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MRV *Scotia*

Survey 0123S

PROGRAMME

5-20 January 2023

Loading: Aberdeen, Tuesday 20 December 2022
Sailing: Leith, Thursday 5 January 2023 (scientific crew travel to Leith and join Wednesday 4 January 2023).
Unloading: Aberdeen, 20 January 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

Fishing gear: BT 137 with Ground gear E;
Sediment Sampling: Day grab;
Litter sampling: Catamaran and neuston trawl;

Objectives

1. To undertake water, sediment and biological sampling for the Clean Seas Environmental Monitoring Programme (CSEMP).

2. To collect water samples for nutrient studies as part of the Scottish Coastal Eutrophication Assessment Survey (SCEAS).

3. Monitor and record all litter brought aboard in all trawls. Sample water column for micro-plastic litter under project ST04C (20463)

4. Extra additional tasks:
   - To check a mooring deployed by the Oceanography group
   - To collect 70 kg of sediment samples to be sent to WEPAL (QUASIMEME) for EQA testing material

Estimated Days Per Project: 11 days 20461; 1 day 20402, 2 days 20463; 2 days 20234.

Procedure

Surface water will be collected for hydrographic nutrient studies (SCEAS) throughout the survey at fixed time intervals (every 30 mins for nutrients, every hour for ammonia and every 12 hours for salinity and chlorophyll samples). From the Forth to Berwick initially, north to Montrose Bank then following the sediment/fish sampling track. Nutrient samples will be analyzed onboard as far as possible. Any remaining at end of survey will be returned to the laboratory for analyses.

Fish sampling for biological effect assessment will be carried out in multiple locations detailed below (Table 1). 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 nine areas (Figure 1): Outer Forth, East Coast, Moray firth, West of Orkney, Upper Minch, Sea of Hebrides, Solway and Hebrides. The number of stations per area varies from 5 to 15. Sediment sampling will also be carried out at the three CSEMP fixed sites (NMMP85 – North Minch, NMMP95 – Inner Moray Firth, NMMP165 – Montrose Bank). Sediments will be sampled for chemical analyses only at all locations. A second grab will not be undertaken at each sampling locations for MP assessment as the Marine Lab is facing sample storage issues due to problems with Building C. 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.

