Zooplankton and Microplankton Data collected in the Gulf of Maine, R.V. EASTWARD, June, 1977 and R.V. CHALLENGE, July, 1979

edited by

V. Jones and F. Setchell

Bigelow Laboratory for Ocean Sciences

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PARTICIPANTS

R/V EASTWARD

F.D. KING	Zooplankton ETS, Phytoplankton ETS
C. SAPIENZA	Phytoplankton ETS, NR

R/V CHALLENGE

T.T. PACKARD	Phytoplankton ETS
F.W. SETCHELL	Phytoplankton ETS, protein

Chlorophyll-*a* data was generously provided by I. Morris for the *R/V EASTWARD* cruise and D. Phinney for the *R/V CHALLENGE* cruise.

METHODS

R/V EASTWARD

Phytoplankton

ETS: Four liter samples were drawn from Niskin bottles, filtered onto 47mm Gelman A/E glass fiber filters, placed in numbered vials, and frozen in liquid nitrogen (Ahmed *et al.*, 1976). The samples were assayed using a semi-automated procedure (Abrahamson *et al.*, 1980) designed from the technique of Kenner and Ahmed (1975a) after return to the laboratory. ETS activity was corrected to *in situ* temperature using the Arrhenius equation and an activation energy of 15 Kcal·mole (Owens and King, 1975).

NR: Four liter samples were drawn from Niskin bottles and assayed immediately following the method of Eppley, Coatsworth, and Solorzano (1969). A standard curve for NO_2^- concentration was determined after the method described by Bass and Packard (1977).

Chlorophyll: was measured fluorometrically following the technique of Holm- Hansen *et al.*, (1965).

Calculations

1) Integrated ETS, NR, and chlorophyll were determined by trapezoidal approximation.
2) Average concentrations or activity was found by dividing the integrated values by the interval of integration in meters.

3) O_2 consumption was calculated from ETS values using the R/ETS factor of 0.15 (Kenner and Ahmed, 1975b).

4) O_2 consumption was converted to CO_2 evolution using an R/Q of 1 and the mass conversion factor of 0.536 (12/22.4).

Zooplankton

ETS: was measured using the method of Owens and King (1975) on the automated system described by Abrahamson *et al.* (1980). The organisms were collected with a 212 μM mesh net, 1m in diameter. A Folson plankton splitter was used to divide the collected material. One quarter of the haul was placed in a numbered plastic vial, promptly frozen in liquid nitrogen, and returned to the laboratory for ETS analysis. ETS activity was corrected to average *in situ* temperature for the depth interval sampled using the Arrhenius equation and an activation energy of 15 Kcal·mole. (Owens and King, 1975).

Calculations

1) Zooplankton O_2 consumption was calculated using the R/ETS factor of Owens and King (1975).

2) CO_2 evolution was calculated using an R/Q of 0.85 and the mass conversion of 0.536 (12/22.4).

3) NH_4^+ excretion was calculated from O_2 consumption using an O:N atomic ratio of 8:1 (Smith and Whitledge, 1977 and Packard, 1979).

METHODS

R/V CHALLENGE

ETS: was measured on 2-4 liter samples from a submersible pumping system (Holligan and Harbor, 1977) or from discrete samples after the method of Kenner and Ahmed (1975a) using the quench solution suggested by Owens and King (1975). All assay were performed on board.

PROTEIN: a portion of the cleared ETS homogenate was frozen and returned to the laboratory where protein was measured using Setchell's (submitted manuscript) modification of Bradford's (1976) coomassie blue dye binding assay.

CHLOROPHYLL: was measured fluorometrically after the method of Yentsch and Menzel (1963) with no correction for phaeopigments.

Calculations:

1) Respiration was calculated from ETS data in the same manner as was done with the *R/V EASTWARD* data.

Experiment to test precision of ETS method: (T. Packard)

Four liters of surface water were collected off Squirrel Island and filtered through a Gelman glass fiber filter. A 5.5 µl homogenate was prepared and four (4) replicates were run through the Kenner and Ahmed (1975) assay on the centrifuged homogenate. The absorbances in a 1 cm path-length cell were 0.30, 0.31, 0.30, and 0.30 as measured by the minispec. The average is 0.30 and the standard deviation is 0.01. This is a 3.3% error.

