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Biological Observations in Fatty Basin, Vancouver Island, British Columbia, 1969

by

Michael Hardon

Biological Station, Nanaimo, B.C.
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Index

Page

INTRODUCTION

This report contains data collected from 10 May to 18 August 1969 during a biological oceanographic investigation conducted at Fatty Basin, Vancouver Island, B. C., site of the Fisheries Research Board of Canada lobster transplant project.

The programme was designed to indicate the abundance of larval lobsters within Fatty Basin, to investigate the dispersal and distribution of larvae within Fatty Basin and in adjacent Useless Inlet, and to measure the zooplankton availability and composition within the same area. Some physico-chemical measurements of seawater conditions were also included. In addition, measurement of solar radiation was taken.

The routine sampling was discontinued after 26 June 1969 when it became apparent that the anticipated accumulation of lobster larvae at the surface failed to appear. Six larval lobsters were collected during the course of the programme. A simple programme for monitoring the zooplankton crop was maintained for the duration of July and August 1969.

Most of the samples were taken from FRB "Decibar" while others were taken from smaller craft located at Fatty Basin. Execution of the programme was by the author during employment as a student assistant. Scientist in charge of the programme was R. J. LeBrasseur, Pacific Oceanographic Group, Fisheries Research Board of Canada, Biological Station, Nanaimo, B. C.

MATERIALS AND METHODS

I. Inlet Monitoring

Four stationary plankton samplers were located in the outlets to Fatty Basin in order to monitor the near-surface layer of incoming and outgoing water. Monitor positions are shown in Fig. 1. Each monitor assembly consisted of a Standard Miller sampler with a mouth orifice of 1/100 metre and with a net having a mesh aperture of 350 microns. Flow meters (T.S.K. Company) were attached to determine volumes of water sampled; the entire assembly was held within the upper 0.3 m of water by styrofoam floats and was anchored to the bottom.

Samples were collected twice each day, once during the flood tide and once during the ebb tide. The duration of sampling period ranged from one hour to three hours. Samples were collected consistently during the same portions of the tidal cycle, which are indicated in Fig. 2. Flow meter readings were recorded in all cases; in instances where the velocity of water current fell within the limits of calibration of the instrument, the volume of water sampled was calculated. It should be noted that flow meter readings were erratic, owing to irregularities in tidal current at the basin outlets and to clogging of the meter mechanism by water-borne debris. Hence the readings could not always be regarded as clearly indicative of the volume sampled. Therefore, in order to compare all monitor samples, the results are expressed as numbers of organisms caught per ten-minute period.

II. Areal Surveys

A series of seven tows within Fatty Basin and ten tows in Useless Inlet was established; positions are indicated in Fig. 3. Tows in Fatty Basin were approximately 400 m in length; those in Useless Inlet were approximately 750 metres in length. When sampling periods of longer duration or tows of greater length were required, the apparatus was towed in a circle of diameter approximately 400 m in the centre of Fatty Basin. This tow was designated the "Inner Circle" and abbreviated "i/c".

1. Miller Surface Areal Samples

This series of samples was collected by suspending the apparatus from the boom and port outrigger of "Decibar" in order to avoid both the bow wash and propeller wake of the vessel. The sampler was held within the upper 0.3 m of water. Velocity was maintained at a constant value over a given tow, but varied overall from 1.5 m/sec to 3.0 m/sec. Standard Miller samplers were used in all cases. Micro Miller Samplers, having a mouth orifice of 1/1000 m^2 and filtering surface aperture of 100 μ, were used in a limited number of cases for collection of microzooplankton.

Collections over the entire area were made at least once every four days; during the intervening periods samples were collected daily at positions 6 and 7. Whenever possible areal surveys were conducted at high water slack.

2. Miller Oblique Areal Samples

Collections were made by lowering a Miller Sampler to a depth of 15 metres and then raising it to the surface at a constant rate while the vessel was underway at a velocity of 3 m/sec.

3. Multiple Miller Areal Samples

A series of Standard Miller samplers was attached to a single cable in order to obtain simultaneously samples from different and discrete depths. The assembly was towed for a given period and the depth of each sampler was recorded.

Samples were preserved in 4% formalin upon collection. Terrestrial and marine debris was removed and the number of organisms in each taxonomic division was determined by visual count using a dissecting microscope. Twelve size categories from 125 μ to 1100 μ were selected for organisms collected by the Micro Miller sampler (microzooplankton). Similarly, eight size categories from "less than 0.5 mm" to "greater than 15.1 mm" were selected for organisms collected by the Standard Miller sampler. The length of each organism was noted and the total number of organisms of each taxonomic division in each size category was determined. Length of copepods was taken as the total length including the urosome; the length of all other organisms was taken as the total length less appendages. Results are expressed as the number of organisms per cubic meter of water unless otherwise stated.

4. Horizontal Areal Tows

A net having a mouth orifice of 1/4 m^2 and mesh aperture of 350 μ was employed in the sampling of larger volumes of water during the later stages of the programme. Where surface samples were taken, the methodology was identical to that used for Miller surface samples; the uppermost 0.57 m of water was sampled in these instances. Subsurface samples were taken by lowering the net to the desired depth, towing it at this depth for a given period, and then raising it quickly to the surface at the conclusion.

Samples were preserved as above, but were analyzed only for the presence of lobster larvae. Other organisms were neither measured nor counted.

During the period 10 June 1969 to 18 June 1969, 56 tows using the 1/4 m^2 net were made in Fatty Basin at depths from 0 m to 7 m. In a total volume of 20,000 m^3, 3 lobster larvae were found.

III. Vertical Hauls

A 1/4 m^2 net of the above description was lowered to the indicated depth and raised to the surface at a velocity of approximately 1 m/sec. Initial samples were taken during darkness in the presence of a strong beam of light and analyzed only for lobster larvae. Eleven hauls were taken in this manner on 18 June 1969 and 19 June 1969. In a total volume of 55 m^3 no larval lobsters were found. Total counts of organisms were made for subsequent samples taken in daylight at high water slack. Results are expressed as the number of organisms per cubic metre. Station positions are identical to those of Fig. 4.

IV. Physico-Chemical Data

Temperature and salinity were measured in situ by an induction salinometer (Industrial Instrument Co.). Concentration of dissolved oxygen was determined according to the method of Strickland and Parsons (1968). Secchi disk readings were determined visually. A 60-m bathythermograph was used for additional temperature determinations, all of which were taken at Station B. Solar radiation was measured by an actinograph (Cassella) located at Fatty Basin. Stations are shown in Fig. 4.

Additional information and data related to the Fatty Basin study is available in Herlinveaux (1966) and Ghelardi (1967).

ACKNOWLEDGMENTS

Generous assistance rendered by Dr. R. J. Ghelardi and Mr. C. T. Shoop and their staff at Fatty Basin is gratefully acknowledged. The cooperation of Mr. Owen Kennedy, Mr. John D. Fulton and Mr. R. H. Herlinveaux, Pacific Oceanographic Group, was invaluable. Thanks are also due to Mr. Robert E. Hirst whose maintenance and operation of "Decibar" ensured continuity of the programme.

REFERENCES

Ghelardi, R. J. 1967. Progress report on the 1965 and 1966 lobster introductions at Fatty Basin, Vancouver Island, British Columbia. Fish. Res. Bd. Canada, Tech. Rept., No. 44, 39 p., 1 appendix.

Herlinveaux, R. H. 1966. Oceanographic phase of the Fatty Basin study for a lobster transplant. Fish. Res. Bd. Canada, MS Rept. (Oceanogr. and Limnol.), No. 228, 21 p., 19 figs., 1 appendix.

Strickland, J.D.H. and T.R. Parsons. 1968. A practical handbook of sea-water analysis. Bull. Fish. Res. Bd. Canada, No. 167, 311 p.

DATA AND RESULTS

Resume of Animals Found in the Pelagic Zone

PHYLUM COELENTERATA

Sarsia flammea

Aequorea aequorea

PHYLUM CTENOPHORA

Pleurobrachia pileus

PHYLUM MOLLUSCA

Class Gastropoda

PHYLUM ARTHROPODA

Class Crustacea

Subclass Copepoda

Acartia

Pseudocalanus minutus

Aetidius armatus

Tortanus discaudatus

Calanus pacificus

Eucalanus bungii bungii

Subclass Cirripedia

Balanus sp. (nauplii, cyprids)

Subclass Malacostraca

Order Amphipoda

Parathemisto pacifica

Order Decapoda

Family Cancrinae

Family Grapsidae

Family Hippolytidae

Family Paguridae

Family Pandalidae

Family Nephropsidae

Homarus americanus

PHYLUM ECTOPROCTA

Cyphonautes larvae

PHYLUM CHAETOGNATHA

Sagitta elegans

PHYLUM CHORDATA

Class Larvacea

Oikopleura sp.

