

# Cruise report



## Environmental Survey of Coastal and Shelf Waters-Southabout: Benthos monitoring 2020 (CV20-001)

**Vessel Name:** *RV Celtic Voyager*

**Call Sign:** EIQN

**Start Date:** 27/01/2020

**End Date:** 5/02/2020

**Port of Dept:** Dun Laoghaire

**Port of Return:** Galway



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## 1. Introduction & Rationale

Since 2011 the Winter Environmental Survey (WES) has operated with an allocated ship-time of up to 13 days on the Celtic Voyager and funded through NDP. These surveys alternate between south-about and a north-about each year with a southerly survey proposed for 2020. The survey covers coastal waters and bays but also shelf waters through offshore transects and as such are complementary to EPAs estuarine water quality monitoring activities.

While all previous surveys have had a strong multi-disciplinary component to them incorporating both Chemical and Biological elements, the survey during 2020 was reduced relative to previous years. During 2020, the Chemistry portion of the survey was omitted as a consequence of resource (personel) limitations. However, during 2020 the survey focused on benthos ecological quality element and some chemistry validation elements. It is expected that the survey will revert to a full multidisciplinary programme in 2021.

## 2. Objectives

*Conduct Water Framework Directive monitoring (Dir 2000/60/EC) and provide supporting information for the implementation of the Natura Directives (Habitats Directive 92/43/EEC).*

- Collect samples to provide data to contribute to classification of WFD (client EPA, DHPLG) ecological status of selected water bodies for benthic macro-invertebrate ecological quality elements in a select number of waterbodies along Eastern, Southern and Western coastal waters.
- Using benthic invertebrates and associated sediment information (Particle Size Analysis) the survey will be able provide additional habitat distribution data (ground truth data) for a variety of Natura sites along the Eastern, Southern and Western Seaboards.

Collect samples for measuring carbonate system parameters (DIC, TA, pCO<sub>2</sub>calc, pHcalc, and  $\Omega$ calc) in coastal waters to contribute to baseline dataset for these variables and calibrate the on-board pCO<sub>2</sub> system.

## 3. Personnel

### Scientific Complement

**Role:** Chief Scientist

**Name:** Francis O'Beirn (FOB) – Benthos Ecology

**Organisation Name:** Marine Environment & Food Safety Services, Marine Institute

**Address:** Marine Institute, Rinville, Oranmore, Galway, Ireland

**Email:** [francis.obeirn@marine.ie](mailto:francis.obeirn@marine.ie)

**Name:** Louise Healy (LH) -Benthos

**Organisation Name:** Marine Environment & Food Safety Services, Marine Institute

**Address:** Marine Institute, Rinville, Oranmore, Galway, Ireland

**Email:** [louise.healy@Marine.ie](mailto:louise.healy@Marine.ie)

**Name:** Jennifer Law (JL) – Chemistry

**Organisation Name:** NUIG – Chemical Oceanography

**Address:** NUI, Galway

**Email:**

### Crew:

**Master** Phillip Baugh

**Mate:** Stephen Lantry

**Officer of the Watch:** Stephen Barr

**Chief Engineer:** Jason White

**Motorman:** Finbarr Goggins

**Able Seaman:** Martin Goggins

**Cook:** Tony Reck

**Tech support:** Lukasz Pawlikowski

## 4. Methods & Protocol

### 4.1. Equipment Listing

#### 4.1.1. Grab sampler

**Make:** Day Grab

**Model:** P&O design

**Sampling Protocols:** Sediments were sampled for benthic infauna using Day grab. Sediment samples were removed from the grab and a small subsample retained (and frozen) for PSA and organic carbon analysis (LOI). The remaining sediment was sieved through a 1mm mesh sieve and fixed in formalin (5%).