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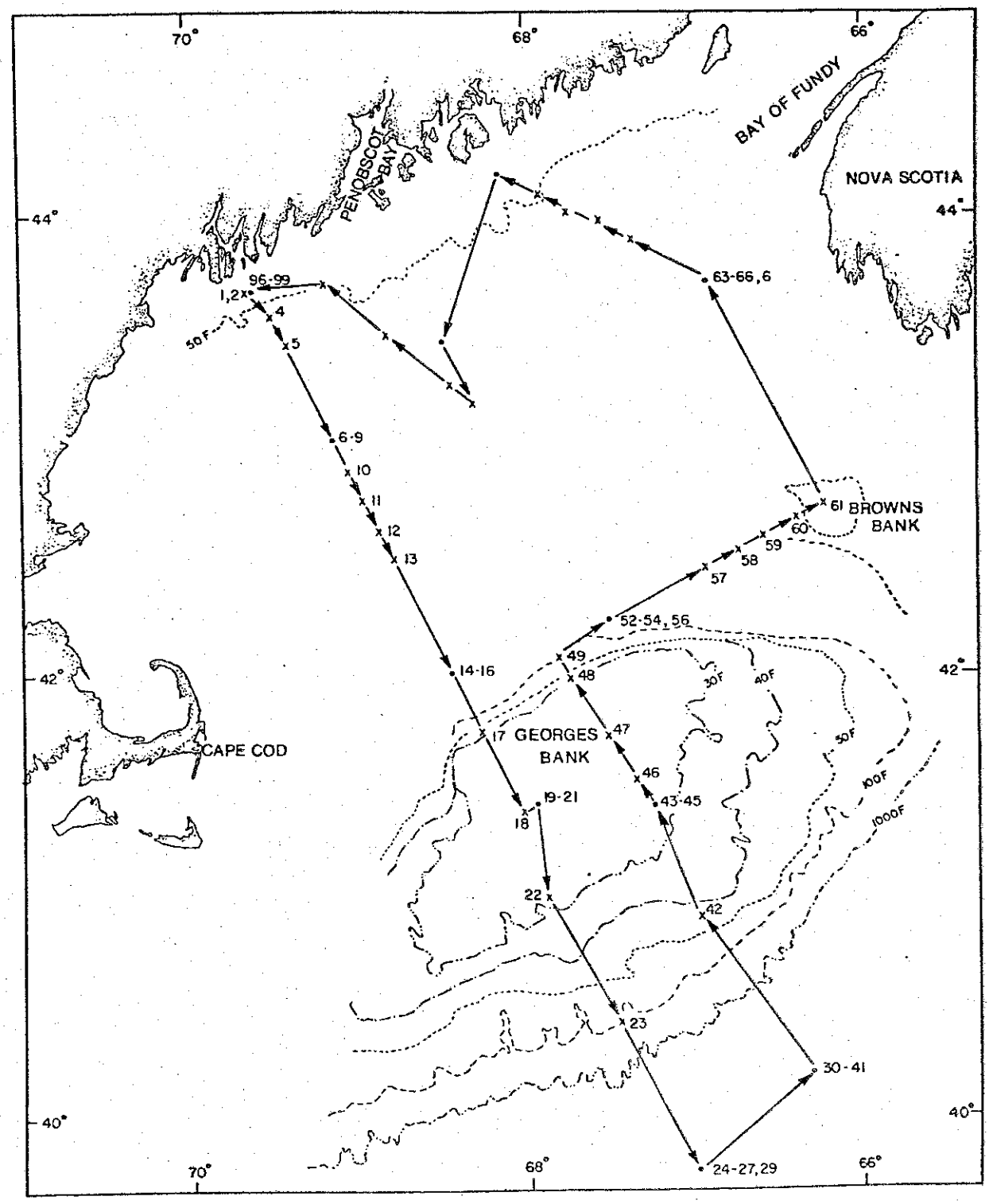

Fig. 1. Cruise track, R.V. EASTWARD, June, 1977.

Table E-1. Summary of microplankton ETS, NR and Chlorophyll *a* data by depth. *R/V EASTWARD* cruise during June-July 1977.

