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EMFF Coastal Sediments Project

Offshore Sampling Survey Report

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Offshore Sampling Survey Report

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Climate and Communications



INFOMAR
Integrated Mapping for the
Sustainable Development
of Ireland's Marine Resource



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EMFF Coastal Sediments Project – Offshore Sampling Survey Report

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The Coastal Sediment Project was funded by the European Maritime Fisheries Fund (EMFF) and led by INFOMAR to conduct sediment sampling and environmental data collection surveys on areas of interest in Ireland’s coastal waters to develop high resolution sediment maps, create habitat maps and support ancillary EMFF projects coordinated by the Marine Institute.

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Introduction

INFOMAR, the national seabed mapping programme, aims to provide comprehensive and accessible marine datasets for Irish waters that underpin and add value to marine research and government policy. These products will foster growth within the national blue economy, maintain the health and integrity of our natural marine environment while facilitating international collaboration and best practice in the sustainable development of Ireland's marine resource. INFOMAR is jointly-managed by the Geological Survey Ireland and the Marine Institute.

There is an ongoing requirement for high resolution substrate maps that accurately depict the sediment properties of the seabed and improve our knowledge of the marine environment.

A Coastal Sediment Sampling Project, funded by the European Maritime Fisheries Fund (EMFF) and led by INFOMAR, was established to conduct intense sediment sampling and environmental data collection (including video) surveys on areas of interest in Ireland's coastal waters to develop high resolution sediment, substrate and habitat maps, increase the accuracy of these key derived products and support ancillary EMFF projects coordinated by the Marine Institute. Furthermore, this strategic campaign will support Ireland's Marine Spatial Plan, and the Marine Strategy Framework Directive, identified as priority action(s) of the EMFF Operational Programme.

This report details the second leg of the EMFF Coastal Sediment Sampling Project which was conducted in offshore coastal waters of the Irish Sea and along Ireland's south coast. Five sampling areas were chosen of which three were surveyed, with each area requiring additional sediment data in order to increase the resolution of existing seabed classification charts. The primary aim of this survey was to retrieve sediment samples for Particle Size Analysis from these selected areas to increase the accuracy of relevant substrate and habitat maps

Methods

Site Selection

Sample locations were selected following a geospatial analysis of existing data within a GIS (ArcMap10). Relevant spatial data included coarse seabed classification and sediment data already collected by INFOMAR. Expected depth ranges throughout the target areas were between 60-80m. Depth ranges were obtained from bathymetric data and confirmed via Single Beam Echosounder onboard the survey vessel. A number of target survey areas were selected to allow for weather contingencies. This included best and worst case scenarios for departure from Dublin Port on Tuesday 14th December and arrival into Cork on Friday 17th. A total of 111 sites were chosen in advance of the survey (Figure 1).

