

IMER 1/79

RVS Ref. No. JM2/79

VESSEL: RRS JOHN MURRAY.CRUISE PERIOD: 11-23 January 1979.

PERSONNEL:

R. Williams	PSO (Senior Scientist)
H.H. Bottrell	SSO
D.V.P. Conway	HSO
N. Collins	HSO
A. Bale	SO
D. Robins	ASO
E. Somerville-Woodward	ASO

ITINERARY:

11	January	15.15	Departed Barry.
		17.30	Started monitoring tracks with horizontal profiling; station checks every 15 min.
		18.00	Station 14 first plankton haul station see Fig. 1.
12	"	13.45	Ship stopped to effect repair and change-over of Flygt pumps.
		15.10	Restarted monitoring grid.
13	"	09.40	Station 33, the last plankton station of the grid.
		11.15	Completed monitoring track past Station 15; set course for Carmarthen Bay.
		18.30	Live plankton collection.
		22.30	Started feeding experiment 1.
14	"	07.32	Commenced Survey 1 (Appendix Ia).
		16.00	Completed grid survey.
		18.00	Live plankton collections.
		22.00	Started feeding experiment 2.
		23.00	Finished feeding experiment 1.
15	"	06.51	Vertical profile at Station 29.
		07.24	Completed Station 29.
		08.25	Vertical profile at Station 25.
		09.12	Completed Station 25.
		10.21	Vertical profile at Station 1.
		11.08	Completed Station 1.
		12.32	Vertical profile at Station 6.
		13.17	Completed Station 6.
		14.02	Vertical profile at Station 31.
		14.38	Completed Station 31.
		14.50	Deployment of Macer sledge.
		20.00	Live plankton collections.
		22.08	Deployment of Macer sledge.
		22.30	Finished feeding experiment 2.
16	"	09.38	Water bottle cast.
		10.15	Deployment of Macer sledge.
		10.17	Commenced ¹⁴ C incubation on deck.
		16.17	Completed ¹⁴ C experiment.
		24.00	Set course for Celtic Sea.
17	"	06.32	Commenced Celtic Sea grid (Appendix IIa)
		16.03	Completed Celtic Sea grid.
		16.19	Plankton sampler inboard.
		16.22	Gale force 8; set course for Milford Haven.
18	"	08.00	Locked in to Milford Haven.

20	January	08.30	Left Milford Haven.
		12.33	Arrived Station 31, Celtic Sea.
		12.36	Live plankton collections.
		13.00	LHPR 1.
		13.06	Feeding experiment 3 started.
		14.18	Vertical profile at Station 31.
		16.10	Completed Station 31.
		17.11	Vertical profile at Station 25.
		18.49	Completed Station 25.
		19.00	Feeding experiment 4 started.
		19.35	LHPR 2.
		20.46	Vertical profile at Station 6.
		22.25	Completed Station 6.
		23.13	Live plankton collections.
21	"	01.00	LHPR 3.
		07.05	LHPR 4.
		09.07	Vertical profile at Station 30.
		10.45	Completed Station 30.
		11.50	Live plankton collections.
		13.00	LHPR 5.
		15.20	Lowestoft 30" sampler deployed.
		17.24	Vertical profile at Station 1.
		19.07	Completed Station 1.
		19.37	Completed feeding experiment 2 and copepod development experiment.
		20.33	Live plankton collections.
22	"	00.59	LHPR 6. Swivel unit parted when system made contact with sea-bed. Loss Report.
		01.54	Set course for Barry - Gale force 8.
		20.30	Docked Barry.
23	"		Unloaded equipment and travelled to Plymouth.

OBJECTIVES:Programme Objectives

1. To compare the rates and processes which control the seasonal development of two species of copepod at two contrasting sites; one a near-shore embayment (Carmarthen Bay), the other, offshore with a seasonally stratified water column (Celtic Sea site).
2. To compare seasonal differences in the rates of nutrient turnover at the two sites with emphasis on sediment-water column interactions at the Carmarthen Bay site.

Cruise Objectives

1.
 - a) To measure levels of nutrients, chlorophyll, total suspended matter, organic matter and the zooplankton and phytoplankton populations.
 - b) To characterise the hydrographic conditions at the two sites.
 - c) To measure the feeding rates and development times of two species of copepod at the two sites.
2. To continue a series of cruises to monitor the performance of the Bristol Channel area to update the validation of the ecosystem model GEMBASE.

PROCEDURES AND METHODS:

As outlined in the Cruise Programme. The grids and station positions were amended to suit the prevailing conditions (Appendices I and II).

