

R1/12

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FRV *Scotia*

Cruise 1105S

## REPORT

16-30 August 2005

### Ports

**Loading:** Aberdeen

**Unloading:** Aberdeen

**Scientific Crew Change:** Oban and Dunoon

### Personnel

|  |  |
|--|--|
| J Mckie  | 16–30 August *                         |
| P Hayes  | 16–30 August                           |
| D Moore  | 16–30 August                           |
| C Shand  | 16 -30 August                          |
| E Dalgarno <sup>*1</sup>                         | 16-22 August                           |
| P Copland <sup>*1</sup>                          | 16-22 August                           |
| G Saunders <sup>*1</sup> (SNH)                   | 16-22 August                           |
| C Henderson <sup>*1</sup><br>(Seaeye Marine Ltd) | 16-22 August                           |
| S O'Neill <sup>*2</sup>                          | 22-30 August                           |
| G Rodger <sup>*2</sup>                           | 22-30 August                           |
| M McCann <sup>*2</sup>                           | 22-30 August                           |
| Tom Wilding <sup>*2</sup>                        | (SAMS) 22-25 August (Left at Dunoon)   |
| Terrie Sawyer <sup>*2</sup>                      | (SAMS) 22-25 August (Left at Dunoon)   |
| Jim Treasurer <sup>*2</sup>                      | (Ardtoe) 22-25 August (Left at Dunoon) |

<sup>\*1</sup> Left by small boat transfer at Oban

<sup>\*2</sup> Joined by small boat transfer at Oban

### Fishing Gear

BT 101 (with tickler chains)

### Sampling Gear

TV sledge, TV drop frame, multi-corer, craib corer, grabs, sieve tables, agassiz trawl and shipboard swathe bathymetry. ROV supplied by SNH.

Liquid nitrogen and formalin carried.

### Project Codes

12 days AE02n and 3 days AE11p

## Objectives

1. To undertake the Garroch Head post cessation survey in collaboration with Scottish Water. Survey will include: fishing, grabbing, water sampling, coring and underwater TV (UTV).
2. To undertake swathe bathymetric and ROV television surveys within the Minches, east of Mingulay.
3. To undertake a grabbing survey to investigate potential new NMMP sites in the vicinity of Shetland to give a greater coverage to enable assessments of the quality of the Scottish marine environment to be made.
4. To undertake standard check monitoring duties, seabed sampling and underwater television, at dredged material disposal sites in the Clyde, Shetland and Small Isles.
5. To undertake bathymetric surveys of selected dredged spoil disposal sites and the Lismore artificial reef, up to a maximum of eight sites on the route from Aberdeen to Garroch Head calling at: Aberdeen, Shetland, Garroch Head, Firth of Lorne and Cloch Point. To map the seabed and to ascertain the usefulness of this technique as a check monitoring tool for the future.
6. To identify potential new sea disposal sites off Shetland. Survey will include grabbing, small beam trawl (agassiz) and underwater TV (dropped from programme).
7. To collect flatfish from the Firth of Clyde for the measurement of DNA Damage; samples to be taken from scheduled trawls and analysis partly undertaken on board.
8. To collect field samples to assist in estimating the biochemical availability of organic contaminants in selected sediments containing apparently high concentrations of PAH, CBs, or PBDE's. Samples to be collected during other operations described above.
9. To collect swathe bathymetry and UTV data from the disused explosives ground in Aberdeen Bay. (Additional Work)
10. To collect seawater for radio-caesium analysis at five locations on route.

## Procedure

Scientific equipment was loaded and set up on 12, 13 and 15 August and scientific staff joined the cruise at 0830 on 16 August in Aberdeen. The vessel departed Aberdeen at 1030 and undertook abandon ship routine and conducted a fire drill before arriving at the Aberdeen dredged material disposal site to undertake a swathe bathymetry survey. On completion of the survey the ROV was extensively wet tested before *Scotia* set sail for Shetland at 1745. *Scotia* arrived at the first NMMP station at 0600 on 17 August and completed three stations before arriving at the Lerwick dredged material disposal site. On completion of the work for Objective 4 *Scotia* sailed to recommence the grab sampling programme for Objective 3 completing the programme at 1530 on 18 August. The ship then sailed for the Mingulay coral reef site (Barra Head) picking up water samples at three locations for caesium analysis on route.

