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Geological Survey of Ireland
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ucc
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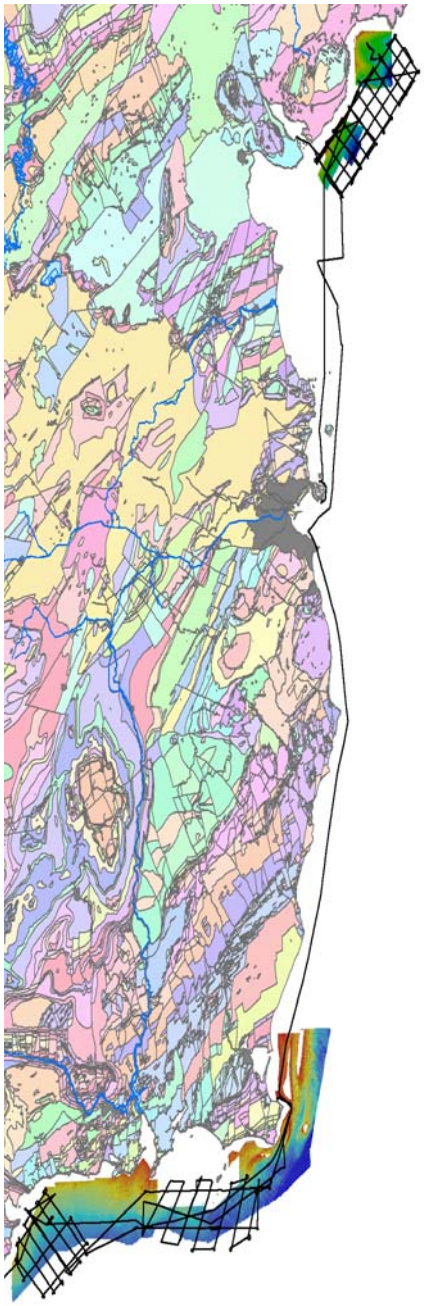
University College Cork, Ireland



Cruise report

NSGeo

RV Celtic Voyager
Survey CV12006

Cork – Dún Laoghaire – Howth

25th of March – 07th of April 2012

Boris Dorschel, James Burns, Mark Coughlan, Niall Finn, Marian McGrath, Sarah Kate McHugh, Jhonny Miranda, Jordan Nixon and Andy Wheeler

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1 EXECUTIVE SUMMARY

The NSGeo survey is a collaborative research survey undertaken by University College Cork, the INFORMAR programme (Geological Survey of Ireland & Marine Institute). Its purpose is to collect baseline information from areas of potential interest for future offshore wind farm developments. In addition, valuable data and samples are collected for geo-engineering appraisals of the investigated areas towards a comprehensive understanding of geological sub-bottom architecture and contemporary sedimentary processes.

The survey targeted three areas in Irish and Northern Irish waters:
Dungarvan area
Saltee Island area
Killkeel and Dundrum Bay area

Due to exceptional weather conditions, **49.7m of vibro cores** were recovered during 33 successful vibro corer deployments. All vibro cores were opened and described on board and the recovered sediments contain over consolidated tills, sands and muds.
In addition, **31 shipek grab samples** were collected. **476 nautical miles (882km) of sparker seismic lines** were recorded. Due to extremely flat seas, the sparker data sets are of excellent quality. Parallel to the sparker seismic data also multibeam echosounder data were recorded.

2 BACKGROUND

Ireland has excellent offshore renewable energy resources including strong and persistent offshore winds. The siting of wind farms however requires consideration of foundation design - foundation easily taking up one third of overall investment. Although it is theoretically possible to site wind turbines anywhere offshore, different substrates (and sub-substrates) require different foundation designs (e.g. monopile, tripod, gravity base, steel jacket) and installation approaches (e.g. driving and/or drilling, or suction caissons). Major worries around the Irish coast are for instance large boulders and stiff clays from Pleistocene glacier deposits. An early-development foundation design allows for a tailor-made installation strategy, and thus reduces the costs of transportation, associated crane capacity and the very substantial equipment on the Jack-Up vessels usually required to put these foundations in place. In addition, seabed mobility will define the strategy of cable emplacement, often the Achilles'heel of a wind farm. The cost of installing wind turbines in inappropriate substrates can prohibitively affect the viability of the development of a wind farm, leading to the concept of cost recoverable foundation solutions and grid emplacement. Because of the nature of the seabed, some marine areas will simply never allow profitable wind farms to be developed in. Knowing what areas of the seabed possess appropriate sedimentary sequences allowing profitable wind farm development is thus a first order need and first step assessment towards a national wind farm development strategy.

In order to provide baseline information on the seabed and sub-seabed conditions in strategic areas for potential offshore wind farm development, NSGeo set out to record high resolution and seabed and sub-seabed information and discrete samples for geo-engineering analyses.

3D seabed topographic, hydrodynamic, sedimentological and sub-seabed seismic data was collected from offshore of the south coast of Ireland and from the northern Irish Sea to analyse the marine environmental conditions. By recording, mapping and analysing this baseline information and subsequent geotechnical analyses, significant knowledge gaps with potentially major bearings on the practicality and costs for both installation and maintenance of future offshore renewable energy infrastructure can be addressed.

The survey is however solely academic and data collected during this survey will feed into academic research attempting to understand the development of offshore sedimentary sequences around Ireland. The recovered sediments provide a palaeo-environmental and potential palaeo-climatic record. Both sites on the south coast and in the northern Irish Sea have a key role to play to reconstruct the dynamics of the BIIS. Mapping the sequences using Sparker seismics and obtaining vibro cores through these sequences provides the opportunity of advancing not only our understanding of the Quaternary and archaeological

history of offshore Ireland, but to provide general insight into rapidly collapsing ice sheets. Furthermore, data collected during this survey can be used to gain a better understanding of contemporary sediment dynamics in these areas.

The collected data will furthermore allow for analysing sediment mobility in the investigated areas. An understanding of sediment transport dynamics and bedform migration rates is of importance to all offshore engineering exercises, coastal sediment budgets and management, and generates a fundamental understanding of how the seabed changes over short time scales.

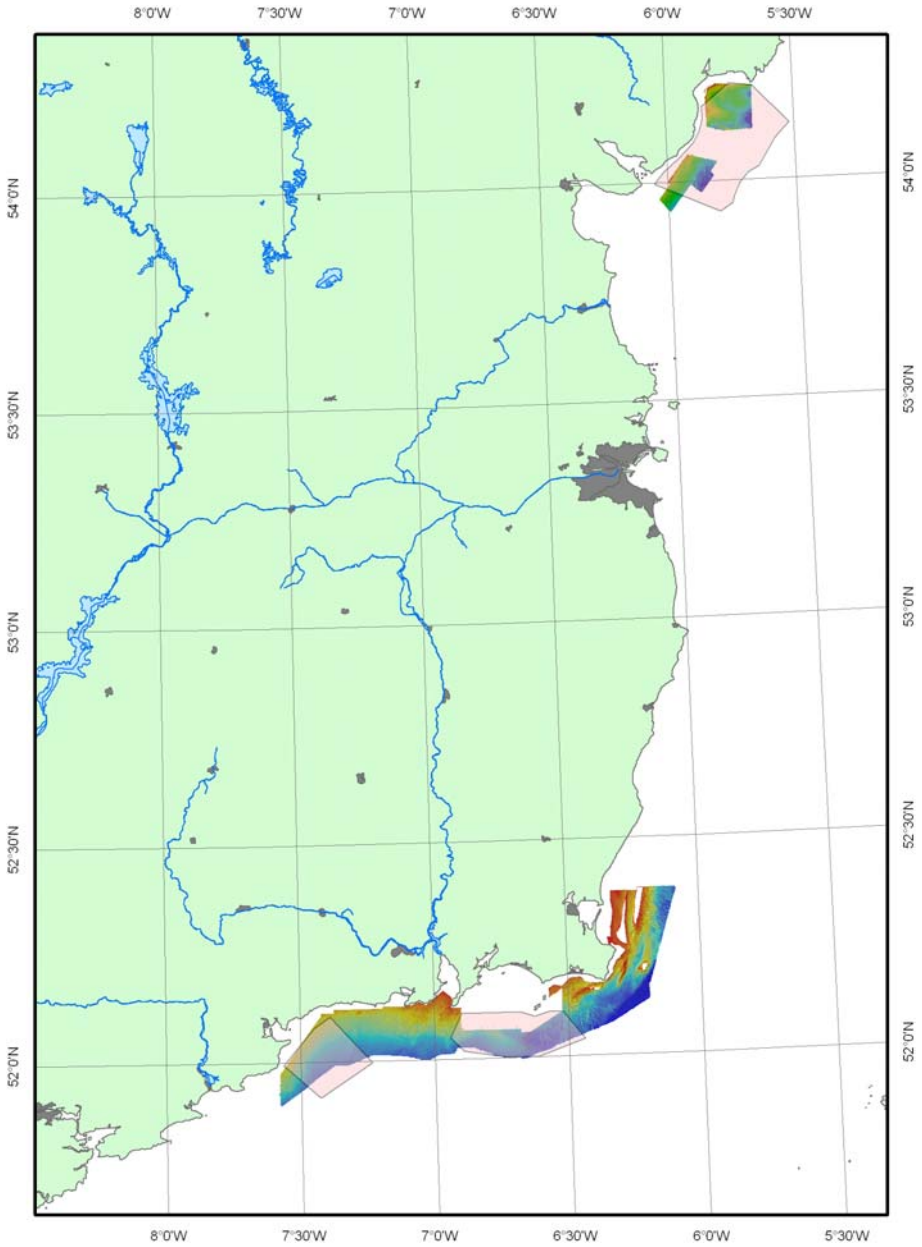


Figure 1. Overview of the survey areas (shaded in red)

3 SURVEY RATIONALE AND OBJECTIVES

The key objectives of this cruise are:

to determine the sub-seabed stratigraphy (the succession of sedimentary layers below the seabed) in high probability areas for renewable energy farm development with particular relevance to the industry's requirements: the lateral extent and variability in e.g. variation in strata thickness, depth, internal sedimentary unit properties and acoustic reflectivity; thus to advise the industry on optimised foundation designs in target areas

to obtain physical samples from the sub-seabed for geotechnical analysis e.g. shear strength, load capacity, internal friction, density, cohesion etc

to obtain and analyse physical samples from the sub-seabed to determine the palaeo environmental development of the seabed through time

to map the spatial distribution and morphological characteristics of sedimentary bedforms and collect physical samples to advance our understanding of seabed mobility in key areas and to advise the industry on optimised cable emplacement strategy in target areas

4 EQUIPMENT

The following equipment was used during the survey:

4.1 Research Vessel – RV Celtic Voyager

The Celtic Voyager is a 31.4 m multi-purpose research vessel. The vessel has wet, dry and chemical laboratories, which are permanently fitted with standard scientific equipment and can accommodate 6-8 scientists with a maximum endurance of 14 days. The vessel is manned by an experienced crew who are highly skilled with the handling and deployment of scientific equipment.

The Celtic Voyager is equipped with a Trimble NT Differential GPS and Kongsberg Simrad Seapath 200 motion reference unit. A 10,000kg general purpose winch hooked through the aft, 4 m high A-frame as well as a 500 kg starboard CTD winch and 1000kg starboard oceanographic winch.

Figure 2. The RV Celtic Voyager

4.2 Simrad EM3002D multibeam echosounder

4.2.1 EM3002D

The EM 3002 is a high resolution shallow water multibeam echosounder with dynamically focused beams suitable for 0.5 to 150 m water depth acquiring bathymetry and backscatter data. The transducers are hull mounted and, depending on the accuracy of positioning, the horizontal accuracy (x,y) is usually less than 50 cm and the vertical accuracy (z) less than 15 cm for the processed bathymetry data.

Figure 3. Hull mounted multibeam transducer on the RVCeltic Voyager (photo of the Marine Institute).

4.2.2 EM1002

The EM1002 is the older version of the multibeam echosounder with a slightly lower resolution than the EM3001.

4.3 Geo-Source 400 Sparker Seismic system

The Geo-Source 1.5 kJ FW Sparker spread seismic system of the Marine Institute was used during the survey. This sparker seismic system consists of a 1.5Kj Geo-Pulse power supply and a 200 tips -Geo-Spark pulse source and an 8 elements mini-streamer towed behind the vessel. Data acquisition was done with a Mini-trace2 topside unit and positioning information was provided by a DGPS positioning system. All spatial data was recorded in UTM Zone 29N in WGS84 datum.

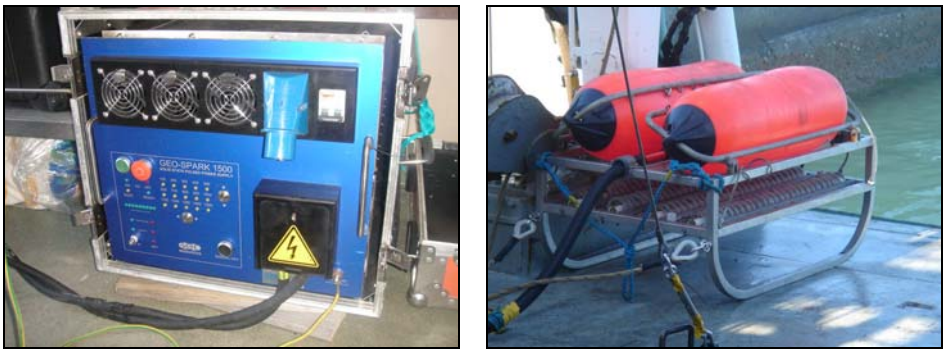


Figure 4. Geo-Spark 1500 power supply and towed Geo-Source 400 Sparker source

4.4 Geo-Resources 6000 vibrocorer

A 3 m vibrocore was used and deployed via the A-Frame. As the vessel does not have dynamic positioning, the vibrocore was only

deployed at slack water when there was limited windage. The vibrocore was lowered to the bottom, activated for a maximum of 1.5 minutes and recovered. Cores contained in the core-liners were cut into 1 m lengths, caped, sealed with electro tape and labelled.
Immediately after recovery, the vibro cores were labelled, cut and split. The archive halves were cleaned, described and cone penetrometer tested (cpt) with a handheld freefall cone penetrometer. Cpt was performed at 5cm intervals. The work halves where only cleaned for later on-shore sampling. All core halves were wrapped with cling-film and stored at ambient temperature in the wet lab.

Figure 5. The Geo-resources 6000 vibrocore being deployed

4.5 Shipek sediment sampler

A Duncan & Associates Shipek sampler was used to sediment samples in both muddy, sandy and gravelly substrates. The sampler scoops a sediment sample from the top 10 cm of the seabed. The Shipek grab was deployed on the starboard winch mid-ship. All Shipek grab samples were described, photographed and sub-sampled for later on-shore analyses. All grab samples were stores in the wet lab at ambient temperature.

Figure 6. Shipek sampler recovered after a successful deployment

4.6 AML Smart SVPlus

The AML SV Plus is a shallow water sound velocity profiler recording sound velocities and pressure through the water column.

Figure 7. AML Smart SV Plus

5 TECHNICAL DIFFICULTIES

5.1 Research Vessel – RV Celtic Voyager

No technical difficulties were encountered.

5.2 Simrad multibeam echosounder

5.2.1 EM3002D

We had a major technical difficulty with the EM3002. The P.U was crashing constantly and shutting itself off and sometimes tripping the trip switch in the dry lab. After restarting it a number of times and rebooting the P.C with no success we decided to switch over to the EM1002.

5.2.2 EM1002

No technical difficulties were encountered.

5.3 Geo-Source 400 Sparker Seismic system

Regular signal disruptions.

In the beginning, when setting up the system, it tripped several times. This could have been due to corrosion of the copper electrode tips on the catamaran unit. After running the system for a short while on low energy, it stabilised and the output energy was increased to operational levels without further technical problems.

During recording of Sparker line 26, the noise levels in the data overrode the seismic signal. The source of the noise was that the cable that grounds the top-side unit to the sea was out of the water Sea ground out of the water.

Irregular system crashes at the start of lines required re-starts of the recording unit. Once restated, the system worked fine. As the crashes occurred at the start of lines, these starts were repeated and no data was lost.

5.4 Geo-Resources 6000 vibrocorer

On station 17, the barrel of the vibro corer was bent and had to be replaced. By the time this was done, tidal currents had increased and a safe vibro corer deployment was impossible.

On station 32 to 35, vibro coring failed due to problems with the magnetic switch. The switch was bypassed and vibro coring was resumed.

On station 37, the core barrel was bent. At the time of coring, there were neither winds nor swell and only light currents. According to existing multibeam coverage and recovered samples, the seabed was levelled and and composed of well sorted fine sands. There is no obvious reason why the core barrel was bent.

5.5 Shipek sediment sampler

The Shipek sediment sampled sampler performed generally well. When the currents where strong, however, sometimes several attempts were necessary to recover a sample.

5.6 AML Smart SVPlus

Half way through the survey, the AML Smart SVPlus stopped communicating to the top-side unit. It was not possible to repair this defect at sea.

6 SURVEY NARRATIVE

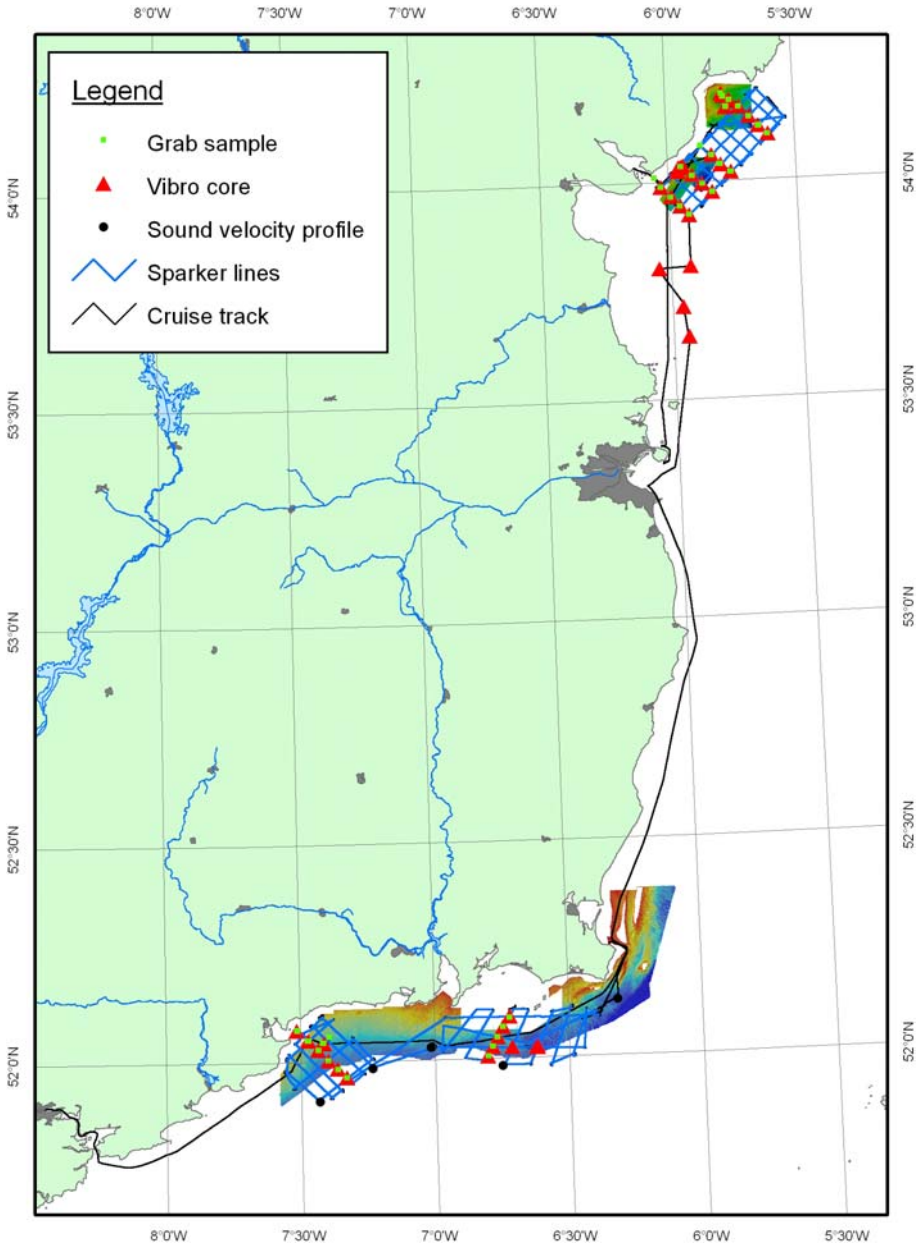


Figure 8. Cruise track and sampling stations

Sunday 25th of March 2012 – *weather sunny, light winds*
(all time GMT)
At 14:00, all scientists and most of the equipment had arrived on board. Some of the main components, the Sparker catamaran and the power unit were missing and had to be taken on board during a port call at a later stage. At 16:00 the scientists were safety briefed familiarised themselves with the ship. The top-side unit of the Sparker system and the multibeam echosounder were set up.

