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BIOLOGICAL OCEANOGRAPHY CRUISE REPORT

LF 29/95

Date 3 - 7 December 1995

PERSONNEL

B Stewart	(SIC), SSO, DANI
P Elliott	SO, DANI
J Xiong	State Oceanic Administration, China
J Guillot	Honorary research assist., QUB
R McKinley	Valeport Ltd
A Beak	Valeport Ltd

CRUISE OBJECTIVES

i. To assess temperature, salinity and nutrient distributions in the north western Irish Sea.
ii. To recover, service and redeploy moorings and instrumentation located at station 38 on the sampling grid.
iii. To monitor release of nutrients from sediment at stations 38 & 47.
iv. Valeport Ltd software engineers to develop and assess software for controlling the flight depth of their UTOW towed body.

CRUISE NARRATIVE

Sunday 3 December 1995

In preparation for the cruise, all DANI scientific crew and Valeport engineers were on board by 2000 hrs when equipment and instrumentation was tested and confirmed to be functioning properly. The RV Lough Foyle departed Belfast at 2100 hrs and sailed overnight in a strong easterly wind towards the mooring site at station 38 (see attached sampling grid). After the vessel departed the entrance of Belfast Lough at 2300 hrs, the Valeport engineers deployed the UTOW. The ship's speed was set to 8 knots and the UTOW towed at a constant speed until it was recovered on Monday at 0200 hrs.

Monday 4 December 1995

In a strong, force 6-7 easterly wind, recovery of mooring (buoy id. No. 2) with water sampler attached, commenced at 0800 hrs. Several unsuccessful attempts were made to recover the buoy to shipdeck and with increasing wind speed, further attempts were postponed. Following deployment of the rosette water sampler and sediment corer at station 38, the winds began to ease and at 1300 hrs the mooring was successfully recovered. The vessel sailed to shelter, close to the Isle of Man, where the water sampler was serviced and mooring components inspected for corrosion. Buoy id. No 2, suffered minor damage to the radar reflector during recovery and was replaced

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by the spare buoy, id. No 1. Increasing winds prevented redeployment of the mooring and DANI staff finished work at 2200 hrs.
The vessel departed from the Isle Of Man into heavy seas at 2300 hrs, when the Valeport engineers deployed the UTOW. The ship's speed was set to 8 knots and the UTOW towed at a constant speed until it was recovered at 0400 hrs Tuesday.

Tuesday 5 December 1995

As strong winds and heavy seas, again prevented redeployment of the mooring at station 38, sampling work commenced on station 45 at 0905 hrs and continued in a southerly direction along a grid of open sea stations 46, 49, 50, 57, 62 and then in a northerly direction along coastal stations 59 and 48 where work was completed at 2030 hrs. Valeport's UTOW was deployed in heavy seas at 1000hrs and towed at a constant speed of 6 knots until it was recovered at 0400 hrs Wednesday.

Wednesday 6 December 1995

Deployment of mooring (buoy id. No 1), with water sampler attached, commenced on station 38 at 0700 hrs and was completed at 1000hrs on position 53^0 51^1.11N 05^0 34^1.40W. Recovery of mooring (buoy id. No 3) commenced at 1030 hrs and was successfully completed at 1100 hrs. The mooring components were inspected for corrosion before redeployment of the guard buoy and anchor section only, at 1350 hrs on position 53^0 50^1.78N 05^0 34^1.60W. Work continued with the sampling schedule from station 47 at 1530 hrs in a northerly direction along coastal stations 36 and 33 to finish on station 24 at 2030 hrs. Valeport's UTOW was again deployed in heavy seas and continually towed until recovered at 0400 hrs Thursday.

Thursday 7 December 1995

Work commenced on station 26 at 0710 hrs and continued in a northerly direction along a grid of stations 22, 21, 16, 15, 14, 6 to finish the sampling survey on station 4 in the North Channel at 1420 hrs. The vessel sailed to dock in Belfast at 1645 hrs where scientific and mooring equipment was dismantled and prepared for unloading.

Friday 8 December 1995

Unloading of scientific equipment commenced at 0830 hrs and was completed at 1030 hrs. The scientific crew disembarked at 1100hrs.

PARAMETERS MONITORED

The CTD/rosette water sampler was deployed at all stations on the sampling grid, to acquire nutrient, chlorophyll a, temperature, salinity and fluorescence data from the depth profile. Suspended solids were determined on a sub surface sample from each station. Daylight permitting, Secchi disc readings were also taken at each station. Algal samples were taken at stations 57, 50, 47, 38, 45, 62, 24,15, 4 and stored frozen for carbon/nitrogen analysis. For the nutrient release study, three sediment cores with overlying seawater were successfully taken at stations 38 & 47 and incubated at seawater temperature. An additional core was taken and subsampled for C/N analysis.

