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MRV *Scotia*

Survey 0522S

PROGRAMME

29 April – 11 May 2022

Loading: Aberdeen, 27 Apr 2022

Unloading: Aberdeen, 11 May 2022

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 (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

Out-turn days per project: 12 days ST05B; 1 day C80040

Gear

Sea-Bird CTDs, mooring frames and 40" buoys, ADCPs and current meter instrumentation, water filtering equipment, plankton nets, mooring equipment, chemistry sampling equipment, weeHoloCam.

Objectives

1. Test the SBE911 and CTD carousel (main CTD crane) and take water samples in a position within or adjacent to the Goldeneye oil field.
2. Perform hydrographic sampling along the JONSIS long term monitoring section in the northern North Sea.
3. Recover and re-deploy three ADCPs (NWSG, NWSD and NWSE: 2 RDI Longrangers and 1 Nortek Signature 100, respectively, with SBE37 T and C sensors) on single string moorings at positions on Fair Isle – Munken (FIM) section.
4. Perform hydrographic sampling along the long term monitoring Faroe-Shetland Channel Nolso – Flugga (NOL) section.
5. Perform hydrographic sampling along the long term monitoring Faroe-Shetland Channel Fair Isle – Munken (FIM) section.
6. Recover an ADCP (AWAC) in steel frame in Loch Erisort.
7. Turn around one ADCP (Sig250) in a trawl resistant AL-200 frame in the Little Minch.
8. Turn around one ADCP (Sig250) in a trawl resistant AL-200 frame in Linne Crowlin.

9. Carry out a line off CTD stations in Loch Ewe between the mouth of the loch and the metocean buoy position.
10. Deploy a subsurface mooring (anchor, ground chain and line) with a surface marker in Loch Ewe.
11. If time allows, carry out a grid of CTD stations in Loch Ewe.
12. Deploy an ADCP (AWAC) in steel frame in the Summer Isles.
13. If time allows, carry out a VMADCP transect in the Loch Broom area.
14. Run the thermosalinograph throughout the survey.
15. Run the VMADCP on all the standard sections.
16. Take water samples for long term storage on Fair Isle – Munken or Nolso – Flugga section stations.
17. Additional sampling: 1) Take water samples for filtration for oil bacteria at selected stations in the FSC; 2) Take zooplankton net samples in the Loch Ewe CTD transect; 3) Deploy the weeHoloCam at all Loch Ewe CTD transect stations and a deep station in the FSC; 4) Take water sample for microplastics bacteria at one FSC station.
18. If weather/time permits conduct CTD sections on the west coast, from the coastline up to the edge of the continental shelf (“Shelf” sections).
19. If weather/time permits repeat the JONSIS line at the end of the survey and extend to 001° 30’ east.
20. If weather/time permits perform fine scale VMADCP/CTD survey work on the JONSIS line (around 59° 17’ N, 001° 15’ W).
21. If weather/time permits, perform VMADCP/CTD survey work in the Moray Firth and/or Aberdeen Bay.
22. If weather/time permits, perform CTD deployments along the AlterECO line (offshore from Aberdeen).

Procedure

North Sea:

On sailing from Aberdeen *Scotia* will make passage to the Goldeneye oil field to test the CTD and carousel water sampler on the main CTD crane and to collect baseline water samples for any potential future Carbon Capture & Storage (CCS) monitoring. The target sampling position will be 58° 0.3’ N 0° 21.96’ W (which is inside the oil field) or, if not possible, as close as practicable near 58° 0.9’ N 0° 19.92’ W, which is just outside.

On completion of these tests and sampling, *Scotia* will sail to the JONSIS section to carry out sampling with the CTD and carousel water sampler. On one of the deeper CTD stations on JONSIS, any SBE37s we carry to be deployed later in the survey will be strapped to the carousel for a calibration dip (stopping at intervals on the way up). On completion of the JONSIS section *Scotia* will make way to the Faroe Shetland Channel.

