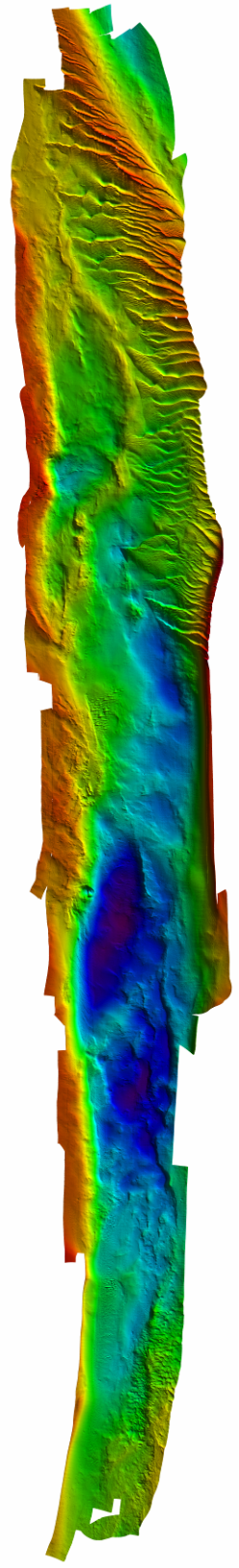

Marine Institute
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Coláiste na hOllscoile Corcaigh, Éire
University College Cork, Ireland

Cruise Report

Irish Sea Marine Assessment

ISMA

RV Celtic Voyager – Survey CV0926 (Legs 1 & 2)

28th Sept. – 18th Oct. 2009

Compiled by

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Contents

Executive Summary 2

Background 4

Survey rationale and objectives 6

Equipment 9

Technical difficulties 18

Survey Narrative 21

Summary of Areas 29

- Northern Mudbelt 30
- Rockabill area 38
- Lambay area 42
- Codling Deep 49

Weather Report 61

Appendices 63

I: Personnel 64
II: Area maps: coverages and sample locations 65
III: Multibeam echosounder lines 69
IV: Sparker seismic lines 76
V: Acoustic doppler current profiler (ADCP) deployment 78
VI: Tide gauge deployments 79
VII: Shipek sampler stations 80
VIII: Reineck box-core stations 96
IX: Vibro-core stations 97
X: Drop camera stations 100
XI: Conductivity-Temperature-Depth (CTD) stations 137
XII: Marine mammal observer report 138

Executive Summary

The Irish Sea Marine Assessment (ISMA) is a collaborative research survey undertaken by University College Cork, the INFOMAR programme (Geological Survey of Ireland & Marine Institute), and Gaelectric Developments Ltd. Its purpose is to produce integrated seabed and sub-seabed mapping products to assist in a fundamental understanding of the seabed and how it changes through time, thereby deriving information pertinent to the development of offshore renewable energy resources.

Four study areas where surveyed:

The Codling Deep is a long north-south deep (or channel) in which tidal currents flow strong. The seabed it typified by mobile sands and gravels, and areas covered by cobbles (stoney ground) rich in seabed life. The sub-seabed geology is complicated with localised drift bodies and numerous erosional surfaces.

The next three areas are relatively flat and experience decreasing current intensity resulting in a decrease in seabed sediment-type particle size from sand (Lambay area) to fine sands (Rockabill area) to muds (Northern Mudbelt). All three areas show sub-horizontal layers of deposits below the seafloor consisting of sands to muds underlain by glacial diamict tills (muds with bolders) and rock.

The Lambay area, covered in rippled sands with shell fragments, has a limited fauna with sponges, red fish and seaweed. The upper sand layer thins in the middle of the area to expose ?lithified sediments at the seabed.

The Rockabill area is also covered with rippled sands that are compacted below the seabed with some fish and shell.

The Northern Mudbelt is a large area heavily burrowed by the commercial Dublin Bay Prawn. The sub-seabed shows shallow accumulation of (biogenic) gas (although not enough to form a geohazard).

