MRV *Scotia*

Survey 1815S

REPORT

10-22 December 2015

Loading: Aberdeen, 8 December 2015
Unloading: Aberdeen, 22 December 2015

Personnel

B Rabe	(SIC)
M Geldart	
D Lee	
J Hindson	
N Collie	
J Hunter	
A Taylor	
A Lechtenboerger	(Visitor – University of Kiel)

Out-turn days per project: 13 days: ST03P

Gear

Sea-Bird CTD/Carousel, Plankton Nets (ARIES)

Objectives

1. Test the CTD in the Buchan Deep off Peterhead and test plankton crane, winch system and ARIES at an appropriate location before its first use.

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

3. Perform routine hydrographic sampling at stations along the long term monitoring Faroe-Shetland Channel sections: Fair Isle-Munken and Nolso-Flugga (Priority 1).

4. Conduct combined plankton/hydrographic observations by deploying Aries in the Faroe-Shetland-Channel at selected stations on the Fair Isle-Munken and Nolso-Flugga lines.

5. Take nutrient, chlorophyll, TA/DIC, oxygen samples along all standard lines.

6. Take oxygen isotope samples along the Faroe-Shetland-Channel sections.

7. Take water samples for bacterial analysis by Heriot Watt University at locations along the long term monitoring sections.

8. Take water samples to investigate the formation of Marine Oil Snow in incubations with Schehallion crude oil by Heriot Watt University along the long term monitoring sections.

9. Run the thermosalinograph throughout the survey.

10. Run the pCO2 system throughout the survey.

11. If time, conduct sampling along any of the following sections (in order of priority, no water sampling):

    - Priority 2: Shelf 0, Shelf 1, Fair Isle N-S, NS-1;
    - Priority 3: FCW/NWZ, Shelf 2;
    - Priority 4: WS-1, Fair Isle E-W, ES-1, ES-2, ES-3, WS-2;
    - Priority 5: East Coast.

12. If sheltering in a suitable location (around Shetland, Orkney, and Pentland Firth) due to bad weather conduct VMADP survey.

Narrative

Staff joined *Scotia* at 08:00 hours (times GMT through out) and sailed from Aberdeen at 09:30 hours on Thursday 10 December and headed to the start of the JONSIS section. A slight delay in sailing time was due to train disruption and a member of staff running late. On route to the first station, following completion of musters, drills, etc, a briefing on the bridge discussed ARIES deployments and tows with all relevant scientists, engineers and crew. At the Buchan Deep the CTD and carousel instrumentation was deployed at a trial station to check that it was functioning properly (Station 455). The system was working but an attached scanmar showed an offset so a second cast (Station 456) was performed to test a separate scanmar sensor which was working fine. The plankton crane and Aries deployment was also tested with a deployment down to 30 m and everything was working properly. The Thermosalinograph was set up but showed low salinity readings. The instrument was cleaned and then showed realistic salinity readings. An un-repairable fault on the PCo2 plumbing system meant the system was inoperable. After successful trials, *Scotia* made way to the first JONSIS station and arrived at 02:38 hours on Friday 11 December. A few of the stations required a repeat cast due to the amount of water needed. This section was completed at 19:10 hours the same day (Stations.457-472).

Scotia then made passage around the west side of Shetland to the start of the Nolso - Flugga section. The line was started at 07:42 hours on Saturday 12 December. Good progress was made in calm weather with no problems. Winds and swell were low to moderate. All Ctd stations (Stations 473-495) and ARIES (7) were completed and the line finished midday on 14 December. Forty six nutrient samples were contaminated due to fish samples residing in an on-board freezer. The vessel then steamed along the eastern side of Faroe to the start of the FIM line and started CTD and water sampling on that line at 15:43 hours on 14 December. A problem with a bearing on the CTD crane was repaired by the engineers while ARIES station FIM-06 was completed. The wind picked up over time and we had to skip station FIM-03 due to strong drift too close to the Foinaven oil platform. The FIM line was completed in the morning of 16 December (Stations 496-515, 5 ARIES).

Along both the NOL and FIM lines extra water sampling was conducted for students at Heriot-Watt-University. We collected water at one station from 5 m for marine oil snow and five samples from different stations for bacterial analysis. Unfortunately, the carbuoy for the marine oil snow experiments leaked and only 31 in extra containers were eventually saved.

