VESSEL	RRS FREDERICK RUSSELL
CRUISE PERIOD	24 September to 5 October 1982
PERSONNEL	R. Williams PSO (Senior Scientist) D.V.P. Conway SSO M. Jordan HSO N.R. Collins HSO A. Pomroy SO D. Robins SO J. Stevens SO C. Hoyle ASO

ITINERARY

23 September		Loaded equipment at Plymouth.
24 September		Delayed sailing due to weather conditions.
27 September	12.30h	Departed Plymouth.
	15.53h	Arrived Station A1.
	18.58h	Anchored Helford River.
29 September	08.07h	Weighed anchor and proceeded to Station CS2.
	12.50h	Deployed UOR.
	18.00h	UOR inboard
	19.04h	Arrived St. CS2; commenced sampling programme
30 September	20.26h	Completed work at CS2; proceeded to Scillies for shelter.
2 October	17.40h	Arrived back on Station
4 October	14.14h	Completed Station work.
	18.45h	Deployed UOR.
	20.30h	Recovered UOR. Set course for Plymouth.
5 October	08.30h	Docked Plymouth.

OBJECTIVES

To measure the impact that the common herbivorous copepod Calanus helgolandicus makes on the level of primary production on shelf seas and to ascertain the flow of carbon through this secondary trophic level.

1) To measure in situ primary production and light in the water column at Station CS2.

2) To measure the abundance and vertical distribution of phytoplankton, bacteria and flagellates.

3) To measure the release of dissolved organic matter by phytoplankton and the concomitant uptake by bacteria.

4) To partition primary production into different size classes of phytoplankton.

5) To determine the vertical distribution, abundance and diel migration of all development stages of Calanus helgolandicus (eggs - adult).

6) To obtain living material for length/dry weight, gut contents, carbon, nitrogen, ash content, calorific value and lipid reserve.

7) To measure the feeding rate (ingestion) of Calanus on natural particulates from three selected depth strata under simulated ambient conditions.

8) To measure the assimilation rate and absorption efficiency by Calanus using radioactive tracer and gut enzyme analysis techniques.

9) To ascertain the horizontal and vertical structure of the biological and physical environment around CS2.

10) To contribute towards a seasonal study of phytoplankton and zooplankton at Station A1 (Joint MBA/IMER project).

PROCEDURES AND METHODS

Outlined in Cruise Programme IMER C4/82.

EQUIPMENT AND OTHER FAILURES

Weather. Gale force winds delayed sailing for 3 days until 12.30 p.m. 24 September and prevented work on the 28 September, and 1 October. Over half the time programmed on station was lost due to bad weather although a large proportion of the work was completed.

Both IMER acoustic monitors failed to operate the doors in the mouth of the DLHPR net because the relay contacts fused; Monitor 2 failed in its operation of the jaws of the RMT net release gear. (See separate internal report).

LHPR hauls - the coarse net system failed in haul 3 and the fine net system in haul 7; haul 6 was discarded through poor gauze advance. The chlorophyll/temperature sensor package, attached to the LHPR, failed to operate because of a fault in the tape recording system.

A similar fault was responsible for the loss of chlorophyll data from the second UOR tow.

The temperature controlled room held the temperature adequately at 12°C but failed to drop below 10°C when required; the cooling equipment was defrosted once during the cruise.

The first 100 m of the Hydrographic wire should be discarded because of contamination through grease coming from excessive lubrication of the wire spooling gear.

RESULTS

Ten bottle casts were taken and water samples analysed for chlorophyll, salinity, nutrients, DOC, bacteria, flagellates, phytoplankton and on 4 occasions particle size distributions were measured. (Table 1).

The IMER Chlorophyll/Temperature/Depth profiling equipment was used to obtain 11 profiles (Table 2). The data recorded by the Chl./T/D were processed immediately using the micro-computer. These data were used to select the depths for

deployment of the ^{14}C incubation bottles. Four on deck and one in-situ experiments were completed; half the incubation bottles were lost on the in-situ rig due to extremely heavy weather during the 24 h incubation. Light was measured continuously at 8 depths throughout the in-situ experiment. Twelve XBT drops were made at and around the station (Table 3). Surface and above thermocline temperature was 14.0°C while the subthermocline temperature was 10.2°C. A four degree thermocline occurred between 40 and 50 m.

Nine LHPR hauls were taken including 3 horizontal tows (Table 4). The euphausiid (Nyctiphanes) was abundant and was thought to be responsible for the large numbers of faecal pellets observed in the samples above the thermocline depth. A greater number of smaller copepods were present in the hauls than the two previous cruises.

Two feeding experiments were carried out, one with Calanus helgolandicus V, ♀ and ♂ and the other with C. finmarchicus Stage V using natural particulates.

