

R1/12

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FRV *Scotia*

Cruise 0797S Part I

REPORT

22-31 May 1997

Loading: Aberdeen, 20-21 May 1996**Unloading:** Aberdeen, 31 May (Saturday)**Fishing Gear:** PT153 with live fish cod-end, PT160, 1.6 m Methot net**Personnel**

W R Turrell	PSO
G Slesser	HSO
R Payne	HSO
R D Adams	SO
P A Gillibrand	HSO
R G J Shelton	SPSO
N T Nicol	Visitor
J Brown	CEFAS
L Fernand	CEFAS
J Cooper	University of Wales

Objectives

1. To conduct sea trials of the Scanfish system in Aberdeen Bay.
2. To deploy 11 drifting buoys in the Fair Isle Current, northern North Sea gyre system.
3. To perform intensive hydrographic surveys of the northern North Sea gyre system, using the CEFAS Scanfish system and the vessel mounted ADCP. Surface parameters will be continuously recorded using the thermosalinograph.
4. To perform directed but limited plankton hauls in order to locate *Nephrops* larvae, and provide material for photography.
5. To perform calibration CTD stations.
6. To survey the JONSIS standard section using the CTD and rosette water sampler.
7. To perform test trawls with the PT160 net in order to locate salmon post-smolts if time permits.
8. To recover any drifters which may be leaving the area.
9. To collect the Aberdeen, Fair Isle and Pentland Firth caesium samples.

Out-turn days per project: GBH1 - 10**Narrative**

Scotia sailed from Aberdeen at 1300 (all times are GMT) on Thursday 22 May, owing to initial problems with the hired Scanfish winch system. She proceeded to the Aberdeen caesium station and this sample was collected at 1350. A successful Scanfish trial was then completed in Aberdeen Bay and *Scotia* proceeded to the first drifter release position.

The first drifter was released at 2130 and the first line of drifters (the MERIDIAN line) was completed by 0030 on Wednesday 23 May. *Scotia* then proceeded to the second line of three drifters (Rattray Head line), which were successfully deployed by 0800. The third line of drifters (JONSIS line) was completed by 2030. *Scotia* then proceeded to the final drifter deployment line, east of Shetland. The two drifters along this line were deployed by 0215 on Saturday 24 May, when passage was made to the start of the first Scanfish line, eastwards out from Shetland to the Meridian.

This line (SCAN10) commenced at 0351 on Saturday 24 May and was completed by 0821. The first Methot net haul was performed at 1000 and a second Scanfish line then followed, down 0°W to the JONSIS line (SCAN11). This line was completed at 1542, a second Methot net haul was performed at 1640, and a CTD survey along the JONSIS line started at 1725. A brief interruption to the survey of this line occurred when *Scotia* attempted to locate a drifting buoy which was indicated to be close to the vessel by the Gonio receiver system. The buoy was eventually located, and this proved a valuable check of the Gonio and VHF-DF systems. The JONSIS line was then restarted and was completed by 0500 on Sunday 25 May.

A Scanfish survey of the JONSIS line then started back towards 0°W (SCAN12). After four hours of survey along this line the Scanfish developed electrical problems. It was recovered, and attempts to trace the fault commenced. Two Methot net hauls were immediately performed, as *Scotia* was now in an area of possible Atlantic inflow. After these hauls, the first post-smolt trawl was performed, commencing at 1300 on Sunday 25 May. A second trawl was then performed within the vertically well-mixed water representing the Fair Isle inflow, and this was completed by 2015.

By this time it was evident that there were serious problems with the Scanfish system, and *Scotia* proceeded back to 0°W and commenced a southerly survey using the CTD. Thus the continuation southwards of the MERIDIAN line commenced at 0230 on Monday 26 May. The line was completed by 1630. A re-survey of the line then started northwards using the Methot net. In all 7 hauls were performed back to the centre of the Fladen Ground. This survey was completed by 0550 on Tuesday 27 May.

Scotia then proceeded on a south-westerly course towards Rattray Head along a line through the previous drifter deployment positions. A CTD survey of this line commenced at 0618 on Tuesday 27 May and was completed by 1712 that day. At this stage communications with the Scanfish manufacturer and further extensive tests had isolated the problem to a power supply card and battery back-up system. A replacement board was arranged to be flown to the UK and collected in Fraserburgh on Thursday 29 May. Hence survey plans were then altered to take account of the requirement to pick up the spare part.

As the Rattray Head CTD section had located a strong coastal salinity front, inshore from which was a possible pathway for migrating post-smolts, trawling recommenced. Two trawls were performed along the southern Moray Firth coast, commencing at 1820, and a third was performed eastwards from the northern Moray Firth coast. This task was completed by 0630 on Wednesday 28 May.