#### 4.1.2. Shipek sediment grab sampler

**Make:** Shipek

**Model:**

**Sampling Protocols:** Not used

#### 4.1.3. CTD Profiler and Rosette Sampler

**Make:** Seabird SBE 911

**Model:** SBE 911plus

**Sampling Protocols - CTD** deployed at designated stations and times. Data collected from temperature, conductivity and pressure sensors. Water samples for nutrients, DO, DIC/TA and DOC/TOC were collected at most stations from the maximum depth reached and surface (~ 3 metres) using niskin bottles (5L) and applying standard MI procedures in line with best practice (Dickson et al. 2007, Grasshof et al 1999). Water samples for metal testing were collected using GO-FLO bottles. GO-FLO bottles were acid cleaned in the laboratory and tested for contamination in advance of the survey

#### 4.1.4. pCO<sub>2</sub> system

**Make:** General Oceanics

**Model:** 8050 pCO<sub>2</sub> system.

Fixed on-board system owned by NUIG. The flow-through system measures and records dissolved CO<sub>2</sub> in surface waters on a continuous basis.

### 4.2. On-board processing

#### ***Benthic Samples:***

**Sediment samples:** At all benthic stations where suitable sediments could be sampled, a subsample of sediments (100-200g) was taken for Particle Size Analysis (PSA) and Loss on Ignition (LOI). The samples were labelled and stored in plastic zip-loc bags and frozen.

**Macroinvertebrate samples:** At each station where sufficient sediment (>2.5L) was retained for faunal analysis. These samples comprised single Day grab samples. Upon retrieval all sediment were washed on a 1mm mesh sieve. All faunal and residue (e.g. sediment and shell matter) were retained and stored in a plastic container and fixed with V:V 4% neutral buffered formalin.

#### ***Water Samples - Chemistry:***

Surface Samples (~3 m) from underway stations were collected for nutrients and salinity as below using the onboard pump. From CTD stations the following were sampled using Niskin bottles according to standard protocol and in the following order: TA/DIC (selected stations), nutrients and salinity.

1. Samples for accurate salinity measurement: Unfiltered glass bottle stored at room temperature for subsequent salinity analysis.
2. 2 x 50 ml PP tubes filled with water filtered through a 0.45 µm cellulose acetate (acid-cleaned polycarbonate) filter and frozen immediately after collection for post-cruise nutrient analysis.
3. DIC/TA samples collected at designated stations. Samples preserved with mercuric chloride (Dickson et al. 2007). Samples were analysed post survey in NUIG for DIC/TA using a Vindta-3C system and methods of Dickson et al (2007).

#### 4.3. Equipment Issues

No issues.

### 5. Narrative

The survey was scheduled from 28<sup>th</sup> Jan (Dun Laoghaire, Co. Dublin) to 8<sup>th</sup> Feb (Galway). The scientific complement joined on the evening of Jan 27<sup>th</sup>. The weather conditions for the duration of the survey were mixed with some periods of strong winds and heavy swell which necessitated sheltering in a number of harbours. The sampling plan arranged with the master each day broadly followed the following arrangement whereby waterbodies were grouped to allow sampling during daylight hours and travel to the next series of waterbodies overnight. This worked well and allowed sufficient rest for the scientific complement and crew.