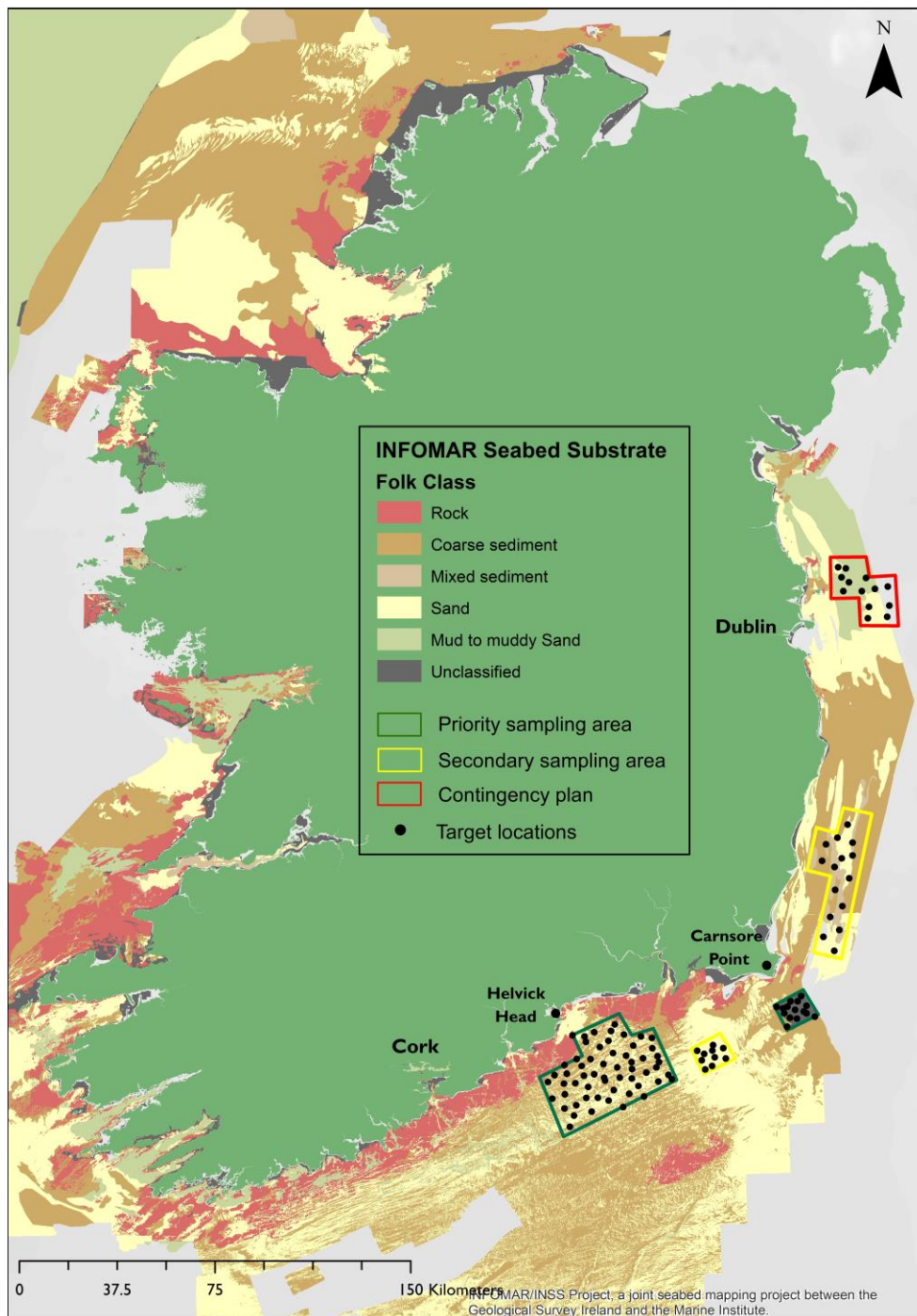


Figure 1. Sample locations within 5 survey areas along Irelands east and south coasts.

Vessel

The survey was conducted aboard the R.V. *Celtic Voyager*. The vessel is 31.4m in length and has wet, dry and chemical laboratories, which are permanently fitted with standard scientific equipment. The presence of a hydraulic A-frame and winch on the stern allows for efficient benthic sampling using a range of equipment including Day grab, Van Veen and Shipeks (depending on sampling criteria). In addition, high resolution GPS information is available to accurately record location of individual sampling locations. Samples can be processed within the wet-lab as required.



Figure 2. R.V. *Celtic Voyager*, used to conduct current sampling effort.

Survey Operations & Equipment

It was anticipated that the survey would run for up to 18 hours per day (0600 – 0000) between Tuesday 14th – Friday 17th December. Scientists were able to join the vessel from 1400 on the 14th in Dublin and disembarked at 0900 on the 17th in Cork. The survey was undertaken by two INFOMAR scientists, operating in accordance with the INFOMAR guidelines for ground-truthing. Operations can generally only take place in < Force 5 conditions unless swell and wave heights are not significant. A number of contingency surveys areas were identified in advance and the exact survey plan could only be decided with the vessel master and Chief Scientist on the day and in conjunction with prevailing and expected weather conditions.

Day Grabs were chosen as the primary sampling equipment. These are heavy and robust and capable of triggering on the seafloor and retrieving sufficient sample from areas of soft sediment to mixed hard ground and gravel even in challenging sea conditions.

The following equipment was prepared and provided by INFOMAR / Marine Institute:

- Sampling equipment including labels, sampling bags, Maunsell Chart.
- GIS plan with 111 sample locations identified and provided in .kml format
- Fish-Boxes for sample storage

Sample analysis

Sediment samples were acquired using a Day grab brought to the wet lab. Where they were briefly described (colour via Maunsell chart, grain size, clade, biogenics) and photographed before being labelled, bagged and retained for post-survey Particle Size Analysis.

