	-0.79	277.4	0.58	0.01	9.57	1441.
20	-1.11	31.850	20	25.631	236.7	-1.10	236.7	0.84	0.05	0.29	1440.
30	-1.34	31.930	30	25.702	229.9	-1.33	229.9	1.07	0.11	0.10	1439.
50	-1.36	32.130	50	25.864	214.4	-1.36	214.5	1.52	0.30	8.90	1440.
76	-1.37	32.390	75	26.075	194.2	-1.37	194.5	2.03	0.63	7.70	1440.
101	-1.39	32.740	100	26.359	167.0	-1.39	167.5	2.49	1.03	6.69	1441.
126	-1.37	33.110	125	26.658	138.5	-1.37	139.2	2.88	1.48	6.85	1442.
151	-1.24	33.510	150	26.978	108.2	-1.23	108.8	3.19	1.91	6.25	1444.
177	-0.90	33.790	175	27.193	87.9	-0.90	88.4	3.44	2.32	5.96	1446.
202	-0.62	34.060	200	27.400	68.4	-0.62	68.7	3.63	2.70	5.50	1448.
303	0.10	34.680	300	27.866	24.8	0.09	24.6	4.06	3.78	5.17	1454.
505	0.34	34.820	500	27.965	15.8	0.32	15.1	4.47	5.38	5.06	1459.

PACIFIC OCEANOGRAPHIC GROUP

REFERENCE NO. 68-55-17

DATE 31/ 8/68

POSITION 74-27.0N, 113-48.0W GMT 11.0

HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	-0.66	20.880	0	16.775	1085.9	-0.66	1085.9	0.00	0.00	9.90	1427.
10	-0.87	31.070	10	24.994	297.4	-0.86	297.2	0.69	0.02	0.29	1440.
20	-1.13	31.870	20	25.648	235.1	-1.12	235.0	0.95	0.05	0.59	1440.
30	-1.31	31.950	30	25.717	228.4	-1.31	228.4	1.18	0.11	0.27	1439.
50	-1.40	32.030	50	25.784	221.9	-1.39	222.1	1.63	0.30	9.24	1439.
76	-1.44	32.370	75	26.060	195.5	-1.43	195.9	2.16	0.64	7.39	1440.
101	-1.41	32.770	100	26.383	164.7	-1.40	165.2	2.62	1.04	6.95	1441.
126	-1.33	33.190	125	26.721	132.5	-1.32	133.1	2.99	1.47	6.47	1443.
151	-0.97	33.660	150	27.090	97.6	-0.97	98.1	3.23	1.88	6.36	1445.
177	-0.69	33.990	175	27.347	73.5	-0.69	73.8	3.50	2.24	5.83	1448.
202	-0.54	34.260	200	27.558	53.5	-0.54	53.8	3.66	2.54	5.51	1449.
328	0.22	34.750	325	27.916	20.3	0.21	19.9	4.12	3.66	4.85	1455.

PACIFIC OCEANOGRAPHIC GROUP

REFERENCE NO. 66-55-18

DATE 31/ 8/68

POSITION 74-22.3N, 114-36.0W

GMT 22.5

HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	-0.99	4.400	0	3.424	2394.5	-0.98	2394.5	0.00	0.00	0.80	1403.
10	-1.30	30.550	10	24.585	336.4	-1.29	336.3	1.36	0.02	0.56	1437.
20	-1.27	30.770	20	24.762	319.4	-1.27	319.3	1.69	0.07	0.64	1438.
30	-1.34	31.680	30	25.500	249.1	-1.34	249.2	1.98	0.14	0.81	1439.
50	-1.38	31.930	50	25.703	229.7	-1.37	229.8	2.46	0.33	0.43	1439.
75	-1.37	32.270	75	25.978	203.4	-1.36	203.7	3.01	0.68	7.70	1440.
101	-1.33	32.660	100	26.292	173.3	-1.33	173.8	3.48	1.11	6.69	1441.
126	-1.31	33.000	125	26.567	147.2	-1.31	147.7	3.88	1.57	6.60	1442.
151	-1.20	33.430	150	26.912	114.5	-1.20	115.0	4.22	2.04	6.38	1444.
176	-0.87	33.800	175	27.200	87.3	-0.87	87.7	4.47	2.46	6.05	1446.
202	-0.59	34.070	200	27.407	67.8	-0.59	68.1	4.66	2.83	5.71	1449.
303	0.13	34.700	300	27.881	23.5	0.12	23.2	5.08	3.89	5.29	1454.
455	0.33	34.810	450	27.958	16.5	0.31	15.9	5.39	5.02	5.04	1458.

