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FV *Lady Nicola UL 584*

REPORT of Survey: Drop-down video survey of seabed habitats and Priority Marine Features around the Orkney Isles

8-17 May 2019

Loading: Kirkwall, 8 May 2019

Boarding: Kirkwall, 8 May 2019

Unloading: Stromness, 17 May 2019

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.

Personnel

G. Pasco
B James
M. Carruthers

Organisation

Seascope Fisheries Research
Scottish Natural Heritage
Scottish Natural Heritage

Role

SIC
8-12 May 2019
13-17 May 2019

Project: 10 days

Gear

EMFF camera frame, umbilicals (300m + 100m), camera system (EMFF system 2), lights and control unit.

SNH camera sledge (backup – not used), GoPro™ Hero 4 camera in housing, lights, 80m umbilical, surface control unit, GPS

Background and Objectives

“Engaging Fishermen in Marine Environmental Monitoring” is a joint project between Marine Scotland (MS), Marine Scotland Science (MSS) and Scottish Natural Heritage (SNH), funded through the European Maritime and Fisheries Fund (EMFF). This survey is one of several planned for 2018 and 2019 working in collaboration with fishermen to collect information on seabed habitats within and adjacent to Scottish Marine Protected Areas (MPAs) <https://www2.gov.scot/Topics/marine/marine-environment/mpanetwork/MPAmonitoring/EMFFproject>

The objectives for this survey were:

- To engage fishermen in marine monitoring work through chartering of fishing vessels and training crew.
- To undertake a programme of targeted DDV sampling to enhance our understanding of the distribution and extent of Priority Marine Features (such as maerl beds, horse mussel beds, flame shell beds, fan mussels) and other benthic habitats in nearshore Orkney waters

The focus of the sampling was to carry out targeted surveys of seabed habitats. DDV will be used to confirm habitat presence, extent and current status of such features. The survey builds upon work in previous years to refine the habitat maps for the area. Figure 1 shows planned survey areas as polygons.

Survey procedure

The initial plan was to deploy the DDV system from the fishing vessel at or near to pre-identified coordinates within the survey polygons in Figure 1. The planned survey positions were manually entered into the vessel navigation system each day as bulk loading of positions was not possible. During operation, the camera frame was lowered over the side of the vessel using the winch/haul and positioned just above the seabed. A live feed of the standard definition video signal was provided to the surface control unit (SCU) located in the wheelhouse, and red-line lasers (100mm apart) enabled the field of view to be judged. The live video feed to the wheelhouse was visible to the skipper and winch operator, to help with locating the camera above the seabed and orientating the vessel during tows.

The vessel was allowed to drift in the direction of the prevailing current or wind for approximately 5 minutes. Longer or shorter runs were appropriate in some situations depending on the local conditions and habitats encountered. Vessel speed in general was approximately 0.5kn during tows. At intervals the camera frame was landed on the seabed to take 'Snapshot' still images of the seabed type and flora/fauna. The Surface Control Unit (SCU) displayed live Standard Definition (SD) video with time/date stamp, GPS location (when operating) and camera depth. LED lighting level was controlled from the SCU and was generally kept at maximum. High Definition (HD) video and still photos were stored in the camera for later downloading. SD video with overlay (including time/date stamp and position coordinates from its dedicated GPS) was recorded directly on the SCU.

Sample location (from the vessel's GPS) and other metadata were recorded on paper forms throughout the survey, with sample metadata transcribed into spreadsheets each day and forms stored ashore at the end of each survey day and used to assist in quality control. Track and waypoints were recorded from a hand-held GPS as backup in case of problems with the camera or vessel positional data, but due to the problems with the SD overlay, post-survey these waypoint positions have been downloaded and used as principal sample location data, and are shown in Tables 1 and 2. Video files were downloaded from the camera at the end of each survey day, and data backed up according to the agreed protocols.

Narrative

Scientists joined the vessel at either Pierowall, Kirkwall or Stromness harbours each day. SNH staff changeover was in Kirkwall on 12 May.

Weather during the first 3 days sampling whilst working out of Pierowall consisted of easterly and northerly winds force 2-4, along with a moderate (1-2 metre) swell. Conditions eased for the remainder of the survey with light (force 0-3) south-easterlies mainly, with little or no significant swell for the remainder of the survey period.

Each night video and stills files were downloaded from the camera, the camera memory cleared and sampling details transcribed from paper forms into spreadsheets.

The survey was undertaken with only one set of camera equipment (EMFF system 2). Issues were encountered with SD camera feed back to the SCU dropping out intermittently throughout the survey, resulting in some stations having to be repeated, and others being stopped short (<5 minutes) at times. This system was subsequently returned for repair.

228 video samples and 2827 accompanying HD still images of the seabed were collected. Table 1 provides the sample station locations (start and end waypoints) and Table 2 brief descriptions of the seabed at each sample station. Figure 2 shows an overview of all stations sampled on this Orkney survey in 2019, and Figures 3-6 show the video start waypoint locations and station numbers for more detailed areas.

Submitted: Guy Pasco & Charlotte Johnston 30 August 2019

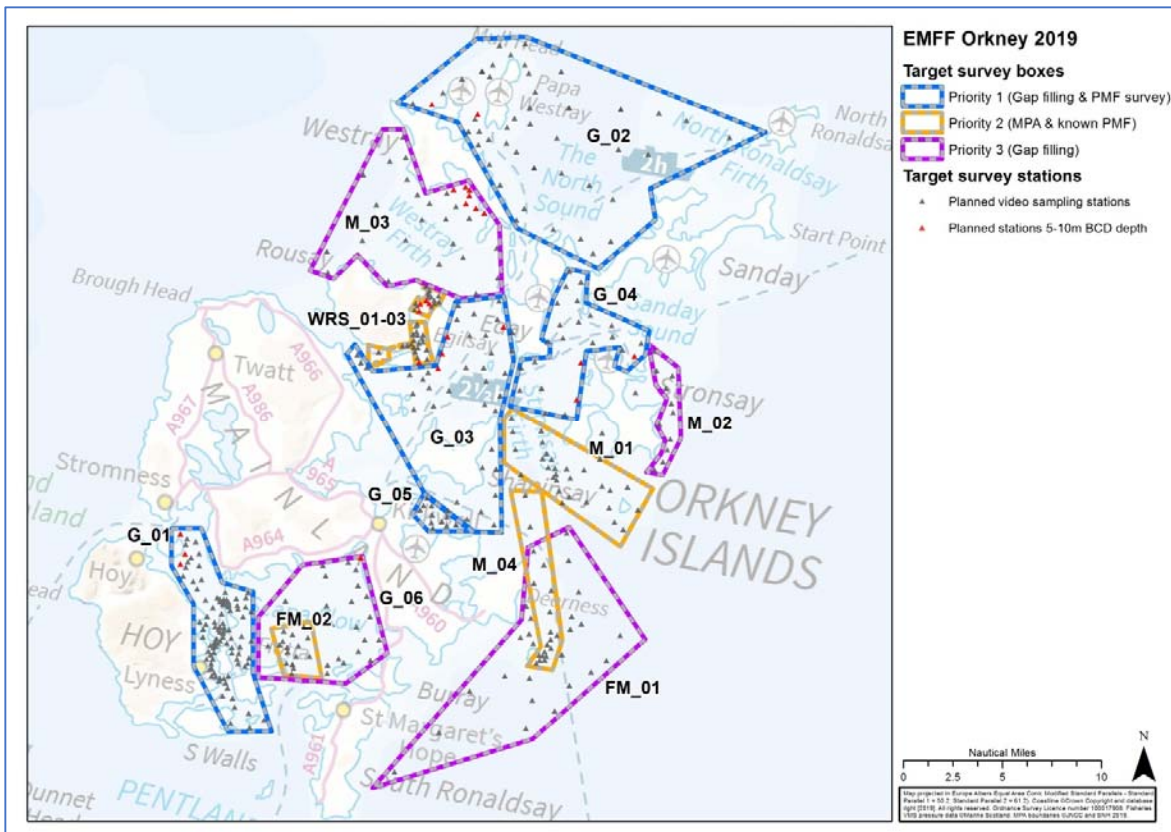


Figure 1. Initially planned 2019 sampling areas around the Orkney Isles.

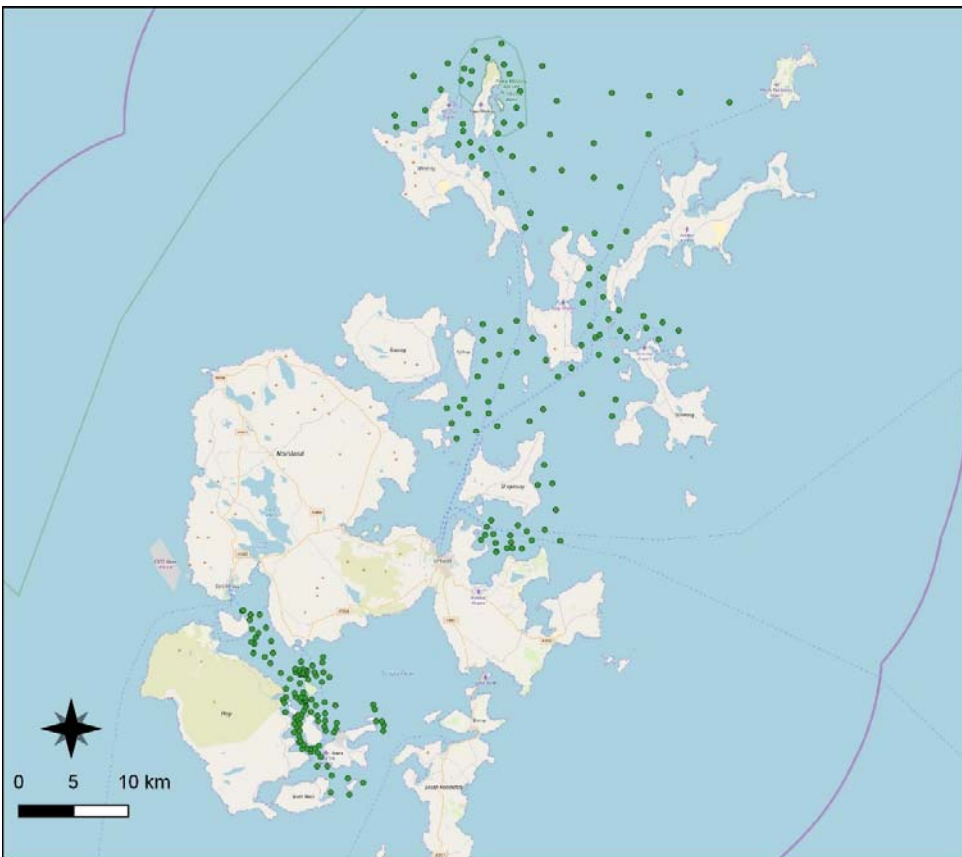


Figure 2. Drop down video stations surveyed in 2019 around the Orkney Isles (start waypoints).

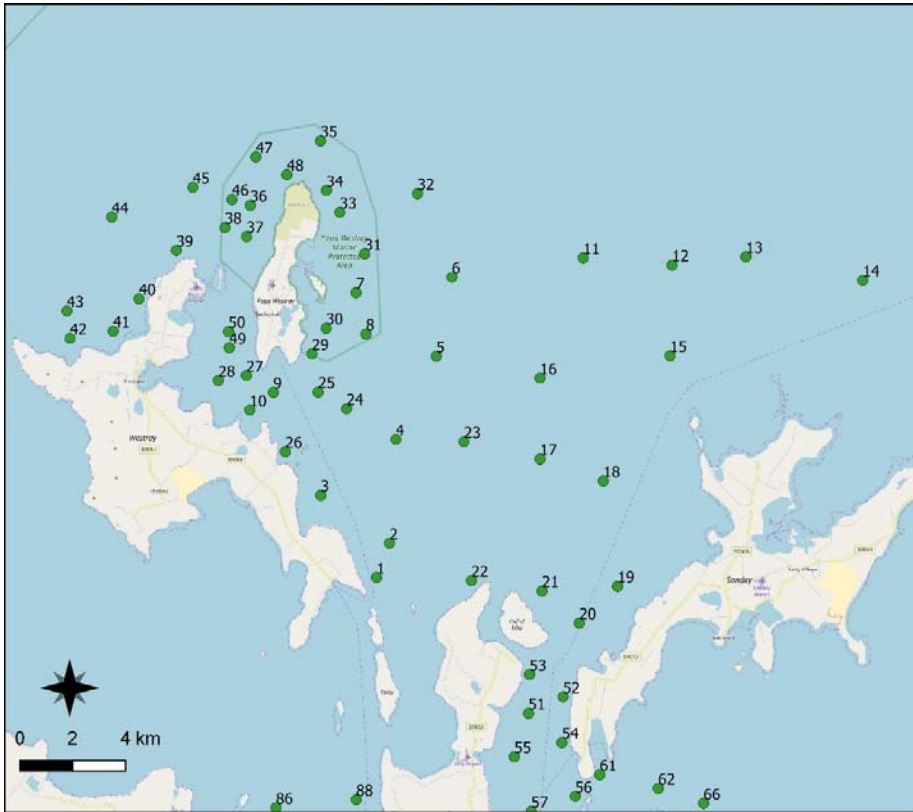


Figure 3. 2019 Drop down video stations (with station numbers) around Westray and Sanday in the northern Orkney Isles.

