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MRV *Scotia*

Survey 0121S

PROGRAMME

05-20 January 2021

Loading: Aberdeen, 21 December 2020

Sailing: Leith, Tuesday 05 January 2021 (scientific crew travel to Leith by hire car and join Monday 04 January 2021).

Unloading: Aberdeen, 20 January 2021

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

Fishing gear: BT 137 with Ground gear E;

Sediment Sampling: Day grab;

Litter sampling: Catamaran and neuston trawl;

Water sampling: Aquatracka fluorometer, Seabird 25 and sampling frame.

Objectives

1. To undertake water, sediment and biological sampling for the Clean Seas Environmental Monitoring Programme (CSEMP).
2. Monitor and record all litter brought aboard in all trawls. Sample water column and sediment for micro-plastic litter.
3. If possible, deploy Aquatracka and Seabird 25 to collect fluorescence data.

Estimated Days Per Project: 12 days 20461; 2 days 20463; 2 days 20234.

Procedure

Once all drills have been completed, the vessel will depart Leith and head to the first sampling station. The order that sampling locations are visited will be weather dependent and coordinated by the SIC in conjunction with vessel officers. Fish sampling for biological effect assessment will be carried out in multiple locations detailed below (Figure 1, Table 1). Due to a lack of sites in certain sampling regions, two new sites (in red in Table 1) will be tested and assessed for the collection of dab (North of Coll and West of Orkney). If successful, the target species will be sampled for the full suite of tests (Table 2). Another new site is also included in the programme, however, this site is of lower priority as it was unsuccessful last year. The focus of the fishing is Shetland and the west coast. Fish will be sampled for chemical analyses, biological effects and fish diseases (Table 2). Some biological effects measurements will be

carried out during the survey. Full sampling requirements are detailed in SOP 0820 and SOP 0830.

Sediment sampling will be carried out in ten areas (Figure 1): Outer Moray, Inner Moray, East Shetland, East Shetland Basin, West Orkney, North Minch, South Minch, Sea of Hebrides, Hebrides and a site in the Scottish Continental Shelf (name TBC). The number of stations per area varies from 5 to 20. Sediment sampling will also be carried out at the three CSEMP fixed sites (NMMP85 – North Minch, NMMP95 – Inner Moray Firth, NMMP165 – Montrose Bank) and also, if time allows, from a single station in the Outer Forth that was missed on the earlier Alba cruise (0720A). Sediments will be sampled for chemical analyses and determination of microplastic at all locations. The coordinates of all sediments site is shown in Table 3 (primary sites) and Table 4 (secondary sites – used if sampling a primary site failed) at the end of this programme. The sediment sampling in the West of Orkney and in the Scottish Continental Shelf are both new sites.

Monitoring of all litter brought on board during trawling operations will continue throughout the survey. The catamaran will be deployed to sample for micro-plastics whenever possible at specific target locations (Figure 1, Table 5). Samples will be processed onboard as far as possible.

The Aquatracka will also be deployed during the survey, at different locations depending on time availability and weather conditions. Vertical dips and towing (2 m deep at ~3 knots) using the sampling frame will both be tested. Data will be initially processed on board to ensure the Aquatracka is collecting data correctly.

General Arrangements

Liquid nitrogen and buffered formalin will be carried aboard for the preservation and storage of biological material. A full list of chemicals to be carried is attached.

Normal contacts will be maintained with the laboratory.

Submitted:
H Anderson and G. Hermann
15 December 2020

Approved:
I Gibb
15 December 2020

Figure 1: 0121S Proposed sediment areas (black box), fishing sites (green circle for priority sites, blue triangle for lower priority sites) and catamaran trawls (small orange diamond). Number of sediment sites with the sampling box varies from 3-10 sites.

