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FRV *Alba na Mara*

Cruise 0409A

REPORT

9-16 March 2009

Ports

Loading: 3 March, Fraserburgh

Unloading: 16 March, Fraserburgh

Scientific Personnel

T Howell	(SIC, March 11 -16)
P Boulcott	(SIC, March 9-11)
M Burns	
C Shand	

Fishing Gear: None

Costs to Project: 8 days MF02Q

Objectives

- To set-up and test UW camera survey equipment
- To produce survey quality video footage and digital stills of the benthos
- To collect preliminary data, such as information relating to species distribution and population variance, necessary for the design of a larger survey
- To perform rough scale ground truthing of 5 potential sample areas in the Firth of Lorn (see map)
- To collect grab samples from each area
- To produce a species identification key for future surveys based on objectives 2 & 5

Narrative

Scientists joined *Alba na Mara* at 1000 (all times GMT) on Monday 9 March in Fraserburgh. Due to high winds *Alba na Mara* remained in Fraserburgh all day. It was decided at this time that, given the weather forecast for the following week, *Alba na Mara* would be unable to make the crossing to the Firth of Lorn. Since many of the cruise objectives could be achieved in the more sheltered waters in and around the Cromarty Firth, a revised cruise was planned around the survey of commercial scallop beds known to exist in this area. The enforced stay in Fraserburgh was also used to set-up the pyramidal camera survey frame and to carry out on deck tests. *Alba na Mara* sailed at 0700 on the 10 March and made passage 15 km northwards to suitable substrate. Rough seas prevented the deployment of the frame at the designated site, and a decision to continue steaming towards the relative shelter of the Cromarty Firth was made. *Alba na Mara* arrived at the Cromarty Firth at 15:30. Several deployments of the camera frame were carried out successfully at this time. *Alba na*

Mara then made passage to her berth at Invergordon, arriving at 1700 on Tuesday 10 March. Trevor Howell joined the *Alba na Mara* at 22:00.

The anchor was lifted at 0700 the following day, where *Alba na Mara* proceeded 20 nautical miles northwest to known scallop grounds. Camera surveys were carried out at 5 stations and adjustments to both camera settings and the lighting rig were made. Upon completion, *Alba na Mara* made her way to Invergordon where she tied up at 1900. An unscheduled change in crew was made at this time. Over the following three days priority was given to the adjustment of the camera frame and to the re-arrangement of the lighting configuration. During this period, 5 scallop grounds were part-surveyed in order to test the camera technique and to examine scallop distribution patterns. Safe anchorage each evening was found in the waters adjacent to Loch Fleet. To assess its suitability in surveying different species, several biotope types were surveyed during this period. On the final day of the cruise *Alba na Mara* made passage to a known scallop area 10 nm east of Cromarty. *Alba na Mara* then made passage to Fraserburgh, arriving in harbour at 17:30.

Results

Survey Coverage: A total of 5 areas that were known to be commercially trawled scallop grounds were surveyed during the course of the cruise (see Figure 1). Data were collected from 49 stations in total, with 10 – 20 quadrat drops being performed at each station (Table 1). Estimates of scallop density for those stations where scallops were detected are given in Table 2.

The proposed ground truthing and sampling of the Firth of Lorn was not possible due to weather conditions.

Deployment: The camera frame was deployed and retrieved successfully over 40 times during the cruise. In those situations where weather and tide conditions caused *Alba na Mara's* speed over ground to be too fast for effective deployment – in excess of 0.6 knots – the dynamic positioning system was used. By operating in this way, the frame could be deployed safely whilst still permitting sufficient movement as to allow the repositioning of the quadrat between drops. A summary of the performance of the dynamic positioning system during camera deployment under different conditions is given in Table 3.