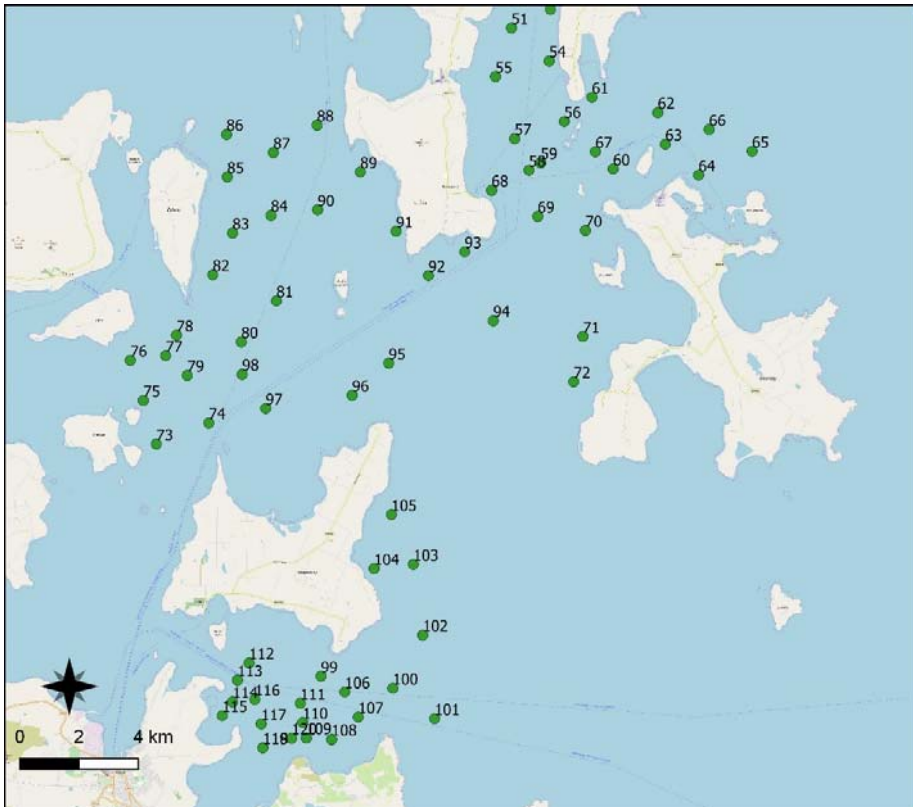


Figure 4. 2019 Drop down video stations (with station numbers) around Shapinsay and Egilsay, central Orkney Isles.

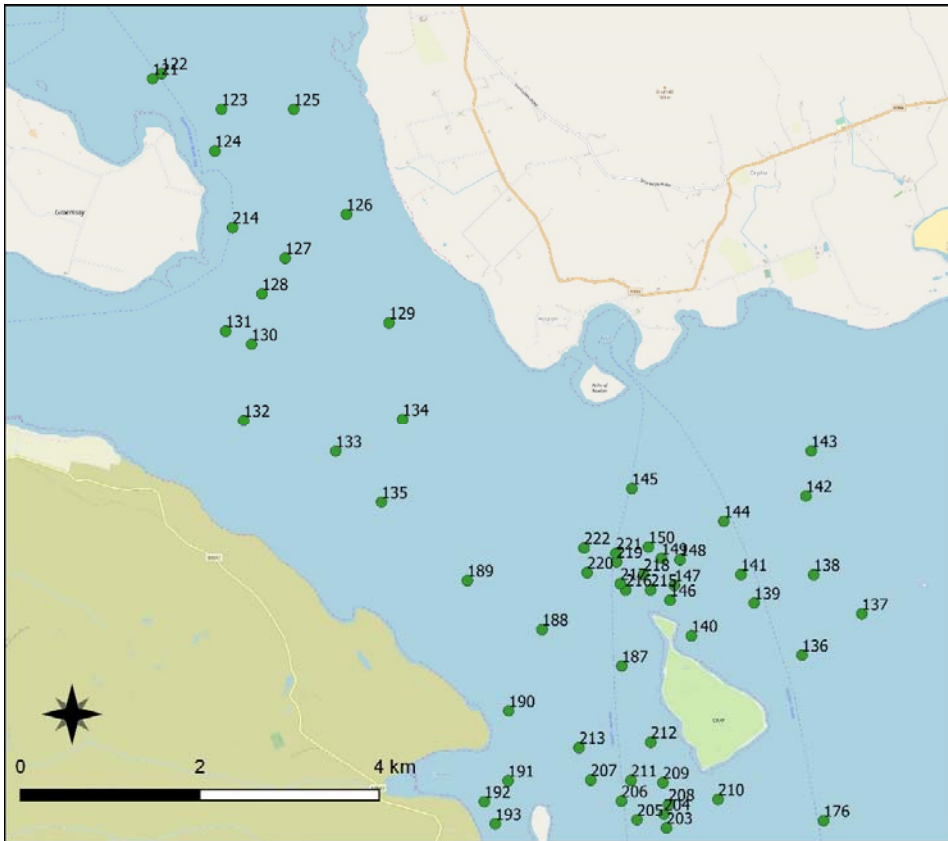


Figure 5. 2019 Drop down video stations (with station numbers) around north western Scapa Flow, southern Orkney Isles.



Figure 6. 2019 Drop down video stations (with station numbers) around south western Scapa Flow and Flotta.

Table 1 Orkney Isles sampling station locations (from hand held GPS waypoints), May 2019

Project code	Survey Area	Station ref.	Site name	Camera gear code	Date	Start time (UTC)	Start Lat.	Start Long.	End time (UTC)	End Lat.	End Long.
MS EMFF	Orkney	1	The North Sound	MS C-Tecnic 2	08/05/2019	12:39:50	59.252269	-2.830001	12:45:56	59.251449	-2.830873
MS EMFF	Orkney	2	The North Sound	MS C-Tecnic 2	08/05/2019	12:59:37	59.263879	-2.821452	13:05:49	59.263260	-2.822493
MS EMFF	Orkney	3	The North Sound	MS C-Tecnic 2	08/05/2019	13:25:18	59.280143	-2.867058	13:31:31	59.279929	-2.868193
MS EMFF	Orkney	4	The North Sound	MS C-Tecnic 2	08/05/2019	13:55:35	59.299079	-2.817236	14:01:26	59.299056	-2.819289
MS EMFF	Orkney	5	The North Sound	MS C-Tecnic 2	08/05/2019	14:25:28	59.327191	-2.790509	14:30:57	59.327597	-2.793198
MS EMFF	Orkney	6	The North Sound	MS C-Tecnic 2	08/05/2019	14:51:23	59.353966	-2.780091	14:57:29	59.354922	-2.782727
MS EMFF	Orkney	7	The North Sound	MS C-Tecnic 2	08/05/2019	15:19:55	59.348710	-2.843588	15:25:34	59.350973	-2.844281
MS EMFF	Orkney	8	The North Sound	MS C-Tecnic 2	08/05/2019	15:45:56	59.334736	-2.837026	15:50:51	59.335729	-2.838091
MS EMFF	Orkney	9	The North Sound	MS C-Tecnic 2	08/05/2019	16:16:09	59.314973	-2.898394	16:22:01	59.314941	-2.899894
MS EMFF	Orkney	10	The North Sound	MS C-Tecnic 2	08/05/2019	16:29:43	59.308998	-2.914051	16:35:35	59.308940	-2.915201
MS EMFF	Orkney	11	The North Sound	MS C-Tecnic 2	09/05/2019	09:10:44	59.360458	-2.693124	09:16:14	59.360005	-2.691455
MS EMFF	Orkney	12	The North Sound	MS C-Tecnic 2	09/05/2019	09:34:35	59.358020	-2.634252	09:44:04	59.357551	-2.627088
MS EMFF	Orkney	13	The North Sound	MS C-Tecnic 2	09/05/2019	09:57:24	59.360833	-2.585325	10:03:39	59.360437	-2.582874
MS EMFF	Orkney	14	The North Sound	MS C-Tecnic 2	09/05/2019	10:29:20	59.352891	-2.507885	10:33:29	59.352107	-2.505231
MS EMFF	Orkney	15	The North Sound	MS C-Tecnic 2	09/05/2019	11:24:30	59.327367	-2.635567	11:30:14	59.327664	-2.633085
MS EMFF	Orkney	16	The North Sound	MS C-Tecnic 2	09/05/2019	11:59:48	59.319820	-2.721744	12:05:02	59.318183	-2.722204
MS EMFF	Orkney	17	The North Sound	MS C-Tecnic 2	09/05/2019	12:22:50	59.292445	-2.721687	12:27:57	59.291136	-2.721717
MS EMFF	Orkney	18	The North Sound	MS C-Tecnic 2	09/05/2019	12:50:15	59.284949	-2.679833	12:55:28	59.284063	-2.679618
MS EMFF	Orkney	19	The North Sound	MS C-Tecnic 2	09/05/2019	13:18:01	59.249289	-2.670372	13:23:47	59.247929	-2.670638
MS EMFF	Orkney	20	The North Sound	MS C-Tecnic 2	09/05/2019	13:37:18	59.236815	-2.695706	13:43:49	59.234741	-2.696036
MS EMFF	Orkney	21	The North Sound	MS C-Tecnic 2	09/05/2019	13:59:02	59.247718	-2.720405	14:06:15	59.246934	-2.720455
MS EMFF	Orkney	22	The North Sound	MS C-Tecnic 2	09/05/2019	14:27:50	59.251239	-2.767186	14:33:01	59.250675	-2.767398
MS EMFF	Orkney	23	The North Sound	MS C-Tecnic 2	09/05/2019	15:13:43	59.298305	-2.772142	15:19:00	59.297729	-2.773819
MS EMFF	Orkney	24	The North Sound	MS C-Tecnic 2	09/05/2019	15:48:03	59.309473	-2.849921	15:53:20	59.309296	-2.850966
MS EMFF	Orkney	25	The North Sound	MS C-Tecnic 2	09/05/2019	16:05:54	59.315093	-2.868726	16:11:04	59.315065	-2.869847
MS EMFF	Orkney	26	The North Sound	MS C-Tecnic 2	09/05/2019	16:26:12	59.294895	-2.890466	16:31:41	59.294147	-2.890652
MS EMFF	Orkney	27	The North Sound	MS C-Tecnic 2	09/05/2019	16:55:59	59.320683	-2.916295	17:01:24	59.320381	-2.916449
MS EMFF	Orkney	28	The North Sound	MS C-Tecnic 2	09/05/2019	17:09:12	59.318976	-2.934865	17:14:17	59.318545	-2.934651
MS EMFF	Orkney	29	The North Sound	MS C-Tecnic 2	10/05/2019	07:55:45	59.328031	-2.872883	08:02:16	59.327432	-2.873360
MS EMFF	Orkney	30	The North Sound	MS C-Tecnic 2	10/05/2019	08:11:25	59.336705	-2.863435	08:17:29	59.336143	-2.864138
MS EMFF	Orkney	31	The North Sound	MS C-Tecnic 2	10/05/2019	08:37:10	59.361824	-2.837861	08:43:18	59.361259	-2.837780
MS EMFF	Orkney	32	The North Sound	MS C-Tecnic 2	10/05/2019	09:11:06	59.382157	-2.802914	09:17:46	59.380874	-2.802349
MS EMFF	Orkney	33	The North Sound	MS C-Tecnic 2	10/05/2019	09:39:03	59.375860	-2.854412	09:44:54	59.374253	-2.854813

