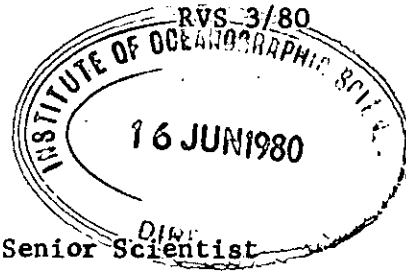


IMER

IMER B4/80



VESSEL RRS JOHN MURRAY

CRUISE PERIOD 19-29 May 1980

PERSONNEL	P H Burkill	HSO	Senior Scientist
	R F C Mantoura	SSO	
	N J P Owens	HSO	
	R J M Howland	SO	
	A J Pomroy	SO	
	E M S-Woodward	ASO	

ITINERARY Sketch charts and station lists are attached

Sunday 18 May	Travelled to Barry. Loaded and tested equipment. The Bellamor 3-tonner broke down in Cardiff and the RVS 3-tonner was called out to move gear to Barry.
Monday 19 May	Sailing was delayed due to Pax-man generator failure and the last morning lock was missed. Locked out at 1900. Proceeded west towards station 34 starting monitoring track (Chart 1). Continuous measurement of incident radiation.
Tuesday 20 May	Continued monitoring track passing Station 23 before midnight, then turning south towards Devon.
Wednesday 21 May	Continued monitoring track, along north Devon coast reaching Avonmouth at 1926. Monitoring track completed at Barry at 2345. Picked up silicate standards from Barry Pilot for auto-analyser. Proceeded to Carmarthen Bay (CB).
Thursday 22 May	Started sampling MULEX variables at station 37 at 1008 to get western boundary conditions and proceeded east-north-east towards station 1 of CB grid (Chart 3). Passed station 1 at 1200 and continued around CB grid (Chart 2) completing at 2132. Nitrification and ammonification rate experiments carried out.

Friday 23 May

Coring at St.2 (0730-0806) to estimate nutrient exchange, respiration and nitrification of sediments. Standard ^{14}C primary production incubation of water from St. 1 and 6. MULEX system set up and tested. Experimental production (EXPRO) set up and tested; insufficient cooling capacity in lab below. Moved out onto deck and cooled with pumped seawater. Coring at St.31 (2065-2034) for respiration and pore water analysis.

Saturday 24 May

Hand net hauls for healthy zooplankton size classes 3 and 4 (0614-0753). Coring St 31 (0857-0921) for respiration and nutrient exchange measurements. MULEX running (1100). $^{14}\text{C}/^{15}\text{N}$ EXPRO experiment and Millipore/GFC filtration experiment. Coring St.31 (2104-2129) for nitrification/denitrification and pore water analysis.

Sunday 25 May

Hand net hauls for healthy zooplankton size-classes 1 and 2 (0620-0755). Standard ^{14}C primary production incubation of water from St.25 and 29; EXPRO incubations of same water using $^{14}\text{C}/^{15}\text{N} - \text{NO}_3$ and $^{15}\text{N} - \text{NH}_3$. MULEX incubations from 0945. Coring St.31 (1057-1118). Testing vertical profiling equipment for light, nutrients and particulates measurements (1137-1149). Coring St.31 (1603-1628) for nitrification and porewater analysis.

Monday 26 May

Coring St.31 (0506-0537) for O_2 , nutrients pore water and nitrification/denitrification estimates. Vertical profiling at 6 contrasting stations (Chart 4) to measure light, nutrient and particulate profiles (0815-1918). Phytoplankton P:B experiments carried out for each station.

Tuesday 27 May

Coring St.2 (0526-0605) for O_2 , nutrients and pore water fluxes. Hand net tows for healthy decapod zoea and Pleurobrachia pileus (0620-0755) at St.2. Standard ^{14}C primary production incubation of water from St.1 and 6, EXPRO incubations of same water using $^{14}\text{C}/^{15}\text{N} - \text{NH}_3$ and $^{15}\text{N} - \text{NO}_3$. Size-to-weight specific metabolism of P. pileus MULEX experiment incubations from 1100. Proceeded west to St. 7 (Chart 4) for deep vertical profiling of light, nutrients and particulates; profiling (1618-1830) to 28 metres through thermocline. Phytoplankton production time course and DCMU-enhanced chlorophyll fluorescence experiments carried out.