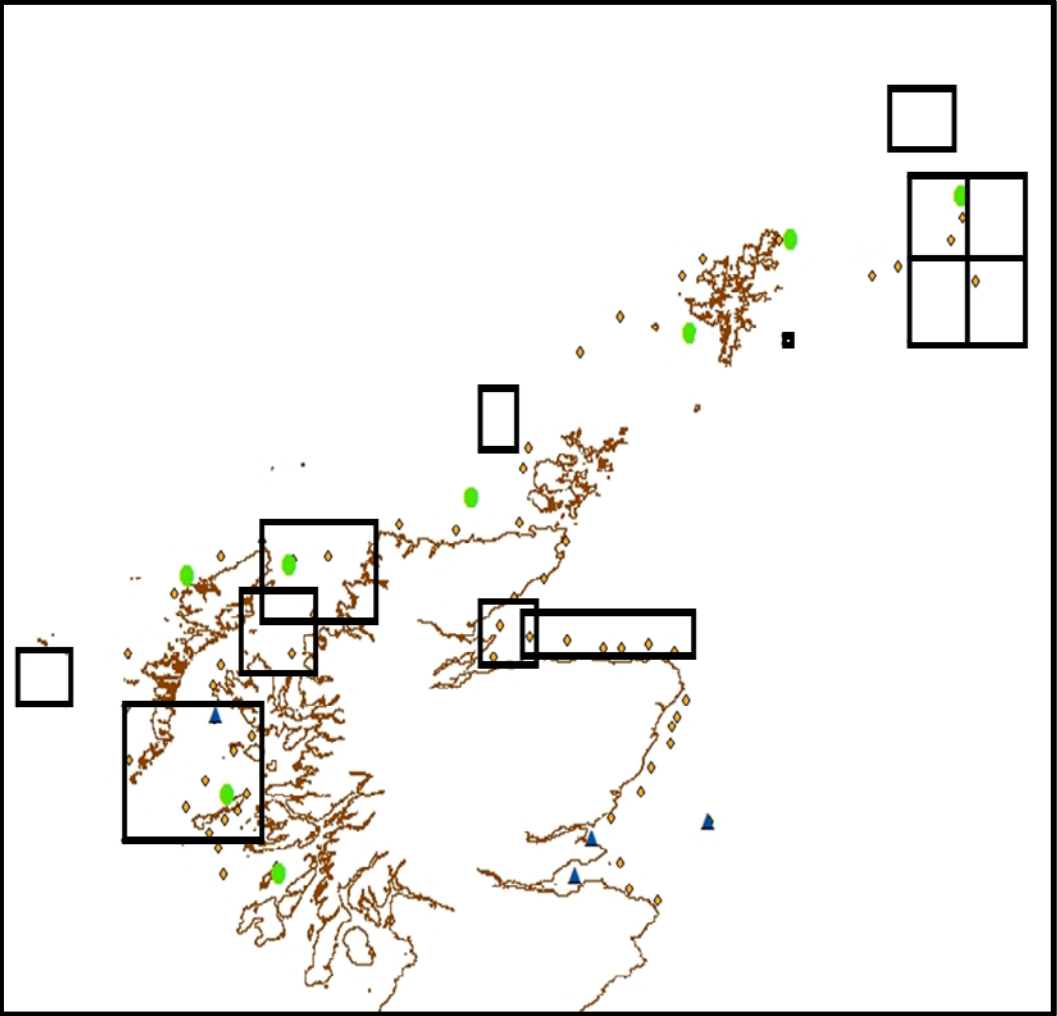


Table 1: 0121S Fishing Sites.

Field ID	Station Dictionary Name	Target Species	Dec Lat	Dec Long	Latitude	Longitude
N Minch	MinchMalin_TheMinchNorth_fi02	Dab (P*)	58.383	-5.967	58 22.98N	005 58.02W
Colonsay	MinchMalin_Colonsay_fi01	Dab (P*)	56.110	-6.080	56 6.60N	006 4.80W
NEW Central Minch (3)**		Dab	57.281	-6.744	57 16.87N	006 44.63W
NEW North of Coll		Dab	56.687	-6.630	56 41.23N	006 37.81W
Hebrides	Hebrides_HebrIntermediate_fi01	Dab	58.300	-7.050	58 18.00N	007 3.00W
W Shetland	WShetland_WShIntermediate_fi01	Dab	60.100	-1.700	60 6.00N	001 42.00W
NEW West Orkney (1)		Dab	58.888	-4.028	58 53.26N	004 1.66W
E Shetland Basin	EShetland_EShOpenSea_fi01	Cod	61.100	1.200	61 6.00N	001 12.00E
E Shetland	EShetland_EShIntermediate_fi01	Dab (P*)	60.778	-0.625	60 46.68N	000 37.50W
St Andrews Bay***	EScotland_CarnoustieFifeN_fi02	Flounder	56.376	-2.749	56 22.56N	002 44.94W
Kingston Hudds***	Forth_FirthFinnerOffshore_fi01	Dab	56.097	-2.923	56 5.82N	002 55.38W
Montrose Bank fixed site 165***	EScotland_EScOpenSea_fi01	Dab	56.500	-1.500	56 30.00N	001 30.00W

* Dab is preferred species but there is also time series for plaice so sample if that's all you get, try to sample plaice once in 5 years.

