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2. Dr McMurray

This cruise was part of DEIR funded project involving DANI, CEFA, SAHFOS costing £250k to develop new marine technology of a new and innovative type. The cruise was a pleasure being successful in technology development and scientific information collected. Two more cruises will develop

Cruise report

Evaluation of U-tow Phytoplankton Sampler

CRUISE NUMBER : LF2598
14-19 June 1998

Personnel

R. Gowen (SIC)	DANI
S.I. Heaney (SIC)	DANI
K. Embleton	Queens
T. Walne	SAHFOS
M. Rawlinson	W.S. Ocean Systems
K. Cook	University of Wales

the conditional sampling & ~~is~~ intelligence of the equipment further. The end result should be a robust package collecting quantitative & quantitative physical chemical & biological data ~~from~~ whilst undulating between depths whilst the ship is underway.

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Cruise Objectives

1. Evaluate and optimise the flight pattern of the new U-tow body.
2. Prove the capability of the data acquisition systems and whole water sampler.
3. Collect scientifically interesting data.

Cruise Narrative

Sunday 14th June

Lough Foyle left Belfast at 21.00h to sail overnight to the Firth of Clyde

Monday 15th June

U-tow deployed at position 5526 0502 at 08.45h. Initially 40m of cable fed out at a tow speed of 3 Knots. All electronic systems on the U-tow functioned correctly. Cable length and velocity were increased to 80m and 6 knots respectively. Adjustments to both level and undulating flight were performed during the tow. The plankton sampling mechanism (PSM) was operated automatically during the tow. A fluorescence peak was observed at 20-25m corresponding with the depth of the thermocline. At 10.22h the U-tow was shut down and removed from the water at position 5535 0459. On examination, the PSM had failed to stop when advancing the mesh and had wound all the mesh through the mechanism.

Two plankton net hauls from 30m to the surface were performed at position 5535 0459 commencing at 11.08h. One third of the plankton sample was size fractionated through 2000µm, 1000µm, 500µm and 200µm sieves, then oven dried to assess dry weight. The remaining sample was preserved with formalin for later taxonomic analysis. This procedure was repeated for all subsequent net haul samples taken. The U-tow was deployed at the same position at 11.25h with 100m of cable paid out and an initial tow speed of 6 knots. The tow was continued until 15.30h using tow speeds of 4, 6 and 8 knots. Undulation trials were very successful, however the PSM again failed to operate properly leaving insufficient gaps between samples and overrunning when winding on the mesh.

U-tow re-launched at 5541 0506 at 17.14h and removed at 5541 0506, 20.12h. Dives to 45m were performed during the trial. Plankton net hauls performed at start and end of tow. PSM worked better than before but still overlapped some samples. During examination of the PSM it was noticed that a grub screw in part of the mesh advancing mechanism was catching and

preventing a roller from turning. This grub screw was subsequently removed from the roller. Work finished at 23.00h.

Tuesday 16th June

Work commenced at 05.45h position 5506 0529 with plankton net hauls. The U-tow was then towed along a transect from this position to 5526 0501. The tow commenced at 06.25h and finished at 09.51h. A tow speed of 8 knot and 100m of cable were used. Plankton net hauls were performed at the end of the tow.

The reverse transect was then followed performing CTD dips at regular intervals. Chlorophyll extractions were performed for all samples taken. Phytoplankton samples were taken at the depth of the fluorescence maximum. Station positions and bottle samples taken were as follows:

Station	CL 1	CL 2	CL 3	CL 4	CL 5	CL 6	CL 7
Position	5527 0501	5523 0505	5520 0509	5517 0513	5514 0518	5510 0524	5505 0530
Bottle	103.6	82.1	52.3	42.0	48.8	66.6	102.1
depths	63.0	52.2	32.1	34.2	30.6	38.7	49.9
(m)	33.1	32.1	20.0	29.2	21.4	16.6	17.2
	21.9	19.9	15.3	19.9	17.3	11.2	10.62
	14.5	11.8	8.0	11.9	12.0	8.6	2.7
	2.4	2.1	2.1	9.1	2.8	2.8	
				1.9			

U-tow deployed on return to Belfast to test water monitor. Eleven samples were taken by manual operation of the water monitor with U-tow in level flight and a further three samples taken automatically in undulating flight. Water monitor samples used for both nutrient analysis (20ml filtered and frozen) and fixed with Lugol's iodine solution for taxonomic analysis of phytoplankton. Plankton net haul performed at end of tow. MV Lough Foyle returned to Belfast 20.00h, R. Gowen departed, S.I. Heaney embarked and vessel left for station 47 in the Irish Sea at 22.00h. Scientists finished work 23.00h.