*Scotia* arrived on station at Mingulay at 1215 on 19 August and started the ROV television survey. The ROV television survey was suspended due to the tide at 1500 and the ship deployed the tide gauge and calibrated the swathe system before returning to complete the first tranche of ROV stations at 2130. The ship then sailed to the first swathe bathymetry waypoint to start the survey, completing a little over 50% of the lines by 0800 on 20 August. On completion, the ship repositioned to the southern section of the survey area to recommence the ROV television survey. After another successful deployment the vessel returned to the swathe survey and completed the priority lines at 1900. Such was the success of the earlier deployment on 20 August the vessel sailed back to the same position to redeploy the ROV completing operations at 2230. *Scotia* then sailed to complete the second priority swathe lines continuing until 0715 on 21 August. The ship returned to ROV station numbers 1, 2 and 3 to complete the survey. Work finished at 1115 and *Scotia* sailed to pick up the tide gauge.

At 1230 the ship set sail for Canna to undertake further work outlined in Objective 4 (Small Isles). Due to a difficult seabed and the worsening weather conditions at both the southern and northern sites the UTV survey was limited (three transects). The footage confirmed that there was, apart from the obvious presence of rock on the seabed, little evidence of the previous sea disposal operations. Because of the seabed and worsening weather it was decided to reduce the grab survey from 9 to 5 stations per site before completing the swathe survey at both sites at 0300 on 22 August. The grab survey was predicated on the basis that the water depths over parts of the sites was around 30-40 m, in fact a large parts of both sites were covered by approximately 200 m of water. This delayed the completion of the grab survey and consequently the start of the swathe bathymetry. Such were the delays that it was decided to postpone work on the Eigg site until after completion of the Garroch Head and Cloch Point surveys. The ship sailed for the Lismore Reef at 0300 on 22 August arriving on time to start the swathe survey at 0800. On completion of this work at 1015 *Scotia* prepared to sail for Oban to disembark Graham Saunders and Chris Henderson and embark Gill Rodger, Margaret McCann, Stephen O'Neill, Tom Wilding, Terrie Sawyer and Jim Treasurer. *Scotia* sailed from Oban at 1315 heading for Garroch Head sewage sludge disposal site; arriving at 2230 to start the work programme outlined in Objective 1.

Immediately on arrival, the multi-corer survey commenced, a total of 22 stations were sampled before operations were completed at 1600 on 23 August. After a quick turnaround the ship started water sampling operations immediately, completing the 22 stations by 0100 on 24 August. Due to worsening weather conditions the planned UTV survey was cancelled and the grab survey delayed until the weather improved at 0800 on 24 August. A total of 10 grab stations were completed before the ship sailed at 1530 to land the sediment microbiological samples at Millport. On completion of this task the ship returned to Garroch Head to undertake a UTV transect and two trawls on position number P8 for the work programme outlined in Objective 7. *Scotia* then sailed to undertake a more detailed UTV survey of the disposal site, running transects of approximately 35 minutes duration at positions P6, P7, M7, T7 and G1. On 25 August *Scotia* concluded the work at Garroch Head after completing two tows at each of the positions G1 (control) and P7 (centre); sufficient fish were obtained to undertake pathological and microbiological examinations. The fish samples were landed at Millport, where the pathological and microbiological analysis was to be undertaken, and *Scotia* set sail for Dunoon (Holy Loch) to disembark Tom Wilding, Terrie Sawyer and Jim Treasurer. The ship then sailed for Cloch Point to start the grab survey outlined in Objective 8 - completing the stations at 0100 before collecting cores and completing the swathe bathymetric survey at 0530.

The ship sailed for Islay arriving at the Port Ellen alternative dredged material sea disposal site at 1300; the swathe bathymetric survey outlined in Objective 5 was completed before sailing for the Portnahaven site. All work on Islay was complete by 0225 and the ship sailed for Colonsay, stopping for one and a half hours to allow some sensitive analysis to be undertaken as part of Objective 7. *Scotia* undertook one trawl tow at Colonsay on route to the Eigg sea disposal site, this area is recognised as a control site for biological effects work. A sediment core was collected for Leeds University at 1400 on route to Eigg. *Scotia* arrived at Eigg at 1500 and completed the UTV, grab and swathe surveys before departing for Helmsdale at 2130.

On 28 August *Scotia* made passage to Helmsdale arriving at 1730 and departed after completing a swathe bathymetric survey (14 lines) and having sat in DP for approximately one hour to allow samples to be worked up at 0000.

On arrival at the MacDuff sea disposal site at 0330 the ship started to work swathe lines and finished the programme (20 lines) at 1415 and set sail for Aberdeen Bay.

*Scotia* arrived in Aberdeen Bay at 1830 on 29 August to start the UTV survey. Work was complete at 2230 and the scientists demobbed the containers in preparation for the unloading on 30 August.

On completion of the unloading at 1030 on 30 August the scientific staff disembarked having had a very successful cruise.

The scientist would like to thank the *Scotia* for the level of co-operation and commitment shown during the cruise and for making the time on board pleasurable.

The scientific staff would also like to wish Captain Peter Barratt a long and happy retirement.