Due to exceptional weather conditions and a 24 hour work routine, in total **352.65 km^2 (35,265 hectares) of seabed was mapped** to a precision of +/- 0.4 m horizontal and 0.1-0.15 m vertical. **534 km of sparker seimic lines** were shot imaging into the sub-seabed by 50 m. In addition **2179 km of pinger seismic lines** (down to 30 m penetration) were

recorded. **269 sediment samples** were taken, **171 biological samples** were taken with an additional **7 faunal samples frozen for DNA studies**. **20 cores** where sunk into the seabed up to a depth of 3 m from which changes in the seabed through time can be studied and geotechnical properties of deposits, that can also be traced deeper, determined. In addition, we took **5 Reineck box-cores** which preserve the upper 30 cm for palaeoenevironmental and geotechnical studies. **975 good quality digital still photographs of the seabed** were taken in **15 areas** and a 1 month long measurements of variation in current speeds throughout the water column was also taken for one key location.

Background

The Irish Marine Assessment (ISMA) survey is a joint collaboration between the University College Cork marine geology group (UCC), the Geological Survey of Ireland and the Marine Institute's "Integrated Mapping for Sustainable Development of Ireland Marine Resources" (INFOMAR) programme, and Gaelectric Developments Ltd. These four organisations have overlapping interests in mapping the Irish Sea for ongoing sediment transport studies, producing baseline coverages and for the assessment of renewable energy potential, respectively.

UCC has been involved in studying sediment transport and mobility in the Irish Sea since pioneering mapping of the Kish Bank in 1998. Since then it has concentrated on sediment dynamics in the south-western Irish Sea for a number of applied projects including two INTERREG projects on habitat mapping (HabMap) and aggregate resource evaluation (IMAGIN). These studies have culminated in 2 recent papers on sediment transport and sediment wave morphometrics and dynamics (Van Landeghem et al., 2009a; b). ISMA will allow UCC, in collaboration with the University of Bangor, to extend out spatial coverage of sediment transport studies along the entire western Irish Sea and also augment our record of repeat coverages to improve our understanding of sediment transport dynamics through time.

INFOMAR is a joint venture between the Geological Survey of Ireland and the Marine Institute following on from the Irish National Seabed Survey (INSS). INFOMAR concerned with producing integrated mapping products covering physical, chemical and biological features of the seabed in productive and commercially valuable inshore waters. INFOMAR focuses on mapping 125,000 km^2 including 26 priority bays and three priority areas including the western Irish Sea. ISMA provides new coverage of previously unmapped seabed in one of the priority area (Irish Sea). Collaboration between INFOMAR, Universities and industry is welcome as it demonstrates, at the outset, the additional value of the data being collected beyond its intrinsic long-term value as a baseline resource dataset.

Renewable energy developments utilise sources of energy that are continually replaced and are inexhaustible e.g. solar, wind, hydro, wave, tidal, biomass, and geothermal powers. The exploitation of these energy sources leads to little or no emissions of carbon dioxide and other greenhouse gases which

cause global climate change, regarded as the most critical environmental problem at present.

It is recognised that Ireland has some of the best offshore wind energy resources in Europe at its disposal to tackle the growing need for renewable energy. ISMA will assess the feasibility of a number of sites in the Irish Sea for wind energy generation. This project is thus directly applicable to Ireland's national strategic interest in this area. ISMA will assess locations in the Irish Sea where the (sub-) seabed favours the economic construction, operation, and maintenance of wind farms without causing severe environmental damage or impacting on the sustainable development of the marine environment.

References

Van Landeghem, K.J.J., Uehara, K., Wheeler, A.J., Scourse, J. D. and Mitchell, N. (2009) Post-glacial sediment dynamics in the Irish Sea and the formation of giant (up to 38 m high), near-symmetrical trochoidal bedforms. *Continental Shelf Research,* 29 , 1723-1736.