PACIFIC OCEANOGRAPHIC GROUP

REFERENCE NO. 68-55-19

DATE 8/ 9/68

POSITION 74-50.8N, 92-44.0W GMT 19.1

HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SCUND
0	-1.61	30.180	0	24.290	364.3	-1.60	364.3	0.00	0.00	0.67	1435.
5	-1.61	30.150	5	24.266	366.8	-1.60	366.6	0.18	0.00	0.56	1435.
10	-1.52	30.180	10	24.289	364.5	-1.51	364.4	0.37	0.02	0.88	1436.
20	-1.36	30.970	20	24.926	303.8	-1.36	303.8	0.71	0.07	0.69	1438.
30	-1.37	32.090	30	25.832	217.5	-1.37	217.5	0.97	0.14	9.99	1439.
50	-1.36	32.580	50	26.228	179.8	-1.35	179.9	1.37	0.30	8.36	1440.
76	-1.33	32.920	75	26.503	153.6	-1.33	153.8	1.79	0.56	7.92	1441.

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 68-55- 20
POSITION 74-45.0N, 92-44.0W
HYDROGRAPHIC CAST DATA

DATE 10/ 9/68
GMT 16.4

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	0.20	31.000	0	24.899	306.2	0.20	306.2	0.00	0.00	9.48	1445.
5	0.20	31.010	5	24.908	305.7	0.20	305.5	0.15	0.00	9.48	1445.
10	0.20	31.240	10	25.092	288.1	0.20	287.9	0.30	0.02	9.15	1445.
20	-0.27	31.560	20	25.370	261.6	-0.27	261.5	0.58	0.06	9.46	1444.
30	-0.69	32.020	30	25.756	224.9	-0.69	224.8	0.83	0.12	9.56	1442.
50	-1.24	32.120	50	25.853	215.4	-1.23	215.6	1.27	0.30	9.03	1440.
76	-1.36	32.810	75	26.415	161.9	-1.36	162.2	1.75	0.59	7.59	1441.
101	-1.49	32.990	100	26.564	147.6	-1.48	148.1	2.14	0.94	7.26	1441.

PACIFIC OCEANOGRAPHIC GROUP

REFERENCE NO. 68-55-21

DATE 13/ 9/68

POSITION 72-20.0N, 80-32.0W GMT 3.9

HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	2.60	26.080	0	20.838	694.4	2.60	694.4	0.00	0.00	9.47	1449.
10	0.70	28.770	10	23.087	479.3	0.70	479.1	0.59	0.02	9.02	1444.
20	0.36	32.110	20	25.784	222.3	0.36	222.1	0.94	0.07	9.40	1447.
30	-0.07	32.320	30	25.973	204.2	-0.06	204.1	1.16	0.13	9.35	1446.
50	-0.83	32.530	50	26.172	185.2	-0.82	185.3	1.55	0.28	8.97	1443.
76	-1.32	32.620	75	26.260	176.6	-1.31	176.9	2.00	0.58	8.19	1441.
101	-1.54	32.700	100	26.330	169.7	-1.54	170.2	2.44	0.97	8.08	1441.
126	-1.51	32.850	125	26.451	158.1	-1.50	158.8	2.85	1.45	7.36	1441.
151	-1.44	33.040	150	26.603	143.5	-1.44	144.4	3.23	1.98	7.42	1442.
202	-1.20	33.350	200	26.847	120.3	-1.20	121.2	3.90	3.17	6.69	1445.
303	-0.79	33.790	300	27.189	87.8	-0.80	88.8	4.93	5.79	5.96	1449.
505	-0.58	33.980	500	27.334	73.7	-0.59	75.0	6.50	12.23	5.17	1453.
708	-0.38	33.990	700	27.333	73.6	-0.40	75.0	7.99	21.43	5.28	1458.