Faroe Shetland Channel (all mooring deployment during daylight hours):

Passage will be made towards the NWSG mooring location to turn around the single string mooring currently deployed, followed by mooring turn-arounds on NWSD and NWSE, carrying out pre-recovery CTD dips (with SBE37 calibrations) in all cases (note that the order of these operations may change for operational reasons). Passage will then be made towards the eastern (Shetland) end of the Nolso – Flugga (NOL) section to collect long term monitoring samples and take CTD profiles for the length of the section. After the NOL section, *Scotia* will head south to the western (Faroe) side of the Fair Isle – Munken (FIM) section to carry out standard CTD and water sampling along that line. We will also aim to deploy the weeHoloCam at one of the deepest stations in the FSC.

West coast (all mooring deployments during daylight hours):

Passage will then be made to the Loch Erisort (east coast of Lewis) mooring position, where an ADCP mooring on steel frame will be recovered by releasing one of the two pop-up buoys, the data will be downloaded and the mooring re-deployed. We then intend to turn around an AL-200 mooring in the Little Minch (west of Skye) and another AL200 mooring in Linne Crowlin (east of Skye). Note that we may decide to carry out the Little Minch work after the work east of Skye, depending on timing and conditions. On completion of that work, *Scotia* will sail to the mouth of Loch Ewe to carry out a CTD transect into the loch (including water and chemistry sampling, and weeHoloCam deployments) and deploy the subsurface mooring on the Loch Ewe metocean buoy, with a surface marker. If time allows, *Scotia* will also carry out a spatial grid of CTD stations in Loch Ewe. After the work in Loch Ewe is completed, *Scotia* will sail to the Summer Isles to deploy the ADCP on a steel frame recovered from Loch Erisort, and to carry out a VMADCP transect in the area it time allows. Depending on timings and other considerations (e.g. weather), CTD sampling along the Shelf lines off the west coast will be carried out.

Additional North Sea work:

On completion of the above and if time allows, additional work (listed among the survey objectives) along the JONSIS line, in the Moray Firth and/or the AlterEco line off Stonehaven will be carried out prior to *Scotia*'s return to Aberdeen. The AlterEco line will take priority over some of the other west coast (e.g. Shelf lines) or other North Sea work outlined above.

Mooring Positions (Recover)

NWSE	60°	16.364" N	04°	23.154" W (short single string)
NWSD	60°	27.058" N	04°	22.436" W (short single string)
NWSG	60°	30.471" N	04°	34.022" W (short single string)
CRO2105	57°	19.208" N	05°	52.232" W (AL-200)
MIN2105	57°	28.801" N	06°	57.601" W (AL-200)
LE2105	58°	06.730" N	06°	21.360" W (steel frame)

Mooring Positions (Deploy)

NWSE	60°	16.356" N	04°	23.054" W (short single string)
NWSD	60°	27.036" N	04°	22.428" W (short single string)
NWSG	60°	30.504" N	04°	34.014" W (short single string)
CRO	57°	19.208" N	05°	52.232" W (AL-200)
MIN	57°	28.801" N	06°	57.601" W (AL-200)
SI	58°	00.900" N	05°	28.900" W (steel frame)

Scientific Procedures

It is expected that deployments of hydrographic equipment will be carried out with the CTD crane whilst the vessel is on station. The plankton crane will be used for the deployment of ADCP moorings in trawl-resistant frames (AL-200s) and short single-string moorings from the hanger deck using an acoustic release to release the frames once they are on/close to the seabed. The steel ADCP frame will most likely be deployed off the aft using the gamma frame, or cod end crane, with the ADCP frame threaded on a bite of rope going back to the net drums. The deployment rope is then pulled through once the frame is on the seabed.

Plankton net samples and weeHoloCam deployments will be carried out using the plankton crane and wire.

Three container laboratories will be required (one for water filtering, one for chemistry and a dry container for communications with sampling equipment). Chlorophyll samples will be stored frozen in the freezer in the Fish House. Nutrient samples will be analysed on board or stored frozen in a fish-free empty freezer on the lower container deck.

