R1/6

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

FRV *Clupea*

Cruise 0806C

REPORT

15 - 28 June 2006

Personnel

SPR Greenstreet	(SIC)
HM Fraser	
IM Gibb	
F Armstrong	(15 - 21 June)
C Greathead	
V Allen	(15 - 21 June)

Cruise Objectives

The primary objective of this "monitoring" cruise was 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 an acoustic survey to determine an abundance estimate for sandeels in the in the water column. Three frequencies, 38, 120, and 200 kH 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.

2. 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.

3. Simultaneously with the demersal trawl survey, a 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, a 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 13 June. Simon Greenstreet, Helen Fraser, Iain Gibb, Eric Armstrong and Victoria Allen joined *Clupea* at Fraserburgh at 1000h BST on the morning of 15 June. The vessel sailed at 1100 h making for anchorage at the Isle of May. Acoustic and seabird at sea survey commenced the next morning, 16 June, and continued over the following three days in good sea conditions. All survey work was conducted between the hours of 0400h and 1500 BST when sandeels were most likely to be active in the water column. At night *Clupea* anchored off Scoughall Bay on 16 June and off St Andrew's on 17, 18, and 19 June.

Acoustic data were integrated over five minute periods. The centre points of all such periods of acoustic survey are shown in Figure 1A. Concentrations of fish in the water column were sampled to determine species and length composition using an International Young Gadoid pelagic trawl fitted with a bobbin ground gear and 6mm mesh codend (Figure 1A). The total catch of each species at length was determined. Clupeids and sandeels were measured to the ½cm below and, as previously, length stratified samples of each species were weighed (to 0.1g) to establish weight-length relationships. Otoliths were also taken from these length-stratified samples to determine age at length. Clear sandeel and clupeid marks were scarce and few sandeels and no clupeids were caught in the pelagic trawls.

A survey of seabirds at sea was undertaken over the entire track shown in Figure 1A. 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 (Figure 1B). RoxAnn data were also routinely collected throughout the entire duration of the acoustic survey including all the track shown in Figure 1A as well as additional track between transects and whilst steaming to and from anchorages

On 20 June a transect of hydrographic stations from south of Fife Ness, across the Wee Bankie to the Marr Bank was sampled and water samples collected for chlorophyll analysis to calibrate the fluorometer (Figure 1C). When this work was complete, *Clupea* sailed to Leith for the half landing. Changing weather conditions, and silting up in the Montrose channel, dictated the need to change the half landing location. The following day, 21 June, the pelagic trawl gear was replaced with a demersal trawl. Eric Armstrong and Victoria Allen left the vessel and Clare Greathead joined. On 22 June *Clupea* sailed to commence demersal trawl sampling and hydrographic survey work. Over the next five days 19 demersal trawl stations were fished (Figure 1D) and 45 hydrograph stations were sampled (Figure 1C). Once again all work was undertaken between 0400h and 1600h BST. *Clupea* anchored up at night off St Abb's Head on 22 and 23 June, off St Andrew's on 24 and 26 June, and off the Isle of May on 25 June.

At each demersal trawl station A Jackson Rockhopper demersal trawl gear (BT 158) with 10mm codend mesh was deployed (Figure 1D). The total numbers at length (to the ½cm below for herring, sprats and sandeels, and to the 1cm below for all other species) of all species in the catch was determined. Samples of herring, sprats and sandeels were weighed to the nearest 0.1g 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 0.1g to determine length-weight relationships. Samples of whiting and haddock were retained and frozen for dietary analysis at the laboratory.

A grid of hydrographic stations, utilising the demersal trawl stations along with additional stations, was sampled over this same period (Figure 1C). At each station the CTD was deployed to close to the seabed. On the last day the same hydrographic stations in the hydro transect sampled prior to the half landing were re-sampled to assess changes in hydrographic conditions over the course of the cruise. Once again water samples were collected at these stations for subsequent chlorophyll analysis.

Having completed all survey work, *Clupea* sailed for Fraserburgh at 0400h on 27 June, arriving at 1500h. The scientific equipment was unloaded during the morning of 28 June and scientists left the ship by 1000.

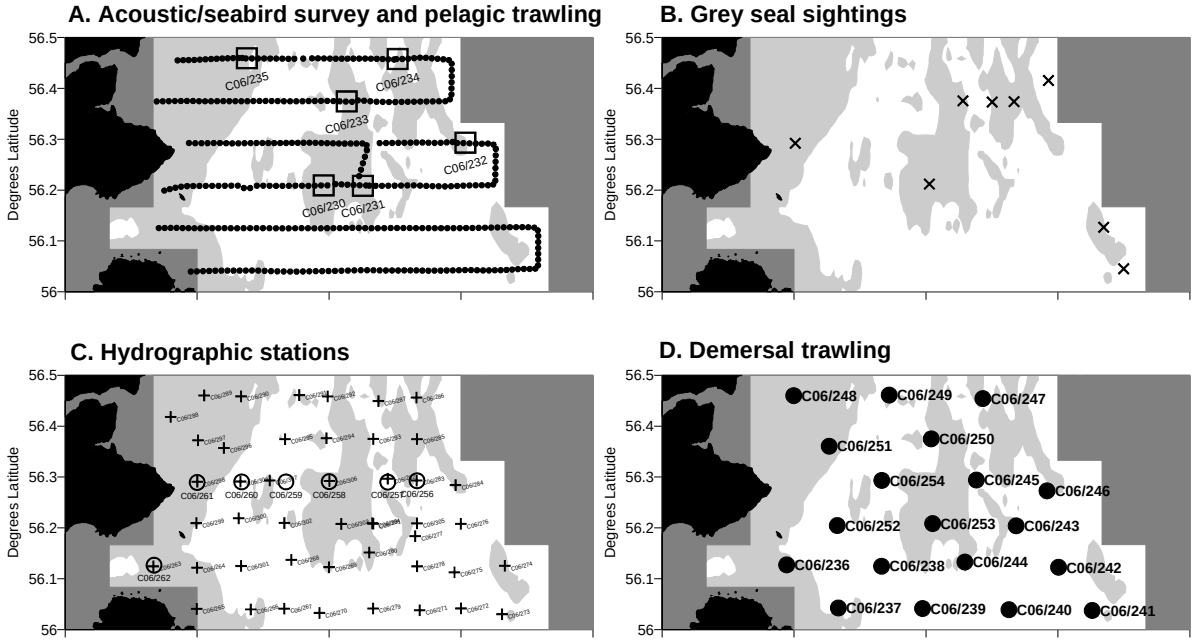

Figure 1: A: Acoustic and seabird (filled circles) survey five minute survey periods and pelagic trawl sample locations; B: Sightings of grey seals; C: Hydrographic sampling stations; D: Demersal trawl stations.

Simon Greenstreet
10 November 2005