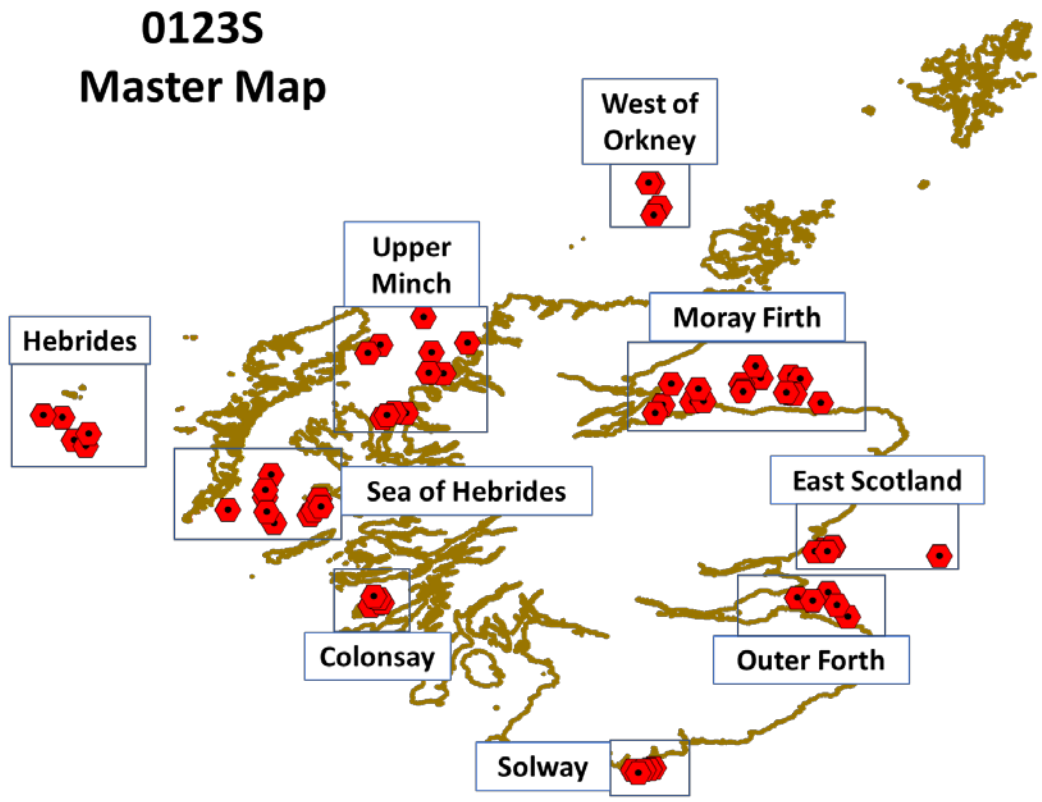

Figure 1: Sediment sampling areas.

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 (Table 5). Samples will be processed onboard as far as possible.

If time allows, a mooring will also be checked for the Oceanography group near the Isle of Arran. *The position of the mooring is (see red star on Figure 2):*

- **Latitude:** *55° 24.900' N* *55.4150*
- **Longitude:** *005° 11.700' W.* *-5.1950*

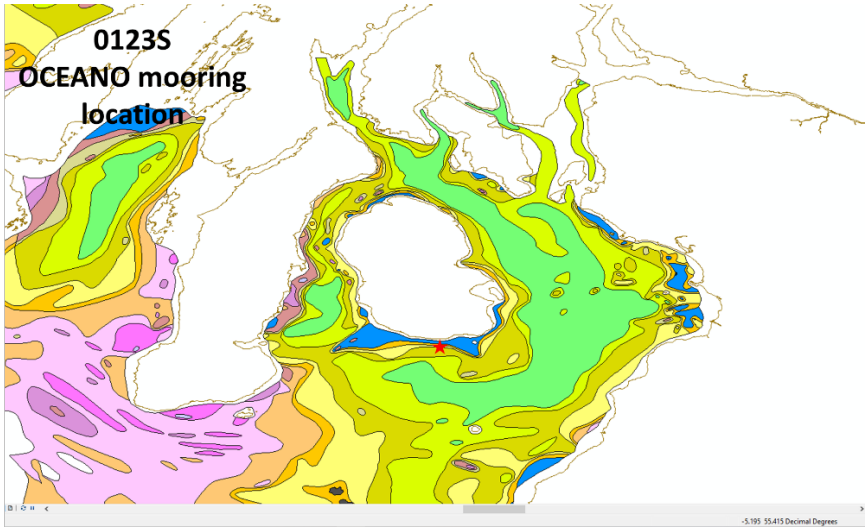

Figure 2: Mooring location.

A request has been received to collect 70 kg of sediment from Aberdeen harbour, to provide the WEPAL laboratory with material for their QUASIMEME proficiency testing. The scientific ship liaison has been informed and is in the process of seeking relevant authorization from the harbour, as operating the DAY GRAB within Aberdeen harbour limits has not been performed before from MRV Scotia.

Extra biota samples will be collected at a “dirty” site – most likely Outer Moray Firth – to provide samples for the OSPAR CONNECT project. Fish will be returned whole to the lab or processed on board if time allows. Further guidelines on how to process the fish samples should be received from the project lead prior to departure. If not, fish shall be frozen whole.

