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FRV *Scotia*

Cruise 0309S

REPORT

20 February-6 March 2009

Ports

Loading: Aberdeen, 17 February 2009
Unloading: Aberdeen, 6 March 2009

Personnel

P Wright (SIC 20 February – 3 March)
I Gibb (20 -25 February)
F Neat (SIC 3-6 March)
M O'Sullivan
J Augley
D Demain
D Tobin (University of Aberdeen)
A Cook (CEFAS)

Project: MF760 – 15 days

Fishing Gear

BT186 trawl with 20mm blinder
SCANMAR

Other Equipment

40 cm Bongo 350µm nets (x2)
Gulf VII plankton nets (x2)
Bongo (x1) and Scripps (x2) depressors
Minilogger and data storage tags
4 fish tanks
Seabird 19 CTD

Objectives

1. To conduct an ichthyoplankton survey of the North West North Sea. This survey will form part of the ICES co-ordinated PGEGGS 2009 survey.

2. To biologically sample all cod (whiting and haddock from two areas) for length, sex and maturity. Otoliths, genetic samples and ovary sections will be extracted at sea and preserved in vials for later analysis.

3. To tag spawning cod from one area for investigations of their movements. Tagging will involve both conventional and data storage tags.

4. To screen cod for haemoglobin types from a coastal and offshore site.

5. To sample male cod for the CODEND project.

Narrative

Scotia departed from Aberdeen at 10:00h on 20 February heading east and after a trial deployment of the new Bongo gear began a grid of plankton stations, generally located in the centre of an ICES rectangle (Figure 1). A vertical CTD cast was undertaken at each plankton station and water samples were taken at the surface and bottom for salinity calibration. Surface salinity and temperature were recorded continuously throughout the cruise using the thermosalinograph. A minilogger was attached to the plankton gear to measure temperature during sampling. Plankton was sampled with a double oblique tow of the Bongo net at approximately 2 knots to within 5 m of the bottom, except for depths > 100m where the maximum depth sampled was 100m in accordance with PGEGGS guidelines. The vertical profile of the tow was monitored using Scanmar. The vertical rate of deployment was within the range 10-15m.min^{-1} depending on depth. Volume filtered was determined using a flow meter inside the mouth of one Bongo that was calibrated from 3 horizontal tows without the net. The mean volume sampled per 1m depth strata was approximately 4.5 m^3 for the 2 nets. Plankton stations were conducted throughout the day and night. Fish eggs and larvae were separated from zooplankton and then plaice and cod like eggs were staged. A sub-sample of up to 50 cod like eggs within the range 1.1-1.7 mm were measured using a calibrated eye piece graticule and then fixed in 100% ethanol for later molecular identification of species using the method of Taylor et al. (2002). Samples from both Bongo nets were only sorted where there were less than the required number of stage I cod like eggs and fewer than 100 other eggs. In one sample with a very high number of eggs, the sample from one net was split. After sorting, remaining eggs and fish larvae were fixed in observation fluid. Any unsorted samples were also fixed in observation fluid.

Trawl sampling to obtain biological samples of cod and haddock was conducted on 21, 23, 27, 28 February in the Moray Firth, Papa Bank, Bressay grounds and Long Hole respectively. The vessel returned to fishing off the east mainland coast on 4-5 March to obtain further biological samples of cod and whiting from the only region where spawning cod had been recorded. Due to concerns over the trawl's bottom contact by the Fishing Master, additional chain was added to the ground gear and some of the floats removed from the headline prior to the Long Hole fishing ground. This modification improved net stability as indicated by Scanmar readings and increased the catches of cod and flatfish.

