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FRV *Scotia*

Cruise 1906S

REPORT

10-22 December 2006

Personnel

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F.Armstrong (10-13)

Project: AE11r – 13 days

Sampling gear: Hydrographic CTD; Plankton nets, ARIES, Dual Methot net, Digital holographic camera, Maxi corer

Area: North Sea-Faeroe Shetland Channel.

Objectives

1. To conduct routine hydrographic sampling at stations along the standard JONSIS, Fair Isle-Munken and Nolso-Flugga survey lines.

2. To conduct plankton and hydrographic sampling with ARIES in the Faeroe Shetland Channel

3. To conduct trials of a digital holographic plankton camera system on ARIES.

4. To conduct a swathe bathmetry survey in the Stonehaven monitoring site area.

5. To take core samples for benthic primary productivity in the Faeroe-Shetland channel and at the Stonehaven monitoring site.

Narrative

Scotia sailed from Aberdeen at 1200 on Sunday 10 December in poor weather to proceed to the swathe survey area at Stonehaven, but severe weather forced the Scotia to seek shelter in Aberdeen Bay.

In the early hours of Monday 11 December, the weather had moderated sufficiently to allow calibration of the swathe system and an S.V.P. (sound velocity probe) cast to be carried out. The swathe survey on a grid of lines commenced at 03.40 and continued in wind speeds up to 60knts at times.

Scotia worked uninterrupted through the next 24 hours on the swathe survey, and completed it by 0750 on Wednesday 13.

The vessel made for Aberdeen in bad weather, to transfer staff and equipment.

On leaving Aberdeen, Scotia proceeded north to an area of deeper water and successfully carried out test deployments of the plankton crane, winch, and CTD.

Scotia made passage to the eastern most end of the Jonsis line, and commenced sampling at 2310 on Wednesday 13 December. In very poor weather a CTD cast was completed at 0026 on Thursday 14 December.

Shortly after this, the vessel suffered a total electrical black out and loss of power, which was quickly dealt with by the ship's engineering staff.

Scotia continued working along the Jonsis line to station 6 where 60-70knt winds and a heavy swell forced the vessel to dodge. Continuing severe weather forced Scotia to continue dodging for approximately 36 hours - until 0930 on Friday 15 December when station 6 of the Jonsis's line was finally completed.

During this period the vessel suffered a failure of the 13amp normal supply sockets, which was repaired by ship's engineers.

The vessel made for Fim station 1, and completed it by midnight on Friday 15 December.

Work on the Fim stations continued in poor weather conditions and by midnight on Saturday 16 December Fim 8 had been completed.

In improving weather and sea conditions work continued on the Fim line. However, at 1055 on Sunday 17 December while two staff were reloading ARIES the plankton winch operated without warning, causing the sampler to rise into the air. One member of staff was thrown clear, but the other was struck on the legs by the sampler.

While the problem with the plankton winch was being investigated, the CTD winch, which was switched off, operated independently and paid out about 20 to 30 metres of wire on to the side deck. Because of this accident the last CTD station on the line was abandoned and the vessel proceeded immediately to Thorshaven to allow both members of staff to have medical check-ups. Thankfully neither had serious injuries, although one member of staff was advised to rest for twenty four hours.

Following the winch incidents, all the ship's engineering staff worked diligently on to find the cause, and although suspect components were replaced as a precautionary measure, no definitive faults were found in the system.

On leaving Thorshaven ship's engineers conducted trials of the plankton and CTD winches at Nol 11 before any sampling was attempted, to ensure that the systems were working safely.

Following a successful test, Nol 11 was completed and Scotia worked steadily through Nol 8, Nol 7, and Nol 6 (which was completed by 1900 on Monday 19 December).

A deployment of the Maxi corer was attempted at Nol 5 but abandoned after it was discovered that there was not enough wire on Hydro winch 3 to allow the corer to reach the bottom at that station.

The Maxi corer was again deployed in poor weather conditions at Nol5 on the plankton wire, but despite being fitted with a Scanmar system it was almost impossible to tell where the corer was in the water column, due to extreme ship movement and air in the water column.

The deployment was abandoned, without the corer getting close to the seabed, but on recovery the bars at the top of the unit were slightly bent, stopping the centre of the corer lifting.