EQUIPMENT AND
OTHER FAILURES:

The sailing time was delayed because of the late delivery of equipment and the bad weather. Work was halted on 17 January 16.22 hours with a Gale Force 8 which took us into Milford Haven with the subsequent loss of 2½ days. The cruise was terminated one day early because the programme was completed and also because of deteriorating weather. The fluorometer, which had undergone extensive bench tests before the cruise, malfunctioned and provided no useful data. The electronic control unit of the Lowestoft 30" combination net failed to activate the sampling system, possibly through insufficient bench tests being carried out on the equipment prior to leaving the laboratory. One of the Flygt pumps failed and had to be replaced. The LHPR was lost on the final tow when the system made contact with the seabed and parted the swivel/shock absorber unit (see Loss Report JM/1/79).

RESULTS:

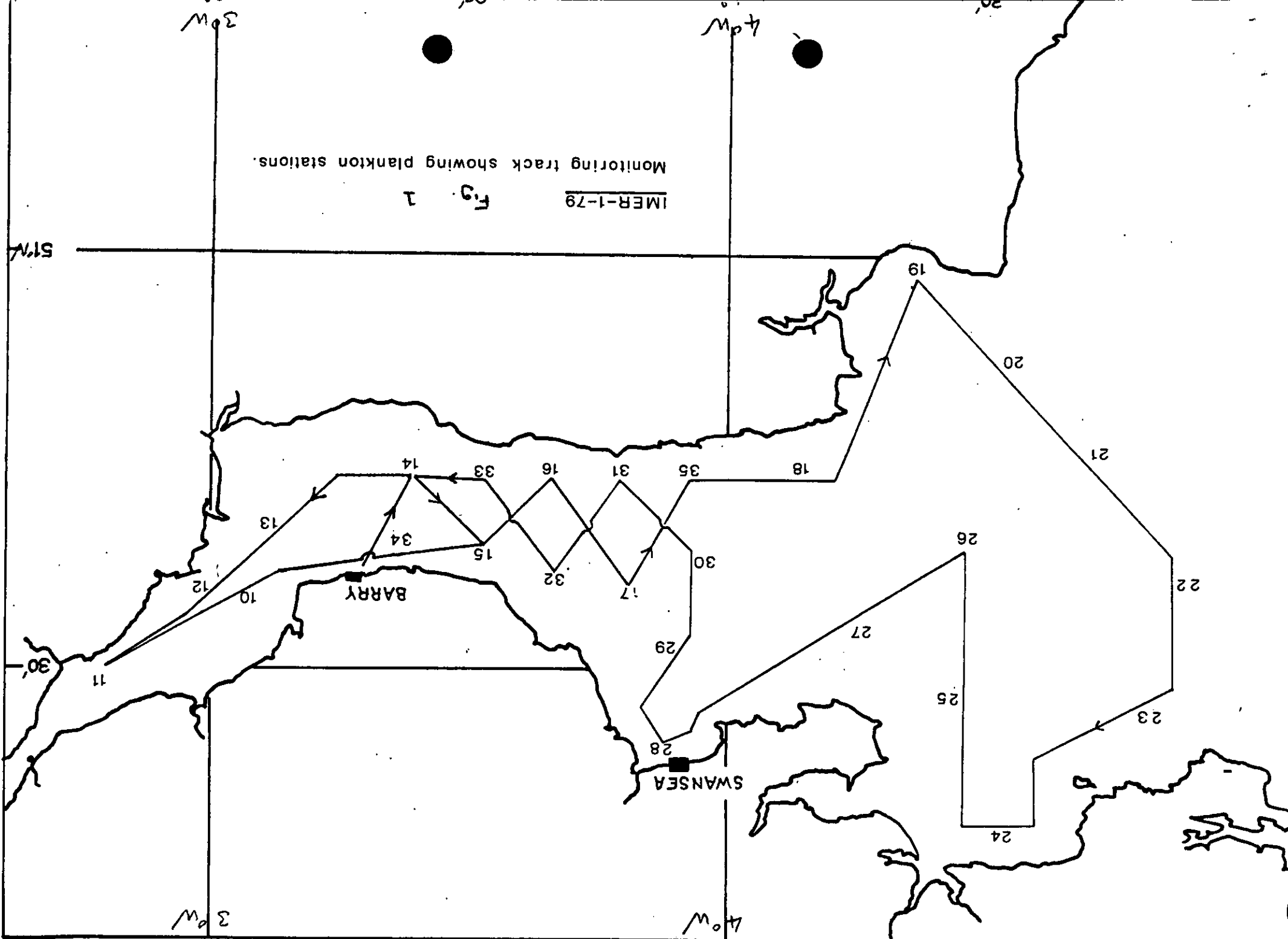
Even in poor weather conditions the monitoring cruise track was successfully completed in 40 hours (Fig. 1, Table 1). One complete grid survey (Appendix Ia) and a series of vertical profiles (Ic) were completed in the Carmarthen Bay site. The survey will be used to investigate the temporal and spatial distribution of particulate organic carbon, nitrate, nitrite, reactive phosphate, reactive silicate, phytoplankton species, chlorophyll, particle size, microseston and net zooplankton (Appendix Ib). The seawater temperature at 3 m varied from 6.4°C in the north east of the Bay to 8.1°C in the south west corner; the water was isothermal in the depth profiles. The salinity varied from 33.1‰ in the north east corner to 33.9‰ in the south west. The particle size distribution was very similar over the whole of the Bay, the distributions being heavily skewed towards the smaller size particles in the 2-8 µm range. Zooplankton was very scarce in the Bay although 2 copepod feeding experiments were carried out with Calanus helgolandicus (copepodites V and adults). One ¹⁴C phytoplankton production experiment was completed at four simulated light levels.