DATE	STN. NO.	POSITION	DEPTH m	%I_o	TEMP. *IN SITU*	TEMP. INCUBATION	NR ACTIVITY (nM NO_2^- $\ell^{-1}h^{-1}$)	ETS ACTIVITY (µℓ O_2 $\ell^{-1}h^{-1}$)	CHL-*a* (µg ℓ^{-1})	NR/CHL	ETS/CHL
6/28	8	43°02.5N 69°08.9W	0	100	9.3	13.9	9.59	0.84	3.92	2.45	0.21
			3.5	40	9.5	↓	6.01	1.17	3.98	1.51	0.29
	↓		6	20	7.0	↓	19.41	0.61	4.45	4.36	0.14
6/29	15	42°00.0N 68°27.0W	0	100	14.4		n.d.	2.03	0.38	n.d.	5.34
			3	40	14.4		n.d.	2.25	0.09	n.d.	25.00
			6	20	14.3		n.d.	2.56	0.37	n.d.	6.92
			9	10	14.2		n.d.	1.64	0.42	n.d.	3.90
			13	3	13.1		n.d.	2.08	0.28	n.d.	7.43
	↓		17	1	11.4		n.d.	1.51	0.73	n.d.	2.07
6/30	20	41°25.0N 67°56.5W	0	100	12.3	14.4	0.50	4.76	3.12	0.16	1.53
			3	40	12.3		0.39	4.29	2.17	0.18	1.98
			5	20	12.3		0.57	4.44	2.17	0.26	2.05
			7	10	12.4		0.47	5.24	2.23	0.21	2.35
			10	4	12.4		0.87	4.00	2.44	0.36	1.64
	↓		14	1	12.3	↓	0.13	6.77	2.33	0.06	2.91
7/1	26	39°45.0N 66°58.9W	0	100	20.0	20.0	0.12	2.19	0.13	0.92	16.85
			4	40	19.9		0.50	3.35	0.23	2.17	14.56
			8	20	19.8		0.15	3.80	0.28	0.53	13.57
			21	10	18.8		0.24	2.13	0.66	0.37	3.23
			33	4	17.2		0.25	3.14	0.12	2.08	26.16
	↓		51	1	14.7	↓	0.06	0.94	0.10	0.62	9.40
7/2	33	40°13.7N 66°15.5W	5	40	n.d.	21.5	0.07	2.01	0.14	0.50	14.36
			35	3	n.d.		0.32	0.65	0.80	0.40	0.81
			45	1	n.d.	↓	0.85	6.99	1.80	0.47	3.88
7/3	45	41°25.5N 67°15.5W	0	100	11.5	11.5	0.78	3.20	2.33	0.33	1.37
			3	40	11.5		0.35	3.52	1.80	0.19	1.96
			6	20	11.3		0.38	4.47	2.39	0.16	1.87
			8	10	11.0		0.59	3.54	3.29	0.18	1.08
			12	4	10.7		0.41	4.74	2.76	0.15	1.72
	↓		17	1	10.7	↓	0.37	4.92	2.54	0.15	1.94

ble E-1. (Cont'd.)

TE	STN. NO.	POSITION	DEPTH m	DEPTH %I_o	TEMP. *IN SITU*	TEMP. INCUBATION	NR ACTIVITY (nM NO_2^- $\ell^{-1}h^{-1}$)	ETS ACTIVITY (µl O_2 $\ell^{-1}h^{-1}$)	CHL-*a* (µg ℓ^{-1})	NR/ CHL	ETS/ CHL
'4	54		0	100	14.5	14.5	0.33	2.12	0.38	0.87	5.58
			4	40	14.2		0.26	2.32	0.52	0.50	4.46
			9	20	13.7		0.20	3.72	0.52	0.38	7.15
			14	10	12.8		0.43	3.09	0.74	0.58	4.17
			21	4	11.4		0.71	2.46	1.12	0.64	2.19
	↓	42°14.1N 67°30.5W	31	1	9.5	↓	0.47	3.54	0.78	0.60	4.54
'5	63		0	100	13.3	13.5	0.13	4.03	0.88	0.15	4.58
			4.5	40	11.7		0.14	3.96	0.94	0.15	4.21
			8	20	10.3		0.17	3.37	1.14	0.15	2.96
			12	10	9.3		0.20	2.63	1.14	0.18	2.30
			16	4	9.1		0.42	3.42	1.00	0.42	3.42
	↓	43°44.0N 66°54.3W	25	1	8.2	↓	0.25	1.62	0.90	0.28	1.80
'6	76		0	100	9.5	16.8	1.47	2.22	2.33	0.63	0.95
			2.5	40	9.0		1.58	2.77	2.44	0.65	0.14
			4.5	20	8.6		1.04	2.55	2.97	0.35	0.86
			7	10	8.2		1.95	3.24	2.86	0.68	1.13
			10	4	8.1		1.03	3.19	3.02	0.34	1.06
	↓	44°11.4N 68°08.9W	17	1	7.3	↓	0.51	1.06	1.59	0.32	0.67
'7	86		0	100	13.1	14.8	0.09	1.65	0.68	0.13	2.42
			5	40	12.6		0.16	1.62	0.64	0.24	2.54
			10	20	12.1		0.56	2.43	0.88	0.64	2.76
			14	10	11.6		0.38	2.12	0.98	0.39	2.16
			20	4	11.0		1.11	1.80	1.32	0.84	1.37
	↓	43°28.0N 68°28.4W	29	1	7.3	↓	0.47	1.28	1.04	0.45	1.23
'8	97		0	100	12.9	12.5	0.33	3.25	0.64	0.52	5.08
			3	40	12.5		0.29	2.07	0.84	0.35	2.47
			5	20	12.2		0.50	0.39	0.84	0.59	0.46
			8.5	10	11.6		0.51	2.58	1.00	0.51	2.58
			13	4	10.9		1.65	1.73	1.42	1.17	1.22
	↓	43°41.9N 69°38.9W	21	1	9.3	↓	0.46	3.05	1.34	0.34	2.28

