

IMER/4/81  
RVS Ref. No. 13/81

VESSEL RRS CHALLENGER

CRUISE PERIOD 25 August - 9 September 1981

PERSONNEL R Williams PSO (Senior Scientist)  
D V P Conway HSO  
N R Collins HSO  
A Lindley SSO  
D B Robins SO  
C Hoyle (Ms) ASO  
L Mavin (Mrs) MBA (MOD - Plymouth)  
S Hutabaret (British Council)

ITINERARY 25 August 10.00 hrs; departed Ardrossan for N.E. Atlantic site (NA) 59° 00'N 19° 00'W. (Fig. 1).  
28 August 08.05 hrs; arrived NA site commenced programme.  
1 September 03.15 hrs; completed programme at NA site proceeded to Celtic Sea site (CS).  
4 September 19.30 hrs; arrived CS site commenced programme.  
8 September 21.48 hrs; completed programme at CS site, set course for Barry.  
9 September 13.20 hrs; Docked Barry.

OBJECTIVES

1. To compare the vertical distributions and diurnal migrations of the developmental stages (including nauplii) of Calanus finmarchicus, Thysanoessa longicaudata and Sagitta maxima from the open ocean with Calanus helgolandicus Nyctiphanes couchi and Sagitta elegans from the Celtic Sea. (The choice of sites is determined by (a) the requirement to obtain the sets of species uncontaminated by each other; this is especially the case with the copepods C. finmarchicus and C. helgolandicus. (b) to maintain the comparative ecological investigations with work carried out at Ocean Weather Station "India" from 1971 to 75 and Celtic Sea from 1977 to 1981).
2. To measure the feeding rates of all species used in the experimental programme under ambient conditions.
3. To obtain fresh material for length/dry weight measurements and to deep freeze material for the determination of carbon, nitrogen, ash and calorific content, of all species used in the experimental programme.
4. At the two sites: to investigate other biotic conditions (chlorophyll, total suspended mater, organic matter and phytoplankton) and hydrography.
5. To obtain eggs from C. finmarchicus and C. helgolandicus for studies on their chromosomes.

## PROCEDURES AND METHODS

See Cruise Programme IMER/4/81

## OPERATION AND EQUIPMENT FAILURES

The IMER temperature, depth, chlorophyll package failed to function, therefore the continuous profiles of chlorophyll required for the DLLS zooplankton hauls were lost.

One of the submersible seawater pumps failed. The satellite navigation system and Loran equipment developed faults early in the cruise with the result that the North Atlantic station positions lack accuracy.

## RESULTS

1. 8 oblique hauls were taken with the double LHPR and 13 with the combined LHPR systems. Both samplers were fitted with fine and coarse mesh nets (431 samples, open ocean; 309 samples, shelf sea) Table 1. Complete night and day haul series were obtained at both sampling sites.

2 (i) Feeding experiments - completed from open ocean site.

## Copepoda

Calanus finmarchicus a) series of experiments with stage V copepodites using natural particulates and a range of concentrations of the diatom Thalassiosira weissflogii as food. The diatom was successfully cultured onboard. The cell concentrations used were 500 cells ml<sup>-1</sup> to 3,500 cells ml<sup>-1</sup>. b) experiments to investigate the possible differences in feeding rate between Stage V Calanus with large and small oil sacs.

Thaliacea Salpa fusiformis. Series of experiments to investigate the size spectrum of natural particulates removed by feeding and the effects of adding different concentrations of one size cell diatom (T. weissflogii) on its feeding rate.

Euphausiacea Thysanoessa longicaudata. Series of experiments using furcilia and adults to determine the size spectrum of their food.

Euphausia krohni - one experiment on juveniles, as above.

2 (ii) Feeding experiments completed from shelf sea.

## Copepoda

Calanus helgolandicus repeat of experiments a and b as for open ocean.

c) A series of experiments to investigate the particle size spectrum of the food of stage II, III and IV copepodites.

Metridia lucens Series of experiments using Stage VI for particle size selection of food.

Pseudocalanus elongatus - as above.

