

R1/6

Not to be cited without prior reference to the Marine Laboratory, Aberdeen

FRV *Clupea*

Cruise 0899C

REPORT

17 May - 4 June 1999

Ports

Loading: Fraserburgh

Unloading: Fraserburgh

Working: Lerwick, 20-21 May and 21-25 May inclusive (bad weather); Invergordon, 26-27, 27-28 and 28-29 May; Inverness, 31 May - 1 June; Buckie, 2-3 June

Personnel

D Saward	17 May - 4 June (In charge)	
D Moore	17 May - 4 June	
J McKie	17 May - 4 June	
Ms L Goodwin	17 May - 4 June	
E Dalgarno	17-20 May	
C Shand	17 May - 3 June	
A Fox	27-28 May	University of Aberdeen
G Hastie	27-28 May	University of Aberdeen
B Leyshon	1 June	Scottish Natural Heritage

Fishing Gear

BT116 and 3 metre light beam trawl

Objectives

1. To undertake grab surveys at the Beatrice C platform, the Marcel and Bravo oilfield prospects, three single-well drilling sites and a control area located 20 kilometres to the southeast of the Beatrice C platform, to collect seabed sediment samples for physical and chemical analyses in the Marine Laboratory, Aberdeen (MLA).
2. To undertake trawl surveys at the Beatrice C platform, the Marcel and Bravo oilfield prospects, three single-well drilling sites and the Moray Firth control site, to collect samples of representative species for chemical analyses at MLA.
3. To undertake a grab survey at the Guillam Bank industrial waste disposal site, to collect seabed sediment samples for physical and chemical analyses at MLA. Where appropriate, core samples may be collected for Eh/pH analyses on FRV *Clupea*.

4. To undertake an underwater television survey at the Guillam Bank industrial waste disposal site, to confirm the levels of seabed debris and to identify the predominant benthic epifauna species.
5. To undertake Agassiz and beam trawl surveys at the Guillam Bank industrial waste disposal site, to collect samples of representative species for chemical analysis at MLA.
6. To undertake grab surveys at selected dredged material disposal sites around the Shetland Isles, Fair Isle and the Orkney Isles, to collect seabed sediment samples for physical and chemical analyses at MLA.
7. To undertake underwater television surveys at selected dredged material disposal sites around the Shetland Isles, Fair Isle and the Orkney Isles, to confirm the levels of seabed debris and to identify the predominant benthic epifauna species.
8. To undertake a grab survey at the Stromness fish processing waste disposal site to collect seabed sediment samples for physical and chemical analyses at MLA. Where appropriate, core samples may be collected for Eh/pH analyses on FRV *Clupea*.
9. To undertake an underwater television survey at the Stromness fish processing waste disposal site, to confirm whether there is evidence of accumulation of waste materials on the sea bed and to identify the predominant benthic epifauna species.
10. To undertake grab surveys at selected dredged material disposal sites off the north coast of Scotland, and in the Moray, Cromarty, Inverness and Beaully Firths, to collect seabed sediment samples for physical and chemical analyses at MLA.
11. To undertake additional grab surveys at the Sutors and Inverness (Beaully Basin) dredged material disposal sites, to collect seabed sediment samples for biological analyses. Where appropriate, core samples may be collected for Eh/pH analyses on FRV *Clupea*.
12. To undertake underwater television surveys at selected dredged material disposal sites off the north coast of Scotland, and in the Moray, Cromarty, Inverness and Beaully Firths, to confirm the levels of seabed debris and to identify the predominant epifauna species.
13. To undertake Agassiz trawl surveys at the Sutors and Beaully Basin dredged material disposal sites, to identify the predominant benthic epifauna species. Where appropriate, samples of representative species may be retained for chemical analysis at MLA.

Out-turn Days Per Project

13 days, A02n; 6 days, A08o.