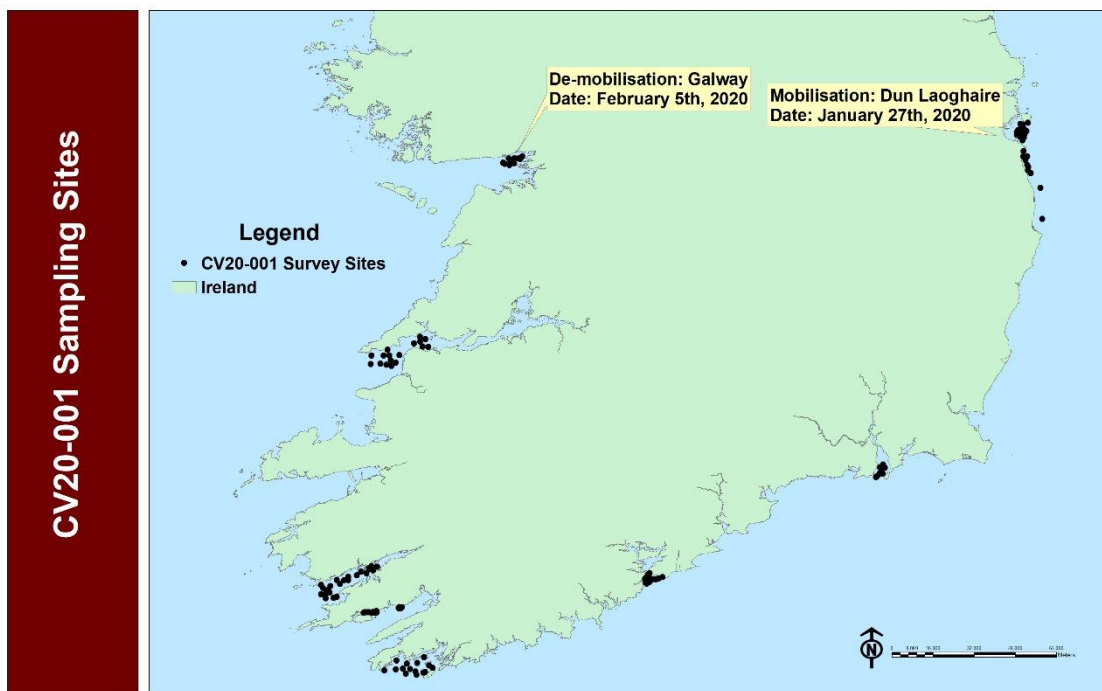


Figure 1: Benthic Sampling Locations for CV20-001.

#### 27<sup>th</sup> Jan

The scientific complement joined the vessel at Dun Laoghaire @1630hrs, which allowed sufficient time for set-up on board.

#### 28<sup>th</sup> Jan

0820hrs: Departed Dun Laoghaire. Sampling commenced in Dublin Bay at 0835hrs. 15 grab stations and 3 CTD stations were sampled. Sampling was completed at 1300hrs. No problems encountered.

1320hrs commenced sampling Killiney Bay; 8 grabs retrieved successful samples, 2 grabs with very coarse material not suitable. 5 CTD – water chemistry samples retrieved successfully. Complete sampling at 1640hrs.

### **29<sup>th</sup> Jan**

Steamed through the night to arrive on station at outermost site of Waterford Transect.

0645hrs: 1<sup>st</sup> CTD station – 8 CTD stations to Cheekpoint completed at 1025hrs.

1100hrs: Commence day grab sampling in Outer Waterford Harbour. Complete 10 sites at 1220hrs (all fine sands).

1220hrs: Commence passage to Cork

1915hrs: Arrive outer Cork Harbour – commence benthic sampling. 15 stations samples 12 grabs successfully retained. 3 grabs too coarse or cobble

2110hrs: Sampling outer cork Harbour completed.

2130hrs: Steam towards Roaringwater Bay.

### **30<sup>th</sup> Jan**

Overnight to Roaringwater Bay

0705hrs: Commence sampling; 15 stations sampled 14 successful (one hard ground No. 076) 2 sites coarse samples (072, 075).

1150hrs: Complete sampling

1200hrs: Steam to Berehaven

1425hrs: Commence sampling in Berehaven: 10 sites fully sampled (fine sands and mud – Echinoderm dominated communities). CTDs followed

1525hrs: Complete sampling – travel to Shot Head

1620hrs: commenced sampling at Shot Head- 7 stations (3 reps) 21 samples total.

1735; complete shot head sampling

1750hrs: CTD – inner Bantry.

1830: CTD – inner Bantry

1830hrs: Steam to Castletownbere. Plan to dock for 1 day to avoid foul weather.

### **31<sup>st</sup> Jan**

Berthed at Castletownbere for full day

### **1<sup>st</sup> Feb**

1000hrs: depart C/bere for Kenmare.