Class Osteichthyes

Ammodytes hexapterus

Artedius lateralis

Blepsias cirrhosus

Chiropsis decagrammus

Clupea pallasii

Cymatogaster aggregata

Lebius superciliosus

Leptocottus armatus

Myoxcephalus polyacathocephalus

Pholis laeta

Rhingobiops nicholsii

Scorpaenichthys marmoratus

Sebastodes melanops

Sebastodes proriger

EXPLANATION OF HEADINGS

1. General Headings

Date:	Day, month
Start Time:	Commencement, Pacific Daylight Saving Time.
Duration:	Sampling period, given as minutes or as minutes: seconds.
Vol. sampled:	Number of cubic metres of water sampled, calculated assuming 100% filtration.
Depth:	Sampling depth in metres.
i/c:	Inner circle tow (centre of Fatty Basin).
μ	Measurement in microns.

2. Taxonomic Headings

Aq:	*Aequorea* sp.
Cirr:	Cirripedia: barnacle nauplii and cyprid stages, length less than 1.0 mm.
Cope:	<1.0: copepods of length (including urosome) less than 1.0 mm. Mostly *Acartia*.
	1.1-1.5: copepods of length between 1.1 mm and 1.5 mm. *Acartia* and some *Pseudocalanus*.
	1.6-2.5: copepods of length between 1.6 mm and 2.5 mm; mostly adult *Acartia*.
Cyph:	Cyphonautes larvae, length less than 1.0 mm.
Deca:	Decapod juveniles, zooea and megalops stages of length between 1.0 mm and 4.6 mm.
E:	Eggs, diameter size indicated.
Ga:	Gastropods: immature forms.
Ha:	*Homarus americanus*, Stage I.

Oik:	Oikopleura sp.
Pl:	Pleurobrachia sp.
Pp:	Parathemisto sp.
Sa:	Sarsia sp.
Se:	Sagitta sp.

3. Physico-Chemical Headings

T°C:	In situ temperature in degrees Centigrade.
S‰:	Salinity in parts per thousand.
Secchi:	Mean Secchi disk depth in metres.
Radiation:	Total radiation in langleys per day.