Narrative

Scientific staff joined the vessel at Fraserburgh during the morning of 17 May, and completed loading operations. Scientific equipment was set up immediately, and the vessel departed Fraserburgh at 1230 hours to proceed to the Moray Firth to commence the grab and trawl surveys outlined in Objectives 1 and 2. Survey operations were suspended at 2100 hours on 17 May, and the vessel remained in the survey area until operations were resumed at 0800 hours on 18 May. Survey operations were again suspended at 1630 hours on 18 May, and

the vessel proceeded to an anchorage off Portmahomack. The vessel remained at anchor until 0700 hours on 19 May, and then returned to the survey area to resume the grab and trawl surveys. Following completion of the sampling programmes at the Beatrice C platform, the Marcel and Bravo oilfield prospects and three single-well drilling sites, the vessel departed the Moray Firth to proceed to the Shetland Isles, berthing at Lerwick at 0730 hours on 20 May. Whilst at Lerwick, the BT116 and net drum were demobilised and transferred to FRV *Scotia*, and the Agassiz and three metre light beam trawls were rigged for survey operations. Following completion of the gear transfer, E Dalgarno disembarked FRV *Clupea* to join FRV *Scotia*. FRV *Clupea* remained at Lerwick until 0800 hours on 21 May, and then proceeded to the Lerwick and Symbister dredged material disposal sites to commence the grab surveys outlined in Objective 6. Following completion of the grab surveys at Lerwick and Symbister, the vessel returned to the Lerwick dredged material disposal site to undertake an underwater television survey as outlined in Objective 7. Following completion of the underwater television investigations, survey operations were suspended and the vessel returned to Lerwick to await an improvement in the weather. Gales prevented departure from Lerwick until 1230 hours on 25 May. The vessel then returned to the Moray Firth, anchoring off Embo at 0630 hours on 26 May. The vessel remained at anchor until 1200 hours on 26 May, and then proceeded to the Guillam Bank industrial waste disposal site to commence the grab survey outlined in Objective 3. Survey operations were suspended at 1830 hours on 26 May, and the vessel proceeded to Invergordon to collect visitors from the University of Aberdeen, Lighthouse Field Station, Cromarty. The visitors joined the vessel at 0800 hours on 27 May, and the vessel departed Invergordon to proceed to the Sutors dredged material disposal site to commence the grab and underwater television surveys outlined in Objectives 10, 11 and 12. Survey operations were suspended at 1845 hours on 27 May, and the vessel returned to Invergordon to allow the visitors to disembark. The visitors re-joined the vessel at 0800 hours on 28 May, and the vessel returned to the Sutors to complete the grab and underwater television surveys, and to commence the Agassiz trawl survey outlined in Objective 13 (supplemented by a single beam trawl tow in the deeper waters of the channel). Following completion of survey operations at the Sutors, the vessel returned to Invergordon to allow the visitors to disembark. The vessel remained at Invergordon until 0800 hours on 29 May, and then returned to Guillam Bank to resume the grab survey, and to commence the underwater television survey outlined in Objective 4. Upon arrival at the survey area, the weather and sea state were unsuitable for underwater television investigations, and a trial confirmed that it was unsafe to proceed with the grab survey. The vessel therefore returned to the Cromarty Firth, and anchored off Cromarty to await an improvement in the weather. The vessel remained at anchor until 0600 hours on 30 May, and then returned to Guillam Bank to complete the grab survey, and to commence the underwater television investigations. Survey operations were suspended at 1200 hours on 30 May, and the vessel proceeded to the Inverness (Beaully Basin) dredged material disposal site to commence the grab and underwater television surveys outlined in Objectives 10 and 12. Survey operations were again suspended at 1715 hours on 30 May, and the vessel proceeded to an anchorage immediately adjacent to the survey area. The vessel remained at anchor until 0700 hours on 31 May, and then returned to the survey area to resume the underwater television survey, and to commence the Agassiz trawl survey outlined in Objective 13. Survey operations were suspended at 1530 hours on 31 May, and the vessel proceeded to Inverness to collect a visitor from Scottish Natural Heritage. The visitor joined the vessel at 1000 hours on 1 June, and the vessel departed Inverness on the tide to return to the Beaully Basin to complete the grab, underwater television and Agassiz trawl surveys. Following completion of Objectives 10-13 inclusive, the visitor disembarked by Pilot Boat to return to Inverness. FRV *Clupea* then departed the survey area, to return to Guillam Bank to resume the underwater television survey. Following completion of Objective 4, the vessel proceeded to an anchorage off Cromarty. The vessel remained at anchor until 0715 hours on 2 June, and then returned to Guillam Bank to commence the Agassiz and beam trawl surveys outlined in Objective 5. Following completion of survey

operations at Guillam Bank, the vessel departed the survey area to proceed to Buckie, berthing at 1615 hours on 2 June. Whilst at Buckie, the underwater television equipment was unloaded for return to Aberdeen, and a replacement umbilical was installed on the slip ring winch. The vessel remained at Buckie until C Shand disembarked at 0500 hours on 3 June, and then proceeded to the Moray Firth control site to complete the grab and trawl surveys outlined in Objectives 1 and 2. Following completion of Objectives 1 and 2, the vessel departed the survey area to return to Fraserburgh, berthing at 1500 hours on 3 June. Scientific equipment was demobilised during the afternoon of 3 June, and unloading and loading operations were completed during the morning of 4 June. Scientific staff disembarked at 1045 hours on 4 June, to return to Aberdeen.