- Wednesday 28 May Coring St.31 (0556-0643) for pore water chemistry. Nitrogen preference index (NPI) experiment carried out with water from St. 29. Hand net tow with size class 4 net for healthy *Aurelia aurita* at St.8 (0836-1010); size to weight specific metabolism of *A. aurita* MULEX experiment incubations from 1030. Left CB (1048) heading towards Barry. Locked in Barry (1830). Packed scientific equipment.
- Thursday 29 May Continued packing gear; transfer to IMER vehicles 1100-1300. Cruise de-briefing (1000-1045). Travel to Plymouth; via Cardiff University (PHB, NJPO, RFCM).
- Friday 30 May Unloaded scientific gear at IMER.

OBJECTIVES

- a) To continue the series of five "MULEX" cruises designed to quantify nutrient cycling processes in Carmarthen Bay, including:
- 1) nutrient excretion rates of the zooplankton assemblage
 - 2) nutrient demand rates by the phytoplankton assemblage
 - 3) nutrient regeneration rates by the benthos
 - 4) nitrification/denitrification processes by bacteria
 - 5) nutrient advection and diffusion from the surrounding regions of Carmarthen Bay
- b) To continue the monitoring of the Bristol Channel and Severn Estuary.

OUTLINE OF PROCEDURES
AND METHODS

- a) The following state variables were measured along the 29 station grid in Carmarthen Bay (Chart 2). Temperature, turbidity, salinity, fluorescence, microseston, POC, PON, Chlorophyll-a, phaeopigments, nitrate, nitrite, silicate, phosphate, ammonia, primary amines, urea, DOC, DON, DOP. Double-oblique hauls with the 30"Lowestoft sampler equipped with 100 μ m and 280 μ m nets were carried out at alternate stations, and counts of nitrifying and ammonifying bacteria every third station. Incident photosynthetically-active radiation (PAR) was measured continuously; seven vertical profiles of PAR, particulates and nutrients were carried out.
- b) Shipboard experimental rate measurements of plankton, benthos and water samples from CB included:
- i) Multiple excretion experiments (MULEX) carried out on four size classes of zooplankton to measure respiration and excretion rates of NH_3 , R.NH_2 , PO_4 , SiO_4 , DOC, DON and DOP.
 - ii) Primary production and nutrient demand rates were measured by standard and experimental production (EXPRO) techniques using $^{14}\text{C-CO}_3$, $^{15}\text{N-NH}_3$ and $^{15}\text{N-NO}_3$.

- iii) Bacterial nutrient remineralization rates were determined using ^{15}N isotope dilution techniques.
- iv) Benthic nutrient regeneration rates were determined using onboard isothermal incubation of cores and measurement of release rates of NH_3 , NO_3 and O_2 .
- v) Estimates of nutrient advection and diffusion in CB regions will be carried out from measurements made at stations within and surrounding CB (Chart 3).

EQUIPMENT PERFORMANCE
AND OVERALL CRUISE SUCCESS

The potential problems involved in taking over commonly required facilities from scientists on the previous cruise (3/80) which had just ended, up in Barry were overcome through forward planning and good liaison. Although 9 hours were lost on the first day due to the late sailing of the ship, this time was easily made up during the remainder of the cruise. All equipment worked well although some minor but irritating failures included a) the integrator for the PAR light sensor failed intermittently; b) enzymatic activity of urease coil was severely reduced thereby limiting the sensitivity of the urea assay; c) insufficient cooling capacity for EXPRO meant that running seawater had to be ducted through the system. The cooling system will have to be redesigned; d) the Lowestoft sampler monitor did not give off-sets for flowmeter measurements; e) the measurement of depth with the monitor proved insensitive for vertical profiling of light due to the design of the MUFAX recorder - a small depth transducer with output onto a separate chart recorder is needed.