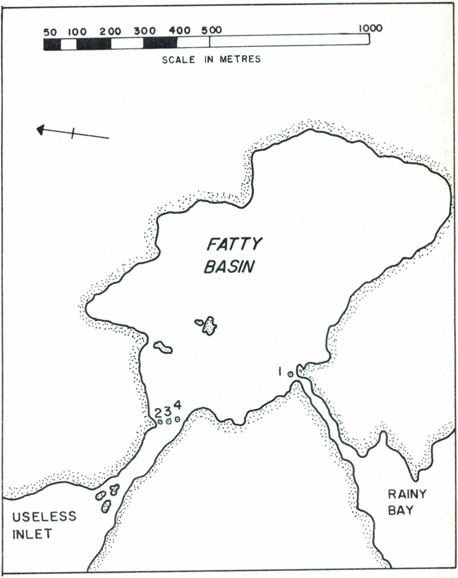


Fig. 1. Location of Inlet Monitor Positions

in Fatty Basin

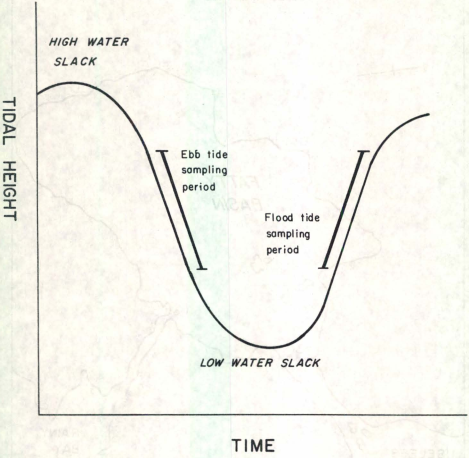


Fig. 2 Sampling Periods of Inlet Monitors

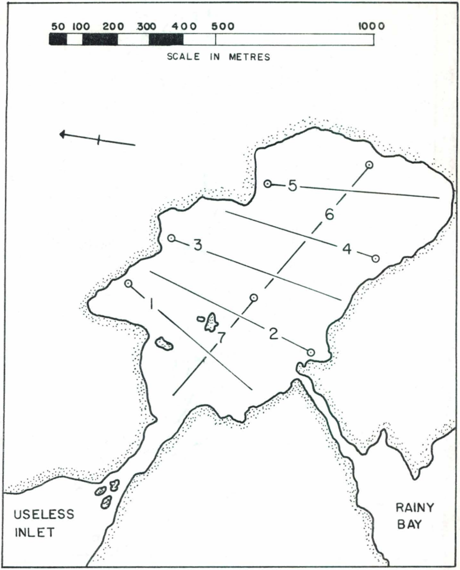


Fig. 3 (a) Location of Areal Survey Positions in Fatty Basin

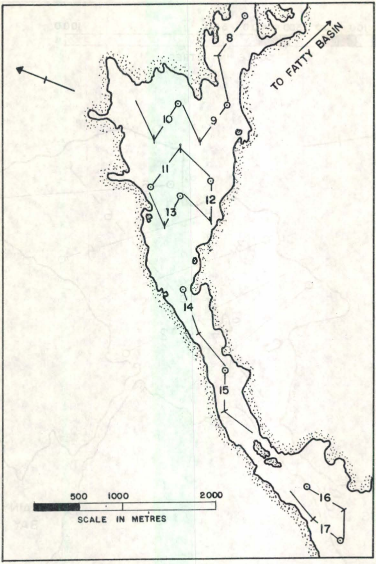


Fig. 3 (b) Location of Areal Survey Positions in Useless Inlet

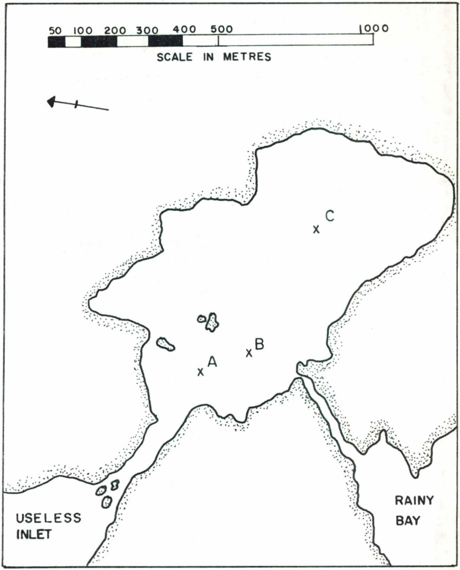


Fig. 4 Location of Physico-Chemical Stations in Fatty Basin

I. Inlet Monitor Results

							Organisms/ten minutes							
										Copepoda				
Date	Start time	Duration	Station	Meter read	Vol. sampled	Tide	Cyph. <1.0	Cirri. <1.0	Oik. <1.0	<1.0	1.1-1.5	1.6-2.5	Deca. 1.0-4.5	Other
10/5	2130	130	1	30		ebb	3.0	0.7	1.1	20.3	38.7	0.9	0.3	3.0 E 120 μ
11/5	0728	137	1	8700		flood	9.8		16.2	98.9	150.0		3.2	0.2 Aq
	1320	121	1	140		ebb	0.4		0.4	0.9	1.3	0.2	0.1	1.7 E 120 μ
	1730	155	1	17530	25.1	flood	46.4	21.8	40.7	13.1	113.8	64.2	1.2	0.2 Aq
12/5	0759	126	1	4280		flood	46.1	6.0	91.7	16.1	94.2	51.4		0.2 Aq
	0810	102	2	3970		flood	3.9	81.1	35.2	77.6	183.5		2.7	1.9 Ga
	0755	122	3	4980		flood	20.9	81.3	89.5	107.2	116.0		1.3	0.2 Sa
	1247	130	1	765		ebb	14.9	9.8	8.0	1.0	4.7			0.1 Sa
	1254	112	2	12690	17.5	ebb	43.2	3.3	22.5	9.6	37.5	26.2	0.4	3.7 E 850 μ
	1257	113	3	7710		ebb	2.3	0.7	1.4	10.6	16.8			1.2 E 120 μ
	1903	124	1	n/r		flood	68.7	69.0	62.2	15.4	167.5		2.6	0.6 Sa; 0.2 Aq
	1908	127	2	13625	19.1	flood	95.1	11.0	83.1	158.7	88.8		3.4	0.9 Pl; 0.3 Sa
	1910	133	3	18825	27.1	flood	168.7	239.0	86.9	158.4	230.4		3.0	1.2 Pp; 0.6 Sa
	1912	134	4	26515	38.6	flood	99.4	100.2	4.1	96.7	93.1		5.3	1.4 Pp; 0.1 Pl
13/5	0742	133	1	15875	22.3	flood	26.9	27.2	25.2	10.5	48.7	21.3	1.5	
	0733	129	2	6200		flood	186.3	85.8	12.0	128.3	87.4		3.1	0.6 Se; 1.2 Sa
	0736	129	3	23540	34.1	flood	79.3	93.0	4.5	130.2	96.7	5.5	11.4	1.8 Pp
	0738	132	4	20815	30.1	flood	132.7	100.0	85.4	96.3	101.8		11.5	0.9 Se; 1.2 Sa
	1325	175	2	120		ebb	93.2	79.5	1.6	24.0	19.2	0.6	0.1	0.05 Ha; 0.1 Pp; 0.1 Se
	1324	178	3	11560		ebb	11.0	13.7	2.2	14.1	10.2		0.4	
	1332	179	4	11980		ebb	56.9	47.3	11.3	17.4	22.1		0.3	
14/5	0804	222	1	24645	34.6	flood	17.1	22.1	7.1	40.9	28.1		0.5	0.9 Ga
	0756	216	2	20160	27.2	flood	62.5	55.5	4.2	40.5	36.1	1.1	0.6	0.4 Pp; 0.2 Se; 0.6 Sa
	0758	220	3	33160	47.5	flood	34.0	35.1	1.0	27.8	34.3		6.5	0.2 Se
	0759	220	4	3320		flood	43.7	39.6	4.3	33.2	41.4	2.1	4.4	0.4 Sa
	1451	150	1	10		ebb	1.4	13.3	1.3	0.2	1.8	0.3	0.1	
	1440	150	2	2670		ebb	34.9	22.5	2.9	10.6	22.4		4.0	0.3 Pp
	1442	151	3	18530	26.3	ebb	13.2	15.6		11.6	7.5			
	1446	151	4	7060		ebb	36.0	30.1		4.5	14.8		1.8	0.1 Sa
	2002	134	1	20960	30.6	flood				No sample				
	1958	128	2	14790	20.7	flood	121.8	112.5	17.8	101.2	86.2		6.2	2.1 Pp; 0.3 Sa
	2000	130	3	28270	42.1	flood	247.3	217.6		125.5	131.0		6.7	1.2 Pp; 2.4 Se
	2002	108	4	9410		flood	121.1	110.0		156.2	200.0		19.2	0.4 Sa
15/5	2117	135	1	27960	41.3	flood	55.1	51.5	25.4	40.5	149.3	2.9	10.6	
	2106	119	2	13580	18.6	flood	82.6	187.5	22.8	88.7	112.9		165.3	

Cont'd ...

							Organisms/ten minutes							
										Copepoda				
Date	Start time	Duration	Station	Meter read	Vol. sampled	Tide	Cyph. <1.0	Cirri. <1.0	Oik. <1.0	<1.0	1.1-1.5	1.6-2.5	Deca. 1.0-4.5	Other
	2110	126	3	60		flood	0.3	1.5		0.1	0.3		0.1	
	2112	131	4	22680	33.0	flood	114.5	115.7	10.6	33.8	57.7		15.5	0.1 Pl; 0.9 Se
16/5	1557	124	1	10		ebb	10.8			0.5	2.5			
	1547	123	2	7780		ebb	195.1	15.3	1.3	0.7	11.7	1.9	0.7	
	1549	124	3	89265	137.6	ebb	66.7	60.6		31.2	20.9			
	1552	124	4	7140		ebb	96.7	13.5		22.2	16.7			
17/5	0358	119	1	1930		ebb	30.7	14.7	0.7	13.4	35.2		0.7	
	0342	125	2	27140	39.8	ebb	67.2	16.7	0.6	13.7	48.0		4.4	0.3 Se
	0345	125	3	10320		ebb	47.0	25.9	0.3	17.2	19.8		2.5	
	0347	125	4	12880	25.5	ebb	41.2	36.1	0.3	12.8	24.0		4.4	0.3 Se
	1049	116	1	12310	15.7	flood	48.6	27.9	0.5	12.0	20.0		5.1	
	1030	121	2	11780	16.2	flood	130.9	132.2	2.3	22.4	50.2			0.7 Se
	1043	114	3	53990	82.1	flood	109.4	100.0	0.4	28.4	71.5		17.8	0.3 E 400 μ
	1045	115	4	2790		flood	130.4	65.7	0.3	6.6	13.5		1.0	0.1 Se
18/5	1130	122	1	16000	22.7	flood	34.0	40.3	0.8	3.9	32.4		7.3	
	1117	125	2	70		flood	50.5	28.9	0.3	26.8	59.5			
	1120	124	3	13490	17.9	flood	60.9	104.5	5.8	36.7	62.9		5.8	1.0 Pp
	1123	124	4	31410	46.9	flood	52.2	71.6	0.2	9.6	30.9		95.0	0.1 Ha
	1747	67	1	120		ebb	22.6	20.5	3.6	1.5	1.8			
	1738	82	2	n/r		ebb	47.5	8.0	0.6	5.3	16.5			
	1741	81	3	3940		ebb	216.2	7.4	0.5		3.4			
	1743	81	4	3480		ebb	173.3	8.1		5.4	11.8		0.1	
19/5	1802	110	1	10		ebb	9.9	3.6		1.9	4.4			
	1752	110	2	196		ebb	18.2			0.3	2.6	0.1		
	1755	109	3	280		ebb	21.2			3.1	4.2			
	1757	111	4	460		ebb	21.4	3.9		0.5	2.5			
20/5	1241	60	1	6975	9.7	flood	113.3	64.6		23.3	37.3			0.3 Aq
	1231	62	2	1790		flood	24.1	23.8		1.7	21.2	0.2		0.3 Se
	1234	61	3	1050		flood	30.4	87.2	6.2	32.4	7.6			1.6 Se; 0.2 Aq
	1236	61	4	1540		flood	72.1	65.5	0.7	25.5	42.6		21.6	
20/5	1839	123	1	20		ebb	2.7	7.3		2.4	3.0			
	1831	121	2	315		ebb	12.3	1.1	0.7	0.9	8.6		0.1	0.2 Se
	1832	122	3	10		ebb	12.1	2.8		3.4	4.9			
	1834	122	4	660		ebb	5.0	1.9		0.8	1.1			

Cont'd ...

Date	Start time	Duration	Station	Meter read	Vol. sampled	Tide	Cyph. <1.0	Cirri. <1.0	Oik. <1.0	Copepoda <1.0	Copepoda 1.1-1.5	Copepoda 1.6-2.5	Deca. 1.0-4.5	Other
							Organisms/ten minutes							
21/5	0642	52	1	1115		ebb	30.0	4.0		11.3	13.8			
	0627	118	2	730		ebb	50.8				2.4	6.1	0.4	0.1 Se
	0630	116	3	7250		ebb	33.7			4.0	6.9			
	0633	117	4	7145		ebb	10.3	0.4		11.0	22.8		0.3	
	1355	64	1	7270	10.4	flood	57.6	54.0	1.5	26.7	27.6		21.7	
	1350	64	2	2300		flood				No sample				
	1351	64	3	6080		flood	51.5	12.5	0.6	33.1	29.3		1.6	
	1347	68	4	810		flood	28.5	21.1		39.7	37.6		0.6	0.4 Se
22/5	1450	60	1	n/r		flood	9.6	13.0	4.0	7.5	8.1		6.0	
	1439	63	2	2200		flood	13.6		1.5	10.0	2.0		0.5	
	1442	62	3	1620		flood	28.7			11.1	0.2		0.3	
	1446	60	4	6620		flood	2.0	72.0		21.3	29.3		1.5	0.3 Pp
	2020	128	1	20		ebb	7.9			4.1	5.9		0.2	0.2 Se
	2011	124	2	150		ebb	3.7	0.7	0.2	4.0	4.0			
	2012	135	3	1875		ebb	9.7			3.0	13.4			0.2 Se
	2015	127	4	10		ebb	7.7			11.3	13.2			0.1 Se
23/5	0809	215	1	1090		ebb	3.6	1.4		4.1	2.6			
	0759	218	2	13440		ebb	11.5			2.3	6.4	0.3		
	0801	218	3	13710		ebb	14.3		0.2	4.6	3.2		2.2	
	0803	218	4	660		ebb	5.7			4.7	5.2		0.2	
24/5	1710	65	1	6170	9.0	flood	68.6	32.9		24.0	27.3		23.6	
	1702	63	2	1080		flood	52.0		12.0	50.1	13.3			
	1704	65	3	3700		flood	40.3	38.7	1.2	1.5	5.8			
	1706	64	4	3880		flood	104.0	45.6	1.6	10.3	10.3		0.9	
25/5	1019	177	1	15		ebb	6.7	2.8		0.4	0.4			
	1011	197	2	25		ebb	4.4		0.2	2.6	1.9			
	1013	216	3	25		ebb	8.3		0.2	6.4	2.7			
	1015	196	4	6175		ebb	6.9	0.3		3.0	5.0			
25/5	1642	52	1	4590	6.2	flood	45.7	19.2		66.1	10.7		17.3	
	1632	53	2	210		flood	27.5	7.7		16.9	9.0			
	1635	54	3	710		flood	50.3	12.2	10.7	34.4	27.4			
	1637	54	4	8310	12.0	flood	31.1	25.9	2.0	11.6	16.4		5.0	
26/5	1111	128	1	15		ebb	7.5			3.0	1.6			
	1105	127	2	6750		ebb	31.1			7.0	5.8			0.1 Se