1655hrs: Arrive at 1<sup>st</sup> grab site after very heavy seas experienced on transit around mizzen head. (1 storage box lost from back deck). Commence sampling.

2220hrs: Complete sampling of 23 stations – (all successful). Depart for Dingle.

### **2<sup>nd</sup> Feb**

0845hrs: Dock at Dingle - foul weather forecasted for following number of days.

### **3<sup>rd</sup> Feb**

Docked at Dingle –weather downtime.

### **4<sup>th</sup> Feb**

1230hrs: Depart Dingle for Shannon Estuary.

2000hrs: Arrive Shannon and commence benthic sampling. Inner sites two fails due to coarse sediment.

Complete- sampling at 0055hrs on Feb 5<sup>th</sup>. 1 CTD station at mouth of Shannon.

### **5<sup>th</sup> Feb**

0055hrs: Depart Shannon for Galway Bay

0645hrs: Arrive south Sound – 5CTD stations en-route.

0850: Commenced Benthic sampling (sampled 7 stations)

1000hrs: Paused sampling to wait for tide to fill

1100hrs: complete last three sampling stations.

1130hrs: complete sampling.

1215hrs: Pilot on board

1240hrs: Arrive Galway Docks

1250hrs: sign off and depart vessel – Survey complete.

**Table 1. Benthic sampling summary table.**

	Date/time	MI Sample Code	Waterbody	Plastics	Water Depth(m)	Sediment type	PSA	Fauna
1	28/01/2020 08:34	MIBE20-012	Dublin Bay	Yes	11	Sand	YES	YES
2	28/01/2020 08:54	MIBE20-014	Dublin Bay	Yes	20	Mud	YES	YES
3	28/01/2020 09:35	MIBE20-008	Dublin Bay	Yes	16.6	Sand	YES	YES
4	28/01/2020 09:50	MIBE20-015	Dublin Bay	Yes	14.2	Mud	YES	YES
5	28/01/2020 10:06	MIBE20-007	Dublin Bay	Yes	17.7	Gravel	YES	YES
6	28/01/2020 10:31	MIBE20-005	Dublin Bay	Yes	10.1	Sand	YES	YES
7	28/01/2020 10:47	MIBE20-006	Dublin Bay	Yes	12.8	Sand	YES	YES
8	28/01/2020 11:01	MIBE20-001	Dublin Bay	Yes	10.6	Sand	YES	YES
9	28/01/2020 11:11	MIBE20-004	Dublin Bay	Yes	9.6	Sand	YES	YES
10	28/01/2020 11:28	MIBE20-003	Dublin Bay	Yes	11.7	Sand	YES	YES
11	28/01/2020 11:44	MIBE20-002	Dublin Bay	Yes	10.8	Sand	YES	YES
12	28/01/2020 12:17	MIBE20-009	Dublin Bay	Yes	10.7	Sand	YES	YES
13	28/01/2020 12:27	MIBE20-010	Dublin Bay	Yes	10.9	Sand	YES	YES
14	28/01/2020 12:37	MIBE20-011	Dublin Bay	Yes	11.5	Sand	YES	YES
15	28/01/2020 12:57	MIBE20-013	Dublin Bay	Yes	15.3	Sand	YES	YES
16	28/01/2020 13:34	MIBE20-022	Killiney Bay	No	25	Sand	YES	YES
17	28/01/2020 13:52	MIBE20-016	Killiney Bay	No	16	Sand	YES	YES
18	28/01/2020 14:08	MIBE20-017	Killiney Bay	No	19	Mud	YES	YES
19	28/01/2020 14:17	MIBE20-018	Killiney Bay	No	17	Mud	YES	YES
20	28/01/2020 14:29	MIBE20-019	Killiney Bay	No	22.5	Mud	YES	YES
21	28/01/2020 14:39	MIBE20-023	Killiney Bay	No	23	Mud +Gravel	YES	YES
22	28/01/2020 15:00	MIBE20-020	Killiney Bay	No	23.5	Mud +Gravel	YES	YES
23	28/01/2020 15:12	MIBE20-021	Killiney Bay	No	0	Sand+Mud	YES	YES
24	28/01/2020 15:45	MIBE20-024x	Killiney Bay	No	31	Hard ground	NO	NO
25	28/01/2020 16:36	MIBE20-025	Killiney Bay	No	23.5	Hard ground	NO	NO