Wednesday 17th June

Work started at 07.00h with a CTD dip and Plankton net hauls at station 47. The U-tow was then deployed from this site along a transect running from station 47 to station 38 and then into Liverpool bay finishing at station 9. At intervals along this transect the U-tow was stopped and removed from the water in order to take CTD profiles and plankton net hauls. These were performed at the following sites:

Station	47	38	3	6	9
Time	07.19	10.32	14.00	19.47	01.28
Position	5343 0609	5346 0538	5343 0504	5335 0416	5328 0324
Bottle	16.2	87.4	72.0	50.9	18.3
depths (m)	11.3	47.3	34.0	21.1	12.5
	7.2	34.3	17.1	8.8	8.2
	4.3	19.1	9.0	1.4	4.8
	2.1	11.9	6.1		1.5
		1.9	1.9		

Samples for nutrient analysis and chlorophyll extraction were taken from the rosette bottles. Phytoplankton samples were also taken from the fluorescence maximum for each dip. Samples from the water monitor were split three ways for nutrient analysis, phytoplankton analysis and estimation of picoplankton numbers. Water monitor samples taken at the start and finish of each

tow were used for chlorophyll extraction to allow comparison with the CTD profile. Scientists finished work at 02.30h, apart from M Rawlinson who discovered a fault while downloading data from the U-tow. M. Rawlinson finally finished work at 06.00 h having discovered that the fault was caused by damage to the towing cable sustained when the cable was initially wound onto the winch.

Thursday 18th June

U-tow cable cut and re-terminated by M. Rawlinson. Unit successfully deployed and tested early afternoon. A series of trials were performed with a load cell connected into the towing cable to assess the strain on the cable at different tow speeds and dive depths.

Vertical profiles were made at station 38 using both the CTD and the U-tow suspended vertically from the A-frame. Water samples were taken from the same depths by both devices to check integrity of the samples. Samples were taken for nutrient and chlorophyll analysis. The depths of the samples were as follows:

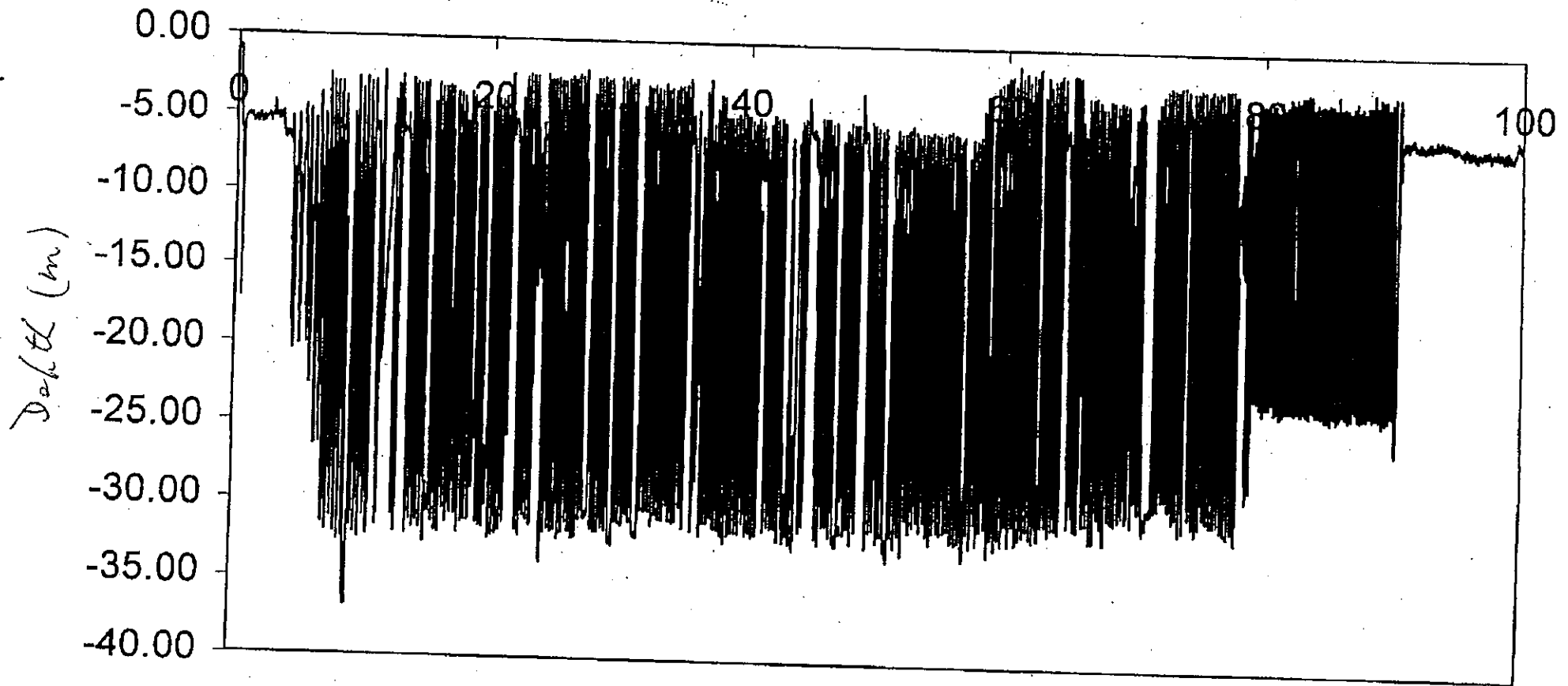
U-tow sample no.	CTD sample no.	U-tow depth	CTD depth	time
D1	-	1	-	21.30
D2	-	1	-	21.32
D3	2	8	8.0	21.37
D4	3	19	18.8	21.42
D5	4	29	29.0	21.49
D6	5	29	29.3	21.51
D7	7	40	39.4	21.54
D8	8	40	39.4	21.56
D9	9	48	48.2	22.01
D10	10	48	48.3	22.03
D11	11	58	58.1	22.08
D12	1	58	58.0	22.10
D13	-	70	-	22.14
D14	-	80	-	22.21