Scotia then proceeded to the start of a CTD section running eastwards along 58°40'N (The 5840 Section), back to the central station on the Meridian. This line was completed by 2040 on Wednesday 28 May, and a further Methot net survey commenced at 2100 along the RATTRAY HEAD line. This was completed by 0515 on Thursday 29 May. As some time was then available before the Scanfish spare part arrived at Fraserburgh, a short CTD section was worked north from the Moray Firth coast along 2°W, again attempting to locate the Moray Firth coastal front. This section was completed by 1100, and *Scotia* proceeded to Fraserburgh where the spare part was collected by 1400.

Scotia immediately sailed back to the central location on the Meridian, and a Scanfish survey of a fourth line radiating out from this central point commenced at 2230 on Thursday 29 May (SCAN15). This line was completed by 0815 on Friday 30 May, when *Scotia* sailed to the start of the final Scanfish survey line (SCAN16). This line was successfully completed at xxx when *Scotia* made passage to Aberdeen, where she arrived at xxx on Saturday 31 May for the half landing.

Results

In summary, despite some component problems with the Scanfish system, the trip was extremely successful, helped by ideal weather conditions. By employing the combined observational techniques provided by the Scanfish system, the CTD and rosette water sampler, the vessel mounted ADCP, the thermosalinograph, the drifting buoys and the plankton sampling equipment, a more complete picture of northern North Sea density structure in the early summer, and associated circulation, has been obtained compared than any that has previously been available. The wealth of data collected will require considerable processing, but initial results, based on the cruise objectives, may be summarised as follows:

1. To conduct sea trials of the Scanfish system in Aberdeen Bay: This objective was successfully achieved. The mechanical arrangement for the deployment of Scanfish from *Scotia* worked well, helped by the good weather and efforts of the crew. The problems that later arose within Scanfish were successfully identified and rectified. In all 31 hours of Scanfish data were collected.

