R1/12

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

FRV *Scotia*

Cruise 0505S

REPORT

5-20 April 2005

Ports

Loading: Aberdeen, 31 March onwards
Half Landing and gear/personnel changeover: Aberdeen, 12 April
Unloading: Aberdeen, 20 April

Personnel

Phil Copland	5-20 April
Martin Burns	5-20 April
Kevin Peach	5-12 April
Rob Kynoch	5-12 April
Ian Gibb	5-12 April
Francis Neat	5-12 April
Sonia Mehault MSc	5-12 April
Mike Stewart	13-20 April
Neil Collie	13-20 April
Jim Hunter	13-20 April
Eric Armstrong	13-20 April
John Dunn	13-20 April
Mike Robertson	13-20 April
Helen Fraser	13-20 April
Anneli Englund (St Andrews)	13- 20 April
David Denoon MSc	13- 20 April

Project days – out-turn:

MF0454	8 Days
MF01TA	8 Days

Fishing Gear

BT 185 monkfish trawl with 2,000 kg Mogere doors
Standard sampling cod-end for above
Modified tagging cod-end for above
Midwater trawl PT160 + multisampler
Methot net insert for multisampler

Equipment

RCTV
1/10 metre square van Veen grabs
Passive acoustic array (drop keel fitting prior to sailing)
Multisampler transducers (drop keel fitting prior to sailing)

Narrative

Scotia departed Aberdeen at 1030 hours on 5 April. An outline of pertinent risk assessments was read to staff and discussions on protocols for these tasks and the implementation of WTD took place after the vessels safety drill. Copies of assessments and protocols were posted in work areas and made available on computer in the scientific office.

Scotia made passage to the Southern Trench in the Moray Firth to make trial deployments of the trawl and RCTV. Alterations to the handling arrangements for the trawl were made and the vessel made for Rona overnight. As the RCTV was not available due to equipment failure, the day was spent conducting instrumentation tows. There was some delay when the port warp was found to have stranded and required to be repaired on board. The cod-ends were changed and the capture of live fish for tagging commenced overnight. A severe Northerly gale halted operations for 36 hours and *Scotia* dodged at Rona in the hope of the weather improving. As the forecast then indicated that the weather would make further work at Rona unlikely, *Scotia* moved to Noup Head to continue tagging through the evening. Passage was made to Copinsay overnight to allow RCTV work to continue. A number of instrumentation and tagging trawls took place in this area with RCTV and net cameras being deployed. Work continued until passage was made to Aberdeen at 1700 hours on 11 April. *Scotia* docked at 0700 hours on 12 April.

Scientific staff and equipment were changed and after an overnight stay, *Scotia* sailed at 1400 hours for the Moray Firth to deploy multisampler frame. An outline of pertinent risk assessments was read to staff and discussions on protocols for these tasks and the implementation of WTD took place after the vessels safety drill. Copies of assessments and protocols were posted in work areas and made available on computer in the scientific office.

Early indications showed that receiver gain adjustments would be required for the acoustic down link on the frame. Passage was made overnight to Scapa Flow where *Scotia* anchored and transducer calibrations commenced. Calibrations were made at 18, 38 and 120 kHz but, with the vessel beginning to move a great deal in the freshening wind, calibration of the 200 kHz transducer was abandoned after the linking string under the vessel was lost as the target was being changed over. Passage was made overnight to the Scalloway deeps where training in use of the EM 950 system was carried out. Observations on possible cetacean and other biological traces were made throughout the cruise as opportunities arose. These studies were made using a towed streamer array; drop keel mounted hydrophones and by deployment of radio sonar buoys in more confined areas. Further details of this are given in Annex 3. Trials of the through water acoustic link to the multisampler frame continued overnight to establish reception gain settings.

Two scientists were transferred ashore in Scalloway on the morning of 16 April using *Scotia's* small boat. Trials of the multisampler frame on the PT160 net continued throughout the following two days. The RCTV was deployed alongside the net to collect archive footage. Colour and monochrome cameras were deployed on the net to monitor the performance of various mechanical components as required. An acoustic survey was carried out on an area of

the deeps using all four available frequencies. The EM950 was also used during this period although the lack of the MRU made the data noisy without motion compensation. Fishing was not carried out during this exercise due to severity of topography and lack of fish traces clear of the bottom. With strong SE gales continuing, *Scotia* left the Scalloway at 2130 hours on 18 April to ensure return to Aberdeen in time for the midnight high tide on Tuesday. A calibration of the Roxann system took place in Aberdeen Bay en route. *Scotia* docked at 2130 hours on Tuesday 19 April. All scientific staff left the vessel after gear had been unloaded.

