

R1/6

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

FRV *Clupea*

Cruise 0802C

REPORT

15-30 May 2002

Ports

Loading: Fraserburgh

Unloading: Fraserburgh

Working: Fraserburgh, Aberdeen, Montrose, Leith and Peterhead

Personnel

J Mckie	15-30 May	(In charge)
P Hayes	15-27 May	
D Moore	15-30 May	
D Walker	15-21 May and 24-30 May*	
C Shand	15-30 May	
C Hall	24-27 May*	

*Joined and disembarked at Port of Leith and pilot cutter off Granton.

Fishing Gear: None

Out-turn Days Per Project: 14 AE02n, 2 AE02a

Objectives

1. To undertake a drop frame television survey of the Fraserburgh dredged material disposal site to assess the condition of the seabed, identify the predominant benthic epifauna species, and the distribution of man-made debris.
2. To undertake Agassiz, craib/gravity corer, grab and underwater television (UWT) surveys of the Peterhead or MacDuff and Aberdeen dredged material disposal sites. Samples will be returned to Aberdeen by the 26 May.
3. To undertake grab surveys to collect seabed sediment samples from the Bell Rock and St Abb's Head sewage sludge disposal sites, and from areas adjacent to both sites, for microbiological analysis on FRV *Clupea*, and for physical, chemical and biological analyses in the Marine Laboratory, Aberdeen (MLA). Where appropriate, core samples will be collected to supplement the grab samples, and Eh / pH analyses undertaken on FRV *Clupea*.

4. To undertake Agassiz trawl surveys to collect benthic epifauna samples from the areas outlined above, for biological analysis, and possible chemical analysis, in MLA.
5. To undertake underwater television surveys to investigate the benthic epifauna in the areas outlined above, for identification and enumeration of the predominant species in MLA.
6. To undertake grab surveys at selected dredged material disposal sites in the Firth of Forth to collect seabed sediment samples for physical and chemical analyses at ML.
7. To undertake underwater television surveys at selected dredged material disposal sites in the Firth of Forth, to confirm the levels of man-made debris and to identify the predominant benthic epifauna species.
8. To map the seabed bathymetry and sediment types on the sewage sludge disposal, dredged material and potential shellfish disposal sites, using RoxAnn®.
9. To undertake a transmissometer survey and collect water samples in the Middle Bank and Blae Rock areas, to investigate the levels of turbidity in the water column.
10. To undertake grab and craib corer surveys at potential shellfish waste disposal sites off Eyemouth to collect seabed sediment samples for physical and chemical analyses at ML.
11. To undertake underwater television at potential shellfish waste disposal sites off Eyemouth, to confirm the levels of man-made debris and to identify the predominant benthic epifauna species.

Narrative

Scientific equipment was loaded and set up on the 14 May and scientific staff joined the vessel 1020 hours on 15 May and completed the setting up of the scientific equipment. *Clupea* departed from Fraserburgh at 1430 hours and proceeded to the Fraserburgh dredged material sea disposal site to undertake the drop frame television and RoxAnn surveys described in Objectives 1 and 8. The surveys commenced at 1515 hours and were terminated at 1835 hours when the *Clupea* departed for Fraserburgh where the vessel remained overnight until 0715 hours the next day. On the 16 May the vessel departed Fraserburgh and proceeded to Peterhead to undertake the surveys outlined in Objectives 2, 4 and 8. Due to seabed conditions and local fishing patterns only drop frame television, grabbing and RoxAnn surveys were undertaken. On completion of the surveys the vessel departed to an anchorage off Cruden Bay arriving at 1715 hours. On leaving the anchorage the vessel set sail for the Aberdeen dredged material disposal site, arriving at 0900 hours. The surveys outlined in Objectives 2, 4 and 8 commenced at 0915 hours. Due to seabed conditions neither craib nor gravity cores were collected. Few buccinum were caught in the Agassiz. On completion of the grab survey, the RoxAnn and UWT surveys were partially completed, *Clupea* set sail at 1735 hours for Aberdeen to exchange scientific equipment, the vessel arrived at 1800 hours and remained in port overnight.