Results

Sample Recovery

Once on location, the day grab was lowered to the seafloor to collect sediment. Upon a failed recovery, up to three attempts were made before recording the station as potential hard-ground and moving on. Table 1 describes the co-ordinates of each site and the relevant data recorded at each. Figure 4 shows the location of 66 sampling stations and a brief description of ground type from any sediment recovered or inferred from non-recovery. In total 65 sediment samples were recovered meaning only one location failed to provide sample. This may be due to hard-ground or an increased swell hindering effective triggering of Day Grab on the seabed

Date	Time	Survey Area	Sample Number	Depth	Latitude	Longitude	Sediment Recovered	Description
14/12/2021	1537	1	001	64	53.38922	-5.73447	Y	Sand
14/12/2021	1600	1	002	68	53.43077	-5.72470	Y	Sand
14/12/2021	1630	1	003	67	53.48607	-5.76070	Y	Mud
14/12/2021	1708	1	004	47	53.48860	-5.86818	Y	Mud
14/12/2021	1731	1	005	65	53.51817	-5.83142	Y	Sand
14/12/2021	1803	1	006	50	53.53565	-5.87601	Y	Mud
14/12/2021	1822	1	007	54	53.57192	-5.89261	Y	Mud
14/12/2021	1840	1	008	63	53.56647	-5.84915	Y	Mud
14/12/2021	1922	1	009	74	53.53059	-5.73524	Y	Mud
14/12/2021	1950	1	010	74	53.49131	-5.68586	Y	Mud
14/12/2021	2020	1	011	80	53.49692	-5.61052	Y	Sand
14/12/2021	2056	1	012	71	53.43117	-5.60600	Y	Sand
14/12/2021	2122	1	013	69	53.39317	-5.62417	Y	Sand
15/12/2021	0900	2	014	75	52.10677	-6.20000	N	N/A
15/12/2021	0924	2	015	67	52.08907	-6.26237	Y	Sand / Shell
15/12/2021	0942	2	016	72	52.08792	-6.22218	Y	Sand / Pebbles
15/12/2021	1008	2	017	80	52.07217	-6.17442	Y	Sand / Pebbles
15/12/2021	1041	2	018	88	52.03298	-6.12963	Y	Sand / Shell
15/12/2021	1102	2	019	82	52.04558	-6.17500	Y	Sand / Shell
15/12/2021	1119	2	020	80	52.05270	-6.19133	Y	Sand / Shell
15/12/2021	1138	2	021	73	52.05995	-6.23892	Y	Sand / Shell

Date	Time	Survey Area	Sample Number	Depth	Latitude	Longitude	Sediment Recovered	Description
15/12/2021	1206	2	022	69	52.07318	-6.28243	Y	Sand
15/12/2021	1224	2	023	69	52.04950	-6.29830	Y	Sand / Shell
15/12/2021	1241	2	024	74	52.03268	-6.26660	Y	Sand / Shell
15/12/2021	1302	2	025	75	52.00258	-6.28625	Y	Sand / Shell
15/12/2021	1807	3	026	61	51.97967	-7.04117	Y	Sand / Shell
15/12/2021	1829	3	027	65	51.94483	-7.04155	Y	Sand
15/12/2021	1849	3	028	68	51.91588	-7.01362	Y	Sand
15/12/2021	1915	3	029	70	51.87882	-7.02183	Y	Sand / Shell
15/12/2021	1942	3	030	72	51.85095	-6.95632	Y	Mud
15/12/2021	2005	3	031	71	51.82935	-7.01170	Y	Sand
15/12/2021	2043	3	032	74	51.81613	-7.12437	Y	Sand
15/12/2021	2107	3	033	74	51.79023	-7.17630	Y	Sand
15/12/2021	2136	3	034	74	51.74507	-7.21183	Y	Sand / Pebbles
15/12/2021	2200	3	035	76	51.76897	-7.29210	Y	Mud
15/12/2021	2230	3	036	76	51.77918	-7.35125	Y	Sand
15/12/2021	2300	3	037	75	51.73115	-7.38608	Y	Mud / Pebbles
15/12/2021	2348	3	038	78	51.68133	-7.50965	Y	Sand / Mud
16/12/2021	0805	3	039	40	51.99483	-7.48543	Y	Gravel
16/12/2021	0827	3	040	51	51.99032	-7.41640	Y	Sand / Shell
16/12/2021	0848	3	041	50	52.00332	-7.36272	Y	Gravel
16/12/2021	0917	3	042	52	52.00645	-7.26828	Y	Sand / Mud
16/12/2021	0945	3	043	57	51.99287	-7.19697	Y	Sand / Mud
16/12/2021	1036	3	044	62	51.95403	-7.14695	Y	Sand
16/12/2021	1100	3	045	61	51.92113	-7.18810	Y	Gravel
16/12/2021	1118	3	046	69	51.89782	-7.15997	Y	Gravel
16/12/2021	1153	3	047	72	51.84435	-7.16103	Y	Gravel
16/12/2021	1212	3	048	76	51.84647	-7.22655	Y	Sand / Mud
16/12/2021	1254	3	049	65	51.93035	-7.26197	Y	Sand
16/12/2021	1317	3	050	61	51.95190	-7.33395	Y	Sand
16/12/2021	1349	3	051	64	51.91223	-7.38823	Y	Gravel
16/12/2021	1419	3	052	75	51.85973	-7.36950	Y	Sand
16/12/2021	1441	3	053	74	51.84712	-7.31250	Y	Sand / Mud
16/12/2021	1516	3	054	79	51.81715	-7.40425	Y	Sand
16/12/2021	1542	3	055	75	51.83092	-7.47480	Y	Sand
16/12/2021	1612	3	056	67	51.88940	-7.43930	Y	Gravel
16/12/2021	1630	3	057	62	51.91322	-7.46448	Y	Gravel
16/12/2021	1655	3	058	59	51.89308	-7.53382	Y	Sand / Shell
16/12/2021	1720	3	059	65	51.85935	-7.58890	Y	Gravel
16/12/2021	1740	3	060	67	51.86448	-7.52297	Y	Sand / Shell
16/12/2021	1813	3	061	77	51.79312	-7.53372	Y	Sand
16/12/2021	1840	3	062	77	51.77765	-7.46485	Y	Sand / Mud
16/12/2021	1857	3	063	81	51.75537	-7.47007	Y	Sand / Mud
16/12/2021	1919	3	064	78	51.72017	-7.48463	Y	Sand / Shell
16/12/2021	1940	3	065	76	51.74305	-7.53642	Y	Gravel
16/12/2021	2010	3	066	74	51.77870	-7.60560	Y	Sand / Shell

