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MRV *Alba na Mara*

## REPORT

Survey 0723A

18-30 May 2023

### Ports

**Loading:** Fraserburgh, 15 May 2023

**Sailing:** Fraserburgh, 18 May 2023

**Unloading:** Fraserburgh, 30 May 2023

In setting the survey programme and specific objectives, etc. the Scientist-in-Charge needs to be aware of the restrictions on working hours and the need to build in adequate rest days and rest breaks as set out in Marine Scotland's Working Time Policy (Lab Notice 34/03). In addition, the Scientist-in-Charge must formally review the risk assessments for the survey with staff on-board before work is commenced.

In the interest of efficient data management it is now mandatory to return the Survey Report, to I Gibb and the Survey Summary Report (old ROSCOP form) to M Geldart, within four weeks of a survey ending. In the case of the Survey Summary Report a nil return is required, if appropriate.

**Costs to Project: 20749 (SU0170) - 13 days.**

### Equipment:

BT 201 - rigged with SELTRA sorting box and 300 mm SMP  
Trawl doors, sweeps, bridles, backstrops and pennants  
Spare netting and twine  
Photosynergy SLS-2500 light unit (blue lights)  
Photosynergy SLS-2500 light unit (Infrared lights)  
Photosynergy SBS-5000 subsea battery units  
20 m Fibre optic side emitting light cables  
LI-COR LI-192SA Underwater Quantum Sensors  
LI-COR LI-250A Light Meter  
LI-COR LI-1500 Light Sensor Logger & U/W Housing  
LI-COR 2222UWB Underwater cables  
LI-COR LI-180 Spectrometer & U/W Housing  
RBR Solo<sup>3</sup> Turbidity logger & sensor  
Aquatec Turbidity logger & sensor  
GoPro, Bowtech, Navigator Video Cameras & Lights  
Flashback recorders and housing  
MS 12 V Battery pods  
Camera frames  
Scanmar units – door, headline, wing, depth

### Background

The current sea trials are part of the FISP funded CodSElect project investigating the application of artificial light for reducing cod catches in Nephrops trawls. Apart from the current

trials, the project involves a number of controlled laboratory tank trials conducted in the Marine Directorate's facilities in the Marine Laboratory in Aberdeen as well as sea trials on board a commercial Nephrops vessel.

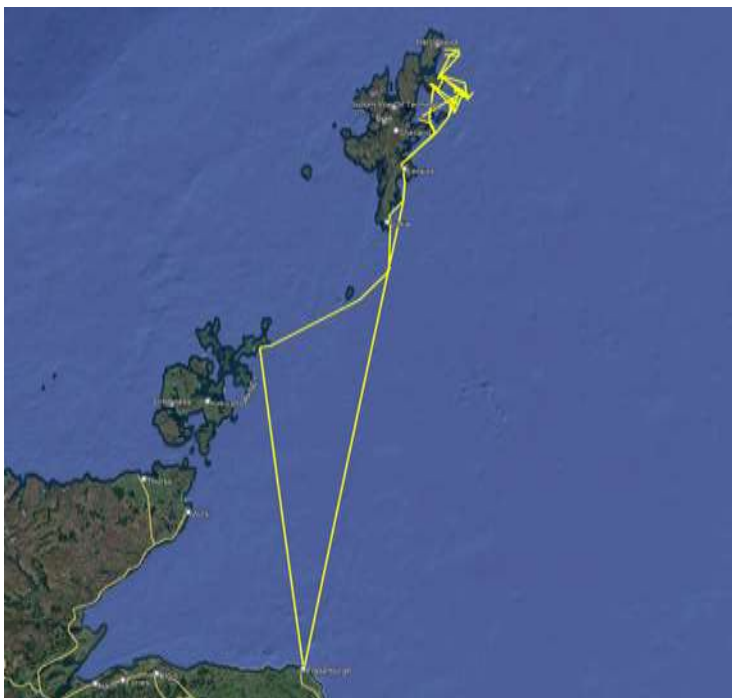
### Objectives

- Investigate whether artificial light can influence fish behaviour and enhance escape through a square mesh panel (SMP) on the top panel of a SELTRA box in the extension of the trawl,
- Obtain video footage of fish behaviour when passing the illuminated bottom panel of a SELTRA box fitted with 300 mm SMP on the top panel.

### Procedure

Equipment was loaded onto Marine Scotland's MRV *Alba na Mara* at Fraserburgh on 15 May 2023, where the BT201 scraper trawl was rigged onto the net drum and SELTRA box and codend attached. Three scientific staff joined *Alba na Mara* at 09:00 on 18 May and the vessel left harbour at 10:00 hours, with drills and familiarisation completed shortly after. The vessel thereafter travelled to Lerwick in Shetland islands, approximately 200 miles North of Aberdeen (Figure1). During the steam to Lerwick the rigging of instrumentation was finalised.

