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FRV *Clupea*

Cruise 0705C

REPORT

18-31 May 2005

Personnel

S P R Greenstreet	(SIC)
H M Fraser	
A Gersten	
N Jacob	(18-24 May)
I Gibb	(24-31 May)
F Armstrong	(24-31 May)
K Longo	(24-31 May)

Cruise Objectives

The primary objective of this "monitoring" cruise is to determine the abundance of sandeels on the main sandbank fishing grounds (the Wee Bankie, Marr Bank and Berwick's Bank) within the northwestern North Sea sandeel closure area. The absolute abundance index is derived through combination of a demersal trawl survey index of sandeel abundance in the seabed sediments and an estimate of the abundance of sandeels in the water column determined by acoustic survey. The cruise thus has the following objectives:

1. To carry out a demersal trawl survey to determine an abundance index for sandeels in the seabed sediment. This demersal trawl survey will also produce abundance indices for herring and sprats, the two other main "prey" species as well as the major piscivorous fish predators in the area, whiting, haddock and cod. At each trawl station the length frequency of all fish species caught will be determined. Sub-samples of sandeels, herring, sprats, cod, haddock, and whiting will be weighed to determine length-weight relationships. Otoliths will be taken to determine age composition. Sub-samples of the gadoid predators will be retained and frozen for subsequent dietary analysis.

2. To carry out an acoustic survey to determine an abundance estimate for sandeels in the in the water column. Both 38 and 120 kH frequencies will be used to aid species recognition. This acoustic survey will also produce abundance estimates for herring and sprats. Concentrations of fish will be sampled using the pelagic trawl. Species composition and length frequency distributions of fish caught will be determined. Sub samples will be weighed and their otoliths removed to establish length-weight relationships and age composition.

3. Simultaneously with the demersal trawl survey, hydrographic survey will be undertaken using a Seabird 19 CTD sampler fitted with fluorometer and transmissometer to determine spatial variation in water temperature, salinity fluoroescence and turbidity across the study area. Approximately 44 vertical dip stations will be sampled. These data are required to inform the analysis of the

demersal trawl and acoustic survey data to derive an overall sandeel abundance estimate.

4. Simultaneously with the acoustic survey, survey of seabirds at sea within the study area will be undertaken using standard census methods. Protection of local breeding seabirds was one of the principal motives underpinning the sandeel fishery closure.

5. Whilst carrying out seabird at sea survey, all sightings of marine mammals (number of animals, species if possible, and their location) will also be recorded.

6. Whilst carrying out acoustic survey work, RoxAnn data will be collected to add to the ongoing mapping of the sediment substrate in the study area.

Out-turn days per project: MF07N 14 days.

Narrative

Scientific equipment was loaded on board *Clupea* on 3 June. Simon Greenstreet, Helen Fraser, Nick Jacob and Anna Gersten joined *Clupea* at Fraserburgh at 1130 BST on the morning of 18 May. The vessel sailed at 1230 making for anchorage at Lunan Bay. Over the following five days 19 demersal trawl stations were fished (Fig. 1A) and 44 hydrograph stations were sampled (Fig. 1B). All work was undertaken between 0400 and 1600 BST. *Clupea* anchored up at night at St Abb's Head on 19 May, Pease Bay on 20 May, Scoughall Road Bay on 21 May, and off Carnoustie on 22 May. On the late afternoon of 23 May, having completed the demersal trawl and hydrographic survey work, Clupea sailed into Montrose to change fishing gear and exchange scientific staff.

At each demersal trawl station A Jackson Rockhopper demersal trawl gear (BT 158) with 10 mm codend mesh was deployed (Fig. 1A). The total numbers at length (to the ½ cm below for herring, sprats and sandeels, and to the 1 cm below for all other species) of all species in the catch was determined. Samples of herring, sprats and sandeels were weighed to the nearest 0.1 g to determine length-weight relationships and otoliths were collected to determine age at length keys. Samples of whiting, haddock and cod were weighed to the nearest 0.1 g to determine length-weight relationships. Samples of whiting and haddock were retained and frozen for dietary analysis at the laboratory. Too few cod were caught to make sampling of this species worthwhile. Samples of gurnard were also collected to assess the importance of this species as a potential predator of sandeels.

A grid of hydrographic stations, utilising the demersal trawl stations along with additional stations, was sampled over this same period (Fig. 1B). At each station the CTD was deployed to close to the seabed. Single 500 ml water samples were collected at each station for subsequent chlorophyll analysis to calibrate the fluorometer. The reverser bottle used to collect this sample was set at variable depths to ensure that all parts of the water column were sampled.