The programme was easily completed due to favourable weather and excellent liaison with ship's compliment. The verdict, results pending, is that the cruise was 100% success.

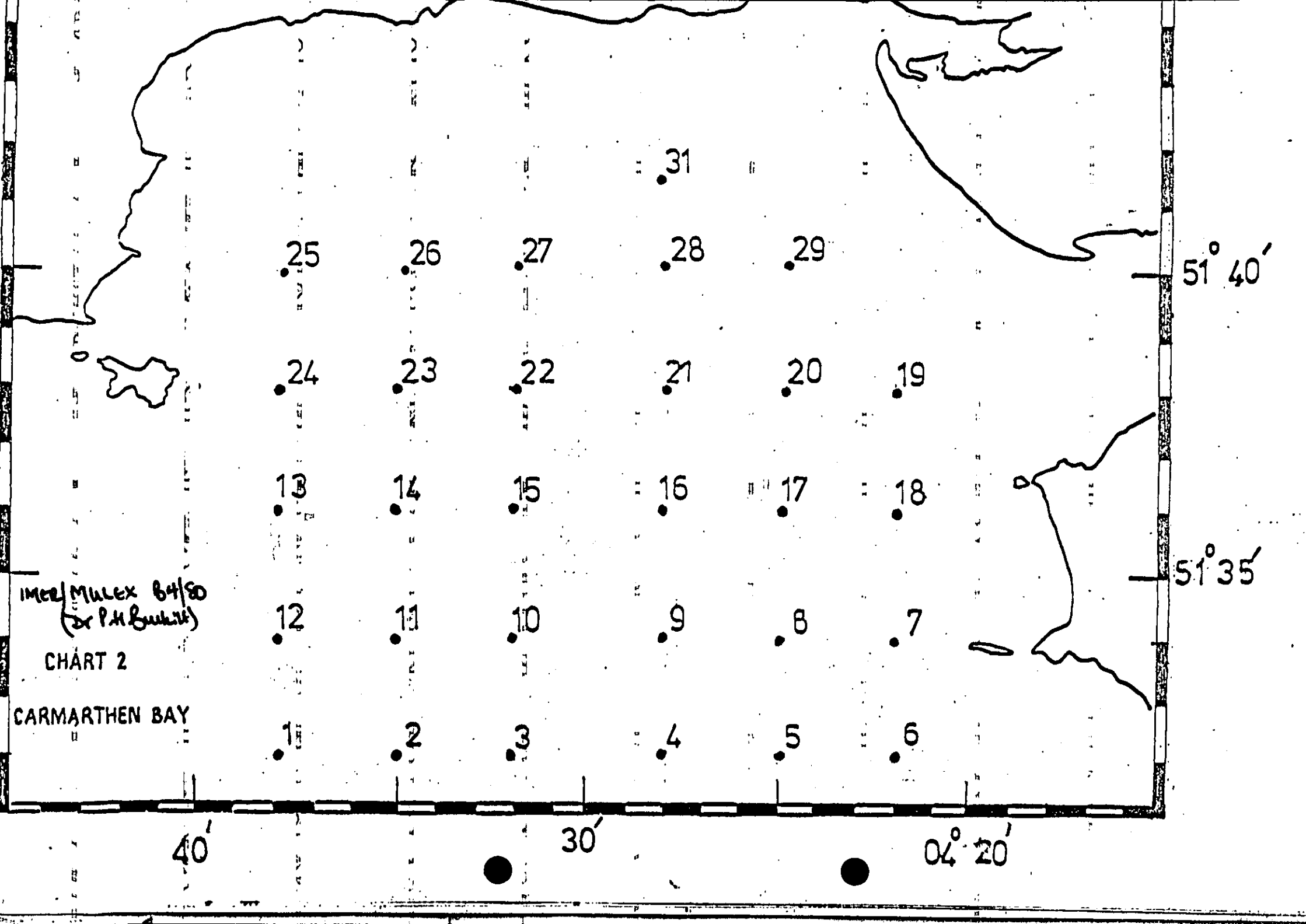
Prepared by:
Approved by:
Date:

P H Burkill
PL Bayne
5 June 1980

APPROXIMATE MID-TOW POSITIONS
OF PLANKTON HAULS

(modified as of B2/80, 14 March 1980)

St.No.	Lat. N.	Long.W.
P 10	51°24.0'	03°06.0'
P 11	51°30.0'	02°47.0'
P 12	51°26.7'	02°59.0'
P 13	51°20.0'	03°08.0'
P 14	51°16.0'	03°21.0'
P 16	51°16.0'	03°40.0'
P 17	51°21.0'	03°48.0'
P 18	51°16.0'	04°00'
P 19	51°01.0'	04°22.0'
P 20	51°07.0'	04°31.0'
P 21	51°14.5'	04°42.5'
P 22	51°24.0'	04°52.0'
P 23	51°34.0'	04°42.0'
P 24	51°41.0'	04°31.0'
P 25	51°31.0'	04°28.0'
P 28	51°35.0'	03°53.0'
P 29	51°28.0'	03°56.0'
P 30	51°21.0'	03°56.0'
P 31	51°16.0'	03°48.0'
P 32	51°23.0'	03°40.0'
P 33	51°16.0'	03°32.0'
P 34	51°21.0'	03°23.5'
P 35	51°20.0'	04°10.0'
P 36	51°12.0'	04°15.0'
P 37	51°27.0'	04°41.0'
P 38	51°16.0'	04°25.0'
P 39	51°28.0'	04°17.0'
P 40	51°27.0'	04°06.0'



IMC/Mulex 64/80
(Dr P.H. Gubler)

CHART 2

CARMARTHEN BAY

51° 40'

51° 35'

40'

30'

04' 20'