Camera Test: Using the digital stills camera in conjunction with a single point flash system did not provide an even enough illumination of the quadrat for the purposes of our study. This was due to the compromise of trying to illuminate a large area whilst avoiding the resultant back-scatter caused by the increased height of the water column. Although unavailable for the present cruise, it is likely that a flash array mounted around the frame would produce more suitable results. To produce more even illumination, the camera system was redeployed with several variations of fixed lighting arrays (see Table 4). Overall, the study compared arrays of 4 halogen lights to those of 4 and then 6 LED lights. The LED lights were found to compare favourably with the halogen lights and, whilst their luminous flux was found to be slightly lower, they have the operational advantage of operating off 24V DC. One caveat to this is that the colour balance of the lights must be closely matched. Such an option was not available during this cruise, with the resultant photographs suffering from patches unequal in hue and saturation. To improve the quality of photographs taken in the future, the lighting rig used in this study will be replaced by an array of 8 LED lights of similar colour temperature.

The digital stills camera was tested using over 70 different combinations of shutter speed, aperture size, focus setting, and fixed-lighting array. Subjective observer scores for these settings are given in Table 4. Following these tests, the camera mode was set to ensure that an *f*-number of 4.0 took priority, with shutter speed selected automatically according to prevailing light conditions. Examples of the photographs taken at this setting are given in Figure 2.

Video images of the quadrat were taken throughout the study from overhead and side elevation. The lighting arrays used in this study proved suitable, although precise positioning of some lamps was necessary in order to avoid glare. These video images were used to confirm the presence scallops indicated by photographic evidence. Details of the video cameras used in this study are given in table 5.

T Howell
27 March 2009.

Figure 1: Map of surveyed sites in the Moray Firth

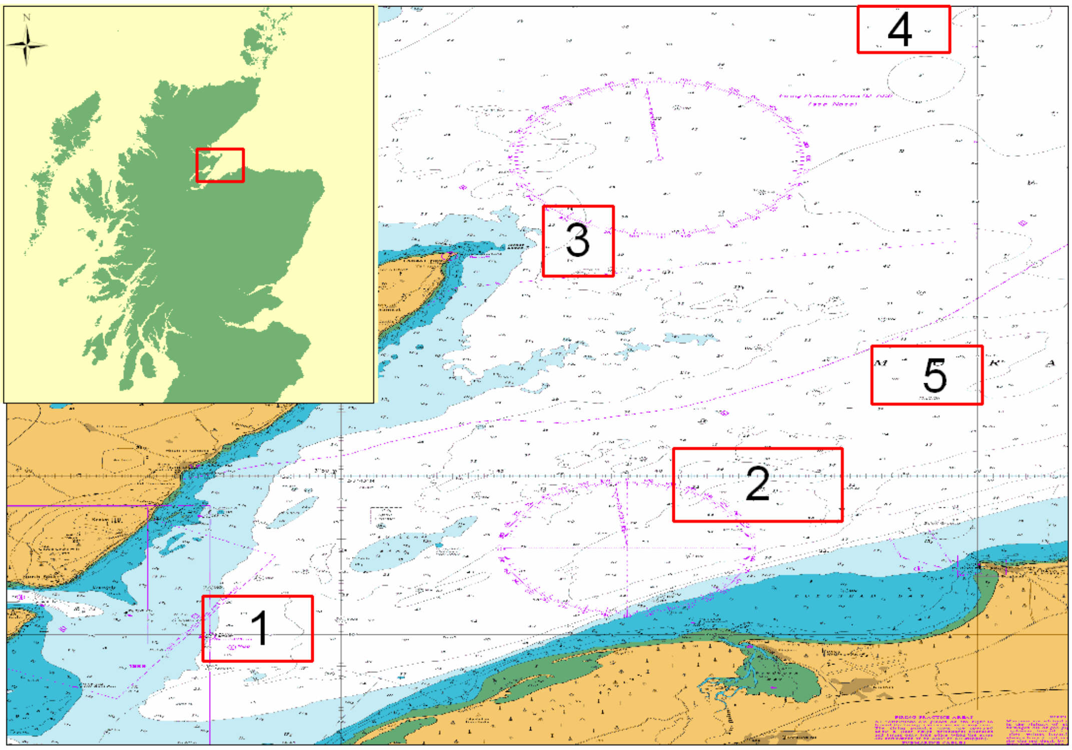

Table 1: Quadrats sampled per sample area.