Following this exercise the Lough Foyle left the station to return overnight to Belfast, arriving in the docks at 08.00h on 19 June.

Preliminary Results

Data presented below are for the transect from station 47 off Drogheda to station 9 in Liverpool Bay.

Dundalk Bay to Liverpool Bay



distance run at 8 knots

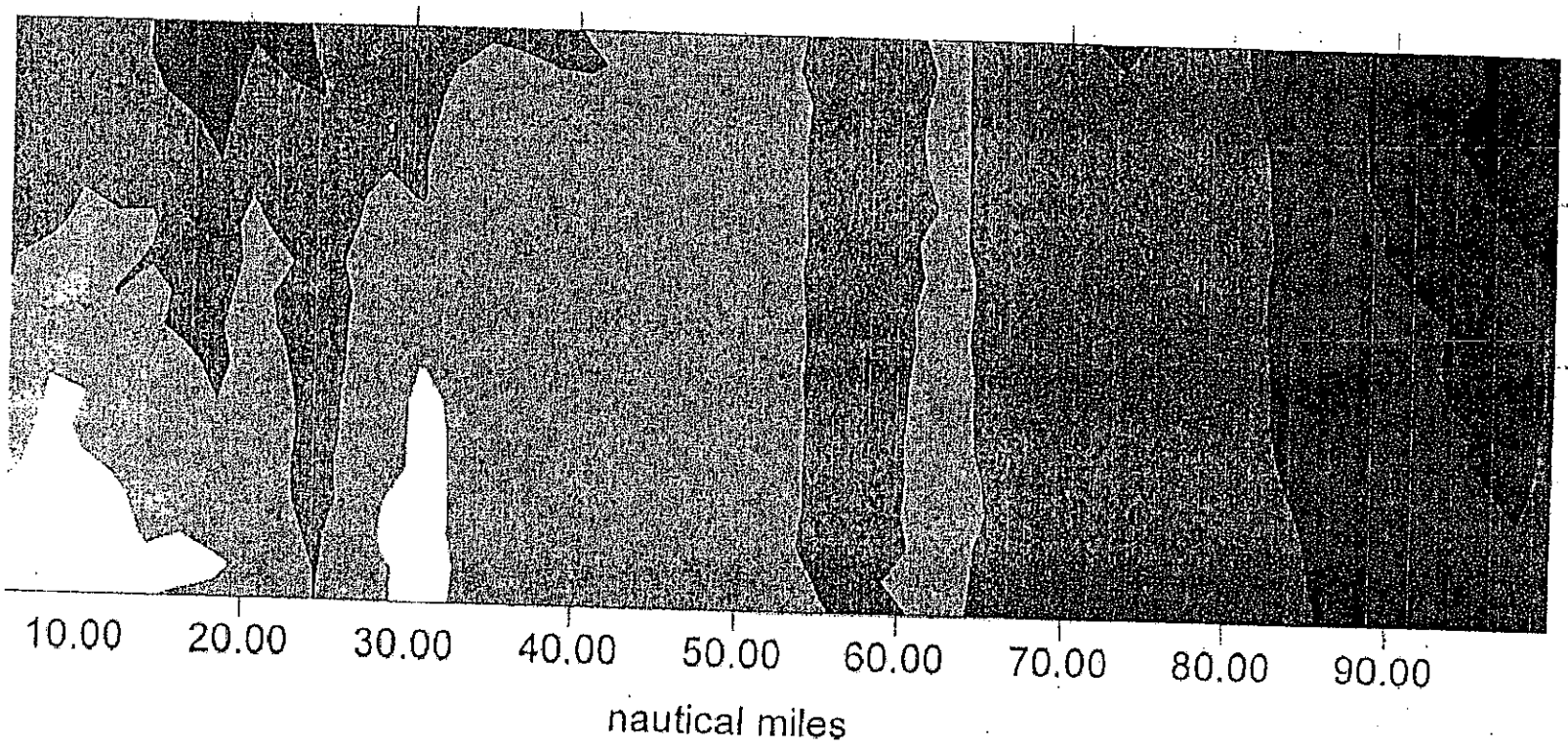
depths over which U-tow undulated.

Temperature

depths at beginning and end of transect are false as the water column was shallower than that shown

temperature °C

Depth



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