	Date/time	MI Sample Code	Waterbody	Plastics	Water Depth(m)	Sediment type	PSA	Fauna
26	29/01/2020 10:58	MIBE20-047	Waterford	No	8.8	Sand	YES	YES
27	29/01/2020 11:07	MIBE20-046	Waterford	No	9.2	Sand	YES	YES
28	29/01/2020 11:16	MIBE20-045	Waterford	No	8	Sand	YES	YES
29	29/01/2020 11:27	MIBE20-044	Waterford	No	8.3	Sand	YES	YES
30	29/01/2020 11:37	MIBE20-043	Waterford	No	9.4	Sand	YES	YES
31	29/01/2020 11:43	MIBE20-042	Waterford	No	11.2	Sand	YES	YES
32	29/01/2020 11:52	MIBE20-040	Waterford	No	12.8	Sand	YES	YES
33	29/01/2020 12:00	MIBE20-041	Waterford	No	15.3	Sand	YES	YES
34	29/01/2020 12:11	MIBE20-039	Waterford	No	19.06	Sand	YES	YES
35	29/01/2020 12:17	MIBE20-048	Waterford	No	19.5	Sand	YES	YES
36	29/01/2020 19:08	MIBE20-060	Outer Cork Hbr	Yes	13.8	Sand	YES	YES
37	29/01/2020 19:20	MIBE20-059	Outer Cork Hbr	Yes	21.2	Sand	YES	YES
38	29/01/2020 19:29	MIBE20-058	Outer Cork Hbr	Yes	22.5	Sand	YES	YES
39	29/01/2020 19:39	MIBE20-057	Outer Cork Hbr	Yes	19.6	Sand	YES	YES
40	29/01/2020 19:48	MIBE20-053	Outer Cork Hbr	Yes	19.5	Mud	YES	YES
41	29/01/2020 19:55	MIBE20-061	Outer Cork Hbr	Yes	18.7	Sand	YES	YES
42	29/01/2020 20:06	MIBE20-063x	Outer Cork Hbr	Yes	17.2	Gravel	NO	NO
43	29/01/2020 20:14	MIBE20-062x	Outer Cork Hbr	Yes	22.8	Gravel	NO	NO
44	29/01/2020 20:21	MIBE20-052	Outer Cork Hbr	Yes	15.3	Sand	YES	YES
45	29/01/2020 20:29	MIBE20-051x	Outer Cork Hbr	Yes	13.3	Gravel	NO	NO
46	29/01/2020 20:38	MIBE20-050	Outer Cork Hbr	Yes	16.7	Sand	YES	YES
47	29/01/2020 20:44	MIBE20-054	Outer Cork Hbr	Yes	17.5	Sand	YES	YES
48	29/01/2020 20:51	MIBE20-056	Outer Cork Hbr	Yes	18.4	Sand	YES	YES
49	29/01/2020 21:00	MIBE20-055	Outer Cork Hbr	Yes	17.8	Sand	YES	YES
50	29/01/2020 21:08	MIBE20-049	Outer Cork Hbr	Yes	17.7	Sand	YES	YES
51	30/01/2020 07:05	MIBE20-069	Roaringwater	No	50	Sand	YES	YES

