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FRV Clupea

Cruise 0807C

REPORT

1 to 14 June 2007

Personnel

SPR Greenstreet	(SIC)
HM Drewery	
E Guirey	
F Armstrong	(1 to 7 June)
C Norris	(1 to 7 June)
C Greathead	(7 to 14 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 had 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 kHz were used to aid species recognition. This acoustic survey also produced herring and sprat abundance estimates. Concentrations of fish were sampled using the pelagic trawl to determine species composition and length frequency distributions. Sub samples of the fish caught were weighed and had 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 also produced abundance indices for herring and sprats, the two other main "prey" species, as well as abundance indices for the major piscivorous fish predators in the area, whiting, haddock and cod. At each trawl station, the length frequency of all fish species caught was determined. Sub-samples of sandeels, herring, sprats, cod, haddock, and whiting were weighed to determine length-weight relationships. Otoliths were removed from sandeels and clupeids to determine age composition. Sub-samples of the gadoid predators were retained and frozen for subsequent dietary and age composition analysis if required.

3. Simultaneously with the demersal trawl survey, hydrographic survey was undertaken using a Seabird 19 CTD sampler fitted with a fluorometer to determine spatial variation in water temperature, salinity and fluorescence across the study area. Nineteen vertical dip stations were sampled. These data were 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 was 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) were recorded.

6. Whilst carrying out acoustic survey work, RoxAnn data were collected to add to 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 29 May. Simon Greenstreet, Helen Fraser, Emma Guirey, Eric Armstrong and Clive Norris joined *Clupea* at Fraserburgh at 1000h BST on the morning of 1 June. The vessel sailed at 1100 making for anchorage off St Andrews. Acoustic and seabird at sea survey commenced the next morning, 2 June, and continued over the following three days in good sea conditions. All survey work was conducted between the hours of 0400 and 1500 BST when sandeels were most likely to be active in the water column. At night, *Clupea* anchored off North Berwick on 2 June, off the Isle of May on 3 and 5 June, and off St Abbs on 4 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 at length relationships. Otoliths were also taken from these length-stratified samples to determine age at length. Clear sandeel “marks” were scarce and mainly located close to water surface. These proved impossible to sample. Clupeid “marks” were more abundant and widespread than in previous years and these were more readily sampled.

Survey of seabirds at sea was undertaken over the track indicated in Figure 1A. Frequent areas of fog prevented complete seabird survey coverage. Data were aggregated over the same five-minute periods as the 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 6 June, the last section of acoustic survey track was steamed and then the northern sections of the Wee Bankie and Marr Bank were searched in an effort to find fishable sandeel “marks”. When this work was complete, *Clupea* sailed to Montrose for the half landing. The following day, 7 June, the pelagic trawl gear was replaced with a demersal trawl. Eric Armstrong and Clive Norris left the vessel and Clare Greathead joined.

On 8 June, *Clupea* sailed to commence demersal trawl sampling and hydrographic survey work. However, at the first station sampled a major leak in the hydraulics system was detected, necessitating a return to Montrose for repairs. These took two days to complete. *Clupea* again sailed from Montrose early in the morning of 10 June to continue demersal trawl and hydrographic survey. Even working into 13 June, insufficient time remained to carry out all the planned work. Approximately half the hydrographic stations were therefore dropped; hydrographic sampling was limited to the locations of the demersal trawl stations only. Over the next four days the remaining 18 demersal trawl stations were fished (Figure 1D) and, in all, 19 hydrographic CTD dips were undertaken (Figure 1C). Water samples were collected at the CTD stations for subsequent chlorophyll analysis. Again all work was undertaken between 0400 and 1600 BST. *Clupea* anchored up at night off St Abb's Head on 10 June, and off the Isle of May on 11 and 12 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 and age composition analysis at the laboratory.

Having completed all the survey work possible, *Clupea* sailed for Fraserburgh at 1200 on 13 June, arriving at 2200. The scientific equipment was unloaded during the morning of 14 June and scientists left the ship by 1100.

Simon Greenstreet

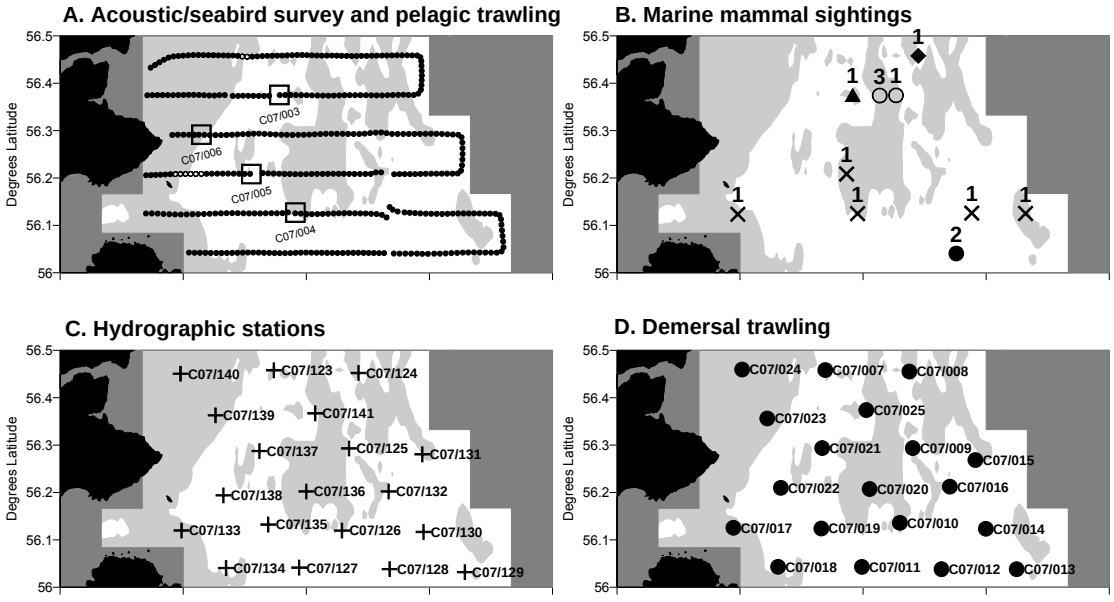

Figure 1. A: Acoustic and seabird (filled circles) survey five minute survey periods and pelagic trawl sample locations; B: Sightings of marine mammals (▲ minke whale; ● bottlenose dolphin; ○ white-beaked dolphin; ♦ porpoise; **X** grey seal; the number of individuals seen at each location is indicated); C: Hydrographic sampling stations; D: Demersal trawl stations.