At station 38, samples were taken for the determination of oxygen by the Winkler method

SUMMARY OF RESULTS

From the acquired nutrient and CTD profile data, the survey area was generally found to be mixed from surface to bottom with typical temperature and salinity 13 °C and 34.10 ppt respectively; typical inorganic nitrogen values were similar to the same period last year and ranged 6-8 micromoles N l^{-1}. Significant freshwater influence was observed at stations 47 and 36 in Dundalk Bay where a steep salinity gradient existed in the top 10 metres of the depth profile. Typical surface salinity 32.40 ppt and at 10 metres 32.90 ppt. Profile temperatures were also 3 - 4 °C lower than monitored at the open sea stations. Also, increased nutrient concentrations in this area, typical inorganic nitrogen 20-25 micromoles N l^{-1} gave further evidence of the River Boyne influence in Dundalk Bay.
Southern open sea stations 50, 57 and 62 were mixed with salinity of 34.60 ppt and a typical temperature of 13.1 °C. Open sea stations 45 and 38, directly north of this region, exhibited stratification at approximately 50 metres, where cooler less saline water typically 13.0 °C and 34.20 ppt formed a distinct layer above 50 metres of water typically 13.4 °C and 34.50 ppt. Inorganic nitrogen for the region ranged 6-7 micromoles N l^{-1} with little change between surface and bottom concentrations.
A similar situation was observed in Feb/March this year, when warmer more saline water had entered the southern regions of the Irish Sea and moved slowly north, producing a "wedge" of increased salinity water in the central Irish Sea. Inorganic nitrogen versus salinity plots for the stations in this region (Fig. 1), fail to identify this higher salinty water as a source of "new" nitrogen to the Irish Sea.

UTOW sea trials (Valeport Ltd)

The first two days of the trial were spent proving that an algorithm based on predicted movement of the UTOW did not work. The next and final two days were spent trying to get the new algorithm to work in an adaptive manner. This met with only partial success. The main objective of the UTOW sea trials was to test how adaptable the software algorithm was to the different parameters it would be presented with in usage. Unfortunately owing to lack of time this work was not carried out. To this end, the Valeport engineers have requested further "ship time" on the Feb/March '96 Biological Oceanography cruise, to finalise the work needed on the new slope algorithm and to carry out various tests to validate that the software is truly adaptive and will wiok in any given environment.

Moored McLane water sampler

The "nutrient" water sampler was programmed and deployed to sample every other day at slack tide, which ensured as much as possible, that all samples were taken at the same depth. On recovery, the sampler was found to have successfully taken 45 samples during the 3 month period of deployment. Results from samples analysed for inorganic nitrogen and orthophosphate are shown in Figure 2.

Nutrient release from sediment cores

Mr Xiong is continuing with this study on the incubated cores in the laboratory. Preliminary results show a limited nutrient release from the sediment is occurring only during the first few days of incubation.

PROBLEMS ENCOUNTERED

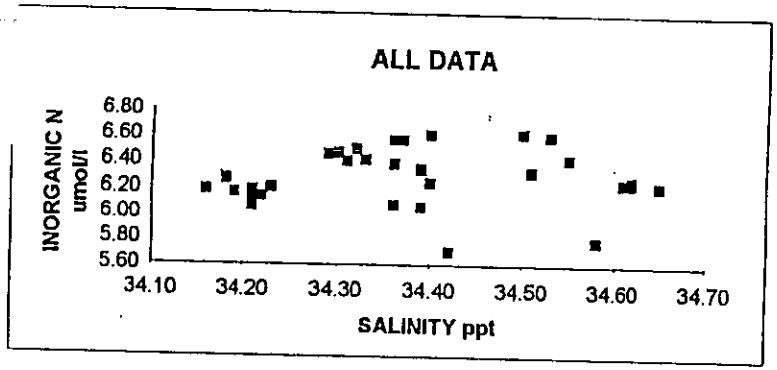
Owing to flu, two of the six scientists scheduled for this cruise were unable to sail. The full work schedule was completed by an under-staffed scientific crew, two of which were unpaid placement students with limited sea experience. To ensure the success of the cruise, meant a considerable committment from the two remaining scientists with sea experience. The situation was further exacerbated through the use of the vessel at night, in rough seas, by the Valeport engineers. After a long working day DANI scientists were unable to sleep at night owing to the excess motion of the vessel.