Euphausiacea Nyctiphanes couchi. Series of experiments using calyptopis, furcilia, post larvae and adults to investigate particle size selection in natural particulates.

All specimens used in these experiments were measured and dried.

3. 8 hauls with the RMT 1 (4 open ocean, 4 Celtic Sea) and numerous deployments of the  $\frac{1}{2}$  m nets were made to obtain fresh material for onboard experiments, length (weight determinations and for drying and freezing for C, N analysis.

Species frozen, oven dried and preserved for subsequent analysis were:-

<u>Chaetognatha</u>	<u>Sagitta serratodentata</u> , <u>S. elegans</u> <u>S. maxima</u> <u>S. zetosios</u> <u>Eukrohnia hamata</u>
<u>Coelenterata</u>	<u>Aglantha digitale</u>
<u>Mollusca</u>	<u>Limacina retroversa</u> , <u>Clione linacina</u>
<u>Euphausiacea</u>	<u>Thysanoessa longicaudata</u> , <u>Nematoscelis megalops</u> , <u>Nematobrachion boopis</u> , <u>Thysanopoda acutifrons</u> , <u>Euphausia krohni</u> , <u>Stylocheiron longicorne</u> , <u>Stylocheiron maximum</u> , <u>Meganyctiphanes norvegica</u> and <u>Nyctiphanes couchi</u> , calyptopis furcilia, juveniles and adults.
<u>Thallicidea</u>	<u>Salpa fusiformis</u>
<u>Copepoda</u>	<u>Calanus finmarchicus</u> , <u>Calanus helgolandicus</u> <u>Pleuromamma robusta</u> , <u>Euchaeta norvegica</u> <u>Metridia lucens</u> and <u>Pseudocalanus elongatus</u> .

4. Water bottle samples from 8 depths were taken at 5 stations from the open ocean site and 3 stations in the Celtic Sea site for measurements of chlorophyll, POC, total suspended matter, particle size distribution, microzooplankton, phytoplankton, salinity and temperature.

5. Eggs from C. finmarchicus and C. helgolandicus were preserved in alcohol/acetic acid at the onset of the first cleavage of the fertilised eggs.

Prepared by:

R Williams:

Approved by:

*B. Bayne*

Date:

4 November 1981

Figure 1.