Once the mobilisation was completed, the Celtic Voyager left the Port of Cork at 19:00 and transited to the 1st research area off the coast of Dungarvan.

Monday 26th of March 2012 – *weather sunny light winds from the east*
Still missing the Sparker system, we commenced coring work in the Dungarvan area. At 07:00 a vibro core transect of 5 cores perpendicular to the coast across the Dungarvan work area was cored. All vibro cores were opened immediately after recovery for geotechnical analyses in order to minimise the loss of water as changes in the water content would significantly alter the geophysical properties of sediments. For all vibro core sites, Shipek grab samples were taken to recover an undisturbed surface sediment sample. After completion of this transect, we vibro cored 2 additional cores along a coastal-parallel transect. Unfortunately, the core barrel of the vibro corer bent at the 7th site at 15:10. Coring was stopped and grab sampling resumed. At 16:28, we left the Dungarvan work area and transited to Rosslare port. The ship arrived in Rosslare port at 22:10.

Tuesday 27th of March 2012 – *weather sunny and calm*
The Sparker system arrived at 07:00 and was brought on board. Setting up of the system started immediately. In the meantime the bent vibro core barrel was taken off the ship. The fuel arrived at 08:00 and fuelling was completed at 11:30. Soon after, we left Rosslare port and transited to the Saltee Islands area to resume survey work. During transit, the set-up of the Sparker system continued and was finalised after a successful test line. At 16:50, the Sparker and multibeam survey started in the Saltee Islands work area.

Wednesday 28th of March 2012 – *weather sunny, no wind*
The sparker and multibeam survey commenced during the night. At 07:00, the sparker and multibeam survey was stopped and, after a short transit, we started vibro coring and grab sampling of a north-south transect perpendicular to the coast in the Saltee area at 07:30. It was necessary to interrupt the Sparker survey for coring as vibro coring was restricted to slack water conditions. By 11:00, the tidal currents were too strong vibro coring and we resumed the Sparker and multibeam survey in the Saltee Islands area. Due to perfect weather and sea conditions, no winds and extremely flat sea, we continued the Sparker survey and did not vibro core during the afternoon slack water. The excellent survey conditions also resulted in high quality seismic data.

Thursday 29th of March 2012 – *weather sunny, light mist, light winds*
Sparker and multibeam data were recorded until 07:00 and once again stopped for vibro coring during slack water. From 07:30 on,

we vibro cored and grab sampled a coast parallel profile in the Saltee island area. Technical problems with the magnetic switch on the vibro corer temporarily interrupted the coring. As soon as the problem was solved, coring commenced. At the second station of the coast-parallel transect, the second, and only spare, core barrel bent. The sediment core from the bent core barrel was however saved. Without the ability to core, we resumed the Sparker survey in the Saltee Islands area at 11:00.
The Sparker survey in the Saltee Islands area was completed at 16:30. After a transit to the Dungarvan area, this area was surveyed with sparter and multibeam.

Friday 30th of March 2012 – *weather overcast, moderate winds*
The sparker and multibeam survey continued for the entire Friday. Due to technical problems (no earth for the top-side unit) line 26 was too noisy and was re-shot at the end of the survey in the Dungarvan area.

Saturday 31st of March 2012 – *overcast, moderate winds increasing in the 2nd half of the day*
At 08:30, the Sparker and multibeam survey in the Dungarvan area was completed (including the repeat of line 26) and we transited back to the Saltee Island area to shoot a final east-west tie line. To also tie-in the two survey areas, sparker and multibeam were recorded during transit.
In the Saltee Island area, a transect line was recorded along the northern boarder of the working area, tying in all southwest-northeast lines.
Towards the end of the tie line, winds picked up and the swell increased to 1.5m. As a result, the Sparker data deteriorated in the westernmost part of the transect line. When we passed Carnsore Point, the swell increased even more and the data quality became poor. We finished the transect line through the Saltee Island area at 19:06 transited to Dún Laoghaire Port.

Sunday 1st of April 2012 – *weather sunny with cloudy intervals, moderate winds*
The Celtic Voyager arrived in Dún Laoghaire at 08:00. Jhonny Miranda left and Jordan Nixon joined the ship. During the port call, the first set of vibro cores was unloaded and to send to Queens University in Belfast. This freed-up needed space in the wet and chemical lab. Two new vibro corer barrels were brought on board, allowing continuing the coring programme in the northern working area. At 10:30 everybody was back on board and after taking on water we left Dún Laoghaire and transited to the northern working area offshore Killkeel and the Dundrum Bay. During transit four sediment cores were recovered from the Mud-belt area. At 19:17, we arrived in the Killkeel / Dundrum Bay area and commenced a Sparker and multibeam survey.

Monday 2nd of April 2012 – *weather overcast, calm to light winds increasing during the night*
The first 3 Sparker lines (43-45) in the Killkeel / Dundrum Bay were completed at 09:00 but line 44 had to be re-shot due to repeated system crashes and resulting data losses. At the time of slack water, winds had slightly increased making it questionable if the conditions still allow for vibro coring. With a gale warning for Tuesday the 3rd of April, and the uncertainty if we would get another vibro coring opportunity, the decision was to core the deepest sites. Coring proved possible and three vibro core transects of 4 cores each and targeted cores from channels and elevated seabed were recovered from the Killkeel area. At 18:04, the Sparker and multibeam survey was resumed.

Tuesday 3rd of April 2012 – *weather overcast, showers, sunny patches, cold, strong north-easterly winds increasing to gale*
After approximately 05:00, winds increased and the Sparker data quality decreased. Data quality was still sufficient for post-cruise processing. At 07:45, at the end of line 50, we stopped the Sparker survey as the increasing winds had further deteriorated the data. With weather and sea conditions unsuitable for vibro coring, we grab sampled in the Killkeel area. At 09:30, the survey was aborted due to north-easterly gales and increasing swell and we transited into shelter in Greenore in the Carlingford Lough.

Wednesday 4th of April 2012 – *weather sunny with scattered clouds, cold, north-easterly gale, snow on the mountains*
Downtime, taking shelter in Greenore.

Thursday 5th of April 2012 – *weather sunny with scattered clouds, cold, moderate winds dying down during the day, swell slowly subsiding as well*
When leaving Greenore port at 05:45, ~1.5m swell prevented Sparker recording and vibro coring. We therefore grab sampled all the vibro corer locations cored on the Monday the 2nd of April. At 10:05, the grab sampling was complete. By this time, the swell had died down enough to resume the Sparker survey. In the beginning, the Sparker data quality was influenced by the swell. But as the swell further subsided, the Sparker data quality continuously improves with.

Friday 6th of April 2012 – *weather sunny with scattered clouds, cold, moderate winds*
The Sparker and multibeam survey was stopped at 07:50 in order to vibro core. A vibro core transect and additional targeted vibro cores were recovered from the Dundrum Bay area. Afterwards, all vibro core sites were also grab sampled. With the last grab sample, the sampling programme for the survey was completed with more samples recovered than anticipated. At 15:00 the Sparker survey was resumed and completed at 22:10. A patch test for the

multibeam echosounder system was performed from 22:30 to 23:00. With the patch test, the scientific programme of the cruise was accomplished and we transited back to Howth.

Saturiday 7th of April 2012
Arrival in Howth at 07:45 and end of cruise.

7 SUMMARY OF AREAS

7.1 Dungarvan Area

The Dungarvan survey area measured roughly 18 x 18 km encompassing 336 km² of varying degrees of silt, sand and gravel as seen from 3m vibro cores taken within the area. Water depths varied from 20 to 55m. Multibeam data revealed what appeared to be bedrock outcropping at the surface at the western and eastern ends of the area. From initial seismic data it was possible to infer channelling which had been subsequently infilled.

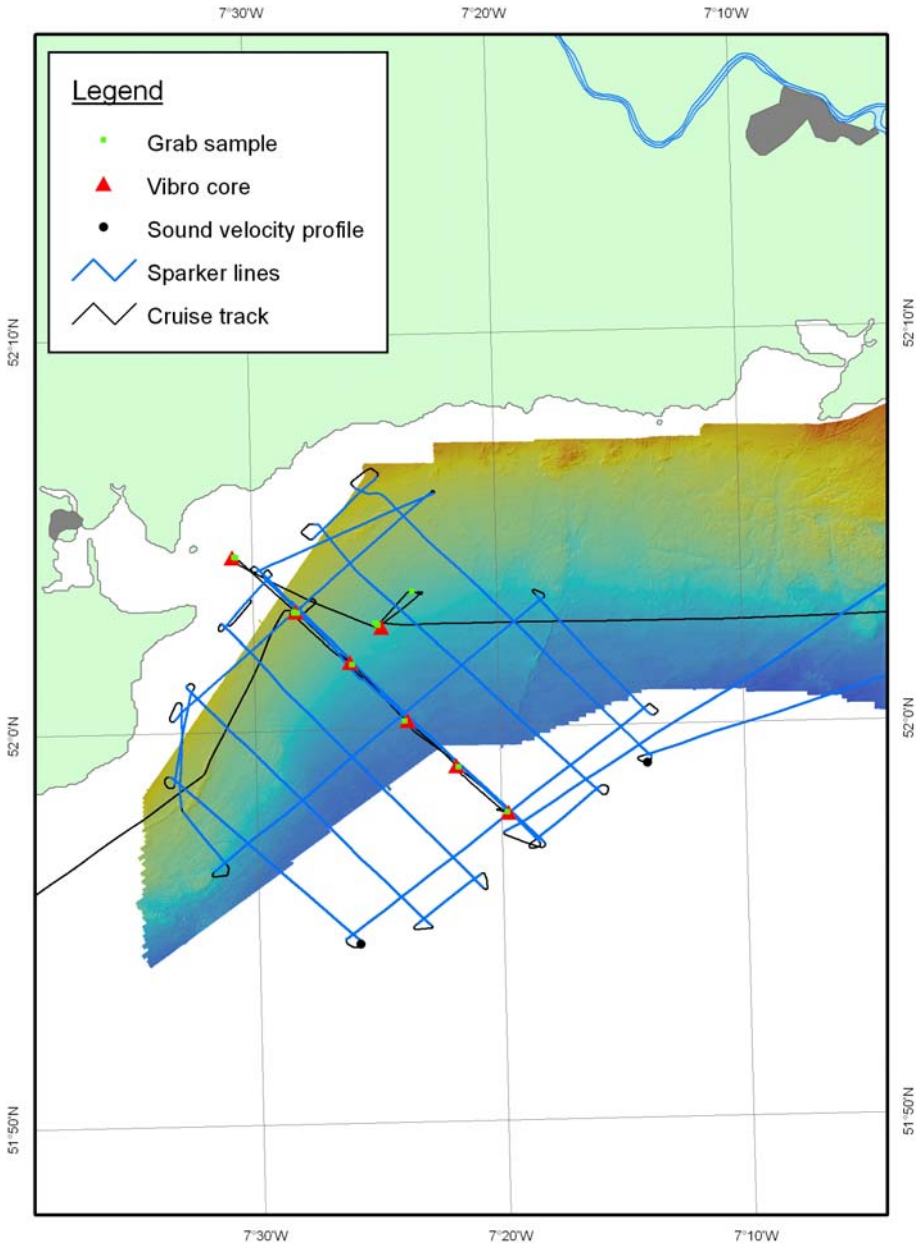


Figure 9. Dungarvan survey area

7.2 Saltee Island Area

This is a relatively dynamic area with large sand waves noted in the eastern half. The area covered 515km² of the seafloor consisting largely of mobile sands overlying a strong initial reflector interpreted as glacial till. Bedrock was marked by a second strong reflector exhibiting distinct anti and syncline features similar to onshore exposures. Infilled channelling was again prevalent in the area, most likely an extension of the River Barrow. Vibro cores with a maximum depth of 3m revealed surface sediments to be composed largely of silts and sands with a minor gravel component in certain areas.

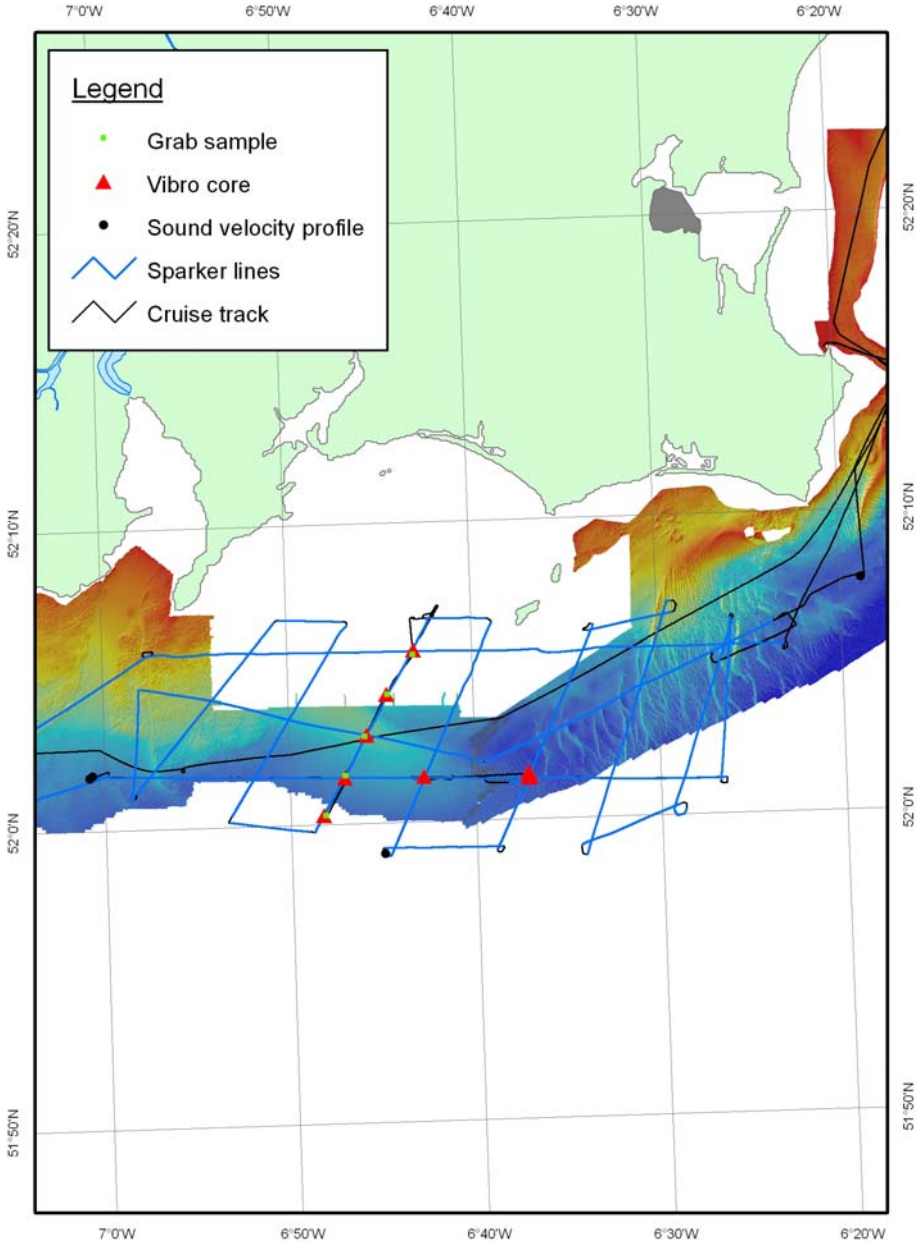


Figure 10. Saltee Islands survey area

7.3 Killkeel & Dundrum Bay Area

The Killkeel Area located north of Carlingford Lough is 122km² in size and is distinguished by sand and silt overlying consolidated clay infilling a series of channels which run between outcropping lithified till that contains boulders up to 30cm in diameter. Attempts to core and grab sample this outcropping till proved unsuccessful. Away from shore in the deeper section of the area surface sediments were mainly sands and silts often with a clay component. Coring attempts in this section were often unsuccessful, possibly due to the uneven topography.

The Dundrum Bay area just north of Killkeel was similarly composed of seemingly outcropping lithified till which led to difficulties coring and sample grabbing close to the shore in the 247 km² area. In the deeper section mainly silts and sands with some gravel were found, often overlying consolidated clays. Channelling was observed on preliminary seismic profiles.