The vessel then made our way to the NW end of the Shelf-1 line, starting at 13:26 hours on 16 December and was completed am on 17 December (Stations 516-524). An extra sample for bacterial analysis was collected at S1-8 due to the one missed station on the FIM line.

Then it was a short steam to the start of the Fair Isle N-S line which was started at 10:30 hours and finished at 19:45 hours the same day (Stations 525-532). After another short steam we started the Fair Isle E-W line at 00:50 hours on 18 December 2015 which was completed without

problems at 10:45 hours the same day (Stations 533-540). Due to large swell to the west of Shetland the decision was made to continue sampling to the east of Shetland in more sheltered water as the wind was from the S and SW. The East of Shetland Line 1 was conducted between 16:05 hours on 18 December and 09:00 hours the following day (Stations 541-554).

The compressor of the large freezer container broke but luckily all samples had already been processed.

The vessel then headed north to the next line, East of Shetland 2, this line was completed from east to west, skipping five stations that are only relevant during stratified conditions. Since we found well-mixed conditions, the higher spatial resolution was not necessary. Sampling was stopped after four stations (Stations 555-558) at 17:45 hours due to poor weather and the vessel headed towards Shetland to shelter overnight. Work continued from the western part of the line at 8:00 hours on 20 December. At noon, after completing Stations 559-563, sampling was stopped due to the weather and imminent SW gale forecast. The vessel then headed for Aberdeen docking at 12:00 hours on 22 December. The vessel was unloaded with equipment returned to the lab and back loaded for survey 0116S.

The thermosalinograph was run continuously throughout the survey.

Results

The whole survey was carried out in good weather with no work disruption except for one evening and an early start on the homeward journey due to gale force winds.

1. CTD and water sampling was carried out along the JONSIS standard section in the northern North Sea.

2. CTD and water sampling was carried out along the standard Faroe Shetland Channel sections, Fair Isle – Munken and Nolso – Flugga (missing one station along the Fair Isle – Munken line).

3. CTD sampling was conducted along the following extra sections: Shelf 1, Fair Isle NS, Fair Isle E-W, East of Shetland 1, East of Shetland 2 (missing two stations) (total CTD stations: 108).

4. 12 ARIES deployments were carried out during the survey, yielding 12 OPC data sets, 12 Seabird CTD profiles and 383 plankton samples.

5. TA/DIC (Total Alkalinity/Dissolved Inorganic Carbon) and oxygen samples were taken at stations JO-1 (Stn.472), JO-3 (468), JO-6A (462), JO-10 (457), FIM-6 (509), FIM-8 (504), FIM-11 (498), NOL-2 (477), NOL-4 (483), NOL-6 (486), NOL-8 (491) and NOL-11 (495).

6. Nutrient samples were taken along the standard lines.

7. Extra water samples were taken for bacterial analysis by Heriot Watt University at standard locations (five samples) and samples were taken at one station on the FIM line for marine oil snow.

8. Oxygen isotope samples were taken at all stations in the Faroe-Shetland-Channel.

9. Throughout the survey sea surface temperature, salinity and fluorescence recordings were made using a Sea-bird SBE21 Thermosalinograph. Surface samples were taken throughout the survey to calibrate the conductivity and fluorometer data.

10. CTD data were e-mailed to BODC throughout the survey for submission to the Met office for input to weather forecasting models.

11. The thermosalinograph was run throughout the survey

Detailed results of the hydrographic data collected during the survey will be made available as the data is worked up. Calibrations were carried out on *Scotia* for both the thermosalinograph and CTD instrumentation.

Submitted:
B Rabe
29 December 2015

Approved:
I Gibb
03 January 2016

Figure 1: Map including the three main monitoring lines Jonsis, FIM and NOL and other potential sampling lines.