** Lower priority: this new site was unsuccessful last year.

*** Low priority due to restrictions on sampling programme from pandemic, plenty of data available from this site.

Table 2: Fish sub-samples required.

	Dab	Cod	Plaice	Flounder
Total no. of fish required	50	25	25	50
Size range of fish (cm)	18 – 30 *	30 – 60	20 – 30 *	18 – 35 *
Disease	50	25 (limited)	N/A	50
Blood	25	25	25	25
Bile	25	25	25	25
Liver (S9 fraction EROD)**	15 MALES	25**	15 MALES	15 MALES
Liver (histology)	50	Only if liver nodule present	N/A	50
Liver (metals) (~ 2g)	25 (5 pools)	25 (5 pools)	25 (5 pools)	25 (5 pools)
Liver (chemistry) (> 4g)	25 (5 pools)	25 (5 pools)	25 (5 pools)	25 (5 pools)
Gonad (histology)	All MALES only	25**	N/A	All MALES only
Otolith	50	25	N/A	50
Flesh (metals) (> 10g)	25 (5 pools)	25 (5 pools)	25 (5 pools)	25 (5 pools)
Flesh (chemistry) (> 30g)	25 (5 pools)	25 (5 pools)	25 (5 pools)	25 (5 pools)

* may decrease by 1 cm for dab, plaice or flounder and by 2 cm if absolutely necessary. In each case this must be noted in cruise report and discussed with relevant DTMs.

** often unable to determine sex of cod at this size range so sample all for EROD and take gonad sample to determine sex, record sex as undetermined in sample record.

Table 3: Sediment grabs locations – PRIMARY SITES.

REGION	Field ID	decLat	decLong	Latitude	Longitude
Outer Forth	Forth (N of Wheat Stack)	56.000	-2.250	55 59.99N	002 14.98W
Montrose Bank	165se	56.5000	-1.5000	56 30.00N	001 30.00W
Moray Firth	MF1.1	57.6840	-3.8610	57 41.04N	003 51.66W
	MF1.2	57.6990	-3.8670	57 41.94N	003 52.02W
	MF1.3	57.8990	-3.4200	57 53.94N	003 25.20W
	MF1.4	57.9580	-3.8480	57 57.48N	003 50.88W
	MF1.5	57.9090	-3.3840	57 54.54N	003 23.04W
	MF2.1	57.8660	-2.8880	57 51.96N	002 53.28W
	MF2.2	57.9120	-3.0590	57 54.72N	003 3.54W
	MF2.3	57.9700	-2.8090	57 58.20N	002 48.54W
	MF2.7	57.8380	-3.2860	57 50.28N	003 17.16W
	MF2.9	57.8780	-3.3970	57 52.68N	003 23.82W
	95se	57.6667	-3.8167	57 40.00N	003 49.00W
Shetland	SHET2.1	60.0110	-0.6480	60 0.66N	000 38.88W
	SHET2.2	60.0140	-0.6430	60 0.84N	000 38.58W
	SHET2.3	60.0140	-0.6410	60 0.84N	000 38.46W
	SHET2.4	60.0290	-0.6470	60 1.74N	000 38.82W
	SHET2.5	60.0400	-0.6920	60 2.40N	000 41.52W
	ESB1 1	60.6280	1.4730	60 37.68N	001 28.38E
	ESB1 2	60.9550	1.4330	60 57.30N	001 25.98E
	ESB1 3	60.6660	1.5770	60 39.96N	001 34.62E
	ESB2 1	60.7180	1.0710	60 43.08N	001 4.26E
	ESB2 2	60.7330	1.2010	60 43.98N	001 12.06E
	ESB2 3	60.8000	1.0950	60 48.00N	001 5.70E

