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MRV *Scotia*

Survey 1920S

REPORT

11-21 December 2020

Loading: Aberdeen, 08 December 2020
Unloading: Aberdeen, 21 December 2020

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

Personnel

B Rabe (SIC)
H Smith (co-SIC)
A Gallego
M Rennie
S Wells
P Stainer
N Mcleod

Out-turn days per project: 11 days: ST05b

Gear

Sea-Bird CTD/Carousel, water filtering equipment, COMPASS data buoy deployment equipment, chemistry sampling equipment

Objectives

1. Test the SBE911 and CTD carousel (main CTD crane) in the Buchan Deep. **(tested in Stonehaven instead)**

2. Perform routine hydrographic sampling at stations along the long term monitoring JONSIS section in the northern North Sea (Priority 1). **(achieved)**

3. Perform routine hydrographic sampling at stations along the long term monitoring Faroe-Shetland Channel section: Nolso-Flugga (Priority 1). **(achieved)**

4. Perform routine hydrographic sampling at stations along the long term monitoring Faroe-Shetland Channel section Fair Isle-Munken (Priority 1). **(achieved)**

5. COMPASS project - Recover existing Loch Ewe mooring and deploy the new data buoy (plus conduct a CTD cast at the mooring location) (Priority 1). **(achieved)**

6. Take salinity, nutrient, chlorophyll, dissolved oxygen, TADIC samples along all standard lines. **(achieved)**

7. Run the thermosalinograph throughout the survey. **(achieved)**

8. Run the VMADCP on all the standard sections. **(achieved)**

   None of the proposed extra work got completed, except the below, due to mostly mechanical issues and some weather delays.

9. Perform a Stonehaven CTD cast at the beginning and end of cruise. **(achieved)**

10. Perform hydrographic sampling along the Stonehaven AlterEco section in the northern North Sea (Priority 2). **(partially achieved, one station conducted)**

11. Perform VMADCP survey in Loch Ewe while waiting for daylight for mooring work **(achieved)**

Narrative

11/12/2020
Scotia left Aberdeen at 08:00, the science crew had a muster drill on the hangar deck and a scientific briefing. We then headed to the Stonehaven sampling site, where we did two CTD casts, one with full sampling and demonstration (until 13:30). At that point the forecast was rather bad for the North Sea and offshore so we headed straight to Loch Ewe in rough conditions.

12/12/2020
Overnight we steamed to Loch Ewe, and got the COMPASS data buoy ready for deployment in the morning. We held a tool box talk in the hangar deck and arrived at the mooring location in Loch Ewe around lunch time. We had checked details of the existing mooring (mooring line, pCO2 mooring, etc) with Jane to make sure we knew what to expect. At that point a motor for an air cooling system in the engine room broke and the engineers worked on it all afternoon. It turned out we would either need a new part (as there was no spare onboard) (get one delivered to Ullapool) or, after various phone calls, try air cooling the system. The decision was made to run tests in the morning (and not in the evening) to have all engineering staff available for this work. We also decided to recover the existing mooring the next day and deploy the COMPASS data buoy. We turned the VMADCP on at 14:30 to collect data at the mouth of Loch Ewe and changed the settings slightly later on to adjust for the deeper water depth.

13/12/2020
The engineers ran their tests after breakfast to determine if the air cooling will work or if we needed a new part. It was determined that more tests were needed after the mooring work. The VMADCP was running during the whole time. At 10:30 the existing Loch Ewe mooring was recovered without any issues. The COMPASS data buoy was ready and deployed at 11:30 with no problems and lots of camera and video footage for documentation. We hung around in the area for an hour to make sure

sensible data was getting transmitted (which it did), conducted one CTD cast for calibration purposes and then started steaming north. The further tests then reveiled that we would need the new part (otherwise we would be restricted to 4 knots) so we made our way to Ullapool (for easy delivery of the part) where we sat on anchor for the rest of the day.

14/12/2020
The part was sourced and had to get delivered to Ullapool. We were anchored in Ullapool until 18:30 when we went alongside to collect the new part, which was onboard by 19:00. The engineers installed the motor as we started heading north towards the eastern end of the NOL line. They tested the new motor but the same issue with overheating occurred again. It turned out that it wasn't the motor after all, there was an issue with a cable. At 23:45 the decision was made to stay along the NW coast overnight in shelter, give the engineers a chance to rest and then let them continue working on the problem in the morning.