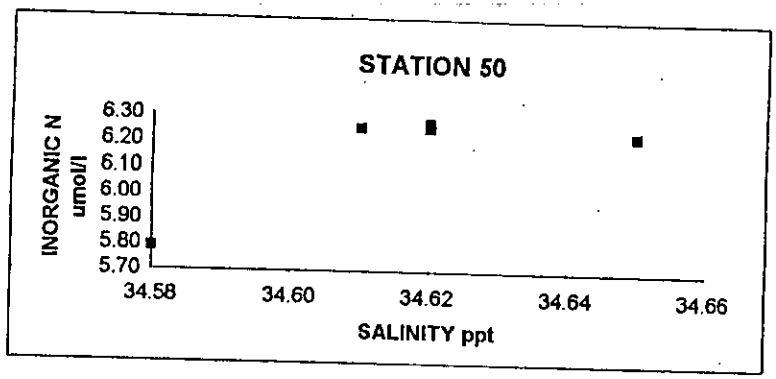
ACKNOWLEGEMENTS

I am grateful to Mr Xiong and Ms Guillot for their help during this cruise. The ship's master, officers, engineers, catering staff and crew are also thanked for their cooperation during this cruise.

B M Stewart

B M STEWART
29 December 1995


ALL DATA
INORGANIC N umol/l
6.80
6.60
6.40
6.20
6.00
5.80
5.60
34.10
34.20
34.30
34.40
34.50
34.60
34.70
SALINITY ppt


STATION 50
INORGANIC N umol/l
6.30
6.20
6.10
6.00
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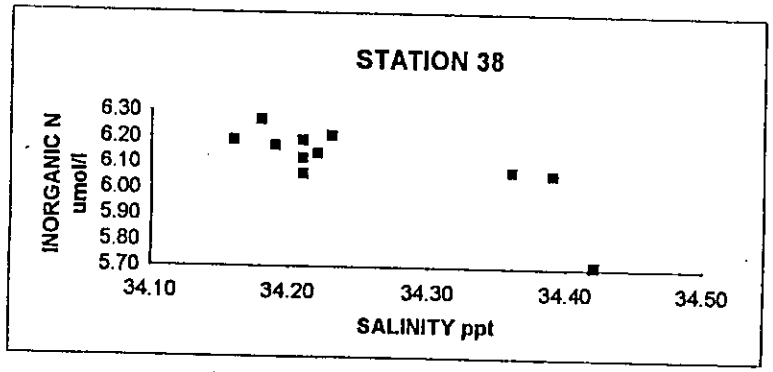
5.80
5.70
34.58
34.60
34.62
34.64
34.66
SALINITY ppt


STATION 38
INORGANIC N umol/l
6.30
6.20
6.10
6.00
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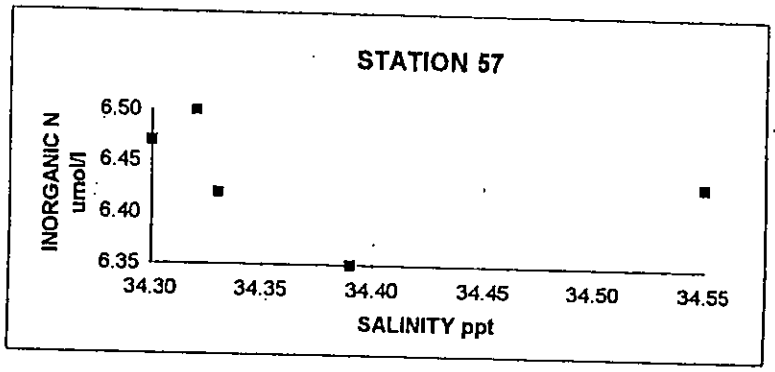
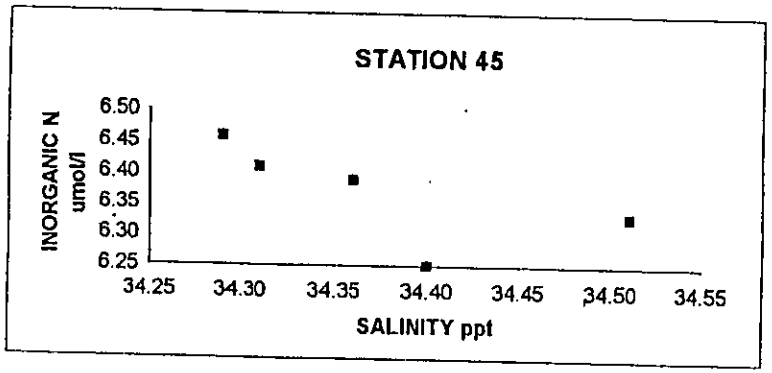
5.80
5.70
34.10
34.20
34.30
34.40
34.50
SALINITY ppt