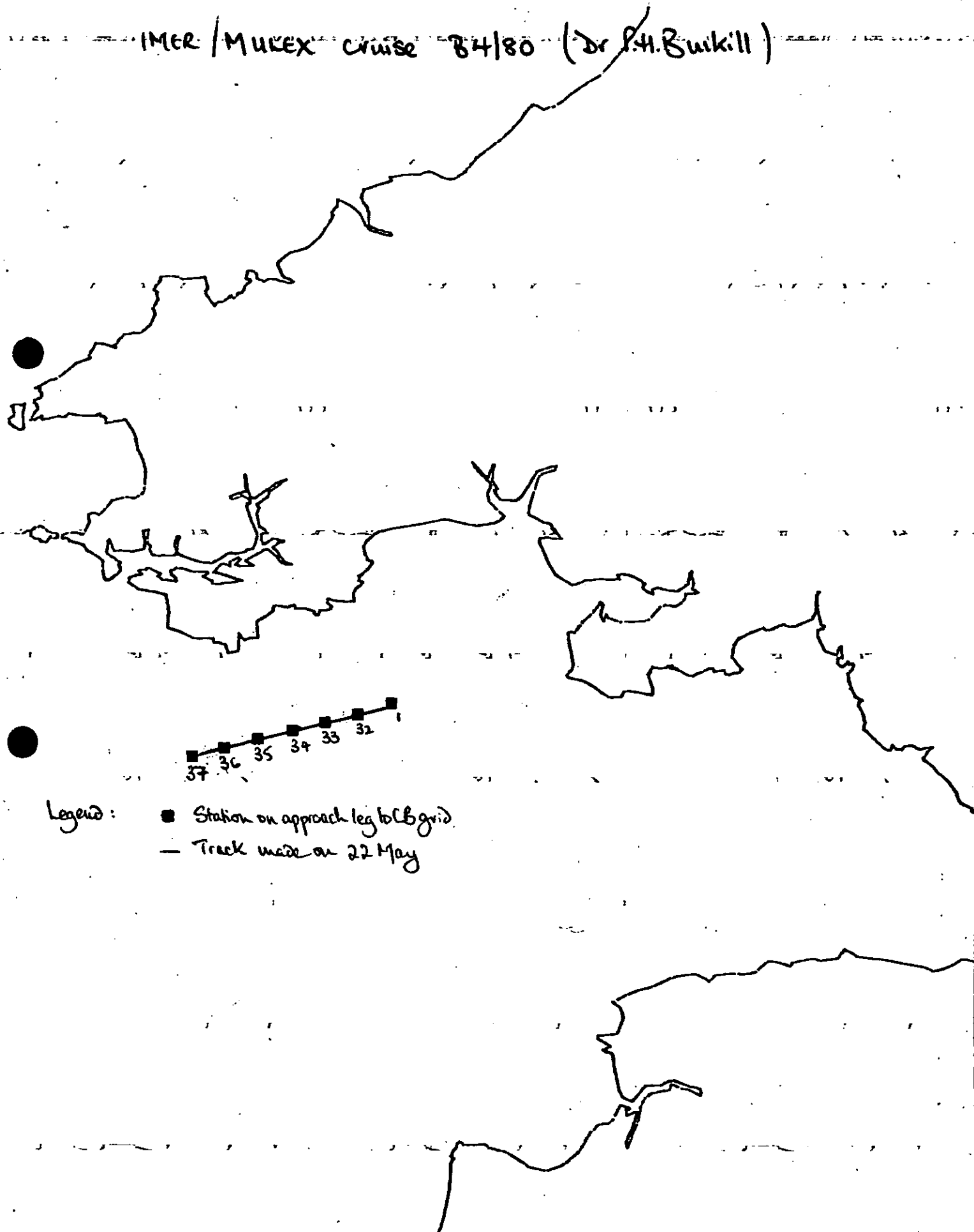
STATION

CARMARTHEN BAY

	Lat.N.	Long.W
1	51° 32' 0"	04° 38' 0"
2	51° 32' 0"	04° 34' 8"
3	51° 32' 0"	04° 32' 6"
4	51° 32' 0"	04° 28' 4"
5	51° 32' 0"	04° 25' 2"
6	51° 32' 0"	04° 22' 0"
7	51° 34' 0"	04° 22' 0"
8	51° 34' 0"	04° 25' 2"
9	51° 34' 0"	04° 28' 4"
10	51° 34' 0"	04° 32' 6"
11	51° 34' 0"	04° 34' 8"
12	51° 34' 0"	04° 38' 0"
13	51° 36' 0"	04° 38' 0"
14	51° 36' 0"	04° 34' 8"
15	51° 36' 0"	04° 32' 6"
16	51° 36' 0"	04° 28' 4"
17	51° 36' 0"	04° 25' 2"
18	51° 36' 0"	04° 22' 0"
19	51° 38' 0"	04° 22' 0"
20	51° 38' 0"	04° 25' 2"
21	51° 38' 0"	04° 28' 4"
22	51° 38' 0"	04° 32' 6"
23	51° 38' 0"	04° 34' 8"
24	51° 38' 0"	04° 38' 0"
25	51° 40' 0"	04° 38' 0"
26	51° 40' 0"	04° 34' 8"
27	51° 40' 0"	04° 32' 6"
28	51° 40' 0"	04° 28' 4"
29	51° 40' 0"	04° 25' 2"