Table I. Co-ordinates and relevant data recorded at 66 sampling locations during CV21_038.

Sample Images

A photo of each sample retrieved was taken on location and named accordingly. An example of some of the various ground types encountered during the survey are shown in Figure 3.

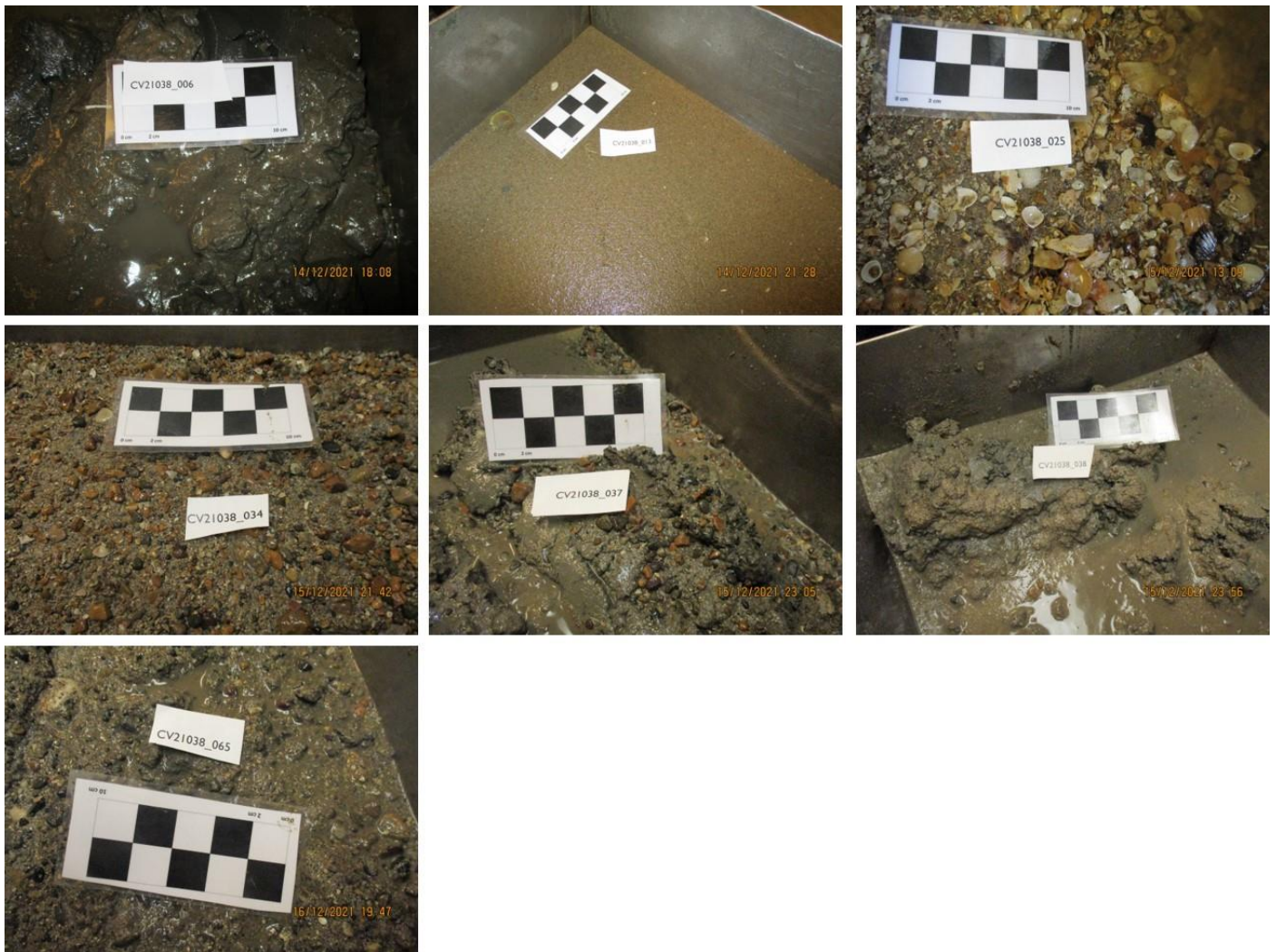


Figure 3. Sediment images from seven locations showing different substrate types recorded during the CV21_038. From top left: 006 – Mud; 013 – Sand; 025 – Sand/Shell; 034 – Sand/Pebble; 037 – Mud/Pebble; 038 – Sand/Mud and 065 – Gravel (Mixed size clasts).



Figure 3. Sampled locations (66) with an initial brief description of sediment type present.

Discussion

Sediment surveys generally require a sea-state of Force 4 or 5 in tandem with a suitable vessel to operate effectively. AS such there is an increased likelihood of success if conducted during summer or autumn months. Nevertheless, the current survey was able to take advantage of opportunistic ship-time on the R.V. *Celtic Voyager* and was planned for December 2021. A survey plan with numerous weather contingencies was created and actual survey logistics were agreed by the ships Master and Chief Scientist on the day of departure.

AS such it was decided to proceed to the Contingency area (red polygon, Figure 1) northeast of Dublin immediately on departure from Dublin Port to begin survey operations before overnight transit to the smaller priority survey area south of Carnsore Point, Co. Wexford. After 6 hours in that location a slow transit during deteriorating conditions would bring the vessel to the priority sampling area south of Helvick Head, Co. Waterford where the vessel could resume survey operations for the remainder of the survey and take advantage of improving weather. This plan allowed