	Date/time	MI Sample Code	Waterbody	Plastics	Water Depth(m)	Sediment type	PSA	Fauna
52	30/01/2020 07:20	MIBE20-070	Roaringwater	No	49.5	Sand	YES	YES
53	30/01/2020 07:33	MIBE20-073	Roaringwater	No	49.5	Sand+Mud	YES	YES
54	30/01/2020 07:44	MIBE20-078	Roaringwater	No	47.5	Sand	YES	YES
55	30/01/2020 08:33	MIBE20-077	Roaringwater	No	42.5	Sand+Mud	YES	YES
56	30/01/2020 08:40	MIBE20-076x	Roaringwater	No	36	Hard ground	NO	NO
57	30/01/2020 09:04	MIBE20-075	Roaringwater	No	23	Sand	YES	YES
58	30/01/2020 09:15	MIBE20-074	Roaringwater	No	33	Sand	YES	YES
59	30/01/2020 09:38	MIBE20-071	Roaringwater	No	41	Sand	YES	YES
60	30/01/2020 09:55	MIBE20-072	Roaringwater	No	26	Sand	YES	YES
61	30/01/2020 10:26	MIBE20-067	Roaringwater	No	46	Sand	YES	YES
62	30/01/2020 10:42	MIBE20-068	Roaringwater	No	49	Sand	YES	YES
63	30/01/2020 11:04	MIBE20-066	Roaringwater	No	30	Sand	YES	YES
64	30/01/2020 11:23	MIBE20-065	Roaringwater	No	52	Sand	YES	YES
65	30/01/2020 11:46	MIBE20-064	Roaringwater	No	50	Sand+Gravel	YES	YES
66	30/01/2020 14:24	MIBE20-125	Berehaven	No	13.5	Mud	YES	YES
67	30/01/2020 14:30	MIBE20-126	Berehaven	No	12.7	Sand+Mud	YES	YES
68	30/01/2020 14:37	MIBE20-127	Berehaven	No	13.9	Mud	YES	YES
69	30/01/2020 14:42	MIBE20-128	Berehaven	No	14.8	Sand	YES	YES
70	30/01/2020 14:49	MIBE20-129	Berehaven	No	15.9	Mud	YES	YES
71	30/01/2020 14:55	MIBE20-130	Berehaven	No	16.7	Mud	YES	YES
72	30/01/2020 15:00	MIBE20-131	Berehaven	No	15.4	Mud	YES	YES
73	30/01/2020 15:07	MIBE20-132	Berehaven	No	18.3	Mud	YES	YES
74	30/01/2020 15:13	MIBE20-133	Berehaven	Yes	19.9	Mud	YES	YES
75	30/01/2020 15:19	MIBE20-134	Berehaven	No	17.8	Mud	YES	YES
76	30/01/2020 16:12	MIBE20-116	Shot Head	No	40	Sand+Mud	YES	YES
77	30/01/2020 16:16	MIBE20-117	Shot Head	No	40.7	Sand+Mud	YES	YES

