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FRV SCOTIA

Cruise 1096S

REPORT

29 May - 14 June 1996

Loading: Aberdeen, 27-28 May 1996

Unloading: Aberdeen

Fishing Gear: PT153 and PT160, live sample Methot net

Personnel

W R Turrell	PSO, SIC
G Slessor	HSO
R Payne	HSO
R D Adams	SO
R G J Shelton	SPSO
A Macdonald	HPTO
S Dye	Visitor
A Williams	Visitor
G Williamson	Visitor
N Nicol	Visitor
Toby Sherwin	Visitor

Objectives

1. To perform hydrographic surveys along the standard Faroe-Shetland Channel sections using a CTD with rosette water sampler. A vessel mounted ADCP and thermosalinograph will also be run continuously.
2. To perform a more detailed hydrographic survey of the Faroe Shetland Channel and Faroe Bank Channel area.
3. To recover, service and redeploy a single ADCP mooring at the shelf edge west of Shetland.
4. To locate the surface signal of mesoscale eddies within the Faroe Shetland Channel, seed an eddy with drifting buoys and recover the buoys.
5. Perform *ad hoc* CTD surveys in order to locate the deep pycnocline at up to five locations north of the Wyville-Thomson Ridge, and to deploy and recover a temporary mooring at each location for a duration of approximately 30 hours at each site.
6. To perform experimental trawls in order to assess gear suitability and the feasibility of catching salmon post-smolts at sea.

7. To perform experimental hauls using an adapted Methot net in order to catch live eel leptocephali for subsequent filming and studies.
8. To perform hydrographic surveys along the JONSIS standard section if time permits.

Out-turn days per project: BKC1 - 6, GBH - 6, KAA2 - 4

Narrative

On leaving Aberdeen at 0930 (all times are GMT) Wednesday 29 May the FRV *Scotia* proceeded towards the easterly end of the JONSIS line, after collecting the Aberdeen caesium sample. During the passage a series of planned straight legs and turns were executed in order to test and calibrate the vessel mounted ADCP. *Scotia* arrived at station 12 of the JONSIS line at 0200 on Thursday 30 May. The hydrographic survey of the line was completed by 1540 that day (Stations 173-184). *Scotia* then proceeded to the Fair Isle caesium position, where a sample was taken, and then continued north towards the start of the Nolso Flugga standard section.

However, during the passage the weather deteriorated, with winds increasing to greater than Force 8, and *Scotia* was forced to seek shelter in Bluemull Sound. She remained there for all of Friday 31 May. Repeated attempts were made to perform tests and trial hauls while in shelter but the severe weather, exceeding Force 9 at times, prevented all tests, except for a single trial of the Methot net. During the early hours of Saturday 1 June *Scotia* proceeded through the Sound to the west of Shetland, where more shelter was available, and a calibration test using the CTD and temperature logging instrumentation was successfully completed during the morning. During the afternoon attempts at trialing the Methot net gear were again abandoned due to the weather. Tests using the drifting buoys were completed, however, and a successful trial of the PT153 pelagic net was completed by 1830 (Trawl 209). This test revealed a defective sealing of the cod-end, which was subsequently rectified. Three Methot net trial hauls were successfully completed between 2100 and 2200 that evening (Hauls 251-253).

When winds had reduced to Force 7, *Scotia* left shelter and proceeded to the start of the Nolso Flugga line, which commenced at 0120 on Sunday 2 June and was completed by 1030 the following day (Stations 185-200). During the first half of this standard section Methot net hauls were performed after each CTD station. A total of nine hauls (Hauls 254-262) were completed between 0050 and 1110. These revealed very little plankton, and due to deteriorating weather, the likelihood of no leptocephali being in the surface waters during daylight, and the delay to the survey these hauls were causing, they were abandoned until the hours of darkness, when three further hauls (Hauls 263-265) were carried out close to the Faroese shelf edge.

After completing the Nolso Flugga line, *Scotia* steamed south along the Faroese shelf and a trial PT153 haul was conducted (Trawl 210), commencing at 1130 Monday 3 June. A few sandeel specimens retrieved were stored on behalf of a Faroese research student.