the vessel to navigate prevailing sea swell, wind and strong local tides effectively. A final total of 66 sampled locations giving a return of 65 samples can be considered a successful sampling campaign for the winter conditions experienced and full thanks is given to the crew of the R.V. *Celtic Voyager* for making the survey possible.

Although only brief sediment descriptions were recorded on-board, there is a clear distinction in granule size and type recorded in the different survey areas. In the Irish Sea, north of Dublin, all sites were classed as sand or mud. The coastal seabed near Carnsore Point is primarily sand with varying amounts of shell and/or pebble mixed through it. Further west in the primary survey area there is more mixed hard ground including gravel of mixed size clasts with mixed pockets of sand and mud. These findings agree with previously acquired backscatter charts of the relevant areas. Further high resolution Particle Size Analysis will be conducted on all sediments and this data will augment the Seabed and Sediment database available via the INFOMAR website (<https://www.infomar.ie/maps/interactive-maps/seabed-and-sediment>). This data will reveal the exact make-up of sediment throughout the survey area from which high-resolution seabed classification charts and habitat maps can be prepared.

The survey was the seconded conducted as part of the EMFF Coastal Sediments Projects. The first campaign in August 2021 collected data from 80 locations in Achill Bay, Co. Mayo. It is anticipated that continued data collection will facilitate high resolution seabed classification charts in areas and bays of interest around the Irish coast and enable the production of high-confidence habitat maps in support of the EMFFs Operational Programme for Marine Biodiversity.