Deployment of the Bongo gear required a moderate sea state and so sampling was suspended in conditions of high swell and winds at or above a Force 8. Poor weather led to a short delay in plankton sampling on 22 February. Westerly plankton stations from Orkney to Shetland were then undertaken. A severe gale led to a further delay with *Scotia* having to take shelter off the south east Shetland coast at 10:30h on 25 February. To avoid any further delays I Gibb was put ashore at Lerwick just prior to taking shelter, rather than the planned later date. *Scotia* then sailed to the Bressay ground station at 13:15h on 26 February when the gale subsided. Due to delays caused by weather and the high risk of further weather disruption in the north of the survey area, 4 plankton stations along the north eastern edge of the survey were dropped. The choice of these stations was based on information received about the sampling distribution of the recently completed Norwegian PGEGGS survey. An additional station that the Norwegian survey had not managed to survey was also sampled. Sampling continued off the east coast of Scotland with trawl sampling undertaken at the Long Hole (110 miles holes region) where 17 cod were tagged and released with data storage tags. P Wright was put ashore in the morning of 3 March at Montrose in order to attend a funeral. The southern plankton station were completed and

trawl stations were completed at locations off the Bell Rock, the Dog Hole (east of Aberdeen) and in the Moray Firth. The ship returned to Aberdeen following the final trawl at 16:00h on 5 March and docked at 21:00h for unloading the next morning.

Results

A total of 53 plankton and CTD stations were completed although 9 CTD readings were lost due to either software or battery failure (Figure 1). Eggs and larvae were sorted from both nets in 43 stations. A total of 11007 eggs were caught from which 4488 were staged and 1215 cod like eggs were extracted for later genetic identification of cod, haddock and whiting ratios. Gill tissue from Norway pout was also taken in the hope that the method of Taylor et al. (2002) could be extended to consider this species.

The densities of stage I cod like eggs are given in Figure 2. The frequency composition of stage I cod like eggs suggested the presence of two major modes, at 1.1 and at 1.4 mm. The lower mode was consistent with the upper diameter range of Norway pout, which were found to be spawning in the northern part of the study area. The highest densities of stage I eggs in the main size range for cod and haddock (i.e. 1.3-1.6 mm) were at stations off the Moray Firth, west of Orkney and northeast of Shetland. Samples from these locations also contained stage V cod eggs. Only 15 spawning cod were caught in total and all but 1 came from the Moray Firth. Spawning haddock were caught on the Bressay grounds. Spawning Norway pout were also recorded in this area.

Mean water column temperatures ranged from 5.7 to 9.7°C. The warmest water temperatures were recorded in the north west of the survey area and the coldest in the coastal waters of the Scottish east coast. The high salinity areas in the north and west of the surveyed area were consistent with Atlantic water (> 35.3$^{o}/_{oo}$; Figure 4).

The numbers of cod, haddock and whiting obtained for biological sampling are given in Table 1. Eleven male cod were obtained for the CEFAS CODEND project. During the Long Hole trawling 17 cod were tagged with G1 CEFAS data storage tags and released. A further 2 cod caught were similarly tagged in the Moray Firth and off Aberdeen.

Screening for cod haemoglobin types proved to be impossible due to vessel movement.

P Wright
17 March 2009

Region	Number of hauls	Number of cod	Cod ovary samples	Number of haddock	Haddock ovary samples	Whiting
Bressay ground	3	15		180	32	
Papa Bank	2	7		21	8	
Long Hole	4	77	8	7	6	
Southern Trench	4	20	6	28	26	
Hole of Pittoulie	1	8	5			
Dog Hole	1	4				87
Broch square						25

Table 1. Numbers of fish measured and mature ovaries sampled by trawl location.