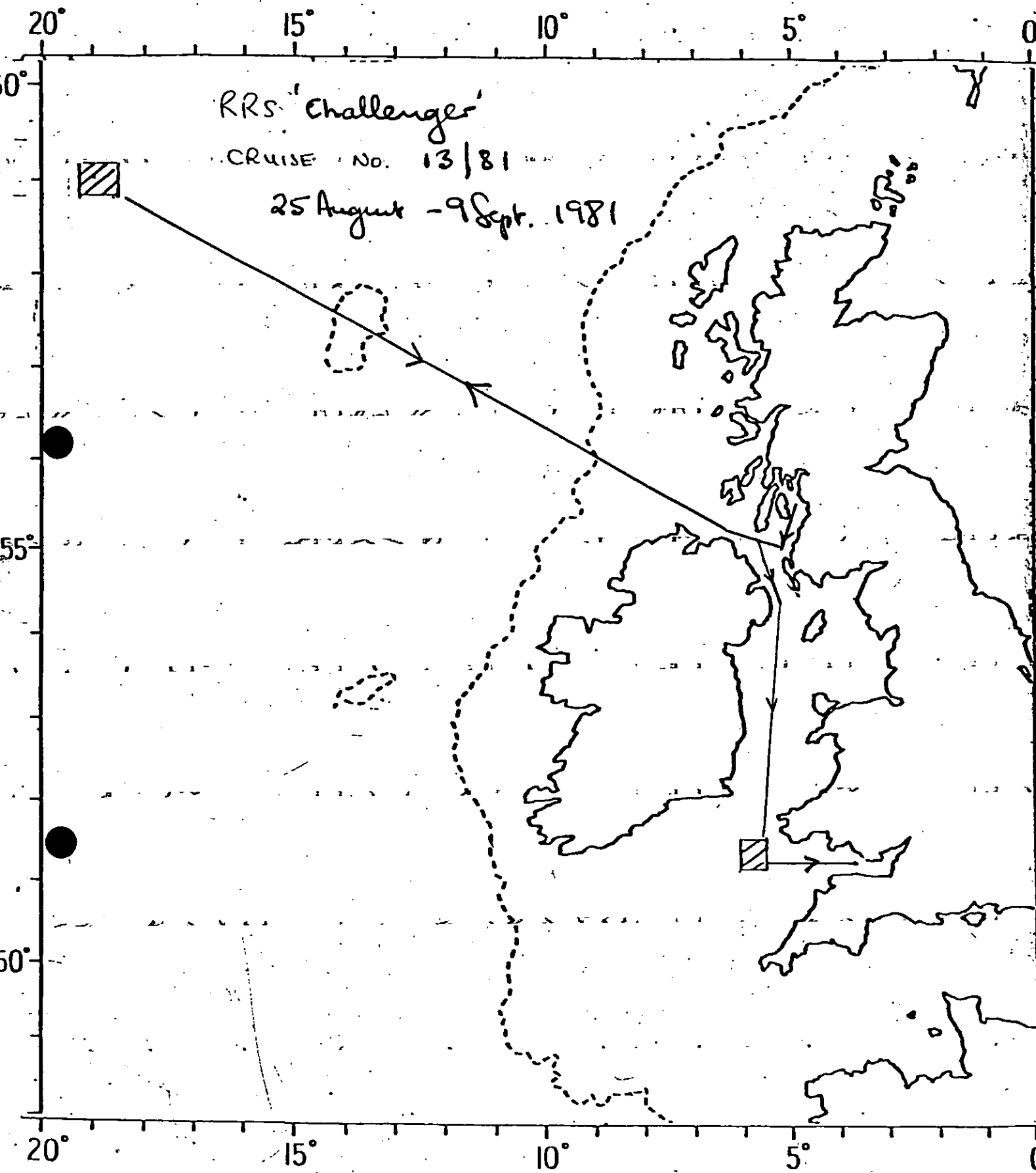


Table 1

## Longhurst Lowestoft System oblique hauls

Open Ocean

System	Haul N°	Date	Time (GMT)	Position	Max depth (m)	Number of samples	
						Coarse	Fine
DLLS	1	28-8-81	1019	58°59'N 19°03'W	780	49	49
"	2	"	2358	59°10'N 18°51'W	526	46	31
"	3	29-8-81	0510	58°55'N 18°55'W	560	-	34
"	4	"	1740	59°04'N 18°58'W	820	49	49
"	5	30-8-81	0523	59°09'N 18°57'W	1000	42	-
CLLS	6	"	1540	59°09'N 18°45'W	403	26	26
"	7	31-8-81	1200	59°03'N 19°03'W	300	-	-
"	8	"	1447	58°58'N 18°47'W	310	3	3
"	9	"	1542	58°57'N 18°36'W	208	12	12

\* Transect across site. Coarse cut and frozen, fine preserved.  
 Samples from hauls 8 and 9 only

Shelf Sea

System	Haul N°	Date	Time (GMT)	Recess location		Max depth (m)	Number of samples	
				Green	Purple		Coarse	Fine
DLLS	1	5-9-81	0010	J39.2	H73.5	82	16	23
"	2	"	1135	J34.5	H76.5	82	25	23
"	3	"	2338	J38.7	H73.7	85	21	20
CLLS	4	6-9-81	0530	J38.7	H70.1	64	14	15
"	5	"	1730	J38.9	H72.1	84	13	21
"	6	7-9-81	1750	J38.7	H69.2	79	-	-
"	7	"	1835	J35.9	H68.9	77	-	12
"	8	8-9-81	0939	J47.4	H78.2	72	12	12
"	9	"	1022	J32.9	H75.8	78	12	12
"	10	"	1130	J38.7	H72.5	88	15	15
"	11	"	1226	J43.3	H70.2	100	15	15
"	12	"	1326	J47.2	H69.1	98	4	4

\*\* Transect across site and testing of manual advance. Samples preserved uncut.