Table E-2. Areal and mean chlorophyll, ETS, AND NR. *R.V EASTWARD*, June, 1977. Areal measurements are for the euphotic zone, 100% to 1% I_o, except as noted. Mean values are areal values divided by depth interval. Units are Chlorophyll-a = mg m^{-2}; mean Chlorophyll-a = µg ℓ^{-1}; ETS = mℓ O_2 $m^{-2}h^{-1}$; mean ETS = µℓ O_2 $\ell^{-1}h^{-1}$; ETS/Chl = µℓ O_2 · µg $Chl^{-1}h^{-1}$; NR = µM NO_2^- $\ell^{-1}h^{-1}$; mean NR = nM NO_2^- $\ell^{-1}h^{-1}$; NR/Chl = nM NO_2^- · µg Chl. These values are calculated from the data presented in Table E-1.

STN. NO.	MAX (m)	ΣCHL-α	MEAN CHL	ΣETS	MEAN ETS	$\frac{\Sigma ETS}{\Sigma CHL}$	ΣNR	MEAN NR	$\frac{\Sigma NR}{\Sigma CHL\text{-}a}$
8*	6	24.36	4.06	5.74	0.96	0.24	59.08	9.85	2.43
15	17	6.00	0.35	34.56	2.03	5.76	--	--	--
20	14	33.22	2.37	67.39	4.81	2.03	7.35	0.52	0.22
26	51	14.51	0.28	132.27	2.59	9.12	10.81	0.21	0.75
33†	45	27.80	0.62	88.15	1.96	3.17	12.05	0.27	0.43
45	17	43.51	2.56	70.79	4.69	1.63	7.71	0.45	0.18
54	31	23.55	0.76	90.43	2.92	3.84	13.80	0.45	0.59
63	25	25.13	1.01	77.59	3.10	3.09	6.15	0.25	0.24
76	17	43.62	2.57	43.32	2.55	0.99	20.03	1.18	0.46
86	29	28.34	0.98	53.02	1.83	1.87	15.89	0.55	0.56
97	21	23.61	1.12	44.46	2.12	1.88	16.79	0.80	0.71

*Samples from 100% to 20% light depth only (Om, 3.5m, and 6m)

†Samples from 40%, 3% and 1% light depth only (5m, 35m and 45m). This number includes a 0-5m average based on the value at the 40% light depth.

Table E-3. Respiration in terms of O_2 consumed and CO_2 evolved. Values are calculated on an areal basis and on a mean euphotic zone basis. Integrated and average ETS values in Table E-2 were used for these calculations.

STN NO.	O_2 CONSUMED (ml O_2 $m^{-2}h^{-1}$)	AVERAGE O_2 CONSUMED ($\mu\ell$ O_2 $\ell^{-1}h^{-1}$)	CO_2 EVOLVED (mg C · $m^{-2}h^{-1}$)	AVERAGE CO_2 EVOLVED (μg C · $l^{-1}h^{-1}$)
8*	0.86	0.14	0.46	0.08
15	5.18	0.30	2.78	0.16
20	10.11	0.72	5.42	0.39
26	19.84	0.39	10.63	0.21
33†	13.22	0.29	7.08	0.16
45	10.62	0.70	5.69	0.38
54	13.56	0.44	7.26	0.24
63	11.64	0.47	6.23	0.25
76	6.50	0.38	3.48	0.20
86	7.95	0.27	4.26	0.14
97	6.67	0.32	3.57	0.17

* Samples from 100%, 40% and 20% light depths only (Om, 3.5m and 6m)

† Samples from 40%, 3% and 1% light depths only (5m, 35m and 45m). This number includes a 0-5m average based on the value at the 40% light depth.

Table E-4. Microplankton ETS, NR, and chlorophyll fractionation data done on samples taken from the 40% light depth during the R.V. EASTWARD cruise to the Gulf of Maine, June, 1977. These numbers have not been checked as the pertinent data were missing from the original data sheets.

STN. NO.	DEPTH (m)	SIZE FRACTION (μ)	TEMP. *in situ*	TEMP. inc.	NR (nM NO_2 $h^{-1}\ell^{-1}$)	ETS (μℓ O_2 $h^{-1}\ell^{-1}$)	CHLOROPHYLL (μg ℓ^{-1})	NR/ CHL	ETS/ CHL
8	3.5	<10	9.5	13.9	--	1.67	0.86	--	1.94
15	3	<10	14.4	--	--	2.90	0.02	--	145.00
20	3	<10	12.3	14.4	0.17	3.21	0.42	0.41	7.64
26	4	<10	19.9	20.0	0.10	4.92	0.13	0.76	37.85
33	5	<10	--	21.5	0.04	4.13	0.02	2.00	206.50
45	3	<10	11.5	11.5	0.22	3.46	0.31	0.71	11.17
54	4	<10	14.2	14.5	0.15	3.08	0.26	0.56	11.83
63	4.5	<10	11.7	13.5	0.04	3.91	0.47	0.09	8.32
76	2.5	<10	9.0	16.8	0.05	0.81	1.46	0.03	0.55
86	5	<10	12.6	14.8	0.03	2.14	0.12	0.27	17.83
97	3	<10	12.5	12.5	0.28	2.34	0.46	0.61	5.09

