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Charter Vessel Cruise

RV "Eastella"

Report

11-24 June 1988

Personnel

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Objectives

1. To study the distribution and biomass of plankton organisms in mixed, frontal and stratified regions of the northern North Sea using dual frequency acoustic back-scattering methods, sampling with opening and closing net systems and optical sensors.
2. To study the relationship between hydrography and nitrogen limitation of phytoplankton growth in contrasting regions of the northern North Sea.
3. To study the reproduction rates of copepod species in contrasting regions of the northern North Sea and relate these to hydrography, and the nitrogen status of phytoplankton.

Narrative

"Eastella" arrived in Aberdeen at 1330 on 11 June. Gear was loaded aboard shortly after arrival and the vessel sailed at 2200 the same day. Three extra scientific staff were carried for the first day which was spent in Aberdeen Bay setting up and testing scientific equipment. As a result of these tests it was concluded that the crane fitted specifically for deploying LOCHNESS (Large opening and closing high-speed-net) was inadequate for this purpose and all further plans for the use of this gear aboard "Eastella" were abandoned. The following day (13 June), further testing of gear and trial deployments were carried out. During these, it was found that both the echosounder systems and the through-water communications system used to operate the opening and closing net were seriously affected by acoustic interference from the vessel. This interference rendered the plankton net unusable since spurious net changes were shown to be triggered by noise from the ship even though the gear was thoroughly checked on deck and found to be 100% operational. Four days (13-16 June) were spent trying to solve the interference problem but eventually use of the gear had to be abandoned. The interference remained a feature of the echosounder records throughout the cruise. Plankton sampling during the cruise continued using a standard Gulf sampler and the Methot-Isaacs Kidd net.

Between 14 and 18 June a general area survey of the Orkney-Shetland Channel and surrounding areas was carried out. Based on these results, a survey line running along the axis of the Fair Isle current was devised and completed between 19 and 20 June. During the remainder of the cruise a detailed investigation of the Fair Isle front was carried out using an instrumented vehicle towed in an undulating track behind the ship. The vessel arrived in Aberdeen at the end of the charter at 0900 on 24 June.

## Results

The difficulties encountered in using the opening and closing nets and echosounder equipment from "Eastella" severely limited the possibility of achieving the first objective of the cruise ie to relate acoustic back-scattering data to net catches. Nevertheless, the other two objectives were carried out.

The general survey using a standard Gulf sampler provided data on integrated zooplankton biomass, whilst towed hydrographic instruments and a fluorometer provided high resolution data on physical structure and phytoplankton biomass distributions. Ten sites representing mixed, frontal and stratified regions were selected for more detailed examination. At each of these positions, light intensity and transmission profile data were collected, together with water samples for nutrient chemistry analysis, and live material for phytoplankton and zooplankton activity studies. Radio-tracer studies were carried out on phytoplankton sampled at two depths to determine the growth rates and the extent of limitation by inorganic nitrogen supply. Live samples of the zooplankton population at each site were sorted into the main constituent copepod species and incubation studies carried out to determine the rates of nitrogen excretion (as ammonia) and the rates of egg production.

Two Argos drifting buoy deployments were carried out during the cruise to determine the relationship between tidal and residual flows in the Orkney-Shetland Channel. The first was released off Sumburgh Head and showed very little residual movement, but made extensive east-west tidal excursions. By contrast, a second deployment between Orkney and Fair Isle showed a strong residual flow (13 km/day).

A strong upwelling event was observed to the west of Orkney during the cruise. Cold nutrient rich water was seen to be mixed to the surface. This patch of cold water was then carried by the residual flow into shallow water between Orkney and Shetland where rapid phytoplankton growth occurred. However, maximum rates of ammonia excretion by herbivorous copepod species were found on the east side of Orkney, implying that the primary production occurring to the west was mainly utilised downstream of the production area. First inspection of the data suggested that excretion and egg production by the copepods were not correlated, implying that food quality may be an important determinant of egg production. Analysis of the data from the phytoplankton studies should help in this respect.

