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FRV *Scotia*

Cruise 1504S

## REPORT

21 October – 7 November

### Personnel

P Fernandes	(SIC)	
E Armstrong		
P Copland		
R Watret		
S Fassler		
C Davis	(21–29 Oct)	
C Mueller	(21–29 Oct)	Visitor (FRS student)
M Stewart	(29 Oct – 7 Nov)	
J Hunter	(29 Oct – 7 Nov)	
M Burns	(29 Oct – 7 Nov)	
R Skeide	(29 Oct – 7 Nov)	Visitor (IMR, Norway)

### Objectives

1. To conduct an acoustic survey to estimate the abundance and distribution of mackerel in the northern North Sea (ICES division IVa).
2. To obtain samples of mackerel for biological analysis, including age, length, weight, sex and maturity.
3. To determine the species composition and target strength of fish in schools using the autonomous echosounder and video rig.
4. To make video observations of the multi-sampling pelagic trawl with the RCTV.

**Out-turn days per project:** MF01ta – 18 days

### Narrative

Scientific staff joined the vessel at 0900 on 21 October and the vessel departed at 1000. A small meeting was held with all scientists and the ship's fishing mates and navigation officers to explain the objectives of the survey and to describe general operating procedures. The vessel proceeded to Scapa Flow to calibrate the acoustic transducers, however, prior to arrival it was evident that poor weather would prevent a successful exercise and so this was abandoned. The survey commenced on 22 October at 1347 at 61°55.5'N 001°00'W. Transects progressed southward along lines of latitude, at spacings of 15 or 7.5 nautical miles (nmi) as planned. Problems with the hydraulic systems on the vessel prevented any fishing operations from 2130 on 22 October until 1500 on 25 October. At 1520 on 27 October an opportunity was taken to calibrate the echosounders due to a break in the [poor] weather in Wick of Grunting, north of Fetlar, Shetland. The vessel docked into Lerwick harbour on 29 October for 24 hours to enable a change of personnel and to give staff their rest day in line with working time directives. The survey resumed at 1432 on 30 October. The first part of the survey was completed at 0656 on 4 November. The second survey commenced immediately, following a zig-zag design of the area of higher mackerel abundance along the 200 m contour: this was interlaced with a complementary survey carried out by the Norwegian FRV *GO Sars*. FRV *Scotia* completed its survey at 1320 on 5 November, after which the vessel rendezvoused with the *GO Sars* to carry out an intercalibration exercise

starting at 2040. This lasted for approximately 7 hours (73 nmi) covering four transects with each vessel taking the lead alternately. The intercalibration was completed at 0400 on 6 November. The vessel returned to Aberdeen on the morning of 7 November.

## Results

The survey was completed despite encountering long periods of poor weather. The total mileage surveyed was approximately 2435 nmi. A total of approximately 50 GB of acoustic data was archived and copied to DVD; this corresponds to 974 acoustic log intervals of 15 minutes duration. Successful calibrations were carried out of the three principal acoustic frequencies on the EK60 echosounder (38, 120 and 200 kHz). Echo traces from mackerel were distinguished on the basis of the difference in acoustic return between the 38 and 200 kHz frequencies, using the latest version of the FRS mackerel identification algorithm, which was displayed in real time (assisting the direction of ground truth trawl hauls).

As expected, most of the mackerel were detected east of the border between EU and Norwegian waters, around Viking and Allen Banks. Ground truth identification and biological sampling of the mackerel echotraces was successful, with the PT160 able to catch large quantities of mackerel. Of the 16 trawl hauls carried out, mackerel were caught in 12, giving a raised total of 6 394 kg. 2042 mackerel were measured for length and 624 mackerel were sampled for weight, sex, maturity and otoliths. Other fish caught include herring (1513 lengths measured from a raised total of 4 830 kg), blue whiting (155 lengths), saithe (13 lengths), silversides, pearlsides, and a variety of small gadoids. No cod were caught.

The deployment and recovery of the trawls passed, in most cases, without incident and no trawls were damaged. However, significant problems were encountered at the start of the survey with the hydraulic system associated with trawl winches. This and the poor weather encountered later in the cruise prevented sampling of mackerel in the northern part of the survey area. Biological samples from this area may be available from trawl catches taken by the *GO Sars*.

The remotely controlled television (RCTV) rig was deployed once to observe the multisampling cod end on the PT160 pelagic trawl. After approximately half an hour of the first deployment, the RCTV cable failed at the point of previous damage and the system could not be used thereafter. Nonetheless, some excellent footage of mackerel streaming out of the open cod-end was recorded. After some other initial problems with the multisampling cod-end system, two tows were successfully completed on 4 November. In both cases this instrument provided data as it was designed to do: the trawl was aimed at three different scattering layers and came up with different proportions of species which coincided with that expected from a cursory examination of the multifrequency acoustic data.

The poor weather encountered, combined with the relative scarcity of large mackerel schools close to the surface, prevented many deployments of the autonomous echosounder and video rig. On the one occasion when the rig was deployed with the vessel positioned reasonably well over a large mackerel school, it proved difficult to drop the rig close to the fish: only two fish were seen in half an hour of recording. However, acoustic data were successfully recorded, and the target strength measurements from these will be compared to catch data from trawl samples taken close by.

Sea surface temperature and salinity was logged throughout the cruise. Additional hydrographic data were obtained from the deployment of a CTD unit: a total of 27 casts were taken.

Overall, the survey proved satisfactory. Considerable numbers of large mackerel schools were detected, and most of those encountered in the central and southern areas were successfully sampled with the pelagic trawl. Problems associated with trawl winches prevented trawling in the first few days and this has resulted in fewer biological samples than were taken last year. The mackerel were contained within the survey area and there was less evidence of mixed schools (herring and mackerel) than in previous years. The interlaced survey and intercalibration with the *GO Sars* was carried out successfully. A full stock estimate and survey report will now be prepared for submission to the ICES Planning Group for Aerial and Acoustic Surveys for Mackerel (PGAAM) in April 2004. Thanks are due to both the crew of the FRV *Scotia* and the scientific staff for a successful cruise.

P G Fernandes  
12 November 2004

Seen in draft: Captain P Ramsey, OIC *Scotia*