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FRV *Scotia*

Cruise 0801S Part I

REPORT

4-18 May 2001

Loading: Aberdeen

Unloading: Aberdeen

Personnel

W R Turrell	In charge
G Slesser	
S Hughes	
P Chatwin	
J Beaton	
N Collie	
C Shaw	
R Swift	University of Aberdeen
G Hastie	University of Aberdeen
D Likely	University of Highlands and Islands
H Eschment	(Part time) Bran and Luebbe

Gear

CTD, ADCP Moorings

Objectives

1. To perform hydrographic surveys along the JONSIS standard section in the northern North Sea.
2. To perform hydrographic surveys along the standard Faroe Shetland Channel sections.
3. To service/relay two of the Nordic WOCE ADCP moorings.
5. To service a mooring east of Lerwick in support of the MAIA contract (if required following MAIA meeting).
6. To service two tide gauge moorings in support of the MAIA contract.
7. To perform a mesoscale feature survey in support of the MAIA contract.
8. To deploy a single string deep water mooring south of Faroe.
9. If time permits, to survey part of the Rockall Trough standard section.
10. Throughout the trip, to perform *ad hoc* sonar buoy and towed array acoustic recordings for cetaceans.

11. Throughout the trip, to undertake an assessment of the improved nutrient analysis system.
12. Throughout the trip, to perform *ad hoc* sampling for primary productivity measurements.

Out-turn: 5 days AE11n, 10 days C675

Narrative

Scotia sailed from Aberdeen at 0900 on Friday 4 May 2001 (all times GMT). After a cruise planning meeting, a test CTD cast was performed. Initial problems with the CTD crane were corrected, and *Scotia* proceeded to the JONSIS standard section. Survey work along this line commenced at 0040 on 5 May 2001 and was completed by 1200 that day. *Scotia* then proceeded to the location of mooring NWSD (60°27.48'N 004°21.94'W). The mooring was confirmed on position acoustically, and an adjacent 12 hour station was performed prior to mooring recovery. This commenced at 2000 and was completed by 0800 on Sunday 6 May 2001. Instructions to release the mooring were transmitted at 1100 that day, but the mooring did not surface, although confirmation of release was received. After repeated attempts to initiate release, with a duplicate set of transponder and deck unit, the MAIA BPR Deep mooring was interrogated and released. This mooring also failed to move from the sea bed, although confirmation that the release had activated was also received. *Scotia* then started to tow a single creeper through the NWSD mooring position. This operation succeeded in parting the mooring above the acoustic release, and the ADCP was recovered at 1940 that day. As light was reducing, the Fair Isle Munken standard section was started at 2230 and station 6a had been completed by 0900 the following day. The Fair Isle Munken line was not completed at that time as equipment being flown to the Faroe islands for collection had been delayed until Thursday 10 May 2001. Thus *Scotia* returned to the MAIA BPR Shallow mooring position, which was successfully released and recovered by 1340 on Monday 7 May.

Mooring operations then restarted, this time for the BPR Deep mooring. Although this mooring, along with the attached cetacean monitoring pop-up, could be seen on the EA500 sounder as being whole, and standing clear from the sea bed, it could not be made to surface. Operations ceased with darkness, and *Scotia* performed a deep CTD survey that night. Mooring operations recommenced at 0700 on Tuesday 8 May 2001, and three remaining cetacean monitoring pop-up moorings were recovered by 1500, when the search for the BPR Deep mooring resumed, but again proved unsuccessful. It was decided that additional recovery gear was needed in order to retrieve the BPR Deep mooring, especially as the record from the BPR Shallow mooring proved to be extremely encouraging, and hence this was ordered to be sent to Lerwick from Aberdeen. *Scotia* then proceeded to the southern end of the Nolso Flugga section, where survey work commenced at 0300 on Wednesday 9 May 2001 and was completed by 0600 on Thursday 10 May 2001, when *Scotia* proceeded to Torshavn, which she entered at 0900.

During the remainder of that day work was performed at the Fiskirannsoknarstovan servicing the NWSD mooring, and testing the older NWSE ADCP. Unfortunately, owing to a strike of luggage handlers in the Faroes, the expected equipment arriving by air could not be collected, and hence the older NWSE ADCP was prepared for re-use. Mr H Eschment left the vessel in Torshavn as tests on the new nutrient analysis system were complete.

Scotia sailed from Torshavn at 0800 on Friday 10 May 2001, and proceeded to the northern end of the Fair Isle Munken line, performing an in-water test of the NWSE ADCP at a sheltered location during the passage. Survey work commenced along this line at 1600 that day, and was completed at 0400 the following day. *Scotia* then performed a combined XBT and thermosalinograph survey of mesoscale features as observed in satellite images received while in Torshavn from the NERC remote sensing unit. A CTD section through a frontal feature was

performed between 1600 on Saturday 12 May 2001 and 0300 on Sunday 13 May 2001, following which *Scotia* completed the XBT survey, ending to the north of Shetland.

Scotia then proceeded to the location of the MAIA coastal hydrography mooring. The buoy was found to be fouled, and approximately 0.5 miles SW of its deployment position. However, it was successfully retrieved by 0700 on Monday 14 May 2001. On recovery the ground line was found to be unshackled, and it can be assumed it had been interfered with by fishing activity. After a brief search for the instrument line, *Scotia* proceeded to Lerwick where the gear recovery nets were uploaded, and Ms S Hughes left the ship owing to an injured foot. *Scotia* sailed at 1700, and returned to the location of the BPR Deep mooring. During recovery operations with the new gear, part of the mooring was brought to the surface, consisting of the cetacean monitoring pop-up and the imploded subsurface buoyancy. The pop-up was successfully recovered by 1100 on Tuesday 15 May 2001 and the BPR deep acoustic release and tide gauge were found acoustically to be located precisely at the deployment location. During the acoustic search, a second mark was observed, indicating the presence of a short (10 m high) mooring in the area. Further recovery operations continued until 1700.