The vessel arrived in Lerwick on 19 May at 04:30 hours where it remained for the day in order for the crew to rest and get back into their shifts for the next day. Scientific personnel carried out the final preparations of gear and equipment while in harbour.



**Figure 1:** Map showing the location of the trials and cruise track.

As the prevalent North-westerly winds limited operations to the East side of Shetland, *Alba* left Lerwick on Saturday 20 May at 07:00 hours heading NE towards Fetlar island and following a shakedown of the gear, trials commenced while looking for suitable grounds to fish. After an initial foul haul (60° 23.783 N, 01° 00.248 W), where the net was retrieved full of sea weed, a further four successful hauls (with 26 cod caught) were completed before reaching anchorage for the night in NE Fetlar (60° 36.674 N, 00° 48.734 W).

*Alba* resumed operations the following morning, 21 May, at 07:00 hours fishing in the broader area between SE of Fetlar and W of Pobie Bank trying different tow positions in search of grounds with good cod numbers. In total six hauls were completed (22 cod caught) two of which were foul. One due to the weight of the batteries and instrumentation altering the geometry of the SELTRA, which was rectified with the insertion of a float over the camera and further two floats, one in either side at the beginning of the top panel of the SELTRA. The other haul was deemed foul because the catch was totally composed of elasmobranchs which were released straight back. *Alba* returned to the same anchorage at 19:00 hours for the night.

On 22 May *Alba* continued the trials and completed four valid hauls, with 26 cod in total, before severely damaging the belly of the net during the fifth haul (60° 32.784 N, 00° 26.874 W) forcing the vessel to return to the Fetlar anchorage at 17:45 hours where repairs of the net continued until the end of the working day.

The next morning *Alba* sailed at 07:00 hours and concluded six successful hauls catching 55 cod in total for the day before returning to the Fetlar anchorage.

As wind conditions deteriorated on 24 May the decision was made at 07:00 hours to move in to another bay in SE Fetlar (60° 35.171 N, 00° 52.190 W) where sufficient shelter was provided to carry calibrations for the EK60 echo sounder. Calibrations commenced at 08:20 hours and finished at 14:30 hours with *Alba* sailing for Lerwick for the scheduled scientific personnel change. The vessel arrived in Lerwick harbour at 18:00 hours and the staff changover was completed accordingly.

*Alba* sailed Northeast on 25 May at 07:00 hours and resumed the trials (60° 30.141 N, 00° 40.601 W) at 10:05 hours completing four valid hauls but the day was concluded with low numbers of cod (11 in total). The vessel returned to the Fetlar anchorage at 18:15 hours where it remained for the night.

On 26 May the sailing was delayed until 7:30 hours as the engineers needed to repair the starboard roller for the door wire. During the second haul the codend and part of the wing were damaged by boulders and repairs were carried out but managed to carry out three further hauls bringing the total for the day to four valid and one foul in which 28 cod were caught in total. With the wind forecast for the following day of NW winds exceeding the vessels safe operational limits and following the captains recommendation the vessel proceeded to Lerwick and was alongside by 21:30 hours.

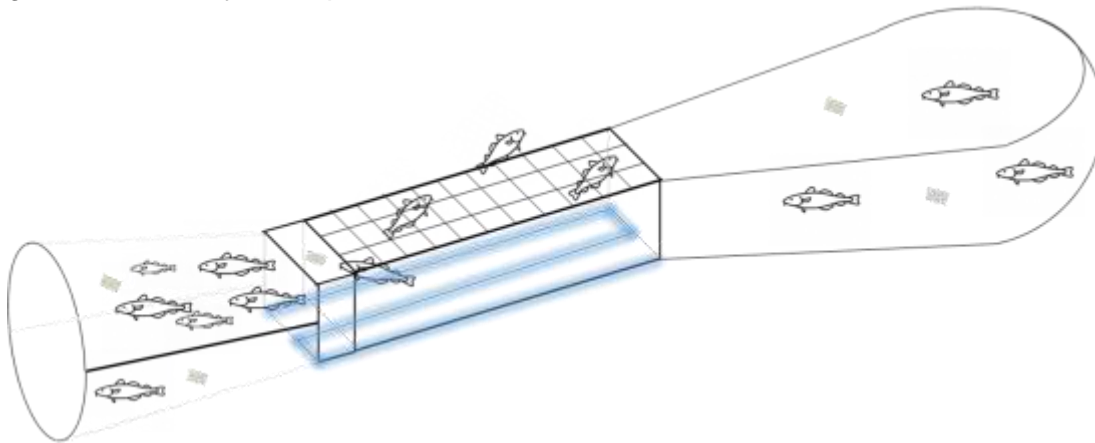
*Alba* left Lerwick at 15:30 hours on 27 May and proceeded South to another anchorage in order to be closer to the grounds where operations would resume the following day. Scientific staff used the opportunity to catch up with data input, photographing equipment and conducting bench tests using the different IR lights and cameras as well as carrying out equipment maintenance. The vessel reached anchorage at 18:00 (56° 54.970, N 01° 16.210 W).