Cont'd ...

Date	Start time	Duration	Station	Meter read	Vol. sampled	Tide	Cyph. <1.0	Cirri. <1.0	Oik. <1.0	Copepoda <1.0	Copepoda 1.1-1.5	Copepoda 1.6-2.5	Deca. 1.0-4.5	Other
							Organisms/ten minutes							
	1102	127	3	3290		ebb	21.7			6.2	5.6		0.1	
	1107	127	4	3370		ebb	17.9			5.5	5.0		0.2	
27/5	0659	65	1	7690	10.9	flood	42.4	50.7	0.3	15.3	16.0	2.4	0.9	0.3 Se
	0647	67	2	1460		flood	56.1		2.1	34.0	32.8			
	0652	64	3	180		flood	49.0	2.8	0.3	25.0	27.1		0.3	
	0654	65	4	6870	9.4	flood	23.6	14.4		15.6	11.6		0.8	0.2 Se
	1209	70	1	20		ebb	16.2	1.3		6.4	5.2			
	1159	71	2	7010	9.4	ebb	40.5			10.1	10.1		0.8	
	1201	72	3	2290		ebb	44.4			5.9	5.4		0.3	
	1204	71	4	4920		ebb	49.0	1.5		11.8	9.0			
28/5	0905	68	1	7200	10.2	flood	42.6	31.1	0.6		0.3		0.9	
	0851	72	2	7670	10.4	flood	66.6	8.0	0.8	4.1	3.6			
	0856	69	3	9840	14.1	flood	68.6	37.6	0.6	11.0	7.5		1.2	
	0859	68	4	37170	57.1	flood	64.1	67.0		4.7	4.7		0.3	
	1301	126	1	20		ebb	9.5			4.1	5.5		0.1	
	1254	124	2	30		ebb	12.0	1.6		1.6	6.0	0.5		
	1256	125	3	80		ebb	12.3			3.5	7.2		0.3	
	1257	126	4	6970		ebb	13.5			6.1	10.0			0.1 Sa
29/5	0857	44	1	7900	11.6	flood	70.0	90.9		20.0	27.2		1.6	
	0838	54	2	5480	7.5	flood	57.7	42.9	0.7	33.3	25.1		0.4	
	0842	53	3	11940	17.8	flood	113.2	82.2		25.6	20.0		1.1	
	0846	51	4	550		flood	117.6	93.3	37.3	26.6	45.4		5.4	
	1359	121	1	4780		ebb	17.6	0.3		3.6	2.8			
	1342	130	2	6730		ebb	7.6	5.8		5.0	6.9		0.2	
	1345	130	3	4420		ebb	26.5			1.4	2.3		0.2	
	1352	125	4	10980		ebb	31.4	8.4		2.8	2.1			
3/6	1239	73	1	790		flood	71.5	56.7	21.9	33.6	40.2		47.6	
	1229	91	2	6220		flood	10.3	16.4	0.2	1.3	1.5		1.3	
	1232	94	3	n/r		flood	14.4	27.6		1.2	3.6		51.3	
	1235	84	4	n/r		flood	16.0	17.1		2.7	6.0		4.8	
4/6	1345	85	1	15360	2.2	flood	261.1	99.7		31.7	69.8	7.0	52.9	0.4 Sa
	1331	103	2	5100		flood	28.5	5.7	0.8	4.4	3.5		1.1	
	1335	86	3	8340	11.4	flood	80.9	27.2		25.8	8.3		10.8	
	1340	n/r	4	n/r		flood			No sample					

Cont'd ...

Date	Start time	Duration	Station	Meter read	Vol. sampled	Tide	Cyph. <1.0	Cirri. <1.0	Oik. <1.0	Copepoda <1.0	Copepoda 1.1-1.5	Copepoda 1.6-2.5	Deca. 1.0-4.5	Other
	1844	232	1	25		ebb	4.6	0.6		1.5	2.8		3.4	
	1839	229	2	1290		ebb	12.7	0.3		3.6	3.5			0.1 Se
	1841	230	3	30		ebb	6.3			1.4	1.8			
5/6	0713	118	1	25		ebb	11.0			0.8	0.8			
	0719	120	2	1190		ebb	41.2		0.3	0.9	1.1		0.2	
	0717	122	3	7760		ebb	18.5			1.3	1.3			
	1427	103	1	10350	14.2	flood	50.0	69.9	4.0	7.7	6.2		12.4	
	1419	77	2	n/r		flood	41.5	42.5		18.1	15.5	1.5	1.3	
	1422	77	3	n/r		flood	10.6	20.5		9.0	7.7		8.0	
6/6	0858	168	1	25		ebb	5.3			0.6	0.3		0.4	
	0851	175	2	7800		ebb	26.7		0.7	3.9	2.4		0.3	
	0854	165	3	1425		ebb	18.4	0.2		3.0	3.0		0.1	
	1521	130	1	8330		flood	20.4	9.0		7.3	11.7		3.9	
	1516	130	2	3760		flood	0.2	4.4	0.3	0.3	0.3		2.6	
	1517	131	3	7160		flood	0.9	1.2		2.3	1.9		3.1	
7/6	0931	118	1	25		ebb	3.9			1.5	2.5			
	0919	123	2	6810		ebb	8.2	0.2		2.1	1.0		3.0	
	0924	120	3	7750		ebb	4.1			0.2	0.4		0.1	
	1625	57	1	8170	11.6	flood	50.5	21.0		1.7	4.5	2.1	18.5	
	1619	55	2	2520		flood	4.5		0.7				0.4	
	1621	55	3	1880		flood	22.7	6.3		3.2	2.7			
8/6	1022	202	1	150		ebb	0.2	5.1		0.1	0.1		0.4	
	1014	203	2	510		ebb	0.2			0.6	0.1		0.3	
	1018	201	3	10910		ebb				0.04	0.04		2.5	
8/6	1640	60	1	9860	14.2	flood	10.0	2.5		0.5		0.5	5.5	
	1631	63	2	385		flood	0.6	0.2					0.5	
	1635	60	3	1730		flood	4.3						0.2	
9/6	1136	123	1	20		ebb	0.1			0.1				
	1130	124	2	350		ebb				0.8			0.8	
	1132	125	3	4670		ebb	0.8							
	1740	94	1	2950		flood	11.0	2.5		0.3	0.9		7.8	
	1732	91	2	420		flood	2.4							6.6 Ga
	1734	92	3	4590		flood					0.1	0.1	0.3	
10.6	1837	130	1	18000	25.7	flood	1.5	0.7			0.2	0.5		

Organisms/ten minutes

Cont'd ...