One complete grid survey (Appendix IIa and b) and five vertical profiles (IIc) were completed in the Celtic Sea site. The seawater temperature at 3 m varied from 9.8 to 10.2°C over the grid and there was a small variation in the salinity from the NW and NE value of 35.1‰ to 35.2‰ in the SW corner of the grid. Five successful hauls were taken with the LHPR although there was a Recorder paper transport problem in LHPR 4 which will make interpretation difficult (Appendix IIId). Net hauls provided zooplankton material for the determination of length, dry weight, calorific value, carbon, nitrogen, lipids and gut content of copepods. Two copepod feeding rate experiments were carried out with C. helgolandicus (stage V and adults). The particle distribution in the water was 25-64 µm consisting of large numbers of naked flagellates, Nitzschia spp, Thalassiosira sp. and dinoflagellates. The large particles of the size spectrum were grazed out by the Calanus in the feeding experiments.

Prepared by: R. Williams
 Approved by: R.S. Glover
 Date: 5 February 1979

Monitoring track showing plankton stations.

IMR-1-79
Fig. 1



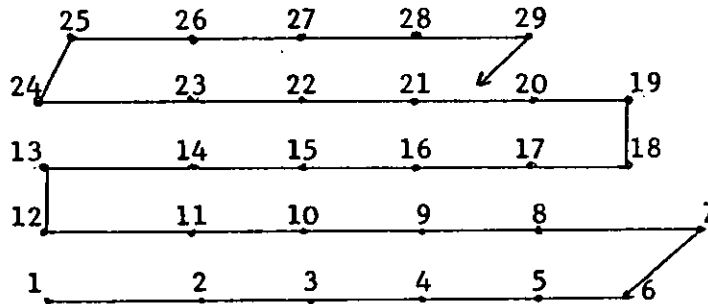
Monitoring - Plankton station positions
11-13 January, 1979.

Lowestoft 30" Sampler

Station Number	Date	Time	Decca		
			Red	Green	Purple
14	11.1.79	1800	C 0.37		B 56.00
13		2008	C 14.65		B 72.60
12		2135	C 19.13		C 50.70
11	12.1.79	0118	D 9.05		B 76.59
10		0342	C 15.85		C 53.12
34		0547	C 0.88		C 50.75
15		0637	B 18.27		B 70.32
16		0735		C 41.75	A 67.60
17		0842		D 34.41	B 55.17
35		0957		D 36.07	J 75.04
18		1110		E 32.80	J 54.13
19		1306		E 35.00	H 50.60
20		1527		E 45.00	H 62.08
21		1715		F 46.20	I 51.30
22		1816		G 36.82	I 59.00
23		2029		G 30.00	J 64.82
24		2213		F 39.11	A 60.91
25		2342		F 33.59	J 77.37
26	13.1.79	0102		F 30.87	J 51.50
27		0213		E 38.89	A 50.00
28		0400		D 42.99	B 70.15
29		0513		D 42.24	B 51.07
30		0604		D 38.65	A 62.80
31		0658		D 30.00	A 57.70
32		0808		C 45.80	B 63.50
33		0940		C 37.08	A 78.24

APPENDIX Ia

Carmarthen Bay Site - Cruise track and station positions, 14 January 1979.