Van Landeghem, K.J.J., Wheeler, A.J., Sutton, G. and Mitchell, N.C. (2009). Variations in sediment wave dimensions across the tidally dominated Irish Sea, NW Europe. *Marine Geology,* 263, 108-119.

Survey objectives and rationale

ISMA objectives are:

To collect high resolution (preferably 120% coverage) bathymetric maps from target areas (Figure 1).

To collect information on the sub-surface in the target areas using sparker seismics to aid regional stratigraphic correlation and palaeoenvironmental development studies as well as assisting in foundation design for offshore wind turbines.

To core shallow 3 m sequences using a vibrocore to obtain geotechnical samples from sub-cropping seismic reflectors and samples high sedimentation rate depositional sequences for palaeoenvironmental studies.

To groundtruth acoustic backscatter maps of the target areas using sediment samplers in order to produce sediment type charts and to assist in hydrodynamic/benthic dynamic interpretations.

To assess biological taxa presence and distribution in the target areas for the purpose of habitat mapping and potential environmental impact assessments.

To study the hydrodynamics in the areas through an evaluation of mapped sedbed bedforms, sediment samples, a deployed current meter and water column profile(s).

The target areas reflect areas of potential interest for offshore wind farm develop and sediment transport studies whilst offering extension to the planned INFOMAR coverage.

To fulfil the objectives the following rational was proposed:

Map areas using the EM3002D multibeam echosounder to provide complete coverage with at least 20% overlaps. In the north-west of the survey, INFOMAR coverage exists although there are some problems with the vertical datum. A repeat grid over this area will allow the INFOMAR data to be incorporated with ISMA data and *vica versa*. Extensions of the survey out to 80 m are to be attempted either will full seabed coverage or via a survey grid. To calibrate the bathymetric data, 3 tide gauges are to be deployed on the

seabed in the area and regular sound velocity profiles taken through the water column.