Table E-5. Zooplankton ETS activity, O_2 consumption, CO_2 evolution, NH_4^+ excretion, and dry weight of collected material. All hauls were done with a 212 μm mesh, 1 m diameter net. ETS activity was corrected to average in situ activity for the haul (Owens and King, 1975).

STATION NO.	DEPTH INTERVAL (m)	ETS (ml O_2 $m^{-2}h^{-1}$)	O_2 CONSUMED	CO_2 EVOLVED (mg C $m^{-2}h^{-1}$)	NH_4^+ (μg-at $m^{-2}h^{-1}$)	DRY WEIGHT (mg m^{-2})
8	30-0	5.76	2.88	1.31	32.14	24.7
8	150-30	25.44	12.72	5.79	141.96	47.8
8	150-30	27.72	13.86	6.31	154.69	47.8
19	30-0	23.61	11.81	5.38	131.81	117.2
26	30-0	0.66	0.33	0.15	3.68	4.3
26	100-30	0.32	0.16	0.07	1.80	0.62
26	200-100	0.41	0.21	0.09	2.29	0.054
30	30-0	1.47	0.74	0.33	8.26	5.84
45	30-0	18.66	9.33	4.25	104.13	--
45	50-30	11.66	5.83	2.65	65.07	78.6
54	30-0	70.23	35.12	15.98	391.91	122.3
54	100-30	41.86	20.93	9.53	233.59	75.2
54	250-100	15.90	7.95	3.62	88.72	15.8
63	30-0	19.77	9.89	4.50	110.32	65.9
63	130-30	94.60	47.30	21.54	527.90	41.1
76	30-0	0.96	0.48	0.22	5.36	22.0
76	60-30	7.02	3.51	1.60	39.17	2.5
85	30-0	89.94	44.97	17.84	501.90	171.2
85	155-30	46.13	23.06	10.50	257.39	38.6
97	30-0	46.53	23.27	10.59	259.65	42.1
97	70-30	0.80	0.40	0.18	4.46	13.8

DATE	STATION NUMBER
July 17, 1979	1-5
July 18, 1979	6,7
July 19, 1979	8,9
July 23, 1979	10,11
July 25, 1979	12,13
July 26, 1979	14,15