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:
G Hermann and G. Packer
6 December 2022

Approved:
I Gibb
19 December 2022

Table 1: 0123S Fishing Sites – Locations and box limits (decimal coordinates)

FIELD Name	New Station Code	Nominal Station Latitude	Nominal Station Longitude	Longitude East Limit	Longitude West Limit	Latitude North Limit	Latitude South Limit
Outer Firth of Forth	Forth_FirthFOuterOffshore_fi01	56.15	-2.50	-2.16	-2.81	56.28	55.92
E Scotland (Montrose Bank)	EScotland_EScOpenSea_fi01	56.50	-1.50	-1.37	-2.31	56.54	56.33
Hebrides (Gallen Head)	Hebrides_HebIntermediate_fi01	58.30	-7.05	-6.90	-7.20	58.40	58.20
Minch Malin (Colonsay) *	MinchMalin_Colonsay_fi01	56.11	-6.08	-6.04	-6.37	56.18	55.95
Outer Moray Firth *	MorayF_MoFOpenSea_fi01	58.05	-3.00	-2.84	-3.10	58.15	57.95
North Coll	MinchMalin_CollAndTiree_fi01	56.69	-6.60	-6.44	-6.72	56.79	56.62
West Orkney	NScotland_NScOpenSea_fi01	58.86	-3.97	-3.75	-4.17	58.98	58.73
Solway Firth (Balcary Point)	IrishSea_BalcaryPoint_fi01	54.75	-4.00	-3.92	-4.08	54.79	54.67
Central Minch	*Not applicable*	57.29	-6.75	NA	NA	NA	NA
Clyde (Skelmorlie)	Clyde_FirthCInnerCumbraes_fi01	55.851	-4.907	-4.895	-4.924	55.882	55.82
Clyde (Irvine Bay)	Clyde_IrvineBay_fi02	55.586	-4.788	-4.745	-4.832	55.609	55.547
Clyde (Pladda)	Clyde_SouthArran_fi01	55.42	-5.215	-5.169	-5.271	55.431	55.412

Note 1: fishing site priority will be decided prior to sailing. The 3 Clyde sites are optional if time allows.
*: dab is the target species for all fishing sites. However, time series exist for **Outer Moray Firth** and **Minch Malin (Colonsay)** so plaice can be sampled there if not enough dab are available

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
Off Forth	**E of Isle of May**	56.1994	-2.4096	56 11.96N	002 24.57W
	N of Wheat Stack	55.9998	-2.2497	55 59.99N	002 14.98W
	NE Torness	56.1001	-2.3404	56 6.00N	002 20.42W
	Rath Grounds	56.1593	-2.6593	56 9.56N	002 39.56W
	S of Isle of May	56.1335	-2.5351	56 8.01N	002 32.11W
East Coast	**EC1.1**	56.5560	-2.4400	56 33.36N	002 26.40W
	EC1.2	56.5800	-2.3650	56 34.80N	002 21.90W
	EC1.3	56.5780	-2.3780	56 34.68N	002 22.68W
	EC1.4	56.5330	-2.5180	56 31.98N	002 31.08W
	EC1.5	56.5340	-2.4140	56 32.04N	002 24.84W
	165se	56.5000	-1.5000	56 30.00N	001 30.00W
Moray Firth	**MF1.1**	57.7560	-3.5120	57 45.36N	003 30.72W
	MF1.2	57.7360	-3.7620	57 44.16N	003 45.72W
	MF1.3	57.7610	-3.4240	57 45.66N	003 25.44W
	MF1.4	57.9050	-3.6890	57 54.30N	003 41.34W
	MF1.5	57.8600	-3.4690	57 51.60N	003 28.14W
	MF2.1	57.9730	-2.7190	57 58.38N	002 43.14W
	MF2.2	57.9590	-2.9570	57 57.54N	002 57.42W
	MF2.3	57.9470	-2.6400	57 56.82N	002 38.40W
	MF2.4	57.9040	-3.1180	57 54.24N	003 7.08W
	MF2.5	57.8500	-3.1000	57 51.00N	003 6.00W
	MF2.6	57.8310	-2.7180	57 49.86N	002 43.08W
	MF2.7	57.8430	-3.1050	57 50.58N	003 6.30W
	MF2.8	57.8190	-2.6860	57 49.14N	002 41.16W
	MF2.9	57.7520	-2.4720	57 45.12N	002 28.32W
	MF2.10	57.8360	-2.7490	57 50.16N	002 44.94W