The Holographic camera was prepared and deployed on an ARIES system at five stations on 19 and 20 December. Some software, and minor hardware glitches were identified and rectified.

As a result a significant number of high quality holograms of plankton were acquired. The full impact of the data will not be available until the holograms are analysed more fully at Aberdeen University.

Ship's engineers removed the bent stainless steel bars from the corer and attempted to straighten them, but failing to do so, they manufactured alternative bars in mild steel.

This temporary repair, allowed trails of the corer to be conducted in an area east of Muckle Flugga where water depth would allow the corer to reach the bottom, with the wire available on the ship.

The corer was deployed with differing numbers of sampling tubes and eventually it did manage to take one core of silty sand, however two of the core tubes lost their retaining rings on that deployment.

Several alternative sites, where the substrate was known to be suitable ,were occupied and a valuable amount of experience was gained on the deployment of the corer, as well as successfully taking cores.

The last core station was completed in the early hours of Thursday 21 December and the holocam was then deployed on ARIES to check set-up and function.

On successful completion of this Scotia set away for Aberdeen , docking at 1545 on Thursday 21 December.

Results

The survey was conducted in marginal weather conditions for a good part of the time, with some very severe wind and sea conditions especially in the early part of the survey.

1. The JONSIS standard section in the northern North Sea was surveyed completely, and the Fair Isle- Munken section was sampled in full with the exception of the last station. The Nolso - Flugga line was surveyed in full with the exception of two CTD stations.

2. Plankton and water samples were collected using CTD, ARIES and a Dual Methot net in the Faeroe Shetland Channel.

3. The Digital Holographic plankton camera was deployed at 5 stations on an ARIES system and produced a significant amount of high quality data.

4. A Swathe bathymetry survey was successfully conducted at the Stonehaven monitoring site.

5. The Maxi corer was not deployed at the Stonehaven site, because of poor weather and unsuitable bottom substrate. Attempts to deploy the Maxi corer in the Faeroe – Shetland channel were unsuccessful due to heavy swell and insufficient wire length. Trials of the corer were conducted in the north sea.

Throughout the cruise surface temperature, salinity and fluorescence recordings were made using a Sea-bird SBE21 Thermosalinograph and a Sea Point Fluorometer.
A total of 48 stations were completed using the Seabird 911 + CTD.
A flow meter, which was installed in the water pipe supplying the fluorometer, performed satisfactorily, and indicated little or no variation in flow during the cruise.
However the fluorometer readings continued to ramp during the cruise, and despite investigation by F.R.S. engineers no explanation could be found. There were several leaks in the pipe work in the water sampling room which were dealt with during the cruise. The water sampling room was thoroughly cleaned, and the thermosalinograph thoroughly flushed out with fresh water at the end of the cruise.

Detailed results of the hydrographic data collected during the cruise will be made available as the data is worked up and interpreted by the laboratory.

The ARIES plankton sampling system functioned efficiently during the survey.

The Dual Methot Net sampling system performed satisfactorily during the survey.

Following a rebuild of the laser earlier this year, the digital holographic plankton camera worked well and produced a significant amount of data, which will be analysed by Aberdeen University in the next year.

The new Bran and Luebbe auto analyser performed efficiently, during the cruise, and easily kept pace with the number of samples being produced. A total of 750 samples were processed for total oxidised nitrogen, silicate and phosphate. Results will be available when data is fully worked up by the laboratory.

OPC Data

Data from the optical plankton counter (OPC) obtained during ARIES deployments were investigated during the cruise. Abundances of equivalent spherical diameters corresponding to the copepodite stages 4 and 5 of *Calanus finmarchicus* were plotted with depth to obtain vertical profiles across the Fair Isle-Munken and Nolso-Flugga transects. While this preliminary analysis has to be verified by analysing collected plankton samples, previous experience indicate that these OPC data provide good estimates of the abundance of over-wintering *Calanus finmarchicus* at depth.

Comparison with results from December 2005 for the Fair Isle-Munken transect indicate a substantially lower concentration of over-wintering copepodites at depth, in particular on the eastern side of the transect (Figure 1). The integrated abundance of *Calanus finmarchicus* copepodite stages 4-5 between 600 and 1000m depth is the lowest recorded since 1992, when the transect was first sampled systematically.