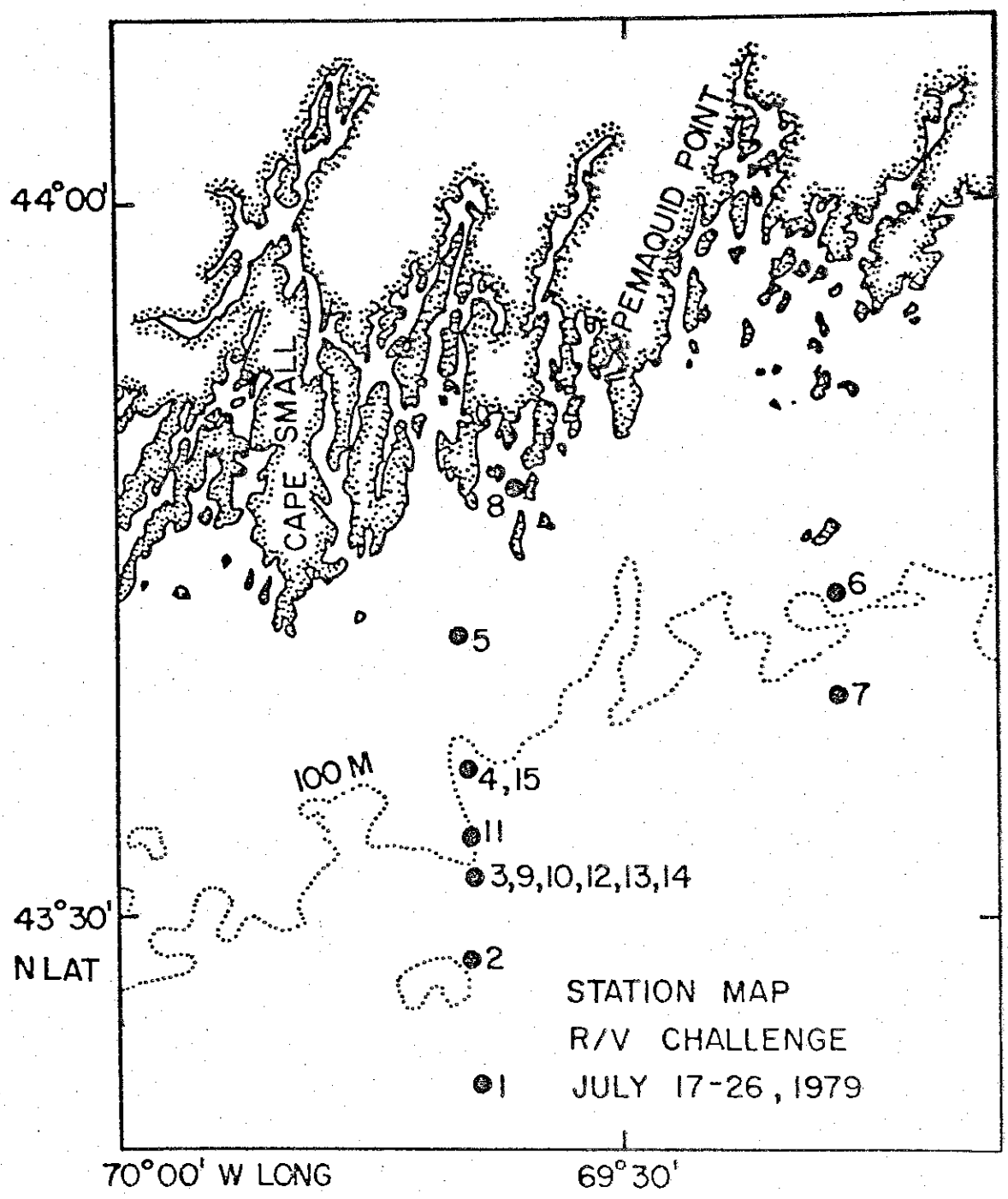

Fig. 2. Station locations, R.V. CHALLENGE cruise, July, 1979.

Table C-1. Summary of microplankton ETS, chlorophyll, and protein measurements for the R.V. CHALLENGE cruise, July, 1979. Protein N is calculated from protein by dividing by 87.5 (6.25 x 14).

STATION & SAMPLE NO.	DEPTH (m)	ETS ($\mu\ell\ O_2\ l^{-1}h^{-1}$)	TOTAL Chl ($\mu g \cdot l^{-1}$)	PROTEIN ($\mu g \cdot l^{-1}$)	PROTEIN N (μg at $\cdot l^{-1}$)	ETS/ CHL	ETS/ PROTEIN	ETS/ N	N/ CHL
8-1	34-20	1.31	1.43	24.43	0.28	0.92	0.05	4.68	0.20
2	20-2	2.46	3.26	110.32	1.25	0.75	0.02	0.97	0.38
9-1	60-49	----	----	2.02	0.02	----	----	----	----
2	49-23	2.65	----	5.66	0.58	----	0.47	4.57	----
3	23-2	4.80	----	77.13	0.88	----	0.06	5.45	----
4	60-49	----	0.31	2.05	0.02	----	----	----	.07
5	49-31	1.87	1.79	32.03	0.37	1.04	0.06	5.05	0.21
6	31-12	5.79	2.48	144.97	1.66	2.33	0.04	3.49	0.67
7	12-2	3.84	1.03	------	----	3.73	----	----	----
10-1	74-45	0.70	0.50	2.02	0.02	1.40	0.35	35.00	0.04
2	45-25	*1.78	0.88	8.58	0.10	2.02	0.21	17.80	0.11
3	25-8	5.74	2.67	115.73	1.32	2.15	0.05	4.35	0.49
4	8-2	*5.31	0.99	61.41	2.70	5.36	0.09	1.97	2.72
5	36	0.34	1.04	4.86	0.06	0.33	0.07	5.67	0.06
6	29	1.15	1.34	10.73	0.12	0.86	0.11	9.58	0.09
7	18	9.94	4.59	212.22	2.43	2.17	0.05	4.09	0.53
12-1	62-54	*0.57	1.24	39.74	0.45	0.46	0.01	1.27	0.36
2	54-44	1.29	3.08	67.62	0.77	0.42	0.02	1.68	0.25
3	44-19	1.48	1.15	19.36	0.22	1.29	0.08	6.73	0.19
† 4	19-4	*1.94	2.37	64.37	0.74	0.82	0.03	2.62	0.31
† 5	29	*1.19	1.66	26.06	0.30	0.72	0.05	3.97	0.18
† 6	14	3.98	1.80	93.47	1.07	2.21	0.04	3.72	0.48
13-1	68-48	1.01	2.04	169.32	1.94	2.50	0.01	0.52	0.95
2	48-23	*0.61	1.38	16.28	0.19	0.46	0.04	3.21	0.14
3	23-6	2.81	1.89	76.69	0.88	1.49	0.04	3.19	0.47
4	6-2	*3.51	1.28	63.28	0.72	2.74	0.06	4.88	0.56

* Noted a few zooplankton in the sample. At Sta. 12-4, luminescence was noted as filter went dry.