	105se	58.0500	-3.0000	58 3.00N	003 00.00W
	95se	57.6667	-3.8167	57 40.00N	003 49.00W
Minch North	**UM1.1**	58.2220	-6.0650	58 13.32N	006 3.90W
	UM1.2	58.1650	-5.6420	58 9.90N	005 38.52W
	UM1.3	57.9940	-5.5490	57 59.64N	005 32.94W
	UM1.4	58.0370	-5.6050	58 2.22N	005 36.30W
	UM1.5	58.1920	-6.0500	58 11.52N	006 3.00W
	85se	58.0000	-5.6667	58 0.00N	005 40.00W
Minch South	**UM2.1**	57.6710	-5.8550	57 40.26N	005 51.30W
	UM2.2	57.6730	-5.9500	57 40.38N	005 57.00W
	UM2.3	58.1620	-6.1650	58 9.72N	006 9.90W
	UM2.4	57.6260	-6.0400	57 37.56N	006 2.40W
	UM2.5	57.6470	-6.0080	57 38.82N	006 0.48W
Sea of Hebrides	**SOH1.1**	57.1640	-6.9570	57 9.84N	006 57.42W
	SOH1.2	56.8340	-6.6370	56 50.04N	006 38.22W
	SOH1.3	56.9770	-7.0040	56 58.62N	007 0.24W
	SOH1.4	56.8770	-7.3040	56 52.62N	007 18.24W
	SOH1.5	56.7690	-6.9280	56 46.14N	006 55.68W
	SOH1.6	56.8690	-6.6090	56 52.14N	006 36.54W
	SOH1.7	56.9640	-6.5580	56 57.84N	006 33.48W
	SOH1.8	57.0390	-7.0030	57 2.34N	007 0.18W
	SOH1.9	56.8630	-6.9910	56 51.78N	006 59.46W
	SOH1.10	56.9020	-6.5480	56 54.12N	006 32.88W
Hebrides	**HEB1 1**	57.4460	-8.5620	57 26.76N	008 33.72W
	HEB1 2	57.6340	-8.6550	57 38.04N	008 39.30W
	HEB1 3	57.3970	-8.4650	57 23.82N	008 27.90W
	HEB1 4	57.6490	-8.8140	57 38.94N	008 48.84W
	HEB1 5	57.4980	-8.4380	57 29.88N	008 26.28W
West Orkney	**WOK 1**	59.5510	-3.8430	59 33.06N	003 50.58W
	WOK 2	59.3210	-3.8120	59 19.26N	003 48.72W
	WOK 3	59.3540	-3.7880	59 21.24N	003 47.28W
	WOK 4	59.2820	-3.8330	59 16.92N	003 49.98W
	WOK 5	59.5510	-3.8780	59 33.06N	003 52.68W
Solway Firth	**SOL 1**	54.7500	-4.0000	54 45.00N	003 60.00W
	SOL 2	54.7665	-3.8345	54 45.99N	003 50.07W
	SOL 3	54.7565	-3.8630	54 45.39N	003 51.78W
	SOL 4	54.7500	-3.9157	54 45.00N	003 54.94W
	SOL 5	54.7272	-3.9600	54 43.63N	003 57.60W
Colonsay	**COL 1**	56.1100	-6.0800	56 6.60N	006 4.80W
	COL 2	56.0890	-6.1420	56 5.34N	006 8.52W
	COL 3	56.1180	-6.0510	56 7.08N	006 3.06W
	COL 4	56.1520	-6.0720	56 9.12N	006 4.32W
	COL 5	56.1680	-6.1160	56 10.08N	006 6.96W