Scotia then proceeded to the Fair Isle Munken line, where survey work commenced at 1550 and was completed by 1600 on Tuesday 4 June (Stations 201-214). Three Methot net hauls were performed during the hours of darkness along this line (Hauls 266-268).

Near to the completion of this line weather again deteriorated. However, the possible signature of a mesoscale eddy had been located near the expected location of the offshore edge of the slope current during the survey. During the following two days a detailed survey of this feature was attempted, employing the thermosalinograph, vessel mounted ADCP and

five shallow CTD casts (Stations 215-219). Despite continuingly strong winds of up to Force 8, the survey continued, although no further CTD casts were performed owing to the worsening weather. In all eight drifting satellite tracked buoys were deployed within and around the feature. Later in the trip satellite imagery received on board confirmed that this feature had been correctly identified.

After the final drifting buoy had been released, at 0130 on Thursday 6 June, *Scotia* proceeded southwest towards the site where Norwegian researchers had previously successfully caught salmon post smolts. During the passage very poor weather was experienced with strong winds and heavy seas, and speed was reduced to 2 knots. On arrival at the haul location, and as the weather was unsuitable for any other work except fishing, three trawls using the PT153 net were accomplished (Trawls 211-213), between 0945 and 2330. Two hauls successfully retrieved salmon post-smolts. A Methot net haul was performed close to the last trawl position during the hours of darkness at 0026 Friday 7 June (Haul 269).

After the Methot net haul, *Scotia* proceeded to the eastern edge of the Wyville-Thomson Ridge, where a preliminary CTD survey commenced at 0708 on Friday 7 June (Stations 220-221). A temporary mooring, designed to record internal wave activity, was deployed behind the ridge based on the results of the CTD observations. The mooring was deployed by 1200. At that time it was considered too late to retrieve the Nordic WOCE ADCP mooring, despite the good weather that prevailed, and the preliminary CTD survey of the shelf edge area was expanded, and completed by 1830 that night (Stations 222-228).

Scotia then returned to the location of the successful post-smolt hauls at the eastern end of the Wyville-Thomson Ridge. Trawling began at 2300 Friday 7 June. Unfortunately during the first haul the PT153 (Trawl 214) net was ripped open, and had to be replaced by PT160 net, rigged to fish at the surface. A successful haul using the PT160 was performed by 0730 on Saturday 8 June (Trawl 215), recovering 55 post-smolts. Two further Methot net hauls were performed, at 0130 and 0800 (Hauls 270-271). However, the weather again deteriorated with winds of up to Force 8. Work was suspended until 2130 when trawling recommenced. A further two trawls (Trawls 216-217) were completed in the area by 0400 Sunday 9 June, when again bad weather ended fishing operations. Between 0000 and 0400 two Methot net hauls were accomplished (Hauls 272-273).

A decision was made to slowly dodge towards a deep water location south of the Wyville-Thomson Ridge where it was considered there was the greatest possibility of catching a leptocephali. The weather at that time precluded any other work, including the recovery of moorings. *Scotia* arrived at the site, and repeated Methot net hauls commenced at 1700 Sunday 9 June. In all 16 were performed (Hauls 274-290). A single leptocephali was caught during haul 282.

Due to a marked improvement in the weather, *Scotia* returned to the site of the internal wave mooring, which was recovered by 0900 on Monday 10 June. *Scotia* then proceeded to the location of the Nordic WOCE bottom mounted ADCP mooring. Owing to the operations of a seismic survey vessel close to the ADCP mooring, recovery of the mooring was delayed until 1800. Prior to recovery a CTD cast was performed (Station 229). Once recovered down loading and servicing of the ADCP continued all night. Hence, between 1950 Monday 10 June and 0740 Tuesday 11 June fishing operations recommenced and four trawls (Trawls 218-221) were performed to the east of the Foinaven oil field. *Scotia* then proceeded back to the location of the mooring, which was redeployed by 1410 that day.

Since the deployment of the drifting buoys, regular information about their location had been faxed to the vessel. Now *Scotia* proceeded to the last recorded location of two slower

moving drifters located within the colder water associated with the mesoscale "eddy" feature. With the aid of the Gonio 400 location equipment, this drifter was recovered at 1912, and a second drifter by 2039. A CTD cast was performed close to the second drifter at 2047 (Station 230). During the night *Scotia* proceeded towards the last known positions of the remaining drifters, while performing a thermosalinograph survey of the area during passage. Four further drifters were recovered between 0300 and 1000 on Wednesday 12 June. Two further CTD casts were performed, on the warm and cold side of the front-like boundary in the area (Stations 231-232). *Scotia* then proceeded south towards Muckle Flugga, and further survey of the surface features of the area were performed.