† These samples were taken from Niskin bottles, samples 1-3 were taken from the submersible pumping system.

Table C-1 Con'td.

STATION & SAMPLE NO.	DEPTH (m)	ETS ($\mu\ell\ O_2\ l^{-1}h^{-1}$)	TOTAL Chl ($\mu g \cdot l^{-1}$)	PROTEIN ($\mu g \cdot l^{-1}$)	PROTEIN N ($\mu g\ at \cdot l^{-1}$)	ETS/ CHL	ETS/ PROTEIN	ETS/ N	N/ CHL
14-1	70-52	1.14	0.36	19.98	0.22	3.17	0.06	5.18	0.61
2	52-29	*0.95	0.63	33.20	0.38	1.51	0.03	2.50	0.60
3	29-10	4.70	3.48	155.33	1.78	1.35	0.03	2.64	0.51
4	10-2	*3.03	1.09	52.71	0.60	2.78	0.06	5.05	0.55
15-1	64-26	1.19	1.04	31.37	0.36	1.14	0.04	3.31	0.35
Mean		2.66	1.66	58.07	.68	1.61	.08	6.94	38
		2.17	1.04	55.81	.63	1.20	.10	9.41	.25
		29	29	30	30	26	28	27	28

* A few zooplankton were noted in these samples.

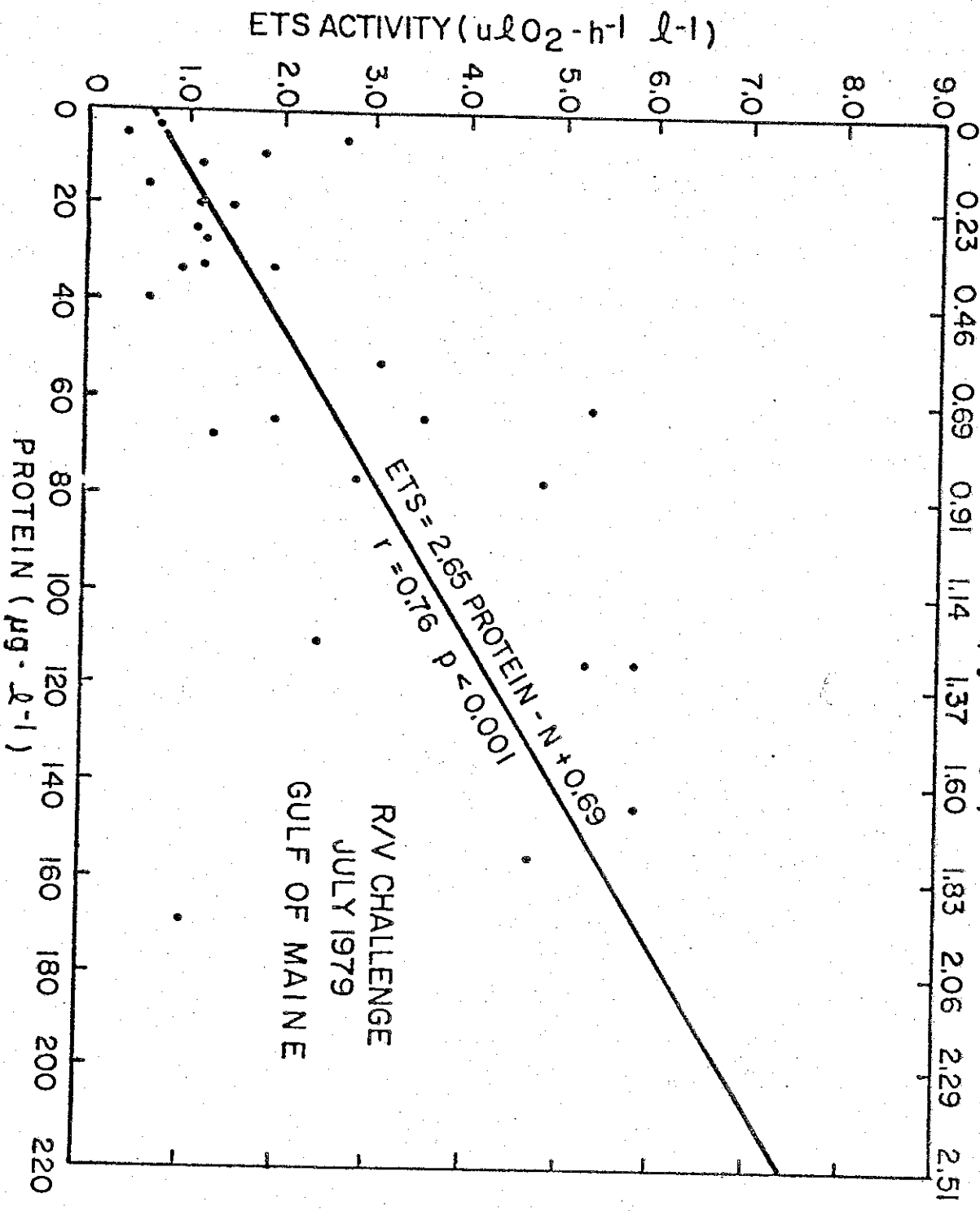
ETS ACTIVITY ($\mu\ell O_2 \cdot h^{-1}\ \ell^{-1}$)
0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
PROTEIN - N ($\mu g \cdot AT \cdot \ell^{-1}$)
0
0.23
0.46
0.69
0.91
1.14
1.37
1.60
1.83
2.06
2.29
2.51
ETS = 2.65 PROTEIN - N + 0.69
r = 0.76 P < 0.001
R/V CHALLENGE
JULY 1979
GULF OF MAINE
0
20
40
60
80
100
120
140
160
180
200
220
PROTEIN ($\mu g \cdot \ell^{-1}$)