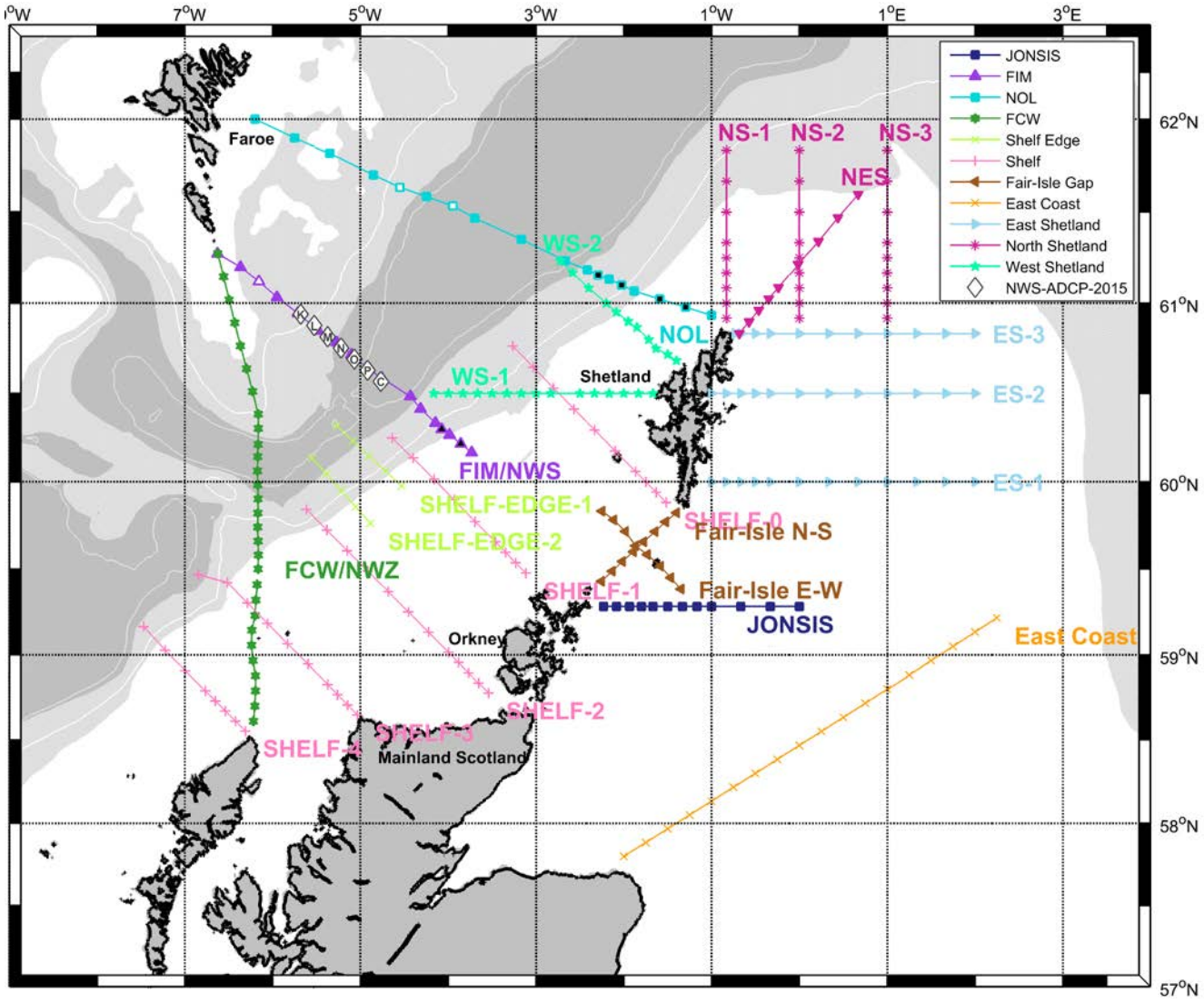

Table 1

JONSIS Line

CODES	#	Name	Latitude	Longitude	Depth	Spacing
N, T,O,CH, DS	01	JO 1	59° 17.00' N	02° 14.00' W	75 m	
N,CH,DS	02	JO 1A	59° 17.00' N	02° 5.00' W	90 m	4.59 nm
N,CH,DS	03	JO 2	59° 17.00' N	01° 56.00' W	100 m	4.59 nm
N, T,O,CH, DS	04	JO 3	59° 17.00' N	01° 48.00' W	80 m	4.08 nm
N,CH,DS	05	JO 4	59° 17.00' N	01° 40.00' W	90 m	4.08 nm
N,CH,DS	06	JO 5	59° 17.00' N	01° 30.00' W	95 m	5.10 nm
N,CH,DS	07	JO 6	59° 17.00' N	01° 20.00' W	110 m	5.10 nm
N, T,O,CH, DS	08	JO 6A	59° 17.00' N	01° 10.00' W	120 m	5.10 nm
N,CH,DS	09	JO 7	59° 17.00' N	01° 0.00' W	125 m	5.10 nm
N,CH,DS	10	JO 8	59° 17.00' N	00° 40.00' W	120 m	10.20 nm
N,CH,DS	11	JO 9	59° 17.00' N	00° 20.00' W	140 m	10.20 nm
N, T,O,CH, DS	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

Standard depths of water bottles:

5, 10, 20, 30, 50, 75, 100 and bottom*

*Fire a ‘bottom’ bottle if seabed is more than 20m below the lowest standard bottle

JONSIS Sampling Strategy

Seasonal Variations

In May and December, the sampling strategy is **full**. Nutrients are taken at all stations, Ta-DIC and Oxygen samples are also taken.