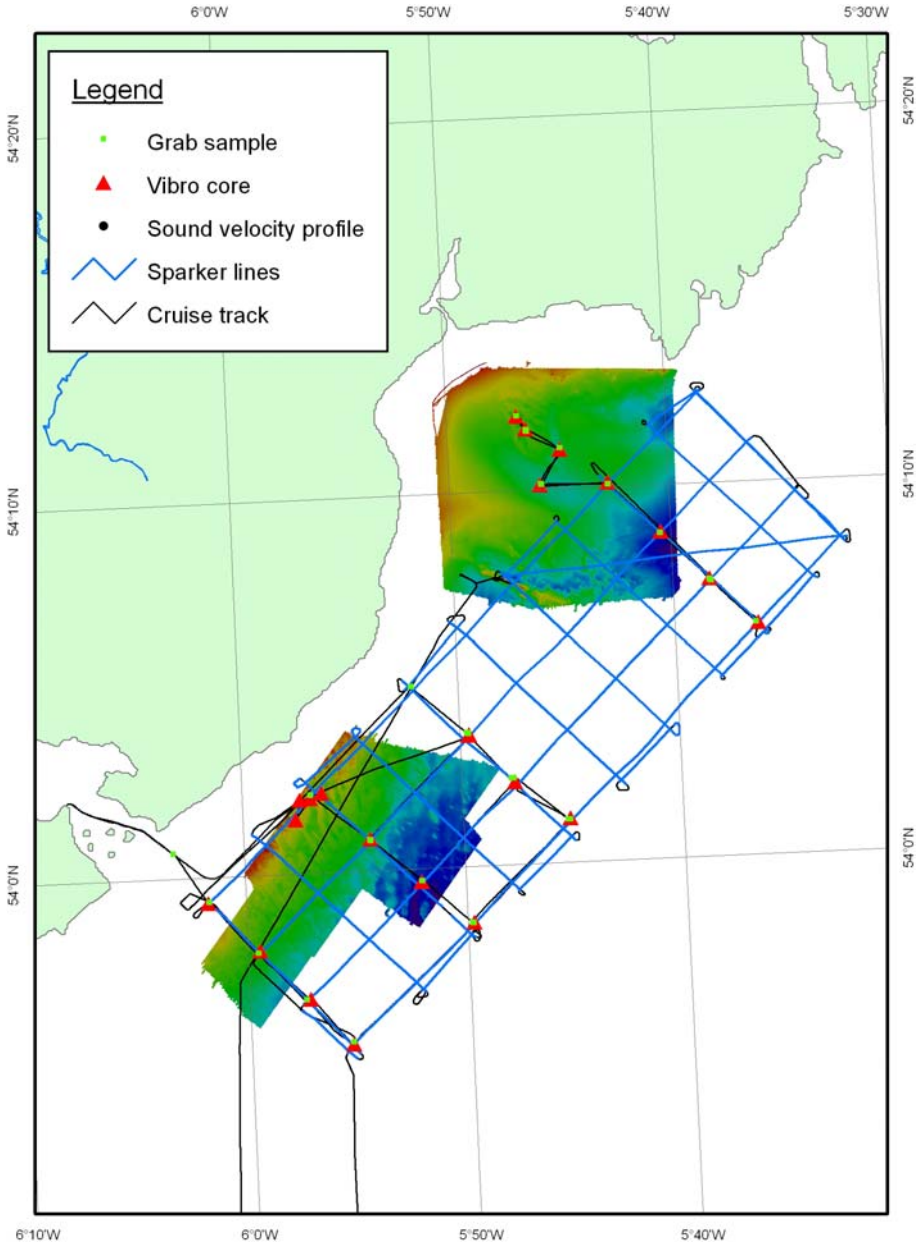


Figure 11. Killkeel and Dundrum Bay survey area

8 WEATHER REPORT – DOWNTIME

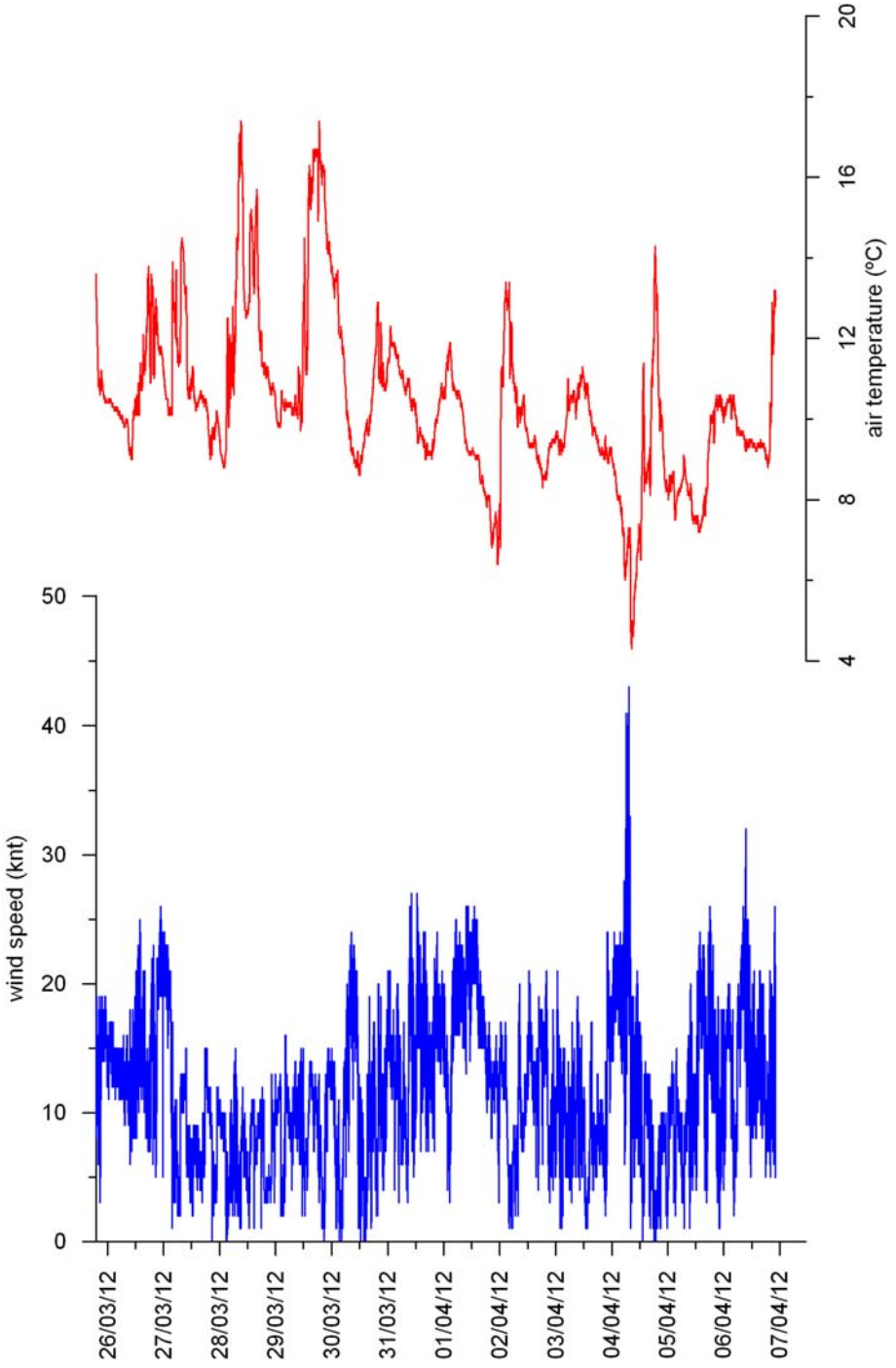


Figure 12. Weather chart

Except for 1.5 days, the weather conditions were very good and allowed for the operation of all equipment planned for this survey. In the afternoon of the 31st of March and from noon on the 3rd of April to the morning of the 5th of April, strong winds prevented any data or sample collection. Around noon on the 5th of April, winds

and swell had died down enough to allow for Sparker operation and vibro corer and grab sampling.
With increased wind speeds on the 31st of March during transit, only 1.5 days of ship time were lost to bad weather.

Appendices

I. PERSONNEL

Ship' crew	**Scientific Party**
Philip Baugh Master	Dr. Boris Dorschel Chief Scientist (UCC)
Brendan Barry C/engineer	James Burns Student (UU)
Brandon McGovern Mate	Mark Coughlan PhD student (UCC)
Lorin McFadden 00W	Niall Finn – Multibeam Operator Geological Survey of Ireland (GSI)
Tommy Byrne Motorman	Marian McGrath – Marine Mammal Observer, PhD student (UCC)
Tom Gilmartin AB	Sarah Kate McHugh INFF
James Burke AB	Jhonny Miranda – Sparker Operator Geomarine Survey Systems / Geosurveys
Kevin O'Leary Cook	Jordan Nixon Student (UU)

