

BIOLOGICAL OCEANOGRAPHY CRUISE : LF2796

(June 30 - July 11)

Personnel

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Cruise Objectives

1. to study microplankton community production and loss at three 'process' stations in the Irish Sea (Dundalk Bay, Liverpool Bay and the summer stratified region).
2. to undertake a limited survey of the distribution of phytoplankton and zooplankton in the vicinity of the three 'process' stations.
3. to undertake trials with a multiplankton sampler.
4. to examine temporal changes in particulate organic carbon and zooplankton faecal pellet carbon over 24 hours at station 45 in the central stratified region.

Cruise narrative

R.V. Lough Foyle departed Belfast at 1900 h on Sunday June 30 and sailed overnight to station 36 in Dundalk Bay (Figure 1). The process and survey stations in Dundalk Bay were worked during July 1-3. Because of strong W to NW winds the mid cruise break in Dublin was taken early (July 4/5). Sampling over a 24 hour period at station 45 took place on August 09 and 10. All of the planned stations were worked during the cruise. Trials with the multiplankton sampler were conducted by M. Dickey-Collas during cruise LF 2696 and were not repeated during this cruise. R.V. Lough Foyle docked in Belfast at 0800 h on July 11.

Preliminary Results

The vertical distribution of temperature, phytoplankton chlorophyll and dissolved inorganic nitrogen at the three process stations are shown in Figure 2a-c. As expected the water column at station 45 was thermally stratified with a surface to bottom difference in temperature (ΔT) of 3.7°C. Weaker stratification ($\Delta T = 1.0^\circ\text{C}$) was

apparent at Stn 47. At the Liverpool Bay process station the water column was isothermal, but significantly warmer than at the other two process stations. Maximum concentrations of dissolved inorganic nitrogen ($\approx 7.0 \text{ mmol m}^{-3}$) were measured below the thermocline at station 45. At this station concentrations in the surface mixed layer ranged from 0.4 to 1.5 mol m^{-3} , and were similar to concentrations measured at the two, shallow coastal stations.

The maximum concentration of phytoplankton chlorophyll (11.5 mg m^{-3}) was measured below the thermocline at station 47. Initial analysis of the phytoplankton community indicates that the phytoplankton was dominated by species of the diatoms *Rhizosolenia* and *Chaetoceros*. At the summer stratified station there was a pronounced sub-surface chlorophyll maximum. The lowest biomass ($\approx 1.0 \text{ mg m}^{-3}$) was observed at the Liverpool Bay process station. At the time this station was worked there was a bloom of the 'dinoflagellate' *Noctiluca*.

All of the samples from the productivity and respiration experiments have been processed and initial work up of the data has been carried out. Chlorophyll concentrations in each size fraction used for productivity experiments are shown in Table I. These results show that at station 47 in Dundalk Bay, 16% of the chlorophyll related phytoplankton biomass was associated with the $< 2.0 \mu\text{m}$ fraction compared with 1.4 and 6.8% at the Liverpool Bay and summer stratified process stations respectively. For Dundalk Bay, daily production was estimated as $1228.4 \text{ mg C m}^{-2} \text{ d}^{-1}$.

Problems encountered

Despite strong winds which made working conditions difficult at times, all of the work was completed satisfactorily. No problems were encountered.

Acknowledgements

I would like to thank both captains the officers and crew of the R.V. Lough Foyle for their assistance during the cruise.



R.J. Gowen

September 23, 1996

ANNEX 1.

Additional scientific work carried out during cruise LF2796

C. Fox, MAFF

Vertical distribution of zooplankton and gut pigment content

A pump was employed to collect 50 litre water samples from selected depths over a 24 hour period at station 45. The inlet hose was attached to the CTD rosette in order to accurately position the depth of the intake. Three samples were collected from depths of 70 m (bottom mixed layer), 40 m (base of the thermocline) and 20 m (sub-surface chlorophyll maximum). Additional zooplankton samples were collected from the three depths for estimation of gut pigment content.

R. Sanders, UEA

Two tracer studies were carried out at each of the process stations to assess the status of the microbial loop.

1. incorporation of tritiated thymidine and leucine into a DNA base and an amino acid respectively.
2. pulse/chase experiments using ^{14}C to follow carbon flow through the pathway of algal uptake, exudation and subsequent microbial utilisation.