In October, the sampling strategy is **reduced.** Nutrients are taken at a limited set of stations, Oxygen samples are taken but no Ta-DIC samples are taken.

Methods/Codes

[S] Salinity and chlorophyll [CH+] (2 liter) to be taken from the thermosalinograph supply at all stations

[DS] Duplicate salinities at all stations at depths of 50m, 75m and 100m

[CH] Chlorophyll (1 liter) to be taken at all stations at 10m, 20m, 30m, 50m and 75m

Nutrients to be taken using plastic tubes. These are analyzed for silicate/nitrate/phosphate. Samples should be stored in a fridge in the chemistry container or in a cleaned (fish free!) freezer below if they are not analyzed on board.

[N] Nutrients to be taken at all depths/ Oxygen Isotopes taken at same depths/locations

[T] TA-DIC to be taken at all depths

[O] Oxygen to be taken at 10m, 30m and 75m

Table 2

Fair Isle – Munken: (Amended for presence of Foinaven oil platform; SEFOS naming changed Nov-2014**,** Updated for 2015 to include additional Faroese Stations).

CODE	#	Name	Latitude	Longitude	Depth	Spacing
N, CH, DS	**01**	**FIM-01**	**60° 10.00' N**	**03° 44.00' W**	**150 m**	
N, CH, DS	**02**	**SEFF1**	**60° 13.00' N**	**03° 51.50' W**	**170 m**	**4.74 nm**
N, T, O, CH, DS	**03**	**FIM-02**	**60° 16.00' N**	**03° 59.00' W**	**200 m**	**4.84 nm**
N, CH, DS ARIES	**04**	**SEFF2**	**60° 18.00' N**	**04° 04.50' W**	**330 m**	**3.36 nm**
N, CH, DS	**** 05***	***FIM-03***	***60° 20.00' N***	***04° 10.00' W***	***390 m***	***3.03 nm***
N, CH, DS	**06**	**FIM-04**	**60° 25.00' N**	**04° 19.00' W**	**655 m**	**6.88 nm**
N, CH, DS ARIES	**07**	**FIM-05**	**60° 29.00' N**	**04° 26.00' W**	**995 m**	**5.45 nm**
N,T,O,CH, DS ARIES (Priority)	**08**	**FIM-06**	**60° 35.00' N**	**04° 45.00' W**	**1090 m**	**11.15 nm**
		*FIM-06**	*60° 35.00' N*	*04° 45.00' W*	*1090 m*	
N, CH, DS	**09**	**FIM-6a**	**60° 38.00' N**	**04° 54.00' W**	**1030 m**	**5.33 nm**
N, CH, DS ARIES	**10**	**FIM-07**	**60° 43.00' N**	**05° 06.00' W**	**915 m**	**7.70 nm**
N, T, O, CH, DS	**11**	**FIM-08**	**60° 47.00' N**	**05° 16.00' W**	**830 m**	**6.34 nm**
N, CH, DS	**12**	**FIM-09**	**60° 51.00' N**	**05° 29.00' W**	**600 m**	**7.36 nm**
nil	13	FARF3	60° 56.70' N	05° 42.80' W	333 m	8.90 nm
N, CH, DS ARIES	**14**	**FIM-10**	**61° 02.00' N**	**05° 57.00' W**	**280 m**	**8.68 nm**
nil	15	FARF2	61° 07.20' N	06° 09.40' W	250 m	7.95 nm
N, T, O, CH, DS	**16**	**FIM-11**	**61° 12.00' N**	**06° 22.00' W**	**240 m**	**7.67 nm**
nil	17	FARF1	61° 16.40' N	06° 37.70' W	100 m	8.80 nm
				Totals	8,558 m	108.18 nm

* FIM-03 - Use 60 20.25'N 004 09.00'W if above position is occupied.