For the Nolso-Flugga transect, the preliminary analysis indicate higher concentrations than in 2005 (Figure 2). As for the Fair Isle-Munken line, higher concentrations were observed on the western deep stations (NOL-07 and NOL-06).

For both transects, the vertical distribution of the *Calanus finmarchicus* copepodites were similar to those observed in 2005.

J Dunn
8 January 2007

Seen in draft – Captain Norman Paddle

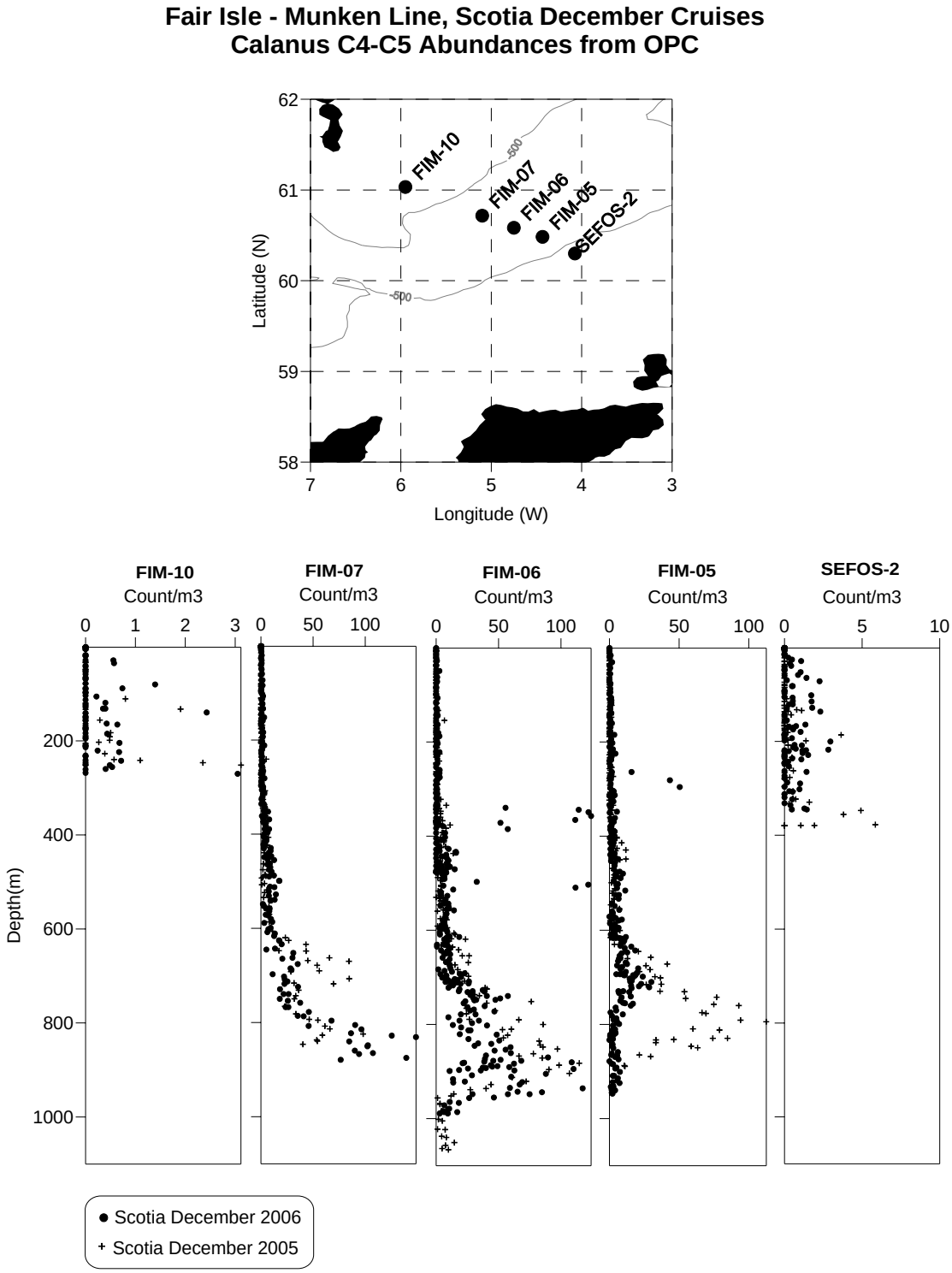

Figure 1: Abundance of ESD size classes equivalent to *Calanus finmarchicus*C4-5 on the five deepest stations of the Fair Isle-Munken line.