STATION 57
INORGANIC N umol/l
6.50
6.45
6.40
6.35
34.30
34.35
34.40
34.45
34.50
34.55
SALINITY ppt


STATION 45
INORGANIC N umol/l
6.50
6.45
6.40
6.35
6.30
6.25
34.25
34.30
34.35
34.40
34.45
34.50
34.55
SALINITY ppt

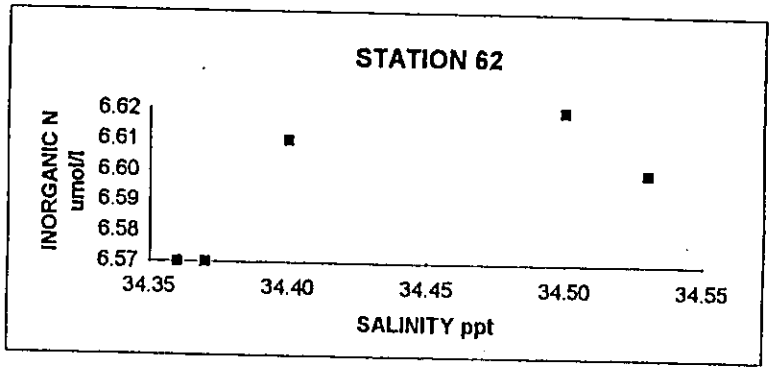
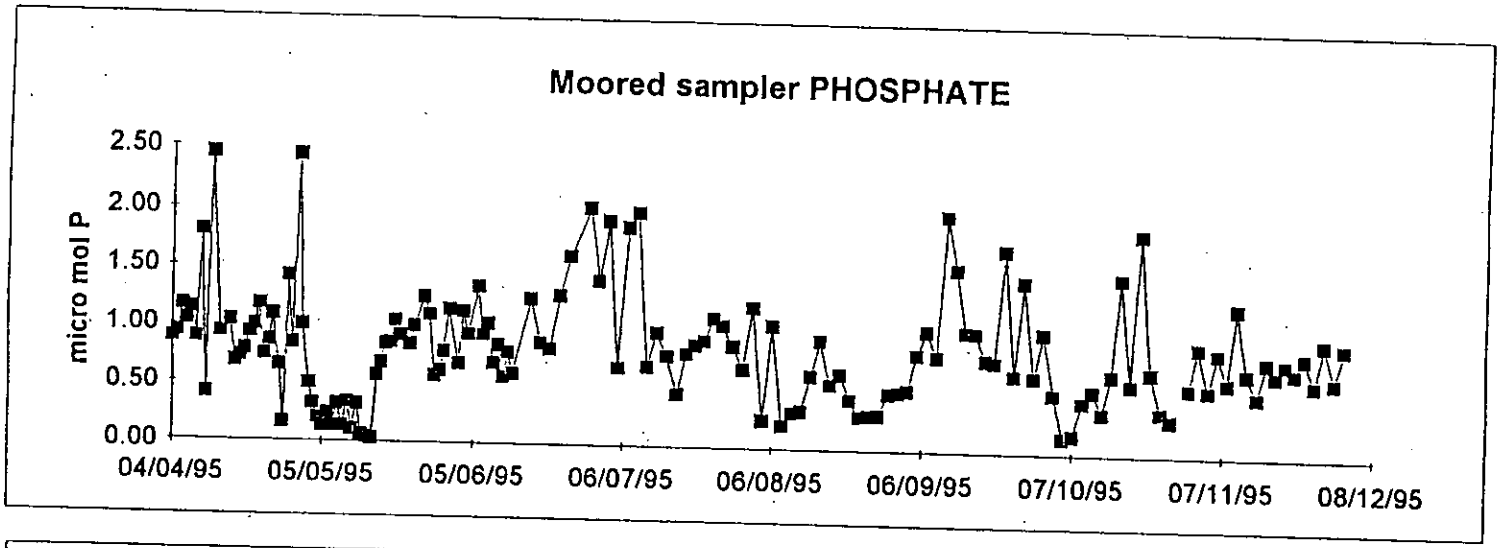

STATION 62
INORGANIC N umol/l
6.62
6.61
6.60
6.59
6.58
6.57
34.35
34.40
34.45
34.50
34.55
SALINITY ppt

Fig 1.