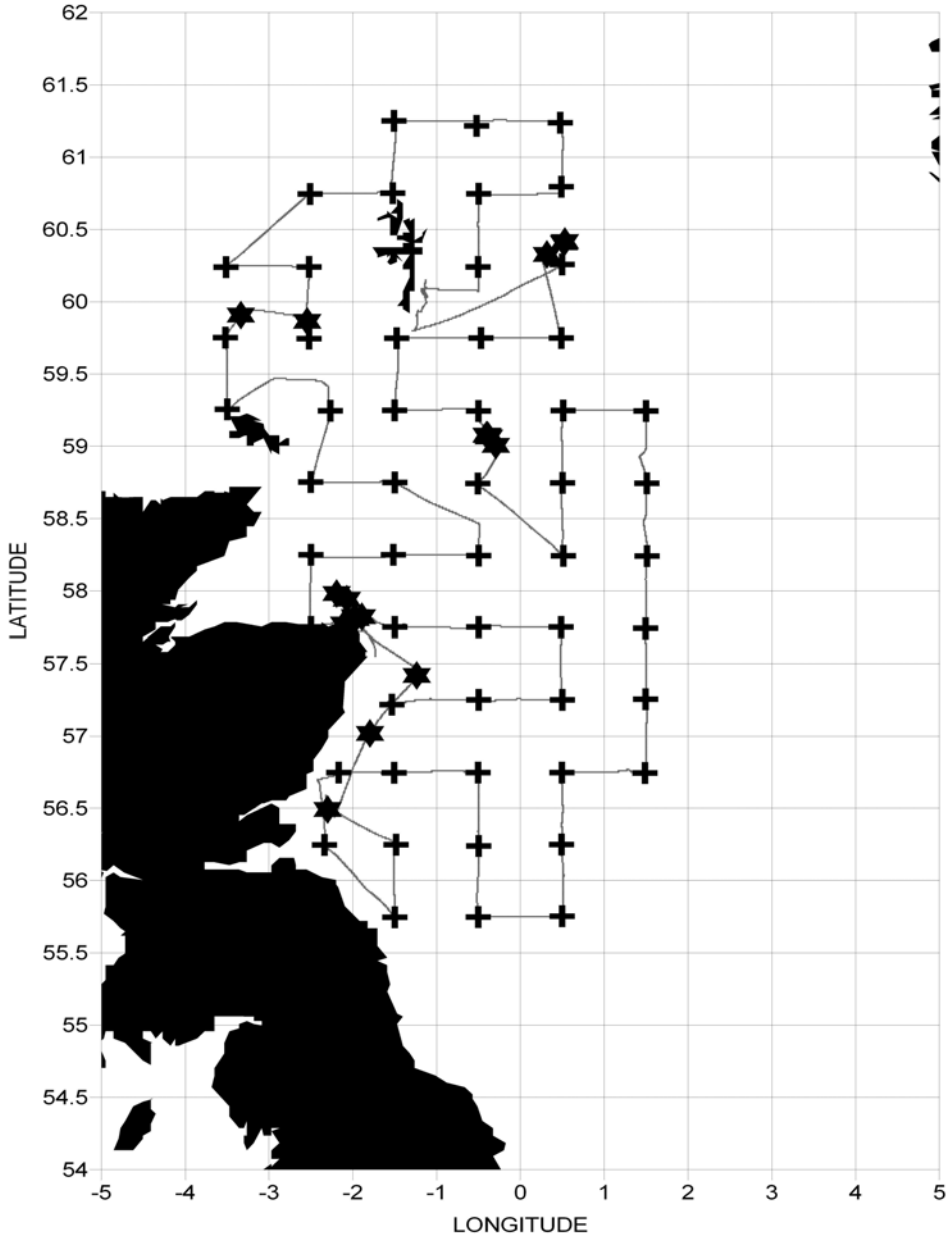

Figure 1. Location of plankton stations (+), trawl stations (stars) and cruise track