Results

1. Monkfish trawl trials

Procedures for handling trawl were quickly established and 15 tows were undertaken. For observation and gear geometry purposes throughout the cruise. Unfortunately weather conditions forced most of the work to be done away from known monkfish areas and in much shallower water depths. Initial tows at Rona showed that the net did catch monkfish if available. Gear and fish behaviour observations using cameras were limited in all areas due to the high turbidity of the water. Scanmar data was collected for a number of tows for engineering studies. An attempt was made at standardising door spread by using a rope tether between the warps. The difficulty of access on *Scotia* would however appear to make this impossible using the equipment available.

Detailed observations are given in Annex 1.

2. Tagging tows

These were very successful even though limited time at Rona was available. It was not possible to work at Scalloway as had been hoped due to weather constraints. Noup Head and Copinsay provided adequate samples for tagging purposes.

Detailed observations for tagging trawls are given in Annex 2.

3. Instrumentation

A total of 17 deployments were carried out using the multisampler frame on the methot net wire or attached to the PT 160 trawl. The trials proved that the 10 kHz acoustic down link, used to trigger the cod-ends, was very reliable over the maximum 550 m range available in the trials. The 43 kHz uplink system, which relays information about frame depth and angle, as well as the detection of cod-end opening and closing, was also very reliable. Observations using cameras indicated however that there are two minor mechanical problems causing unreliable net release and net detection. It has been established that reshaping of the release mechanism will be required to prevent bars ‘hanging up’ and that stronger magnets or a more sensitive proximity switch are essential to make net status information reliable. Detailed observations on the performance of the system will be made available to the customer on return to the laboratory.
A dual methot liner was installed within a cod-end and caused no problems for shooting and recovery.

Data was collected from the ships Thermosalinograph system throughout the cruise to establish water flow rates. Conversion of this data to engineering units will be carried out in the Laboratory.

4. **Acoustic instrumentation**

Calibration of acoustic transducers indicated that all four were operating correctly although a full calibration of the 200 kHz unit was not possible due to deteriorating weather conditions.

a) Multibeam mapping. Since the required analysis software was not available, staff were only able to familiarise themselves with the mechanics of data collection using the Sound Velocity Profiler and the EM950. It was felt that a single exercise in data collection was adequate rather than the two dedicated sessions planned An FTP link was established between the EM950 machine and the analysis PC. This allowed real time transfer of data files as they were collected on the EM 950. This facility is essential to the HABMAP project.

b) Passive acoustic systems. The systems were used when echosounder systems were not required on the vessel. Comparisons of towed and drop keel mounted systems were made. Sonar buoys were deployed as appropriate. A précis of the draft St Andrews report is given in Annex 3.

P J Copland
15 July 2005

Seen in draft: P Ramsay

Annex 1

Gear Trials – Monkfish Gear

Initial gear performance trials were carried out to assess gear geometry (headline height, door and wing-end spread) and door performance (pitch and roll angles) in water depths of 120m - using Scanmar acoustic instrumentation. During the first haul it became apparent that the gear was slightly under spread due to the relatively low door spread and high headline height values recorded. It was noted during the haul, that data on otterboard pitch suggested that there was a bias towards towing off the front end of the keel. In an effort to obtain an even pitch the length of the upper backstop chains were reduced by one link (approximately 0.1 m). During the second haul, otterboard pitch angle had increased by approximately 4 degrees but there was no appreciable increase in spread. The conclusion was drawn that the weight of these otterboards (2,000 kg) was more suited to deeper waters >200 m where uplift of the warp ends would reduce door contact with the seabed. During the third haul load cell data was collected to assess the tensions at the mouth of the trawl (upper and lower bridle loads. From the results it is clear that rigged with the lower adjuster chains at their full-length (9 m) the gear tows off the footrope (Table 1).