Date	Start time	Duration	Station	Meter read	Vol. sampled	Tide	Organisms/ten minutes							
										Copepoda				
							Cyph. <1.0	Cirri. <1.0	Oik. <1.0	<1.0	1.1-1.5	1.6-2.5	Deca. 1.0-4.5	Other
	1829	130	2	7450		flood		0.5					0.2	
	1832	130	3	20680	29.6	flood	1.5	0.3					0.3	
11/6	0735	133	1	15760	23.3	flood	1.2	7.2			1.2		0.6	
	0727	132	2	3130		flood	3.0			5.9	3.2		0.6	
	0729	133	3	10930		flood	1.0						0.8	
	1340	150	1	15		ebb				0.1	0.1			0.2 Ga
	1335	144	2	1360		ebb							0.1	0.7 Ga
	1337	144	3	3160		ebb		0.3					0.2	
12/6	0901	81	1	14400	19.6	flood				5.9	5.9		3.0	
	0854	76	2	1380		flood	3.9			0.1	0.1		4.7	
	0856	77	3	3890		flood	0.5	1.8		1.0	0.5		42.6	
	0857	78	4	23250		flood				No sample				
	1442	103	1	10		ebb		0.1	0.1					
	1432	114	2	10		ebb	2.2							
	1434	113	3	2470		ebb	1.2			0.1	0.1		0.2	
	1435	115	4	10		ebb		0.1				0.1	1.4	
13/6	0931	163	1	15450	20.1	flood	0.2				0.1	0.1	1.1	
	0924	161	2	1720		flood	0.2		0.1				17.9	
	0925	163	3	2550		flood		0.2			0.2		5.8	
	0927	163	4	26510	38.1	flood		0.4					12.0	
13/6	1516	127	1	30		ebb							0.5	
	1507	129	2	940		ebb	2.1						0.2	
	1509	129	3	520		ebb	3.6						0.2	0.2 Ga
	1512	129	4	470		ebb	0.4			0.2	0.1		1.1	0.5 Ga
15/6	1016	129	1	16530	23.2	flood	0.5						3.4	
	1006	124	2	130		flood	0.6						15.2	
	1008	126	3	n/r		flood		0.8					2.2	
	1012	124	4	n/r		flood				No sample				
	1619	207	1	20		ebb	0.1				0.04		0.1	
	1609	223	2	20		ebb								0.4 Ga
	1611	224	3	5190		ebb							0.1	
	1616	220	4	n/r		ebb		0.04	0.04					
17/6	1212	155	1	3950		flood							1.5	
	1201	100	2	4210		flood	0.4						0.2	
	1204	100	3	4400		flood	0.4		0.1		0.3		0.5	
	1208	93	4	n/r		flood				No sample				

II. 1. (a) Standard Miller Surface Areal Samples

Date	Start time	Duration	Station	Vol. sampled	Organisms/m³ Cyph. <1.0	Cirri. <1.0	Oik. <1.0	Cope. <1.0	Cope. 1.1-1.5	Cope. 1.6-2.5	Deca. 1.0-4.5	Other
13/5	1045	4:15	1	3.8	0.8	0.3	0.8	107.4	346.1		0.3	
	1050	3:00	2	2.7	2.2		4.1	122.2	156.2	2.2	1.1	
	1101	3:55	3	3.5	2.6		1.1	24.0	49.7			
	1107	4:10	4	3.8	10.5			36.3	121.6		0.3	
	1116	2:10	5	2.9	5.5	2.4	2.8	20.0	25.5		0.3	
	1122	4:35	6	4.1	2.7		0.2	21.5	33.2			0.2 Ga
	1128	4:20	7	3.9	10.5		0.8	21.3	40.3			
	1346	6:40	8	10.0	2.8	0.7		7.6	7.2		1.2	
	1355	9:25	9	9.9	11.8			4.6	7.3		0.1	0.1 Pp
	1405	11:00	10	9.9	28.1			3.8	4.3		0.1	
	1425	9:15	11	8.3	73.0				4.5			
	1437	9:20	12	8.4	35.7		0.5	6.2	8.6			
	1447	7:30	13	6.8	30.3			1.6	0.9			
	1507	8:50	14	8.0	27.5			2.9	9.6		0.7	
	1517	9:55	15	8.9	31.7			0.1	3.7		0.3	
	1532	9:15	16	8.3	19.1			0.5	1.9			
	1543	8:30	17	7.7	3.8			0.9	1.6			
15/5	1332	4:25	1	4.0	46.5		0.3	3.0	88.5		0.3	0.3 Sa
	1338	5:20	2	4.8	51.7		0.6	3.8	10.4			
	1345	4:20	3	3.9	24.1			31.8	19.5			
	1351	4:35	4	4.1	19.5		0.7	14.8	14.4		0.7	
	1358	3:10	5	2.9	3.8		0.7	38.6	44.8			
	1406	4:55	6	4.4	1.4			18.6	26.4			
	1411	4:45	7	4.3	26.7			13.7	25.3			
16/5	1407	4:35	6	4.1	114.1				0.5			
	1414	4:15	7	3.8	30.8			3.7	26.8			
17/5	1526	5:15	6	4.7	379.6		0.4	5.3	7.9		1.3	
	1532	5:45	7	5.2	230.8		0.6	1.5	3.1		0.8	
18/5	1551	4:50	6	4.4	55.5			6.6	15.0		0.9	0.3 Ha
	1558	4:00	7	3.6	48.3			8.6	15.0		0.3	
19/5	1603	5:00	6	4.5	149.3			6.2	38.2			
	1610	5:00	7	4.5	103.6			13.3	23.1			

Cont'd ...

Date	Start time	Duration	Station	Vol. sampled	Organisms/m³ Cyph. <1.0	Cirri. <1.0	Oik. <1.0	Cope. <1.0	Cope. 1.1-1.5	Cope. 1.6-2.5	Deca. 1.0-4.5	Other
20/5	1713	5:00	6	4.5	110.0			13.8	29.8		0.7	
	1719	4:45	7	4.3	113.0			15.6	22.3		1.2	
21/5	1746	4:30	1	4.1	131.5			27.8	36.1		1.0	
	1753	4:30	2	4.1	124.6			22.4	19.5	0.2	3.2	
	1759	4:55	3	4.4	230.5			16.8	9.1		5.9	
	1805	4:05	4	3.7	81.6			9.5	16.2		4.1	
	1812	3:45	5	3.4	770.6		0.9	2.4	9.4	0.6	4.4	
	1818	5:00	6	4.5	185.3		0.4	14.7	14.2		36.9	
	1824	4:25	7	4.0	239.3		1.3	76.5	51.0		9.3	
	1724	8:55	8	8.0	17.8	3.6		9.1	2.9	0.1		
	1713	8:45	9	7.9	15.7	11.1		0.3	0.6			
	1702	8:35	10	7.7	61.2	15.1		1.3	2.1			
	1630	8:00	11	7.2	76.7	11.9					0.1	
	1640	8:00	12	7.2	28.1	3.8						
	1649	8:20	13	7.5	24.3	1.9	1.2					
	1615	10:00	14	9.0	32.3	0.1	0.9	0.1	0.2			
	1604	9:25	15	8.5	10.9	1.6		2.5	1.6			
			16					No sample				
			17					No sample				
22/5	1855	5:00	6	4.5	44.0			1.1	2.2	1.1	8.7	
	1901	5:00	7	4.5	28.4			9.3	6.2		11.1	
24/5	2016	5:10	6	4.7	35.1	2.8		5.1	2.6		6.2	
	2023	5:35	7	5.0	90.0			5.0	4.8		0.8	
25/5	2109	5:00	6	4.5	8.4			2.9	5.6		2.4	
	2115	7:35	7	6.8	13.5	6.3		5.1	4.1		0.3	
26/5	1943	2:50	1	3.8	3.4			2.4	3.4			
	1950	2:20	2	3.2	3.8	0.6		1.3	1.6	0.6	1.3	
	1953	2:30	3	3.4	4.1	2.6	0.6	0.6	3.0		0.3	
	1958	2:30	4	3.4	2.4				0.6	4.1	1.2	
	2003	2:30	5	3.4	27.9			2.1	5.6		2.1	
	2008	2:30	6	3.4	12.6			1.5	3.5			
	2012	2:50	7	3.8	5.5		0.3	1.1	1.3		0.5	

Cont'd ...