Moored sampler PHOSPHATE
micro mol P
2.50
2.00
1.50
1.00
0.50
0.00
04/04/95
05/05/95
05/06/95
06/07/95
06/08/95
06/09/95
07/10/95
07/11/95
08/12/95

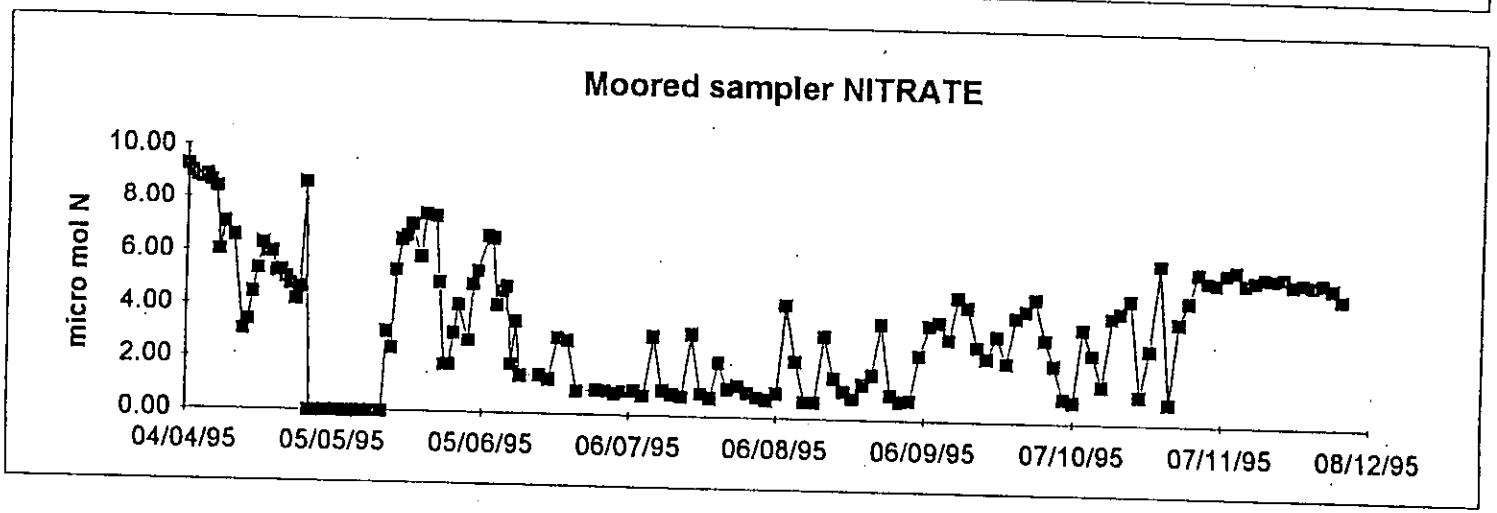

Moored sampler NITRATE
micro mol N
10.00
8.00
6.00
4.00
2.00
0.00
04/04/95
05/05/95
05/06/95
06/07/95
06/08/95
06/09/95
07/10/95
07/11/95
08/12/95

Fig 2.

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PROPOSED WORK SCHEDULE

STATION	Lat.	Long.	Activity
36	53 51	06 11	CTD, Secchi
47	53 43	06 09	CTD, Secchi, C/N, corer, + sediment C/N & Chl a
48	53 37	06 03	CTD, Secchi
59	53 28	06 03	CTD, Secchi
62	53 21	05 30	CTD, Secchi & C/N
57	53 28	05 28	CTD, Secchi & C/N
49	53 37	05 45	CTD, Secchi
46	53 43	05 50	CTD, Secchi
45	53 43	05 32	CTD, Secchi & C/N
50	53 37	05 28	CTD, Secchi & C/N
38	53 51	05 34	CTD, Secchi, C/N, corer + sediment Chl a Service of mooring & instrumentation
4	54 41	05 20	CTD, Secchi & C/N.
6	54 36	05 10	CTD, Secchi
16	54 21	05 10	CTD, Secchi
21	54 13	05 16	CTD, Secchi
26	54 06	05 21	CTD, Secchi
33	53 58	05 50	CTD, Secchi
24	54 06	05 52	CTD, Secchi & C/N
22	54 13	05 31	CTD, Secchi
15	54 21	05 25	CTD, Secchi & C/N
14	54 28	05 23	CTD, Secchi

Note

In addition and outside the Biological Oceanography survey working hours, the vessel will be required to tow Valeport Ltd. instrumentation at various speeds over a variety of distances.

Biological Oceanography cruise 4 - 8 December 1995
Proposed Sampling Stations.
LF 29/95