Project code	Survey Area	Station ref.	Site name	Camera gear code	Date	Start time (UTC)	Start Lat.	Start Long.	End time (UTC)	End Lat.	End Long.
MS EMFF	Orkney	34	The North Sound	MS C-Tecnic 2	10/05/2019	09:54:31	59.383253	-2.863237	10:00:27	59.384029	-2.863112
MS EMFF	Orkney	35	The North Sound	MS C-Tecnic 2	10/05/2019	10:18:49	59.400030	-2.867153	10:23:59	59.400054	-2.858962
MS EMFF	Orkney	36	The North Sound	MS C-Tecnic 2	10/05/2019	11:11:45	59.378255	-2.913706	11:17:04	59.379270	-2.910298
MS EMFF	Orkney	37	The North Sound	MS C-Tecnic 2	10/05/2019	11:26:54	59.367685	-2.916114	11:32:41	59.366777	-2.915744
MS EMFF	Orkney	38	The North Sound	MS C-Tecnic 2	10/05/2019	11:49:35	59.370733	-2.930537	11:55:31	59.370758	-2.928298
MS EMFF	Orkney	39	The North Sound	MS C-Tecnic 2	10/05/2019	12:14:18	59.363046	-2.962671	12:19:59	59.364170	-2.959635
MS EMFF	Orkney	40	The North Sound	MS C-Tecnic 2	10/05/2019	12:37:35	59.346635	-2.987482	12:42:55	59.346208	-2.987806
MS EMFF	Orkney	41	The North Sound	MS C-Tecnic 2	10/05/2019	12:55:13	59.335692	-3.004567	13:00:25	59.335326	-3.005082
MS EMFF	Orkney	42	The North Sound	MS C-Tecnic 2	10/05/2019	13:10:22	59.333260	-3.033168	13:15:42	59.333333	-3.034481
MS EMFF	Orkney	43	The North Sound	MS C-Tecnic 2	10/05/2019	13:26:07	59.342552	-3.035192	13:31:33	59.342131	-3.036157
MS EMFF	Orkney	44	The North Sound	MS C-Tecnic 2	10/05/2019	13:57:34	59.374241	-3.005502	14:04:15	59.374452	-3.002369
MS EMFF	Orkney	45	The North Sound	MS C-Tecnic 2	10/05/2019	14:22:39	59.384286	-2.951822	14:27:13	59.384664	-2.949976
MS EMFF	Orkney	46	The North Sound	MS C-Tecnic 2	10/05/2019	14:39:17	59.380189	-2.925847	14:44:33	59.379952	-2.924906
MS EMFF	Orkney	47	The North Sound	MS C-Tecnic 2	10/05/2019	14:59:24	59.394552	-2.910015	15:05:05	59.394322	-2.909199
MS EMFF	Orkney	48	The North Sound	MS C-Tecnic 2	10/05/2019	15:17:26	59.388609	-2.889464	15:25:11	59.387751	-2.893006
MS EMFF	Orkney	49	The North Sound	MS C-Tecnic 2	10/05/2019	16:43:13	59.330047	-2.927634	16:48:57	59.330400	-2.927749
MS EMFF	Orkney	50	The North Sound	MS C-Tecnic 2	10/05/2019	16:55:50	59.335581	-2.928145	17:01:11	59.336428	-2.928188
MS EMFF	Orkney	51	Eday, Sanday and Stronsay	MS C-Tecnic 2	11/05/2019	09:22:58	59.206162	-2.729355	09:28:19	59.206990	-2.727710
MS EMFF	Orkney	52	Eday, Sanday and Stronsay	MS C-Tecnic 2	11/05/2019	09:36:47	59.211771	-2.706493	09:42:01	59.212072	-2.705886
MS EMFF	Orkney	53	Eday, Sanday and Stronsay	MS C-Tecnic 2	11/05/2019	09:51:47	59.219365	-2.728629	09:57:54	59.220020	-2.727006
MS EMFF	Orkney	54	Eday, Sanday and Stronsay	MS C-Tecnic 2	11/05/2019	10:13:01	59.196240	-2.707214	10:18:18	59.195058	-2.705549
MS EMFF	Orkney	55	Eday, Sanday and Stronsay	MS C-Tecnic 2	11/05/2019	10:31:26	59.191511	-2.738750	10:36:36	59.191076	-2.737974
MS EMFF	Orkney	56	Eday, Sanday and Stronsay	MS C-Tecnic 2	11/05/2019	10:51:22	59.178034	-2.698376	10:59:05	59.176276	-2.697361
MS EMFF	Orkney	57	Eday, Sanday and Stronsay	MS C-Tecnic 2	11/05/2019	11:10:19	59.172879	-2.727477	11:17:18	59.171403	-2.725509
MS EMFF	Orkney	58	Eday, Sanday and Stronsay	MS C-Tecnic 2	11/05/2019	11:23:25	59.163342	-2.719142	11:29:41	59.162162	-2.717896
MS EMFF	Orkney	59	Eday, Sanday and Stronsay	MS C-Tecnic 2	11/05/2019	11:36:29	59.165589	-2.712229	11:42:11	59.164343	-2.710860

Project code	Survey Area	Station ref.	Site name	Camera gear code	Date	Start time (UTC)	Start Lat.	Start Long.	End time (UTC)	End Lat.	End Long.
MS EMFF	Orkney	60	Eday, Sanday and Stronsay	MS C-Tecnic 2	11/05/2019	11:54:23	59.163714	-2.669688	12:00:00	59.164713	-2.667806
MS EMFF	Orkney	61	Eday, Sanday and Stronsay	MS C-Tecnic 2	11/05/2019	12:13:30	59.185336	-2.682121	12:18:45	59.185436	-2.682242
MS EMFF	Orkney	62	Eday, Sanday and Stronsay	MS C-Tecnic 2	11/05/2019	12:31:40	59.180726	-2.643417	12:37:01	59.181400	-2.641446
MS EMFF	Orkney	63	Eday, Sanday and Stronsay	MS C-Tecnic 2	11/05/2019	12:45:38	59.171187	-2.639024	12:50:44	59.171490	-2.639426
MS EMFF	Orkney	64	Eday, Sanday and Stronsay	MS C-Tecnic 2	11/05/2019	13:01:57	59.161882	-2.619482	13:07:22	59.161430	-2.619376
MS EMFF	Orkney	65	Eday, Sanday and Stronsay	MS C-Tecnic 2	11/05/2019	13:19:59	59.169068	-2.588069	13:25:13	59.168155	-2.588168
MS EMFF	Orkney	66	Eday, Sanday and Stronsay	MS C-Tecnic 2	11/05/2019	13:52:21	59.175609	-2.613336	13:57:32	59.174933	-2.614269
MS EMFF	Orkney	67	Eday, Sanday and Stronsay	MS C-Tecnic 2	11/05/2019	14:16:31	59.168937	-2.680074	14:21:54	59.168124	-2.680694
MS EMFF	Orkney	68	Eday, Sanday and Stronsay	MS C-Tecnic 2	11/05/2019	14:41:02	59.157316	-2.741040	14:48:23	59.156130	-2.738125
MS EMFF	Orkney	69	Eday, Sanday and Stronsay	MS C-Tecnic 2	11/05/2019	14:57:50	59.149465	-2.713941	15:03:16	59.147444	-2.713425
MS EMFF	Orkney	70	Eday, Sanday and Stronsay	MS C-Tecnic 2	11/05/2019	15:13:04	59.145205	-2.685958	15:18:46	59.144062	-2.686179
MS EMFF	Orkney	71	Eday, Sanday and Stronsay	MS C-Tecnic 2	11/05/2019	15:34:46	59.113275	-2.687418	15:40:33	59.112198	-2.686798
MS EMFF	Orkney	72	Eday, Sanday and Stronsay	MS C-Tecnic 2	11/05/2019	15:49:27	59.099621	-2.692847	15:54:31	59.098652	-2.692217
MS EMFF	Orkney	73	Shapinsay	MS C-Tecnic 2	12/05/2019	08:08:45	59.080828	-2.937877	08:14:13	59.081031	-2.936892
MS EMFF	Orkney	74	Shapinsay	MS C-Tecnic 2	12/05/2019	08:58:11	59.087189	-2.907089	09:03:49	59.087984	-2.905148
MS EMFF	Orkney	75	Shapinsay	MS C-Tecnic 2	12/05/2019	09:17:22	59.094011	-2.945500	09:22:28	59.093363	-2.945174
MS EMFF	Orkney	76	Shapinsay	MS C-Tecnic 2	12/05/2019	09:32:53	59.106067	-2.953152	09:38:34	59.106293	-2.952888
MS EMFF	Orkney	77	Shapinsay	MS C-Tecnic 2	12/05/2019	09:47:37	59.107509	-2.932416	09:52:55	59.107827	-2.931704
MS EMFF	Orkney	78	Shapinsay	MS C-Tecnic 2	12/05/2019	09:59:28	59.113637	-2.926031	10:04:28	59.114115	-2.925393
MS EMFF	Orkney	79	Shapinsay	MS C-Tecnic 2	12/05/2019	10:14:18	59.101590	-2.919713	10:19:26	59.101933	-2.919090
MS EMFF	Orkney	80	Shapinsay	MS C-Tecnic 2	12/05/2019	10:31:42	59.111650	-2.887974	10:36:52	59.112410	-2.888449
MS EMFF	Orkney	81	Shapinsay	MS C-Tecnic 2	12/05/2019	10:46:24	59.124029	-2.867361	10:51:34	59.125512	-2.868778
MS EMFF	Orkney	82	Shapinsay	MS C-Tecnic 2	12/05/2019	11:05:03	59.131843	-2.904761	11:10:17	59.132186	-2.903411
MS EMFF	Orkney	83	Shapinsay	MS C-Tecnic 2	12/05/2019	11:18:41	59.144443	-2.893131	11:24:04	59.144373	-2.891082

Project code	Survey Area	Station ref.	Site name	Camera gear code	Date	Start time (UTC)	Start Lat.	Start Long.	End time (UTC)	End Lat.	End Long.
MS EMFF	Orkney	84	Shapinsay	MS C-Tecnic 2	12/05/2019	11:34:36	59.149768	-2.870570	11:39:57	59.149010	-2.868491
MS EMFF	Orkney	85	Shapinsay	MS C-Tecnic 2	12/05/2019	11:56:51	59.161305	-2.896249	12:01:55	59.159323	-2.896445
MS EMFF	Orkney	86	Shapinsay	MS C-Tecnic 2	12/05/2019	12:15:30	59.174139	-2.896650	12:20:41	59.173182	-2.895403
MS EMFF	Orkney	87	Shapinsay	MS C-Tecnic 2	12/05/2019	12:32:46	59.168677	-2.869179	12:36:42	59.167345	-2.868424
MS EMFF	Orkney	88	Shapinsay	MS C-Tecnic 2	12/05/2019	12:50:33	59.176894	-2.843511	12:55:40	59.175702	-2.841863
MS EMFF	Orkney	89	Shapinsay	MS C-Tecnic 2	12/05/2019	13:09:38	59.162836	-2.818127	13:14:48	59.162245	-2.817214
MS EMFF	Orkney	90	Shapinsay	MS C-Tecnic 2	12/05/2019	13:37:52	59.151449	-2.843159	13:41:12	59.149166	-2.841636
MS EMFF	Orkney	91	Shapinsay	MS C-Tecnic 2	12/05/2019	13:56:26	59.145002	-2.797086	14:01:57	59.146232	-2.797246
MS EMFF	Orkney	92	Eday, Sanday and Stronsay	MS C-Tecnic 2	12/05/2019	14:19:01	59.131639	-2.778109	14:24:12	59.131010	-2.777410
MS EMFF	Orkney	93	Eday, Sanday and Stronsay	MS C-Tecnic 2	12/05/2019	14:33:26	59.138814	-2.756847	14:38:23	59.138801	-2.755886
MS EMFF	Orkney	94	Eday, Sanday and Stronsay	MS C-Tecnic 2	12/05/2019	14:53:14	59.118027	-2.740052	14:58:28	59.117587	-2.741490
MS EMFF	Orkney	95	Shapinsay	MS C-Tecnic 2	12/05/2019	15:22:11	59.105230	-2.801420	15:27:17	59.104518	-2.799536
MS EMFF	Orkney	96	Shapinsay	MS C-Tecnic 2	12/05/2019	15:56:40	59.095566	-2.822879	16:01:46	59.095515	-2.819856
MS EMFF	Orkney	97	Shapinsay	MS C-Tecnic 2	12/05/2019	16:21:18	59.091588	-2.873668	16:25:06	59.091274	-2.873424
MS EMFF	Orkney	98	Shapinsay	MS C-Tecnic 2	12/05/2019	16:35:07	59.101884	-2.887503	16:40:38	59.101433	-2.887008
MS EMFF	Orkney	99	Shapinsay	MS C-Tecnic 2	13/05/2019	08:09:45	59.010707	-2.841228	08:16:07	59.010543	-2.844053
MS EMFF	Orkney	100	Shapinsay	MS C-Tecnic 2	13/05/2019	08:32:37	59.007065	-2.799036	08:37:46	59.008204	-2.800367
MS EMFF	Orkney	101	Shapinsay	MS C-Tecnic 2	13/05/2019	08:52:12	58.997869	-2.774520	08:57:22	58.998664	-2.775920
MS EMFF	Orkney	102	Shapinsay	MS C-Tecnic 2	13/05/2019	09:12:13	59.023143	-2.781453	09:17:28	59.024600	-2.783240
MS EMFF	Orkney	103	Shapinsay	MS C-Tecnic 2	13/05/2019	09:31:03	59.044525	-2.786987	09:36:19	59.046156	-2.787233
MS EMFF	Orkney	104	Shapinsay	MS C-Tecnic 2	13/05/2019	09:47:02	59.043219	-2.810026	09:52:15	59.043377	-2.811008
MS EMFF	Orkney	105	Shapinsay	MS C-Tecnic 2	13/05/2019	10:05:35	59.059541	-2.799865	10:10:39	59.060681	-2.798500
MS EMFF	Orkney	106	Shapinsay	MS C-Tecnic 2	13/05/2019	10:53:00	59.005943	-2.827236	11:00:15	59.006488	-2.830283
MS EMFF	Orkney	107	Shapinsay	MS C-Tecnic 2	13/05/2019	11:09:07	58.998350	-2.819346	11:16:31	58.999236	-2.819902
MS EMFF	Orkney	108	Head of Holland	MS C-Tecnic 2	13/05/2019	11:27:54	58.991588	-2.834946	11:34:26	58.992186	-2.833849
MS EMFF	Orkney	109	Head of Holland	MS C-Tecnic 2	13/05/2019	11:46:23	58.992040	-2.849813	11:52:42	58.992744	-2.850070
MS EMFF	Orkney	110	Head of Holland	MS C-Tecnic 2	13/05/2019	11:58:08	58.996701	-2.851965	12:03:39	58.997093	-2.852590
MS EMFF	Orkney	111	Shapinsay	MS C-Tecnic 2	13/05/2019	12:10:13	59.002506	-2.853291	12:15:26	59.002909	-2.854572
MS EMFF	Orkney	112	Shapinsay	MS C-Tecnic 2	13/05/2019	12:28:16	59.014718	-2.883423	12:33:21	59.015320	-2.884785
MS EMFF	Orkney	113	Head of Holland	MS C-Tecnic 2	13/05/2019	12:41:33	59.009519	-2.890258	12:48:38	59.010287	-2.890140
MS EMFF	Orkney	114	Head of Holland	MS C-Tecnic 2	13/05/2019	13:15:51	59.002923	-2.893123	13:22:03	59.003518	-2.894013
MS EMFF	Orkney	115	Head of Holland	MS C-Tecnic 2	13/05/2019	13:28:40	58.998785	-2.899209	13:34:26	58.999479	-2.899657

