

VESSEL RRS FREDERICK RUSSELL

CRUISE PERIOD 16 - 27 August 1982

PERSONNEL I R Joint PSO Principal Scientist
D V P Conway SSO
N R Collins HSO
M B Jordan HSO
A J Pomroy SO
D B Robins SO
G J Bailey ASO
C M Hoyle ASO

ITINERARY

Monday 16 August 1600 Departed Plymouth.
1900 Arrived Station A1; water bottle cast
and chlorophyll sensor profile.
2030 Set course for CS2.

Tuesday 17 August 0100 Deployed UOR and towed on track up to
CS2 and continued on 20 Km square grid
round CS2.
1030 Recovered UOR.
1115 Water bottle drop and chlorophyll sensor
profile. Weather deteriorating (winds
force 8-9) so left CS2 for Crow Sound,
Isles of Scilly.

Wednesday 18 August 1400 Set course for CS2.
1930 Arrived CS2; conditions still too bad
to deploy gear.

Thursday 19 August 0600 Station work began on CS2 (c.f. Table 1).

Tuesday 24 August 1000 Weather deteriorating (winds force 8),
left CS2 for Crow Sound. Experimental
zooplankton programme continued whilst
at anchor.

Wednesday 25 August 0900 Set course for CS2.
1430 Resumed station work at CS2.

Thursday 26 August 1000 Water bottle drops and chlorophyll sensor
profiles at 9 stations on a 15 Km square
grid round CS2.
2000 Completed station work, set course for
Barry.

Friday 27 August 0500 Water samples taken every 15 minutes as
ship steamed along Bristol Channel.
1000 Completed sampling.
1030 Docked Barry.
1100 Began unloading equipment.
1300 Left for Plymouth.
1640 Arrived IMER.

OBJECTIVES

To measure the impact that the common herbivorous copepod Calanus helgolandicus makes on the level of primary production in shelf seas and to estimate 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 to 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 Program IMER/C3/82.

EQUIPMENT AND OTHER FAILURES

Two days work at CS2 was lost because of bad weather but time was made up on the rest of the cruise and all objectives were achieved.

The UOR failed to undulate because of a faulty servo mechanism and no data were obtained. There were faults with two acoustic command systems; one system would function with the LHPR sampler but would not open and close the RMT and the other system worked the RMT but was not compatible with the LHPR. However, once the command systems were deployed with compatible samplers, they both functioned satisfactorily. The temperature control on the controlled-temperature laboratory is inadequate and the room temperature fluctuates by 4 or 5°C during the day. Two RMT nets split in heavy seas at the end of the cruise.

RESULTS

A total of 21 bottle casts were taken (Table 1); water was sampled from 9 depths and analysed for chlorophyll, salinity, nitrate, nitrite, phosphate, ammonia, DOC, POC, particle size distribution and samples were preserved for the enumeration of bacteria, flagellates and phytoplankton.

The IMER chlorophyll-temperature-depth sensor was used on 22 profiles but no data were obtained for two profiles when wires broke in the sensor. The recorded data were processed immediately the sensor was recovered using the shipboard micro-processor to give profiles of temperature and chlorophyll distribution; these data were used to determine some of the depths sampled by water bottles. There was no chlorophyll maximum on the thermocline.

Five in situ incubations were done to measure primary production. The samples were incubated at nine depths and on two occasions light meters were deployed at the same depths as the ^{14}C incubation bottles to record the irradiance available to the phytoplankton. Five incubations were done in an on-deck incubator at four simulated light levels.

A total of 17 LHPR hauls were taken; two of these hauls were day and night horizontal tows just below and just above the thermocline to sample the distribution of animals around the thermocline. Intensive sampling at 3 hour intervals was done to study the night-time migration of Calanus.

Two species of Calanus were present, C. helgolandicus and C. finmarchicus and feeding experiments were done with both species. Measurements were made of assimilation, reproductive effort, and somatic condition. Animals were also starved to assess the effect of starvation on extra-cellular enzyme activity.

In addition to the in situ light meters, profiles of light intensity down the water column were done with a submersible light meter. The bottom of the euphotic zone (1% surface irradiance) occurred at between 20 and 25 metres, about 5 m above the thermocline.

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MBA Denton
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TABLE 1 Record of water bottle casts, chlorophyll sensor profiles, expendable bathythermograph profiles (XBT) and Longhurst Hardy Plankton Recorder Hauls (LHPR).

Date	Station	Time	Water bottles	Chlorophyll sensor	XBT	LHPR samples	
						Course net	fine net
16.8.82	A1	1845	✓	✓	✓	-	-
17.8.82	CS2	1100	✓	✓	✓	-	-
19.8.82	CS2	0900	✓	✓	✓	15	15
"	CS2	1320	-	-	-	21	21
"	CS2	1500	✓	✓	✓	-	-
20.8.82	CS2	0900	✓	✓	✓	-	-
"	CS2	1300	-	✓	-	-	-
"	CS2	1800	✓	✓	✓	19	19
"	CS2	2230	✓	✓	✓	18	18
21.8.82	CS2	0600	✓	✓	✓	14	20
"	CS2	1215	-	✓	✓	18	18
"	CS2	1800	-	✓	✓	16	16
22.8.82	CS2	0015	-	✓	✓	39	47
"	CS2	0700	✓	✓	✓	19	19
"	CS2	1215	-	✓	✓	40	-
23.8.82	CS2	0015	-	✓	✓	32	32
"	CS2	1230	-	✓	✓	39	39
24.8.82	CS2	0800	✓	✓	-	-	-
25.8.82	CS2	1420	✓	-	-	-	-
"	CS2	1815	-	✓	✓	19	-
"	CS2	2100	-	-	-	18	-
26.8.82	CS2	0005	-	-	-	13	-
"	CS2	0305	-	-	-	24	-
"	CS2	0600	-	-	-	27	-
"	CS2	0800	✓	-	✓	-	-
"	grid stn 1	1045	✓	-	✓	-	-
"	grid stn 2	1149	✓	-	✓	-	-
"	grid stn 3	1245	✓	✓	✓	-	-
"	grid stn 4	1400	✓	-	-	-	-
"	grid stn 5	1506	✓	✓	✓	-	-
"	grid stn 6	1615	✓	-	✓	-	-
"	CS2	1740	✓	✓	✓	-	-
"	grid stn 7	1910	✓	-	✓	-	-
"	grid stn 8	2020	✓	✓	✓	-	-
Totals			21	22	25	17	11