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FRV *Scotia*

Cruise 0702S

REPORT

26 April - 10 May 2002

Personnel

E G Jones	(In charge)
D G Reid	(3–10 May)
P J Copland	(26–30 April and 3–10 May)
P J Barkel	
M Burns	
R Kynoch	
N S Collie	(29 April – 3 May)
K Peach	
C G Davis	
I Penny	
O Goudie	

Objectives

1. To assess the performance of a newly designed small mesh cod end liner (9 mm) with respect to its effect, if any on the geometry and water flow in the cod end of the trawl.

2. To mount a low light CCD camera on the trawl extension in order to make quantitative counts of fish passing into the cod end which can be correlated with cod-end catches as a comparison with, and back-up, to the small mesh liner.

3. To obtain quantitative information on fish populations in the mouth of the trawl and between the wings using the Reson Seabat mounted on the RCTV along with simultaneous video footage using the SIT and ccd cameras where possible to give information on species identification. These data will be compared with data collected in Nov/Dec.

4. To use the Seabat to make an assessment of possible areas where fish escapes are high in the GOV trawl.

Out-turn days per project: MF0662 - 15 days

Narrative

Equipment was loaded in Aberdeen between 23–25 April. Staff joined the vessel on Friday 26 April and *Scotia* sailed at 1030 hours. The RCTV – Seabat system was tested in the water *en route* to proposed fishing grounds east of Orkney. Problems were encountered with

the performance of the television system and the multibeam sonar failed completely, despite functioning on deck in harbour. Apart from modifications to the underwater harness to allow the use of a local DC supply for the Seabat, the configuration was identical to that operated successfully on a previous *Scotia* cruise, using a generator power supply separate from the ship's mains. Technical staff worked through the system, testing the various components whilst *Scotia* continued to steam for Orkney. Bad weather prevented work commencing in the desired area the following day and the vessel steamed to alternative, more sheltered grounds on the Smith's Bank, Moray Firth (58.1'N, 3.4'W). The RCTV was deployed, this time without the sonar, but the problems persisted, despite changing over the SIT camera and tail, so the umbilical cable was swapped for the spare. Whilst the RCTV was being reconnected, the trawl was shot by the crew for practice and then again with the RCTV, which appeared to be working with the second cable. On Sunday, experimental tows with the net camera in different positions were carried out, but net damage was sustained and the RCTV telemetry system failed on deck completely, so the decision was made to return to Aberdeen. On Monday 29 April the RCTV telemetry pod was repaired and pressure tested, a new 700 m umbilical cable taken onboard along with a back-up Seabat unit hired from Seatronics. *Scotia* sailed at 1900 hours for the Buchan Deeps (57.44'N, 1.26'W) where instrumentation tows for objective 1 were planned for the next two days. The net was shot *en route* to assemble the load cells and the RCTV was deployed with the new cable. Once again, problems were encountered with the multibeam sonar, whichever combination of processor and sonar head was used. The following day, instrumentation trials commenced to measure water flow and drag of the standard GOV at four different towing speeds. That evening Phil Copland was put ashore to Aberdeen by pilot boat with the multibeam systems. Instrumentation trials using the 9 mm blinder were completed on Wednesday 1 May. Following an overnight steam to the Moray Firth, net camera trials continued. A number of positions and angles were assessed for mounting a self-recording net camera. The objective was to use this camera to identify fish that were observed on the sonar that could not be identified by the RCTV SIT camera due to the extended operational range of the RCTV. On Friday 3 May camera trials continued until the trawl came fast on an unmarked wreck. The net sustained extensive damage and after being repaired, a new trawl was put on the ground gear as *Scotia* steamed for Peterhead. Once personnel were exchanged (Neil Collie departed and Dave Reid and Phil Copland joined), *Scotia* steamed for fishing grounds east of Orkney.

During this time, extensive checks on both the RCTV system onboard and the Seabat system back onshore had been carried out. With the aid of the ship's engineering personnel, a number of faults wereisolated which had all contributed to the failure of the Seabat-RCTV system;

- The signal levels of the Seabat when using the 700 m cable length were found to be marginal, leading to intermittent operation. The system requires synchronisation pulse voltage levels of around 0.4-0.45 volts to operate, but under vessel operating conditions the voltage levels were around 0.48 volts.

- The internal coaxial lead between the TV winch and junction box was found to have a fault to the vessels earth and the seal of the junction box on the winch had corroded, resulting in dampness and salt crystals inside the box and slight corrosion evident on terminal blocks.

- The switched mode ac/dc power converter installed on the RCTV (essential in order to avoid the voltage drop on conductors which would occur if DC were to be used to power the Reson system from the surface) introduced slight noise to the system. This may have been enough in a marginal situation to stop operation.