II. AREA MAPS: COVERAGES AND SAMPLE LOCATIONS

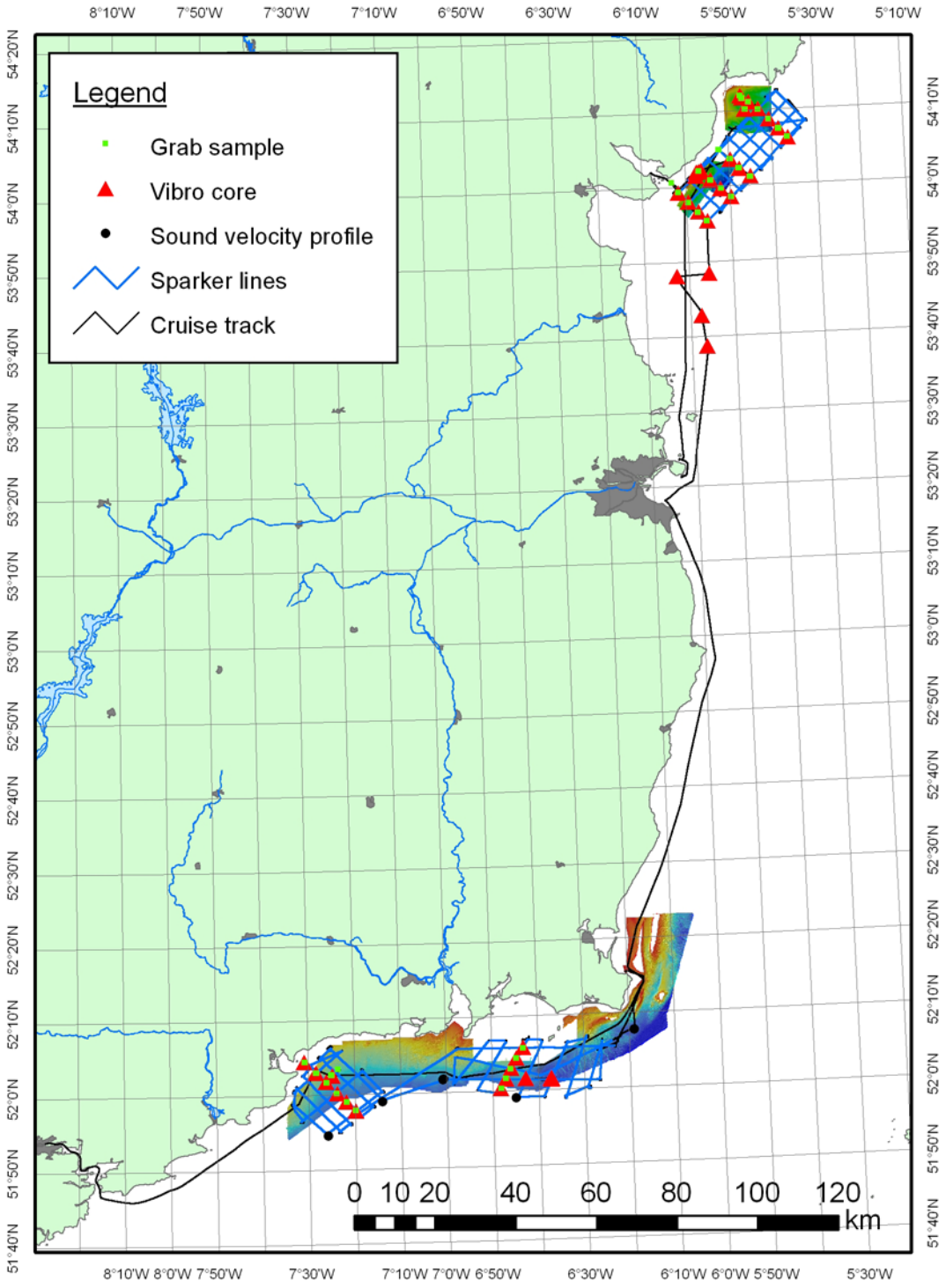


Figure 13. Sample stations and survey lines NSGeo survey

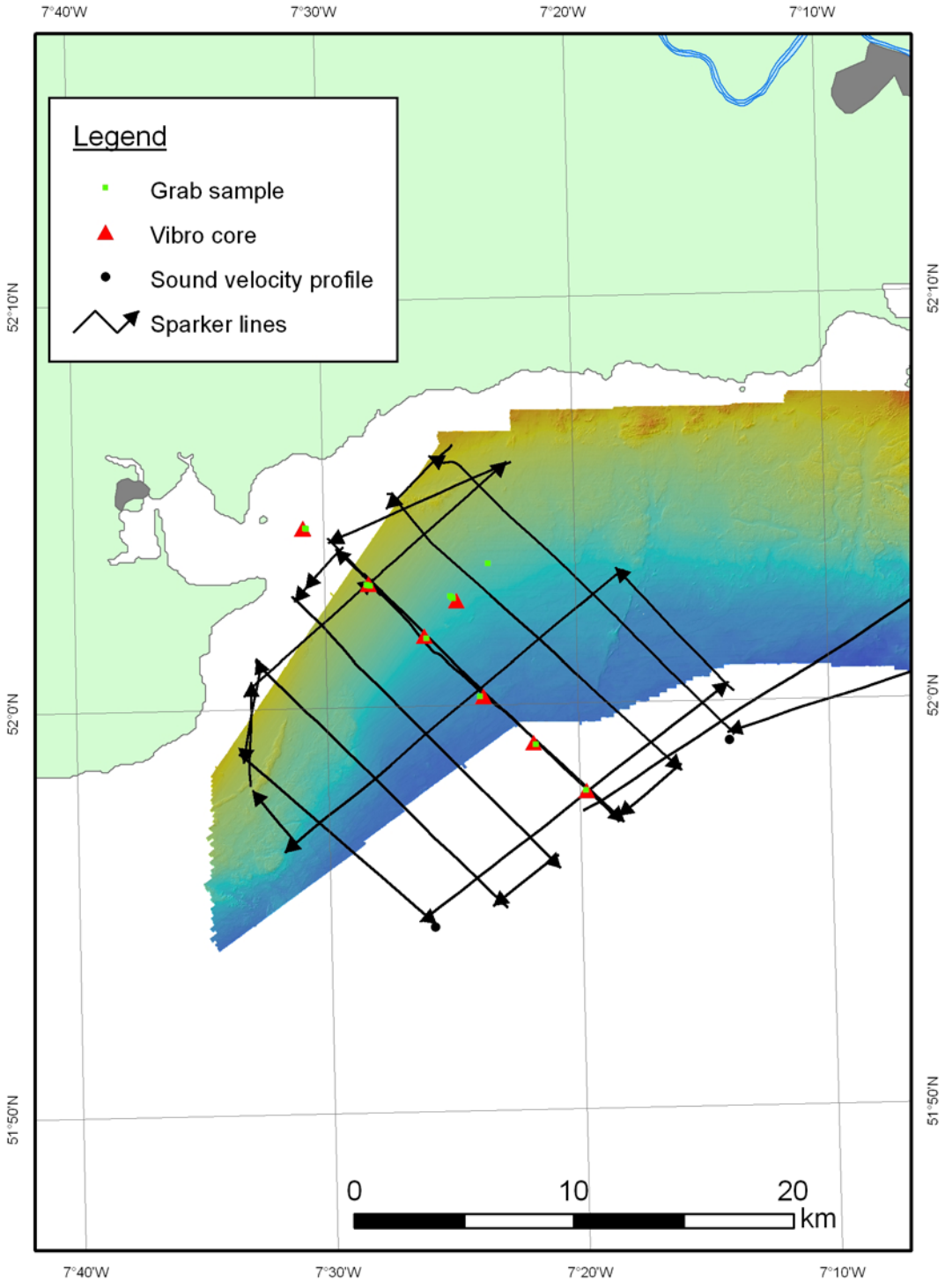


Figure 14. Sample stations and survey lines Dungarvan area

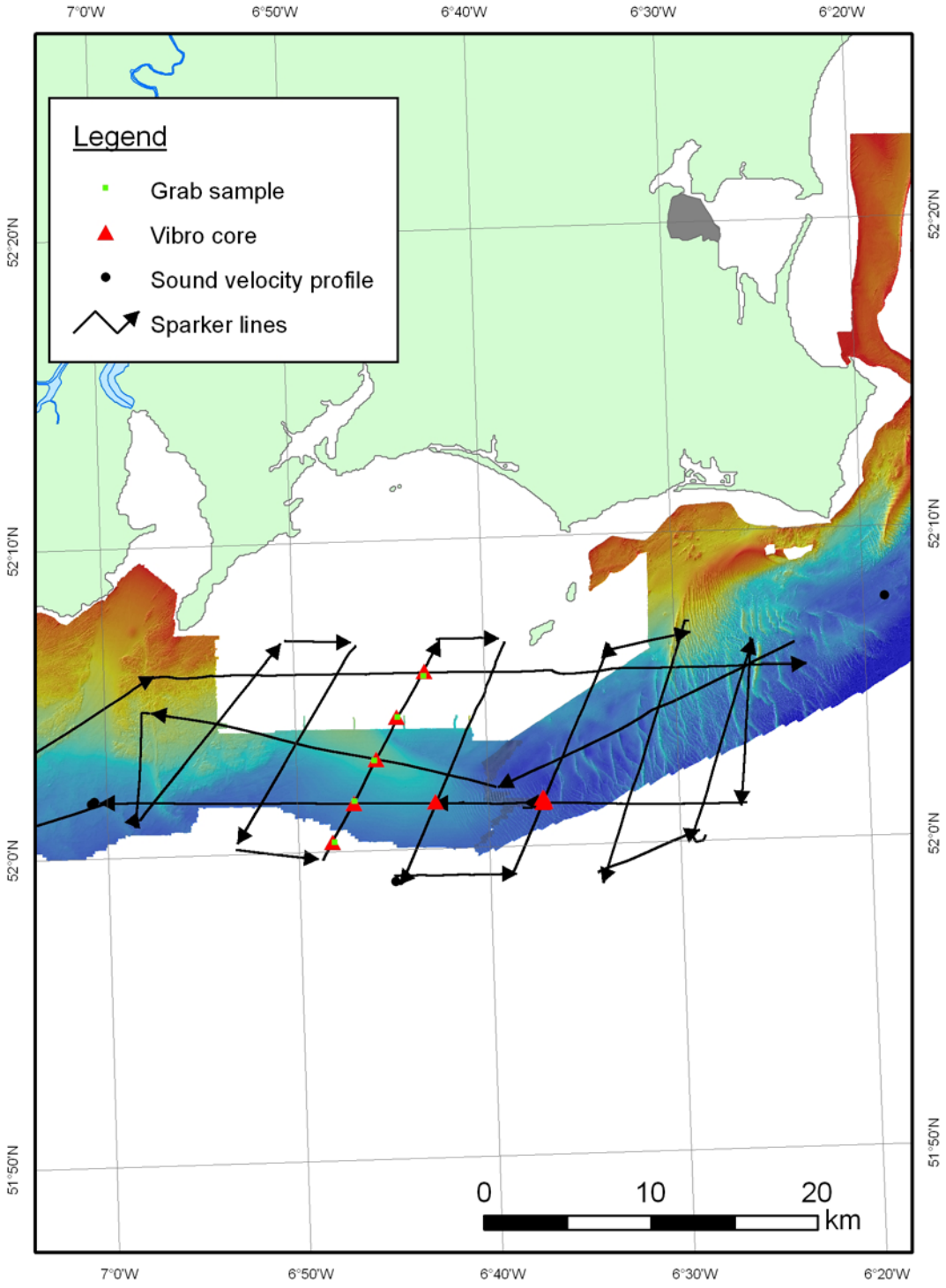


Figure 15. Sample stations and survey lines Saltee Island area

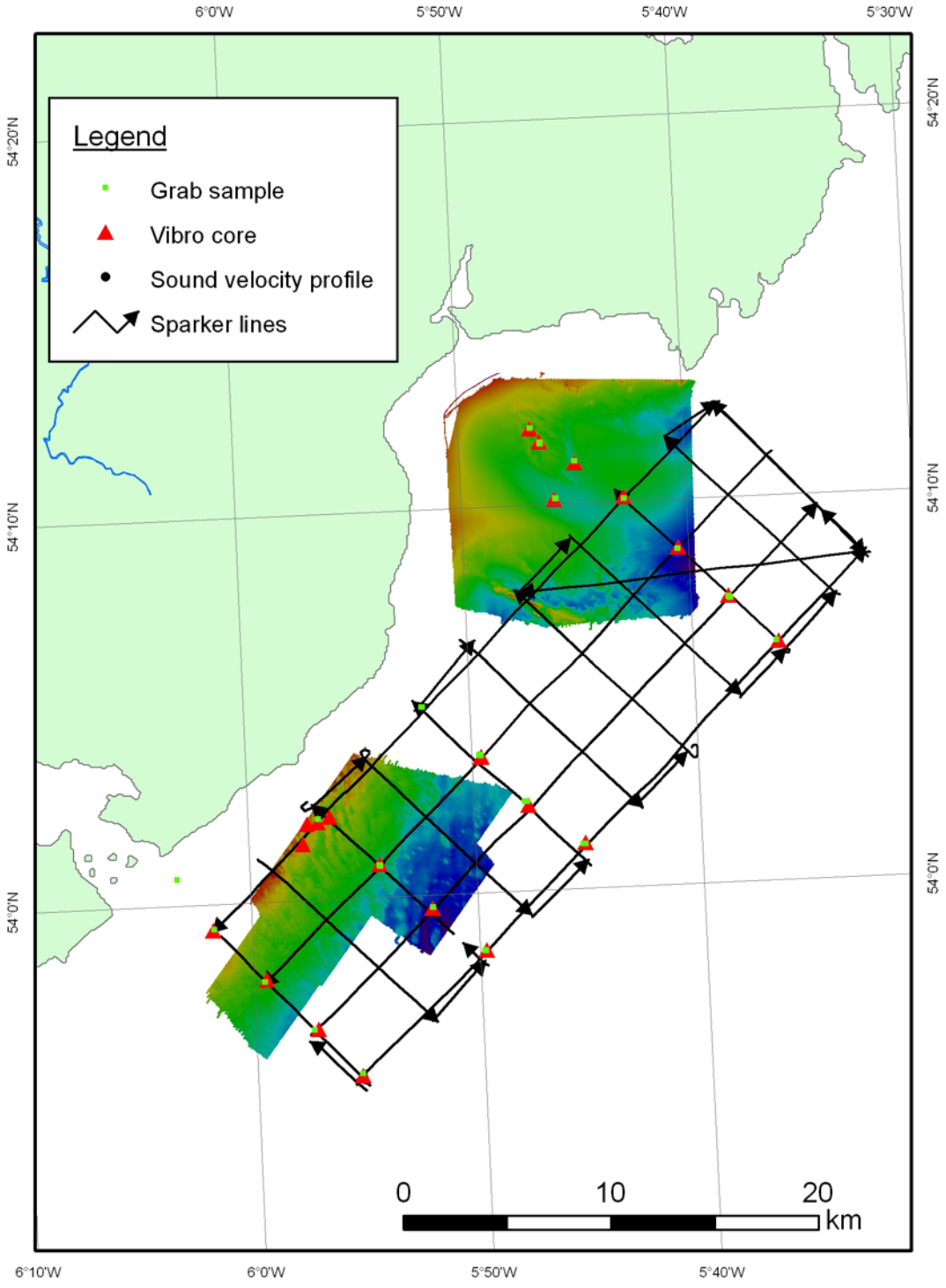


Figure 16. Sample stations and survey lines Killkeel and Dundrum Bay area

III. STATION LIST – SAMPLING

Cruise	Station	Type	Lat		Lon		Depth	Date	Time	Recovery	Comments
			Deg N	Min	Deg W	Min	m		UTC	cm	
CV12_UCC	001	VC	52	3.0213	7	28.2291	35	26/03/12	07:24:00	165	
CV12_UCC	002	VC	52	1.7151	7	36.0647	46	26/03/12	08:27:00	171	
CV12_UCC	003	VC	52	0.2151	7	23.7524	52	26/03/12	09:02:00	135	
CV12_UCC	004	VC	51	59.0424	7	21.7951	55	26/03/12	09:43:00	39	
CV12_UCC	005	VC	51	57.8304	7	19.7081	58	26/03/12	10:15:00	31	
CV12_UCC	006	SHIPEK	51	57.8560	7	19.7441	57	26/03/12	10:48:00	full	
CV12_UCC	007	SHIPEK	51	59.0260	7	21.7110	53	26/03/12	11:46:00	full	
CV12_UCC	008	SHIPEK	52	0.2117	7	23.8554	50	26/03/12	12:09:00	full	
CV12_UCC	009	SHIPEK	52	1.6636	7	25.9516	44	26/03/12	12:33:00	full	
CV12_UCC	010	SHIPEK	52	2.9054	7	28.1801	33	26/03/12	12:58:00	empty	
CV12_UCC	011	SHIPEK	52	2.9930	7	28.2935	32	26/03/12	13:20:00	empty	
CV12_UCC	012	SHIPEK	52	3.0260	7	28.3252	32	26/03/12	13:25:00	full	
CV12_UCC	013	SHIPEK	52	4.4243	7	30.6668	20	26/03/12	13:47:00	empty	
CV12_UCC	014	SHIPEK	52	4.4445	7	30.7171	20	26/03/12	13:50:00	full	
CV12_UCC	015	VC	52	4.4243	7	30.7964	20	26/03/12	13:58:00	no recovery	
CV12_UCC	016	VC	52	4.4212	7	30.8058	20	26/03/12	14:13:00	54	
CV12_UCC	017	VC	52	2.5711	7	24.7453	43	26/03/12	15:10:00	137	vibro corer bent due to strong currents
CV12_UCC	018	SHIPEK	52	3.4847	7	23.4554	42	26/03/12	16:05:00	full	
CV12_UCC	019	SHIPEK	52	2.6413	7	24.8730	44	26/03/12	16:21:00	empty	
CV12_UCC	020	SHIPEK	52	2.6668	7	24.9238	44	26/03/12	16:25:00	empty	
CV12_UCC	021	SHIPEK	52	2.6951	7	24.9969	43	26/03/12	16:28:00	empty	
CV12_UCC	022	VC	52	5.7697	6	43.1319	33	28/03/12	07:40:00	247	
CV12_UCC	023	VC	52	4.3282	6	44.6786	42	28/03/12	08:08:00	56	
CV12_UCC	024	VC	52	2.9770	6	45.8227	43	28/03/12	08:29:00	211	
CV12_UCC	025	VC	52	1.5808	6	47.0259	51	28/03/12	08:49:00	272	
CV12_UCC	026	VC	52	0.3365	6	48.2070	56	28/03/12	09:11:00	292	
CV12_UCC	027	SHIPEK	52	0.3380	6	48.0962	56	28/03/12	09:29:00	full	

Cruise	Station	Type	Lat		Lon		Depth	Date	Time	Recovery	Comments
			Deg N	Min	Deg W	Min	m		UTC	cm	
CV12_UCC	028	SHIPEK	52	1.6388	6	47.0042	50	28/03/12	09:55:00	full	
CV12_UCC	029	SHIPEK	52	2.9258	6	45.9159	43	28/03/12	10:11:00	full	
CV12_UCC	030	SHIPEK	52	4.3217	6	44.6390	40	28/03/12	10:28:00	full	
CV12_UCC	031	SHIPEK	52	5.6520	6	43.1938	32	28/03/12	10:48:00	full	
CV12_UCC	032	VC	52	1.4202	6	37.1145	57	29/03/12	07:56:00	no recovery	technical fail - magnetic switch
CV12_UCC	033	VC	52	1.4107	6	37.1217	58	29/03/12	07:58:00	no recovery	technical fail - magnetic switch
CV12_UCC	034	VC	52	1.4561	6	37.0401	59	29/03/12	08:30:00	no recovery	technical fail - magnetic switch
CV12_UCC	035	VC	52	1.5598	6	37.1367	59	29/03/12	09:13:00	no recovery	technical fail - magnetic switch
CV12_UCC	036	VC	52	1.5648	6	37.0667	60	29/03/12	09:29:00	286	
CV12_UCC	037	VC	52	1.5461	6	42.7798	49.5	29/03/12	10:05:00	257	vibro corer barrel bent, sediment core recovered
CV12_UCC	038	VC	52	38.6993	5	56.4873	42	01/04/12	15:25:00	258	
CV12_UCC	039	VC	53	42.7616	5	57.5076	41	01/04/12	16:13:00	292	
CV12_UCC	040	VC	53	48.1247	6	2.7625		01/04/12	17:16:00	285	
CV12_UCC	041	VC	53	48.3841	5	55.4912	44	01/04/12	17:57:00	302	
CV12_UCC	042	VC	53	59.3502	6	1.7428	18	02/04/12	08:57:00	no recovery	~20cm of consolidated till in core catcher (bag sample)
CV12_UCC	043	VC	53	58.0078	5	59.4470	29	02/04/12	09:22:00	139	cores not opened, extremely water-rich sediments
CV12_UCC	044	VC	53	56.6540	5	57.2509	35	02/04/12	09:52:00	35.5	cores not opened, extremely water-rich sediments
CV12_UCC	045	VC	53	55.3944	5	55.3885	42	02/04/12	10:16:00	208	
CV12_UCC	046	VC	53	58.5381	5	49.7123	44	02/04/12	10:59:00	172	
CV12_UCC	047	VC	54	1.2203	5	45.1383	40	02/04/12	11:55:00	128	
CV12_UCC	048	VC	54	2.2503	5	47.5658	35	02/04/12	12:25:00	62	
CV12_UCC	049	VC	53	59.6817	5	52.0181	37	02/04/12	13:07:00	39	Top 5cm bag sample
CV12_UCC	050	VC	54	0.8827	5	54.2527	31	02/04/12	13:35:00	no recovery	
CV12_UCC	051	VC	54	3.5496	5	49.6106	30	02/04/12	14:21:00	no recovery	
CV12_UCC	052	VC	54	3.5614	5	49.5622	30	02/04/12	14:27:00	no recovery	
CV12_UCC	053	VC	54	2.0351	5	56.8980	24	02/04/12	15:54:00	93	
CV12_UCC	054	VC	54	1.4793	5	57.5925	26	02/04/12	16:09:00	105	
CV12_UCC	055	VC	54	1.9970	5	57.3907	26	02/04/12	16:26:00	no recovery	stones in core catcher (bag sample)
CV12_UCC	056	SHIPEK	53	55.4775	5	55.3915	43	03/04/12	08:16:00	full	

Cruise	Station	Type	Lat		Lon		Depth	Date	Time	Recovery	Comments
			Deg N	Min	Deg W	Min	m		UTC	cm	
CV12_UCC	057	SHIPEK	53	56.6570	5	57.4031	37	03/04/12	08:34:00	full	
CV12_UCC	058	--									Correction to synchronise the log sheet with Quinsy log
CV12_UCC	059	SHIPEK	53	57.9620	5	59.5049	31	03/04/12	08:53:00	full	
CV12_UCC	060	SHIPEK	53	59.3826	6	1.6491	19	03/04/12	09:11:00	full	
CV12_UCC	061	SHIPEK	54	0.6954	6	3.1925	12	03/04/12	09:27:00	full	
CV12_UCC	062	SHIPEK	54	2.1260	5	56.8790	27	05/04/12	07:04:00	full	
CV12_UCC	063	SHIPEK	54	0.8736	5	54.2552	33	05/04/12	07:25:00	full	
CV12_UCC	064	SHIPEK	54	0.8411	5	54.2481	33	05/04/12	07:30:00	full	
CV12_UCC	065	SHIPEK	53	59.7008	5	52.9859	39	05/04/12	07:47:00	full	
CV12_UCC	066	SHIPEK	53	58.5129	5	49.7149	46	05/04/12	08:07:00	empty	
CV12_UCC	067	SHIPEK	53	58.3262	5	49.7442	46	05/04/12	08:09:00	full	
CV12_UCC	068	SHIPEK	54	1.1692	5	45.1129	42	05/04/12	08:41:00	empty	
CV12_UCC	069	SHIPEK	54	1.1791	5	45.2381	42	05/04/12	08:45:00	full	
CV12_UCC	070	SHIPEK	54	2.3468	5	47.6202	37	05/04/12	09:04:00	empty	
CV12_UCC	071	SHIPEK	54	2.3537	5	47.6820	37	05/04/12	09:08:00	empty	
CV12_UCC	072	SHIPEK	54	2.3487	5	47.7423	37	05/04/12	09:11:00	full	
CV12_UCC	073	SHIPEK	54	3.6037	5	49.5895	33	05/04/12	09:28:00	empty	
CV12_UCC	074	SHIPEK	54	3.6175	5	49.6034	33	05/04/12	09:31:00	empty	
CV12_UCC	075	SHIPEK	54	3.6129	5	49.6416	33	05/04/12	09:34:00	full	
CV12_UCC	076	SHIPEK	54	4.8935	5	52.0727	23	05/04/12	09:53:00	empty	
CV12_UCC	077	SHIPEK	54	4.9198	5	52.0923	23	05/04/12	09:56:00	empty	
CV12_UCC	078	SHIPEK	54	4.9187	5	52.1164	23	05/04/12	09:59:00	full	
CV12_UCC	079	VC	54	8.7601	5	40.4159	33	06/04/12	08:37:00	113	Top ~12cm bag sample
CV12_UCC	080	VC	54	6.2210	5	36.2152	51	06/04/12	09:12:00	160	
CV12_UCC	081	VC	54	7.4581	5	38.3337	37	06/04/12	09:35:00	52	~20cm of consolidated till in core catcher (bag sample)
CV12_UCC	082	VC	54	10.1357	5	42.7797	29	06/04/12	10:10:00	31	water rich, not opened
CV12_UCC	083	VC	54	10.1501	5	45.8398	30	06/04/12	10:29:00	86	
CV12_UCC	084	VC	54	11.0844	5	44.8784	29	06/04/12	10:45:00	41	
CV12_UCC	085	VC	54	11.6676	5	46.3973	26	06/04/12	11:00:00	no recovery	hard seabed

Cruise	Station	Type	Lat		Lon		Depth	Date	Time	Recovery	Comments
			Deg N	Min	Deg W	Min	m		UTC	cm	
CV12_UCC	086	VC	54	12.0113	5	46.7964	27.5	06/04/12	11:11:00	16	
CV12_UCC	087	SHIPEK	54	12.0152	5	46.7856	27	06/04/12	12:19:00	full	
CV12_UCC	088	SHIPEK	54	11.6554	5	46.3749	25	06/04/12	12:28:00	empty	
CV12_UCC	089	SHIPEK	54	11.6280	5	46.3737	25	06/04/12	12:31:00	empty	
CV12_UCC	090	SHIPEK	54	11.6028	5	46.3557	25	06/04/12	12:33:00	empty	
CV12_UCC	091	SHIPEK	54	11.1202	5	44.8659	28	06/04/12	12:49:00	full	
CV12_UCC	092	SHIPEK	54	10.1818	5	45.7738	28	06/04/12	13:04:00	empty	
CV12_UCC	093	SHIPEK	54	10.1639	5	45.7700	28	06/04/12	13:06:00	full	
CV12_UCC	094	SHIPEK	54	10.0998	5	42.7515	27	06/04/12	13:26:00	full	
CV12_UCC	095	SHIPEK	54	8.7349	5	40.4894	32	06/04/12	13:46:00	full	
CV12_UCC	096	SHIPEK	54	7.4356	5	38.3470	34	06/04/12	14:06:00	empty	
CV12_UCC	097	SHIPEK	54	7.4139	5	38.3036	32	06/04/12	14:08:00	empty	
CV12_UCC	098	SHIPEK	54	7.3914	5	38.2697	32	06/04/12	14:10:00	empty	
CV12_UCC	099	SHIPEK	54	6.2454	5	36.3233	48	06/04/12	14:28:00	full	

IV. SPARKER SEISMIC LINES AND MULTIBEAM ECHOSOUNDER LINES

Line Name	Date	Start time	End time	SOL_lat	SOL_lon	EOL_lat	EOL_lon	Trigger Rate	Energy	Joules per tip	record length	Sample interval	speed
								s	J		ms	ms	knts
sp001	27 March 2012	17:26	17:51					1	300	1.5	500	0.1 ms	
sp002	27 March 2012	17:54	18:10					1	300	1.5	500	0.1 ms	
unb 003	27 March 2012	18:11	18:12					1	600	3	500	0.1 ms	
CV12_UCC_Sparker_003	27 March 2012	16:53	19:17	52˚6.350' N	6˚23.684' W	52˚1.969' N	6˚39.479' W	1	600	3	500	0.1 ms	3.5-4
CV12_uCC_sparker_004	27 March 2012	19:17	22:51	52˚1.972' N	6˚39.536' W	52˚4.683' N	6˚57.547' W	1	600	3	500	0.1 ms	3.5-4
CV12_UCC_Sparker_005	27 March 2012	22:51	23:17	52˚4.686' N	6˚57.575' W	52˚1.042' N	6˚58.417' W	1	600	3	500	0.1 ms	3.5-4
CV12_UCC_Sparker_006	28 March 2012	23:20	01:08	52˚1.233' N	6˚58.302' W	52˚6.808' N	6˚50.661' W	1	600	3	500	0.1 ms	3.5-4
CV12_UCC_Sparker_007	28 March 2012	01:10	01:42	52˚6.896' N	6˚50.453' W	52˚6.784' N	6˚46.964' W	1	600	3	500	0.1 ms	3.5-4
CV12_UCC_Sparker_008	28 March 2012	01:45	03:29	52˚6.664' N	6˚46.705' W	52˚0.387' N	6˚53.222' W	1	600	3	500	0.1 ms	3.5-4
CV12_UCC_Sparker_009	28 March 2012	03:33	04:20	52˚0.190' N	6˚53.323' W	51˚59.819' N	6˚48.983' W	1	600	3	500	0.1 ms	3.5-4
CV12_UCC_Sparker_010	28 March 2012	04:22	06:29	51˚59.803' N	6˚48.809' W	52˚6.752' N	6˚42.309' W	1	600	3	500	0.1 ms	3.5-4
CV12_UCC_Sparker_011	28 March 2012	12:01	12:34	52˚6.792' N	6˚42.466' W	52˚6.752' N	6˚39.172' W	1	600	3	500	0.1 ms	3.5-4
CV12_UCC_Sparker_012	28 March 2012	12:37	14:57	52˚6.658' N	6˚38.918' W	51˚58.931' N	6˚44.798' W	1	600	3	500	0.1 ms	3.5-4
CV12_UCC_Sparker_013	28 March 2012	15:14	16:37	51˚59.205' N	6˚45.026' W	51˚59.150' N	6˚38.621' W	1	600	3	500	0.1 ms	3.5-4
CV12_UCC_Sparker_014	28 March 2012	16:44	19:09	51˚59.067' N	6˚38.946' W	52˚6.469' N	6˚33.571' W	1	600	3	500	0.1 ms	3.5-4
CV12_UCC_Sparker_015	28 March 2012	19:16	19:59	52˚6.248' N	6˚33.769' W	52˚6.766' N	6˚29.143' W	1	600	3	500	0.1 ms	3.5-4
CV12_UCC_Sparker_016	28 March 2012	20:08	22:44	52˚7.136' N	6˚29.182' W	51˚58.782' N	6˚34.162' W	1	600	3	500	0.1 ms	3.5-4
CV12_UCC_Sparker_017	28 March 2012	22:49	23:44	51˚59.089' N	6˚34.393' W	52˚0.373' N	6˚29.001' W	1	600	3	500	0.1 ms	3.5-4
CV12_UCC_Sparker_018	28 March 2012	23:52	01:58	52˚0.207' N	6˚28.690' W	52˚6.480' N	6˚25.887' W	1	600	3	500	0.1 ms	3.5-4
CV12_UCC_Sparker_019	29 March 2012	02:03	03:35	52˚6.542' N	6˚26.015' W	52˚1.110' N	6˚26.783' W	1	600	3	500	0.1 ms	3.5-4
CV12_UCC_Sparker_020A	29 March 2012	03:46	05:42	52˚1.215' N	6˚26.474' W	52˚1.431' N	6˚38.166' W	1	600	3	500	0.1 ms	3.5-4
CV12_UCC_Sparker_020B	29 March 2012	06:13	07:13	52˚1.269' N	6˚38.225' W	52˚1.525' N	6˚42.925' W	1	600	3	500	0.1 ms	3.5-4
CV12_UCC_Sparker_020C	29 March 2012	11:33	14:58	52˚1.527' N	6˚41.264' W	52˚1.829' N	7˚0.389' W	1	600	3	500	0.1 ms	3.5-4
CV12_UCC_Sparker_021	29 March 2012	15:36	18:07	52˚1.899' N	6˚59.801' W	51˚59.217' N	7˚14.091' W	1	600	3	300	0.1 ms	3.5-4
CV12_UCC_Sparker_022	29 March 2012	18:29	21:21	51˚59.157' N	7˚13.842' W	52˚6.157' N	7˚25.745' W	1	600	3	300	0.1 ms	3.5-4
CV12_UCC_Sparker_023	29 March 2012	21:41	22:20	52˚6.428' N	7˚24.803' W	52˚4.890' N	7˚27.481' W	1.1	800	4	300	0.1 ms	3.5-4

