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Cruise Report : July 1992

Biological oceanography of the
north western Irish Sea

Personnel

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Objectives

To investigate the distribution of dissolved inorganic nutrients and phytoplankton biomass in relation to the vertical structure of the water column. To estimate phytoplankton production at selected locations and carry out a comparison between *in situ* and ship-board, incubator estimates of primary production.

Narrative

A complete list of station positions and work carried out at each station is given in Table I. The following is an outline of each days work:

July 13 : the Lough Foyle departed Belfast at 0700 on the 13th of July and proceeded to stn 4. The final station of the day (stn 33) was completed by 2100.

July 14 : work at stn 36 was started at 0800 and the final stn (46) was completed by 2300.

July 15 : work at stn 38 was started at 0930 and the final stn (30) was completed by 2100.

July 16: work at stn 18 was started at 0800 and the final stn (14) was completed by 1810 and the ship returned to Belfast.

Sampling

At each station a vertical profile of temperature, conductivity and fluorescence was measured with the Hydrobios CTD and Chelsea Instruments fluorometer. Water samples were collected from depths selected on the basis of the vertical distribution of temperature and salinity for estimation of phytoplankton chlorophyll and dissolved inorganic nutrients (nitrate, nitrite, ammonia, phosphate, silicate and urea). Water samples (50 ml) were preserved with acidic Lugol's iodine for microscopic analysis of phytoplankton species composition and abundance. The CTD was calibrated for salinity against precision salinometer measurements on discrete water samples and for temperature using reversing thermometers. At each station two vertical zooplankton hauls were made using one of the Bongo nets fitted with a 300 um mesh net. One sample was preserved with formalin for later analysis of species and the second sample was filtered using pre-weighed filters to obtain an estimate of zooplankton biomass. Secchi depth was recorded at each station.

The spatial distribution of physical (temperature and salinity) chemical (dissolved nutrients) and biological (phytoplankton chlorophyll) variables in near surface water were mapped continuously when the ship was steaming between stations.

At selected stations downwelling and upwelling irradiance was measured using Licor 2 Phi sensors. At these stations water samples were collected and used to estimate carbon fixation by phytoplankton using a standard $^{14}C$ incubation technique. *In situ* experiments were carried out at stations 45 and 62. For each experiment water samples were collected from selected depths in the upper region of the water column placed in tissue culture flasks and inoculated with a known amount of $^{14}C$ bicarbonate solution. The flasks were then fixed to racks tied to the productivity rig which was deployed in the sea such that the flasks were positioned at depths corresponding to the depth from which the original water samples were collected.

Samples of near bottom water were collected from selected stations for the estimation of dissolved oxygen.

Equipment

All stations were successfully worked and a total of 9 productivity experiments were carried out. The Hydrobios CTD gave a few minor problems and only 5 water bottles were operational at the end of the cruise.

A break in the cable of the Licor deck sensor (surface irradiance) prevented the acquisition of surface irradiance data during the deployment of the underwater Licor irradiance sensors. The Traaks autoanalyser was successfully run throughout the cruise. Only minor faults were encountered and these did not affect the sampling programme.

Preliminary results of productivity experiments

Estimates of phytoplankton production (mg Carbon $m^{-3}$ $h^{-1}$) based on the two *in situ* experiments are shown in Figure 1. Total column production (not corrected for respiration) at Stn 45 was 73.3 mg C $h^{-1}$ and the peak production occurred at a depth of approximately 8 m. In contrast total column production at stn 62 was higher (107.4 mg C $h^{-1}$) and the maximum production occurred at the surface. Such differences may reflect the influence of stratification on the distribution of phytoplankton and availability of nutrients.

Acknowledgements

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R.J. Gowen SIC
(1st September 1992)

TABLE 1

| Station | Position | Activity |
|---|---|---|
| July 13 | | |
| 4 | 5441 0510 | CTD; Zooplankton; Secchi; Light; [P] |
| 6 | 5436 0510 | CTD; Zooplankton; Secchi |
| 16 | 5421 0510 | CTD; Zooplankton; Secchi; Light; [P] |
| 21 | 5413 0516 | CTD; Zooplankton; Secchi |
| 26 | 5406 0522 | CTD; Zooplankton; Secchi |
| 31 | 5358 0520 | CTD; Zooplankton; Secchi |
| 33 | 5358 0550 | CTD; Zooplankton; Secchi |
| July 14 | | |
| 36 | 5351 0611 | CTD; Zooplankton; Secchi |
| 47 | 5443 0609 | CTD; Zooplankton; Secchi; Light; [P] |
| 62 | 5321 0530 | CTD; Zooplankton; Secchi; Light; DO; [P] |
| 57 | 5328 0528 | CTD; Zooplankton; Secchi; DO |
| 50 | 5337 0528 | CTD; Zooplankton; Secchi; DO |
| 46 | 5443 0550 | CTD; Zooplankton; Secchi |
| July 15 | | |
| 38 | 5351 0534 | CTD; Zooplankton; Secchi; Light; DO; [P] |
| 45 | 5343 0532 | CTD; Zooplankton; Secchi; Light; DO; [P] |
| 44 | 5343 0514 | CTD; Zooplankton; Secchi |
| 43 | 5343 0456 | CTD; Zooplankton; secchi |
| 40 | 5351 0457 | CTD; Zooplankton; Secchi |
| 30 | 5358 0505 | CTD; Zooplankton; Secchi |
| July 16 | | |
| 18 | 5421 0451 | CTD; Zooplankton; secchi |
| 20 | 5413 0500 | CTD; Zooplankton; Secchi |
| 21 | 5413 0516 | CTD; Zooplankton; Secchi |
| 24 | 5406 0553 | CTD; Zooplankton; Secchi; Light; [P] |
| 22 | 5413 0531 | CDT; Zooplankton; Secchi |
| 15 | 5421 0525 | CTD; Zooplankton; Secchi |
| 14 | 5428 0523 | CTD; Zooplankton; Secchi |