REGION	Field ID	decLat	decLong	Latitude	Longitude
	ESB3 1	60.4620	1.3300	60 27.72N	001 19.80E
	ESB3 2	60.5020	1.8370	60 30.12N	001 50.22E
	ESB3 3	60.5150	1.3510	60 30.90N	001 21.06E
	ESB 4 1	60.2590	1.2330	60 15.54N	001 13.98E
	ESB 4 2	60.1890	1.1390	60 11.34N	001 8.34E
	ESB 4 3	60.2890	1.0430	60 17.34N	001 2.58E
	SCSnew 1	61.5580	0.6540	61 33.48N	000 39.24E
	SCSnew 2	61.5390	0.6120	61 32.34N	000 36.72E
	SCSnew 3	61.5680	0.9570	61 34.08N	000 57.42E
	SCSnew 4	61.4620	0.8800	61 27.72N	000 52.80E
SCSnew 5	61.6450	0.8430	61 38.70N	000 50.58E	
The Minch North	UM1.1	58.2760	-5.6540	58 16.56N	005 39.24W
	UM1.2	58.3350	-5.6960	58 20.10N	005 41.76W
	UM1.3	58.0470	-5.6020	58 2.82N	005 36.12W
	UM1.4	58.1310	-5.8770	58 7.86N	005 52.62W
	UM1.5	58.1980	-5.9040	58 11.88N	005 54.24W
	85se	58.0000	-5.6667	58 0.00N	005 40.00W
The Minch South	UM2.1	57.8650	-6.1470	57 51.90N	006 8.82W
	UM2.2	58.0910	-6.2690	58 5.46N	006 16.14W
	UM2.3	58.0130	-6.2390	58 0.78N	006 14.34W
	UM2.4	58.1470	-5.8020	58 8.82N	005 48.12W
	UM2.5	57.6920	-6.1070	57 41.52N	006 6.42W
Sea of Hebrides	SOH1.1	56.5470	-7.5350	56 32.82N	007 32.10W
	SOH1.2	57.0030	-6.5480	57 0.18N	006 32.88W
	SOH1.3	56.8700	-7.4430	56 52.20N	007 26.58W
	SOH1.4	56.5080	-7.6430	56 30.48N	007 38.58W
	SOH1.5	56.8370	-7.0960	56 50.22N	007 5.76W
	SOH1.6	56.7400	-6.9260	56 44.40N	006 55.56W
	SOH1.7	56.6840	-7.5580	56 41.04N	007 33.48W
	SOH1.8	56.7260	-7.1010	56 43.56N	007 6.06W
	SOH1.9	56.9100	-7.2020	56 54.60N	007 12.12W
	SOH1.10	57.0510	-6.9040	57 3.06N	006 54.24W
Orkney	WOK1	59.4550	-3.8160	59 27.30N	003 48.96W
	WOK2	59.5540	-3.8240	59 33.24N	003 49.44W
	WOK3	59.4710	-3.8450	59 28.26N	003 50.70W
	WOK4	59.4410	-3.8620	59 26.46N	003 51.72W
	WOK5	59.4470	-3.7670	59 26.82N	003 46.02W
Hebrides	HEB1.1	57.5500	-8.7830	57 33.00N	008 46.98W
	HEB1.2	57.4690	-8.5810	57 28.14N	008 34.86W
	HEB1.3	57.5170	-8.6900	57 31.02N	008 41.40W
	HEB1.4	57.3760	-8.5350	57 22.56N	008 32.10W
	HEB1.5	57.3970	-8.4700	57 23.82N	008 28.20W

Table 4: Sediment grabs locations – SECONDARY/BACK-UP SITES.