In addition, microbial utilisation of organic carbon was estimated by measuring respiration in water samples filtered through a $< 1.0 \mu\text{m}$ filter. Water samples were also preserved for estimation of bacterial biomass and dissolved organic carbon.

Table I. Concentrations of chlorophyll in the four size fractions (whole, < 20 μm , < 5.0 μm and < 2.0 μm) used for primary production and community respiration experiments.

Dundalk Bay

Fraction	Whole	< 20.0 μm	< 5.0 μm	< 2.0 μm
Chlorophyll	2.5 mg	0.5 mg	0.3 mg	0.4 mg
Fraction	> 20.0	< 20.0 > 5.0	< 5.0 > 2.0	< 2.0
Chlorophyll	1.30 mg	0.50 mg	0.30 mg	0.40 mg
Proportion of total	52%	20%	12%	16%

Liverpool Bay

Fraction	Whole	< 20.0 μm	< 5.0 μm	< 2.0 μm
Chlorophyll	1.41 mg	1.04 mg	0.10 mg	0.02 mg
Fraction	> 20.0	< 20.0 > 5.0	< 5.0 > 2.0	< 2.0
Chlorophyll	0.37 mg	0.94 mg	0.08 mg	0.02 mg
Proportion of total	26.2%	66.7%	5.6%	1.4%

Central stratified region

Fraction	Whole	< 20.0 μm	< 5.0 μm	< 2.0 μm
Chlorophyll	4.44 mg	2.31 mg	0.83 mg	0.30 mg
Fraction	> 20.0	< 20.0 > 5.0	< 5.0 > 2.0	< 2.0
Chlorophyll	2.13 mg	1.48 mg	0.53 mg	0.30 mg
Proportion of total	48.0%	33.3%	11.9%	6.8%

Figure 1.

A map of the Irish Sea showing the positions of stations worked during R.V. Lough Foyle cruise LF2796. Stations 47 (Dundalk Bay), 45 (summer stratified region) and LBp (Liverpool Bay) were the process stations. The solid lines indicate the approximate positions of the tidal mixing fronts.