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

REGION	Field ID	decLat	decLong	Latitude	Longitude
East Coast	**EC1.6**	56.5690	-2.1310	56 34.14N	002 7.86W
	EC1.7	56.6160	-2.2280	56 36.96N	002 13.68W
	EC1.8	56.5650	-2.3990	56 33.90N	002 23.94W
Moray Firth	**MF1 6**	57.6730	-3.7790	57 40.38N	003 46.74W
	MF1 7	57.8990	-3.8240	57 53.94N	003 49.44W
	MF1 8	57.8850	-3.5080	57 53.10N	003 30.48W
Moray Firth	**MF2 11**	57.9530	-2.1890	57 57.18N	002 11.34W
	MF2 12	57.8650	-2.0940	57 51.90N	002 5.64W
	MF2 13	57.9510	-2.9520	57 57.06N	002 57.12W
Minch North	**UM1.6**	58.2360	-6.0970	58 2.22N	005 36.30W
	UM1.7	58.5550	-5.5630	58 33.30N	005 33.78W
	UM1.8	58.2210	-5.7810	58 13.26N	005 46.86W
Minch South	**UM2.6**	58.0620	-5.8280	58 3.72N	005 49.68W
	UM2.7	58.1370	-6.0980	58 8.22N	006 5.88W
	UM2.8	57.6080	-6.0630	57 36.48N	006 3.78W
	UM2.9	58.0120	-5.7880	58 0.72N	005 47.28W
	UM2.10	58.1620	-5.9460	58 9.72N	005 56.76W
Sea of Hebrides	**SOH1.11**	57.0760	-6.9920	57 4.56N	006 59.52W
	SOH1.12	56.9490	-6.9530	56 56.94N	006 57.18W
	SOH1.13	56.4280	-6.6910	56 25.68N	006 41.46W
	SOH1.14	56.7470	-7.3520	56 44.82N	007 21.12W
	SOH1.15	56.6270	-7.4050	56 37.62N	007 24.30W
Hebrides	**HEB1 6**	57.4730	-8.6210	57 28.38N	008 37.26W
	HEB1 7	57.4020	-8.4230	57 24.12N	008 25.38W
	HEB1 8	57.4280	-8.4870	57 25.68N	008 29.22W
	HEB1 9	57.5530	-8.6460	57 33.18N	008 38.76W
	HEB1 10	57.3880	-8.4300	57 23.28N	008 25.80W
West Orkney	**WOK 6**	59.3920	-3.7120	59 23.52N	003 42.72W
	WOK 7	59.4690	-3.7870	59 28.14N	003 47.22W
	WOK 8	59.3530	-3.6720	59 21.18N	003 40.32W
	WOK 9	59.4860	-3.9130	59 29.16N	003 54.78W
	WOK 10	59.2540	-3.7740	59 15.24N	003 46.44W

Table 5: Microplastic (MP) sea surface trawl location

Geographic area	Name	Latitude Decimal	Longitude Decimal	Latitude Degrees	Longitude Degrees
Forth and Tay	FoTa1	55.994	-2.35	55 59.64N	002 21.00W
	FoTa2	55.905	-2.035	55 54.30N	002 2.10W
	FoTa3	56.186	-2.434	56 11.16N	002 26.04W
	FoTa4	56.52	-2.543	56 31.20N	002 32.58W
	FoTa5	56.702	-2.224	56 42.12N	002 13.44W
Montrose Bank	MB	56.488	-1.492	56 29.28N	001 29.52W
NE Coast	NEC1	56.882	-2.116	56 52.92N	002 6.96W
	NEC2	57.064	-1.901	57 3.84N	001 54.06W
	NEC3	57.185	-1.891	57 11.10N	001 53.46W
	NEC4	57.252	-1.841	57 15.12N	001 50.46W
	NEC5	57.386	-1.739	57 23.16N	001 44.34W
	NEC6	57.741	-1.861	57 44.46N	001 51.66W
Moray Firth	MF1	57.792	-2.142	57 47.52N	002 8.52W
	MF2	57.762	-2.421	57 45.72N	002 25.26W
	MF3	57.761	-2.626	57 45.66N	002 37.56W
	MF4	57.827	-3.01	57 49.62N	003 0.60W
	MF5	57.852	-3.406	57 51.12N	003 24.36W
	MF6	57.701	-3.786	57 42.06N	003 47.16W
	MF7	57.928	-3.724	57 55.68N	003 43.44W
	MF8	58.132	-3.57	58 7.92N	003 34.20W
	MF9	58.277	-3.252	58 16.62N	003 15.12W
	MF10	58.558	-3.022	58 33.48N	003 1.32W
North Coast	NC1	58.695	-3.513	58 41.70N	003 30.78W
	NC2	58.635	-4.196	58 38.10N	004 11.76W
	NC3	58.669	-4.792	58 40.14N	004 47.52W
Outer Hebrides	OH1	58.551	-6.258	58 33.06N	006 15.48W
	OH2	58.443	-6.694	58 26.58N	006 41.64W
	OH3	58.166	-7.186	58 9.96N	007 11.16W
	OH4	57.725	-7.693	57 43.50N	007 41.58W
	OH5	57.321	-7.698	57 19.26N	007 41.88W
	OH6	56.946	-7.68	56 56.76N	007 40.80W
Minches	Minches1	58.44	-5.553	58 26.40N	005 33.18W
	Minches2	58.417	-5.927	58 25.02N	005 55.62W
	Minches3	58.016	-5.708	58 0.96N	005 42.48W
	Minches4	57.723	-5.938	57 43.38N	005 56.28W
	Minches5	57.64	-6.691	57 38.40N	006 41.46W
	Minches6	57.496	-6.773	57 29.76N	006 46.38W
	Minches7	57.241	-6.769	57 14.46N	006 46.14W
	Minches8	57.124	-6.371	57 7.44N	006 22.26W
	Minches9	57.012	-6.562	57 0.72N	006 33.72W