Fig. 3.

Table C-2. Respiratory O_2 Consumption and CO_2 Evolution from ETS data (Table C-1), *R/V CHALLENGE*, July 1979.

STATION AND SAMPLE NO.	DEPTH OR INTERVAL (m)	O_2 CONSUMPTION ($\mu\ell\ O_2\ \ell^{-1}h^{-1}$)	CO_2 EVOLVED ($\mu g\ C\ \ell^{-1}h^{-1}$)
8-1	34-20	0.20	0.11
2	20-2	0.37	0.20
9-1	60-49	--	--
2	49-23	0.40	0.21
3	23-2	0.72	0.39
5	49-31	0.28	0.15
6	31-12	0.87	0.47
7	12-2	0.58	0.31
10-1	74-45	0.11	0.06
2	45-28	0.27	0.14
3	28-8	0.86	0.46
4	8-2	0.80	0.43
5	36	0.05	0.03
6	29	0.17	0.09
7	18	1.49	0.80
12-1	62-54	0.09	0.05
2	54-44	0.19	0.10
3	44-19	0.22	0.12
4	19-4	0.29	0.16
5	29	0.18	0.10
6	14	0.60	0.32
13-1	68-48	0.15	0.08
2	48-23	0.09	0.05
3	23-6	0.42	0.23
4	6-2	0.53	0.28
14-1	75-52	0.17	0.09
2	52-29	0.14	0.08
3	29-10	0.71	0.38
4	10-2	0.45	0.24
15-1	69-26	0.18	0.10

Table C-3. Microplankton ETS activity in samples taken in the Gulf of Maine, July 17, 1979, during the *R/V CHALLENGE* cruise. Measurements were made by T. Packard using a mini-spectrophotometer, 1 cm cell, and 4 liters of filtrate. A blank consisted of 0.1 ml of filtered seawater ground with a glass fiber filter (A = 0.020). The "I" in the depth description columns means the values are integrated. Chlorophyll measurements were done by D. Phinney by the method described in Yentsch and Menzel (1963) with the exception that calibration is standardized against pure CHL-*a* (Sigma Scientific). Gary Grunseich has depth profiles.

STATION NO.	DEPTH DESCRIPTION	CORRECTED DEPTH INTERVAL	ETS ACTIVITY ($\mu\ell\ O_2\ h^{-1}\ell^{-1}$)	CHLOROPHYLL ($\mu g\ \ell^{-1}$)	ETS/CHL	METHODS NOTES	BIOLOGY NOTES
1	Surface-I	14-2	1.81	0.75	2.41	Centrifugation done after incubation, temperature not exact	
	Chl-Max-I	33-14	---	2.18	---		
1	Bottom-I	52-33	1.46	0.88	1.67	Temp.=10°C, Centrifugation done after incubation.	filter a light yellow color Small copepod unable to remove in sample
2	Surface-I	8.5-2	---	0.67	---		
2	Chl-Max-I	36-8.5	3.67	2.04	1.81	"	filter a golden brown color
2	Chl-Max	16	15.65	2.56	6.11	"	
2	Bottom-I	56-36	1.95	0.53	3.68	Temp. not exact, centrifugation done after incubation	Removed 3 copepods
4	Surface -I	9-2	3.19	1.42	2.25	Centrifugation done before incubation; temp. exact	
4	Thermocline-II	26-9	4.67	3.04	1.54	"	Golden brown color
4	Thermocline-I	42-26	0.27	0.53	0.51	"	Filter went dry after 15 sec.
4	Bottom-I	60-42	0.29	0.38	0.76	"	