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RRS "Challenger"

Cruise 87/23A

Report

6 - 27 January 1988

Personnel

M R Heath	SSO (in charge)
J C Gamble	PSO
R B Mitchell	SSO
J Dunn	HSO
C D Hall	HSO
S J Hay	HSO
N T Nicoll	HSO
D L Baird	ASO
L Cargill	ASO
A Matthews	ASO (pt 2 only)
J T M Hunter	PTO
J Grant	Craftsman
R Powell (NERC, RVS Barry)	(pt 1 only)

Objectives

1. To carry out a survey of the distribution of herring larvae, plankton and hydrographic parameters in the North Sea.

2. To perform a series of intensive studies of the vertical distribution of herring larvae.

Narrative

Scientific gear was loaded during 6 January and the vessel sailed from Aberdeen at 1800. All sampling equipment was tested in Aberdeen Bay during 7 January, and surveying commenced at 1900. During the following 8 days sampling was carried out in the central North Sea, and the vessel docked in Esbjerg for the mid-cruise break at 1300 on 15 January.

"Challenger" sailed from Esbjerg at 1400 on 16 January and proceeded to commence a 2 day study of the vertical distribution of herring larvae. A current meter mooring was laid at 54°45'N 06°00'E on the morning of 17 January and an Argos buoy released close-by. Sampling with the large opening and closing net (LOCHNESS) and the standard Methot-net continued for 48h after which the mooring was recovered. The vessel then proceeded to attempt recovery of the Argos buoy, but this could not be located so the vessel continued northwards to carry out surveying work in the northern North Sea.

Between 19 and 24 January sampling was carried out between the Norwegian and Scottish coasts from 57°15'N to 59°15'N. Bad weather forced the vessel to shelter during most of 25 January. A 24h study of the vertical distribution of larvae at a position approximately 80 nm east of Aberdeen was carried out during 26 January and the vessel then docked in Aberdeen at 0800 the following morning.

Results

1. General distribution of herring larvae and plankton.

Routine sampling of herring larvae was carried out with the 5m^2 Methot-Isaacs-Kidd net. Replicate oblique tows were carried out at each station and hydrographic data collected in each case using a self recording CTD mounted on the net. Additional sampling of zooplankton, phytoplankton, light intensity and hydrography was carried out at 12 stations throughout the North Sea. At each station the vertical distribution of various size fractions of zooplankton was determined using a profiling pump system and material collected for photosynthesis measurements by the 14C incubation method and for copepod egg production measurements. Herring larvae caught at these sites were measured and retained for dry weight measurements, biochemical analysis and otolith examination.

Herring larvae were caught in large numbers (up to 1120 per haul) in the southern end of the survey area, adjacent to the UK coast, and in a patch extending from off Peterhead towards the entrance to the Skagerak. When converted to numbers below unit sea-surface area these catches represented up to 12/m^2. larvae were not caught in the central part of the North Sea on the Dogger Bank, or off the North western coast of Denmark. In general the larvae in the south were larger than those caught in the north, but a group of small individuals, probably originating from winter spawning in the English Channel, was also sampled in the south-east of the area.

Phytoplankton biomass was remarkably high over the Dogger Bank and off the Danish coast. High concentrations of the diatom Rhizosolenia and the dinoflagellate Ceratium tripos were widespread in this area. Elsewhere, chlorophyll concentrations were low. High rates of egg production by copepod species (especially Calanus) were recorded at several stations in the east and central North Sea, and rates of up to 20 eggs per female per day were measured at sites east of the Dogger Bank. In the northenn North Sea, egg production was generally less than 1 egg per female per day.

The hydrographic sampling indicated that the water column was fully mixed over most of the North Sea. Slight stratification was present in the Fladen area, along the edge of the Norwegian Deeps, and along the southern shore of the Moray Firth. Surface water temperatures were between 6° and 8.5°C in all areas. The acoustic doppler current profiler (ADCP) was operated throughout the cruise and an evaluation of the data will be carried out at a later date.

2. Larvae vertical distribution studies.

a. SE Dogger Bank site.

The first vertical distribution study was carried out between 17 and 19 January in shallow (40 m) water to the SE of Dogger Bank where high concentration of larvae between 20 and 40 mm long were found in the first part of the cruise. The new 5m^2 opening and closing net was used to sample herring larvae in 4 depth strata until strong winds prevented its deployment. The remainder of the study was completed using multiple deployments of the standard 5m^2 Methot-net. Large catches of larvae (up to 800/5 min tow) were taken with both gears, but there was a pronounded diurnal variation in catch size, approximately 6 times as many larvae being caught at night as during the day. The results indicated that the larvae were generally located in mid-water, but showed periodic changes in aggregation. During the study, the Argos buoy was carried northwards. However, there was reason to believe that the buoy may have been recovered by one of several beam trawlers working in the area at some time during this period.