(NOTE: The position of the CTD sampling station in the Goldeneye oil field will be adjusted for any exclusion zones and oil infrastructure).

(NOTE: The survey will take *Scotia* into the Foinaven Development Area. This is now standard practice and normal on-site communications will be established with the Foinaven co-ordinating officer).

(NOTE: Hydrographic stations at NOL and FIM have been amended to avoid entering Faroese territorial waters).

Normal contacts will be maintained with the laboratory.

Submitted:
A Gallego
Date: 25 April 2022

Approved:
I Gibb
Date: 27 April 2022

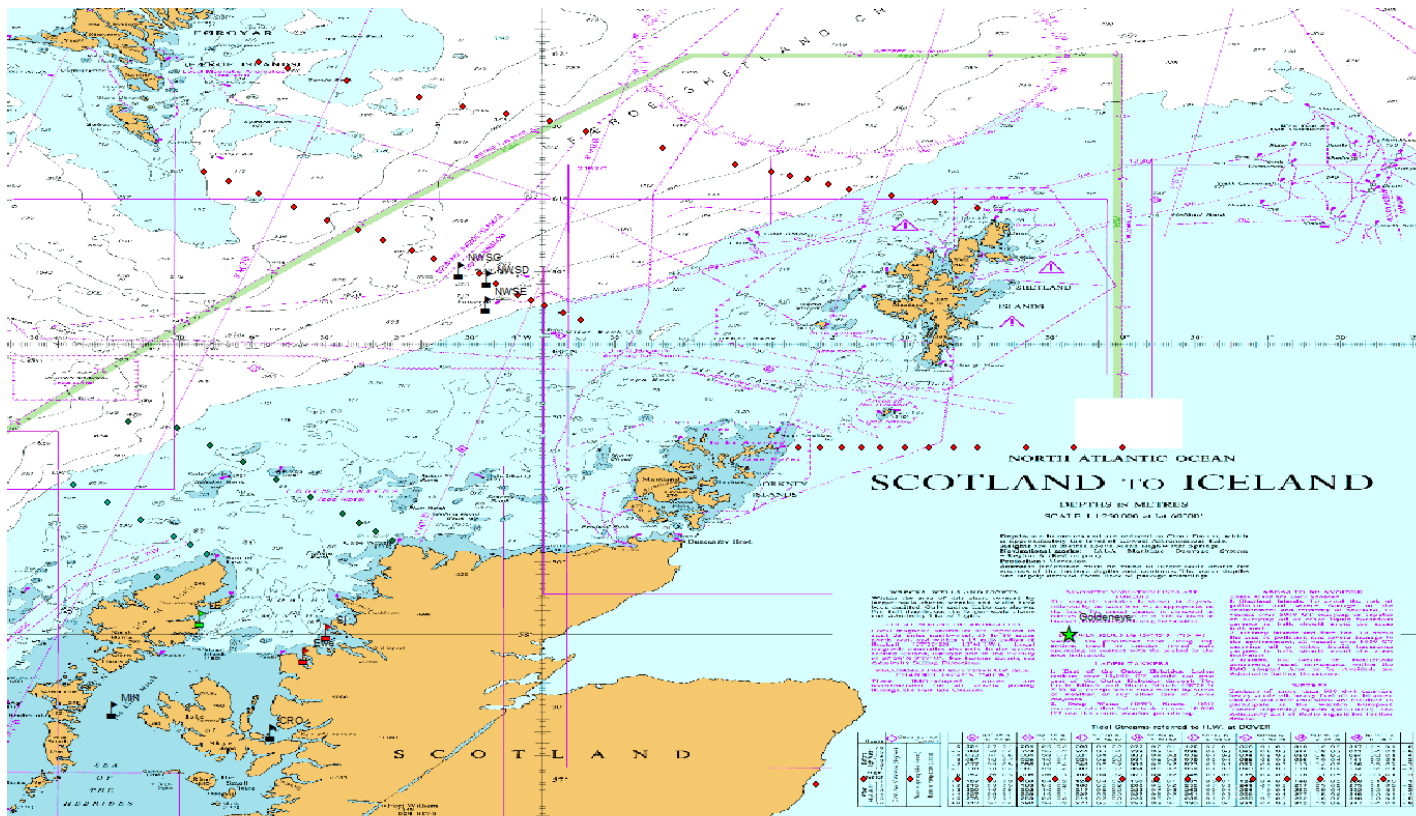
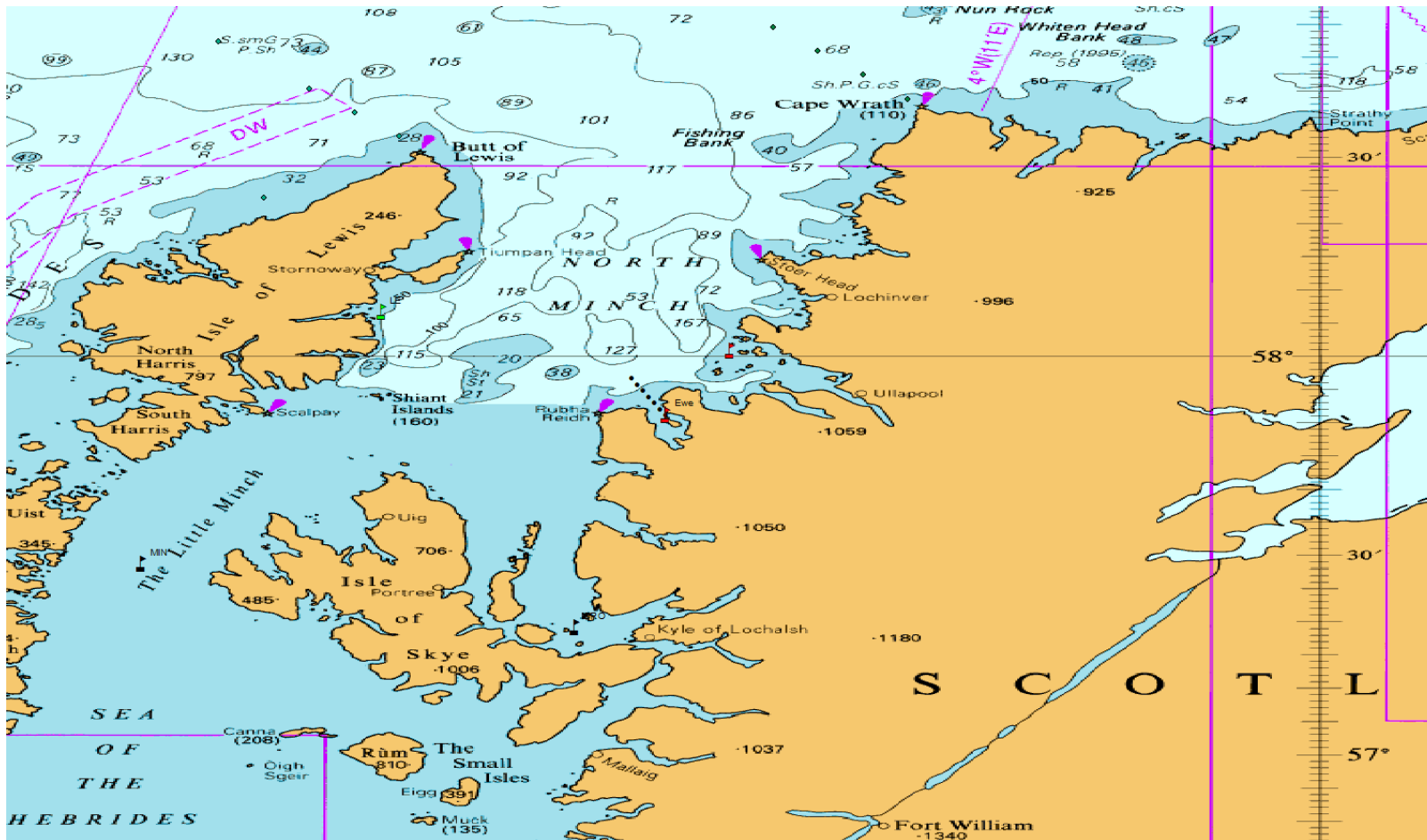