Line Name	Date	Start time	End time	SOL_lat	SOL_lon	EOL_lat	EOL_lon	Trigger Rate	Energy	Joules per tip	record length	Sample interval	speed
								s	J		ms	ms	knts
CV12_UCC_Sparker_024	29 March 2012	22:36	01:19	52˚5.249' N	7˚27.447' W	51˚58.305' N	7˚15.949' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_025	30 March 2012	01:31	02:03	51˚58.458' N	7˚15.961' W	51˚57.207' N	7˚18.499' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_026	30 March 2012	02:19	05:19	51˚57.067' N	7˚18.478' W	52˚3.911' N	7˚29.545' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_027A	30 March 2012	05:26	05:49	52˚3.960' N	7˚29.226' W	52˚2.954' N	7˚30.782' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_027B	30 March 2012	06:11	06:27	52˚3.372' N	7˚30.162' W	52˚2.642' N	7˚31.219' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_028	30 March 2012	06:34	09:11	52˚2.771' N	7˚31.315' W	51˚55.956' N	7˚20.846' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_029	30 March 2012	09:21	09:52	51˚56.293' N	7˚20.910' W	51˚55.066' N	7˚23.550' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_030	30 March 2012	10:02	12:28	51˚55.013' N	7˚22.977' W	52˚1.243' N	7˚32.765' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_031	30 March 2012	12:32	13:10	52˚1.113' N	7˚32.537' W	51˚58.695' N	7˚33.370' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_032	30 March 2012	13:23	15:10	51˚58.916' N	7˚33.569' W	51˚54.664' N	7˚25.845' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_033	30 March 2012	15:28	18:06	51˚54.707' N	7˚26.470' W	52˚0.450' N	7˚14.010' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_034	30 March 2012	18:16	19:28	52˚0.242' N	7˚13.785' W	52˚3.323' N	7˚18.396' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_035	30 March 2012	19:38	22:40	52˚3.261' N	7˚18.082' W	51˚56.486' N	7˚31.809' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_036	30 March 2012	22:56	23:26	51˚56.678' N	7˚31.325' W	51˚58.026' N	7˚33.047' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_037	30 March 2012	23:27	00:08	51˚58.123' N	7˚33.103' W	52˚0.702' N	7˚33.017' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_038A	31 March 2012	00:21	01:41	52˚0.346' N	7˚33.304' W	52˚3.148' N	7˚28.074' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_038B	31 March 2012	02:00	03:15	52˚3.122' N	7˚28.081' W	52˚5.981' N	7˚22.648' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_039	31 March 2012	03:18	04:40	52˚5.980' N	7˚22.469' W	52˚4.068' N	7˚29.828' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_040	31 March 2012	04:48	08:08	52˚4.185' N	7˚29.859' W	51˚57.064' N	7˚18.277' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_041	31 March 2012	08:25	12:44	51˚57.356' N	7˚19.907' W	52˚5.880' N	6˚57.356' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_042	31 March 2012	12:56	19:06	52˚5.816' N	6˚57.692' W	52˚5.634' N	6˚23.088' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_043	01 April 2012	19:17	00:39	53˚55.185' N	5˚55.711' W	54˚8.538' N	5˚32.142' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_044	02 April 2012	00:49	01:22	54˚8.278' N	5˚32.100' W	54˚9.573' N	5˚34.101' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_045	02 April 2012	03:01	08:25	54˚12.513' N	5˚38.309' W	53˚59.292' N	6˚1.803' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_046	02 April 2012	18:04	19:37	53˚59.217' N	6˚1.434' W	53˚55.142' N	5˚55.103' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_047	02 April 2012	19:42	20:17	53˚55.014' N	5˚55.259' W	53˚56.364' N	5˚57.705' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_048	02 April 2012	20:20	01:36	53˚56.520' N	5˚57.630' W	54˚9.739' N	5˚34.227' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_49	03 April 2012	01:42	02:50	54˚9.517' N	5˚33.987' W	54˚12.522' N	5˚38.708' W	1.1	800	4	300	0.1 ms	3.5-4

Line Name	Date	Start time	End time	SOL_lat	SOL_lon	EOL_lat	EOL_lon	Trigger Rate	Energy	Joules per tip	record length	Sample interval	speed
								s	J		ms	ms	knts
CV12_UCC_Sparker_050	03 April 2012	02:12	07:42	54˚11.164' N	5˚36.126' W	53˚57.829' N	5˚59.648' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_051	05 April 2012	10:53	18:31	54˚1.164' N	5˚59.617' W	53˚56.717' N	5˚51.997' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_052	05 April 2012	12:49	13:52	53˚56.768' N	5˚52.261' W	53˚58.274' N	5˚49.773' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_053A	05 April 2012	14:13	14:28	53˚58.131' N	5˚49.635' W	53˚58.757' N	5˚50.755' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_053B	05 April 2012	14:33	15:55	53˚58.984' N	5˚51.134' W	54˚2.515' N	5˚57.183' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_054	05 April 2012	15:56	16:39	54˚2.580' N	5˚57.288' W	54˚3.702' N	5˚54.639' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_055	05 April 2012	16:39	18:31	54˚3.712' N	5˚54.620' W	53˚59.393' N	5˚47.641' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_056	05 April 2012	18:39	19:15	53˚59.335' N	5˚47.670' W	54˚0.784' N	5˚45.035' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_057	05 April 2012	19:22	21:10	54˚0.613' N	5˚44.946' W	54˚5.102' N	5˚52.533' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_058	05 April 2012	21:21	22:01	54˚4.822' N	5˚52.443' W	54˚6.597' N	5˚49.637' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_059	05 April 2012	22:16	00:04	54˚6.622' N	5˚50.319' W	54˚2.045' N	5˚42.554' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_060	06 April 2012	00:16	00:50	54˚2.119' N	5˚42.905' W	54˚3.471' N	5˚40.463' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_061	06 April 2012	00:52	02:50	54˚3.559' N	5˚40.306' W	54˚7.850' N	5˚47.840' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_062	06 April 2012	03:01	03:34	54˚7.715' N	5˚47.702' W	54˚9.125' N	5˚45.207' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_063	06 April 2012	03:42	05:26	54˚9.210' N	5˚45.255' W	54˚4.857' N	5˚37.977' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_064	06 April 2012	05:31	06:01	54˚4.775' N	5˚38.042' W	54˚6.016' N	5˚35.890' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_065	06 April 2012	06:04	07:49	54˚5.970' N	5˚35.732' W	54˚10.353' N	5˚43.183' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_066	06 April 2012	14:54	15:32	54˚5.922' N	5˚35.780' W	54˚7.440' N	5˚33.562' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_067	06 April 2012	15:37	17:21	54˚7.335' N	5˚33.400' W	54˚11.691' N	5˚40.889' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_068	06 April 2012	17:27	17:56	54˚11.668' N	5˚40.790' W	54˚12.506' N	5˚38.446' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_069	06 April 2012	18:00	19:35	54˚12.537' N	5˚38.608' W	54˚8.343' N	5˚32.221' W	1.1	800	4	300	0.1 ms	3.5-4
CV12_UCC_Sparker_070	06 April 2012	19:39	22:07	54˚8.389' N	5˚32.017' W	54˚7.757' N	5˚47.602' W	1.1	800	4	300	0.1 ms	3.5-4

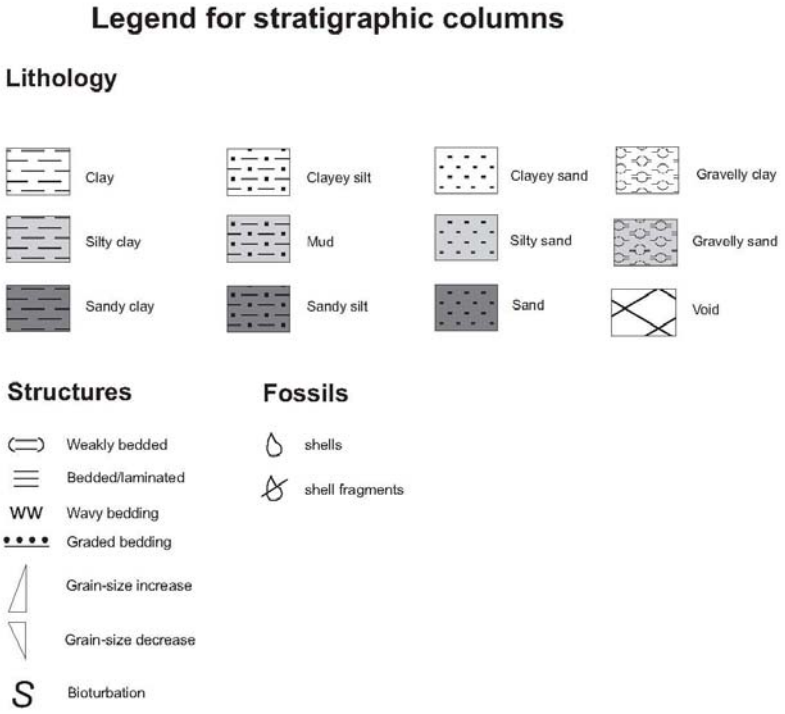
V. SOUND VELOCITY PROBE (SVP) STATIONS

Cruise	File name	Type	Lat		Long		Date	Time	Comments
			Deg N	Min	Deg W	Min		UTC	
CV12_UCC	SVP27031201	SVP	52	7.7406	6	18.8562372	27/03/2012	13:04	Entered into EM3002 AND EA400
CV12_UCC	SVP28031201	SVP	51	59.0214	6	44.9805098	28/03/2012	15:04	Entered into EM1002 AND EA400
CV12_UCC	SVP29031201	SVP	52	1.8477	7	0.6602825			Failed
CV12_UCC	SVP29031201a	SVP	52	1.7850	7	0.7871492	29/03/2012	15:15	Entered into EM1002 AND EA400
CV12_UCC	SVP29031202	SVP	51	59.0246	7	13.9841721	29/03/2012	18:18	Entered into EM1002 AND EA400
CV12_UCC	SVP30031201	SVP	51	54.5721	7	25.8605923	30/03/2012	15:13	Entered into EM1002 AND EA400

VI. VIBRO CORE SECTION LIST

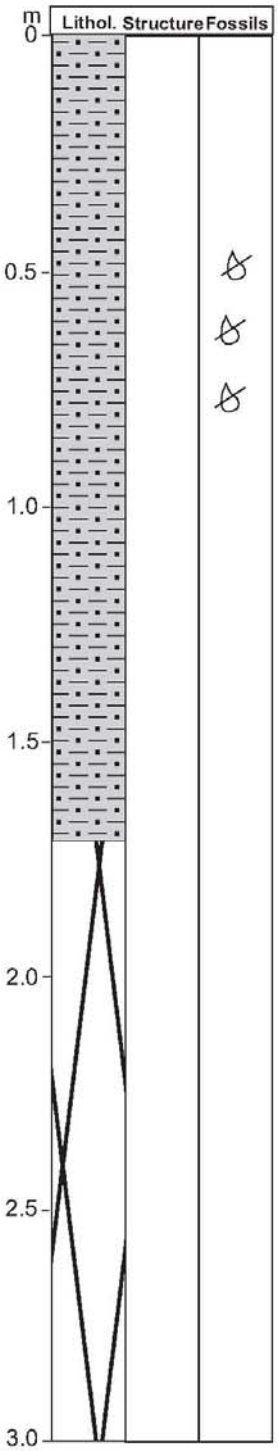
Cruise	Station No.	No. of section	Total length	Section	Section	Section
	Core		cm	cm	cm	cm
CV12_UCC	001	2	165	0-65	65-165	
CV12_UCC	002	2	171	0-71	71-171	
CV12_UCC	003	2	135	0-35	65-135	
CV12_UCC	004	1	39	0-39		
CV12_UCC	005	1	31	0-31		
CV12_UCC	016	1	54	0-54		
CV12_UCC	017	2	137	0-37	37-137	
CV12_UCC	022	3	247	0-47	47-147	147-247
CV12_UCC	023	1	56	0-56		
CV12_UCC	024	3	211	0-11	11-111	111-211
CV12_UCC	025	3	272	0-72	72-172	172-272
CV12_UCC	026	3	292	0-92	92-192	
CV12_UCC	036	3	286	0-86	86-186	186-286
CV12_UCC	037	3	257	0-57	57-157	157-257
CV12_UCC	038	3	258	0-58	58-158	158-258
CV12_UCC	039	3	292	0-92	92-192	192-292
CV12_UCC	040	3	285	0-85	85-185	185-285
CV12_UCC	041	3	302	0-102	102-202	202-302
CV12_UCC	043	2	139	0-39	39-139	
CV12_UCC	044	1	35.5	0-35.5		
CV12_UCC	045	3	208	0-11	11-108	108-208
CV12_UCC	046	2	172	0-72	72-172	172-272
CV12_UCC	047	2	128	0-28	28-128	
CV12_UCC	048	1	62	0-62		
CV12_UCC	049	1	39	0-39		
CV12_UCC	053	1	93	0-93		
CV12_UCC	054	2	105	0-13	13-108	
CV12_UCC	079	bag sample + 1	113	0-12 (bag)	12-113	
CV12_UCC	080		160	0-60	60-160	
CV12_UCC	081	1 + bag sample	52	0-52	52-72 (bag)	
CV12_UCC	082	1	31	0-31		
CV12_UCC	083	1	86	0-86		
CV12_UCC	084	1	41	0-41		
CV12_UCC	086	1	16	0-16		
Total			**4970.5**			

VII. VIBRO CORE DESCRIPTION



CV12_UCC_001 Date: 26.03.12 Pos: 52°03.0213'N 07°28.2291'W
Water Depth: 35 m Core Length: 165 cm

Lithology



Darl brown sand, high water content to 29 cm

Dark brown in colour

Light brown

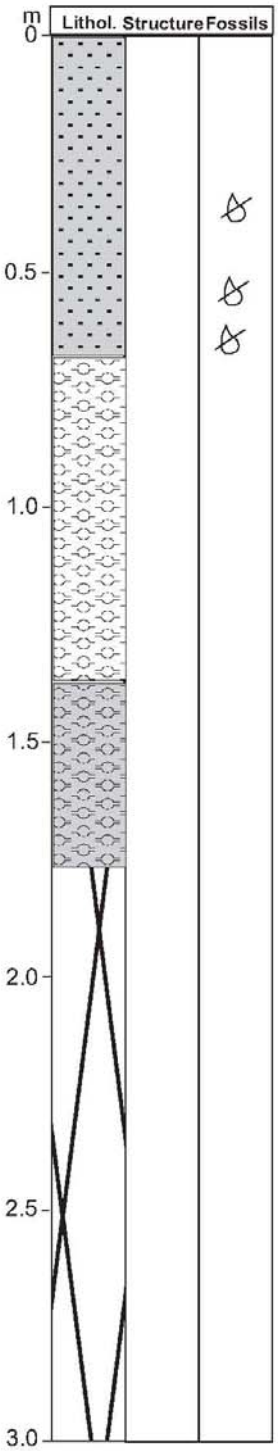
Dark brown

Light brown

CV12_UCC_002

Date: 26.03.12 Pos: 52°01.7151'N 07°36.0647'W
Water Depth: 46 m Core Length: 171 cm

Lithology



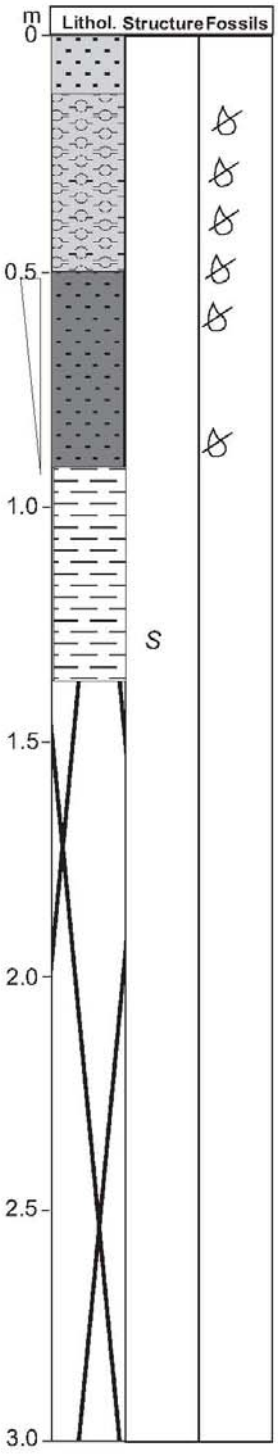
Dark brown colour

Sharp transition to gravelly-clayey silt marked by colour change from dark brown to red-brown

Cobble present, sub-angular, 9-15 cm

CV12_UCC_003 Date: 26.03.12 Pos: 52°00.2151'N 07°23.7524'W
Water Depth: 52 m Core Length: 135 cm

Lithology



Dark brown/grey silty sand

Light brown sand, high shell content and pebbles

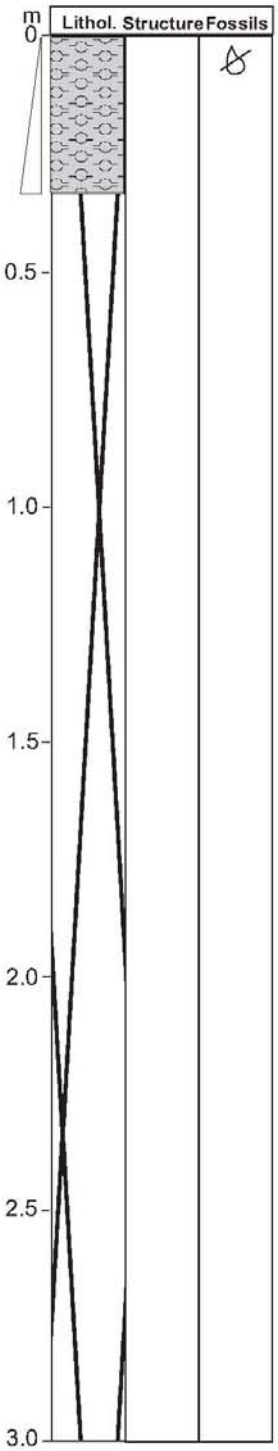
Water logged light brown sand with pebbles

Stiff brown clay

Burrow

CV12_UCC_004 Date: 26.03.12 Pos: 52°00.2151'N 07°23.7524'W
Water Depth: 55 m Core Length: 135 cm

Lithology



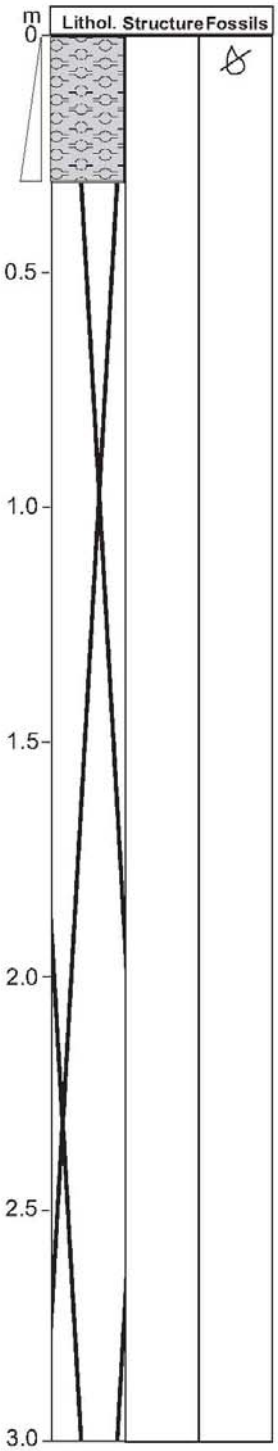
Dark brown colour

Change to light brown colour with increase in gravel component

2

CV12_UCC_005 Date: 26.03.12 Pos: 51°57.8304'N 07°19.7081'W
Water Depth: 58 m Core Length: 31 cm