- The system, monitor, processor and power supply, were being powered within the container from adjacent mains sockets. These transpired to be operating on different phases of the ships supply as one was filtered and the other un-filtered.

- A mis-wiring in the RCTV telemetry and power pod resulted in the Reson telemetry signal being grounded when the systems were plugged in together. This was not apparent on the pod wiring diagram and was only found after all the connections were checked by voltmeter.

The faulty coaxial cables and corroded terminal blocks were replaced and the mis-wiring removed. A Reson-supplied cable compensation system, brought onboard on Friday, increased the DC level and matched the impedence to the Reson processor. By the end of the first week a fully operational system was achieved. Full use was made of the second week with between five and seven hauls achieved each day during daylight hours, towards objectives 2, 3 and 4. Standard tows of 30 minutes using the multibeam sonar on the RCTV and low light ccd cameras positioned on the net monitor the fish population entering the trawl were carried out in two areas (59.2'N, 2.3'W and 58.8'N, 2.4'W). A photomultiplier was used to make light intensity profiles of the water column at the start and end of each haul. A further five developmental tows tested the Simrad SM2000 multibeam and experimented with weights and a depressor fin to improve the performance of the RCTV. *Scotia* steamed for Aberdeen at 1800 hours on Thursday 9 May, stopping *en route* to test the effectiveness of an electronic filter device for removing interference on the video and sonar signals when the RCTV was powered using the ship's mains supply. *Scotia* docked in Aberdeen harbour at 1000 hours on Friday 10 May.

Results

A total of 50 hauls and 26 light intensity profiles were completed over the course of this cruise. During the first week difficulties with the RCTV/Seabat system resulted in the loss of approximately two days along with half a day due to bad weather. However, during this week a full set of instrumentation tows was completed as well as a number of useful experimental netcam tows. Baseline data on the internal and external water flow, net speed and warp tensions were collected at different towing speeds for the standard cod-end blinder as well as the small mesh blinder. Initial analysis of these data suggests no significant difference in drag and performance between the two nets.

A low light, self-recording ccd camera and infra-red light were successfully deployed in a frame ahead of the codend to make counts of fish as they passed into the codend. This will give time series information on numbers and species of fish entering the codend and in some instances allow estimation of time taken for fish passing into the net to reach the codend.

To obtain quantitative information on fish populations in the mouth of the net (objective 3), the multibeam sonar was positioned between 2-4 m above the top sheet, just behind the groundgear, orientated directly downwards. This gave an operational range of approximately 10-12 m and allowed the entire net volume to be sampled. At this range, the SIT camera on the vehicle could not be used to identify fish. The previous cruise had attempted to use low light, self-recording CCD cameras mounted on the headline looking back down towards the ground gear. However, this still resulted in an operational range too great to make species identification. On this cruise a number of different net camera positions were tested. The optimum arrangement, giving the best opportunity for species identification and the minimum distance between sonar and camera positions was found to be at the join of the 120 mm and 80 mm netting panels. This was approximately 8 m behind the position of the sonar. The

camera was mounted in a protective "top hat" frame below the selvedge looking across the net. For the 30 quantitative hauls obtained, a consistent protocol was followed. For each tow, the GOV net was shot as far as the doors, the RCTV was deployed and cable paid out until the vehicle was sitting above the net. Both cable and trawl warps were then paid out together. As the net reached the sea-floor the RCTV was manoeuvred into position and maintained at this point for the duration of the tow. After 30 minutes, the RCTV was driven upwards and the net lifted off the bottom as soon as the vehicle was clear. For each of these hauls the following data was collected:

- Acoustic data of fish populations passing over footrope.
- Video footage of fish passing camera ahead of the extension.
- Video footage of fish passing into the cod-end.
- Catch data (worked up as per the IBTS protocols).
- Scanmar information.
- Light intensity at depth at the start and end of each haul.

In total, 6.5 Gb of acoustic data and 30 hours of videotape were collected. This information is in the process of analysis. Insufficient time was available to achieve objective 4 but a single trial tow was used to position the Seabat in an alternative position where it was thought, more escapes might occur, compared with the standard position. A number of instruments were also tested during the cruise; an upgraded SM 2000 multibeam sonar as an alternative to the Seabat, the Simrad P132 (a through water acoustic system to monitor bottom contact of fishing gear) and a Marport Depth sensor. These trials were promising, but highlighted faults with the systems. Relevant feedback has been supplied to the manufacturers.

Emma Jones
25 September 2002

Seen in draft: P Ramsay, OIC *Scotia*