Clupea left Aberdeen at 0715 hours and proceeded to the Bell Rock sewage sludge dumpsite to start work on Objectives 3, 4, 5 and 8. Survey operations commenced at 1300 hours and were completed at 1800 hours when the ship sailed for an anchorage off May Island. On leaving the anchorage at 0700 hours on 19 May the vessel returned to Bell Rock to complete the UWT survey and undertake grab sampling as outlined in Objective 3 and to continue the RoxAnn survey of the disposal site. UWT operations recommenced at

0850 hrs and were terminated on completion at 1140 hours, the grab survey outlined in Objective 3 started at 1150 hours and 29 stations were sampled by 1710 hours. Before making passage to the anchorage in St Andrews Bay a RoxAnn survey of the Bell Rock site was undertaken and a grab sample collected at the control station. *Clupea* arrived in St Andrews Bay at 2045 hours.

On the 20 May *Clupea* left the anchorage at 0700 hours and returned to the Bell Rock site to undertake the sampling outlined in Objectives 3, 4 and 8. The grab survey commenced at 0850 hours and was completed at 1155 hours, the Agassiz trawl survey started at 1225 hours and was completed at 1545 hours. The RoxAnn survey was undertaken between 1600 and 1700 hours and the ship then made passage to the Control site and completed the grab and Agassiz sampling. Having completed all the survey work at Bell Rock the *Clupea* set sail at 1745 hours for Montrose to allow Douglas Walker to disembark. The ship arrived in port at 1930 hours.

At 0700 hours on 21 May the vessel departed Montrose and sailed for St Abbs Head dump site arriving at 1100 hours to start the UWT and RoxAnn surveys outlined in Objectives 3 and 8. On completion of the UWT survey on the dumpsite the vessel steamed slowly across the dumpsite collecting RoxAnn data on its way to the anchorage at Fidra arriving at 2045 hours.

Clupea set sail from the anchorage in Fidra at 0645 hours and proceeded to the St Abbs Head control station to complete the UWT survey and start the grabbing survey outlined in Objective 3. The vessel arrived on station at 0935 hours and started the grabbing survey outlined in Objectives 3 and 8, the weather was too rough to undertake UWT. On completion of the grab survey at 1515 hours the vessel returned to the Fidra anchorage to allow scientists to process the microbiological samples in relative comfort.

On the 23 May the *Clupea* left the Fidra anchorage at 0645 hours and sailed back to St Abbs Head to complete/undertake the sampling outlined in Objectives 3, 4, 5 and 8. Due to poor weather conditions the final UWT transect could not be completed at the control site. All the other sampling was completed and the vessel departed the site at 1630 hours and headed for the small vessel anchorage off Granton in the Firth of Forth arriving at 2000 hours.

Derek Moore left the ship at 0800 hours by Pilot Cutter and *Clupea* departed the anchorage at 0815 hours and proceeded to Oxcars dredged material disposal site to undertake Agassiz and grab surveys of the site. The survey started at 0830 hours and was terminated at 1105 hours when the vessel proceeded to the Blae Rock dredged material disposal site to undertake RoxAnn, UWT and grabbing surveys. The surveys started at 1120 hours and completed at 1720 hours when the vessel set sail for Leith Docks. *Clupea* docked at 1930 hours and equipment and scientific personnel changes were made.

Clupea left Leith Docks at 0955 hours on 25 May and made passage to Narrow Deeps to start equipment trials and prepared to undertake the surveying outlined in Objective 9. On completion of the trials at 1130 hours the vessel moved into the survey area to the north east of Middlebank parallel to Inchkieth to undertake surveys using the towed transmissometer for horizontal profiling and the rosette water sampler for vertical profiles. On completion of the first phase of the survey the *Clupea* moved off station to undertake a RoxAnn survey of the Narrow Deeps dredged material disposal site returning to complete the gear trials in the survey area off Inchkieth. On completion of the survey *Clupea* proceeded to the Narrow Deeps to undertake a grab survey before departing for the anchorage at 1900 hours. *Clupea* anchored off Granton at 1945 hours.

On 26 May *Clupea* left the anchorage at 0615 hours and proceeded to the anchor position within the survey area to the north east of Middlebank off Inchkieth, the ship was in position at 0645 hours. The survey commenced at 0730 hours, however, due to technical problems with scientific equipment data was not collected between 0900 and 0930 hours. Following repairs to the rosette sampler the programme was successfully completed without any further problems at 2030 hours. *Clupea* arrived at the Granton anchorage at 2050 hours where she remained overnight.

Peter Hayes and Chris Hall left the ship by Pilot Cutter at 0730 hours on 27 May, soon after their departure *Clupea* set sail for the Anstruther dredged material disposal site arriving on station at 0950 hours. On completion of the grabbing stations at 1020 hours the vessel then undertook a RoxAnn survey of the entire Anstruther site completing the survey at 1055 hours when the vessel set sail for the Aberdeen Harbour to off load scientific equipment and prepare for working on the Aberdeen dredged material disposal site on 28 May.