Area	Date surveyed	Coordinates of first drop	Stations	No. quadrats surveyed
1	10/03/2009	3°52.063'W 57°40.312'N	1 - 6	14
2	11/03/2009	3°37.013'W 57°44.485'N	7 - 15	192
3	12/03/2009	3°42.749'W 57°52.750'N	16 - 22	97
4	14/3/2009	3°32.831'W 57°59.254'N	23 - 32	93
5	15/03/2009	3°32.439'W 57°48.035'N	33 - 39	140

Table 2: Estimates of scallop densities from selected stations. Only those stations where scallops were recorded are included.

Area No.	Station No.	Scallop counts	Estimated density (m^{-2})
2	7	4	0.07
2	10	4	0.1
2	12	1	0.03
3	20	1	0.05
4	24	2	0.1
4	25	2	0.1
4	26	2	0.1
4	29	1	0.05
4	31	1	0.05
5	35	3	0.08
5	38	1	0.03

Table 3: Dynamic positioning - operation during deployment

Wind	SSW. 30 mph 20° on Port Bow
Tide	ENE
Wave Ht.	2 m
Boat Position	Operating offset approx. 15 m

Wind	SW. 35 mph 10° on Port Bow
Tide	ENE
Wave Ht.	2 m
Boat Position	Operating offset approx. 15 m

Wind	SW. 40 mph 45° on Port Bow
Tide	NE
Wave Ht.	2 m
Boat Position	Could not maintain position

Wind	SW. 40 mph 25° on Star. Quarter
Tide	NE
Wave Ht.	2 m
Boat Position	Lost position slowly

Table 4: Camera performance tests under conditions of varying shutter speed, *f*-number, focal setting, and camera mode. Camera model: Kongsberg OE14-208 digital stills camera.

F stop	Shutter speed	ISO	Mode	Focus	Light config.	Result
8	1/400	200	OFF	Auto	4 LED	Image unusable
2	1/400	200	OFF	Auto	4 LED	V. Poor
2	1/160	200	OFF	Auto	4 LED	Poor
2.8	1/60	200	OFF	Auto	4 LED	Poor/Moderate
4	1/60	200	OFF	Auto	4 LED	Poor
3.5	1/60	200	OFF	Auto	4 LED	Poor
4.5	1/60	200	OFF	Auto	4 LED	Poor
5	1/60	200	OFF	Auto	4 LED	V. Poor
5	1/30	200	OFF	Auto	4 LED	Poor
4	1/30	200	OFF	Auto	4 LED	Poor/Moderate
3.5	1/30	200	OFF	Auto	4 LED	Moderate
3.5	1/40	200	OFF	Auto	4 LED	Poor/Moderate
3.5	1/50	200	OFF	Auto	4 LED	Poor
3.5	1/60	200	OFF	Auto	4 LED	Poor
2	1/125	200	OFF	Auto	4 LED	Poor/Moderate
2.5	1/125	200	OFF	Auto	4 LED	Poor
2.8	1/125	200	OFF	Auto	4 LED	Poor
2.5	1/100	200	OFF	Auto	4 LED	Poor/Moderate
2.2	1/100	200	OFF	Auto	4 LED	Poor/Moderate
2.0	1/100	200	OFF	Auto	4 LED	Poor/Moderate
2.0	1/100	200	OFF	Auto	6 LED	Moderate/Good
2.2	1/100	200	OFF	Auto	6 LED	Moderate/Good
2.5	1/100	200	OFF	Auto	6 LED	Moderate
2.8	1/100	200	OFF	Auto	6 LED	Poor/Moderate
3.2	1/100	200	OFF	Auto	6 LED	Poor
3.2	1/80	200	OFF	Auto	6 LED	Poor/Moderate
3.5	1/80	200	OFF	Auto	6 LED	Poor
3.5	1/60	200	OFF	Auto	6 LED	Poor/Moderate
3.2	1/60	200	OFF	Auto	6 LED	Moderate
2.8	1/60	200	OFF	Auto	6 LED	Moderate/Good
2.8	1/40	200	OFF	Auto	6 LED	Good
2.8	1/60	200	OFF	2 m	6 LED	Moderate
2.8	1/60	200	OFF	2 m +	6 LED	Moderate/Poor
2.8	1/60	200	OFF	1.8 m	6 LED	Moderate/Poor
2.8	1/60	200	OFF	1 m	6 LED	Moderate/Poor
2.8	1/60	200	OFF	∞	6 LED	Moderate/Poor
2.8	1/60	200	OFF	5 m	6 LED	Moderate/Poor
2.8	1/60	200	OFF	4.7 m	6 LED	Moderate/Poor
2.8	1/60	200	OFF	1.8 m	6 LED	Moderate
2.8	1/60	200	OFF	1.2 m	6 LED	Moderate/Poor
4	1/25	200	Aperture priority	2 m	6 LED	Good
5.6	1/13	200	Aperture priority	2 m	6 LED	Moderate
F stop	**Shutter speed**	**ISO**	**Mode**	**Focus**	**Light config.**	**Result**
6.3	1/10	200	Aperture priority	2 m	6 LED	Moderate/Poor
7.1	1/8	200	Aperture priority	2 m	6 LED	Moderate/Poor
8.0	1/6	200	Aperture priority	2 m	6 LED	Moderate/Poor
8	1/60	200	OFF	2 m	6 LED	Unusable image