Operations resumed on 28 May with *Alba* sailing at 07:00 hours and heading SSE of Sumburgh Head to suitable grounds (59° 40.180 N, 01° 15.243 W) where four successful hauls, with a total of 82 cod, were completed. The vessel then travelled Southwest to Orkney where it arrived at 20:10 hours for anchorage near Start Point (59° 15.476 N, 02° 27.999 W).

On Monday 29 May once the vessel left anchorage at 07:00 hours the net was shot and towed for cleaning while equipment and work areas were tidied up and cleaned. On completion *Alba* headed back towards Fraserburgh where it arrived at 17:30 hours. Equipment and scientific personnel were offloaded the morning of 30 May.

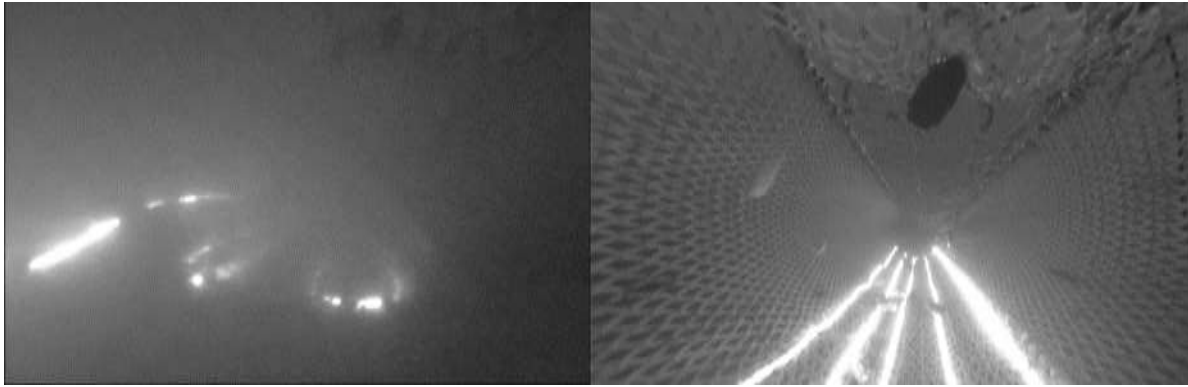
## Fish Behaviour Trials

The BT201 trawl extension was rigged with a SELTRA box incorporating a 300 mm SMP on the top panel, situated 9 m from the codline. The bottom panel of the SELTRA was rigged with a 20 meter fibre optic (FO) cable illuminated by two 460 nm (blue) Photosynergy SLS2500 LED light pod units, one attached on each end to produce uniform intensity output throughout the fibre length. The SLS2500 were initially powered by the 12V battery packs that are routinely used in MS RV trials and are made in house by MS. On the fifth day of the trials (haul 16) the battery packs were replaced by, the newly developed for the purposes of the CodSElect project, Photosynergy SBS5000 battery packs. The SBS5000 operated satisfactory and are a suitable replacement to the existing MS battery packs with the additional advantage of being a fraction of the size and weight of the former. The FO cable was fitted along the length of an insert in the bottom panel of the SELTRA as illustrated in Figure 2. Hauls were conducted in pairs with one haul being the control (lights OFF) and the other the test (light ON). As fish numbers were abundant on the grounds each haul was limited to 30 minutes to minimise catch bulk. The net was towed at three knots with Scanmar units monitoring wing spread and a trawl-eye providing headline height during each haul. Hauls were conducted at depths approximately between 80 and 150 meters in typical Nephrops grounds fished by a scraper trawl.



**Figure 2:** SELTRA box with 300 mm SMP and the net-mounting configuration of illuminated bottom panel. The configuration utilises a 20 m Lightpath fibre optic cable injected in each end by an SLS2500 unit in order to produce uniform intensity output throughout the length of the fibre. The units used in the trials emitted a wavelength of 460 nm (blue).