## Results

1. The Garroch Head post cessation survey in collaboration with Scottish Water and Dunstaffnage Marine Laboratory was very satisfactorily completed. The survey included:
  - **Fishing:** Five trawls were completed and 13 commercial fish/shellfish species (1193 fish/shellfish in total) were collected for pathological and microbiological examination in the Millport Laboratory. Immediately after the fish were brought on board all fish from both sites (P7 and G1) were externally examined. Any obvious tumours, lymphocystis, lesions, skin hyperplasia, skin ulcers, skeletal deformities or skeletal damage was noted.
  - **Grabbing:** Two Van Veen grab samples were obtained from each of nine selected positions for infaunal analysis and sediment microbiology.
  - **Multicoring:** The multi-corer was used to collect relatively undisturbed sediment cores from 22 positions. Eh and pH measurements were made on the cores on board ship along with a visual description. Sediment samples were retained for total carbon and nitrogen; metal concentrations and organochlorines.
  - **Water sampling:** At 22 positions a Knudsen bottle was used to collect seawater from approximately 3 m above the sediment surface for temperature, salinity and oxygen analysis.

- **Underwater TV:** A total of six UTV transects were run to ascertain the extent of manmade debris and to gain an appreciation of the potential residual qualitative impacts of sewage sludge disposal operations.
2. The ROV television survey (nine successful deployments and one unsuccessful) at Mingulay was completed and pockets of coral were identified through out the survey area. A total of ten hours ROV deployment time was completed with some excellent high quality video images of *Lophelia* and surrounding rocky reef secured, despite some difficult tidal conditions. The priority areas were surveyed using the swathe bathymetry package (a total of around 24 hours work and 34 lines completed); this will provide Scottish Natural Heritage with a great deal of new information on the bathymetry and distribution of substrates and habitats in the area.
  3. Ten potential sites (five on the east and five on the west) were identified around Shetland and it is hoped that these will be selected for inclusion in the redesigned NMMP survey.
  - 4a) Nine grab stations, three underwater TV transects and a swathe bathymetry survey (seven lines) were completed at the Lerwick sea disposal site. Early indications are that previous disposal operations have had a minimal impact on the seabed. The information gathered will also be used to manage future sea disposal operations, possibly helping to develop a “conceptual grid” which will hopefully minimise any potential impacts in the future. The ROV was deployed for experience and some useful footage was recorded.
  - 4b) A total of ten grab stations, three UTV transects and a swathe survey (three lines at each site) were completed at the sea disposal sites off Canna. A review of the UTV footage confirmed that apart from the presence of large fragments of rock and some boulders there appears to be no other impacts on the seabed. However, the bathymetric data shows that the Admiralty chart for the area is incorrect; water depths are much greater. This information will be passed to the Hydrographic Office on our return to Aberdeen.
  - 4c) Nine grab stations, a swathe survey (six lines) and two UTV transects were completed at the Eigg sea disposal site. Preliminary analysis of the grab samples and UTV footage suggests that the dredged material was predominately rock and is confined largely to the northern sector of the site.
  5. Swathe bathymetric surveys were completed at the following:
    - Aberdeen sea disposal site: A total of seven lines.
    - Islay sea disposal sites: Both the Port Ellen alternative and the Portnahaven sites were swathed with a total of fourteen lines at Port Ellen and fourteen lines at Portnahaven.
    - Cloch Point sea disposal site: A total of eight lines were completed.
    - Helmsdale sea disposal site: A total of fourteen lines were completed.
    - MacDuff sea disposal site: A total of twenty lines completed.
    - Lismore reef: A total of eight lines were completed.

Early indications are that this technique will be a very useful tool and will help describe and perhaps quantify the condition of and features present on the seabed at these sites.

6. Up to twenty plaice (*Pleuronectes platessa*) from Garroch Head and Colonsay (control site) were collected for the measurement of DNA Damage using the COMET assay; samples were taken from scheduled trawls, processed, embedded on agar slides and the slides underwent electrophoresis. Useful experience was gained in the practicalities of carrying out the processing of cells, including sampling blood under dark room conditions, the number of fish that could be processed, the pros and cons of TREVAGEN HT slides and the use of a gimbal table in conjunction with running an electrophoresis tank while at sea. Final analysis of the gel slides will be undertaken on land.
7. At Cloch Point sediment was collected from thirty two grab and two core positions for heavy metals, particle size, PAH, CB's and/or PBDE's analysis back in Aberdeen.
8. Three UTV transects were completed at the disused explosives dump ground in Aberdeen Bay there was no evidence of any manmade debris on the seabed.
9. Seawater for radio caesium analysis was collected from four locations during the cruise.

J C McKie  
25 October 2005

Seen in Draft Captain P Barratt