

R1/6

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

FRV *Alba na Mara*

Cruise 0508A

REPORT

11 to 24 June 2008

Personnel

SPR Greenstreet	(SIC)
HM Drewery	
E Guirey	
F Armstrong	(11 to 17 June)
V Allen	(11 to 17 June)
C Greathead	(17 to 24 June)

Cruise Objectives

The primary objective of this “ecosystem monitoring” cruise was to determine the abundance of sandeels and other potential pelagic fish prey on and around the main sandbanks (the Wee Bankie, Marr Bank and Berwick’s Bank) within the northwestern North Sea sandeel closure area. The study area is close to major seabird colonies situated at the mouth of the Firth of Forth and along the coasts both to the south and to the north. Fishing has in the past had a major impact on the availability of sandeel prey to breeding seabirds utilising this area as feeding grounds, but closing the area to fishing neutralised the impact of fishing on seabird prey resources. More recently the breeding performance of many seabirds in the area has again declined and there is growing concern that environmental changes associated with warming sea temperatures may be affecting the availability of prey to marine top predators in the region. An absolute sandeel 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. Two separate indices of the abundance of sprats and herring are obtained from each of these survey methods. The demersal trawl survey provides an index of the abundance of piscivorous fish predators in the study area, and a census of seabirds and marine mammals in the area was carried out simultaneously with the acoustic survey. To determine the influence of hydrographic conditions on prey availability, particularly to seabird predators, CTD data were collected whilst the demersal trawl survey was carried out.

The cruise therefore 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.
 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.

Out-turn days per project: AE11D 14 days.

Narrative

Scientific equipment was loaded on board *Alba na Mara* on 6 June. S Greenstreet, H Drewery, E Guirey, E Armstrong and V Allen joined *Alba na Mara* at Fraserburgh at 1000h BST on the morning of 11 June. The vessel sailed at 1100h to make passage for anchorage off Carnoustie. However, failure of the steering gear off Montrose necessitated going into port for repairs. Repairs took all day on 12 June and the vessel left Montrose at 2300h to make anchorage at Carnoustie. Acoustic and seabird survey commenced at 0400 of the morning of 13 June. The north-most two transects were covered on 13 June and the vessel anchored in St Andrews Bay (Figure 1). On 14 June most of the middle two transect were covered, leaving just the furthest offshore sections, and the vessel anchored of the Isle of May for the night. On 15 June the vessel sailed out along the transect running east out from the mouth of the Firth of Forth, picked up the remainder of the two middle transects, and then continued along the Firth of Forth transect. *Alba na Mara* spent the night lying on station at the eastern end of the return southern-most transect. This transect was completed during the morning of 16 June and when finished, the vessel made for Montrose to make fishing gear and scientific staff changes (E Armstrong and V Allen left and C Greathead joined the vessel).

All acoustic and seabird at sea survey work was conducted between the hours of 0400h and 1600h BST when sandeels were most likely to be active in the water column. Few fishable “marks” were observed and pelagic fishing was only carried out on the eastern edge of the Marr Bank and off Dunbar (Figure 1). Clear sandeel “marks” were scarce and these proved impossible to sample. Clupeid “marks” were observed, but usually in single scattered shoals, which were also difficult to sample adequately. No herring, sprats, or sandeels were caught. Numbers at length of all other species in the catches were determined. Acoustic data were integrated over five minute periods. The centre points of all such periods of acoustic survey are shown in Figure 1. Survey of seabirds at sea was undertaken over the track indicated in Figure 1. 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 2).

Alba na Mara left Montrose at 0200h on the morning of 18 June to commence demersal trawl sampling and hydrographic survey work. Hydrographic stations at each fishing station, and at intermediate locations, were sampled as the vessel carried out the demersal trawl survey. The vessel made for the most northeasterly fishing station (Figure 3) and continued to work picking up the offshore stations as a priority. The vessel lay offshore over the night of 18 June on the Berwick's Bank. Deteriorating weather on 19 June curtailed survey work in the afternoon and *Alba na Mara* sailed for anchorage off St Andrews. Survey work resumed the following day in the north of the study area working east to maintain the focus on the offshore stations and the vessel again lay overnight on station at the south of the Wee Bankie. Survey work continued through 21 June, but impending poor weather required *Alba na Mara* to make anchorage for the night in Gullane Bay inside the Firth of Forth. This weather system passed through the night and survey work resumed on 22 June, completing the remaining inshore fishing stations. *Alba na Mara* again had to shelter from weather overnight in St Andrew's Bay. On 23 June the last three hydrographic stations were completed whilst the vessel was on route to Leith. A total of 19 demersal trawl stations were fished (Figure 3) and 44 hydrographic stations were sampled (Figure 4).