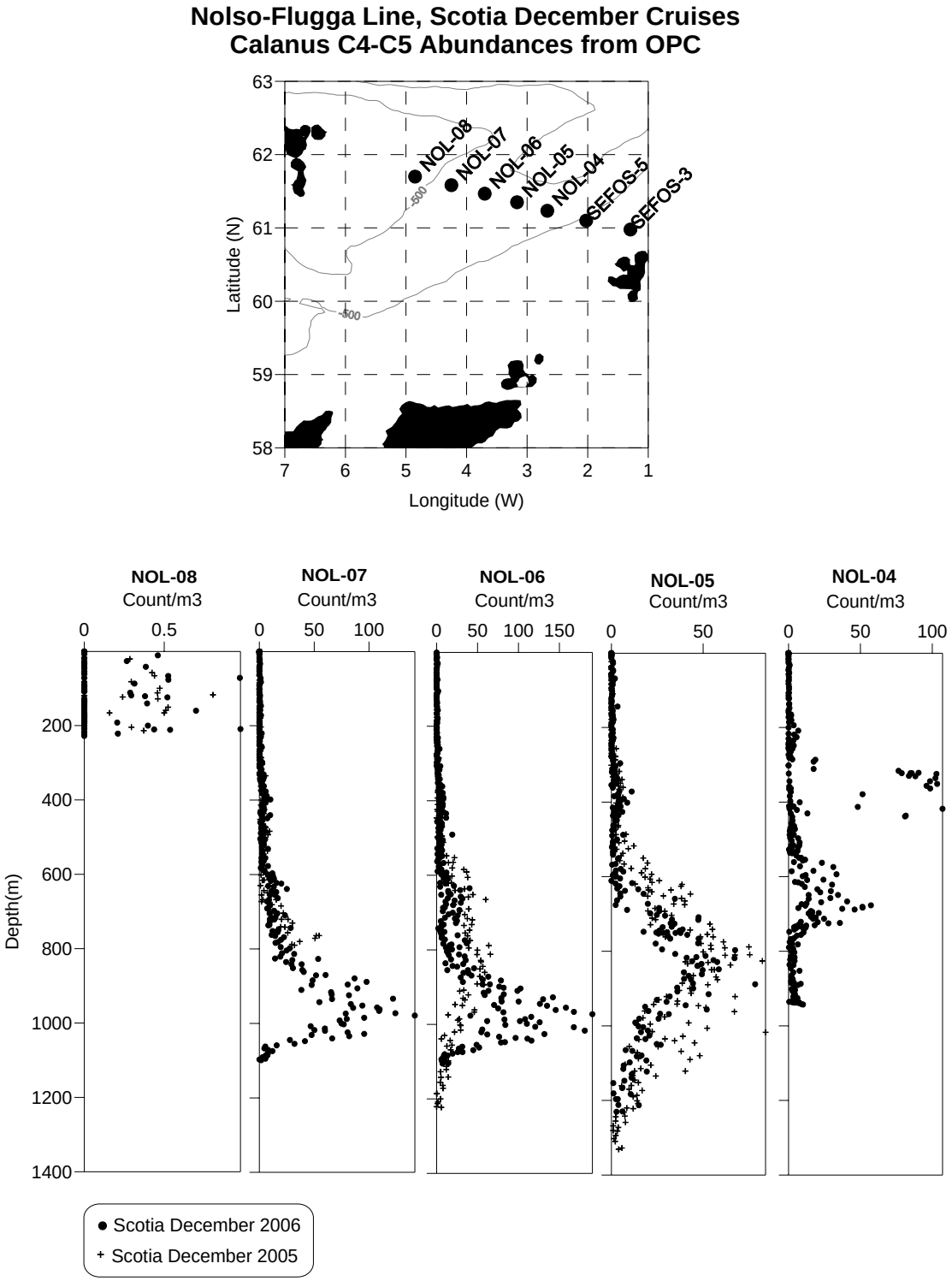

Figure 2: Abundance of ESD size classes equivalent to *Calanus finmarchicus*C4-5 on the five deepest stations of the Nolso-Flugga line.