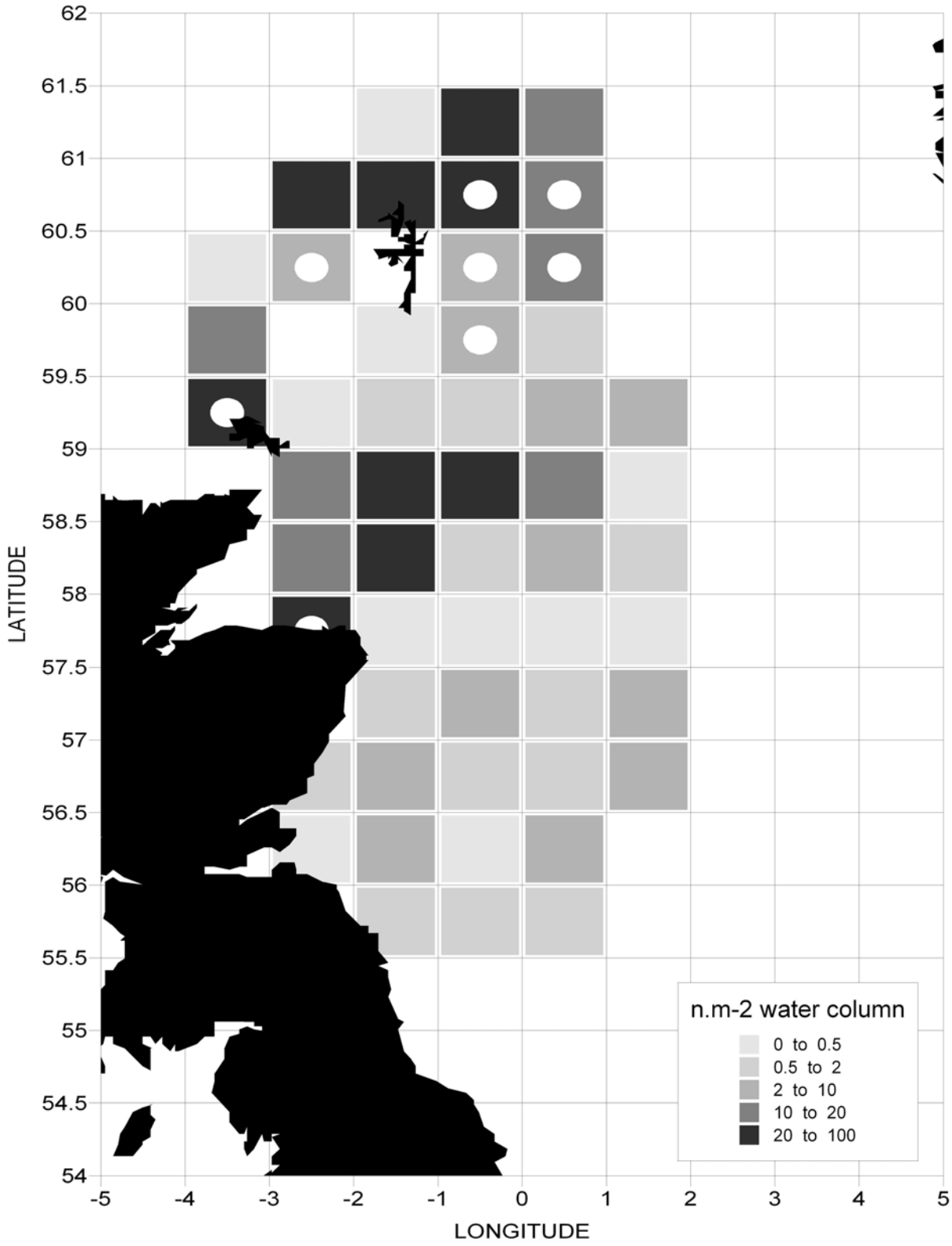

Figure 2. Density distribution of cod like eggs 1.1 -1.7 mm diameter in the water column. White circles represent stations containing stage V cod eggs.