Lithology



Dark grey in colour- Gravelly sandy silts

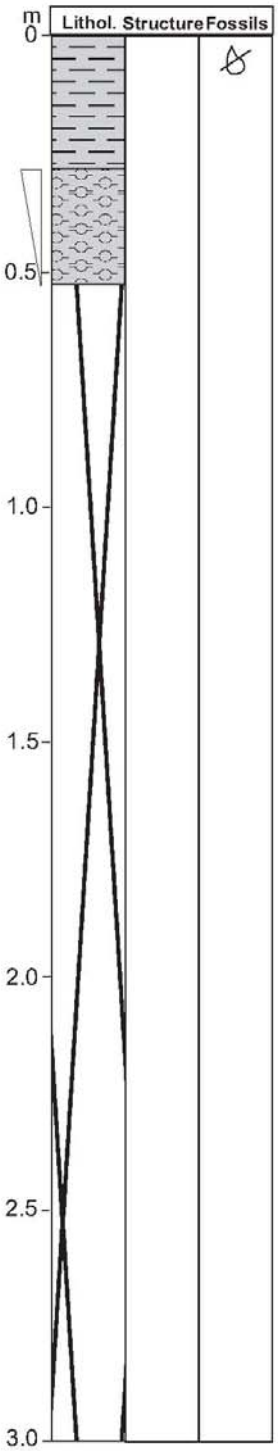
Downcore coarsening coupled with lighter brown colour

Pebbles 0.5 - 3 cm

2

CV12_UCC_016 Date: 26.03.12 Pos: 52°4.4212'N 07°30.8058'W
Water Depth: 20 m Core Length: 54 cm

Lithology



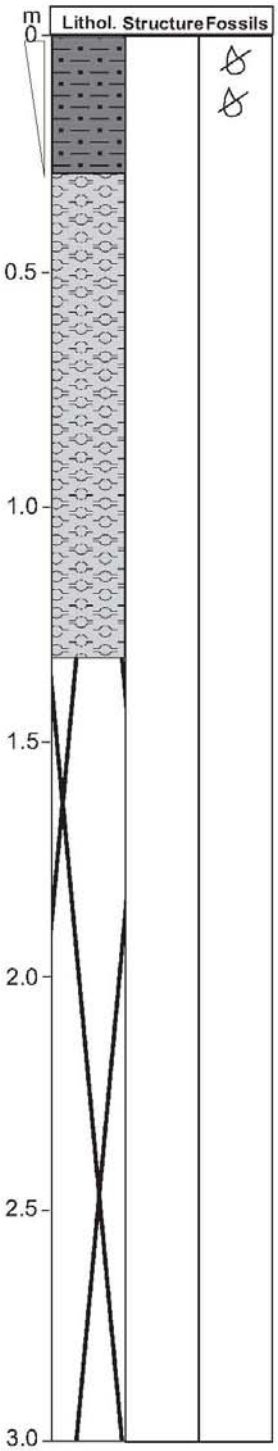
Dark grey in colour

Sharp transition to gravelly sands

2

CV12_UCC_017 Date: 26.03.12 Pos: 52°2.5711'N 07°24.7453'W
Water Depth: 43 m Core Length: 137 cm

Lithology



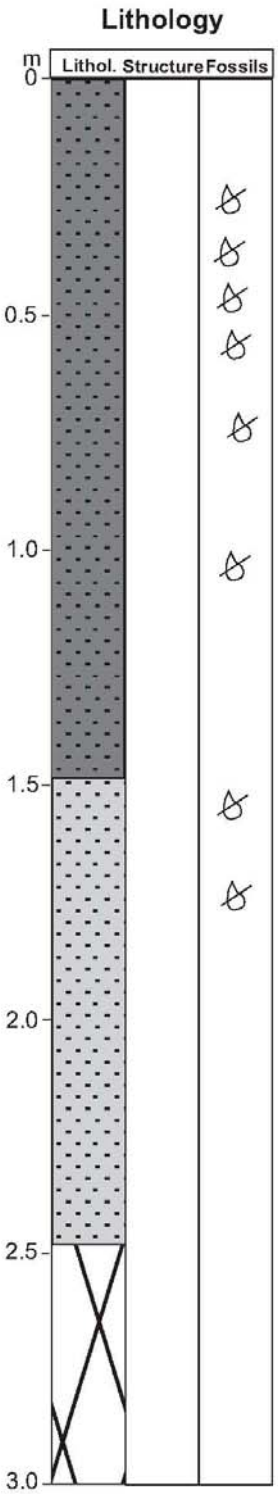
Dark grey
Noticeable fining and change in colour to dark brown

Water logged .Pebbles 1-5 cm

Cobble 6 cm.

Cobble 7 cm

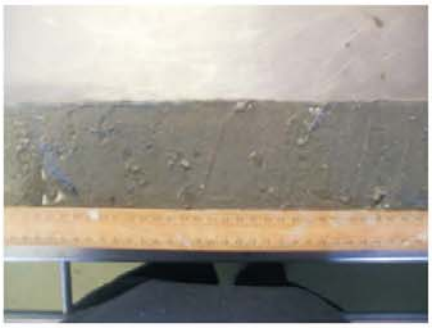
CV12_UCC_022 Date: 28.03.12 Pos: 52°05.7697'N 06°43.1319'W
Water Depth: 33 m Core Length: 247 cm

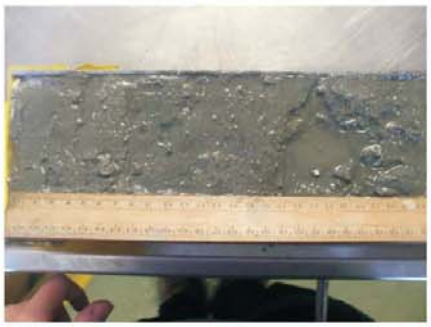


Medium brown in colour

Shell particles 0.5 cm

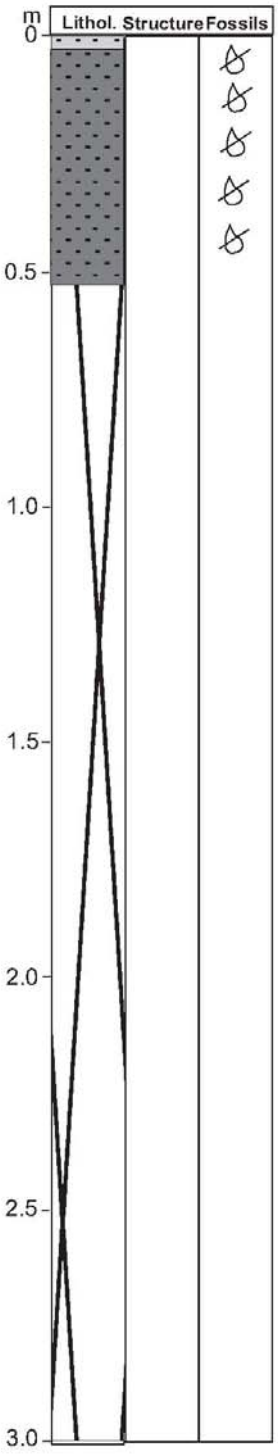
Medium brown colour, high water content





CV12_UCC_023	Date: 28.03.12 Pos: 52°04.3282'N 06°44.6786'W Water Depth: 42 m Core Length: 56 cm

Lithology



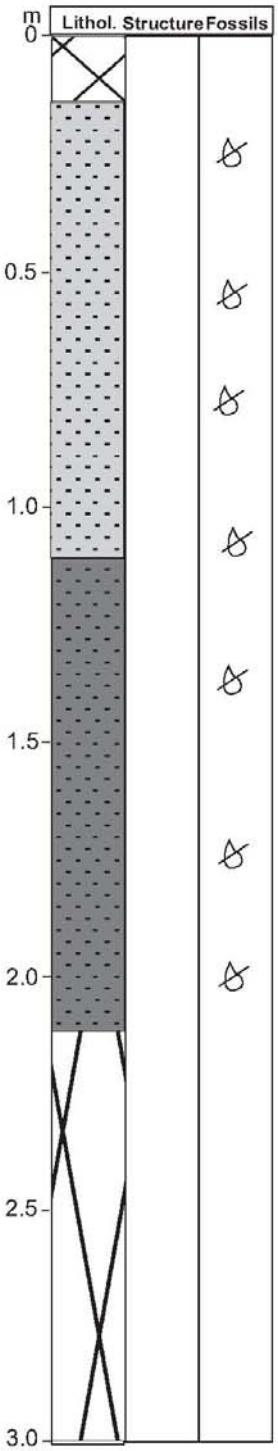
Light brown in colour

Coarser sand, densely packed with high shell content

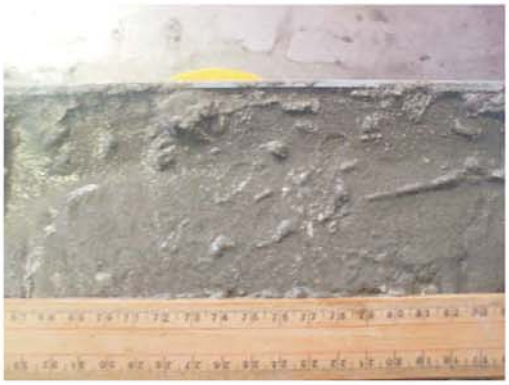
2

CV12_UCC_024 Date: 28.03.12 Pos: 52°02.9770'N 06°45.8227'W
Water Depth: 43 m Core Length: 211 cm

Lithology

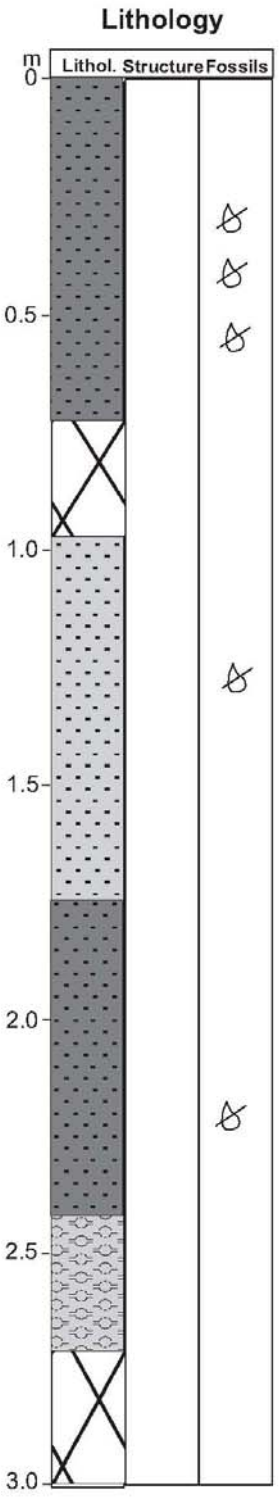


Dark brown in colour



Sands well sorted, medium brown with minor shell component throughout

CV12_UCC_025 Date: 28.03.12 Pos: 52°01.5808'N 06°47.0259'W
Water Depth: 51 m Core Length: 272 cm



Medium brown in colour

Missing

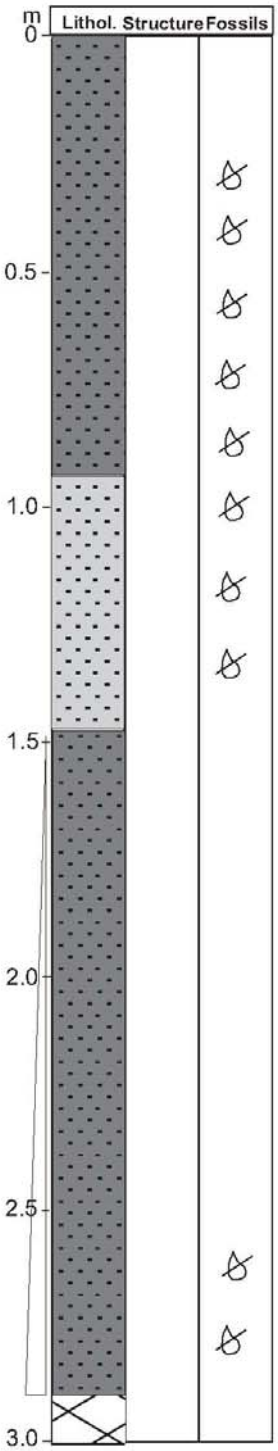
Dark fine sands that are dense

Sharp transition to finer, lighter sands

CV12_UCC_026

Date: 28.03.12 Pos: 52°00.3365'N 06°48.2070'W
Water Depth: 56 m Core Length: 292 cm

Lithology

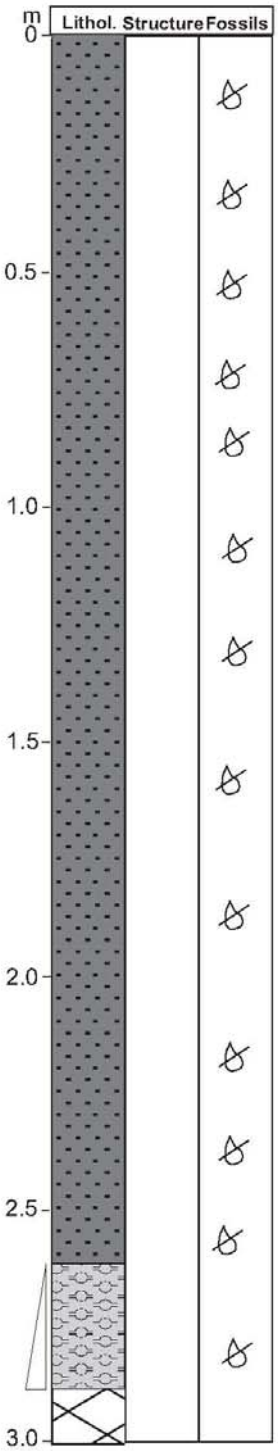


Medium to dark brown in colour

High water content until 147 cm approx.

CV12_UCC_036 Date: 29.03.12 Pos: 52°01.5648'N 06°37.0667'W
Water Depth: 60 m Core Length: 286 cm

Lithology

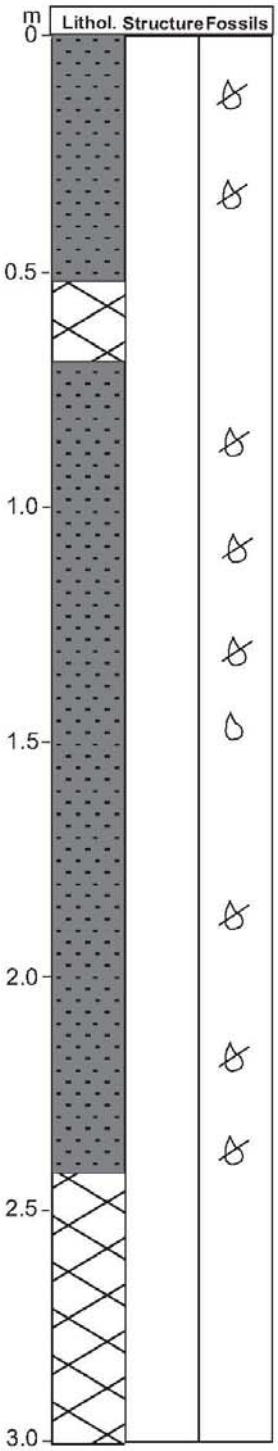


Dark brown sands with minor shell component throughout

Sharp transition to gravel

CV12_UCC_037 Date: 29.03.12 Pos: 52°01.5461'N 06°42.7798'W
Water Depth: 49.5 m Core Length: 257 cm

Lithology



Light to medium brown sands throughout with shell component

Core incomplete

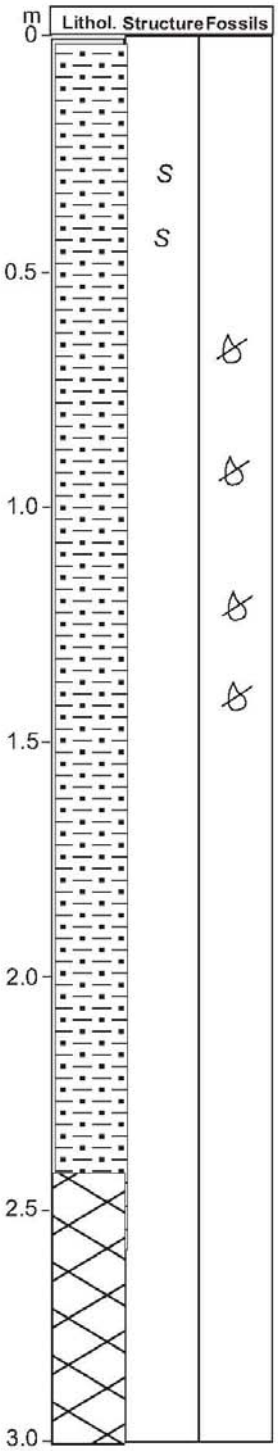
Insitu bivalve

Shell component <30mm

CV12_UCC_038

Date: 01.04.12 Pos: 52°38.6993'N 05°56.4873'W
Water Depth: 42 m Core Length: 258 cm

Lithology

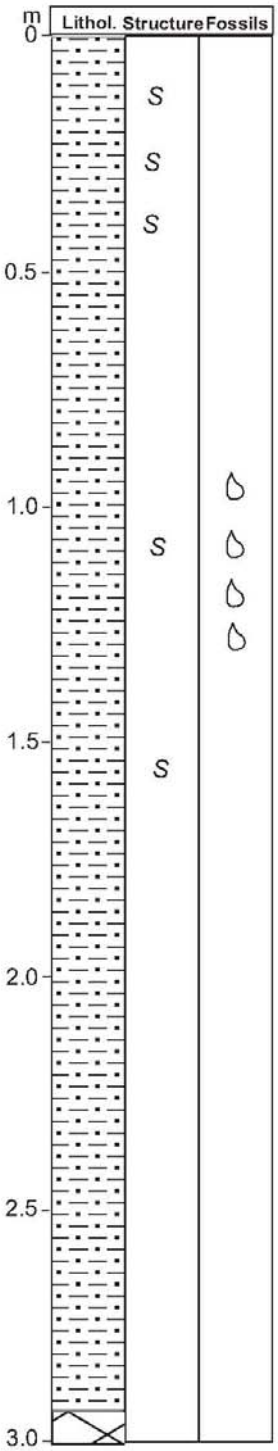


Medium brown muddy silts throughout

Bioturbation represented by dark, organic layers

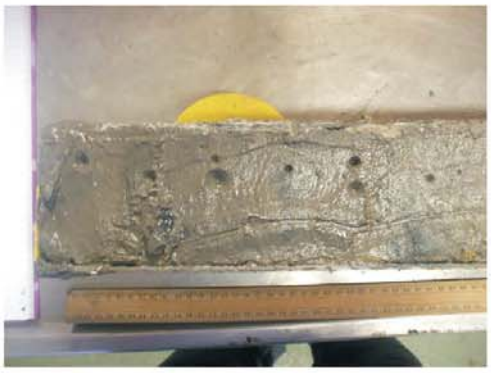
CV12_UCC_039 Date: 01.04.12 Pos: 53°42.7616'N 05°57.5076'W
Water Depth: 41 m Core Length: 292 cm