Two assimilation experiments were completed with C. helgolandicus using radioactive labelled natural particulates and onboard cultured Thalassiosira weissflogii. One reproductive effort experiment using C. helgolandicus feeding on ^{14}C labelled T. weissflogii was completed. Female copepods and liberated eggs were stored for later analysis. Approximately 200 Calanus helgolandicus Stages IV, V, ♀ and ♂ and 100 C. finmarchicus Stage V were photographed and dried for analyses of dry weight and carbon and nitrogen content. Two experiments were carried out with C. helgolandicus to determine the effects on extra-cellular enzyme activity of starvation over 3 days.

Two UOR tows (Table 5) and 6 RMT net hauls (Table 6) were completed.

Prepared by R. Williams

Approved by

Date 22 October 1982

Circulation list

Internal R.S. Glover, B.L. Bayne, G.A. Robinson, R. Williams, I.R. Joint, J. Aiken, H.H. Bottrell, D.V.P. Conway, N.R. Collins, M.B. Jordan, A. Pomroy, D.B. Robins, G.J. Bailey, C.M. Hoyle, Notice Board, File.

External NERC Foxton (Seindon)
RVS Skinner (Barry)
IOS Mrs Edwards (MIAS)
MBA Denton
DAFS Parrish
MAFF Harden-Jones

Table 1

Water bottle casts

Profile No.	Date	Time (BST)	Position at Start (Decca) Green	Purple	Depths (m)
1	27.9.82	1600	F41.10	B59.44	1, 5, 10, 20, 50
2	29.9.82	1930	F35.80	E55.75	1, 5, 10, 20, 30, 40, 50, 60, 80
3	29.9.82	2340	F35.95	E57.25	"
4	30.9.82	0530	F36.00	E56.40	"
5	30.9.82	1215	F35.73	E55.62	"
6	30.9.82	2000	F39.70	E50.10	1, 5, 10, 20, 30, 40, 60, 80
7	2.10.82	1810	F34.15	E56.60	"
8	3.10.82	0600	F36.80	E55.70	2, 5, 7, 10, 15, 20, 25, 30
9	4.10.82	0610	F31.40	E58.60	"
10	4.10.82	1400	F35.42	E55.90	1, 5, 10, 20, 30, 40, 60, 80

Table 2

Chlorophyll, Temperature, Depth Profiles

Profile No.	Date	Time (BST)	Position (Decca) Green	Purple
1	29.9.82	1945	F36.00	E55.70
2	30.9.82	0015	F35.70	E57.50
3	30.9.82	0600	F36.00	E56.70
4	30.9.82	1230	F35.86	E55.57
5	30.9.82	1920	F38.97	D51.07
6	2.10.82	1840	F33.80	E57.00
7	3.10.82	0630	F36.40	E56.30
8	3.10.82	1000	F36.00	E56.00
9	3.10.82	1200	F40.17	E54.36
10	4.10.82	0640	F30.90	E59.00
11	4.10.82	1320	F35.07	E55.70

Table 3

Expendable Bathythermograph profiles

Profile No.	Day	Time (BST)	Position (Decca) Green	Purple	Depth (m)
1	29.7.82	1618	F43.00	B60.18	103
2	29.9.82	1814	F34.06	E63.80	108
3	29.9.82	2034	F36.58	E55.87	102
4	30.9.82	0147	F37.30	E60.00	106
5	30.9.82	0643	F36.20	E56.50	107
6	30.9.82	1328	F39.13	E53.02	108
7	3o.9.82	1945	F39.50	E50.50	109
8	2.10.82	1855	F33.80	E57.00	105
9	3.10.82	0016	F39.76	E54.46	104
10	3.10.82	0730	F36.90	E58.10	110
11	3.10.82	1325	F39.00	E53.20	103
12	4.10.82	1214	F36.26	E58.03	104

Table 4

Longhurst Hardy Plankton Recorder Hauls

Haul No.	Date	Time (BST)	Position (Decca) Green	Purple	Number of Samples Coarse	Fine
1	29.9.82	2015	F36.58	E55.87	29	29
2	30.9.82	0031	F35.90	E57.96	23	23
3	30.9.82	0630	F36.20	E56.50	23	25
4	30.9.82	1304	F36.46	E55.20	17	17
5	30.9.82	1836	F39.00	E54.70	18	18
6	3.10.82	0006	F39.05	E54.18	-	34
7	3.10.82	0708	F36.20	E57.30	23	15
8	3.10.82	1312	F37.52	E54.3¾	28	33
9	4.10.82	1207	F36.26	E58.03	32	32