On 24 May the demersal trawl was replaced with an International Young Gadoid pelagic trawl fitted with a bobbin ground gear and 6 mm mesh codend. Nick Jacob left the vessel and Eric Armstrong, Iain Gibb and Katie Longo joined the vessel. *Clupea* departed Montrose at 0330 BST on 25 May to commence acoustic survey and seabird survey work. Six transects, starting from the north and working south, were covered as far as possible over the following five days (Fig. 1C). Once again all work was carried out between 0400 and 1600 BST. *Clupea* anchored up at night in St Andrews Bay on 25 May, off the Isle of May on 26 and 27 May, at Fidra on 28 May and in Lunan Bay on 29 May. Poor weather on 28 May made survey work impossible and *Clupea* lay at anchor off the Isle of May over this time. Conditions were still poor on 29 May and seabird survey was only possible whilst

steaming before the wind in an easterly direction. Acoustic data were collected on the return westerly leg, but the quality of these data is dubious due to the disturbed sea conditions affecting the transducer towed body. Because of the loss of survey time, only half of the most southerly transect could be covered.

Acoustic data were integrated over five minute periods. The centre points of all such periods of acoustic survey are shown in Figure 1C. Concentrations of fish in the water column were sampled by pelagic trawl to determine species and length composition (Fig. 1C). The total catch of each species at length was determined. Clupeids and sandeels were measured to the ½ cm below and, as previously, length stratified samples of each species were weighed (to 0.1 g) to establish weight-length relationships. Otoliths were also taken from these length-stratified samples to determine age at length.

Survey of seabirds at sea was undertaken over the track shown in Figure 1C indicated by filled circles. Data were aggregated over the same five-minute periods of acoustic integration to allow direct comparison of predator abundance and prey density. Standard survey techniques were employed, incorporating as far as possible, recent developments to allow greater description of bird behaviour at sea. The numbers, identity and locations of all marine mammals observed at sea were also recorded (Fig. 1D). RoxAnn data were also routinely collected throughout the entire duration of the acoustic survey including all the track shown in Figure 1C as well as additional track between transects and whilst steaming to and from anchorages.

Clupea left Lunan Bay to steam for Fraserburgh at 0730 on 30 May, arriving at 1700. The scientific equipment was unloaded during the morning of 31 May and scientists left the ship by 1200.

S P R Greenstreet
10 June 2005-06-10

Seen in draft: A Simpson, OIC

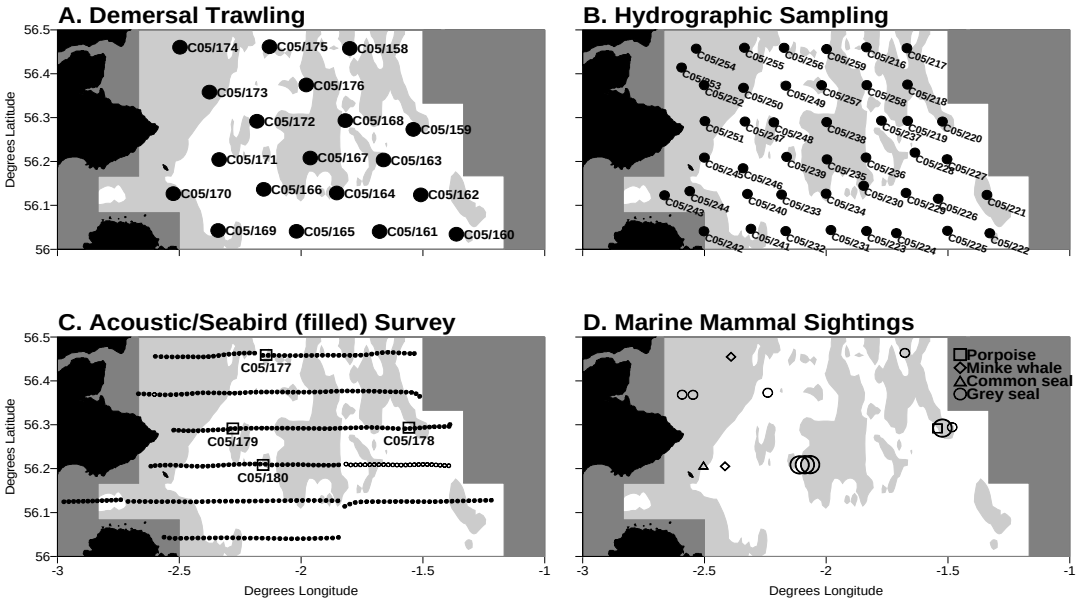

Figure 1 A: Demersal stations; B: Hydrographic stations; C Acoustic and seabird (filled circles) survey five minute survey periods and pelagic trawl sample locations; D: Sightings of marine mammals (small symbols represent single animals, larger symbols represent two animals).