Results

1. Grab sampling was undertaken at the Beatrice C platform, the Marcel and Bravo oilfield prospects, three single-well drilling sites and a control site in the Moray Firth. A total of 33 sampling stations were occupied; 110 Day grab deployments undertaken; and 99 seabed sediment samples collected. Ninety-nine surface scoop sub-samples were taken from the grabs, and deep frozen for hydrocarbon and PAH analyses in MLA.
2. Trawl sampling was undertaken at the Beatrice C platform, the Marcel and Bravo oilfield prospects, three single-well drilling sites and a control site in the Moray Firth. A total of eight trawls of approximately 30 minutes duration, and three trawls of approximately one hour duration (at the control site), were completed. A total of 78 plaice (*Pleuronectes platessa*) were collected for hydrocarbon and PAH investigations. The livers of selected plaice from each sampling area were removed, and pooled for hydrocarbon and PAH analyses. The fish were then filleted, and one skinned fillet from each fish pooled for hydrocarbon and PAH analyses, and the second skinned fillet from each fish pooled for taste panel assessment. All of the sub-samples were deep frozen for analysis or assessment in MLA.
3. Grab sampling was undertaken at the Guillam Bank industrial waste disposal site and a control site in the Moray Firth. A total of 39 sampling stations were occupied; 58 Day grab deployments undertaken; and 48 seabed sediment samples collected. Thirty-six core sub-samples and two scoop sub-samples (where insufficient sediment was collected to obtain a core) were taken from selected grabs for particle size analysis; and 38 surface scoop sub-samples were taken from the same grabs for heavy metal analysis. Seventeen separate surface scoop sub-samples were taken from selected grabs for PCB congener analysis; and a further 17 separate surface scoop sub-samples were taken from selected grabs for hydrocarbon and PAH analyses. All of the sub-samples were deep frozen for analysis in MLA. Core sampling was not undertaken at Guillam Bank, as there was no evidence of significant anoxia in any of the sediment samples collected using the Day grab.
4. Towed sledge underwater television investigations were undertaken at the Guillam Bank industrial waste disposal site. A total of six transects, of between approximately 30 and 90 minutes duration, were completed and the videotape records retained for analysis in MLA. A preliminary assessment of the records, undertaken during the survey, indicated that very little man-made debris was present on the sea bed in the areas that were investigated.
5. Agassiz trawl investigations were undertaken at the Guillam Bank industrial waste disposal site. A total of six Agassiz trawl tows, of between approximately 15 and

25 minutes duration, were completed. The benthic epifauna present in the trawls were identified and enumerated on FRV *Clupea*, and plaice (*Pleuronectes platessa*) obtained from two sampling areas were retained to supplement samples obtained using the beam trawl. Two beam trawl tows, each of approximately 30 minutes duration, were undertaken at the Guillam Bank industrial waste disposal site. The organisms present in the trawls were identified and enumerated on FRV *Clupea*, and plaice obtained from two sampling areas were added to the samples obtained using the Agassiz trawl. Very few plaice were caught in one of the sampling areas, and the sample was supplemented by a separate sample of common dab (*Limanda limanda*). A total of 16 plaice and eight common dab were collected for hydrocarbon and PAH investigations. The livers of selected fish from each sampling area were removed, and pooled for hydrocarbon and PAH analyses (plaice and common dab samples were kept separate). The fish were then filleted, and one skinned fillet from each fish pooled for hydrocarbon and PAH analyses, and the second skinned fillet from each fish pooled for taste panel assessment (again, plaice and common dab samples were kept separate). All of the sub-samples were deep frozen for analysis or assessment in MLA. Significant quantities of smelter waste (broken cell liner) were recovered in the two Agassiz trawls and the single beam trawl undertaken in the area used for sea disposal.