Ambient light and turbidity conditions were recorded in real time during all fishing operations. Two LI-COR LI-192SA underwater quantum sensors, coupled on a LI-COR LI-1500 light sensor logger (in a custom made underwater housing by the MS engineering team), were rigged to collect real time ambient and artificial light data, while turbidity was recorded by an RBR Solo<sup>3</sup> logger equipped with a Seapoint turbidity sensor. In some hauls a LI-COR LI-180 spectrometer was mounted in the taper, 9.5 m ahead of the SELTRA box, to test if there is an alteration in wavelength further away from the artificial light source. The data collected from all of the instrumentation will provide information on the environmental conditions that might affect light propagation and its efficiency during the trials as well as how fish might perceive their surroundings during trawling (Figure 3).



**Figure 3:** Stills from footage captured during different hauls showing the SELTRA box with illuminated fibre optic cables and how different environmental conditions such as turbidity can affect light propagation and visibility of the SMP.

The light units, battery packs, cameras and instrumentation were not wound onto the net drum as it could damage the equipment. During hauling the net was wound onto the drum up to the first attached unit, then the power block was used to bring the codend aboard using a dog rope. Large bins were used on deck to receive and store the catch from the codend. The catch was subsequently sorted into key species, weighed and individual total length measurements recorded. A total of 35 hauls were completed, 30 of which valid, with catch weight and length distribution data collected from 44 species. Although cod numbers were patchy on the grounds a total of 250 cod were caught during the trials.

The vessel 12 hour period of operation was 0700 to 1900 hours during the trials, therefore, all hauls were conducted in daylight (Figure 4). A minimum of four fishing hauls were carried out each trial day apart from days that fishing operations were not possible. A summary of the trip schedule and hauls during the cruise is provided in Table 1 and cruise tracks in Figure 1. The cruise ended in Fraserburgh on 30 May with all staff, fishing gear and scientific equipment returning to the Marine Laboratory in Aberdeen. Normal contacts were maintained with the laboratory.

May	18	19	20	21	22	23	24	25	26	27	28	29	30
<b>Sunrise</b>	04:19	04:17	04:15	04:13	04:11	04:08	04:06	04:04	04:03	04:01	03:59	03:57	03:56
<b>Sunset</b>	21:44	21:46	21:48	21:50	21:53	21:55	21:57	21:59	22:01	22:03	22:05	22:07	22:09

**Figure 4:** Daylight hours for the Shetland Islands for the period of the trials (ref. point: Lerwick).

Date	Schedule					
15/05/2023	Loading Alba					
18/05/2023	Travel to Shetland					
19/05/2023	Vessel Crew Rest / Switch Crew Shifts Back to 12hr Operations					
20/05/2023	Haul 1 - Test Gear - Foul	Travel to Alternative Grounds	Haul 2 - Test Gear - Valid	Haul 3 - Control Gear - Valid	Haul 4 - Test Gear - Valid	Haul 5 - Control Gear - Valid
21/05/2023	Haul 6 - Test Gear - Valid	Haul 7 - Control Gear - Valid	Haul 8 - Control Gear - Valid	Haul 9 - Test Gear - Foul	Haul 10 - Test Gear - Foul	Haul 11 - Test Gear - Valid
22/05/2023	Haul 12 - Test Gear - Valid	Haul 13 - Control Gear - Valid	Haul 14 - Test Gear - Valid	Haul 15 - Control Gear - Valid	Haul 16 - Test Gear - Foul	Net Repairs
23/05/2023	Haul 17 - Control Gear - Valid	Haul 18 - Test Gear - Valid	Haul 19 - Test Gear - Valid	Haul 20 - Control Gear - Valid	Haul 21 - Test Gear - Valid	Haul 22 - Control Gear - Valid
24/05/2023	EK60 Calibrations / Crew Change					
25/05/2023	Travel to Fishing Grounds		Haul 23 - Control Gear - Valid	Haul 24 - Test Gear - Valid	Haul 25 - Control Gear - Valid	Haul 26 - Test Gear - Valid
26/05/2023	Haul 27 - Test Gear - Valid	Haul 28 - Control Gear - Foul	Net Repairs	Haul 29 - Control Gear - Valid	Haul 30 - Test Gear - Valid	Haul 31 - Control Gear - Valid
27/05/2023	In Lerwick Harbour Due To Strong Winds				Travel To Anchorage	
28/05/2023	Travel to Fishing Grounds	Haul 32 - Control Gear - Valid	Haul 33 - Test Gear - Valid	Haul 34 - Test Gear - Valid	Haul 35 - Control Gear - Valid	Travel To Orkney Anchorage
29/05/2023	Cleaning Net & Dissassembly		Travel To Fraserburgh / End Of Trip Preparations			
30/05/2023	Unloading Alba					

**Table 1:** Summary of trip and hauls.

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04 July 2023

Approved: Matt Gubbins  
01/08/23