Sea of Hebrides	SOH1	56.784	-6.856	56 47.04N	006 51.36W
	SOH2	56.699	-6.416	56 41.94N	006 24.96W
	SOH3	56.598	-7.071	56 35.88N	007 4.26W
	SOH4	56.572	-6.516	56 34.32N	006 30.96W
	SOH5	56.498	-6.649	56 29.88N	006 38.94W
	SOH6	56.407	-6.822	56 24.42N	006 49.32W
	SOH7	56.297	-6.728	56 17.82N	006 43.68W
	SOH8	56.158	-6.107	56 9.48N	006 6.42W
	SOH9	56.095	-6.665	56 5.70N	006 39.90W
Solway	Solway1	54.8	-3.74	54 48.00N	003 44.40W
	Solway2	54.755	-3.865	54 45.30N	003 51.90W
	Solway3	54.7	-4.161	54 42.00N	004 09.66W
	Solway4	54.635	-4.443	54 38.10N	004 26.58W
	Solway5	54.788	-5.167	54 47.28N	005 10.02W
	Solway6	54.624	-5.001	54 37.44N	005 00.06W

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MRV *Scotia*

Survey 0123S

PROGRAMME AMENDMENT

05-20 January 2023

Additional Objective:

5. To deploy 8 acoustic moorings around Scotland on behalf of the Renewables group (REEA)

Procedure

Acoustics moorings prepared by the REEA group will be deployed in eight different locations detailed in Table 1 and Figure 1 below. All equipment has been set up to start recording on 14 January. Scientific crew will assemble each mooring prior to reaching the deployment location by connecting the instrument rope and a 70 kg weight (7 x 10 kg chain link) to the acoustics release devices.

Name	Depth (m)	Location Name	Lat_DD	Lon_DD	Lat_DdM	Lon_DdM
9	89	Orkney West	58.8789	-3.7078	58° 52.7316'N	003° 42.4687'W
10a	63	Totegan_5	58.6223	-4.0002	58° 37.3388'N	004° 00.0122'W
11	52	Nun bank	58.8893	-4.9044	58° 53.3586'N	004° 54.2653'W
13	83	Garenin	58.4397	-7.2158	58° 26.3848'N	007° 12.9467'W
15	60	Barra	57.0894	-7.7026	57° 05.3646'N	007° 42.1540'W
17	65	Soa	56.1692	-6.4645	56° 10.1496'N	006° 27.8724'W
18	85	Portencross	55.6252	-5.0653	55° 37.5106'N	005° 03.9207'W
19	44	Kilbrannan Sound	55.3474	-5.3939	55° 20.8435'N	005° 23.6338'W