Lithology



Clayey silt throughout

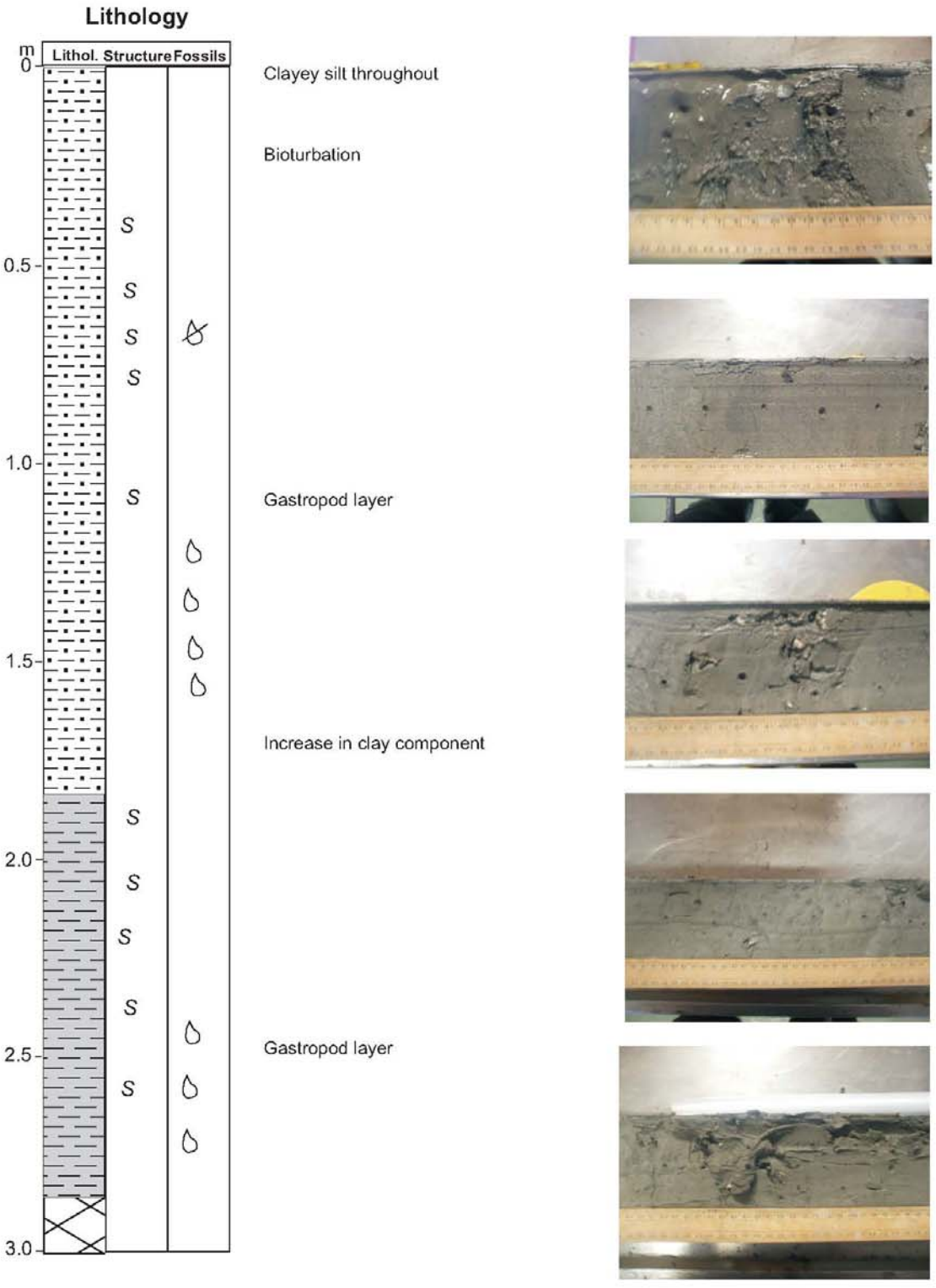
Bioturbation



Gastropods

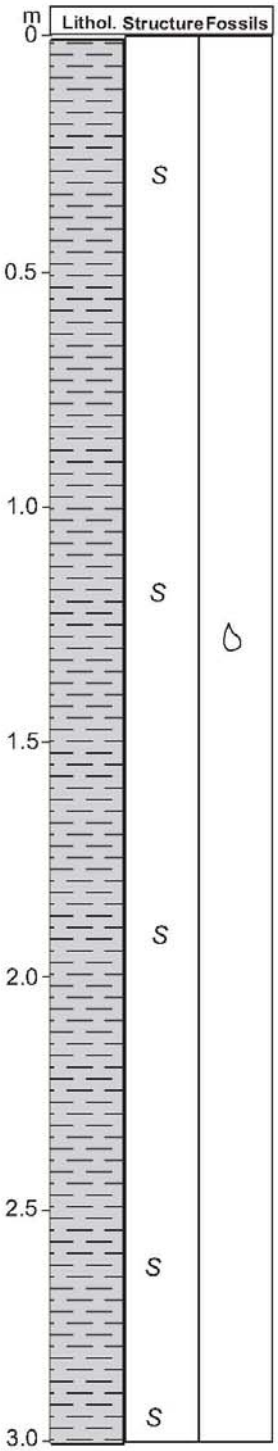
Increase in clay component

CV12_UCC_040 Date: 01.04.12 Pos: 53°48.1247'N 06°02.7625'W
Water Depth: ??? m Core Length: 285 cm



CV12_UCC_041 Date: 01.04.12 Pos: 53°48.3841'N 05°55.49212'W
Water Depth: 44 m Core Length: 302 cm

Lithology



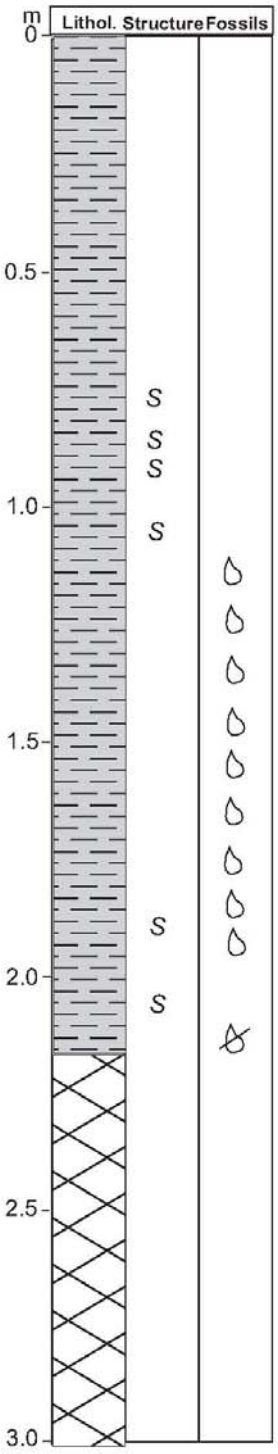
Dark grey/ brown silty clay with subtle bioturbation throughout

Burrow with silty infill

Infilled burrow

CV12_UCC_045 Date: 02.04.12 Pos: 53°55.3944'N 05°55.3885'W
Water Depth: 42 m Core Length: 208 cm

Lithology



Dark grey/brown silty clay throughout with evidence for bioturbation

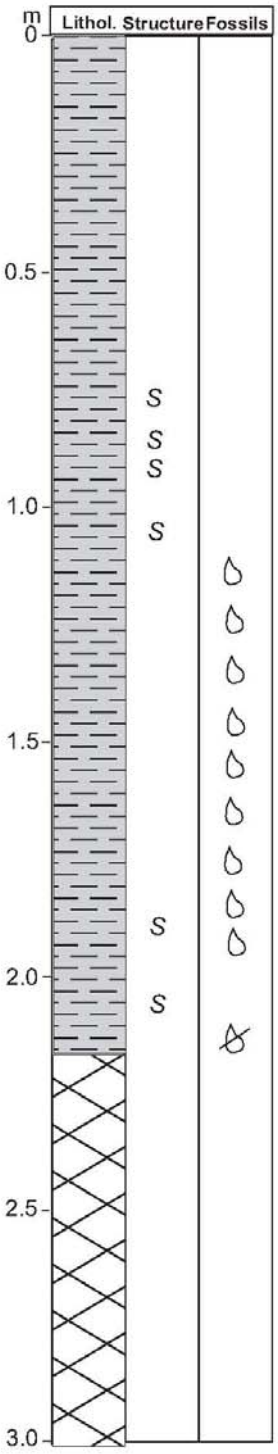
Burrows

Gastropod layer 119 - 194 cm coupled with change in sediment colour to a lighter brown

At 194 cm sediment becomes water logged and also displays change in colour to red-brown

CV12_UCC_046 Date: 02.04.12 Pos: 53°58.5381'N 05°49.7123'W
Water Depth: 44 m Core Length: 172 cm

Lithology



Dark grey/brown silty clay throughout with evidence for bioturbation

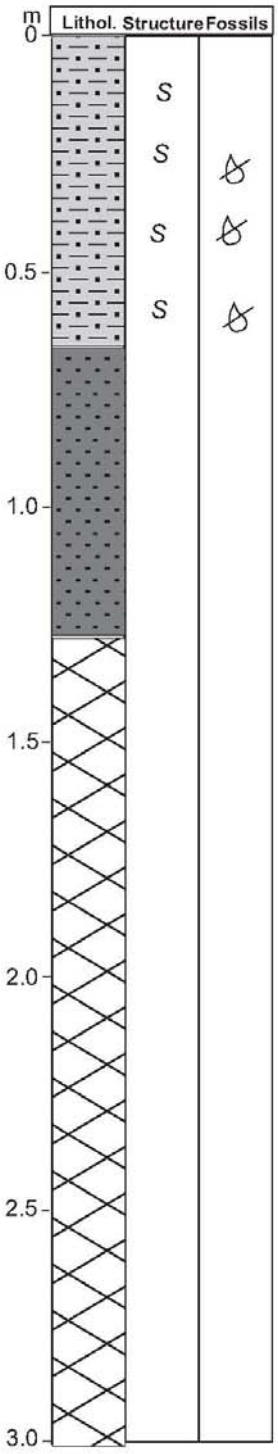
Burrows

Gastropod layer 119 - 194 cm coupled with change in sediment colour to a lighter brown

At 194 cm sediment becomes water logged and also displays change in colour to red-brown

CV12_UCC_047 Date: 02.04.12 Pos: 54°01.2203'N 05°45.1383'W
Water Depth: 40 m Core Length: 128 cm

Lithology



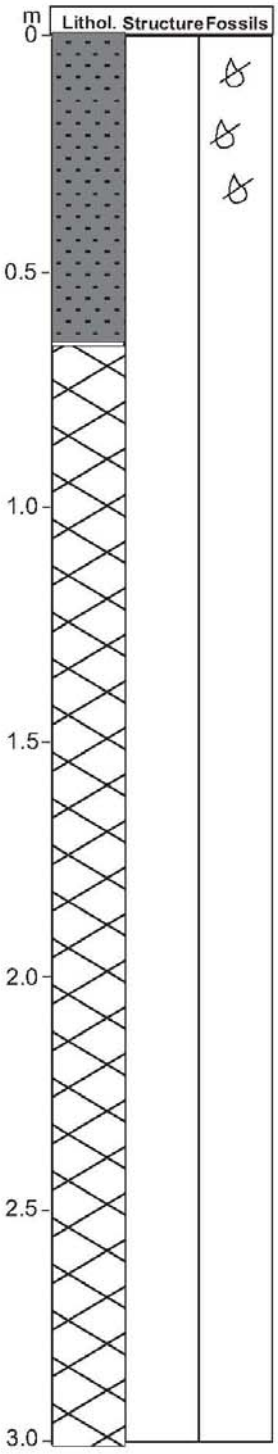
Medium brown silt with black organic material throughout

Lighter brown in colour water logged sediment

Transition to sand which is lighter brown/red

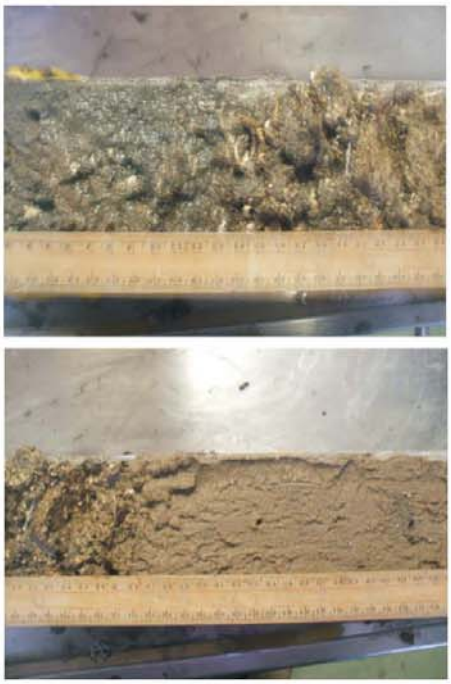
CV12_UCC_048 Date: 02.04.12 Pos: 54°02.2503'N 05°47.5658'W
Water Depth: 35 m Core Length: 62 cm

Lithology



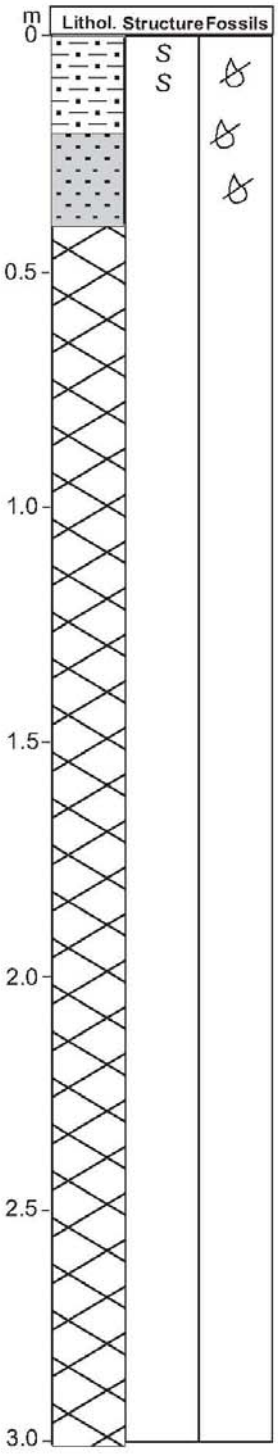
Medium to dark sand with shell component

At 13 cm transition to lighter brown shell with high shell component



CV12_UCC_049 Date: 02.04.12 Pos: 53°59.6817'N 05°52.0181'W
Water Depth: 37 m Core Length: 39 cm

Lithology

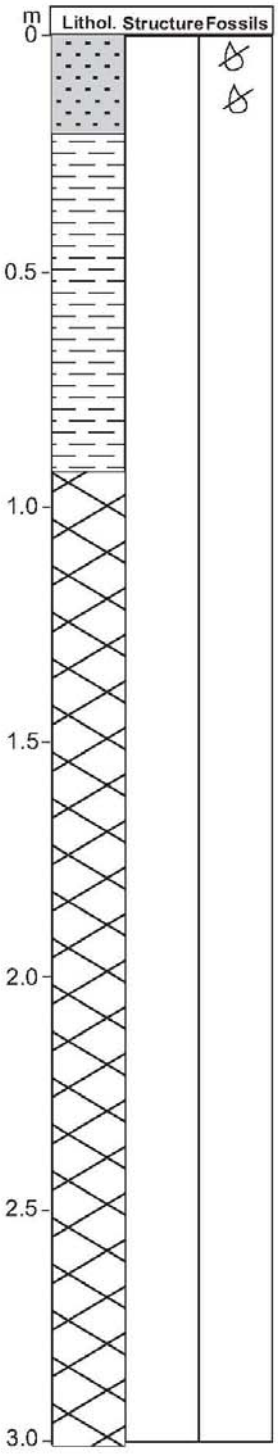


Dark brown silty clay with black organic matter
11-24 cm pebbles <24mm

Water logged light brown silty sand with shell component

CV12_UCC_053 Date: 02.04.12 Pos: 54°02.0351'N 05°56.8980'W
Water Depth: 24 m Core Length: 93 cm

Lithology

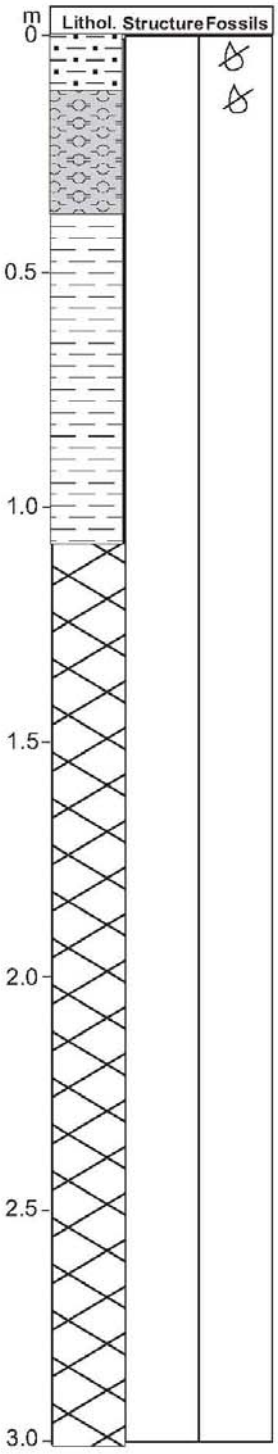


Water logged medium brown silty sand with some pebbles < 3 cm with high shell component

Uniform reddish-brown clay

CV12_UCC_054 Date: 02.04.12 Pos: 54°01.4793'N 05°57.5925'W
Water Depth: 26 m Core Length: 105 cm

Lithology



Dark brown clayey silt with few shell fragments

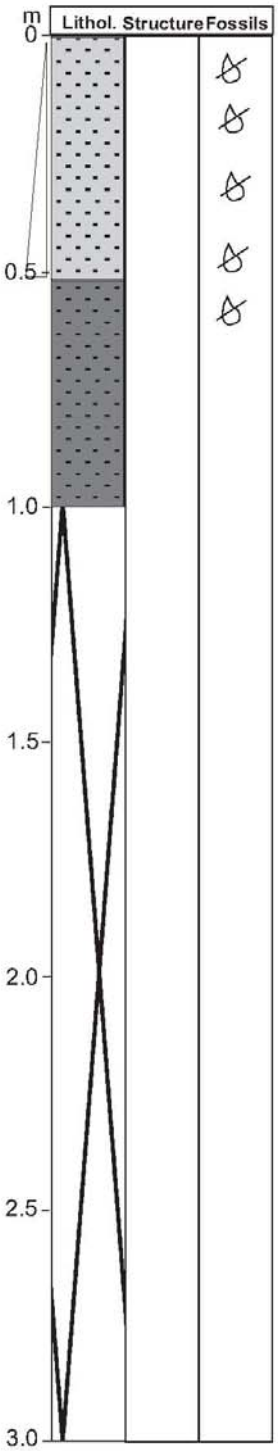
Gravelly sands with pebbles <1mm high water content with few shell fragments and black organic matter

Uniform light brown clay which is very resistant

Change to red-brown colour

CV12_UCC_079 Date: 06.04.12 Pos: 54°08.7575'N 05°40.4557'W
Water Depth: 33 m Core Length: 100 cm

Lithology



Silty sand, initially dark grey grading to light brown coarsening downward with increased shell component

Medium sands, water logged, minor silt component, abundant shell fragments

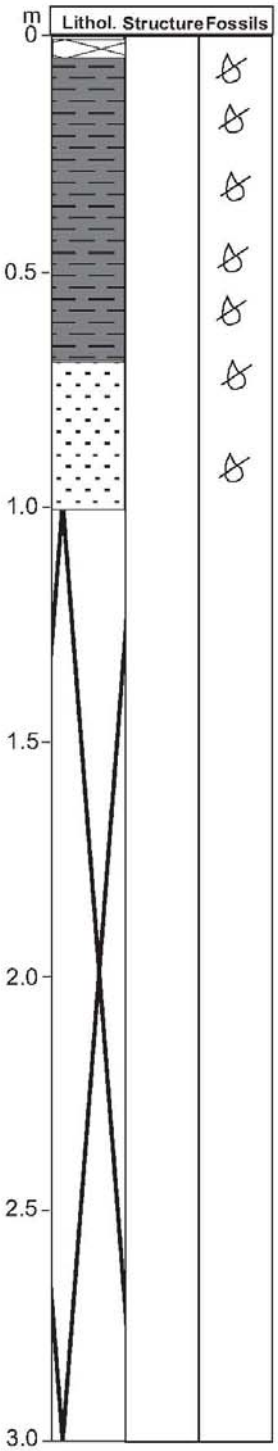
Fine to medium sands,dark grey and water logged

2

CV12_UCC_080

Date: 06.04.12 Pos: 54°06.2175'N 05°36.2047'W
Water Depth: 51 m Core Length: 100 cm