On leaving Aberdeen Harbour at 0700 hours on 28 May *Clupea* proceeded to the disposal site and started working at 0740 hours. On completion of the survey at 1610 hours *Clupea* made passage for the Fraserburgh dredged material disposal site berthing in Peterhead overnight due to unfavourable weather conditions.

At 0700 hours *Clupea* left Peterhead and sailed for Fraserburgh dredged material disposal site arriving at 0815 hours to undertake the surveys outlined in Objectives 1, 2, 4 and 8. On completion of the surveys at 1730 hours the *Clupea* set sail for Fraserburgh docking at 1800 hours when scientific equipment was demobilised. Unloading was completed at 1030 hours on 30 May and scientific staff disembarked at 1045 hours to return to Aberdeen.

Results

1. The drop frame television and RoxAnn surveys of the Fraserburgh dredged material disposal sites were completed and an understanding of the seabed condition and range of benthic epifauna species was gained. The range and distribution of man-made debris was logged and the seabed conditions in the recently reshaped disposal site has been noted, the information should allow FRS to predict the impact that any future sea disposal operations will have on the seabed in the vicinity of the site. A similar survey was undertaken on an adjacent proposed site. A total of 13 RoxAnn transects, 16 grab stations, 11 UWT transects and 1 Agassiz trawl were completed.
2. The drop frame survey of the Peterhead dredged material site was curtailed due to the number of creels deployed on the seabed, three successful deployments were made. A full RoxAnn survey was completed and 13 day grab deployments provided sediment samples. All sediment samples were subdivided for organic components, particle size, heavy metal and TBT analyses back in the laboratory. Despite having to curtail the drop frame survey, enough information has been collected to allow a reasonable assessment of seabed conditions within the dredged spoil disposal site. A similar but more extensive survey of the Aberdeen site (six drop frame and five UWT transects, 33 grab samples and seven Agassiz trawls) will allow a more comprehensive assessment of the condition of the seabed within and out with, particularly to the south east of, the site. It is thought that the predominant tidal streams in the area will carry dumped material in a south easterly direction into deeper water. A number of sediment samples showed traces of dredged material, however, it should be noted that sea disposal operations were ongoing during the early part of the survey work.

3. One towed sledge underwater television (UWT) transect of approximately 20 minutes was undertaken in the vicinity of each of the ten Bell Rock (including control) stations sampled for macrobenthos infauna analysis. A log of observations was made during the course of each transect and a tape of the records were retained for analysis in the laboratory.
4. Grab sampling for physical, chemical and microbiological analyses was undertaken at a total of 30 stations at the Bell Rock site. A RoxAnn survey of the site was also undertaken.
5. All the seabed sediment samples collected at Bell Rock were sub-sampled for microbiological analysis. Sub-samples were removed from the surface of the sediment using a sterile spatula. The sub-samples were processed on FRV *Clupea*, and faecal coliforms and streptococci enumerated. Processed material was stored in a refrigerator, for enumeration of *Clostridium perfringens* spores in the laboratory. Faecal coliforms were detected in none of the 30 sediment samples. A number of non-target micro-organisms were detected on ten of the culture plates; eleven (11) plates were returned to Aberdeen for confirmation. Staff in Aberdeen subsequently confirmed that the colonies were non-target micro-organisms. No faecal streptococci were detected in any of the samples and it was noted that non-target micro-organisms were present on only six of the culture plates. It is not surprising that no positive results were noted as Bell Rock has not been used for sewage sludge dumping since October 1998.
6. Grab sampling for macrobenthos infauna analyses was undertaken at all ten of the sampling stations in the vicinity of the Bell Rock sewage sludge disposal site. Thirty Day grab samples were collected, three samples from each station. The samples were washed through a 0.5 mm mesh sieve. The macrobenthos infauna remaining in the sieves were transferred to sample buckets and fixed in a 10% solution of formalin in sea water. The samples were then stored for analysis in the laboratory.
7. One Agassiz trawl of approximately 10 minutes duration was undertaken in the vicinity of each of the nine Bell Rock stations sampled for macrobenthos infauna analyses and at the adjacent control sampling area. The epifauna present in the trawls were identified and enumerated on FRV *Clupea*. The litter present in the trawls was identified and enumerated. Very few commercially exploited species were caught in the trawls, some but no major items of litter were observed and no sub-samples were obtained for chemical analysis.
8. In the vicinity of each of the nine St Abbs Head (not the control) stations sampled for macrobenthos infauna one towed sledge underwater television transect of approximately 20 minutes was undertaken. A log of observations was made during the course of each transect and a tape of the records were retained for analysis in the laboratory.
9. Grab sampling for physical, chemical and microbiological analyses was undertaken at a total of 30 sampling stations in the vicinity of the St Abbs Head site and in an adjacent control area. A RoxAnn survey of the site was also undertaken.