Table 5

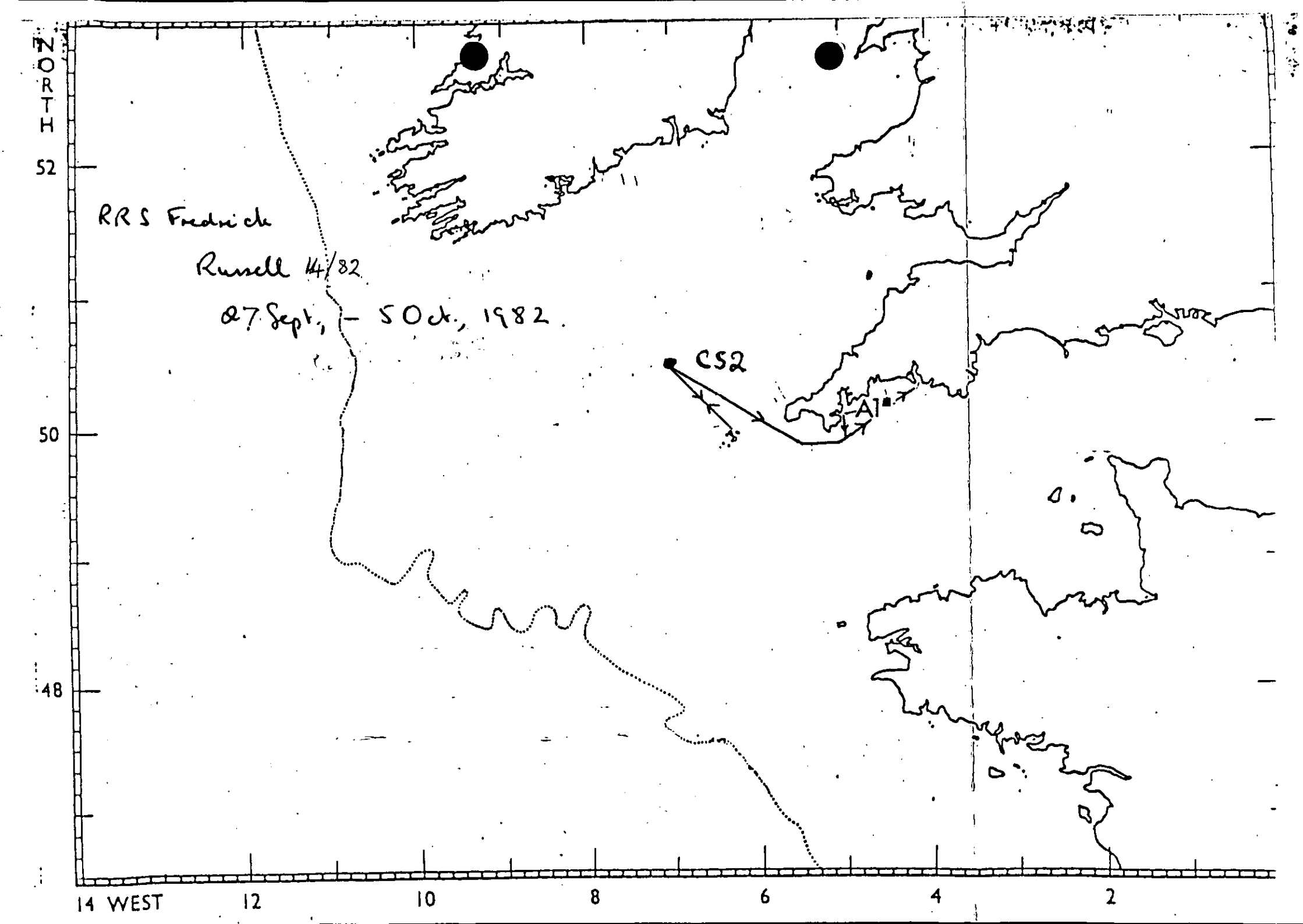
Undulating Oceanographic Recorder

Tow No.	Date	Time (BST)	Position (Decca) Green	Purple	Course
1	29.9.82	1253	G30.80	C65.84	O/B 315°
	29.9.82	1330	G30.16	C74.22	A/C 310°
	29.9.82	1600	F37.80	D74.70	A/C 305°
	29.9.82	1805	F33.64	E64.75	I/B
2	4.10.82	1845	F31.00	E63.30	O/B
	4.10.82	2030	F34.30	E76.00	I/B

Table 6

RMT Hauls

Haul No.	Date	Time (BST)	Position (Decca) Green	Purple	Depth (m)
1	29.9.82	2235	F35.62	E55.85	16-0
2	30.9.82	0318	F35.64	E55.84	95-70
3	2.10.82	2108	F32.97	E56.28	95-70
4	2.10.82	2136	F35.04	E55.80	100-65
5	2.10.82	2155	F35.80	E55.58	60-43
6	2.10.82	2229	F36.83	E55.16	32-0


NORTH
52
50
48
14 WEST
12
10
8
6
4
2
RRS Frederick Russell 14/82
27 Sept. – 5 Oct., 1982.
CS2
A1