Standard depths of water bottles:
5, *50*, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000 and bottom
If all 12 bottles used drop 50m depth.
Fire a bottom bottle if seabed is more than 50m below the lowest standard bottle

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] [Priority 2, FIM-04, FIM-06a, ARIES at FIM-10]

Fair Isle - Munken Sampling Strategy

Notes

Standard stations (FIM* and SEFF*) taken by Marine Scotland are marked in **bold**.

Additional Faroese stations (FARF*) were incorporated in 2015, NO water sampling is required at these stations.

Seasonal Variations

In May and December, the sampling strategy is **full**. Nutrients are taken at all stations, Ta-DIC and Oxygen samples are also taken.

In October, the sampling strategy is **reduced.** Nutrients are taken at a limited set of stations, Oxygen samples are taken but no Ta-DIC samples are taken.

Methods/Codes

[S] Salinity and chlorophyll [CH+] (2 liter) to be taken from the thermosalinograph supply at all **standard** stations (i.e. not FAR*)

[DS] Duplicate salinities at all **standard** stations and all depths **except** at 5m, 50m, 400m, 500m and 600m.

[CH] Chlorophyll (1 liter) to be taken at all **standard** stations at 5m and 50m

Nutrients to be taken using plastic tubes. These are analyzed for silicate/nitrate/phosphate. Samples should be stored in a fridge in the chemistry container or in a cleaned (fish free!) freezer below if they are not analysed on board.

[N] denotes Nutrients to be taken at all depths/ Oxygen Isotopes taken at same depths/locations

[N*] denotes Nutrients to be taken at 5, 100, 300, 500, 700, 900, 1100 and bottom.

[T] denotes TA-DIC to be taken at all depths.

[O] denotes Oxygen to be taken at 5, 100, 300, 700, 900, 1100 and bottom [exclude 500m!]

FIM-01 4 replicate samples at 50m and 100m
FIM-06 4 replicate samples at 200m, 500m, 800m, 1000m
Use former IAPSO Standard Sea Water bottles. Crimp sealed and labelled

Table 3

Nolso-Flugga: (SEFOS naming changed Nov-2014, Updated for 2015 to include additional Faroese Stations).

CODES	#	Name	Latitude	Longitude	Depth	Spacing
N, CH, DS	**01**	**NOL-01**	**60° 56.00' N**	**01° 00.00' W**	**110 m**	
N, CH, DS ARIES	**02**	**SEFN1**	**60° 58.70' N**	**01° 17.70' W**	**125 m**	**9.00 nm**
N, CH, DS	**03**	**SEFN2**	**61° 01.40' N**	**01° 35.40' W**	**155 m**	**8.99 nm**
N, T, O, CH, DS	**04**	**NOL-02**	**61° 04.00' N**	**01° 53.00' W**	**270 m**	**8.91 nm**
N, CH, DS ARIES	**05**	**SEFN3**	**61° 06.00' N**	**02° 01.50' W**	**440 m**	**4.57 nm**
N, CH, DS	**06**	**NOL-03**	**61° 08.00' N**	**02° 10.00' W**	**550 m**	**4.57 nm**
N, CH, DS	**07**	**SEFN4**	**61° 09.30' N**	**02° 17.50' W**	**630 m**	**3.85 nm**
N, CH, DS	**08**	**NOL-3a**	**61° 11.00' N**	**02° 25.00' W**	**730 m**	**3.98 nm**
N, T, O, CH, DS ARIES	**09**	**NOL-04**	**61° 14.00' N**	**02° 40.00' W**	**1080 m**	**7.82 nm**
N, CH, DS ARIES(Priority)	**10**	**NOL-05**	**61° 21.00' N**	**03° 10.00' W**	**1370 m**	**16.03 nm**
	10	*NOL-05**	*61° 21.00' N*	*03° 10.00' W*	*1370 m*	*16.03 nm*
N, T, O, CH, DS ARIES(Priority)	**11**	**NOL-06**	**61° 28.00' N**	**03° 42.00' W**	**1235 m**	**16.84 nm**
nil	12	FARN2	61° 32.00' N	03° 57.00' W	1200 m	8.18 nm
N, CH, DS ARIES	**13**	**NOL-07**	**61° 35.00' N**	**04° 15.00' W**	**990 m**	**9.08 nm**
nil	14	FARN1	61° 38.00' N	04° 33.00' W	530 m	9.07 nm
N, T, O, CH, DS ARIES	**15**	**NOL-08**	**61° 42.00' N**	**04° 51.00' W**	**235 m**	**9.44 nm**
N, CH, DS	**16**	**NOL-09**	**61° 49.00' N**	**05° 21.00' W**	**180 m**	**15.84 nm**
N, CH, DS	**17**	**NOL-10**	**61° 54.00' N**	**05° 45.00' W**	**290 m**	**12.37 nm**
N, T, O,CH, DS	**18**	**NOL-11**	**62° 00.00' N**	**06° 12.00' W**	**125 m**	**14.04 nm**
				Totals	10245 m	162.60 nm