Chart Showing Key Activities on 0522S - Priority hydrographic lines are shown as red dots, lower priority lines as green dots, moorings for turnaround are black, for recovery green and for deployment red.



Zoomed chart showing the west coast planned activities, including the Loch Ewe CTD transect.

JONSIS

#	Name	Latitude	Longitude	Depth	Spacing
01	JO 1	59° 17.00' N	02° 14.00' W	75 m	
02	JO 1A	59° 17.00' N	02° 5.00' W	90 m	4.59 nm
03	JO 2	59° 17.00' N	01° 56.00' W	100 m	4.59 nm
04	JO 3	59° 17.00' N	01° 48.00' W	80 m	4.08 nm
05	JO 4	59° 17.00' N	01° 40.00' W	90 m	4.08 nm
06	JO 5	59° 17.00' N	01° 30.00' W	95 m	5.10 nm
07	JO 6	59° 17.00' N	01° 20.00' W	110 m	5.10 nm
08	JO 6A	59° 17.00' N	01° 10.00' W	120 m	5.10 nm
09	JO 7	59° 17.00' N	01° 0.00' W	125 m	5.10 nm
10	JO 8	59° 17.00' N	00° 40.00' W	120 m	10.20 nm
11	JO 9	59° 17.00' N	00° 20.00' W	140 m	10.20 nm
12	JO10	59° 17.00' N	00° 0.00' W	135 m	10.20 nm
Totals				1180 m	68.36 nm

Nolso-Flugga (NOL)

#	Name	Latitude	Longitude	Depth	Spacing
01	NOL-01	60° 56.00' N	01° 00.00' W	110 m	
02	SEFN1	60° 58.70' N	01° 17.70' W	125 m	9.00 nm
03	SEFN2	61° 01.40' N	01° 35.40' W	155 m	8.99 nm
04	NOL-02	61° 04.00' N	01° 53.00' W	270 m	8.91 nm
05	SEFN3	61° 06.00' N	02° 01.50' W	440 m	4.57 nm
06	NOL-03	61° 08.00' N	02° 10.00' W	550 m	4.57 nm
07	SEFN4	61° 09.30' N	02° 17.50' W	630 m	3.85 nm
08	NOL-3a	61° 11.00' N	02° 25.00' W	730 m	3.98 nm
09	NOL-04	61° 14.00' N	02° 40.00' W	1080 m	7.82 nm
10	NOL-05	61° 21.00' N	03° 10.00' W	1370 m	16.03 nm
11	NOL-06	61° 28.00' N	03° 42.00' W	1235 m	16.84 nm
12	FARN2	61° 32.00' N	03° 57.00' W	1200 m	8.18 nm
13	NOL-07	61° 35.00' N	04° 15.00' W	990 m	9.08 nm
14	FARN1	61° 38.00' N	04° 33.00' W	530 m	9.07 nm
15	NOL-08	61° 42.00' N	04° 51.00' W	235 m	9.44 nm
16	NOL-09	61° 49.00' N	05° 21.00' W	180 m	15.84 nm
17	NOL-10	61° 54.00' N	05° 45.00' W	290 m	12.37 nm
18	NOL-11A	61° 56.50' N	05° 57.00' W	159 m	7.0 nm
Totals				10245 m	162.60 nm

Fair Isle - Munken (FIM)