6. Grab sampling was undertaken at the Lerwick and Symbister (A and B) dredged material disposal sites. A total of 25 sampling stations were occupied; 52 Day grab deployments undertaken; and 15 seabed sediment samples collected. Ten core sub-samples and five scoop sub-samples (where insufficient sediment was collected to obtain a core) were taken from the grabs for particle size analysis; and 15 surface scoop sub-samples were taken for heavy metal analysis. All of the sub-samples were deep frozen for analysis in MLA. Grab sampling at the Scalloway, Punds Voe, Foula, North Haven (Fair Isle), Stronsay, Kikwall, Stromness A, Stromness B and Scapa dredged material disposal sites had to be cancelled, because of the time lost to bad weather.
7. Towed sledge underwater television investigations were undertaken at the Lerwick dredged material disposal site. Two transects, each of approximately 30 minutes duration, were completed and the videotape record retained for analysis in MLA. A preliminary assessment of the record, undertaken during the survey, indicated that very little man-made debris was present on the sea bed. Underwater television investigations at the North Haven and Stromness B dredged material disposal sites had to be cancelled, because of the time lost to bad weather.
8. Grab and core sampling at the Stromness fish processing waste disposal site (Stromness C) had to be cancelled, because of the time lost to bad weather.
9. Underwater television investigations at the Stromness C fish processing waste disposal site had to be cancelled, because of the time lost to bad weather.
10. Grab sampling for physical and chemical analyses was undertaken at the Sutors and Inverness (Beaully Basin) dredged material disposal sites. A total of 41 sampling stations were occupied; 95 Day grab deployments undertaken; and 35 seabed sediment samples collected. Fifteen core sub-samples and 20 scoop sub-samples (where insufficient sediment was collected to obtain a core) were taken from the grabs for particle size analysis in MLA; and 35 surface scoop sub-samples were taken for heavy metal analysis in MLA. Thirty-five separate surface scoop sub-samples were taken from the grabs for PCB congener analysis in MLA; and a further 16 separate surface scoop sub-samples were taken from the grabs at the Sutors site and split into three separate samples for

physical, chemical and toxicological analyses at the University of Aberdeen. The sub-samples collected for MLA were deep frozen on FRV *Clupea*, and the sub-samples collected for the University of Aberdeen were transported to the Lighthouse Field Station, Cromarty. Grab sampling at the Thurso, Scrabster, Gill's Bay, Wick, Helmsdale, Dornoch, Riff Bank Buoy, Cromarty, Evanton, Ardersier (Whiteness Sands), Nairn, Burghead, Lossiemouth, Buckie and Macduff dredged material disposal sites had to be cancelled, because of the time lost to bad weather.

11. Grab sampling for benthic infauna characterisation was undertaken at the Sutors dredged material disposal site. A total of eight sampling stations were occupied; 15 Day grab deployments undertaken; and seven seabed sediment samples collected. The grab samples were washed through a 0.5 mm mesh sieve, and the benthic infauna samples retained in the sieves were transferred to buckets and fixed in a 10% solution of formalin in sea water. The buckets were then sealed, and transported to the Lighthouse Field Station, Cromarty for examination at the University of Aberdeen. Core sampling was not undertaken because of the nature of the seabed sediments. Grab sampling for benthic infauna characterisation (and supplementary core sampling) was not undertaken at the Inverness (Beaully Basin) dredged material disposal site because of the nature of the seabed sediments.
12. Towed sledge underwater television investigations were undertaken at the Sutors and Inverness (Beaully Basin) dredged material disposal sites. A total of 14 transects, of between approximately 20 minutes and one hour duration, were completed and the videotape records retained for analysis in MLA. A preliminary assessment of the records, undertaken during the survey, indicated that moderate quantities of man-made debris were present on the sea bed in both survey areas (metallic debris at the Sutors, and masonry and tyres at the Beaully Basin). Underwater television investigations at the Whiteness Sands (Ardersier), Burghead, Buckie and Macduff dredged material disposal sites had to be cancelled, because of the time lost to bad weather.
13. Agassiz trawl investigations were undertaken at the Sutors and Inverness (Beaully Basin) dredged material disposal sites. A total of 10 Agassiz trawl tows, of between approximately 10 and 25 minutes duration, were completed. The benthic epifauna present in the trawls were identified and enumerated on FRV *Clupea*, and samples of the brown shrimp (*Crangon crangon*) from both areas were deep frozen for PCB congener analysis in MLA. One beam trawl tow of 25 minutes duration was completed at the Sutors dredged material disposal site, to supplement the Agassiz trawl investigations. The organisms present in the trawl were identified and enumerated on FRV *Clupea*.

Derek Seward
14 June 1999