PACIFIC OCEANOGRAPHIC GROUP

REFERENCE NO. 68- 0- 22

DATE 15/ 9/68

POSITION 72- 4.5N, 80-48.0W

GMT 18.0

HYDROGRAPHIC CAST DATA

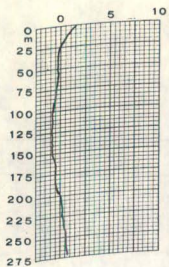
PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	2.25	25.140	0	20.110	764.3	2.25	764.3	0.00	0.00	8.70	1446.
5	2.21	25.430	5	20.344	742.1	2.21	741.9	0.38	0.01	8.80	1446.
10	2.17	25.940	10	20.752	702.9	2.17	702.7	0.74	0.04	9.13	1447.
20	1.34	31.000	20	24.841	312.1	1.34	311.8	1.25	0.10	9.68	1450.
30	0.51	32.110	30	25.777	223.0	0.51	222.8	1.51	0.17	0.21	1448.
50	-0.75	32.490	50	26.137	188.5	-0.75	188.5	1.91	0.34	9.25	1443.
76	-1.16	32.650	75	26.280	174.8	-1.16	175.0	2.36	0.63	8.19	1442.
101	-1.57	32.720	100	26.347	168.1	-1.57	168.6	2.80	1.01	7.68	1440.

SECTION II.

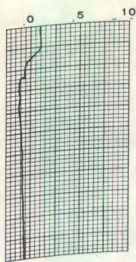
Bathothermograms

Bathothermogram Positions

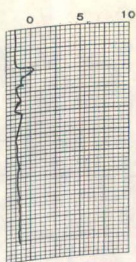
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1	76°59.5'	71°50'	1
2	77°00'	74°10'	2
3	67°55'	76°09'	3
4	76°17.5'	77°56'	4
5	76°07.1'	84°54'	5
6	77°28'	89°13'	6
7	76°53.6'	89°49'	7
8	76°23.5'	89°12.5'	8
9	76°11.1'	79°43'	9
10	72°44.5'	76°43'	
11	72°46.4'	76°38.7'	10
12	72°48.3'	76°35.6'	
13	72°42.6'	78°30.4'	11
14	72°47.4'	80°16.5'	
15	72°49.3'	80°07.5'	12
16	72°50.8'	80°01'	
17	73°40'	80°56'	
18	73°40'	81°11.5'	13
19	73°40'	81°23'	
20	73°54.8'	86°02'	
21	74°10'	85°59.4'	14
22	74°25'	86°00.5'	
23	74°46'	110°22'	
24	74°42'	110°02'	
25	74°38.5'	109°47.5'	15
26	74°18.0'	110°00'	16
27	74°27'	113°48'	17
28	74°22.3'	114°36'	18
29	74°50.8'	99°34'	19
30	74°45'	92°44'	20
31	72°20'	80°32'	21
32	72°04.5'	80°48'	22