Project code	Survey Area	Station ref.	Site name	Camera gear code	Date	Start time (UTC)	Start Lat.	Start Long.	End time (UTC)	End Lat.	End Long.
MS EMFF	Orkney	116	Head of Holland	MS C-Tecnic 2	13/05/2019	13:44:44	59.003675	-2.880029	13:50:02	59.004152	-2.879582
MS EMFF	Orkney	117	Head of Holland	MS C-Tecnic 2	13/05/2019	13:58:20	58.996254	-2.876306	14:04:25	58.996779	-2.876133
MS EMFF	Orkney	118	Head of Holland	MS C-Tecnic 2	13/05/2019	14:11:47	58.989153	-2.875253	14:17:25	58.989911	-2.875742
MS EMFF	Orkney	119	Head of Holland	MS C-Tecnic 2	13/05/2019	14:26:18	58.989022	-2.875376	14:31:57	58.986025	-2.871698
MS EMFF	Orkney	120	Head of Holland	MS C-Tecnic 2	13/05/2019	14:40:54	58.991961	-2.858423	14:48:32	58.992916	-2.858056
MS EMFF	Orkney	121	West Scapa Flow	MS C-Tecnic 2	14/05/2019	07:50:48	58.941054	-3.275606	07:53:35	58.941628	-3.276126
MS EMFF	Orkney	122	West Scapa Flow	MS C-Tecnic 2	14/05/2019	07:59:31	58.941593	-3.273861	08:06:31	58.942488	-3.277838
MS EMFF	Orkney	123	West Scapa Flow	MS C-Tecnic 2	14/05/2019	08:14:40	58.938028	-3.262260	08:20:14	58.938757	-3.263155
MS EMFF	Orkney	124	West Scapa Flow	MS C-Tecnic 2	14/05/2019	08:31:22	58.933853	-3.263539	08:36:29	58.934731	-3.263795
MS EMFF	Orkney	125	West Scapa Flow	MS C-Tecnic 2	14/05/2019	08:46:01	58.938018	-3.248283	08:53:08	58.939616	-3.248754
MS EMFF	Orkney	126	West Scapa Flow	MS C-Tecnic 2	14/05/2019	09:09:40	58.927557	-3.238105	09:14:57	58.928350	-3.238038
MS EMFF	Orkney	127	West Scapa Flow	MS C-Tecnic 2	14/05/2019	09:22:39	58.923182	-3.249940	09:28:14	58.924562	-3.250037
MS EMFF	Orkney	128	West Scapa Flow	MS C-Tecnic 2	14/05/2019	09:35:01	58.919630	-3.254438	09:40:25	58.920784	-3.254054
MS EMFF	Orkney	129	West Scapa Flow	MS C-Tecnic 2	14/05/2019	09:53:49	58.916739	-3.229877	09:59:11	58.917368	-3.230959
MS EMFF	Orkney	130	West Scapa Flow	MS C-Tecnic 2	14/05/2019	10:10:13	58.914602	-3.256469	10:12:25	58.915012	-3.256557
MS EMFF	Orkney	131	West Scapa Flow	MS C-Tecnic 2	14/05/2019	10:25:36	58.915926	-3.261457	10:29:02	58.916256	-3.261104
MS EMFF	Orkney	132	West Scapa Flow	MS C-Tecnic 2	14/05/2019	10:42:19	58.906967	-3.257971	10:47:26	58.907318	-3.258823
MS EMFF	Orkney	133	West Scapa Flow	MS C-Tecnic 2	14/05/2019	11:03:06	58.903846	-3.240179	11:08:27	58.903929	-3.240959
MS EMFF	Orkney	134	West Scapa Flow	MS C-Tecnic 2	14/05/2019	11:20:43	58.907093	-3.227249	11:26:17	58.907268	-3.227910
MS EMFF	Orkney	135	West Scapa Flow	MS C-Tecnic 2	14/05/2019	11:38:53	58.898771	-3.231333	11:44:19	58.898858	-3.232098
MS EMFF	Orkney	136	West Scapa Flow	MS C-Tecnic 2	14/05/2019	12:29:37	58.883448	-3.150030	12:37:44	58.884223	-3.150801
MS EMFF	Orkney	137	West Scapa Flow	MS C-Tecnic 2	14/05/2019	12:48:32	58.887577	-3.138458	12:56:07	58.888156	-3.138685
MS EMFF	Orkney	138	West Scapa Flow	MS C-Tecnic 2	14/05/2019	13:03:23	58.891484	-3.147765	13:08:59	58.891843	-3.148296
MS EMFF	Orkney	139	West Scapa Flow	MS C-Tecnic 2	14/05/2019	13:17:17	58.888665	-3.159282	13:23:33	58.889023	-3.159440
MS EMFF	Orkney	140	West Scapa Flow	MS C-Tecnic 2	14/05/2019	13:32:03	58.885386	-3.171400	13:39:39	58.886395	-3.170808
MS EMFF	Orkney	141	West Scapa Flow	MS C-Tecnic 2	14/05/2019	13:51:56	58.891501	-3.161825	13:59:10	58.892093	-3.161398
MS EMFF	Orkney	142	West Scapa Flow	MS C-Tecnic 2	14/05/2019	14:09:45	58.899359	-3.149266	14:15:18	58.899954	-3.148888
MS EMFF	Orkney	143	West Scapa Flow	MS C-Tecnic 2	14/05/2019	14:23:13	58.903863	-3.148250	14:28:21	58.903526	-3.147565
MS EMFF	Orkney	144	West Scapa Flow	MS C-Tecnic 2	14/05/2019	14:39:53	58.896833	-3.165116	14:47:16	58.897174	-3.164610
MS EMFF	Orkney	145	West Scapa Flow	MS C-Tecnic 2	14/05/2019	15:19:31	58.900114	-3.182912	15:26:08	58.899882	-3.181822
MS EMFF	Orkney	146	West Scapa Flow	MS C-Tecnic 2	14/05/2019	15:37:17	58.888957	-3.175552	15:43:49	58.889571	-3.177023
MS EMFF	Orkney	147	West Scapa Flow	MS C-Tecnic 2	14/05/2019	15:50:34	58.890435	-3.174698	15:56:04	58.890098	-3.174339
MS EMFF	Orkney	148	West Scapa Flow	MS C-Tecnic 2	14/05/2019	16:04:07	58.892972	-3.173608	16:09:37	58.893069	-3.171935
MS EMFF	Orkney	149	West Scapa Flow	MS C-Tecnic 2	14/05/2019	16:19:05	58.893119	-3.177195	16:26:24	58.893466	-3.175387
MS EMFF	Orkney	150	West Scapa Flow	MS C-Tecnic 2	14/05/2019	16:33:15	58.894288	-3.179701	16:39:32	58.894347	-3.178308

Project code	Survey Area	Station ref.	Site name	Camera gear code	Date	Start time (UTC)	Start Lat.	Start Long.	End time (UTC)	End Lat.	End Long.
MS EMFF	Orkney	151	West Scapa Flow	MS C-Tecnic 2	15/05/2019	08:50:51	58.793582	-3.136149	08:56:05	58.793894	-3.136030
MS EMFF	Orkney	152	West Scapa Flow	MS C-Tecnic 2	15/05/2019	09:09:37	58.791940	-3.106820	09:15:03	58.791490	-3.108607
MS EMFF	Orkney	153	West Scapa Flow	MS C-Tecnic 2	15/05/2019	09:32:39	58.801543	-3.085155	09:38:12	58.801533	-3.086881
MS EMFF	Orkney	154	West Scapa Flow	MS C-Tecnic 2	15/05/2019	09:50:01	58.805056	-3.109194	09:55:30	58.804911	-3.111118
MS EMFF	Orkney	155	West Scapa Flow	MS C-Tecnic 2	15/05/2019	10:04:29	58.807268	-3.134554	10:09:45	58.807020	-3.134141
MS EMFF	Orkney	156	West Scapa Flow	MS C-Tecnic 2	15/05/2019	10:17:10	58.814765	-3.141449	10:25:00	58.814047	-3.140484
MS EMFF	Orkney	157	West Scapa Flow	MS C-Tecnic 2	15/05/2019	10:32:54	58.814753	-3.157533	10:38:58	58.815179	-3.157762
MS EMFF	Orkney	158	West Scapa Flow	MS C-Tecnic 2	15/05/2019	10:45:54	58.822416	-3.151953	10:51:07	58.822780	-3.151491
MS EMFF	Orkney	159	West Scapa Flow	MS C-Tecnic 2	15/05/2019	11:00:02	58.825959	-3.157101	11:05:23	58.826218	-3.158191
MS EMFF	Orkney	160	West Scapa Flow	MS C-Tecnic 2	15/05/2019	11:10:40	58.826276	-3.167777	11:16:19	58.826569	-3.167623
MS EMFF	Orkney	161	West Scapa Flow	MS C-Tecnic 2	15/05/2019	11:20:23	58.829083	-3.167435	11:26:36	58.829624	-3.167232
MS EMFF	Orkney	162	West Scapa Flow	MS C-Tecnic 2	15/05/2019	11:31:19	58.829600	-3.160746	11:36:24	58.830160	-3.161254
MS EMFF	Orkney	163	West Scapa Flow	MS C-Tecnic 2	15/05/2019	11:41:27	58.831660	-3.154703	11:46:43	58.831294	-3.156615
MS EMFF	Orkney	164	West Scapa Flow	MS C-Tecnic 2	15/05/2019	11:54:08	58.829392	-3.174316	12:00:28	58.830042	-3.173725
MS EMFF	Orkney	165	West Scapa Flow	MS C-Tecnic 2	15/05/2019	12:05:16	58.829206	-3.181380	12:13:26	58.829785	-3.182100
MS EMFF	Orkney	166	West Scapa Flow	MS C-Tecnic 2	15/05/2019	12:17:22	58.832391	-3.178057	12:23:08	58.832258	-3.178506
MS EMFF	Orkney	167	West Scapa Flow	MS C-Tecnic 2	15/05/2019	12:28:05	58.834716	-3.185836	12:35:31	58.834763	-3.186299
MS EMFF	Orkney	168	West Scapa Flow	MS C-Tecnic 2	15/05/2019	13:04:04	58.835675	-3.183860	13:09:35	58.836417	-3.184755
MS EMFF	Orkney	169	West Scapa Flow	MS C-Tecnic 2	15/05/2019	13:13:59	58.839288	-3.185771	13:19:27	58.840157	-3.187139
MS EMFF	Orkney	170	West Scapa Flow	MS C-Tecnic 2	15/05/2019	13:25:10	58.842491	-3.193898	13:30:09	58.843383	-3.194810
MS EMFF	Orkney	171	West Scapa Flow	MS C-Tecnic 2	15/05/2019	13:35:46	58.843819	-3.184816	13:41:12	58.844756	-3.186099
MS EMFF	Orkney	172	West Scapa Flow	MS C-Tecnic 2	15/05/2019	13:45:18	58.846995	-3.189664	13:50:28	58.848107	-3.190266
MS EMFF	Orkney	173	West Scapa Flow	MS C-Tecnic 2	15/05/2019	13:55:19	58.849485	-3.193448	14:00:40	58.850230	-3.193732
MS EMFF	Orkney	174	West Scapa Flow	MS C-Tecnic 2	15/05/2019	14:05:31	58.854535	-3.192132	14:10:43	58.855289	-3.192401
MS EMFF	Orkney	175	West Scapa Flow	MS C-Tecnic 2	15/05/2019	14:23:41	58.864353	-3.159829	14:29:01	58.864889	-3.160419
MS EMFF	Orkney	176	West Scapa Flow	MS C-Tecnic 2	15/05/2019	14:38:20	58.866891	-3.145852	14:43:23	58.866962	-3.146496
MS EMFF	Orkney	177	West Scapa Flow	MS C-Tecnic 2	15/05/2019	14:52:51	58.864422	-3.128806	14:57:49	58.864467	-3.129627
MS EMFF	Orkney	178	West Scapa Flow	MS C-Tecnic 2	15/05/2019	15:10:21	58.850201	-3.126664	15:15:37	58.850381	-3.127763
MS EMFF	Orkney	179	West Scapa Flow	MS C-Tecnic 2	15/05/2019	15:22:19	58.845456	-3.127791	15:27:36	58.845609	-3.128585
MS EMFF	Orkney	180	West Scapa Flow	MS C-Tecnic 2	15/05/2019	15:31:58	58.842582	-3.131031	15:37:20	58.842570	-3.132576
MS EMFF	Orkney	181	West Scapa Flow	MS C-Tecnic 2	15/05/2019	15:42:46	58.843856	-3.144029	15:48:04	58.844158	-3.144844
MS EMFF	Orkney	182	West Scapa Flow	MS C-Tecnic 2	15/05/2019	15:53:40	58.847309	-3.146258	15:58:45	58.847446	-3.147054
MS EMFF	Orkney	183	West Scapa Flow	MS C-Tecnic 2	15/05/2019	16:05:13	58.852040	-3.144902	16:10:28	58.852165	-3.145996
MS EMFF	Orkney	184	West Scapa Flow	MS C-Tecnic 2	15/05/2019	16:15:44	58.851691	-3.155956	16:21:40	58.852155	-3.156750
MS EMFF	Orkney	185	West Scapa Flow	MS C-Tecnic 2	15/05/2019	16:26:35	58.856054	-3.157271	16:31:50	58.856492	-3.157689