b. East of Aberdeen

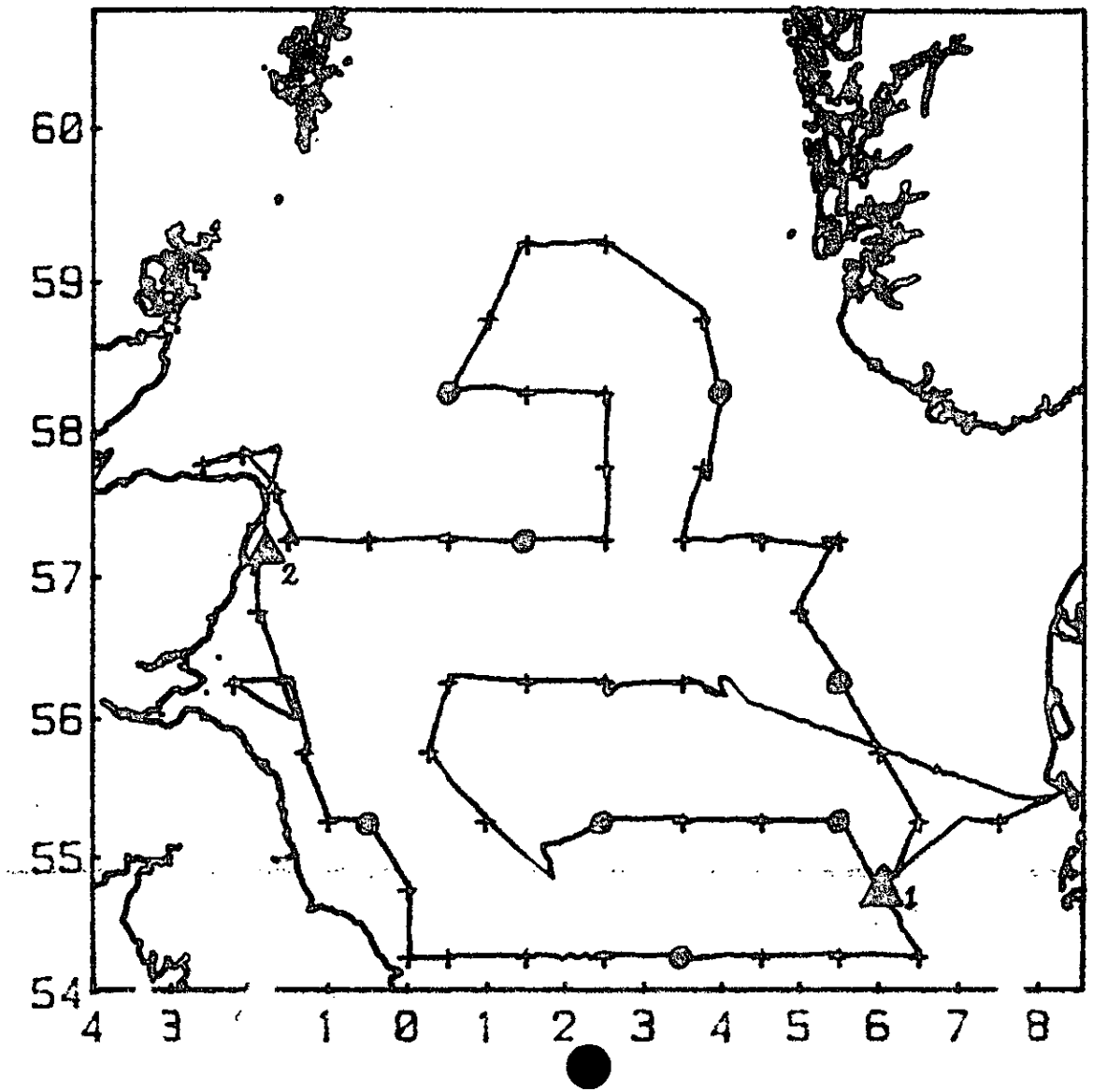
The second vertical distribution study was carried out in 90 m of water off Aberdeen on 26 January. It was not possible to deploy a current meter mooring at the site, but the ADCP was operated throughout the investigation. Larvae were sampled with the LOCHNESS and the standard Methot-net. The results indicated that larvae were well mixed through the water column at night, but concentrated in the upper 10 m during daylight.

3. Performance of sampling gear.

The new $5m^2$ opening and closing net functioned successfully and proved capable of taking large catches of herring larvae. Additional instrumentation was attached during some tows to record the heel and pitch of the gear underwater and these indicated that the net was towing reasonably level and upright. The main problem was the short scope of the towing wire which resulted in severe snatching in choppy seas and restricted the use of the gear. Deployment through the main 'A' frame on "Challenger" proved to be a very simple operation.

M Heath
27 January 1988

CHALLENGER 6-27 JANUARY 1988



▲1 17-19/1/88
MOORING + 24 SAMPLING STATIONS

▲2 26/1/88
10 SAMPLING STATIONS

\+ ROUTINE SAMPLING

⊙ DETAILED SAMPLING