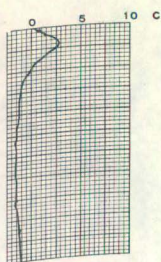
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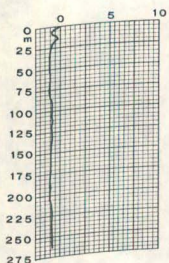
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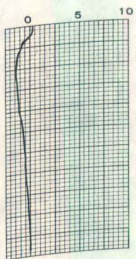
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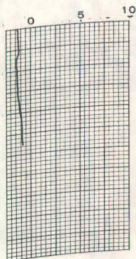
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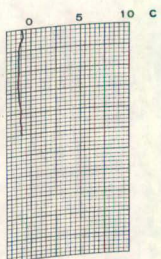
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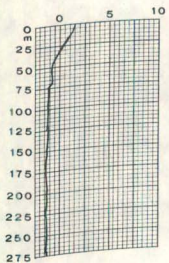
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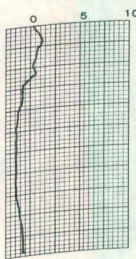
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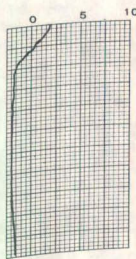
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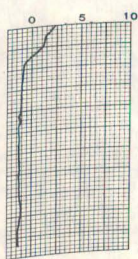
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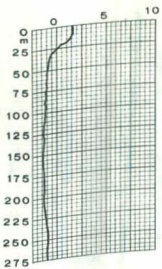
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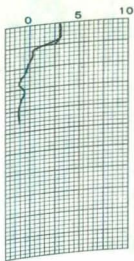
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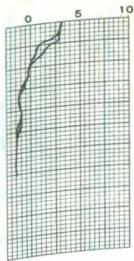
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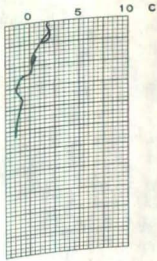
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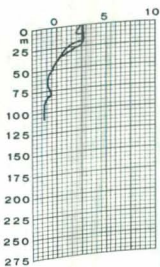
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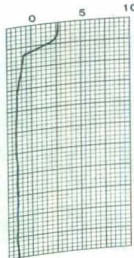
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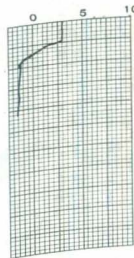
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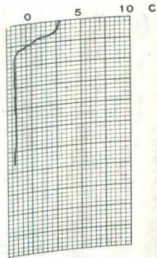
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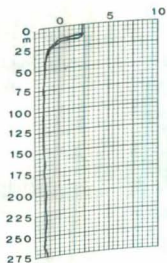
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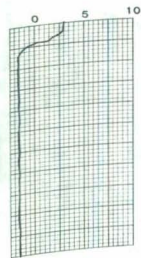
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20



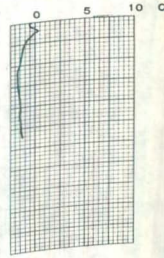
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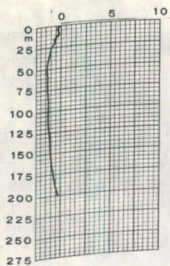
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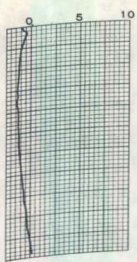
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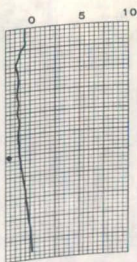
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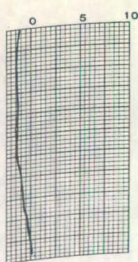
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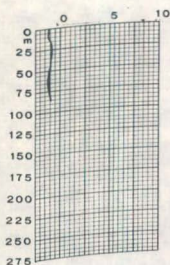
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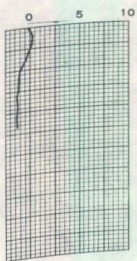
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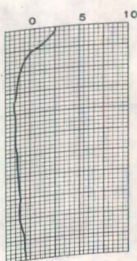
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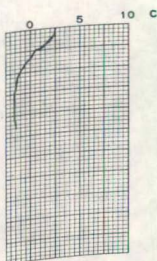
29



30



31



32