Project code	Survey Area	Station ref.	Site name	Camera gear code	Date	Start time (UTC)	Start Lat.	Start Long.	End time (UTC)	End Lat.	End Long.
MS EMFF	Orkney	186	West Scapa Flow	MS C-Tecnic 2	15/05/2019	16:39:29	58.857865	-3.145125	16:44:36	58.857919	-3.145952
MS EMFF	Orkney	187	West Scapa Flow	MS C-Tecnic 2	16/05/2019	08:15:08	58.882357	-3.184864	08:21:10	58.883465	-3.186190
MS EMFF	Orkney	188	West Scapa Flow	MS C-Tecnic 2	16/05/2019	08:29:44	58.886012	-3.200286	08:35:13	58.887034	-3.201039
MS EMFF	Orkney	189	West Scapa Flow	MS C-Tecnic 2	16/05/2019	08:45:24	58.890911	-3.214722	08:50:31	58.891876	-3.215301
MS EMFF	Orkney	190	West Scapa Flow	MS C-Tecnic 2	16/05/2019	09:07:23	58.877878	-3.206718	09:12:27	58.879158	-3.209035
MS EMFF	Orkney	191	West Scapa Flow	MS C-Tecnic 2	16/05/2019	09:26:34	58.870883	-3.206862	09:31:42	58.871804	-3.207765
MS EMFF	Orkney	192	West Scapa Flow	MS C-Tecnic 2	16/05/2019	09:39:58	58.868809	-3.211437	09:45:14	58.869442	-3.211131
MS EMFF	Orkney	193	West Scapa Flow	MS C-Tecnic 2	16/05/2019	09:51:16	58.866575	-3.209323	09:56:21	58.867128	-3.209449
MS EMFF	Orkney	194*	West Scapa Flow	MS C-Tecnic 2	16/05/2019	10:06:24	58.858850	-3.207650	10:11:21	58.859063	-3.208741
MS EMFF	Orkney	195	West Scapa Flow	MS C-Tecnic 2	16/05/2019	10:29:23	58.852716	-3.187117	10:35:08	58.853466	-3.188714
MS EMFF	Orkney	196*	West Scapa Flow	MS C-Tecnic 2	16/05/2019	10:41:05	58.849333	-3.184500	10:47:13	58.850184	-3.185892
MS EMFF	Orkney	197	West Scapa Flow	MS C-Tecnic 2	16/05/2019	10:57:00	58.854434	-3.183199	11:04:09	58.855288	-3.185636
MS EMFF	Orkney	198	West Scapa Flow	MS C-Tecnic 2	16/05/2019	11:09:22	58.856576	-3.187036	11:14:21	58.857120	-3.187792
MS EMFF	Orkney	199	West Scapa Flow	MS C-Tecnic 2	16/05/2019	11:20:10	58.857095	-3.181556	11:35:03	58.858483	-3.186772
MS EMFF	Orkney	200	West Scapa Flow	MS C-Tecnic 2	16/05/2019	12:22:03	58.859043	-3.167374	12:27:59	58.860267	-3.168642
MS EMFF	Orkney	201	West Scapa Flow	MS C-Tecnic 2	16/05/2019	12:36:45	58.859881	-3.178572	12:51:16	58.861480	-3.186049
MS EMFF	Orkney	202	West Scapa Flow	MS C-Tecnic 2	16/05/2019	12:58:51	58.863128	-3.175356	13:06:03	58.864484	-3.176065
MS EMFF	Orkney	203	West Scapa Flow	MS C-Tecnic 2	16/05/2019	13:11:36	58.866164	-3.176228	13:17:20	58.867091	-3.177388
MS EMFF	Orkney	204	West Scapa Flow	MS C-Tecnic 2	16/05/2019	13:21:50	58.867538	-3.176712	13:27:20	58.868382	-3.177778
MS EMFF	Orkney	205	West Scapa Flow	MS C-Tecnic 2	16/05/2019	13:32:40	58.866990	-3.181927	13:38:43	58.868013	-3.182216
MS EMFF	Orkney	206	West Scapa Flow	MS C-Tecnic 2	16/05/2019	13:44:19	58.868861	-3.184920	13:49:54	58.869818	-3.185877
MS EMFF	Orkney	207	West Scapa Flow	MS C-Tecnic 2	16/05/2019	13:56:19	58.870955	-3.190867	14:01:47	58.871259	-3.191853
MS EMFF	Orkney	208	West Scapa Flow	MS C-Tecnic 2	16/05/2019	14:12:30	58.868519	-3.175843	14:19:58	58.869630	-3.176853
MS EMFF	Orkney	209	West Scapa Flow	MS C-Tecnic 2	16/05/2019	14:26:03	58.870695	-3.176913	14:32:44	58.871338	-3.177442
MS EMFF	Orkney	210	West Scapa Flow	MS C-Tecnic 2	16/05/2019	14:42:21	58.869035	-3.166257	14:47:34	58.869970	-3.166484
MS EMFF	Orkney	211	West Scapa Flow	MS C-Tecnic 2	16/05/2019	14:56:21	58.870914	-3.183094	15:04:15	58.872074	-3.184690
MS EMFF	Orkney	212	West Scapa Flow	MS C-Tecnic 2	16/05/2019	15:10:08	58.874749	-3.179272	15:16:26	58.875195	-3.181019
MS EMFF	Orkney	213	West Scapa Flow	MS C-Tecnic 2	16/05/2019	15:32:07	58.874204	-3.193128	15:38:10	58.874818	-3.193672
MS EMFF	Orkney	214	West Scapa Flow	MS C-Tecnic 2	17/05/2019	07:49:09	58.926251	-3.260113	07:57:13	58.927732	-3.260960
MS EMFF	Orkney	215	West Scapa Flow	MS C-Tecnic 2	17/05/2019	08:28:40	58.889976	-3.179295	08:35:46	58.889649	-3.180742
MS EMFF	Orkney	216	West Scapa Flow	MS C-Tecnic 2	17/05/2019	08:40:35	58.889967	-3.184136	08:48:24	58.889899	-3.185512
MS EMFF	Orkney	217	West Scapa Flow	MS C-Tecnic 2	17/05/2019	08:52:33	58.890599	-3.185164	08:57:41	58.890336	-3.185978
MS EMFF	Orkney	218	West Scapa Flow	MS C-Tecnic 2	17/05/2019	09:04:20	58.891498	-3.180679	09:11:31	58.891771	-3.181613
MS EMFF	Orkney	219	West Scapa Flow	MS C-Tecnic 2	17/05/2019	09:18:35	58.892762	-3.185896	09:24:44	58.892758	-3.187261
MS EMFF	Orkney	220	West Scapa Flow	MS C-Tecnic 2	17/05/2019	09:30:58	58.891695	-3.191572	09:38:38	58.891591	-3.193343

Project code	Survey Area	Station ref.	Site name	Camera gear code	Date	Start time (UTC)	Start Lat.	Start Long.	End time (UTC)	End Lat.	End Long.
MS EMFF	Orkney	221	West Scapa Flow	MS C-Tecnic 2	17/05/2019	09:48:19	58.893635	-3.186014	09:55:19	58.893627	-3.188205
MS EMFF	Orkney	222	West Scapa Flow	MS C-Tecnic 2	17/05/2019	10:01:40	58.894173	-3.192157	10:18:13	58.894305	-3.198096
MS EMFF	Orkney	223	North Flotta	MS C-Tecnic 2	17/05/2019	11:12:38	58.843694	-3.053473	11:17:56	58.844131	-3.053948
MS EMFF	Orkney	224	North Flotta	MS C-Tecnic 2	17/05/2019	11:26:07	58.848523	-3.052653	11:31:36	58.848666	-3.053305
MS EMFF	Orkney	225	North Flotta	MS C-Tecnic 2	17/05/2019	11:39:36	58.851536	-3.055549	11:44:54	58.852101	-3.056516
MS EMFF	Orkney	226	North Flotta	MS C-Tecnic 2	17/05/2019	11:51:59	58.851599	-3.064434	11:56:58	58.851483	-3.065260
MS EMFF	Orkney	227	North Flotta	MS C-Tecnic 2	17/05/2019	12:09:41	58.861255	-3.066841	12:14:56	58.861453	-3.067764
MS EMFF	Orkney	228	North Flotta	MS C-Tecnic 2	17/05/2019	12:20:34	58.864931	-3.069185	12:25:42	58.865048	-3.070082

Note: * stations 194 and 196 data for start time, latitude and longitude are from vessel navigation system due to missing hand held GPS waypoint

Table 2 Orkney Isles sampling station descriptions, May 2019

Station ref.	Site name	Date	Depth Start (mBSL)	Depth End (mBSL)	Vessel speed (knots)	Video notes Main substrate type	Video notes Flora and/or fauna
1	The North Sound	08/05/2019	40.1	37.6	0.6	Mixed boulders and cobbles with sand and gravel (finer fraction 60%+)	Pink and orange crusts, ?Flustra, Echinus, starfish (?Strichastrella)
2	The North Sound	08/05/2019	49	48.9	0.5	Fine silty sand with sparse shells	Limited visible biota
3	The North Sound	08/05/2019	45.1	45.2	0.3	Coarse sand and stony gravels. Some shells	?Flustra. Some drift algae
4	The North Sound	08/05/2019	53.7	54.8	0.6	Fine silty sand	Scattered brittlestars ?Ophiura, crab, sparse drift algal debris
5	The North Sound	08/05/2019	49.9	50.9	1.3	Coarse sand with some shells. Hard packed	None recorded
6	The North Sound	08/05/2019	62.6	59.5	1	Very hard packed, fine sand with pebbles, shells and occasional cobbles	?Flustra. Some drift algae, keel worms on stones
7	The North Sound	08/05/2019	48.9	49.2	1.8	Pebbles and cobbles with some sand	Brittlestars, Echinus, ?Luidia ciliaris, Flustra
8	The North Sound	08/05/2019	46.8	47.8	0.9	Pebbles and cobbles on sand. Hard ground	Brittlestars, Echinus, ?Luidia ciliaris, Flustra, scallop shells, pink encrusting corallines on stones
9	The North Sound	08/05/2019	28.4	29.2	0.4	Fine sand but quite hard	Drift algal debris
10	The North Sound	08/05/2019	16.1	15.3	0.4	Fine sand with scattered maerl and shells	Live maerl (possibly C abundance in troughs), drift and some live algae
11	The North Sound	09/05/2019	56.2	54.2	0.8	Coarse sand with some shells	Limited visible biota
12	The North Sound	09/05/2019	15	25.1	1.4	Bedrock and cobbles	Kelp park / forest - thins out with depth. L. hyperborea and red algae
13	The North Sound	09/05/2019	34.5	35.2	0.9	Sand on bedrock with boulders	Barnacles, Flustra / Securiflustra, urchins, brittlestars, anemones, small attached kelp plants / sporelings, ?small orange squirts
14	The North Sound	09/05/2019	31	28.3	1.7	Rugged terrain. Bedrock with sediment pockets initially with more sediment later	Small kelp plants, barnacles, pink encrusting algae, dead man's fingers, red algae
15	The North Sound	09/05/2019	37.6	38	0.8	Bedrock and cobbles amongst fine sand pockets (?50/50% split)	Flustra / Securiflustra bryozoans, pink encrusting algae on rocks, dead man's fingers, anemones, Luidia ciliaris
16	The North Sound	09/05/2019	41.4	43.4	1.3	Hard packed rippled sand plain	Sparse drift kelp debris. Limited visible biota
17	The North Sound	09/05/2019	41.6	42.7	0.9	Coarse sand with some shells	Limited visible biota
18	The North Sound	09/05/2019	45.5	46	0.5	Hard packed sand and pebbles - mixed	Shells possibly incl. ?Modiolus (sparse), drift kelp blades, one ?Chlamys