REGION	Field ID	decLat	decLong	Latitude	Longitude
Moray Firth	MF1 6	57.778	-3.422	57 46.68N	003 25.32W
	MF1 7	57.688	-3.700	57 41.28N	003 42.00W
	MF1 8	57.743	-3.786	57 44.58N	003 47.16W
	MF1 9	57.718	-3.804	57 43.08N	003 48.24W
	MF1 10	57.874	-3.521	57 52.44N	003 31.26W
	MF2 11	57.990	-2.838	57 59.40N	002 50.28W
	MF2 12	57.886	-2.734	57 53.16N	002 44.04W
	MF2 13	57.829	-2.996	57 49.74N	002 59.76W
	MF2 14	57.828	-2.016	57 49.68N	002 0.96W
	MF2 15	57.857	-2.000	57 51.42N	002 0.06W
Shetland	Shet2 6	60.054	-0.653	60 3.24N	000 39.18W
	Shet2 7	60.024	-0.686	60 1.44N	000 41.16W
	Shet2 8	60.023	-0.676	60 1.38N	000 40.56W
	ESB1 4	60.944	1.586	60 56.64N	001 35.16E
	ESB1 5	60.812	1.292	60 48.72N	001 17.52E
	ESB2 4	60.806	1.089	60 48.36N	001 5.34E
	ESB2 5	60.81	1.077	60 48.60N	001 4.62E
	ESB3 4	60.295	1.34	60 17.70N	001 20.40E
	ESB3 5	60.386	1.462	60 23.16N	001 27.72E
	ESB4 4	60.361	0.859	60 21.66N	000 51.54E
	ESB4 5	60.362	1.195	60 21.72N	001 11.70E
	SCSnew 6	61.551	0.655	61 33.06N	000 39.30E
	SCSnew 7	61.636	0.937	61 38.16N	000 56.22E
	SCSnew 8	61.599	0.877	61 35.94N	000 52.62E
The Minch North	UM1.6	58.161	-5.854	58 9.66N	005 51.24W
	UM1.7	58.223	-5.546	58 13.38N	005 32.76W
	UM1.8	58.189	-5.787	58 11.34N	005 47.22W
	UM1.9	58.134	-5.670	58 8.04N	005 40.20W
	UM1.10	58.315	-5.945	58 18.90N	005 56.70W
The Minch South	UM2.6	57.86	-6.087	57 51.48N	006 5.22W
	UM2.7	57.762	-6.014	57 45.72N	006 0.84W
	UM2.8	57.727	-5.923	57 43.62N	005 55.38W
	UM2.9	57.906	-6.028	57 54.36N	006 1.68W
	UM2.10	57.820	-5.945	57 49.20N	005 56.70W
Sea of Hebrides	SOH1.11	56.607	-7.536	56 36.42N	007 32.16W
	SOH1.12	56.750	-7.491	56 45.00N	007 29.46W
	SOH1.13	56.357	-6.914	56 21.42N	006 54.84W
	SOH1.14	56.790	-6.778	56 47.40N	006 46.68W
	SOH1.15	56.888	-6.414	56 53.28N	006 24.84W
Orkney	WOK 6	59.352	-3.634	59 21.12N	003 38.04W
	WOK 7	59.502	-3.643	59 30.12N	003 38.58W
	WOK 8	59.379	-3.773	59 22.74N	003 46.38W

REGION	Field ID	decLat	decLong	Latitude	Longitude
	WOK 9	59.440	-3.749	59 26.40N	003 44.94W
	WOK 10	59.378	-3.787	59 22.68N	003 47.22W
Hebrides	HEB1.6	57.687	-8.585	57 41.22N	008 35.10W
	HEB1.7	57.561	-8.754	57 33.66N	008 45.24W
	HEB1.8	57.464	-8.523	57 27.84N	008 31.38W

Table 5: Catamaran trawl locations.