In an effort to obtain visual and sonar information regarding the shape of the gear, observations were carried out for 7 hauls using mini cameras mounted onto the trawl and the Sea-bat multi-beam sonar mounted on the RCTV. However, due to the poor underwater visibility caused by northerly gales at the start of the cruise only limited visual information was obtained throughout the remainder of the cruise. Seabat data was obtained on ground gear contact and wing height. It was found that bottom contact appeared good around the full length of the ground gear and that wingend height was approximately 3-4 m.

Table 1

Mean upper and lower bridle loads for three different ground speeds

	Speed Over the Ground (kts)	Mean Upper Bridle Load (kg)	Mean Lower Bridle Load (kg)
Block 1	2.8	689	1197
Block 2	3.5	994	1534
Block 3	3.1	827	1350
Block 4	3.1	1240	1725
Block 5	3.5	1450	1982
Block 6	2.8	1077	1594

Annex 2

Tagging

A total of 15 hauls, using a modified cod-end attached to the BT185, were conducted to collect live fish over four nights. Fish in good condition and of suitable size were tagged using either Data Storage Tags (DST) or T-bar tags (release numbers shown below). Fish were tagged and released at Rona, Noup Head and Copinsay. Fin clips were taken from all DST tagged fish for genetic analysis. A minilogger attached to the trawl collected information on bottom temperature throughout each tow and CTD information was collected at each release position.

Two cod-ends were eventually damaged due to a combination of adverse weather conditions and the large number of pelagic fish encountered.

Species	DST	T-Bar
Haddock	40	125
Whiting	-	25
Cod	3	-
Monkfish	4	2

Annex 3

Passive Acoustic Observations

Sample recordings were made with different echosounders operating, both at sea and in port. Records at different vessel speeds and in changing sea conditions were also made.

Results and conclusions:

The towed array was deployed for a total of 30 hours. The drop keel mounted hydrophones were used continuously (with audio listening and Rainbow Click programme for high frequency detections) for most of the cruise (approximately 170 hours). The use of multiple echosounders however created too much noise in the targeted frequency bands for recordings to be made while they were in use.

- In general, the hull-mounted system appeared to work well and in a wider range of conditions that the towed array could do. This was in regard of audio as well as high frequency monitoring.

- The active echosounders did interfere with the hull mounted and created difficulties in particular when surveying for porpoises (100 to 160 kHz). Vibration noise did not seem to interfere with the system and propeller noise was not picked up much at all. For most of the time audio recordings could be made without using the high pass filter. Propeller noise could be clearly heard when using the towed array.

- The hull mounted hydrophone worked well in comparison with the towed array. The towed system did not function well at all when swell increased while it was possible to alter settings on the hull mounted system so that noise levels came to an acceptable level except when conditions were very rough e.g. when heading back towards Aberdeen in SE gale.

- Noise levels were more of a problem at higher speed and acceptable levels were achieved at speeds only up to 8 knots (depending on sea conditions). Seismic bursts, from nearby survey vessels, could be heard with the towed array but not when listening to the hull-mounted hydrophone. The towed array was affected by rain, causing quite substantially raised noise levels, in particular in broadband background noise; this did not affect the hull-mounted hydrophones.

- Possible porpoise detection was made using the towed hydrophone on 18 April at 0200 hours. No concurrent detections were made from the hull-mounted hydrophone. Heavy rain created some broadband noise at the same time and the detections will have to be validated. The detections and high frequency recordings made will be investigated further to establish if they were of cetacean origin.

- Notes made in the Logger programme and a representative sample of recordings under different conditions will be further evaluated to provide more conclusive answers to whether the drop keel system is a good alternative or addition to the traditional towed system.

Deployment of sonar buoys

Sonar buoys were deployed at times when the vessel was stationary or operating within a restricted area. Five buoys were deployed in the Scalloway deeps area spread over four days. Radio contact with buoys did not last for very long periods of time, the maximum for just over 2 hours. It is uncertain why contact was lost but high wind speed at the time may have caused the buoys to drift. Alternatively, the antenna used may not have high enough sensitivity and a comparison with another system could be useful No obvious detections were made while listening in real time but further analysis may provide detections of fish. A total of 240 minutes of sonar buoy recording was made.