During Thursday 13 June *Scotia* steamed south through the North Sea to the Fladen area, where two further trawls (Trawls 222-223) were performed in an area of known sandeel abundance. A CTD cast was performed in the area (Station 233) and *Scotia* then proceeded to Aberdeen, where she berthed at approximately 0700 Friday 14 June.

Results

1. Standard hydrography

North Sea: The JONSIS line revealed a thermally stratified offshore northern North Sea, with well-mixed conditions inshore. Greatest salinities (35.12 uncalibrated) occurred within the intermediate boundary area suggesting density-driven Atlantic inflow.

Faroe-Shetland Channel: The Nolso-Flugga section revealed typical conditions, with a warm (9.5°C) saline (35.35) core at the shelf edge. A break in the T-S diagram again indicated a distinction between Sub-Polar Mode water of northerly (MNA) and southerly (NA) origin. The TS diagram also revealed the continued presence of AI/NI and NSI intermediate water masses. The NSI water mass appeared to be concentrated along the northerly side of the Channel, and was absent from the extreme southerly side, where mixing was apparent directly between NSDW and AI/NI water.

The Fair Isle Munken section revealed similar results. Close to the offshore boundary of the slope current, a doming of the isotherms coincided with a depression of surface temperature. This feature was identified as a mesoscale eddy or meander.

Time did not permit a survey of the Faroe Bank Channel, although a limited survey was performed north of the Wyville-Thomson ridge.

2. Mesoscale hydrographic features

After the identification of the eddy-like feature the eight drifters were successfully deployed within and around the feature. The drifters deployed within the cooler central waters moved more slowly than those within the warmer water, which moved towards the northeast fairly rapidly. However, these drifters subsequently turned northwest and crossed the Channel. In all six of the drifters, with their temperature loggers, were successfully retrieved. One drifter has been retrieved by a seismic survey vessel, and one is believed to be caught within the Foinaven oil field, possibly on an exploration rig. Subsequent analysis of these results will hopefully shed new light on the circulation of the Channel, with relevance to the transport of water, plankton, fish larvae and pollutants within the Channel, and to the currents experienced by the rigs themselves.

3. Internal wave mooring

Only a single internal wave monitoring mooring was deployed. However, this was located at the most likely area for the observation of the "Nolter maelstrom" feature. All instrumentation was successfully recovered and data analysis proceeds. The thermistor chain malfunctioned, possibly owing to a faulty main battery.

4. Nordic WOCE ADCP mooring

This mooring was successfully recovered, down loaded and redeployed. Data appears to be valid for the entire period, and processing will now proceed.

5. Salmon post-smolt trawling

Fifteen experimental trawls for salmon post-smolts were accomplished, and 162 post-smolts were caught. These results were extremely encouraging. Post-smolts were caught both with the larger PT153 net, and the standard PT160. Initial evidence suggests these fish aggregate at the surface during the day, and descend at night. They certainly favour the waters of the shelf edge current. Much further analysis remains, including stomach content analysis, genetic studies, investigation for internal tags and examination for hatchery origin fish. A preliminary data report has been prepared.

6. Leptocephali hauls

A total of 40 Methot net hauls were performed, 17 at one location south of the Wyville-Thomson Ridge. One leptocephali was recovered. The exercise demonstrated that, although the gear was more than adequate to catch eel larvae, they were not present within surface waters north of the Wyville-Thomson Ridge in any large numbers. The Faroe-Shetland Channel surveys are hence not the best cruises to perform this work.

Acknowledgement

The efforts of the Officers and crew of the FRV *Scotia* are greatly appreciated. This was a very demanding trip, and it was only with the full and helpful cooperation of everyone on board that it was so successful. Their efforts are greatly appreciated by myself, Dr Shelton and by the visitors we had with us.

W R Turrell
30 July 1996

Seen in draft: J Nichols