REGION	Field ID	decLat	decLong	Latitude	Longitude
Forth and Tay	Forth and Tay 1	55.994	-2.35	55 59.64N	002 21.00W
	Forth and Tay 2	55.905	-2.035	55 54.30N	002 2.10W
	Forth and Tay 3	56.186	-2.434	56 11.16N	002 26.04W
	Forth and Tay 4	56.52	-2.543	56 31.20N	002 32.58W
	Forth and Tay 5	56.702	-2.224	56 42.12N	002 13.44W
Montrose	Montrose Bank	56.488	-1.492	56 29.28N	001 29.52W
North East Coast	NE Coast 1	56.882	-2.116	56 52.92N	002 6.96W
	NE Coast 2	57.064	-1.901	57 3.84N	001 54.06W
	NE Coast 3	57.185	-1.891	57 11.10N	001 53.46W
	NE Coast 4	57.252	-1.841	57 15.12N	001 50.46W
	NE Coast 5	57.386	-1.739	57 23.16N	001 44.34W
	NE Coast 6	57.741	-1.861	57 44.46N	001 51.66W
Moray Firth	Moray Firth 1	57.792	-2.142	57 47.52N	002 8.52W
	Moray Firth 2	57.762	-2.421	57 45.72N	002 25.26W
	Moray Firth 3	57.761	-2.626	57 45.66N	002 37.56W
	Moray Firth 4	57.827	-3.01	57 49.62N	003 0.60W
	Moray Firth 5	57.852	-3.406	57 51.12N	003 24.36W
	Moray Firth 6	57.701	-3.786	57 42.06N	003 47.16W
	Moray Firth 7	57.928	-3.724	57 55.68N	003 43.44W
	Moray Firth 8	58.132	-3.57	58 7.92N	003 34.20W
	Moray Firth 9	58.277	-3.252	58 16.62N	003 15.12W
	Moray Firth 10	58.558	-3.022	58 33.48N	003 1.32W
North Coast	North Coast 1	58.695	-3.513	58 41.70N	003 30.78W
	North Coast 2	58.635	-4.196	58 38.10N	004 11.76W
	North Coast 3	58.669	-4.792	58 40.14N	004 47.52W
Outer Hebrides	Outer Hebrides 1	58.551	-6.258	58 33.06N	006 15.48W
	Outer Hebrides 2	58.443	-6.694	58 26.58N	006 41.64W
	Outer Hebrides 3	58.166	-7.186	58 9.96N	007 11.16W
	Outer Hebrides 4	57.725	-7.693	57 43.50N	007 41.58W
	Outer Hebrides 5	57.321	-7.698	57 19.26N	007 41.88W
	Outer Hebrides 6	56.946	-7.68	56 56.76N	007 40.80W
Minches	Minches 1	58.44	-5.553	58 26.40N	005 33.18W
	Minches 2	58.417	-5.927	58 25.02N	005 55.62W
	Minches 3	58.016	-5.708	58 0.96N	005 42.48W
	Minches 4	57.723	-5.938	57 43.38N	005 56.28W
	Minches 5	57.64	-6.691	57 38.40N	006 41.46W
	Minches 6	57.496	-6.773	57 29.76N	006 46.38W
	Minches 7	57.241	-6.769	57 14.46N	006 46.14W

REGION	Field ID	decLat	decLong	Latitude	Longitude
	Minches 8	57.124	-6.371	57 7.44N	006 22.26W
	Minches 9	57.012	-6.562	57 0.72N	006 33.72W
Sea of Hebrides	SOH 1	56.784	-6.856	56 47.04N	006 51.36W
	SOH 2	56.699	-6.416	56 41.94N	006 24.96W
	SOH 3	56.598	-7.071	56 35.88N	007 4.26W
	SOH 4	56.572	-6.516	56 34.32N	006 30.96W
	SOH 5	56.498	-6.649	56 29.88N	006 38.94W
	SOH 6	56.407	-6.822	56 24.42N	006 49.32W
	SOH 7	56.297	-6.728	56 17.82N	006 43.68W
	SOH 8	56.158	-6.107	56 9.48N	006 6.42W
	SOH 9	56.095	-6.665	56 5.70N	006 39.90W
Shetland	Shetland Basin 1	60.764	1.0789	60 45.84N	001 4.73E
	Shetland Basin 2	60.462	1.342	60 27.72N	001 20.52E
	Shetland Basin 3	60.578	0.5205	60 34.68N	000 31.23E
	Shetland Basin 4	60.938	1.2138	60 56.28N	001 12.83E
	Shetland Basin 5	60.5128	0.2427	60 30.77N	000 14.56E
	Shetland 1	60.7631	-0.7443	60 45.79N	000 44.66W
	Shetland 2	60.6352	-1.5595	60 38.11N	001 33.57W
	Shetland 3	60.501	-1.777	60 30.06N	001 46.62W
	Shetland 4	60.207	-2.445	60 12.42N	002 26.70W
	Shetland 5	59.941	-2.87	59 56.46N	002 52.20W
Orkney	West of Orkney 1	59.244	-3.425	59 14.64N	003 25.50W
	West of Orkney 2	59.0917	-3.4765	59 5.50N	003 28.59W