8	1/30	200	OFF	2 m	6 LED	V. Poor
2.0	1/60	200	Shutter Priority	2 m	6 LED	Moderate/Good
2.0	1/80	200	Shutter Priority	2 m	6 LED	Moderate/Good
2.0	1/100	200	Shutter Priority	2 m	6 LED	Moderate
2.0	1/125	200	Shutter Priority	2 m	6 LED	Moderate/Poor
2.0	1/160	200	Shutter Priority	2 m	6 LED	Poor
2.0	1/20	200	Full Auto	Auto	6 LED	Moderate
8	1/60	200	OFF	1.8 m	4 HAL	Unusable image
7.1	1/60	200	OFF	1.8 m	4 HAL	Unusable image
6.3	1/60	200	OFF	1.8 m	4 HAL	V. Poor
5.6	1/60	200	OFF	1.8 m	4 HAL	Poor
5.1	1/60	200	OFF	1.8 m	4 HAL	Poor
4.5	1/60	200	OFF	1.8 m	4 HAL	Poor
4	1/60	200	OFF	1.8 m	4 HAL	Poor/Moderate
3.5	1/60	200	OFF	1.8 m	4 HAL	Poor/Moderate
3.2	1/60	200	OFF	1.8 m	4 HAL	Poor/Moderate
2.8	1/60	200	OFF	1.8 m	4 HAL	Moderate
2.5	1/60	200	OFF	1.8 m	4 HAL	Moderate
2.2	1/60	200	OFF	1.8 m	4 HAL	Moderate
2.0	1/60	200	OFF	1.8 m	4 HAL	Moderate
6.3	1/40	200	OFF	1.8 m	4 HAL	V. Poor
5.6	1/40	200	OFF	1.8 m	4 HAL	Poor
5.1	1/40	200	OFF	1.8 m	4 HAL	Poor
4.5	1/40	200	OFF	1.8 m	4 HAL	Poor/Moderate
4	1/40	200	OFF	1.8 m	4 HAL	Poor/Moderate
3.5	1/40	200	OFF	1.8 m	4 HAL	Poor/Moderate
3.2	1/40	200	OFF	1.8 m	4 HAL	Moderate
2.8	1/40	200	OFF	1.8 m	4 HAL	Moderate
2.5	1/40	200	OFF	1.8 m	4 HAL	Moderate
2.2	1/40	200	OFF	1.8 m	4 HAL	Moderate
2.0	1/40	200	OFF	1.8 m	4 HAL	Moderate

Table 5: Cameras tested

Type	**Manufacturer**	**Model**	**Comments**
Digital Stills	Kongsberg	OE14-208	See text
Video	Kongsberg	1366 colour	Worked well
Video	Kongsberg	14-366 colour	Developed fault
Video	Kongsberg	1358 monochrome	Worked well
Video	Deepsea Power & Light	Micro-SeaCam 2000	Worked well

Figure 2. Two examples of the photographs taken during the quadrat study. Camera settings were: shutter speed 1/25 s (aperture priority); *f*-number 4.0; focal setting 1.8 m; flash offline; ISO 200; 6 LED lights.