15/12/2020
In the morning the engineers reinstalled the old (smaller) motor with the new cable and ran some more tests, which worked. The VMADCP was turned on at 08:00, just in case we would be in the area for a while. Contingency plans were made to skip stations on FIM, all of FIM, stations on NOL and/or stations on Jonsis. But the trials were successful and by 11:00 we were on our way to the eastern end of NOL. We steamed north for the rest of the day.

16/12/2020
We started the NOL line at 05:00 after a few issues with the DP. The downstairs walk-in freezer packed in in the last days and the nutrient samples from Stonehaven had completely defrosted. Nutrient samples were then stored in the back-up freezer. We continued working on NOL stations throughout the rest of the day.

17/12/2020
We continued sampling on NOL with a few bottle firing issues and successfully finished the line at 16:30. The last NOL station (NOL-11) was moved (NOL-11A) to avoid entering the 12nm Faroese waters. We then made our way to the start of the FIM line where we skipped FARF – 01 and slightly moved FIM 11. We started FIM at 21:20 and continued on the line for the rest of the night in good conditions.

18/12/2020
We continued sampling FIM in good conditions (3m swell, wind picking up over time) and finished the line successfully at 22:00. We then steamed to the western end of the Jonsis line.

19/12/2020
We arrived at the western end of the Jonsis line at 5:00 and started the sampling. The wind picked up during the day so at stations with TADIC and dissolved oxygen samples we asked the bridge to stay in DP until the sampling was finished. The whole line was successfully completed by 18:45 and we started making our way south-east to Stonehaven. The wind had picked up again and we had to go slower in bumpy conditions for the rest of the night.

20/12/2020
Overnight and the first part of the day we steamed towards Stonehaven where we arrived at 14:15, We conducted sampling at the two main Stonehaven sites and one AlterEco site. We then made our way back to Aberdeen, packing equipment away and we were at the quayside at 20:00.

21/12/2020
We unloaded first thing in the morning and all science crew had disembarked by xxx.

The TSG was running throughout the trip with 24 salinity and chlorophyll samples collected for

calibration.

COMPASS Data buoy Position (Recovery/Deployment during daylight hours)

Loch Ewe	57° 50.982' N	005° 39.01' W	water depth: ~45m

Scientific Procedures

Deployments of hydrographic equipment were carried out with the CTD crane whilst the vessel was on station. The mooring recovery and buoy deployment was done from the trawl deck.
Two container laboratories were used (one for water filtering and a dry container for communications with sampling equipment). Chlorophyll samples were stored frozen in the freezer in the Fish House and nutrient samples in the back-up freezer down below.

(NOTE: The survey will potentially 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).

Normal contacts were maintained with the laboratory.

Sampling

Overall, 52 hydrographic stations were completed. 298 nutrient samples were collected (one at sampled depth), as well as 115 chlorophyll (one at sampled depth) (plus 24 for TSG calibration), 99 oxygens (triplicates at each sampled depth), 286 TADICs (duplicates at each depth) and 92 salinity calibration samples (duplicates at each sampled depth) (plus 24 for TSG calibration).

Submitted:
Berit Rabe and Helen Smith
20 December 2020

Approved:

Figure 1: Map of main monitoring lines (Jonsis, NOL, FIM)