Station ref.	Site name	Date	Depth Start (mBSL)	Depth End (mBSL)	Vessel speed (knots)	Video notes Main substrate type	Video notes Flora and/or fauna
19	The North Sound	09/05/2019	37.9	37.4	0.8	Cobbles and very large boulders	Dead man's fingers, enc. orange crusts, urchins, pink encrusting algae on rock, starfish, crevice brittlestars. Exposed bedrock with faunal turf
20	The North Sound	09/05/2019	31.5	26.7	1.1	Low relief bedrock outcrops with boulder amongst medium sand (30?70%) changes to greater proportion of bedrock	Dead man's fingers, urchins, pink encrusting algae on rock
21	The North Sound	09/05/2019	37.5	36.9	0.3	Bedrock with some fine sand in grooves on top. Moves onto mixed ground with boulders, cobbles and pebbles	Urchins, orange crusts
22	The North Sound	09/05/2019	30.1	29.3	0.4	Fine sand with ripples	Little visible biota
23	The North Sound	09/05/2019	48.2	49.2	0.7	Fine sand	Ocassional drift algae
24	The North Sound	09/05/2019	46.4	46.2	0.2	Fine clean sand with a few shells	Little visible biota
25	The North Sound	09/05/2019	39	38.8	0.4	Fine sand	Little visible biota
26	The North Sound	09/05/2019	18.2	16.5	0.6	Medium sand with pebbles, cobbles and boulders	Kelp park (<i>Laminaria hyperborea</i> with sparse <i>Saccharina latissima</i> ?), <i>Porania puvillus</i> , red algae, pink encrusting algae
27	The North Sound	09/05/2019	22	22.9	0.2	Fine sand with some shells (razors)	Scattered drift algal debris
28	The North Sound	09/05/2019	13.2	13.5	0.3	Fine rippled sand	Some attached algae. Possibly brittlestar arms in the sediment?
29	The North Sound	10/05/2019	20.2	21.2	0.4	Quite hard-packed medium fine sand with shells	Some algal debris - didn't appear attached
30	The North Sound	10/05/2019	14.9	20.4	0.4	Initially bedrock and boulders with some sediment; from 19m more mixed sediments	<i>Laminaria hyperborea</i> forest with urchins and red algae
31	The North Sound	10/05/2019	56	55.9	0.5	Coarse pebbles and gravel	Brittlestars, dead man's fingers, seven arm starfish, urchins. Possibly x1 horse mussel
32	The North Sound	10/05/2019	34	29.3	0.7	Fine sands	Flustra / <i>Securiflustra</i> bryozoans but loose on sand bank
33	The North Sound	10/05/2019	37.8	38.4	0.9	Bedrock with clean sands	Seven arm starfish, dead man's fingers, encrusting orange growths, Flustra / <i>Securiflustra</i> , possibly small ascidians, sunstars, urchins, pink encrusting coralline algae on rock

Station ref.	Site name	Date	Depth Start (mBSL)	Depth End (mBSL)	Vessel speed (knots)	Video notes Main substrate type	Video notes Flora and/or fauna
34	The North Sound	10/05/2019	32	35.2	0.6	Bedrock with clean sands	Sparse red algae, dead man's fingers, urchins, pink encrusting coralline algae on rock. Lower relief rock with increased proportion of <i>Flustra</i> / <i>Securiflustra</i> at the end
35	The North Sound	10/05/2019	40	40.3	3.2	Very tide-swept bedrock	Low faunal crusts, dead man's fingers, barnacles, urchins
36	The North Sound	10/05/2019	31	26.4	2	Tide-swept bedrock ridges and boulders	Dead man's fingers, urchins, some red algae, ?grey turf / sponge growth. Sparse kelp at 27m
37	The North Sound	10/05/2019	17.3	15.7	0.5	Rugged bedrock	<i>Laminaria hyperborea</i> kelp forest with urchins and red algae
38	The North Sound	10/05/2019	33.4	33.6	0.8	Flat sheet bedrock	Quite bare bedrock in places but patches of dead man's fingers, urchins, starfish, crabs, some pink encrusting algae, sunstars and ? <i>Marthasterias glacialis</i>
39	The North Sound	10/05/2019	29.3	26.2	1.2	Bedrock	Faunal turf with dead man's fingers, urchins, some red algae. Kelp on top of small wall at 24m - park with red and brown algae including <i>Dichtoyota dichotoma</i> and <i>Odonthalia denetata</i> ?
40	The North Sound	10/05/2019	15.4	14.8	0.2	Sand affected bedrock	Kelp forest with red algae on kelp stipes and bedrock
41	The North Sound	10/05/2019	14.2	13.7	0.3	Sand affected bedrock	Kelp forest with red algae on kelp stipes and bedrock. Urchins
42	The North Sound	10/05/2019	18.4	19.3	0.5	Bedrock	<i>Laminaria hyperborea</i> kelp forest with urchins and pink enc. Coralline algae on rock
43	The North Sound	10/05/2019	38.2	41.6	0.5	Bedrock ridges with areas of clean sands	Dead man's fingers, brittlestars, <i>Flustra</i> / <i>Securiflustra</i> , urchins, ? <i>Solaster</i>
44	The North Sound	10/05/2019	55.2	52.5	1	Bedrock with sand	Dead man's fingers, keelworms, urchins, anemones, brittlestars
45	The North Sound	10/05/2019	41.6	41.8	0.9	Bedrock with sand	Dead man's fingers, starfish, <i>Flustra</i> / <i>Securiflustra</i> , urchins anemones
46	The North Sound	10/05/2019	35.8	37.2	0.4	Bedrock with sand	Urchins, starfish, bryozoans, low faunal turf, ?sponges
47	The North Sound	10/05/2019	40.1	40	0.4	Bedrock with sand	Dead man's fingers, starfish, low faunal turf, ? <i>Alcyonidium</i> , ?dwarf plumose anemones

Station ref.	Site name	Date	Depth Start (mBSL)	Depth End (mBSL)	Vessel speed (knots)	Video notes Main substrate type	Video notes Flora and/or fauna
48	The North Sound	10/05/2019	30.2	30.1	1.8	Bedrock	Faunal turf with some red algae, hydroids, ?dwarf plumose anemones, other anemones
49	The North Sound	10/05/2019	17.3	17.1	0.1	Fine sands	Drift algal debris incl possible seagrass blades, common starfish, a flatfish and razor shells
50	The North Sound	10/05/2019	10.2	11.3	0.6	Fine sands	Seaweeds including some attached to small pebbles. A small rock/outcrop with kelps
51	Eday, Sanday and Stronsay	11/05/2019	32.5	32.9	0.7	Bedrock with patches of coarse sand	Dead man's fingers, Flustra / Securiflustra, hydroids, urchins, pink encrusting algae on rock, anemones, starfish, crabs
52	Eday, Sanday and Stronsay	11/05/2019	11.6	11.2	0.2	Pebbles, cobbles and gravel with boulders	Mixed kelp park of Laminaria hyperborea and Saccharina latissima with red algae on stipes and seabed and urchins
53	Eday, Sanday and Stronsay	11/05/2019	16.9	17.7	0.6	Sand with pebbles, cobbles and bedrock. Sandier towards end of run	Mixed kelp park of Laminaria hyperborea and Saccharina latissima - pink encrusting algae on rock, Flustra / Securiflustra, dead man's fingers, starfish, red algae, anemones
54	Eday, Sanday and Stronsay	11/05/2019	24.4	23.1	1	Hard packed flat bottom - pebbles and cobbles with coarse sand	Flustra / Securiflustra, Saccharina latissima, Luidia ciliaris, brittlestars, anemones, dead man's fingers
55	Eday, Sanday and Stronsay	11/05/2019	25.5	25.6	0.5	Flat ground of cobbles and boulders with gravel	Pink encrusting coralline algae on rocks, bryozoans, dead man's fingers, anemones, ?hydroid turf, starfish, urchins
56	Eday, Sanday and Stronsay	11/05/2019	21.4	19.1	0.8	Maerl on silty sands with shells and stones	Maerl bed initially (a veneer - not thick but with a good proportion of live maerl). Seven arm starfish, filamentous algae. Maerl stops after 5 mins
57	Eday, Sanday and Stronsay	11/05/2019	23.1	20.6	1	Fine sand with mussel shells	Scattered horse mussel shells and a few live mussels. Flustra / Securiflustra patches
58	Eday, Sanday and Stronsay	11/05/2019	17.6	17.7	0.6	Fine sand, pebbles and cobbles with lots of mussel shells	Horse mussel Modiolus modiolus shell debris but no live mussels observed
59	Eday, Sanday and Stronsay	11/05/2019	23.8	23.9	1.1	Coarse sand with cobbles, pebbles and lots of mussel shells	Flustra / Securiflustra clumps, pink encrusting coralline algae on rocks
60	Eday, Sanday and Stronsay	11/05/2019	12.8	12	1	Coarse sand and gravel including maerl derived gravel	Sparse live maerl with sugar kelp, Ulva sp. and assorted filamentous algae. Starfish
61	Eday, Sanday and Stronsay	11/05/2019	13.2	14.4	0.3	Fine sand with some shells	Scattered drift algal debris and clumps of Desmarestia (attached to small stones)

Station ref.	Site name	Date	Depth Start (mBSL)	Depth End (mBSL)	Vessel speed (knots)	Video notes Main substrate type	Video notes Flora and/or fauna
62	Eday, Sanday and Stronsay	11/05/2019	16.3	15.4	0.9	Maerl and stony gravel with pebbles and cobbles	Sparse live maerl amongst maerl gravel. Scattered large sugar kelp plants
63	Eday, Sanday and Stronsay	11/05/2019	13.4	13.7	0.3	Fine sand with pebbles and cobbles	Mixed kelps and other seaweeds on sediments (KSwSS)
64	Eday, Sanday and Stronsay	11/05/2019	13.6	13.3	0.3	Fine sand with pebbles and cobbles	Assorted drift and some attached algae on sediments
65	Eday, Sanday and Stronsay	11/05/2019	21.1	21	0.6	Boulders and bedrock with finer silty sediments	Sparse kelp, filamentous red algal fluff turf on rocks, brittlestars in crevices and starfish
66	Eday, Sanday and Stronsay	11/05/2019	14.5	14.4	0.5	Stones on sandy sediments	Mixed kelp park of Laminaria hyperborea and Saccharina latissima
67	Eday, Sanday and Stronsay	11/05/2019	18.9	18.8	0.6	Boulders and cobbles with coarse sandy gravels	Kelp park with urchins, starfish, dead man's fingers, red algae and brittlestars
68	Eday, Sanday and Stronsay	11/05/2019	21.9	22.3	1.2	Maerl with pebbles	Nice maerl bed with algae including sugar kelp and Dichtoyota dichotoma. Brittlestars, mussel and razor shells, starfish and urchins
69	Eday, Sanday and Stronsay	11/05/2019	25.9	27.1	1.5	Hard packed sand, pebbles and gravel	Drift algae and some horse mussel shells but no live seen
70	Eday, Sanday and Stronsay	11/05/2019	11.6	11.6	0.7	Pebbles, cobbles and coarse sandy gravel with some maerl	Maerl (low proportion of material and live) with mixed kelps and other seaweeds
71	Eday, Sanday and Stronsay	11/05/2019	16.2	16.2	0.9	Fine sand with sparse maerl gravel, pebbles and shells	Sugar kelp and other seaweeds with a very low proportion of live maerl (?<2%)
72	Eday, Sanday and Stronsay	11/05/2019	14.7	16.1	1	Maerl and coarse sand initially then coarse sand	Sugar kelp and filamentous seaweeds. Maerl material and live maerl probably qualifies as a bed initially but then a sand dominated biotope
73	Shapinsay	12/05/2019	12.2	12.1	0.4	Maerl gravel with coarse sand and shells	Maerl bed (~5% live but with lots of maerl gravel) with starfish and drift and some attached filamentous seaweeds
74	Shapinsay	12/05/2019	17.7	16.6	1	Maerl with pebbles and shells	Nice maerl bed with sugar kelp, starfish and sparse red algae
75	Shapinsay	12/05/2019	12.2	12.2	0.2	Coarse sand with some maerl and shells	Sparse live maerl and maerl gravel with sugar kelp and filamentous algae on shells
76	Shapinsay	12/05/2019	19.6	19.7	0.1	Soft fine sand with pebbles and maerl	Maerl bed on fine silty sediments. Sugar kelp and other algae with peacock worms, crabs, queenies with orange sponge covers