					Organisms/m^3							
Date	Start time	Duration	Station	Vol. sampled	Cyph. <1.0	Cirri. <1.0	Oik. <1.0	Cope. <1.0	Cope. 1.1-1.5	Cope. 1.6-2.5	Deca. 1.0-4.5	Other
26/5	1807	4:45	8	6.4	3.0	1.0			0.5		0.3	
	1813	5:00	9	6.8	1.3	0.7		0.6	0.1		0.3	
	1819	5:00	10	6.8	2.6	0.7		0.6	0.4	0.1	0.4	
	1830	5:00	11	6.8	6.3	0.4		0.1			0.1	
	1837	5:00	12	6.8	4.1	1.5		0.6			0.6	
	1843	5:00	13	6.8	0.7	0.6						
	1853	5:00	14	6.8	0.4	0.7		0.6				
	1900	5:00	15	6.8	1.8	0.1						
	1909	5:00	16	6.8	0.7							
	1914	5:00	17	6.8	0.4			0.1				
27/5	0950	5:00	6	4.5	38.7			5.3	6.4		0.4	
	0956	5:00	7	4.5	12.9			6.7	8.0			
28/5	1102	5:00	6	4.5	24.0			7.6	4.4			
	1108	5:00	7	4.5	10.2	1.6		1.1	6.9			
29/5	1231	6:00	6	5.4	16.1			0.4	1.5			
	1247	5:00	7	4.5	14.0	0.2		1.8	0.9			
30/5	0815	2:30	1	3.4	15.9	0.6	0.6	1.2	7.4		0.3	
	0821	2:30	2	3.4	28.2				1.8		0.3	
	0835	2:30	3	3.4	42.4	0.6		4.7	2.1		1.2	
	0831	2:40	4	3.6	18.6			0.3	0.3		0.8	
	0837	2:20	5	3.2	59.4			0.3	1.6		1.3	
	0841	2:30	6	3.4	84.1			2.6	5.3		0.3	
	0845	2:30	7	3.4	16.5	1.2			2.1		0.9	
	1005	5:00	8	6.8	52.4	0.6		0.7	1.9		0.1	
	1012	5:00	9	6.8	80.7	2.1		2.6	4.0		0.3	
	1018	5:00	10	6.8	46.2	0.4		1.8	2.4		1.0	
	1028	5:00	11	6.8	46.5	0.9		1.0	1.2		0.3	
	1034	5:00	12	6.8	32.2			0.9	0.4			
	1041	5:00	13	6.8	21.3			1.6	1.5		0.1	
	1050	5:00	14	6.8	3.5	1.8		2.9	5.1		1.3	
	1056	5:00	15	6.8	2.5			6.3	5.7		1.8	
	1105	5:00	16	6.8	1.2	0.3		1.3	2.2		0.4	
	1112	5:00	17	6.8	0.7			0.1	0.1			

Cont'd ...

Date	Start time	Duration	Station	Vol. sampled	Organisms/m^3							
					Cyph. <1.0	Cirri. <1.0	Oik. <1.0	Cope. <1.0	Cope. 1.1-1.5	Cope. 1.6-2.5	Deca. 1.0-4.5	Other
2/6	1707	5:00	6	4.5	181.3	0.2		6.0	12.0		0.7	
	1713	4:00	7	3.6	151.1		33.3	6.4	7.2			
3/6	1611	2:20	1	3.2	58.4	0.6		12.8	12.8		8.1	
	1617	2:30	2	3.4	87.6		3.5		7.9		1.8	
	1621	2:30	3	3.4	94.7	1.2	0.3	0.9	0.9		3.2	
	1625	2:30	4	3.4	70.9	0.3		7.1	10.0		1.8	
	1633	2:30	5	3.4	120.9		0.3	6.2	10.3			
	1638	2:30	6	3.4	85.9			24.1	37.1			
	1642	2:30	7	3.4	172.1			3.2	5.6		2.4	
	1428	5:00	8	6.8	20.3	0.4		66.8	0.9		5.6	
	1434	5:00	9	6.8	21.0	1.0		0.3	1.9	0.1	2.2	
	1441	5:00	10	6.8	43.5	0.6		2.1	0.6		1.9	
	1451	5:00	11	6.8	32.2			1.9	1.0	0.1	0.4	
	1458	5:00	12	6.8	28.8	0.4		2.6	2.1		1.9	
	1504	5:00	13	6.8	19.4			0.3	1.0	0.1	2.8	
	1514	5:00	14	6.8	12.8			0.9	2.2		26.5	
	1520	5:00	15	6.8	8.4			1.3	0.9		15.0	
	1531	5:00	16	7.5	151.2	0.1		0.7	0.1		2.5	
	1537	5:00	17	7.1	38.5	0.1		1.1	1.0		0.4	
4/6	1852	5:30	6	5.0	48.4			0.8	1.2		0.2	
	1859	5:30	7	5.0	27.0			0.8	1.0		0.2	
5/6	1816	5:00	6	4.5	19.2			0.4	0.4			
	1822	5:00	7	4.5	25.8			0.6	1.3		0.8	
6/6	0617	2:50	1	3.8	4.5			0.3			10.5	0.3 Ha
	0623	2:50	2	3.8	11.1			0.3	0.5		1.8	
	0627	2:30	3	3.4	3.2			1.5	0.9		0.9	
	0632	2:15	4	3.0	6.7			0.3	0.3		1.3	
	0636	2:00	5	2.7	4.1			1.1	2.6		1.1	
	0642	2:30	6	3.4	1.5			1.8	0.6		2.9	
	0645	2:30	7	3.4	3.2			0.9			11.8	
	0711	5:00	8	6.8				0.1			2.4	
	0717	5:00	9	6.8	2.1			0.1			5.0	

Cont'd ...

Date	Start time	Duration	Station	Vol. sampled	Organisms/m³ Cyph. <1.0	Cirri. <1.0	Oik. <1.0	Cope. <1.0	Cope. 1.1-1.5	Cope. 1.6-2.5	Deca. 1.0-4.5	Other
6/6	0723	5:00	10	6.8	10.4						2.1	
	0732	5:00	11	6.8	4.1	0.1		0.1	0.6		1.6	
	0738	5:00	12	6.8	16.6			0.9	0.7		2.6	
	0743	5:00	13	6.8	3.1	0.1		1.6	0.6		2.1	
	0751	5:00	14	6.8	1.6			1.2	0.9		5.4	
	0757	5:00	15	6.8	1.9			0.6	0.4		2.1	
	0804	5:00	16	6.8				2.9	3.1		2.5	
	0810	5:00	17	6.8	0.3			5.3	4.3		0.6	
7/6	2013	5:00	6	4.5	0.2			0.2	1.1	0.2		
	2019	6:00	7	5.4	0.7	0.4					0.7	
8/6	0949	5:00	6	4.5		0.7		0.7	0.4		1.6	
	0956	5:00	7	3.9					0.5		1.8	
9/6	0937	5:30	6	5.0							1.4	
	0943	3:20	7	3.0				0.3	0.7		2.0	
10/6	1109	5:00	8	7.5	0.3						0.1	0.1 Ga
	1115	5:00	9	7.5							0.9	
	1122	5:00	10	7.5					0.1		0.4	
	1132	5:00	11	7.5							0.7	
	1140	5:00	12	6.7	0.1	0.3			2.5			
	1146	5:00	13	7.1	0.3			0.3			0.6	
	1157	5:00	14	6.8	0.4				0.7		1.0	
	1203	5:00	15	6.8	0.1				0.6		0.4	
	1210	5:00	16	6.8	3.1				0.1		0.7	
	1216	5:00	17	6.8	0.9				0.4		0.3	
7/7	1955	4:30	6	4.1	0.5						71.7	
	2001	4:30	7	4.1							8.8	
23/7	2130	4:30	6	4.1							0.2	
	2140	4:30	7	4.1				0.5				
29/7	1749	4:30	7	4.1	0.7		0.2	0.7			3.2	
	1741	4:30	6	4.1								0.2 E 800 µ
5/8	1920	4:30	6	4.1							1.5	0.3 Pl
	1943	4:30	7		8.8	1.0		0.5			1.5	

					Organisms/m^3							
Date	Start time	Duration	Station	Vol. sampled	Cyph. <1.0	Cirri. <1.0	Oik. <1.0	Cope. <1.0	Cope. 1.1-1.5	Cope. 1.6-2.5	Deca. 1.0-4.5	Other
13/8	1412	4:30	6	4.1				0.5			2.0	
	1424	4:30	7	4.1		3.7		0.2			2.4	
18/8	1701	5:00	6	4.5	0.9	0.9					2.7	2.4 Pl
18/8	1708	5:00	7	4.5		0.2						