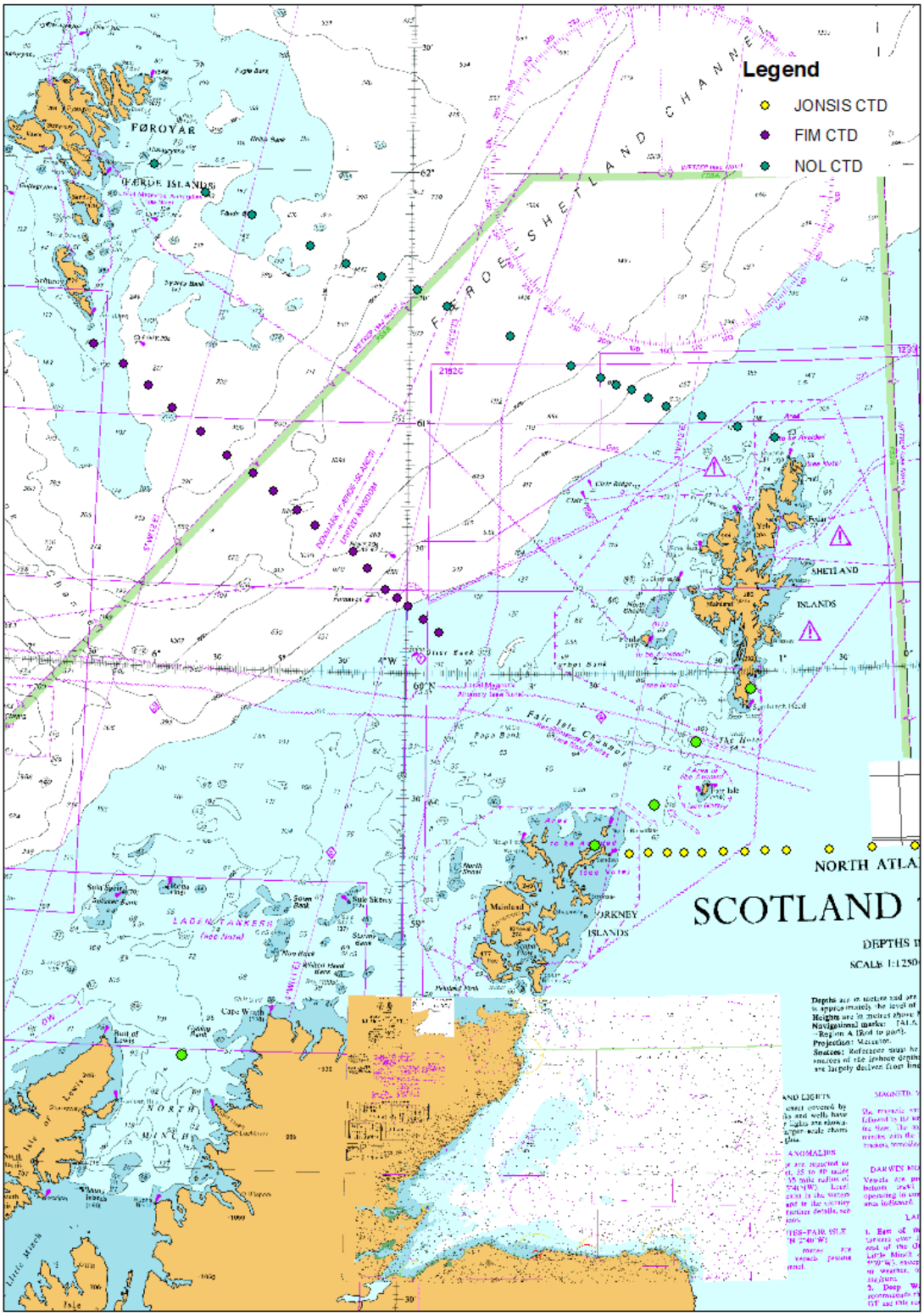

Figure 2: Map of COMPASS data buoy deployment location

Table 1: Jonsis

CODES	#	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

Priority Stations are JO-01, JO-03 and JO-06a, JO-10

Table 2: NOL line
Nolso-Flugga

CODE	#	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-11**	**62° 00.00' N**	**06° 12.00' W**	**125 m**	**14.04 nm**
				Totals	8250 m	162.60 nm

If stations need to be missed they should be dropped in this order
[Priority 4: FARN1, FARN2], [Priority 3: SEFN1, SEFN2, SEFN3, SEFN4]
[Priority 2, NOL-3a, NOL-05, NOL-07, NOL-10]

Table 3: FIM
Fair Isle - Munken

(Amended for presence of Foinaven oil platform)

CODE	#	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**	***FIM-03***	***60° 20.00' N***	***04° 10.00' W***	***390 m***	***3.03 nm***
	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-11**	**61° 12.00' N**	**06° 22.00' W**	**240 m**	**7.67 nm**
	17	FARF1	61° 16.40' N	06° 37.70' W	100 m	8.80 nm
				Totals	8,558 m	108.18 nm

If stations need to be missed they should be dropped in this order
[Priority 4: FARF1, FARF2. FARF3], [Priority 3: SEFF1, SEFF2]
[Priority 2, FIM-04, FIM-06a, FIM-07]

Table 4: Stonehaven sampling

Stonehaven CTD stations

CODE	#	Name	Latitude	Longitude	Depth [m]	Spacing
N, CH, O, DS, TADIC	**1**	**Stonehaven 2**	**56° 57.801' N**	**02° 06.795' W**	47	0.77 nm
CTD only	**2**	**Stonehaven 1**	**56° 57.801' N**	**02° 08.157' W**	47	

Standard depths of water bottles at Stonehaven: 1, 5, 10, bottom