Note : [P] refers to ship-board incubation experiment



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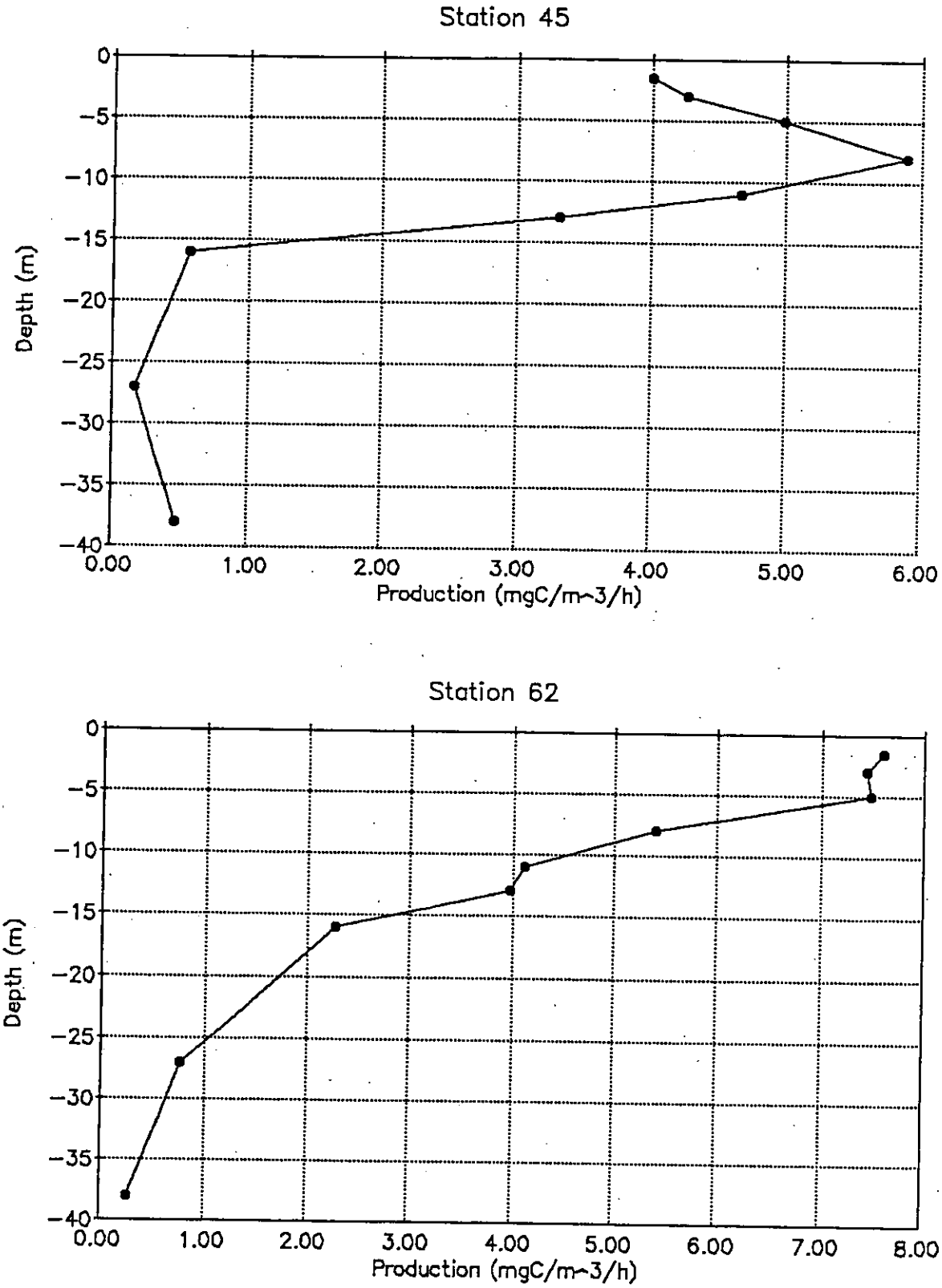
FIGURE 1. Estimates of primary production based on *in situ* experiments



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