II. 1. (b) Micro Miller Surface Areal Samples

					Organisms/m^3							
					Nauplii			Copepoda			Cyph.	Oik.
Date	Start time	Duration	Station	Vol. sampled	<0.23	0.24-0.33	>0.34	<0.45	<0.46-0.65	>0.66	<1.0	<1.0
21/5	1746	4:30	1	0.4	1412.5	9117.5	620.0	410.0	3155.0	7837.5	3902.5	
	1753	4:30	2	0.4	422.5	7450.0	505.0	332.5	2512.5	7040.0	3167.5	32.5
	1759	4:55	3	0.4	570.4	8420.4	568.2	345.4	2927.3	7481.8	3937.5	
	1805	4:05	4	0.4	702.4	12040.5	813.5	537.8	8601.2	9944.5	4742.5	35.0
	1812	3:45	5	0.3	526.4	11517.7	776.5	514.7	3735.3	9511.0		70.0
	1818	5:00	6	0.5	758.0	12448.9	840.0	625.0	4055.5	11170.8	5952.5	145.0
	1824	4:25	7	0.4	425.0	7572.5	5100.0	337.5	2607.5	6467.5		2065.0
	1724	8:55	8	0.8	495.1	8807.5	593.8	393.8	3185.1	11711.3		5002.5
	1713	8:45	9	0.5	226.4	4039.7	271.7	181.1	1330.2	3533.5	1820.0	
	1702	8:50	10	0.8	92.5	1638.7	110.0	73.7	558.7	1400.0	61.2	15.0
	1630	8:00	11	0.7	137.1	3058.5	205.7	137.1	1012.8	2604.2		1300.0
	1640	8:00	12	0.7	111.4	2388.5	128.5	85.7	637.1	1625.7	210.0	
	1649	8:20	13	0.75	96.0	1966.7	105.3	88.0	706.7	1678.7	836.0	
	1615	10:00	14	0.9	42.2	761.1	51.1	34.4	283.3	650.0	323.3	
	1604	9:25	15	0.9	63.3	1032.2	70.0	46.6	346.6	884.4	440.0	
			16			No sample						
			17			No sample						
3/6	1611	2:20	1	0.3	503.3	8976.6	606.6	400.0	2776.6	7666.6	3816.6	
	1617	2:30	2	0.3	426.5	7611.8	511.8	338.2	2658.8	6502.9	4452.9	
	1621	2:30	3	0.3	461.8	8232.4	555.9	367.6	3323.5	6941.2	350.0	
	1625	2:30	4	0.3	326.5	6914.7	467.6	308.8	2350.0	5902.9	2941.2	
	1633	2:30	5	0.3	405.9	7202.9	485.3	320.6	2173.5	6150.0	3064.7	161.8
	1628	2:30	6	0.3	441.2	7826.5	526.5	350.0	2726.5	6679.4	3326.5	161.8
	1642	2:30	7	0.3	502.9	8979.4	605.9	400.0	3073.5	7664.7	3814.7	214.7
	1428	5:00	8	0.7	157.4	2319.1	155.9	102.9	794.1	1980.9	985.3	
	1434	5:00	9	0.7	123.5	2204.4	148.5	20.6	754.4	1880.9		75.0
	1441	5:00	10	0.7	145.6	2594.1	175.0	116.2	891.2	2216.2	1102.9	
	1451	5:00	11	0.7	133.8	1633.0	161.8	107.4	848.5	2051.5	1020.6	
	1458	5:00	12	0.7	155.9	2808.8	189.7	125.0	1001.5	2398.5	1194.1	39.7
	1504	5:00	13	0.7	47.1	848.5	57.4	38.2	275.0	723.5	360.3	
	1514	5:00	14	0.7	67.6	1029.4	66.8	50.0	358.8	969.1	482.4	
	1520	5:00	15	0.7	77.9	1011.8	67.6	52.9	357.4	855.9	426.5	
	1531	5:00	16	0.8	188.0	3121.3	210.7	140.0	1072.0	2665.3	1406.7	
	1537	5:00	17	0.7	116.9	2097.2	140.8	93.0	681.7	1790.1	888.7	

II. 2. Standard Miller Oblique Areal Samples

						Organisms/m³						
Date	Start time	Duration	Station	Vol. sampled	Depth	Cyph. <1.0	Cirri. <1.0	Oik. <1.0	Cope. <1.0	Cope. 1.1-1.5	Cope. 1.6-2.5	Deca. 1.0-4.5
26/5	2025	5:00	7 & 6	6.8	15	0.6	5.3		8.2	7.1		3.0
	2032	5:00	6 & 7	6.8	15		28.2		4.9	5.3	0.6	8.4
30/5	0931	5:30	7 & 6	7.4	15	74.6			20.3	34.9	3.2	37.3
	0941	5:00	6 & 7	6.8	15	1.6	41.2		16.3	37.9	0.4	14.0

II. 3. Multiple Miller Areal Samples

Date	Start time	Duration	Station	Vol. sampled	Depth	Organisms/m^3 Cyph. <1.0	Cirri. <1.0	Oik. <1.0	Cope. <1.0	Cope. 1.1-1.5	Cope. 1.6-2.5	Deca. 1.0-4.5	Other
15 July 69	1809	5:00	6 & 7	4.5	0	0.7						15.3	
	1809	5:00	6 & 7	4.5	0.7				0.4	0.2		0.9	
	1809	5:00	6 & 7	4.5	1.4							12.2	
	1809	5:00	6 & 7	4.5	2.2		0.2					13.3	
	1809	5:00	6 & 7	4.5	2.9							20.9	
	1809	5:00	6 & 7	4.5	3.7		0.4					12.4	
	1809	5:00	6 & 7	4.5	4.4	0.4							
	1809	5:00	6 & 7	4.5	5.9		2.0	1.3				64.0	
	1809	5:00	6 & 7	4.5	7.4	2.2						76.7	0.2 Aq
	1809	5:00	6 & 7	4.5	8.9		14.4					50.0	
15 July 69	1845	10:00	7,12,14	9.0	0					No sample			
	1845	10:00	7,12,14	9.0	3.7					0.4		7.9	
	1845	10:00	7,12,14	9.0	7.4		1.3			0.9	0.4	130.7	
	1845	10:00	7,12,14	9.0	11.2		14.0			3.8	4.7	12.4	
	1845	10:00	7,12,14	9.0	14.9			0.3	3.0	7.0		17.3	2.3 Sa
	1845	10:00	7,12,14	9.0	18.6				5.3	6.4		34.4	0.4 Pp
	1845	10:00	7,12,14	9.0	22.3					No sample			
	1845	10:00	7,12,14	9.0	26.0					No sample			
	1845	10:00	7,12,14	9.0	29.8					No sample			
	1845	10:00	7,12,14	9.0	33.5					No sample			

III. Vertical Hauls

					Organisms/m^3							
								Copepoda				
Date	Time	Station	Depth	Vol. sampled	Cyph. <1.0	Cirri. <1.0	Oik. <1.0	<1.0	1.1-1.5	1.6-2.5	Deca. 1.0-2.5	Other
7/7	1942	A	19	4.8	5.7	93.5		2.3	2.5		77.5	
	1945	B	26	6.5	2.3			1.7	0.9		119.1	
	1948	C	13	3.3	6.2	33.2					88.3	
23/7	2125	B	24	6.0	4.0	105.0					8.3	29.5 Sa
29/7	1730	B	24	6.0	9.5	88.5					23.0	31.0 Sa
5/8	1920	B	26	6.5	21.7	71.1		2.3	8.8	2.8	8.8	13.5 Sa
13/8	1400	B	26	6.5		19.4		3.2	0.3		38.8	19.4 Sa
18/8	1654	B	26	6.5		58.1					69.2	83.0 Sa; 4.3 Pl

IV. Physico-Chemical Data

(a) Seawater Temperature, Salinity, Dissolved Oxygen Content. Secchi Disk Readings. Measurement of Solar Radiation

Date	Time	Station	Depth	T°C	S‰	O_2 ml/l	Secchi
23/5		B	0	15.98	21.24		
			2	15.55	23.55		
			4	14.80	23.53		
			6	14.90	24.03		
			8	14.83	23.80		
			10	14.84	24.03		
			15	14.29	24.17		
			19	12.98	24.49		
27/5		B	0			5.82	
			2			5.15	
			4			7.29	
			6			6.61	
			10			6.83	
			15			5.49	
28/5	1050	B					6
	1054	C					6
29/5	1226	B					6
	1228	C					6
4/6	1655	A	0	18.01	18.54	6.81	6
			2	16.96	20.14	7.12	
			4	16.32	21.14		
			6	15.43	21.54	6.92	
			8	15.13	21.72		
			10	15.02	22.13	6.72	
			14			6.08	
			15	14.74	22.02		
4/6	1715	B	0	18.51	18.81	7.04	5
			2	16.32	20.32	4.61	
			4	15.82	20.84		
			6	15.21	21.56	3.00	
			8	15.17	21.75		
			10	15.12	21.96	2.87	
			15	14.71	22.32		
			20	14.48	23.04	2.04	
			25	12.69	24.70		
			26			H_2S	
			31	10.54	29.14		
	1730	C	0	17.21	19.25	6.91	5
			2	16.24	20.66	7.06	
			4	15.73	21.42		
			6	15.38	21.60	6.98	