Station ref.	Site name	Date	Depth Start (mBSL)	Depth End (mBSL)	Vessel speed (knots)	Video notes Main substrate type	Video notes Flora and/or fauna
77	Shapinsay	12/05/2019	25	24.6	0.3	Fine sand with pebbles and shells	Pockets of shell clumps (inc. razor shells) with sparse hydroids, burrowing anemones and sparse maerl thalli (live and dead but <1%?)
78	Shapinsay	12/05/2019	20.1	20.4	0.4	Fine sand	Sparse filamentous algae, razor shells, ?drift seagrass blades, crabs and ?burrowing anemones
79	Shapinsay	12/05/2019	19.9	19.8	0.4	Gravel and pebbles with coarse sand and lots of shells	Some maerl present with urchins, sugar kelp, starfish and filamentous algae
80	Shapinsay	12/05/2019	18.1	18.1	0.4	Bedrock and stones with maerl	Very nice maerl bed around rocks supporting a mixed kelp forest. Starfish, brown seaweeds (Desmarestia and Dictyota dichotoma) and brittlestars
81	Shapinsay	12/05/2019	14.5	15.9	1.1	Bedrock with pockets of coarse sands	Tide-swept kelp forest with red algae, starfish and bryozoans on stipes
82	Shapinsay	12/05/2019	12.3	14.6	0.6	Bedrock with cobbles, pebbles and pockets of coarse sands	Kelp forest of Laminaria hyperborea with red algae on stipes
83	Shapinsay	12/05/2019	16.6	19.7	0.7	Bedrock with cobbles, pebbles and pockets of coarse sands	Kelp forest of Laminaria hyperborea with red algae, urchins and starfish
84	Shapinsay	12/05/2019	29	34.5	0.8	Flat bedrock with large boulders	Anemones, hydroids, barnacles and pink encrusting coralline algae on rock
85	Shapinsay	12/05/2019	27	27.4	1.6	Bedrock with stones, gravel and oatches of coarse sand	Anemones, starfish and bryozoans
86	Shapinsay	12/05/2019	26.6	33.5	0.7	Medium fine sand around bedrock / boulders	Hydroids and anemones on rock. Some drift kelp
87	Shapinsay	12/05/2019	35.1	35.2	1.3	Bedrock with coarse sand patches	Anemones, barnacles, dead man's fingers, hydroids, urchins, orange sponges and other encrusting sponges
88	Shapinsay	12/05/2019	31.1	30.2	1	Bedrock with coarse sand patches	Anemones, barnacles, dead man's fingers, hydroids, urchins, orange sponges and other encrusting sponges
89	Shapinsay	12/05/2019	14.3	17.1	0.3	Coarse sand with pebbles and shells	Mixed kelps - sugar kelp and furbellows with other algae
90	Shapinsay	12/05/2019	34.5	37.5	2.5	Bedrock	Tide-swept bedrock with sponges, hydroids and urchins
91	Shapinsay	12/05/2019	33.3	31.4	0.8	Boulders, cobbles, pebbles and gravel with coarse sand	Dead man's fingers, bryozoans, starfish, hydroids, pink encrusting coralline algae on rocks. Large colony of ?Salmacina / Filograna

Station ref.	Site name	Date	Depth Start (mBSL)	Depth End (mBSL)	Vessel speed (knots)	Video notes Main substrate type	Video notes Flora and/or fauna
92	Eday, Sanday and Stronsay	12/05/2019	13.6	13.7	0.4	Bedrock with pockets of coarse sands	Kelp forest Laminaria hyperborea with barnacles, starfish, red and brown seaweeds and urchins
93	Eday, Sanday and Stronsay	12/05/2019	15.2	15.6	0.4	Fine sand (with diatom film in places?) with sparse shells	Limited visible biota - sparse sugar kelp and bootlace weed
94	Eday, Sanday and Stronsay	12/05/2019	29.7	25.7	0.9	Hard packed pebbles and cobbles with horse mussel shells and coarse sand	Horse mussel Modiolus modiolus shell debris but no live mussels observed. Queen scallops (sparse), starfish, brittlestars (sparse) and pink encrusting algae on shells
95	Shapinsay	12/05/2019	30.4	30.7	0.9	Bedrock with pockets of coarse sands	Barnacles and pink encrusting algae on rock with anemones, small areas of orange sponges and clumps of hydroids
96	Shapinsay	12/05/2019	20.9	21.4	1.4	Cobbles and large boulders with coarse sand	Kelp park with red algae, urchins and starfish. Pink encrusting algae on hard substrates
97	Shapinsay	12/05/2019	20.7	20.7	0.1	Fine sand with shells	Drift seaweeds and razorfish shells
98	Shapinsay	12/05/2019	21.4	22.8	0.6	Maerl and shells with coarse sand	Maerl bed (pockets of quite dense live thalli with maerl gravel) but limited visible epibiota. Some sugar kelp and razorfish shells
99	Shapinsay	13/05/2019	26.9	26.4	0.9	Very shelly	Mussel shells, no live observed
100	Shapinsay	13/05/2019	31.2	31.7	1	Sand with boulders	Pink encrusting on boulders, Flustra, sponges, starfish
101	Shapinsay	13/05/2019	36.9	36.1	1.2-0.4	Shelly sand	Sparse kelp, Asterias, urchins
102	Shapinsay	13/05/2019	37.5	37.8	1.3-0.7	Sand	Pink encrusting on boulders, kelp park, Asterias, brittlestars
103	Shapinsay	13/05/2019	36.2	35.9	0.9	Shelly sand and cobbles	Horse mussel shells, no live observed
104	Shapinsay	13/05/2019	24.5	23.8	0.4	Maerl gravel, shells, coarse sand	razor shells
105	Shapinsay	13/05/2019	27.1	27.3	1.6-0.9	Sand and shells	Horse mussel shells, no live observed
106	Shapinsay	13/05/2019	26.2	27.3	1.4-0.9	cobbles and shells	horse mussel shells, ? Live, Flustra
107	Shapinsay	13/05/2019	26.4	26.8	0.5	cobbles, maerl gravel and shells	occ scallop shell, horse mussel inc live, Flustra, anemones
108	Head of Holland	13/05/2019	15.3	15.5	0.4	maerl and sand	maerl, foliose red algae, razor shells, sugar kelp
109	Head of Holland	13/05/2019	24.2	24.4	0.4	Maerl and coarse sand	maerl, sea squirts, razor shells, dead mans fingers
110	Head of Holland	13/05/2019	18.4	19.4	0.4	Maerl and coarse sand	maerl, anemones, ?gravel cucumber, razor shells

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111	Shapinsay	13/05/2019	28	28.6	0.6	cobbles and shelly coarse sand	live horse mussels, brittle stars, flustra, echinus
112	Shapinsay	13/05/2019	24.7	24.8	0.7	shells and cobbles, coarse sand	horse mussel shells
113	Head of Holland	13/05/2019	26.1	26.9	0.4	rocky reef- boulders, cobbles with pockets of coarse sand	dead mans fingers, brittlestars, crossaster, asterias, echinus, flustra, pink encrusting on boulders, hydroid
114	Head of Holland	13/05/2019	23.4	23	0.5	Sand	razor shells, sea slug egg ribbons, sea squirts
115	Head of Holland	13/05/2019	13.6	14.8	0.6	Sand	sea squirts, turitella?
116	Head of Holland	13/05/2019	25.3	25.8	0.3	Maerl gravel and sand	Maerl (?not much live)
117	Head of Holland	13/05/2019	23.7	11.5	0.4	Maerl and gravel	Maerl, razor shells, sea slug egg ribbons, sea squirts, hydroids
118	Head of Holland	13/05/2019	16.6	17	0.5	Fine sand	sea squirts
119	Head of Holland	13/05/2019	13.9	14.7	0.5	Fine sand	kelp, sea squirts, ?turitella
120	Head of Holland	13/05/2019	22.1	16.7	0.5	maerl and coarse sand	maerl, sea squirts, Luidia ciliaris
121	West Scapa Flow	14/05/2019	10.2	13.9	?	Shelly clean sand	No maerl observed. Kelps.
122	West Scapa Flow	14/05/2019	18.1	17.3	1.6	Shelly clean sand	L hyperborea, L saccharina (Maerl attached to holdfast of L sacc that was snagged on camera.)
123	West Scapa Flow	14/05/2019	18	14.8	0.8	Shelly clean sand	Occasional maerl twiglets, L hyperborea, L saccharina
124	West Scapa Flow	14/05/2019	14.9	14.4	0.6	Coarse shelly sand, maerl and maerl gravel	Maerl (~50% live), L hyperborea, L saccharina
125	West Scapa Flow	14/05/2019	21	21.6	1.7-0.8	Coarse shelly sand with cobbles and stones	Maerl, kelp forest/ park, pink encrusting on stones, foliose reds, Echinus, Flustra, anemones
126	West Scapa Flow	14/05/2019	15.1	16.1	0.7	Stones and boulders with maerl in between	Pockets of live maerl in between boulders, L hyp forest, foliose reds
127	West Scapa Flow	14/05/2019	15.3	17.3	0.6	Maerl and maerl gravel with shell drifts	Maerl (~25-50% live in places). Occ L hyp and L sacc
128	West Scapa Flow	14/05/2019	19.8	18.9	0.7	Fine shelly sand	Occ L hyp and L Sacc, drift kelps
129	West Scapa Flow	14/05/2019	23.5	23.6	0.6	Maerl and maerl gravel with pebbles and shells	Maerl - some live. Luidia ciliaris. Occ L sacc. Hydroid turf
130	West Scapa Flow	14/05/2019	15.6	16.1	0.7	Fine sand	No obvious epifauna
131	West Scapa Flow	14/05/2019	16.1	15.8	0.4	Fine sand	worm casts and occ L hyp
132	West Scapa Flow	14/05/2019	36.1	35.8	0.2	Fine sand maerl gravel with shells	Butterfish?, drift kelps
133	West Scapa Flow	14/05/2019	66	67	0.3	Maerl gravel on fine sand, shelly	Butterfish?, crabs
134	West Scapa Flow	14/05/2019	47.4	47.9	0.2	Maerl gravel cobbles, shells	Keel worms, henricia star fish?

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135	West Scapa Flow	14/05/2019	52.9	49.5	0.3	Maerl gravel, coarse sand, shells and cobbles	keel worms, occ anemones, crabs
136	West Scapa Flow	14/05/2019	42.8	34.9	0.3	Muddy sand with shells	Squat lobster, Echinus, scallops
137	West Scapa Flow	14/05/2019	25.1	26.5	0.3	Muddy sand	Mat of ?silted red algae, horse mussels, tube anemone, luidia ciliaris, scallops, Nucula nucleus
138	West Scapa Flow	14/05/2019	37.2	39.8	0.3	Muddy sand with shells	Scallops, anemones, small burrows
139	West Scapa Flow	14/05/2019	37	31.6	0.3	Muddy sand with shells,	Scallops, anemones, small burrows, echinus, ?horse mussels, pagarus
140	West Scapa Flow	14/05/2019	22	25.3	0.8	Muddy sand with shells, moving onto silted cobbles	Scallops, silted mat of red algae, horse mussels, Nucula nucleus
141	West Scapa Flow	14/05/2019	38.4	40.2	0.1	Muddy sand with shells	Scallops, Echinus, small burrows, burrowing anemone, horse mussel shells, Nucula nucleus
142	West Scapa Flow	14/05/2019	36.4	39.4	0.2-0.8	Muddy sand with shells	Small burrows, horse mussels, scallops, brittlestars, ?devonshire cup coral
143	West Scapa Flow	14/05/2019	39.8	33.6	0.6	Muddy sand with shells	scallops, brittlestars, echinus, horse mussels, small burrows
144	West Scapa Flow	14/05/2019	30.3	33.2	0.3	Muddy sand with shells and cobbles	Tube anemone
145	West Scapa Flow	14/05/2019	36.9	37.2	0.4	Fine sand with cobbles and shells	Scallops, horse mussels, crabs, pagarus, Nucula nucleus
146	West Scapa Flow	14/05/2019	25.7	25.4	0.7	Fine sand and shells	Horse mussel bed, scallops, brittlestars, luidia ciliaris, Nucula nucleus
147	West Scapa Flow	14/05/2019	38.4	37.1	0.2	Silty sand and shells in pockets between hard ground	Consolidated looking horse mussel bed, hydroid turf, echinus, scallops, Nucula nucleus
148	West Scapa Flow	14/05/2019	42.9	41.3	0.6	Fine sand with shells	Horse mussels, hydroid turf, ?sea squirts, scallops, crossaster, luidia ciliaris, Nucula nucleus
149	West Scapa Flow	14/05/2019	48	39.9	0.5	Fine sand with shells	Horse mussels, scallops, Echinus, crabs, crossaster, hydroid turf, Nucula nucleus
150	West Scapa Flow	14/05/2019	40.1	38.5	0.5	Fine sand with shells	Horse mussels, echinus, Luidia ciliaris, Nucula nucleus
151	West Scapa Flow	15/05/2019	17.2	16.9	0.3	Coarse sand	L saccharina and Desmerestia
152	West Scapa Flow	15/05/2019	64.1	62.7	0.5	Bedrock and boulders	Dead mans fingers, anemones, echinus, asterias, brittlestars
153	West Scapa Flow	15/05/2019	55.1	53	0.9	Stones and ?bedrock	Brittlestar bed, dead mans fingers, keel worms