Standard depths of water bottles:

5, *50*, 100, *200*, 300, *400*, 500, 600, 700, 800, 900, 1000, 1100, 1200 and bottom

If all 12 bottles used drop 50m, 200m and 400m depths in this order.
Fire a bottom bottle if seabed is more than 50m below the lowest standard bottle

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-10, ARIES at NOL-08]

Nolso-Flugga Sampling Strategy

Notes

Standard stations (NOL* and SEFN*) taken by Marine Scotland are marked in **bold**.

Additional Faroese stations (FARN*) were incorporated in 2015, NO water sampling is required at these stations

Seasonal Variations

In May and December, the sampling strategy is **full**. Nutrients are taken at all stations, Ta-DIC and Oxygen samples are also taken.

In October, the sampling strategy is **reduced.** Nutrients are taken at a limited set of stations, Oxygen samples are taken but no Ta-DIC samples are taken.

Methods/Codes

[S] Salinity and chlorophyll [CH+] (2 liter) to be taken from the thermosalinograph supply at all **standard** stations (i.e not FAR*)

[DS] Duplicate salinities at all **standard** stations and all depths **except** at 5m, 50m, 400m, 500m and 600m.

[CH] Chlorophyll (1 liter) to be taken at all **standard** stations at 5m and 50m

Nutrients to be taken using plastic tubes. These are analyzed for silicate/nitrate/phosphate. Samples should be stored in a fridge in the chemistry container or in a cleaned (fish free!) freezer below if they are not analyzed on board.

[N] Nutrients to be taken at all depths/ Oxygen Isotopes taken at same depths/locations

[N*] Nutrients to be taken at 5, 100, 300, 500, 700, 900, 1100 and bottom

[T] TA-DIC to be taken at all depths

[O] Oxygen to be taken at 5, 100, 300, 700, 900, 1100 and bottom [exclude 500m!]

Table 4

Shelf 1

	Name	Latitude	Longitude	Depth	Spacing
01	S1_1	59° 28.61' N	03° 07.08' W	m	
02	S1_2	59° 32.14' N	03° 14.02' W	m	4.99 nm
03	S1_3	59° 35.75' N	03° 20.95' W	m	5.03 nm
04	S1_4	59° 39.41' N	03° 27.89' W	m	5.06 nm
05	S1_5	59° 46.46' N	03° 41.96' W	m	9.99 nm
06	S1_6	59° 53.74' N	03° 55.93' W	m	10.10 nm
07	S1_7	60° 00.88' N	04° 09.99' W	m	10.01 nm
08	S1_8	60° 08.01' N	04° 24.25' W	m	10.06 nm
09	S1_9	60° 14.96' N	04° 38.22' W	m	9.81 nm
			Totals	m	65.05 nm

No water sampling.

Table 5

Fair Isle N-S

	Name	Latitude	Longitude	Depth	Spacing
01	FI_NS1	59° 49.40' N	01° 24.00' W	67 m	
02	FI_NS2	59° 46.30' N	01° 31.50' W	99 m	4.88 nm
03	FI_NS3	59° 42.90' N	01° 38.70' W	121 m	4.97 nm
04	FI_NS4	59° 39.40' N	01° 46.40' W	106 m	5.22 nm
05	FI_NS5	59° 36.00' N	01° 53.50' W	90 m	4.94 nm
06	FI_NS6	59° 32.60' N	02° 01.00' W	109 m	5.09 nm
07	FI_NS7	59° 29.20' N	02° 08.00' W	86 m	4.91 nm
08	FI_NS8	59° 25.70' N	02° 15.30' W	56 m	5.09 nm
			Totals	m	35.10 nm

Note: FI_NS8 may have to be canceled if arriving on position outside of +/- 1 hours either side of slack water due to up to 3 knot tide.

No water sampling.