Station Positions

<u>Station</u>	<u>Time (GMT)</u>	<u>Decca Positions</u>		<u>Station</u>	<u>Time (GMT)</u>	<u>Decca Positions</u>	
501	0732	F 42.20	J 67.80	516	1216	F 34.25	A 56.26
502	0750	F 39.70	J 70.50	517	1233	F 31.81	A 59.62
503	0810	F 36.80	J 73.70	518	1242	F 30.43	A 61.43
504	0838	F 33.35	J 78.15	519	1302	F 31.12	A 65.01
505	0900	F 30.80	A 51.77	520	1313	F 32.32	A 63.27
506	0913	E 47.40	A 53.82	521	1331	F 34.71	A 59.60
507	0934	E 46.92	A 59.08	522	1357	F 38.10	A 55.54
508	0950	F 31.39	A 55.70	523	1416	F 40.48	A 52.32
509	1004	F 33.95	A 51.94	524	1435	F 43.03	J 79.28
510	1022	F 37.27	J 77.67	525	1453	F 42.61	A 53.83
511	1036	F 39.97	J 74.64	526	1506	F 40.75	A 56.09
512	1048	F 42.55	J 71.70	527	1524	F 38.07	A 59.16
513	1111	F 42.90	J 75.49	528	1544	F 35.11	A 63.29
514	1133	F 40.19	J 78.73	529	1600	F 32.75	A 66.52
515	1152	F 37.64	A 51.94				

Nutrients, chlorophyll, salinity, temperature, particle size and microseston were measured at all stations; DOC at all but the first five stations. DON and DOP were measured at alternate stations, and selected stations were sampled for POC and phytoplankton species counts.

APPENDIX IbCarmarthen Bay site - 14 January, 1979.Lowestoft 30" Sampler

<u>Haul No.</u>	<u>Time (GMT)</u>		<u>Decca Positions</u>			
	<u>Shot</u>	<u>Recovered</u>	<u>Shot</u>		<u>Recovered</u>	
1	0813	0846	F 36.43	J 74.78	F 32.27	A 50.06
2	0913	0928	E 47.49	A 54.73	E 47.16	A 58.20
3	0947	1005	F 31.48	A 56.12	F 34.41	A 51.90
4	1015	1032	F 35.91	A 78.80	F 39.80	J 75.32
5	1036	1058	F 40.68	J 74.36	F 43.00	J 73.97
6	1118	1136	F 42.03	J 77.04	F 39.74	J 79.96
7	1144	1209	F 38.69	A 51.21	F 35.21	A 55.62
8	1216	1232	F 34.39	A 56.72	F 31.87	A 60.09
9	1308	1331	F 32.12	A 64.33	F 35.11	A 59.78
10	1336	1358	F 35.66	A 59.05	F 38.82	A 55.21
11	1402	1419	F 39.20	A 54.61	F 41.82	A 51.22
12	1457	1519	F 42.12	A 54.99	F 38.72	A 58.95
13	1524	1548	F 37.85	A 59.98	F 34.53	A 64.63

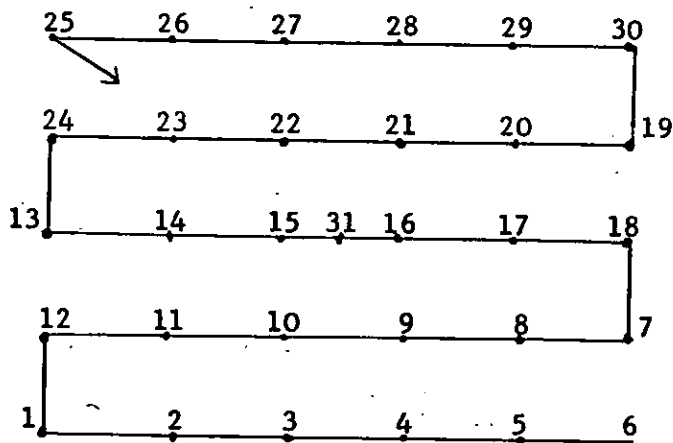
APPENDIX IcCarmarthen Bay site - Vertical Profiles - 15 January, 1979.

<u>Station</u>	<u>Time Cast</u>		<u>Decca Positions</u>		<u>Depths (m)</u>
	<u>Start</u>	<u>Finish</u>			
530	0651	0725	F 32.93	A 66.50	15, 8, 1
531	0830	0915	F 42.90	A 53.84	17, 9, 1
532	1021	1112	F 42.08	J 66.53	30, 20, 10, 1
533	1251	1317	E 47.41	A 53.44	15, 8, 1
534	1403	1440	F 35.98	A 53.91	20, 10, 1

Nutrients, chlorophyll, salinity, temperature, microseston, particle size, phytoplankton species counts, POC and DOC were measured at all depths.