#	Name	Latitude	Longitude	Depth	Spacing
01	FIM-01	60° 10.00' N	03° 44.00' W	150 m	
02	SEFF1	60° 13.00' N	03° 51.50' W	170 m	4.74 nm
03	FIM-02	60° 16.00' N	03° 59.00' W	200 m	4.84 nm
04	SEFF2	60° 18.00' N	04° 04.50' W	330 m	3.36 nm
* 05	<i>FIM-03</i>	<i>60° 20.00' N</i>	<i>04° 10.00' W</i>	<i>390 m</i>	<i>3.03 nm</i>
06	FIM-04	60° 25.00' N	04° 19.00' W	655 m	6.88 nm
07	FIM-05	60° 29.00' N	04° 26.00' W	995 m	5.45 nm
08	FIM-06	60° 35.00' N	04° 45.00' W	1090 m	11.15 nm
09	FIM-6a	60° 38.00' N	04° 54.00' W	1030 m	5.33 nm
10	FIM-07	60° 43.00' N	05° 06.00' W	915 m	7.70 nm
11	FIM-08	60° 47.00' N	05° 16.00' W	830 m	6.34 nm
12	FIM-09	60° 51.00' N	05° 29.00' W	600 m	7.36 nm
13	FARF3	60° 56.70' N	05° 42.80' W	333 m	8.90 nm
14	FIM-10	61° 02.00' N	05° 57.00' W	280 m	8.68 nm
15	FARF2	61° 07.20' N	06° 09.40' W	250 m	7.95 nm
16	FIM-11A	61° 11.30' N	06° 20.00' W	242 m	7.0 nm
Totals				8,558 m	108.18 nm

AlterEco

#	Name	Latitude	Longitude	Depth [m]	Spacing
01	AlterEco1	57° 00.00' N	02° 04.00' E	92	
02	AlterEco2	57° 00.00' N	01° 48.00' E	94	8.72 nm
03	AlterEco3	57° 00.00' N	01° 36.00' E	99	6.54 nm
04	AlterEco4	57° 00.00' N	01° 22.00' E	104	7.63 nm
05	AlterEco5	57° 00.00' N	01° 08.00' E	85	7.63 nm
06	AlterEco6	57° 00.00' N	00° 54.00' E	102	7.61 nm
07	AlterEco7	57° 00.00' N	00° 40.00' E	92	7.61 nm
08	AlterEco8	57° 00.00' N	00° 27.00' E	89	7.09 nm
09	AlterEco9	57° 00.00' N	00° 14.00' E	84	7.09 nm
10	AlterEco10	57° 00.00' N	00° 00.00' E	83	7.61 nm
11	AlterEco11	57° 00.00' N	00° 14.00' W	79	7.61 nm
12	AlterEco12	57° 00.00' N	00° 28.00' W	82	7.63 nm
13	AlterEco13	57° 00.00' N	00° 42.00' W	68	7.63 nm
14	AlterEco14	57° 00.00' N	00° 55.00' W	75	7.07 nm
15	AlterEco15	57° 00.00' N	01° 08.00' W	67	7.07 nm
16	AlterEco16	57° 00.00' N	01° 28.00' W	68	10.91 nm
17	AlterEco17	57° 00.00' N	01° 47.00' W	98	10.56 nm
18	<i>AlterEco18</i>	<i>56° 57.80' N</i>	<i>02° 06.80' W</i>	<i>47</i>	<i>10.78 nm</i>
Totals				1508 m	136.83 nm

Loch Ewe Transect

stn	lat		lon			Depth	distance
0	57	50.982	5	39.010	W	46	
1	57	52.104	5	39.674	W	32	1
2	57	53.061	5	40.245	W	37	1
3	57	53.977	5	41.118	W	55	1
4	57	54.893	5	41.992	W	62	1
5	57	55.810	5	42.865	W	82	1
6	57	56.726	5	43.739	W	104	1
7	57	57.642	5	44.612	W	95	1
8	57	58.559	5	45.486	W	123	1
						640	8