Lithology



0 - 3 cm void

Sandy/silty clay, medium grey/brown in colour, small shell fragments <2mm

Water logged, large bivalve fragments <15mm and abundant gastropods

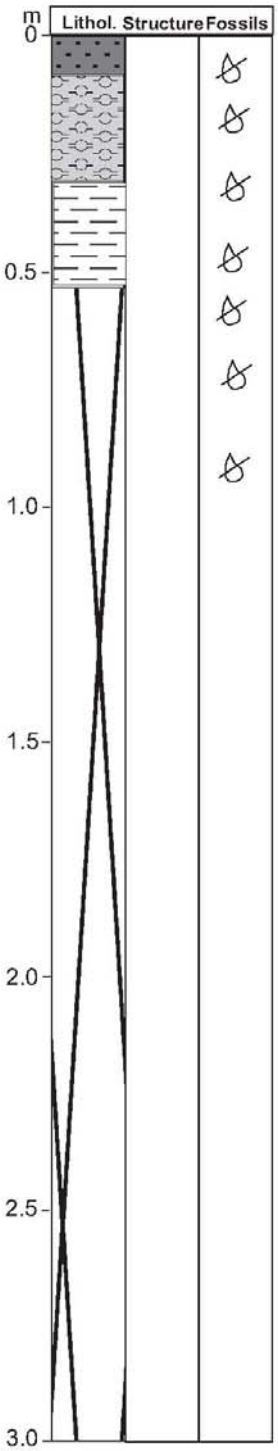
Clayey sands, shell fragments, large bivalve shell at 68nto 71cm

2

CV12_UCC_081

Date: 06.04.12 Pos: 54°07.4534'N 05°38.3290'W
Water Depth: 37 m Core Length: 52 cm

Lithology



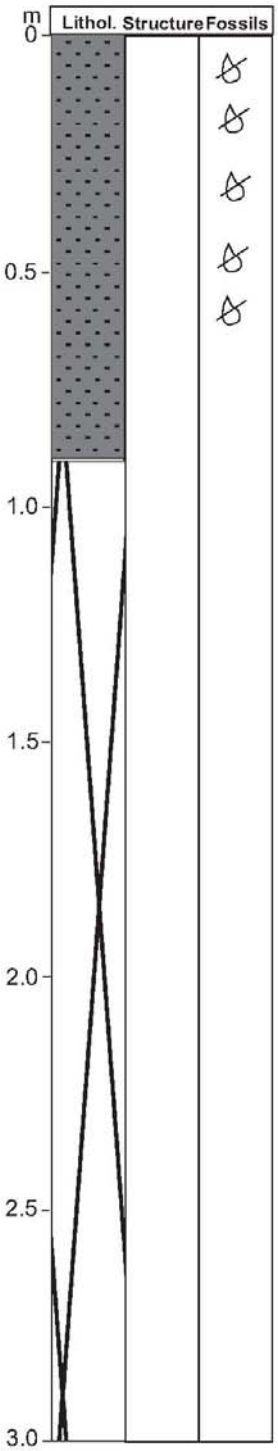
Compacted sands, medium grey/brown, medium sorted, shell fragments of <5mm
Shell has compacted, sandy matrix, brown/red some intact bivalve. Sub angular boulders and pebbles
Very compacted clays. Reddish brown.

2

CV12_UCC_083

Date: 06.04.12 Pos: 54°10.1448'N 05°45.8349'W
Water Depth: 30 m Core Length: 87 cm

Lithology



Fine sand, dark grey/brown, some shell fragments <5mm, high water content

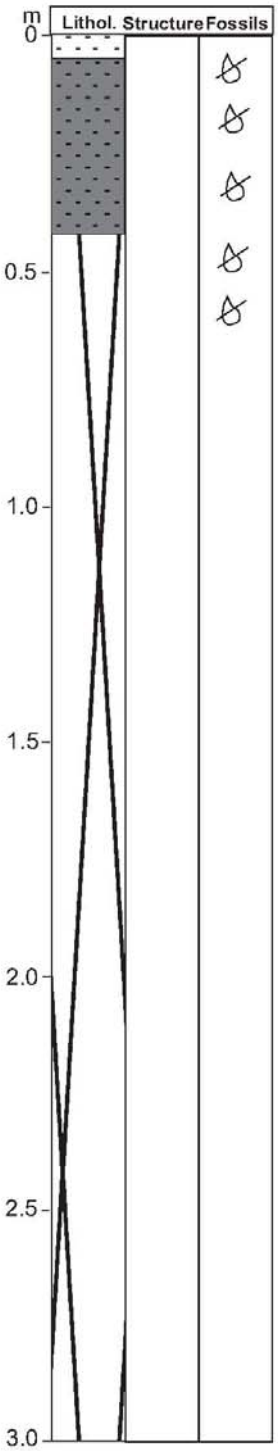
Fine sand, fine shell fragments, intact gastropods, some sub angular pebbles <10mm, high water content

Large sub angular boulder present

2

CV12_UCC_084 Date: 06.04.12 Pos: 54°11.0815'N 05°44.8690'W
Water Depth: 29 m Core Length: 41 cm

Lithology



Dark brown clayey sand
Fine sands, dark grey

Fine sand, water logged shell fragment and pebbles <3mm

Fine sands, dark brown, water logged, 6cm cobble at 28-30 cm

2

VIII. SHIPEK GRAB SAMPLE DESCRIPTIONS

Cruise	Station No	Date	Time	Recovery	Photo	Comments
CV12_UCC	006	26/03/12	10:48:00	full	5693 MM	coarse pebble size, muddy matrix, shell fragments, agglutinated worm tube
CV12_UCC	007	26/03/12	11:46:00	full	5701, 5702 MM	sand, shell fragments (<4mm), agglutinated worm tubes
CV12_UCC	008	26/03/12	12:09:00	full	5706 MM	sand, muddy matrix, some shell fragments, agglutinated worm tubes, mud flasers
CV12_UCC	009	26/03/12	12:33:00	full	5708 MM	sandy silt, some coars grains, shell fragments, many intact small bivalve shells
CV12_UCC	012	26/03/12	13:25:00	full	5709 MM	sandy silt, small shell fragments, worms present, ophiuroid
CV12_UCC	014	26/03/12	13:50:00	full	5711 MM	silt, very little sand, ophiuroid
CV12_UCC	018	26/03/12	16:05:00	full	5722 MM	coarse sand sized shell hash, pebbles
CV12_UCC	027	28/03/12	09:29:00	full		well sorted sands
CV12_UCC	028	28/03/12	09:55:00	full		well sorted fine sands, sand sized shell fragments
CV12_UCC	029	28/03/12	10:11:00	full	5764, 5765 MM	well sorted fine sands, dark fine sand patches, sand sized shell fragments, small intact bivalve shells (singel valve), large intact bivalve shells
CV12_UCC	030	28/03/12	10:28:00	full	5773 MM	coarse sand sized shell hash, <3mm intact bivalve shells, large shell fragments, few coarse sand grains
CV12_UCC	031	28/03/12	10:48:00	full	5778 MM	fine sands, clay flasers, some fine broken shells, some <2mm intact bivalve shells
CV12_UCC	056	03/04/12	08:16:00	full	5862 MM	homogenious silty clay, minor sand, dark grey, black organic patches, bioturbation
CV12_UCC	057	03/04/12	08:34:00	full	5863 MM	homogenious clayey sandy silt, grey brown, water-rich, gastropods, some shell fragments, bivalve shells, bioturbation, burrows filled with oxidised sandy silt
CV12_UCC	059	03/04/12	08:53:00	full	5864 MM	uncompacted clayey silty sands generallty homogenious, dark brown oxidised water-rich, angular cobbles <70mm, angular pebbles <20mm, rounded pebbles <10mm, shell fragments <30mm, small intact bivalve shells <5mm, clay flasers
CV12_UCC	060	03/04/12	09:11:00	full	5865, 5866 MM	Polymict, boulders <100mm, sub-angular, silty sand matrix, rounded and subangular pebbles <20mm, shell fragments <30mm
CV12_UCC	061	03/04/12	09:27:00	full	5867 MM	Polymict, pebbles, sub-angular boulders <40mm, sandy matrix, shell fragments
CV12_UCC	062	05/04/12	07:04:00	full	1671 BD	Medium sand, medium grey/ brown, rounded pebbles <20mm, sub angular pebbles <20mm, shell fragments, intact gastropods & clay flasers
CV12_UCC	063	05/04/12	07:25:00	full	1673 BD	Sandy silty clay, brown/grey, larger boulder 150mm width surpels (worm tubes), shell fragments, intact bivalve shell, large brittle star
CV12_UCC	064	05/04/12	07:30:00	full	1674 BD	Gravelly sandy silt with shell fragments & intact gastropods some rounded & sub angular pebbles <20mm, bottom of grab noticably more compact, dark grey, brown
CV12_UCC	065	05/04/12	07:47:00	full	1675 BD	Predominately sandy silt with intact gastropod, quite well compacted also some bivalve fragments
CV12_UCC	067	05/04/12	08:09:00	full	1676 BD	Homogenous dark grey sandy silt, more compacted towards the bottom no discernable shell component
CV12_UCC	069	05/04/12	08:45:00	full	1678 BD	Well sorted fine sands, homogenous, dark brown, sea urchin present
CV12_UCC	072	05/04/12	09:11:00	full	1680 BD	Medium sand, medium sorted, dark to medium brown, shell fragments 1 to 30mm, sub angular pebbles <10mm most of the pebbles are at bottom of sample, slightly compacted & contains gastropods & brittle star

Cruise	Station No	Date	Time	Recovery	Photo	Comments
						fish
CV12_UCC	075	05/04/12	09:34:00	full	5888 MM	Silty sands, dark brown, homogenous, shell fragments <10mm, sub angular pebbles < 10mm throughout, large bivalve shell 30mm
CV12_UCC	078	05/04/12	09:59:00	full	5890 MM	Polymict gravelly clayey silt with boulders <8cm which are rounded to sub angular, dark grey/ brown colour, larger clay component at bottom which is quite cohesive, some shell fragments <8mm
CV12_UCC	087	06/04/12	12:19:00	full	1712 BD	Predominately sandy silt with shell component & angular pebbles <10mm, some clayey sandy silt, shells <50mm
CV12_UCC	091	06/04/12	12:49:00	full	1714 BD	Silty fine sands, gastropods with shell fragments <20mm, some clayey components
CV12_UCC	093	06/04/12	13:06:00	full	1717 BD	Silty fine sand, dark grey in colour, homogenous throughout
CV12_UCC	094	06/04/12	13:26:00	full	1718 BD	Homogenous dark grey fine sands, minimal shell components of gastropods & bivalves
CV12_UCC	095	06/04/12	13:46:00	full	1721 BD	Homogenous dark grey fine sands with small shell fragments (minimal) <3mm
CV12_UCC	099	06/04/12	14:28:00	full	1722 BD	Dark grey, homogenous sandy silt, evidence of bioturbation (dark black patches)

IX. MARINE MAMMAL OBSERVER REPORT

R.V. Celtic Voyager – NSGeo/CV12_UCC

South Coast between Dungarvan and Rosslare
North Coast between Carlingford Lough and Dundrum

25th March- 07th April 2012

MMO: Marian McGrath

Introduction
Ireland's Exclusive Economic Zone (EEZ) has one of the most important marine mammal habitats in Europe. All marine mammal species in Irish waters are protected by the 1976 wildlife act (and wildlife amendment act 2000). The National parks and Wildlife Service (NPWS) has set aside Special Areas of Conservation (SACs) and Special Protected Areas (SPAs) under this wildlife act to ensure no operations can take place in areas where an abundance of marine mammals are present. Such operations include seismic surveys, multi-beam and side-scan sonar which have been set aside in a code of practice published by the NPWS (Anon. 2007).
Marine Mammal Observers (MMO) are required by law to be aboard any vessel which is carrying out seismic surveys within Irish waters. It has been recognised that the sound generated by seismic sources has the potential to cause both disturbance and injury to marine mammals (JNNC, 2010).
The aim of the cruise CV12_UCC (NSGeo) was to collect Sparker seismic data and to collect 3D seabed topographic, hydrodynamic, sedimentological and sub-seabed seismic data from off the south coast of Ireland and from the northern Irish Sea. The objective of the cruise is to analyse the marine environmental conditions to enable the optimisation of foundation design for offshore renewable energy infrastructure.

Date & Location of Survey
25th March to 1st April 2012: Dungarvan to Rosslare
1st April to 7th April 2012: Dundrum to Kilkeel

Survey Vessel
R.V Celtic Voyager

Marine Mammal Observers/Qualifications
- Qualified MMO: Marian McGrath
- Casual Observations: Bridge and deck crew

Survey Areas
1. Dungarvan to Rosslare
2. Dundrum to Kilkeel

Acoustic Survey Equipment
During the cruise the following equipment were used:
- Pinger System operating at 3.5 kHz
- Sparker System operating between 120 Hz to 2 kHz
- Multibeam (EM3002, EM1002) operating between 293 kHz – 307 kHz

Marine Mammal Observations
Marine mammal observations were carried out from the bridge and on the bow of the ship. These areas gave the best view point of both sides and in front of the vessel. Prior to commencement of the acoustic survey a 30 minute observation was done either on the bow of the ship or on the bridge depending on the weather. Weather conditions were favourable for the majority of the cruise. Most days were sunny with calm seas. There were

two days on the second week the 3rd and 4th April where the ship had to dock as sea conditions were too bad to continue collecting data.
Observations were undertaken using a reticuled binoculars and also by the naked eye. Distance to marine mammals was determined using this reticuled binoculars and height above sea level. To determine the range one of the divisions present in the binoculars is placed on the horizon. A formula is then used to determine the distance of the mammal from the ship. The formula is:

Distance (m) = (height of eye above sea level (m) x 1000/ no. of mils down from horizon)

A record was also kept each day of any marine mammals seen outside of pre-shooting searches. This was carried out by the MMO and the crew of the ship as mammals were spotted.

Pre-Shoot Searches
As detailed in the NPWS code of Practice, a 30 minute watch was carried out prior to shooting the Sparker for mammals within 1000m range of the equipment. If marine mammals were spotted within this area, Sparker would have to be halted for a certain period of time or the vessel would have to move to a different area of the survey. If no marine mammals were seen within the 30 minute watch then a soft start would commence. A Multibeam (EM3002, EM1002), Sparker and Pinger soft start was carried out each time the acoustic equipment was switched on.
A normal soft start comprises of a ramp up of source power of acoustic emission over at least 20 minutes until full power is reached. However, in this survey a ramp up was not possible with the Sparker and Multibeam systems onboard, so as a recommended alternative, the soft start consisted of turning power on and off during the soft start period. Once the Multibeam and Pinger systems reached full power, they remained active during the survey. The Sparker was stopped when the Vibro Cores were taken so soft starts were carried out each time it was re-started. The Sparker was always started during daylight hours to allow for MMO watches to be carried out prior to soft starts. Watches do not need to be carried out once the Sparker is already operating on full power. Throughout the duration of this survey no marine mammals were seen during the 30 minute watches prior to the soft starts.

References
Anon. 2007. Code of Practice for the Protection of Marine Mammals during Acoustic Seafloor Surveys in Irish Waters. National Parks and Wildlife Service.
JNCC. 2010. Joint Nature Conservation Committee guidelines for minimising the risk of disturbance and injury to marine mammals from seismic surveys.

Record of Operations Forms

MARINE MAMMAL RECORDING FORM - RECORD OF OPERATIONS

Ship: RV Celtic Voyager **Client:** UCC **Seismic Contractor:** Marine Institute **PAD No:** N/A

Complete this form every time the airguns are used, including overnight, whether for shooting a line or for testing or for any other purpose.
(Times should be in GMT)

End of line is not filled in here as Sparker was not turned off between change of lines.

	Seismic activity						Pre-shooting search					Action necessary		
Date	Time when soft start began	Time when airguns reached full power	Time of start of line	Time of end of line	Time output reduced to 150 dB (if relevant)	Time when airguns stopped	Who carried out a search for marine mammals? (Job title)	Time when pre-shooting search for marine mammals began	Time when search for marine mammals ended	Was there any reason why marine mammals may not have been seen? (e.g. dark, fog, swell, etc.)	Were hydro-phones used?	Were marine mammals present before the airguns began firing?	If yes, give time when marine mammals were last seen	If marine mammals were present, what action was taken? (e.g. delay shooting)
27/03/12	16:45	17:15	17:26				MMO	16:15	16:45	No	No	No		
28/03/12	11:22	11:52	12:01				MMO	10:50	11:22	No	No	No		
29/03/12	10:47	11:23	11:33				MMO	10:20	10:47	No	No	No		
01/04/12	19:30	20:00	20:10				MMO	19:00	19:30	No	No	No		
02/04/12	16:20	17:50	18:00				MMO	15:50	16:20	No	No	No		
05/04/12	10:10	10:40	10:53				MMO	09:40	10:10	No	No	No		
06/04/12	14:30	14:45	14:56				MMO	14:00	14:30	No	No	No		

Marine Mammal Data

Casual observations of marine mammals were noted by the MMO and by the crew and other scientists. Common Dolphins, Porpoises and possibly a Fin Whale were sighted during this survey.

Weather conditions were very favourable for most of the survey allowing good visibility for the majority of the time. .

Below is a table of the observed sea life.

Date	Time (UTC)	Vessel	Latitude	Longitude	Species	Water depth	Certainty of identification	behaviour	Number
26/03/2012	12:47	C. Voyager	52°02.3647	07°27.1775	Common Dolphin	00	100%	Swimming	Mother & Calf (as part of a larger pod)
28/03/2012	11:30	C. Voyager	52° 04.6413	06° 44.3321	Porpoise	00	100%	Swimming/feeding	6 Adults
28/03/2012	12:00	C. Voyager	52° 03.45	06° 43.22	Fin Whale	00	75%	Breaching	1 Adult
28/03/2012	14:55	C. Voyager	52° 02.3	06° 42.1	Common Dolphin	00	100%	Swimming / feeding	8 Adults
29/03/2012	19:39	C. Voyager	52° 02.408	06° 65.702	Porpoise	00	100%	Swimming / feeding	5 Adults
29/03/2012	19:51	C. Voyager	52° 02.380	06° 61.847	Common Dolphin	00	100%	Swimming / feeding	14 Adults
29/03/2012	15:00	C. Voyager	52° 01.2984	07° 02.8689	Fin Whale	00	50%	Breaching	1 Adult
31/03/2012	17:58	C. Voyager	52° 05.3931	06° 29.7742	Common Dolphin	00	100%	Swimming/feeding	5 Adults
31/03/2012	20:35	C. Voyager	52° 06.591	06° 22.388	Common Dolphin	00	100%	feeding	5 Adults

X. IRISH SEA SHANTY

I

Boris is our very own Captain Jack Sparrow,
He's weird, tall and very narrow,
But he's not quite as cute,
And can't play the flute,
So he's walking the plank at noon tomorrow.

II.

Marian has found her sea legs,
And learned how to cook eggs,
So far this cruise,
She's not allowed any booze,
No matter how much she begs.

III.

You can tell Sarah is used to work ships,
By the way that she wiggles her hips,
She skips across deck
Without giving a feck
What'd she be like after sugar and crisps?!

IV.

James hails from Coleraine,
Sometimes his accent's a strain,
With his diddly-diddly-dee,
It's all gibberish to me,
We suspect he may be insane.

V.

Johnny's got Hollywood hair,
Being banned from the deck just ain't fair,
Some man for the Sparker,
His tan's getting darker,
As he smokes in the Irish Sea air.

VI.

Niall's the baby faced guy,
The binman from the GSI,
When not on the radio,
He's scoffing down Haribo,
Yet he's trying to give up the fry.

VI.I

Now, Jordan's a Jolly Nice Fellow,
Who's Rather in Love with His Pillow,
He Lies in His Cot,
And Sleeps Quite A lot,
But it Makes him all Quiet and Mellow