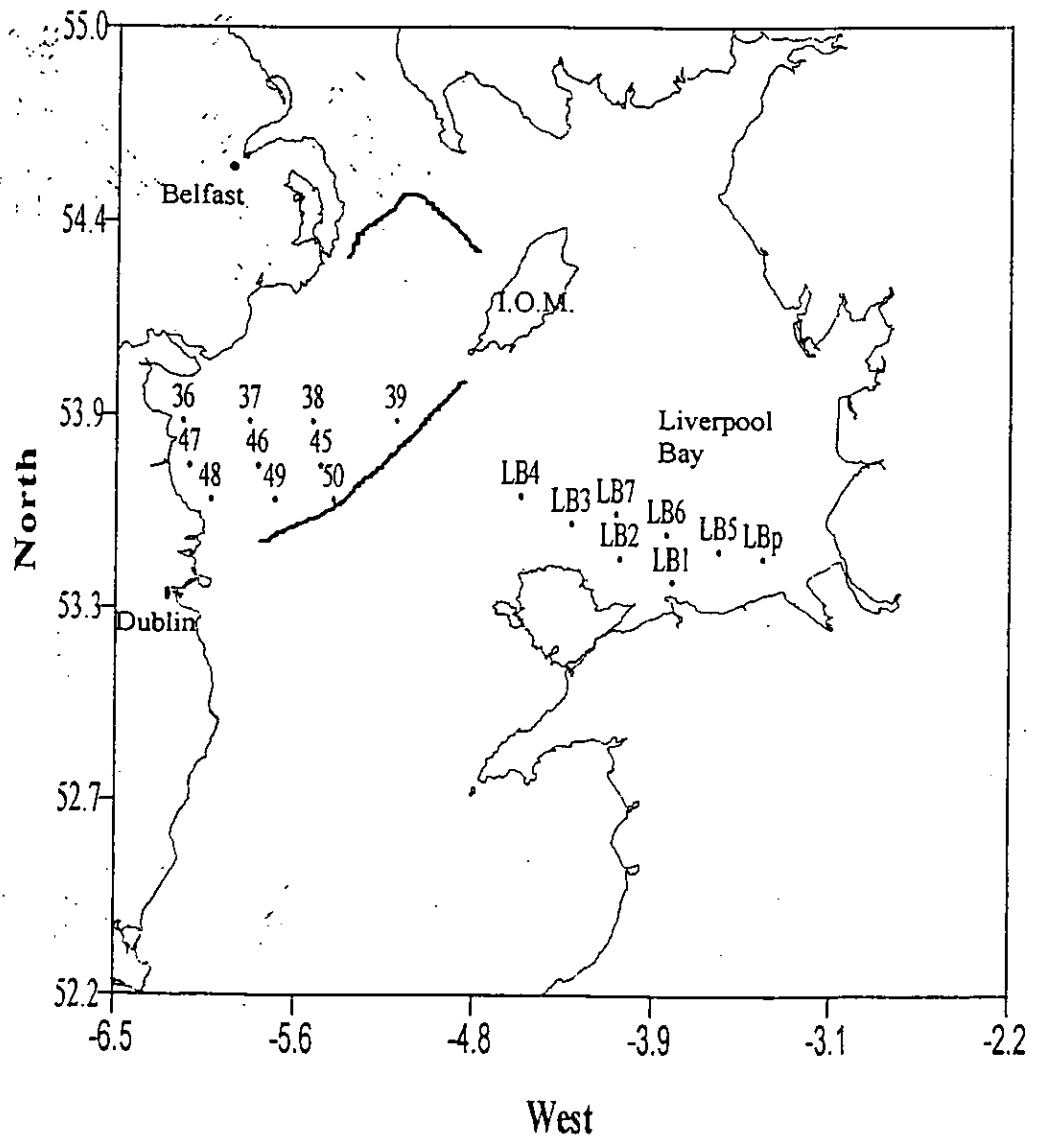


Figure 2A. Vertical profiles of temperature at the three process stations during July 06-10.