APPENDIX IIa

Celtic Sea site - Cruise track and station positions, 17 January 1979.



Station Positions

<u>Station</u>	<u>Time (GMT)</u>	<u>Decca Positions</u>		<u>Station</u>	<u>Time (GMT)</u>	<u>Decca Positions</u>	
706	0632	J 34.05	H 68.26	715	1121	J 41.24	H 70.48
705	0650	J 36.84	H 66.68	714	1137	J 43.81	H 69.22
704	0707	J 39.52	H 65.37	713	1154	J 46.50	H 67.95
703	0732	J 43.24	H 63.53	724	1221	J 45.60	H 71.25
702	0748	J 45.76	H 62.54	723	1241	J 42.92	H 72.64
701	0807	A 30.45	H 60.91	722	1300	J 40.33	H 73.90
712	0829	J 47.51	H 64.72	721	1324	J 36.90	H 75.70
711	0849	J 44.71	H 65.36	720	1343	J 34.25	H 77.24
710	0909	J 42.00	H 67.27	719	1400	J 31.70	H 78.77
709	0930	J 38.68	H 69.29	730	1433	J 30.80	I 52.25
708	0950	J 35.95	H 70.27	729	1453	J 33.34	I 50.52
707	1009	H 33.27	H 71.55	728	1511	J 36.10	H 79.10
718	1026	J 32.27	H 75.19	727	1534	J 39.42	H 77.10
717	1043	J 35.19	H 73.90	726	1547	J 42.00	H 75.78
716	1058	J 37.70	H 72.21	725	1603	J 44.45	H 74.67
731	1110	J 39.52	H 71.23				

Nutrients, chlorophyll, salinity, temperature, particle size, microseston, DOC and carbohydrate were measured at all stations. DON and DOP were measured at alternate stations, and selected stations were sampled for POC and phytoplankton species counts.

APPENDIX IIB

Celtic Sea site - 17 January, 1979

Lowestoft 20" plankton hauls.

<u>Haul No.</u>	<u>Time (GMT)</u>		<u>Decca Positions</u>			
	<u>Shot</u>	<u>Recovered</u>	<u>Shot</u>		<u>Recovered</u>	
1	0653	0725	J 37.45	H 66.73	J 42.06	H 64.07
2	0730	0805	J 43.08	H 63.38	A 30.45	H 61.21
3	0834	0959	J 46.82	H 65.26	J 34.53	H 71.27
4	1030	1134	J 33.21	H 75.16	J 43.47	H 69.70
5	1225	1402	J 45.95	H 71.98	J 31.40	H 79.33
6	1442	1619	J 31.73	I 52.00	J 46.31	H 71.47

APPENDIX IIC

Celtic Sea site - Vertical Profiles, 20-21 January, 1979.

<u>Station</u>	<u>Time Cast</u>		<u>Decca Positions</u>		<u>Depths (m)</u>
	<u>Start</u>	<u>Finish</u>			
732	1432	1605	J 39.80	H 71.10	80,60,40,20,10,5,1
733	1706	1900	J 44.66	H 73.77	80,60,40,20,10,5,1
734	2045	2224	J 34.00	H 67.90	80,60,40,20,10,5,1
735	0905	1045	J 30.63	I 52.47	80,60,40,20,10,5,1
736	1723	1905	A 30.25	H 60.46	80,60,40,20,10,5,1

Nutrients, chlorophyll, salinity, temperature, microseston, particle size, phytoplankton species counts, POC and DOC were measured at all depths.

APPENDIX IID

Celtic Sea site - Longhurst Hardy Plankton Recorder Hauls

<u>Haul No.</u>	<u>Date</u>	<u>Time (GMT)</u>	<u>Shooting Position</u>		<u>Hauling Position</u>		<u>No. of Samples</u>
1	20.1.79	1308	J 39.84	H 71.18	J 42.00	H 67.45	29
2	20.1.79	1934	J 39.05	H 71.12	J 37.10	H 70.35	26
3	21.1.79	0100	J 39.80	H 70.80	J 43.04	H 65.87	51
4	21.1.79	0705	J 39.51	H 71.37	J 36.24	H 74.82	Paper Jam
5	21.1.79	1308	J 39.30	H 71.27	J 37.00	H 71.20	38
6	22.1.79	0058	J 39.21	H 71.43	J 35.62	H 74.43	System Lost