Again all work was undertaken between 0400h and 1600h BST. 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. No water samples could be collected at the hydrographic stations because of a mismatch between the size of the winch cable and the bottle fixing points.

Alba na Mara arrived at Leith at 1600h on 23 June. Scientific staff left the vessel at 1130 on 24 June. Scientific equipment was unloaded during the morning of 26 June once the vessel had returned to Fraserburgh.

S Greenstreet
26 June 2008

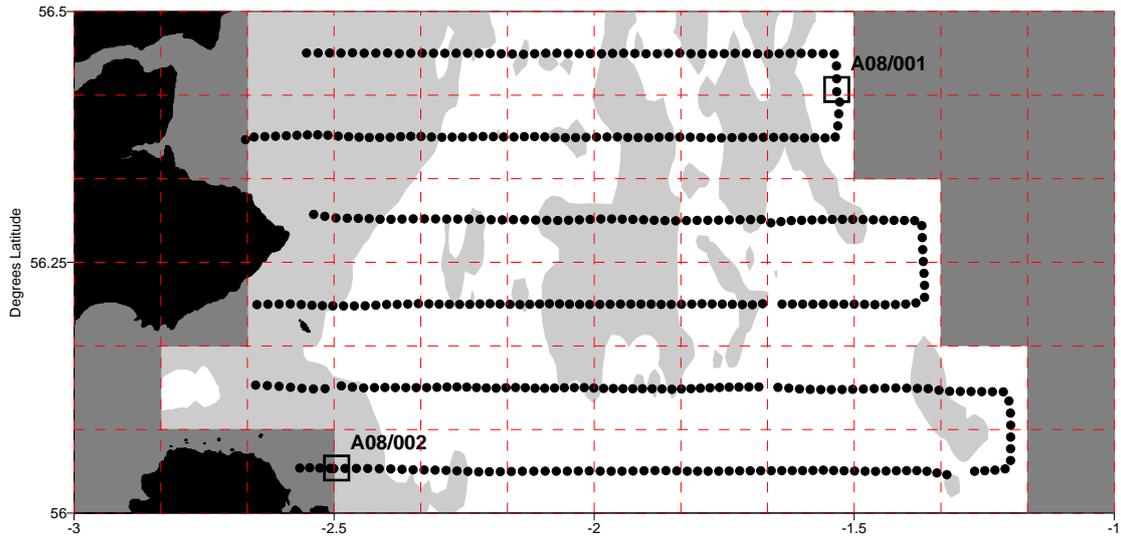


Figure 1. Centre points of acoustic and seabird at sea survey five-minute integration periods (circles) and location of pelagic trawl samples.

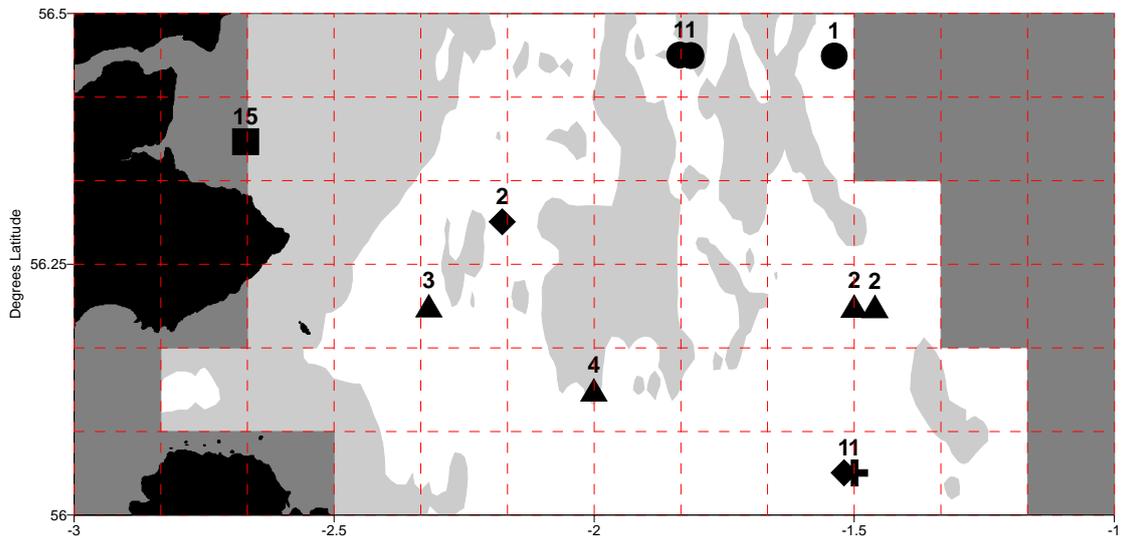


Figure 2. Number and location of marine mammals sighted (circles – grey seals; triangles – white-beaked dolphins; squares – bottlenose dolphins; diamonds – porpoise; cross – minke whale).