Date	Time	Station	Depth	T°C	S‰	O_2 ml/l	Secchi
			8	15.20	21.71		
			10	15.11	21.96	6.17	
			15	14.70	22.21	6.29	
			17	14.74	22.23		
5/6	1805	A					5
	1808	B					5
	1812	C					5
6/6	1942	A					5
	1944	B					5
	1958	C					6
7/6	1956	A					5
	1959	B					5
	2010	C					5
8/6	0800	A	0	16.53	17.23	6.57	6
			2	16.21	21.23	6.56	
			4	16.01	21.48		
			6	15.96	21.60	6.42	
			8	15.68	21.68		
			10	15.45	21.88	5.97	
			13	15.13	22.15		
	0832	B	0	17.81	18.53	6.51	6
			2	16.88	20.88	6.50	
			4	16.36	21.67		
			6	16.10	21.84	6.45	
			8	16.05	22.04		
			10	15.60	22.21	6.13	
			15	15.33	22.22	6.43	
			20	14.06	22.07	2.39	
			25	10.79	26.38	H_2S	
	0921	C	0	17.18	18.43	6.47	
			2	16.74	21.07	6.69	
			4	16.25	21.54		
			6	15.99	21.61	6.52	
			8	15.95	21.73		
			10	15.74	21.97	6.04	
			12	15.31	22.08		
9/6	0915	A					6
	0919	B					5
	0932	C					5

Cont'd ...

Date	Time	Station	Depth	T°C	S‰	O_2 ml/l	Secchi
10.6	1615	A					5
	1620	B					5
	1634	C					5
11/6	1151	A	0	19.37	18.80		5
			2	18.38	18.89		
			4	17.85	20.88		
			6	17.03	21.45		
			8	16.68	21.51		
			10	16.65	21.72		
			15	15.60	22.23		
			20	14.44	22.89		
			22	15.61	23.18		
	1156	B	0	17.75	18.71		4
			2	17.50	19.48		
			4	16.60	21.37		
			6	16.32	21.67		
			8	15.91	21.97		
			10	15.79	22.07		
			15	15.59	22.17		
			20	14.68	22.80		
			23	14.28	21.54		
	1208		0	19.32	18.54		4
			2	18.52	19.93		
			4	17.22	21.19		
			6	16.45	21.62		
			8	16.20	21.93		
			10	16.00	21.93		
			13	16.04	21.93		
12/6	1154	A	0	18.30	18.22		5
			2	17.09	20.50		
			4	17.41	20.40		
			6	17.14	21.36		
			8	16.65	21.73		
			10	15.95	21.93		
			15	15.78	22.17		
			19	15.84	22.10		
	1203	B	0	17.38	18.51		5
			2	17.13	19.95		
			4	16.73	21.05		
			6	16.41	21.54		
			8	15.85	22.02		
			10	15.80	22.08		
			15	15.41	22.26		
			18	15.39	20.03		

Cont'd ...

Date	Time	Station	Depth	T°C	S‰	O_2 ml/l	Secchi
	1212	B	0	18.47	17.96		4
			2	17.26	20.96		
			4	16.78	21.23		
			6	16.53	21.28		
			8	16.17	21.67		
			10	16.00	21.77		
			15	16.53	21.97		
13/6	0915	B	0	16.69	19.45		
			2	16.50	20.64		
			4	16.18	21.41		
			6	15.84	21.66		
			8	15.90	21.66		
			10	15.52	22.00		
			15	14.99	22.34		
			18	14.50	23.00		
			20	13.90	23.46		
			22	13.00	24.39		
			25	11.33	25.40		
			28	10.05	26.28		
	0930	C	0	17.35	18.70		
			2	17.22	20.29		
			4	16.78	21.21		
			6	16.38	21.40		
			8	16.24	21.66		
			10	15.74	21.72		
			12	15.60	22.04		
13/6	1852	A	0			7.39	4
			2			7.48	
			6			6.64	
			10			5.55	
	1815	B	0			6.82	4
			2			5.39	
			6			6.81	
			10			5.86	
			15			3.90	
			20			0.99	
			25			H_2S	
13/6	1751	C	0			6.94	4
			2			6.09	
			6			5.08	
			10			5.54	
			12			5.08	

Cont'd ...

Date	Time	Station	Depth	T°C	S‰	O_2 ml/l	Secchi
14/6	1748	A					4
	1742	B					4
	1736	C					4
15/6	1430	A					4
	1433	B					4
	1442	C					4
16/6	1527	A					4
	1529	B					4
	1538	C					4
17/6	0900	A					5
	0905	B					5
	0918	C					5
18/6	1626	A					4
	1633	B					4
	1637	C					4
19/6	1731	A					4
	1739	B	0	18.69	20.29		4
			2	17.92	21.56		
			4	17.31	21.82		
			6	17.06	21.94		
			10	16.53	22.18		
			15	16.53	22.50		
			20	16.41	22.68		
			25	11.39	25.38		
			29	10.48	26.09		
	1744	C					4
23/6	2044	A					5
	2045	B					5
	2054	C					5
26/6	1550	A					5
	1556	B					5
	1559	C					5
3/7	0938	B	0	15.98	22.43		
			2	15.98	23.57		
			4	15.82	23.78		
			6	15.81	23.78		
			8	15.70	23.84		

Cont'd ...

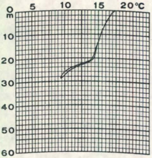
Date	Time	Station	Depth	T°C	S‰	O_2 ml/l	Secchi
			12	15.62	23.94		
			17	15.55	23.96		
			22	15.42	23.96		
			26	15.44	23.96		

Radiation in langleys.

Date (1969)	Total langleys/day
May 22	556.0
23	441.2
24	257.6
25	..
26	96.6
27	81.6
28	128.8
29	440.1
30	..
31	..
June 1	..
2	..
3	451.9
4	648.4
5	580.7
6	346.7
7	645.1
8	904.9
9	879.2
10	524.9
11	449.8
12	524.9
13	128.8
14	709.5
15	764.3
16	771.8
17	774.0
18	731.0
19	327.4
20	151.4
21	184.6
22	311.3
23	237.2
24	443.3
25	647.3
26	764.3

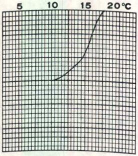
IV. (b) Bathythermographs

#1



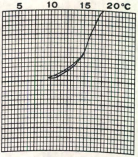
1212 - 6 June

#2



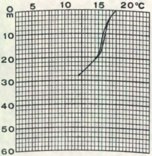
2000 - 7 June

#3



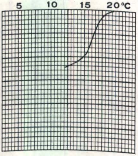
0900 - 8 June

#4



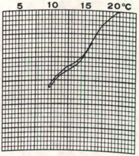
0922 - 9 June

#5



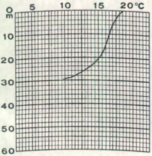
1638 - 10 June

#6



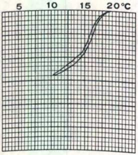
1200 - 11 June

#7



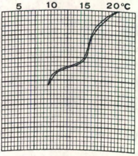
1745 - 12 June

#8



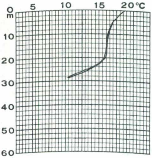
1800 - 13 June

#9



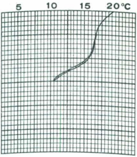
1743 - 14 June

#10



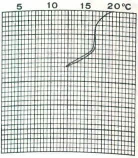
1435 - 15 June

#11



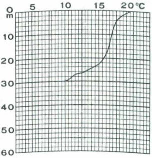
1530 - 16 June

#12



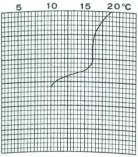
0909 - 17 June

#13



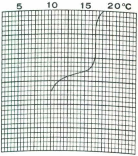
1630 - 18 June

#14



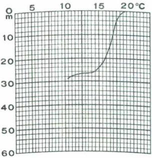
1735 - 19 June

#15



2048 - 23 June

#16



2114 - 26 June