Table 1: Mooring deployment location details

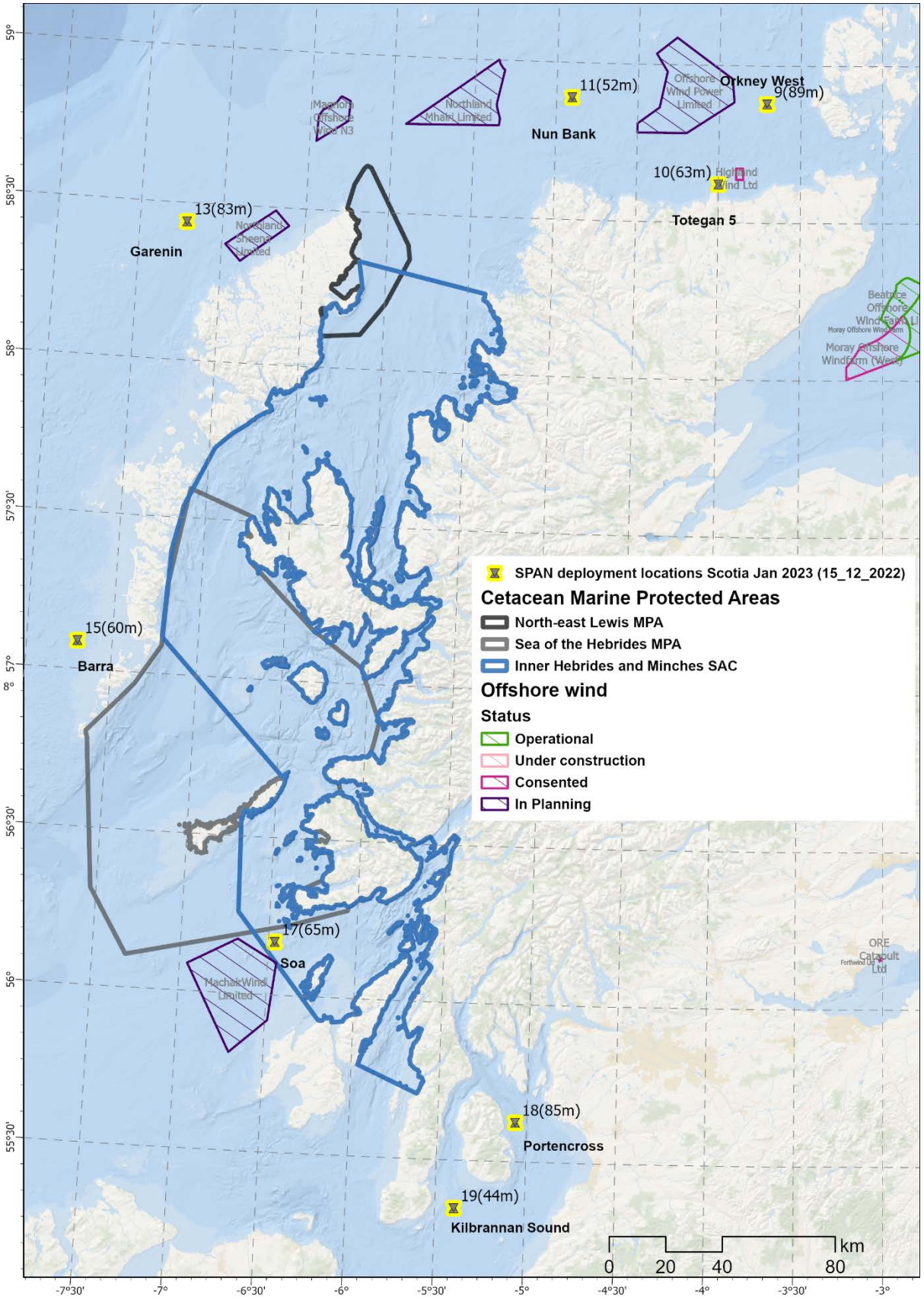

Figure 1: Mooring deployment location details ("SPAN" on map)