10. All the seabed sediment samples collected at St Abbs Head were sub-sampled for microbiological analysis. Sub-samples were removed from the surface of the sediment using a sterile spatula. The sub-samples were processed on FRV *Clupea*, and faecal coliforms and streptococci enumerated. Processed material was stored in a refrigerator, for enumeration of *Clostridium perfringens* spores in the laboratory. Faecal coliforms were detected in none of the 30 sediment samples. A number of non-target micro-organisms were detected on ten of the culture plates; twenty one (21) plates were returned to Aberdeen for confirmation. Staff in Aberdeen subsequently confirmed that the colonies were non-target micro-organisms. No faecal streptococci were detected in any of the samples and it was noted that non-target micro-organisms were not present on any of the culture plates. It is not surprising that no positive results were noted as St Abbs Head has not been used for sewage sludge dumping since December 1998.
11. Grab sampling for macrobenthos infauna analyses was undertaken at all ten of the sampling stations in the vicinity of the St Abbs Head sewage sludge disposal site. Thirty Day grab samples were collected, three samples from each station. The samples were washed through a 0.5 mm mesh sieve. The macrobenthos infauna remaining in the sieves were transferred to sample buckets and fixed in a 10% solution of formalin in sea water. The samples were then stored for analysis in the laboratory.
12. One Agassiz trawl of approximately 10 minutes duration was undertaken in the vicinity of each of the nine St Abbs Head stations sampled for macrobenthos infauna analyses and at the adjacent control sampling area. The epifauna present in the trawls were identified and enumerated, very few items were recorded, on FRV *Clupea*. The litter present in the trawls was identified and enumerated. Very few commercially exploited species were caught in the trawls, no major items of litter were observed and no sub-samples were obtained for chemical analysis.
13. Three Agassiz trawls were completed on the Oxcars dredged material dump site, the epifauna present in the trawls were enumerated on FRV *Clupea*. No major items of litter were present and no commercially exploited species were caught. Only two bucinum were caught, this was not enough to justify continuing the search for these animals in and around the dredged material disposal site. Grab sampling (four stations) for physical and chemical analysis was undertaken, the samples were returned to Aberdeen for analysis. A visual inspection of the sediment suggests that the seabed has been impacted by the sea disposal operations.
14. A total of 11 grab samples for physical and chemical analysis were collected and 4 UWT transects were completed on the Blae Rock dredged material disposal site. A detailed RoxAnn survey was undertaken over the entire site. Visual observations suggest that there is evidence that the centre of the site has been impacted by the sea disposal operations dredged material disposal operations.
15. A total of 10 grab samples for physical and chemical analysis were collected from the Narrow Deep dredged material disposal site. A detailed RoxAnn survey was undertaken over the entire site. Visual observations suggest that there is no evidence that the site has been impacted by the sea disposal operations.
16. A total of 5 grab samples for physical and chemical analysis were collected from the Anstruther dredged material disposal site. A detailed RoxAnn survey was undertaken over the entire site. Visual observations suggest that there is no evidence that the site has been impacted by the sea disposal operations.

17. Transmission and Rosette gear trials were undertaken over the Middlebank survey area and the Narrow Deep dredged material disposal site. A 12 hours anchor station was worked collecting background transmission data and water samples were filtered onboard, the filter papers will be dried and weighed in the laboratory and the data used as calibration data for the transmissometer. A total of 39 vertical transmissometer dips were undertaken and 24 water samples collected during the 12 hour survey. Water samples were filtered onboard *Clupea* for measurement of suspended loadings in Aberdeen, the data will be used to help calibrate the transmissometer. The data collected will be used to plan a more detailed survey of the Middlebank gravel extraction area during the first operation, the aim of this survey will be to track the sediment plume generated by the extraction operation.

J McKie
8 January 2002

Seen in draft: A Simpson, OIC *Clupea*