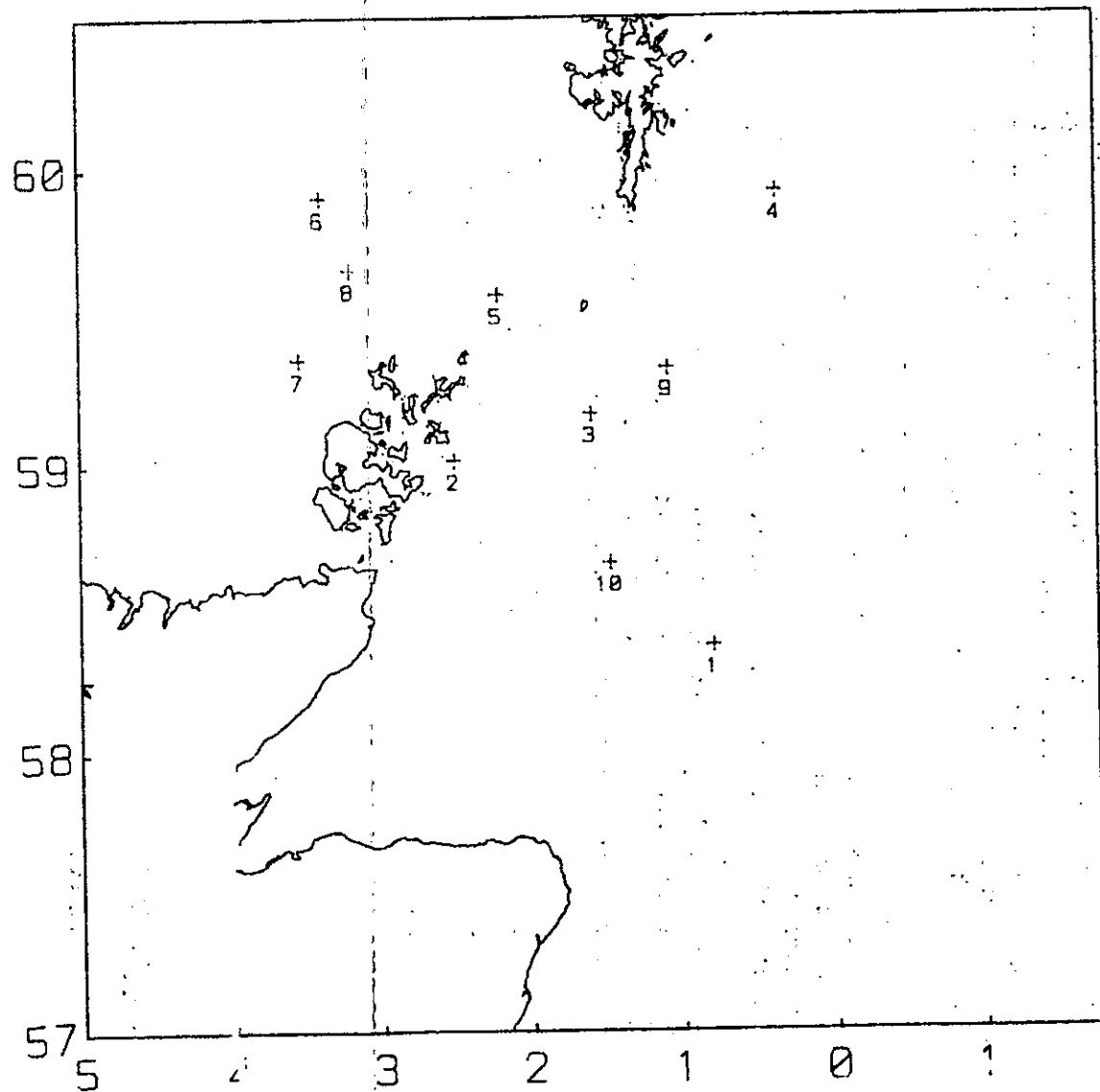
M Heath  
7 July 1988

Seen in draft

Capt R Holliday

'Eastella' detailed sampling positions 11-24 June 1988

STATION NUMBER



Eastella survey track 11-24 June 1988