Analysis of data from earlier in the trip, revealing the coincidence of cetacean locations determined by passive acoustics and surface physical features, allowed the design of a combined acoustic/XBT/thermosalinograph survey which commenced at 1700 and was completed by 1100 on Wednesday 16 May 2001. A final set of recovery attempts were made until 1500, when the replacement NWSD mooring was prepared, and successfully redeployed by 1700. *Scotia* then proceeded to the location of FIM 4, where one shallow and one deep nutrient test sampling station were performed. This was concluded at 0000 on Thursday 17 May 2001, when *Scotia* sailed to Aberdeen, via the collection point for Quasimeme low nutrient sea water. *Scotia* entered Aberdeen at 0600 on Friday 18 May 2001.

Results

The survey was characterised by extremely good weather, with winds never exceeding Force 3-4 during the entire period. Most objectives were met, although moorings once again proved problematic.

1. To perform hydrographic surveys along the JONSIS standard section in the northern North Sea. The JONSIS line was surveyed. The offshore areas of the northern North Sea were stratified, with surface temperature of 7.6°C, and near bed temperatures of 6°C. Surface waters were nutrient depleted.
2. To perform hydrographic surveys along the standard Faroe Shetland Channel sections: both sections were surveyed, with full depth CTD casts. All salinity and nutrient chemistry samples were analysed on board. In terms of water mass, there has been little change since December 2000.
3. To service/relay two of the Nordic WOCE ADCP moorings: NWSD was recovered and relayed at 60°27.48'N 04°21.94'W. Mooring NWSE was not relayed as the older ADCP did not pass its pre-deployment tests. It will be returned to RDI for servicing.
4. To service a mooring east of Lerwick in support of the MAIA contract: The mooring was recovered, but unfortunately the instrument was detached from the remainder of the mooring.
5. To service two tide gauge moorings in support of the MAIA contract: MAIA BPR Shallow was successfully recovered. Initial analysis does indeed reveal correlations between its filtered record and that of along-channel speed at 200 m at NWSD. Unfortunately MAIA BPR Deep was not recovered. It was certainly struck at least once by a heavy trawling

gear during recovery operations, sufficient to part the mooring above the tide gauge allowing the upper part to be recovered, but it was acoustically confirmed that the release and tide gauge did not move. It is very suspect that this occurred, and points perhaps to the anchor and release being embedded in the soft sediment, or somehow firmly tangled together.

On leaving the survey area, the tide gauge and release remained located at 60°27.748'N 04°22.364'W, and an unknown target, resembling a single point mooring with buoyancy located approximately 10 m above the bed, remained located at 60°27.191'N 04°21.887'W.

6. To perform a mesoscale feature survey in support of the MAIA contract: two surveys were completed combining over 90 XBT casts and a CTD section, along with continuous surface measurements of temperature, salinity fluorescence and nutrients. Preliminary analysis reveals a close resemblance to satellite imagery received in Torshavn mid-way through the cruise. These surveys have provided a wealth of data for further analysis. In particular, the combination of the passive acoustic survey for cetaceans (Objective 10) with the detailed hydrochemical survey has provided a useful data set for future analysis, and comparison to previous surveys.
7. To deploy a single string deep water mooring south of Faroe: due to the lack of time, and the lack of available acoustic releases, this mooring was not deployed.
8. If time permits to survey part of the Rockall Trough standard section: no time was available for this objective.
9. Passive acoustic surveys for cetaceans in the Faroe Shetland Channel: passive acoustic surveys for cetaceans were conducted using a combination of static and towed hydrophone arrays. Records of opportunistic sightings were also made. Static monitoring was carried out at standard hydrographic stations along the Fair Isle Munken and Nolso Flugga lines using sonobuoys. Towed array surveys were carried out between standard hydrographic stations along Fair Isle Munken and Nolso Flugga lines, where travel times exceeded one hour, and between transect lines. Towed array surveys were also carried out alongside XBT surveys of a frontal system and associated gyres. Sperm whales and dolphin species were acoustically detected during these surveys. Sightings of the following species were also made; fin whale, sperm whale, minke whale, killer whale, common dolphin and grey seals.

Pop-up moorings: Six 'Popups' (autonomous whale detection units) had been previously deployed in the Foinaven Schiehallion development area for varying lengths of time. These units were deployed as part of long-term project to detect and then track the fine scale movements of large whales (fin and blue whale) in the Faroe Shetlands Channel. One unit was deployed in October 2000 (Cruise 1600S). A further five units were deployed in an array on 15 March using BP Amoco logistic support. During the present cruise four units were recovered, the long-term unit deployed with the tide gauge and three units from the array deployed in March. Two units were lost to trawling, although one has since been recovered. The location of the recovered moorings were:

	Latitude	Longitude
PU No#31 (site D)	60°27.000'N	004°22.750'W
PU No#30 (site A)	60°22.631'N	004°27.500'W
PU No#29 (site C)	60°22.640'N	004°07.375'W
PU No#28 (site B)	60°22.686'N	004°17.400'W

10. Throughout the trip, to undertake an assessment of the improved nutrient analysis system: the new system was extensively tested during the first part of the trip. A separate report is being prepared by FRS and Bran and Luebbe. Preliminary results are extremely promising, and it would appear early problems with this system have been cured. Two detailed statistically designed tests were performed, and await analysis and comparison to the previous system.
11. Throughout the trip, to perform ad-hoc sampling for primary productivity measurements: unfortunately the visitor from PML had to cancel at the last minute owing to an injury.

W R Turrell
29 May 2001

Seen in draft: R Walton, OIC