	Date/time	MI Sample Code	Waterbody	Plastics	Water Depth(m)	Sediment type	PSA	Fauna
78	30/01/2020 16:19	MIBE20-118	Shot Head	No	40.4	Sand+Mud	YES	YES
79	30/01/2020 16:25	MIBE20-107	Shot Head	No	40.5	Sand+Mud	YES	YES
80	30/01/2020 16:27	MIBE20-108	Shot Head	No	40.8	Sand+Mud	YES	YES
81	30/01/2020 16:30	MIBE20-109	Shot Head	No	40.6	Sand+Mud	YES	YES
82	30/01/2020 16:37	MIBE20-104	Shot Head	No	40.4	Sand+Mud	YES	YES
83	30/01/2020 16:40	MIBE20-105	Shot Head	No	40.4	Sand+Mud	YES	YES
84	30/01/2020 16:42	MIBE20-106	Shot Head	No	40.8	Sand+Mud	YES	YES
85	30/01/2020 16:50	MIBE20-110	Shot Head	No	40.2	Sand+Mud	YES	YES
86	30/01/2020 16:57	MIBE20-111	Shot Head	No	40	Sand+Mud	YES	YES
87	30/01/2020 16:57	MIBE20-112	Shot Head	No	40.1	Sand+Mud	YES	YES
88	30/01/2020 17:03	MIBE20-113	Shot Head	No	40	Sand+Mud	YES	YES
89	30/01/2020 17:06	MIBE20-114	Shot Head	No	40	Sand+Mud	YES	YES
90	30/01/2020 17:09	MIBE20-115	Shot Head	No	39.7	Sand+Mud	YES	YES
91	30/01/2020 17:15	MIBE20-119	Shot Head	No	40.31	Sand+Mud	YES	YES
92	30/01/2020 17:18	MIBE20-120	Shot Head	No	40.29	Sand+Mud	YES	YES
93	30/01/2020 17:21	MIBE20-121	Shot Head	No	40.7	Sand+Mud	YES	YES
94	30/01/2020 17:26	MIBE20-122	Shot Head	No	39.66	Sand	YES	YES
95	30/01/2020 17:29	MIBE20-123	Shot Head	No	39.53	Sand	YES	YES
96	30/01/2020 17:31	MIBE20-124	Shot Head	No	39.6	Sand+Mud	YES	YES
97	01/02/2020 16:56	MIBE20-101	Kenmare	No	29.8	Mud	YES	YES
98	01/02/2020 17:06	MIBE20-097	Kenmare	No	28.5	Sand+Gravel	YES	YES
99	01/02/2020 17:18	MIBE20-100	Kenmare	No	20.1	Mud	YES	YES
100	01/02/2020 17:25	MIBE20-099	Kenmare	No	31.9	Mud	YES	YES
101	01/02/2020 17:32	MIBE20-098	Kenmare	No	32.4	Mud	YES	YES
102	01/02/2020 17:45	MIBE20-096	Kenmare	No	35.8	Mud	YES	YES
103	01/02/2020 17:57	MIBE20-095	Kenmare	No	38.28	Mud	YES	YES

	Date/time	MI Sample Code	Waterbody	Plastics	Water Depth(m)	Sediment type	PSA	Fauna
104	01/02/2020 18:27	mibe20-094	Kenmare	No	41	Mud	YES	YES
105	01/02/2020 18:43	MIBE20-093	Kenmare	No	44.3	Mud	YES	YES
106	01/02/2020 18:54	MIBE20-092	Kenmare	No	45.1	Mud	YES	YES
107	01/02/2020 19:05	MIBE20-091	Kenmare	No	48.7	Mud	YES	YES
108	01/02/2020 19:22	MIBE20-089	Kenmare	No	42.7	Mud	YES	YES
109	01/02/2020 19:35	MIBE20-090	Kenmare	No	50	Sand+Mud	YES	YES
110	01/02/2020 19:57	MIBE20-087	Kenmare	No	57.2	Sand+Mud	YES	YES
111	01/02/2020 20:18	MIBE20-079	Kenmare	No	46.8	Sand	YES	YES
112	01/02/2020 20:27	mibe20-081	Kenmare	No	60.9	Mud	YES	YES
113	01/02/2020 20:43	MIBE20-088	Kenmare	No	61	Sand+Mud	YES	YES
114	01/02/2020 20:53	MIBE20-086	Kenmare	No	61.6	Sand+Mud	YES	YES
115	01/02/2020 21:05	MIBE20-085	Kenmare	No	63.74	Sand+Mud	YES	YES
116	01/02/2020 21:27	MIBE20-082	Kenmare	No	43.2	Sand	YES	YES
117	01/02/2020 21:36	MIBE20-080	Kenmare	No	42.8	Sand+Mud	YES	YES
118	01/02/2020 21:58	MIBE20-084	Kenmare	No	64	Sand+Mud	YES	YES
119	01/02/2020 22:12	MIBE20-083	Kenmare	No	66.1	Sand+Mud	YES	YES
120	04/02/2020 20:06	MIBE20-141	Mouth of the Shannon	No	35	Hard ground	NO	NO
121	04/02/2020 20:25	MIBE20-136	Mouth of the Shannon	No	20.5	Mud +Gravel	YES	NO
122	04/02/2020 20:36	MIBE20-135	Mouth of the Shannon	No	11	Mud +Gravel	YES	YES
123	04/02/2020 20:52	MIBE20-137	Mouth of the Shannon	No	9	Sand	YES	YES
124	04/02/2020 21:02	MIBE20-138	Mouth of the Shannon	No	11	Sand+Gravel	YES	YES
125	04/02/2020 21:10	MIBE20-139	Mouth of the Shannon	No	18	Sand+Gravel	YES	YES
126	04/02/2020 21:23	MIBE20-140	Mouth of the Shannon	No	24	Sand+Mud +Gravel	YES	YES
127	04/02/2020 22:06	MIBE20-142	Mouth of the Shannon	No	18	Sand	YES	YES
128	04/02/2020 22:23	MIBE20-143	Mouth of the Shannon	No	17.3	Sand	YES	YES
129	04/02/2020 22:36	MIBE20-147	Mouth of the Shannon	No	20	Sand	YES	YES