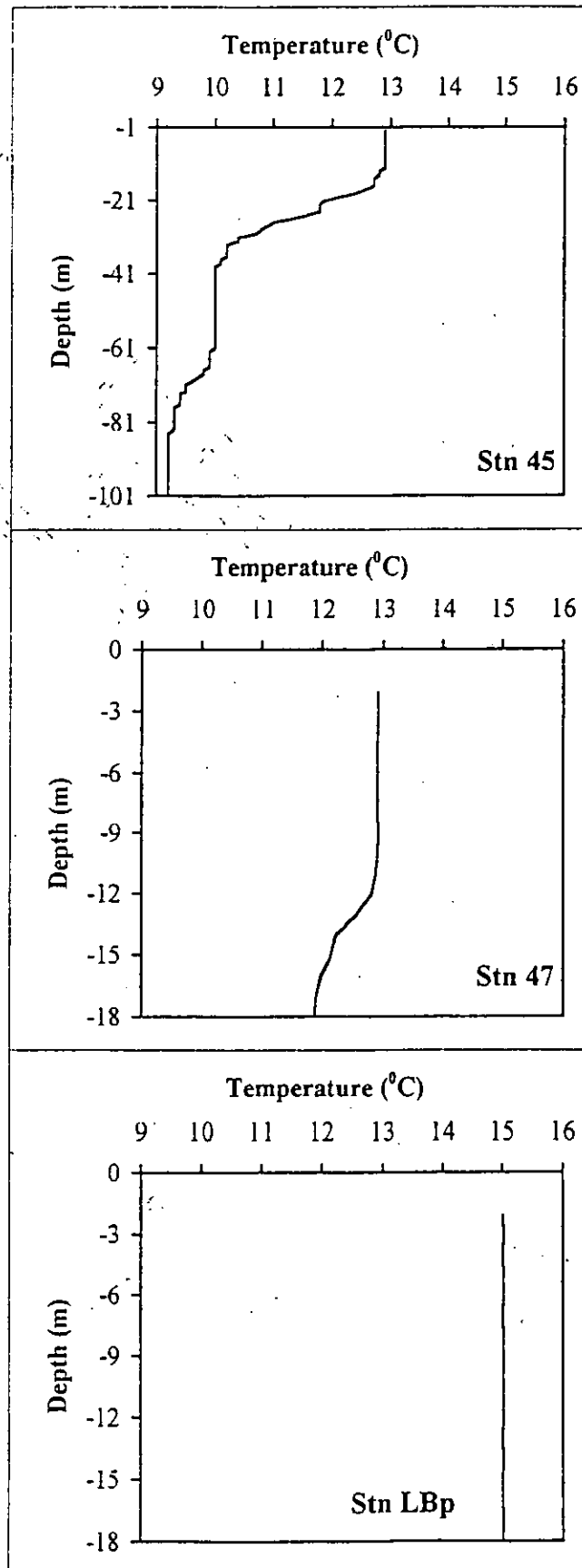


Figure 2B. Vertical profiles of nitrate at the three process stations during July 06-10.

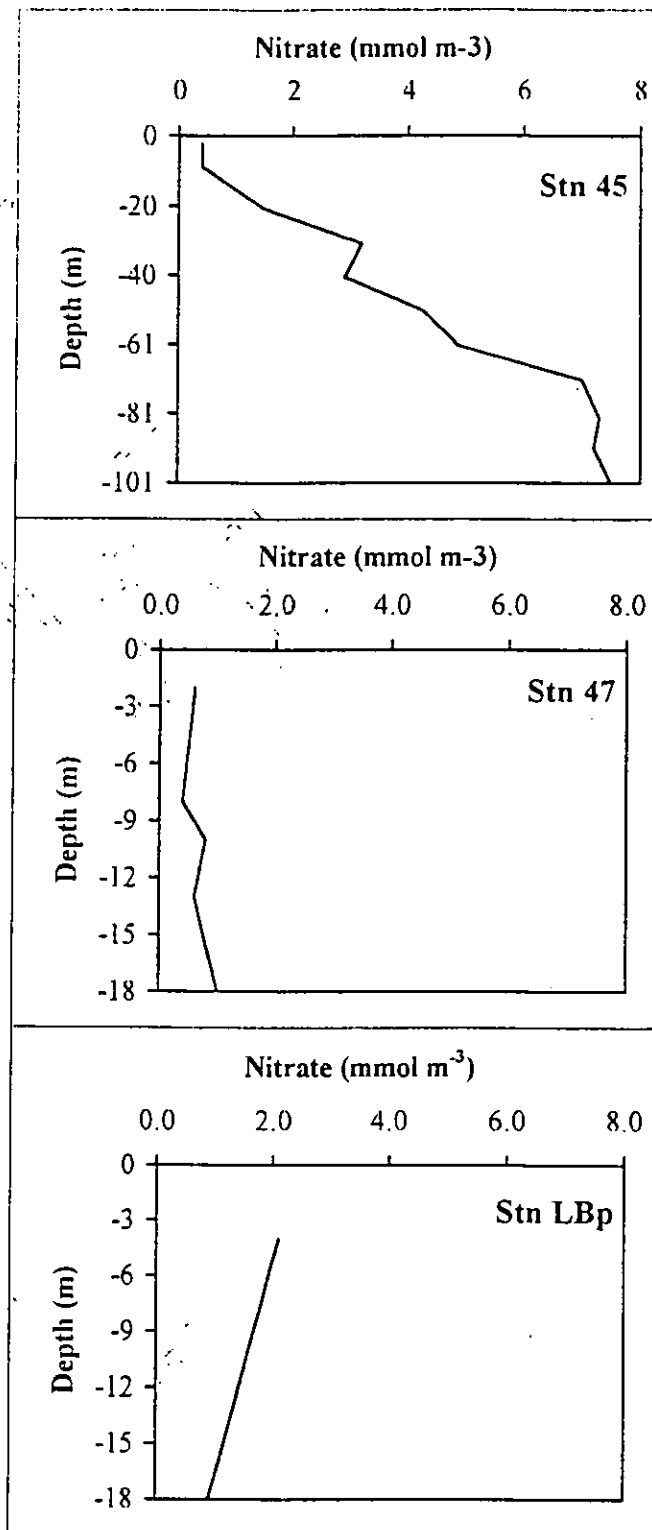


Figure 2C. Vertical profiles of phytoplankton chlorophyll at the three process stations during July 06 - 10.