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154	West Scapa Flow	15/05/2019	25.1	25.4	0.8	Maerl and maerl gravel, coarse sand with small pebbles	Live maerl (up to ~50% in patches).
155	West Scapa Flow	15/05/2019	19.1	21.1	0.2	Maerl and maerl gravel, patches of shelly sand	Live maerl (up to ~50% in patches). Occ L hyp, echinus
156	West Scapa Flow	15/05/2019	22.7	22.5	0.3	Coarse sand with cobbles and stones, onto maerl	Foliose seaweeds, hydroid turf, pink encrusting, barnacles, keel worms, maerl (possibly ~50% live in patches)
157	West Scapa Flow	15/05/2019	15.3	15.5	0.5	Fine sand	algal tufts
158	West Scapa Flow	15/05/2019	17.1	15.3	0.2	Maerl and maerl gravel, coarse sand and shell drifts	Algal tufts, tube anemones, scallops, hydroid turf
159	West Scapa Flow	15/05/2019	20.3	20	0.5	coarse shelly sand with cobbles and maerl gravel	hydroid turf and foliose reds
160	West Scapa Flow	15/05/2019	19	19.1	0.2	Maerl gravel, coarse shelly sand	red algae, hydroid turf, anemones
161	West Scapa Flow	15/05/2019	17.9	18.4	0.8	Maerl gravel and fine shelly sand	Red algae, cerianthus
162	West Scapa Flow	15/05/2019	15.6	15.5	0.5	Fine sand	Small burrows, algal tufts
163	West Scapa Flow	15/05/2019	11.2	13.9	0.8	Maerl, maerl gravel and shell gravel, small stones onto boulders	Maerl, red algae, hydroids, scallops
164	West Scapa Flow	15/05/2019	18.3	18.1	0.3	Maerl gravel and fine shelly sand.	Red algal mat and hydroid turf. Nucula. Luidia, ?Flame shell
165	West Scapa Flow	15/05/2019	16	15.9	0.3	Fine sand	Silted mat of red algae, ?flame shell
166	West Scapa Flow	15/05/2019	19.1	19.3	0.3	Coarse sand and sparse maerl gravel	Red algal mat, scallops, crabs ?flame shell
167	West Scapa Flow	15/05/2019	16.9	16.9	0.4	Fine sand and sparse maerl gravel	Silted mat of red algae, ?flame shell
168	West Scapa Flow	15/05/2019	17.1	17.1	0.7	Fine shelly sand	Silted mat of red algae. Encrusting pink on stones, ?flame shell
169	West Scapa Flow	15/05/2019	15.6	16.1	0.8	Fine shelly sand	Silted mat of red algae, cerianthus, razor shells, ?flame shell
170	West Scapa Flow	15/05/2019	15.8	14.9	0.8	Fine shelly sand	Silted mat of red algae, ?horse mussel, ?flame shell
171	West Scapa Flow	15/05/2019	15.9	16.4	0.8	coarse shelly sand and maerl gravel	red algal mats, ?flame shell
172	West Scapa Flow	15/05/2019	15.4	16.1	0.9	coarse shelly sand and sparse maerl gravel	red algal mats, ?flame shell
173	West Scapa Flow	15/05/2019	15.2	13.8	0.6	fine shelly sand and sparse maerl gravel	Red algal mats, scallops, hydroid turf, ?flame shell
174	West Scapa Flow	15/05/2019	14.5	14	0.6	Coarse sand	Red and green algal mats, hydroid turf, ?flame shell
175	West Scapa Flow	15/05/2019	28.1	28.3	0.4	hard packed fine sand and cobbles	scallops, cerianthus,

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176	West Scapa Flow	15/05/2019	33.1	28.4	0.3	Fine sand with small shells and cobbles	scallops, nucula, cerianthus, devonshire cup corals
177	West Scapa Flow	15/05/2019	24.9	25.5	0.4	muddy sand	silted mat of red algae, king scallop, luidia
178	West Scapa Flow	15/05/2019	29	22.6	0.4	muddy sand, cobbles and shells	cerianthus, small burrows, pagarus, scallops
179	West Scapa Flow	15/05/2019	23.8	24	0.5	fine shelly sand, sparse maerl gravel	silted kelp and red algae. Rubbish (bottles and mug)
180	West Scapa Flow	15/05/2019	13.6	12.9	0.5	coarse shelly sand	green algal tufts, king scallop
181	West Scapa Flow	15/05/2019	13.4	13.6	0.4	fine shelly sand	cerianthus, algae tufts
182	West Scapa Flow	15/05/2019	19.5	16.4	0.4	sandy mud	mat of silted red algae, ?horse mussel, L sacc
183	West Scapa Flow	15/05/2019	24.6	25.3	0.4	Muddy sand with shells and cobbles	silted red algae mat, cerianthus
184	West Scapa Flow	15/05/2019	10.8	10	0.3	shelly sand	mat of green algae, asterias, hydroid, spider crabs on sugar kelp
185	West Scapa Flow	15/05/2019	23.1	23.9	0.3	fine sand with shells	scallops, virgularia, cerianthus, nucula
186	West Scapa Flow	15/05/2019	31.3	31.6	0.4	sand with shell gravel and cobbles	cerianthus, scallops, luidia, small burrows
187	West Scapa Flow	16/05/2019	23	24.4	1	muddy sand with sparse shell gravel	patches of silted red algae, cerianthus, brittlestar bed at end
188	West Scapa Flow	16/05/2019	42.3	44.9	0.4	muddy sand	virgularia, brittlestars, small burrows
189	West Scapa Flow	16/05/2019	50	50.5	0.8	muddy sand	small burrows, drift kelp
190	West Scapa Flow	16/05/2019	36	26.9	1	muddy sand	virgularia, cerianthus, ?penatula,
191	West Scapa Flow	16/05/2019	23.1	23.6	0.8	muddy sand	queen scallops, turitella, cerianthus, small burrows
192	West Scapa Flow	16/05/2019	21.1	21.2	0.7	sandy mud with organic layer	very silted red algae, cerianthus
193	West Scapa Flow	16/05/2019	20.5	20.8	0.4	sandy mud with organic layer	very silted red algae
194	West Scapa Flow	16/05/2019	15.8	15.7	0.3	fine sand with shell fragments	green algae
195	West Scapa Flow	16/05/2019	16	16.1	0.8	fine sand and maerl gravel, shell fragments	mat of foliose red algae, queen scallops, ?flame shell bed
196	West Scapa Flow	16/05/2019	16.5	16.5	0.7	shelly sand and maerl gravel	Some live maerl thalli, mat of foliose red algae, hydroids, scallops, ?flame shell bed, ?horse mussels
197	West Scapa Flow	16/05/2019	16.1	16.6	0.9	coarse shelly sand and maerl gravel	occasional live maerl thalli, ?flame shell bed, mat of red foliose algae, hydroids, green algae, queen scallops
198	West Scapa Flow	16/05/2019	14.8	12.5	0.9	coarse shelly sand and maerl gravel	sparse live maerl thalli at start, green algae, mat of red foliose algae, ?horse mussel, ?flame shell

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199	West Scapa Flow	16/05/2019	17.3	12.6	0.6	coarse sand and maerl gravel	mat of foliose reds, hydroids, scallops, flame shell bed, ?horse mussel, sparse live maerl thalli, ?maerl under foliose reds
200	West Scapa Flow	16/05/2019	24.8	25.6	0.8	coarse shelly sand and maerl gravel	queen scallops, cerianthus, patches of foliose red algae
201	West Scapa Flow	16/05/2019	20.4	10.7	1-1.4	coarse shelly sand and maerl gravel, some cobbles	queen scallops, cerianthus, sparse live maerl thalli, mat of foliose reds, ?flame shell bed, horse mussel shells, ?horse mussels, nucula
202	West Scapa Flow	16/05/2019	21	20.9	1	fine sand, shell gravel, cobbles and stones	Mat of foliose reds, horse mussel shells, ?flame shell bed- nest burrows
203	West Scapa Flow	16/05/2019	20.3	18.9	0.8	coarse shelly sand, cobbles and stones, shell debris	horse mussel shells, ?live horse mussels, nucula, mat of foliose reds, ?flame shell bed - nest burrows
204	West Scapa Flow	16/05/2019	19.4	20.5	0.7	coarse shelly sand, gravel and cobbles	horse mussels, queen scallops, patches of red foliose algae, ?flame shell bed
205	West Scapa Flow	16/05/2019	20.6	20.9	0.8	fine sand, shells and cobbles	mat of foliose reds, ?flame shell bed- nest burrows, hydroids, ?horse mussels
206	West Scapa Flow	16/05/2019	20.3	20.3	0.7	fine sand, shells and cobbles, sparse maerl gravel	mat of foliose red algae, ?flame shell bed, dogfish
207	West Scapa Flow	16/05/2019	22.7	23.5	0.4	Fine sand, hard packed shells	Horse mussels, red algae, echinus, nucula, scallops
208	West Scapa Flow	16/05/2019	19.7	19.7	0.9	coarse sand and shells	mat of foliose red algae, hydroids, ?horse mussels, ?flame shell bed, echinus
209	West Scapa Flow	16/05/2019	19.2	19.9	0.9	coarse sand and shells	mats of foliose red algae, ?flame shell bed - nest burrows and byssus
210	West Scapa Flow	16/05/2019	24	22.1	0.7	fine sand, shell gravel and cobbles	mats of foliose red algae, ?flame shell bed, cerianthus, hydroid turf
211	West Scapa Flow	16/05/2019	21.2	21.4	0.7	fine sand with shell gravel, pebbles	pink encrusted pebbles, patches of foliose red algal mat, ?flame shell bed, scallops
212	West Scapa Flow	16/05/2019	16.6	17.3	0.6	fine sand and shells	patches of foliose red algal mat, cerianthus
213	West Scapa Flow	16/05/2019	33.5	35.5	0.8	fine sand and shell fragments	cerianthus, barnacles, keel worms, squat lobsters
214	West Scapa Flow	17/05/2019	11.6	11.4	0.8	Maerl, shell drifts	Maerl (75-100% live in patches), L saccharina, Desmerestia, red algae, dogfish
215	West Scapa Flow	17/05/2019	25.7	21.4	0.5	Fine sand and shells	Horse mussel bed, ophiolithrix, ophiocomina, ?Urticina, king scallops, luidia,
216	West Scapa Flow	17/05/2019	21.4	20.5	0.4	Fine sand and shells	Horse mussel bed, ophiolithrix, ophiocomina, luidia

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217	West Scapa Flow	17/05/2019	20.8	21.3	0.3	Fine sand	Horse mussel bed, brittlestars-ophiothrix, ophiocomina, echinus
218	West Scapa Flow	17/05/2019	38.4	38.5	0.3	fine sand and shell fragments	Horse mussel bed, brittlestars-ophiothrix, keel worm
219	West Scapa Flow	17/05/2019	38	36.1	0.8	fine sand and shell fragments	horse mussel bed, brittlestars, luidia, nucula, crossaster, keel worms, barnacles, crabs, echinus, queen scallops
220	West Scapa Flow	17/05/2019	31.1	35.7	0.5	fine sand and shell fragments	horse mussel bed, brittlestars - ophiothrix, ophiocomina, echinus, Nucula, spider crabs
221	West Scapa Flow	17/05/2019	42.7	38.8	0.6	Fine sand and shell fragments	horse mussel bed, brittlestars- ophiothrix, ophiocomina, echinus, scallops, luidia, crabs, nucula, hydroids, crossaster
222	West Scapa Flow	17/05/2019	40.1	47.7	0.6	fine sand and shell fragments with softer sediment towards end of tow	horse mussel bed, echinus, whelks, crabs, Nucula, keel worms, pagarus, drift kelp, hydroids
223	North Flotta	17/05/2019	49.7	51.4	0.6	Mud	small burrows, sparse epifauna
224	North Flotta	17/05/2019	48.6	50.2	0.3	muddy sand with wreckage/ boulders	squats, hydroids, ?feather star
225	North Flotta	17/05/2019	58.1	59.1	0.4	sandy mud with ?diatom layer	squats
226	North Flotta	17/05/2019	18.9	18.8	0.3	fine sand	green algae, cerianthus
227	North Flotta	17/05/2019	31.9	32.7	0.3	muddy sand with ?diatom layer	squats, crab
228	North Flotta	17/05/2019	30.1	30.6	0.4	fine sand with ?diatom layer	virgularia, burrows, anemones, turitella