	Date/time	MI Sample Code	Waterbody	Plastics	Water Depth(m)	Sediment type	PSA	Fauna
130	04/02/2020 22:53	MIBE20-146	Mouth of the Shannon	No	16	Sand	YES	YES
131	04/02/2020 23:05	MIBE20-145	Mouth of the Shannon	No	27	Sand+Gravel	YES	YES
132	04/02/2020 23:16	MIBE20-144	Mouth of the Shannon	No	17.8	Sand	YES	YES
133	04/02/2020 23:37	MIBE20-149	Mouth of the Shannon	No	20	Sand	YES	YES
134	04/02/2020 23:55	MIBE20-148	Mouth of the Shannon	No	21	Sand	YES	YES
135	05/02/2020 00:09	MIBE20-150	Mouth of the Shannon	No	27	Sand	YES	YES
136	05/02/2020 00:32	MIBE20-151	Mouth of the Shannon	No	43	Sand	YES	YES
137	05/02/2020 00:50	MIBE20-152	Mouth of the Shannon	No	40	Sand	YES	YES
138	05/02/2020 08:48	MIBE20-155	Galway Bay	Yes	14	Sand+Gravel	YES	YES
139	05/02/2020 09:00	MIBE20-154	Galway Bay	Yes	13.6	Sand+Mud	YES	YES
140	05/02/2020 09:25	MIBE20-160	Galway Bay	Yes	19	Sand+Mud	YES	YES
141	05/02/2020 09:33	MIBE20-159	Galway Bay	Yes	17.7	Sand+Mud	YES	YES
142	05/02/2020 09:57	MIBE20-161	Galway Bay	Yes	13.7	Sand+Mud	YES	YES
143	05/02/2020 10:07	MIBE20-158	Galway Bay	Yes	14	Sand+Mud	YES	YES
144	05/02/2020 10:22	MIBE20-157	Galway Bay	Yes	13.1	Sand+Mud	YES	YES
145	05/02/2020 11:26	MIBE20-153	Galway Bay	Yes	10.9	Sand+Mud	YES	YES
146	05/02/2020 11:32	MIBE20-156	Galway Bay	Yes	11.5	Sand+Mud	YES	YES
147	05/02/2020 11:41	MIBE20-162	Galway Bay	Yes	9.4	Sand+Mud	YES	YES

## 6. Conclusions

*Effective completion of the cruise objectives.*

The survey was considered very successful as a result of efficient use of survey time when weather conditions allowed, along with excellent technical support. The open and constant communication between the Master and Scientific complement also contributed to the success of the survey. In total, 147 grabs were attempted with 139 successfully retained. Benthic sampling was completed for all the priority areas targeted. In addition, valuable OA water samples were retained in order to calibrate/ground-truth the on-board  $p\text{CO}_2$  system. In all, it was a very successful survey. This was in no small measure to the excellent support provided to the reduced scientific complement from the Master and his crew.

The scientific team would especially like to acknowledge and thank the efforts of the master (Philip Baugh), and all of the crew for their excellent support throughout the survey as well as shore based staff of Vessel operations/P&O team for their excellent support and help over the course of this survey.