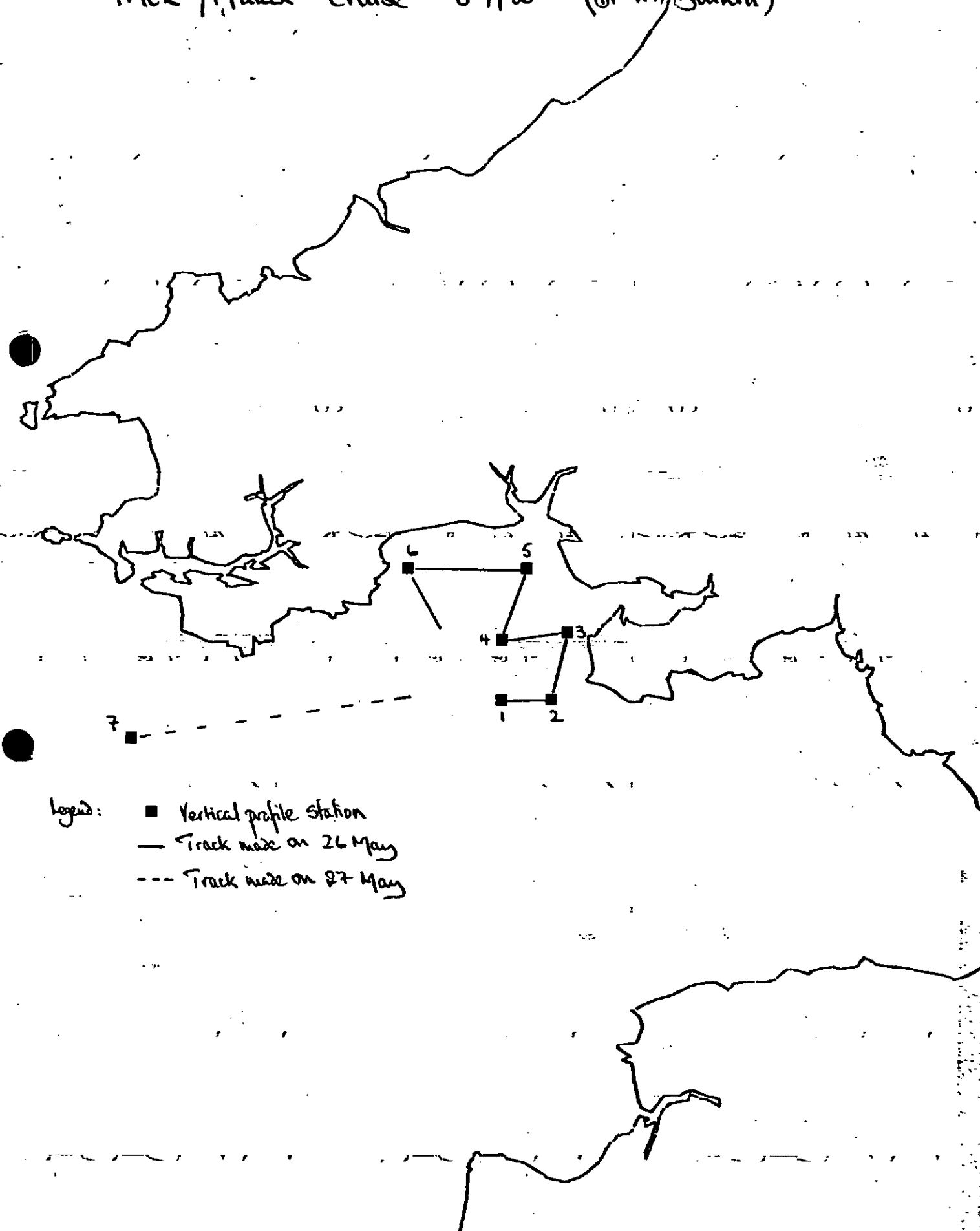
Chart 3: Approach leg track and stations to Carnarthen Bay grid to investigate boundary conditions to west of grid.

IMER / MUXEX cruise 84/80 (Dr P.H. Bulkill)



Legend: ■ Station on approach leg to CB grid
— Track made on 22 May

Chart 4: Track and stations investigated for vertical profiles of light, particulates and nutrients, and for eastern and northern boundary conditions for Mulex grid.
IMER / Mulex cruise 84/80 (Dr P.H. Burkil)



Legend:
■ Vertical profile station
— Track made on 26 May
--- Track made on 27 May