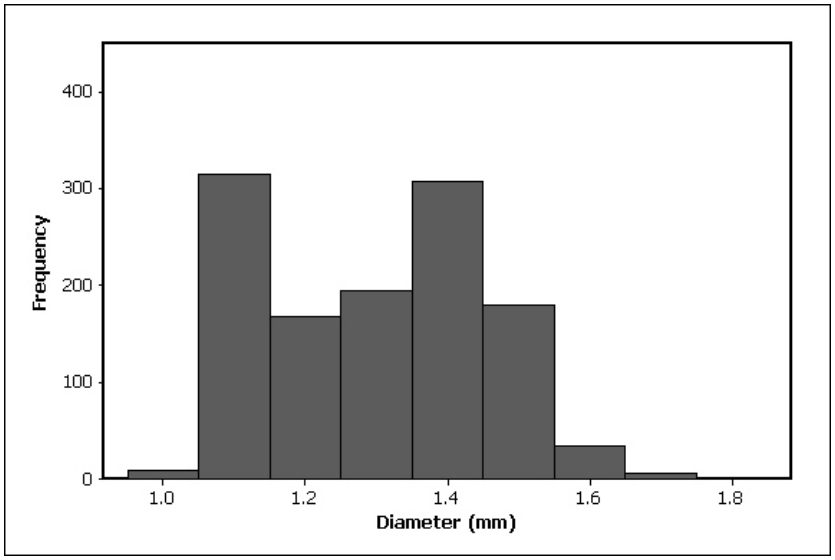

Figure 3. Frequency composition of cod like eggs preserved in ethanol for genetic identification.

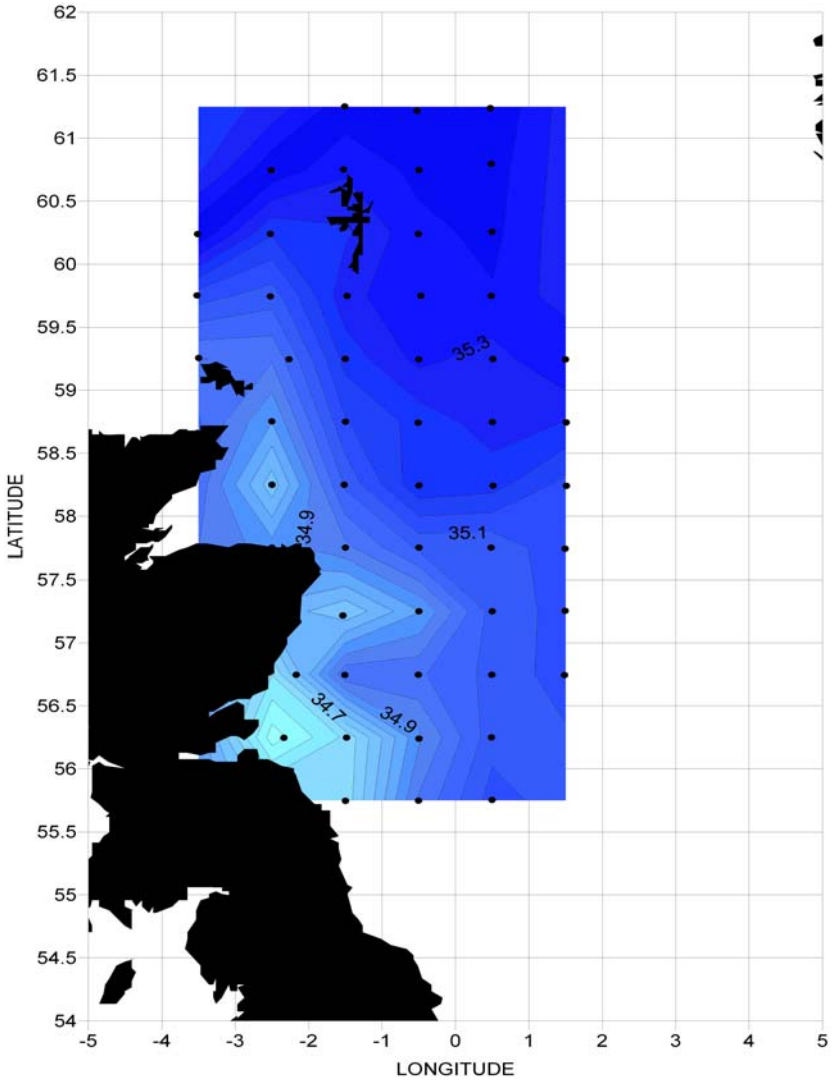

Figure 4. Near bottom salinities during survey.