Table 6

Fair Isle E-W

	Name	Latitude	Longitude	Depth	Spacing
01	FI_1	59° 23.00' N	01° 21.00' W	m	
02	FI_2	59° 27.00' N	01° 28.00' W	m	5.35 nm
03	FI_3	59° 31.00' N	01° 35.00' W	m	5.34 nm
04	FI_4	59° 35.00' N	01° 44.00' W	m	6.06 nm
05	FI_5	59° 38.00' N	01° 52.00' W	m	5.03 nm
06	FI_6	59° 43.00' N	01° 59.00' W	m	6.12 nm
07	FI_7	59° 47.00' N	02° 07.00' W	m	5.67 nm
08	FI_8	59° 50.00' N	02° 15.00' W	m	5.01 nm
			Totals	m	38.58 nm

No water sampling.

Table 7

ES-1

	Name	Latitude	Longitude	Depth	Spacing
01	*ES1_0*	*60° 00.00' N*	*01° 07.08' W*	*78 m*	
02	*ES1_0A*	*60° 00.00' N*	*00° 02.26' W*	*92 m*	*1 nm*
03	**ES1_1**	**60° 00.00' N**	**00° 00.00' W**	**106 m**	**2 nm**
04	*ES1_1A*	*60° 00.00' N*	*00° 55.00' W*	*130 m*	*2.45 nm*
05	**ES1_2**	**60° 00.00' N**	**00° 50.00' W**	**130 m**	**4.99 nm**
06	**ES1_3**	**60° 00.00' N**	**00° 40.00' W**	**125 m**	**4.99 nm**
07	**ES1_4**	**60° 00.00' N**	**00° 30.00' W**	**125 m**	**4.99 nm**
08	**ES1_5**	**60° 00.00' N**	**00° 20.00' W**	**150 m**	**4.99 nm**
09	**ES1_6**	**60° 00.00' N**	**00° 00.00' E**	**150 m**	**9.99 nm**
10	**ES1_7**	**60° 00.00' N**	**00° 20.00' E**	**130 m**	**9.99 nm**
11	**ES1_8**	**60° 00.00' N**	**00° 40.00' E**	**125 m**	**9.99 nm**
12	**ES1_9**	**60° 00.00' N**	**01° 00.00' E**	**125 m**	**9.99 nm**
13	ES1_10	60° 00.00' N	01° 20.00' E	120 m	9.99 nm
14	ES1_11	60° 00.00' N	01° 40.00' E	120 m	9.99 nm
			Totals	1410 m	79.90 nm

No water sampling.

Table 8

ES-2

	Name	Latitude	Longitude	Depth	Spacing
01	ES_2M1	60° 30.00' N	01° 00.00' W	97 m	
02	ES_2M2	60° 30.00' N	00° 50.00' W	107 m	4.92 nm
03	*ES_2M2A*	*60° 30.00' N*	*00° 45.00' W*	*89 m*	*2.45 nm*
04	**ES_2M3**	**60° 30.00' N**	**00° 40.00' W**	**136 m**	**2.45 nm**
05	*ES_2M3A*	*60° 30.00' N*	*00° 35.00' W*	*129 m*	*2.45 nm*
06	**ES_2M4**	**60° 30.00' N**	**00° 30.00' W**	**104 m**	**2.45 nm**
07	*ES_2M4A*	*60° 30.00' N*	*00° 25.00' W*	*89 m*	*2.45 nm*
08	**ES_2M5**	**60° 30.00' N**	**00° 20.00' W**	**79 m**	**4.92 nm**
09	*ES_2M5A*	*60° 30.00' N*	*00° 10.00' W*	*111 m*	*4.92 nm*
10	**ES_2M6**	**60° 30.00' N**	**00° 00.00' E**	**117 m**	**4.92 nm**
11	*ES_2M6A*	*60° 30.00' N*	*00° 10.00' E*	*134 m*	*4.92 nm*
12	**ES_2M7**	**60° 30.00' N**	**00° 20.00' E**	**145 m**	**9.84 nm**
13	**ES_2M8**	**60° 30.00' N**	**00° 40.00' E**	**148 m**	**9.84 nm**
14	**ES_2M9**	**60° 30.00' N**	**01° 00.00' E**	**147 m**	**9.84 nm**
15	ES_2M10	60° 30.00' N	01° 20.00' E	129 m	9.84 nm
16	ES_2M11	60° 30.00' N	01° 40.00' E	121 m	9.84 nm
			Totals	m	78.69 nm

No water sampling.