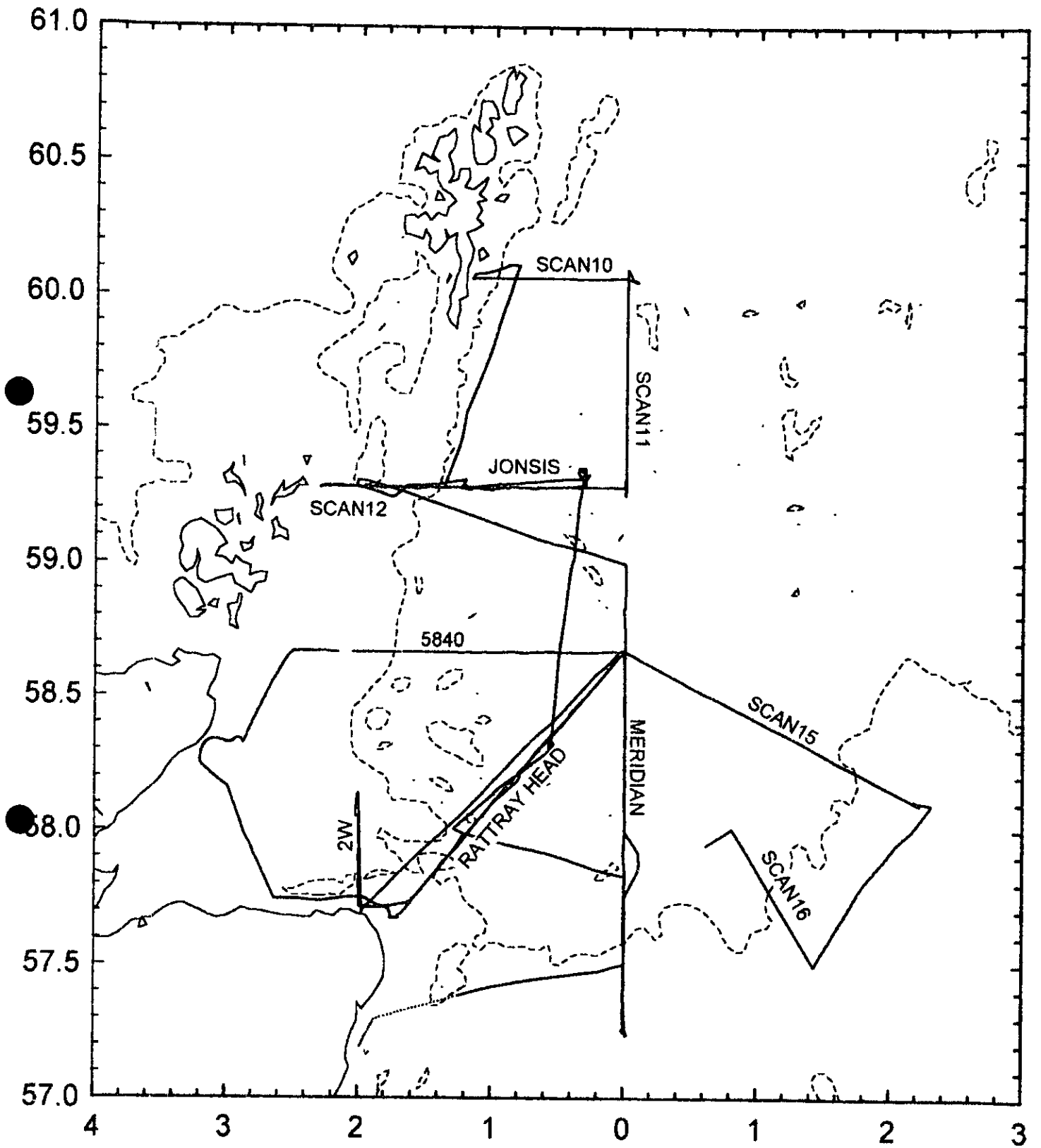
2. To deploy 11 drifting buoys in the Fair Isle Current, northern North Sea gyre system: All 11 buoys were successfully deployed and, except for one which was recovered by a fisherman, gave excellent data throughout the trip. Daily updates of buoy position were faxed to the vessel, revealing a general cyclonic circulation around the deep Fladen Ground. The comparison of these buoy drifts with the ADCP and CTD data will help to reveal the dynamics of the area.
3. To perform intensive hydrographic surveys of the northern North Sea gyre system, using the CEFAS Scanfish system and the vessel mounted ADCP. Surface parameters will be continuously recorded using the thermosalinograph: Despite the problems noted above, an intense grid was obtained using a combination of CTD profiles and Scanfish surveys. The VM-ADCP functioned well throughout the trip and preliminary indications suggest that the measurements revealed a persistent easterly core of flow within the water column above the 100 m contour. Further analysis of the data must be performed to confirm this interpretation. The occupation of the transects using the CTD did not take much longer than when using the Scanfish, although much lower spatial resolution was achieved. For the Fladen area, the preliminary results suggest that the CTD surveys were able to resolve the bottom front around the deeper basin, and will be suitable for geostrophic estimates of the baroclinic component of flow. Temperature and salinity sections revealed a complex structure across the basin. While on the JONSIS line, and to some extent the 5840 line, the density structure was dominated by temperature. East of the Rattray Head line the density appeared to be controlled by the salinity distribution. In all sections the density structure revealed a mid-water pycnocline at approximately 40 m, above water depths greater than 110 m, which became deeper and intercepted the sea bed between the 80 m and 100 m depth contours. At the JONSIS, 5840 and Rattray Head sections the water was predominantly vertically homogeneous. However at the Meridian, section the seasonal thermal stratification persisted beyond the bottom front. It would appear from these preliminary results that the fresh water leaving the Moray Firth along its southern shore significantly modifies the density structure of the North Sea to its immediate east.
4. To perform directed but limited plankton hauls in order to locate *Nephrops* larvae, and to provide material for photography: In all 20 plankton hauls were performed, and initial analysis done on board by Mr N T Nicol has revealed a total of 332 *Nephrops* larvae in the samples, the greatest number in one haul being 108. The distribution of larvae suggested that most originated from within the Fladen area itself, and that none arrived from sources farther west.
5. To perform calibration CTD stations: These were successfully completed.
6. To survey the JONSIS standard section using the CTD and rosette water sampler: The JONSIS standard section was successfully surveyed.
7. To perform test trawls with the PT160 net in order to locate salmon post-smolts if time permits: Five experimental two hour hauls were performed using the PT160. Two hauls were performed east of the Fair Isle Channel at stations which, in terms of temperature and salinity, might have been regarded as potential migration "gateways" for post smolts leaving east coast Scottish rivers. 0- and 1-group sandeels were present in abundance at both stations together with small numbers of lumpsuckers, *Cyclopterus lumpus*, and sticklebacks, *Gasterosteus aculeatus*. No post smolt was obtained however. Similar negative results followed from coastal hauls two nautical miles off Kinnaird and Troup Heads and from an east-west haul from 0.5 nautical miles north of Wick. The Troup Head haul was notable for the inclusion of a single adult angler fish, *Lophius piscatorius*.
8. To recover any drifters which may be leaving the area: Apart from the single drifter which was recovered by a fisherman, and which will be obtained from him during Part II, all drifters performed well and remained within the survey area.
9. To collect the Aberdeen, Fair Isle and Pentland Firth caesium samples: Only the Aberdeen caesium was collected in Part I.

W R Turrell
20 June 1997

Seen in draft: J Nichols, Captain of *Scotia*

Cruise 0797S Part 1

DETAILED CRUISE TRACK AND SECTION NAMES



Cruise 0797S

CTD Station Numbers