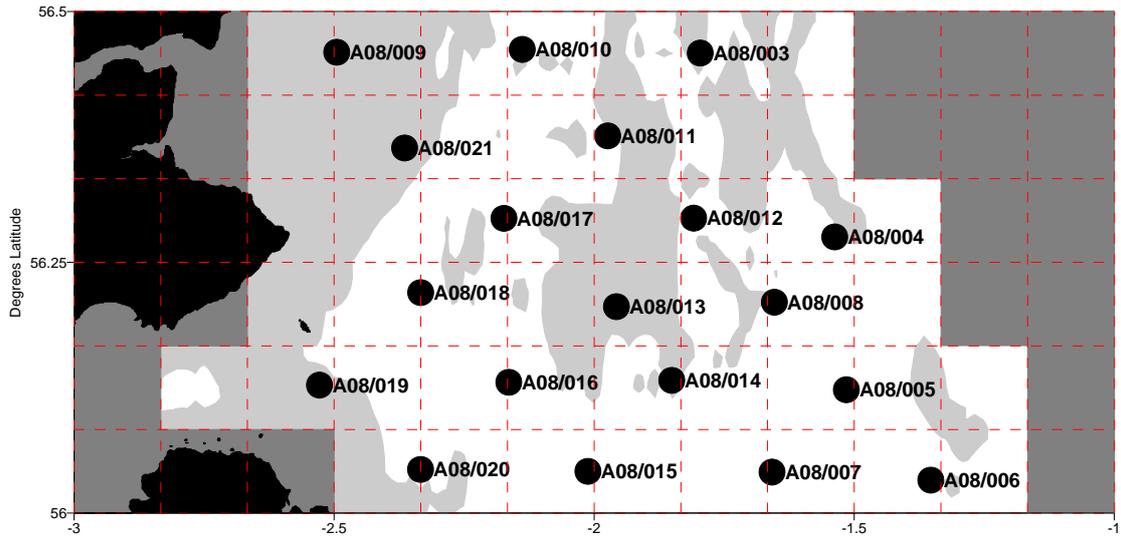


Figure 3. Demersal trawl survey stations fished.

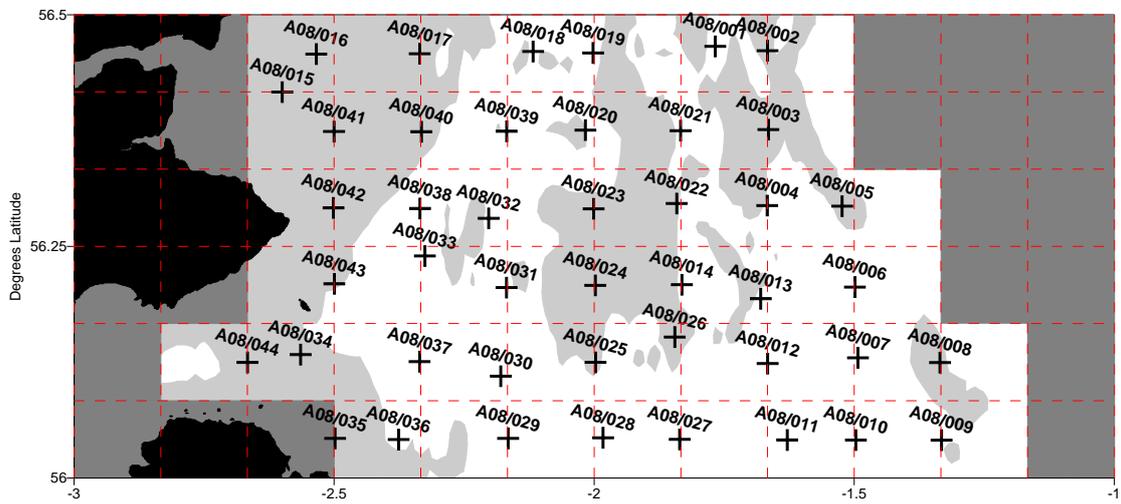


Figure 4 Hydrographic stations sampled by CTD.