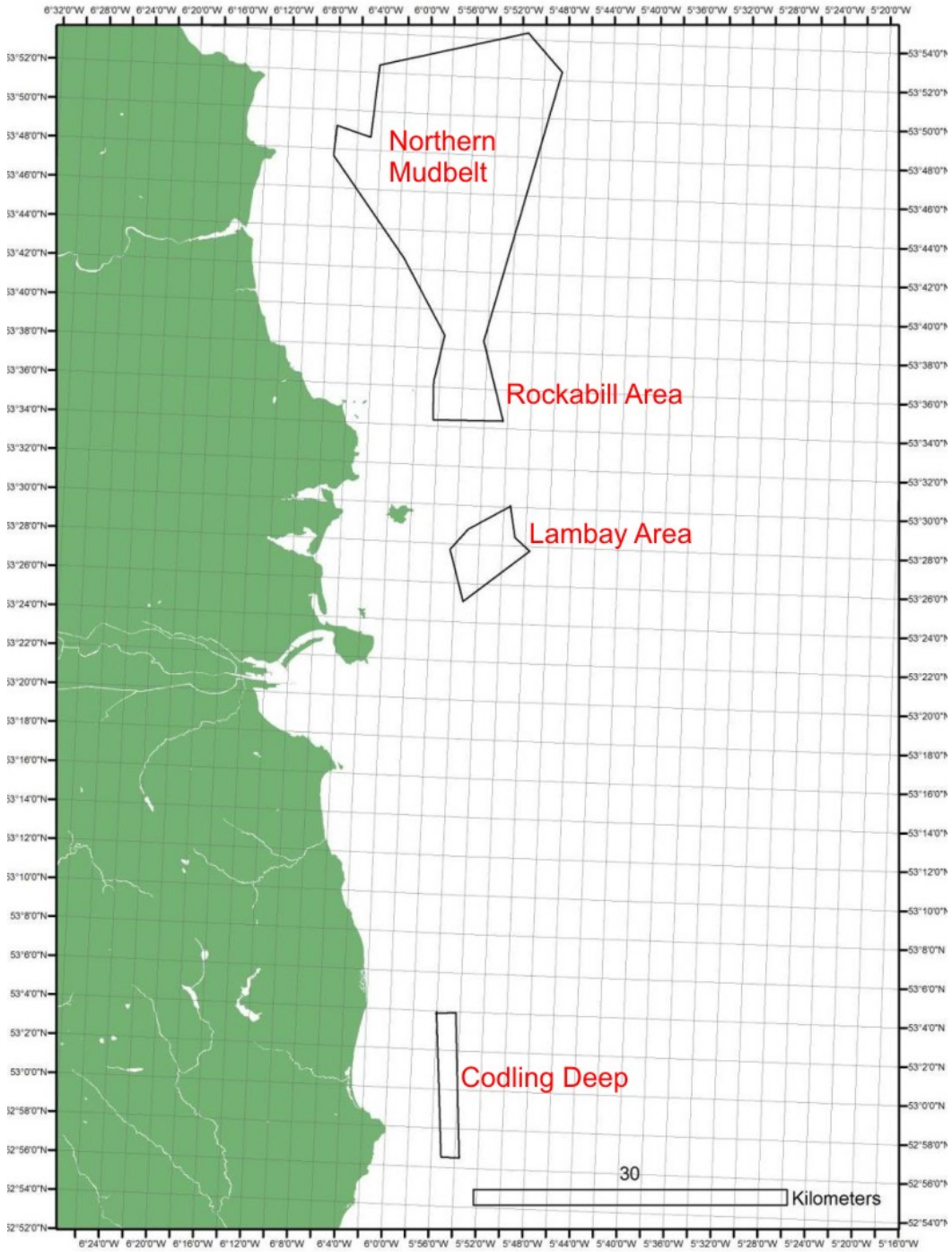


Figure 1. The proposed survey areas

A regular grid of seismic lines will be run with an approximate 200 m spacing.

Sediment and biological samples will be taken to provide a spatially distributed coverage of the target areas whilst sampling all backscatter facies (where practical).

To undertake digital stills camera transects across the area to visually groundtruth the backscatter facies, study smaller scale bedforms and identify megafaunal presence.

To collect vibro-cores, gravity cores and Reineck box-cores (as appropriate) on targets identified by the seismics and acoustic backscatter.

To do a limited study of the water masses properties using an acoustic doppler current profiler (ADCP) and conductivity-temperature-depth (CTD) profiler

The survey is to be broken up into 2 legs: Leg 1 will collect geophysical data and deploy the ADCP, Leg 2 will groundtruth the geophysical coverage using sediment samples, cores and a benthic camera.

The ADCP is to be recovered after a full lunar cycle during a separate recovery mission.

Equipment

The following equipment was used during the survey:

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.

She is equipped with a Trimble NT Differential GPS and Kongsberg Simrad Seapath 200 motion reference unit. A 10,000 kg general purpose winch hooked through the aft, 4 m high A-frame as well as a 500 kg starboard CTD winch and 1000 kg starboard oceanographic winch used for the sampling and camera operations on this survey.

Figure 2. The RV Celtic Voyager.

Simrad EM3002D multibeam echosounder

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. Data processing was performed on board with the CARIS HIPS and SIPS software package.

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

AML Smart SVPlus

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

Geo-Source 400 Sparker Seismic system

The Geo-Source 400 sparker seismic system consists of the Geo-Spark 6 kJ pulsed power supply which emits a pulse to the sparker source which is towed behind the vessel. The source comprises four electrode modules that are evenly spaced in a planar array. The return signal is picked up in Geo-Sense single channel hydrophone array.

Figure 4. Geo-Spark 6 kJ pulsed power supply and towed Geo-Source 400 Sparker source

Sea-Bird SBE 9plus conductivity-temperature-depth (CTD) profiler

The Sea-Bird SBE 9plus CTD profiler was used to determine water mass properties. She was lowered into the water and held at the surface until the sensors equilibrated and then lowered steady to 5 m off the bottom logging in real-time. The capacity to take water samples was not used on this survey. The CTD was deployed on the starboard winch mid-ship.

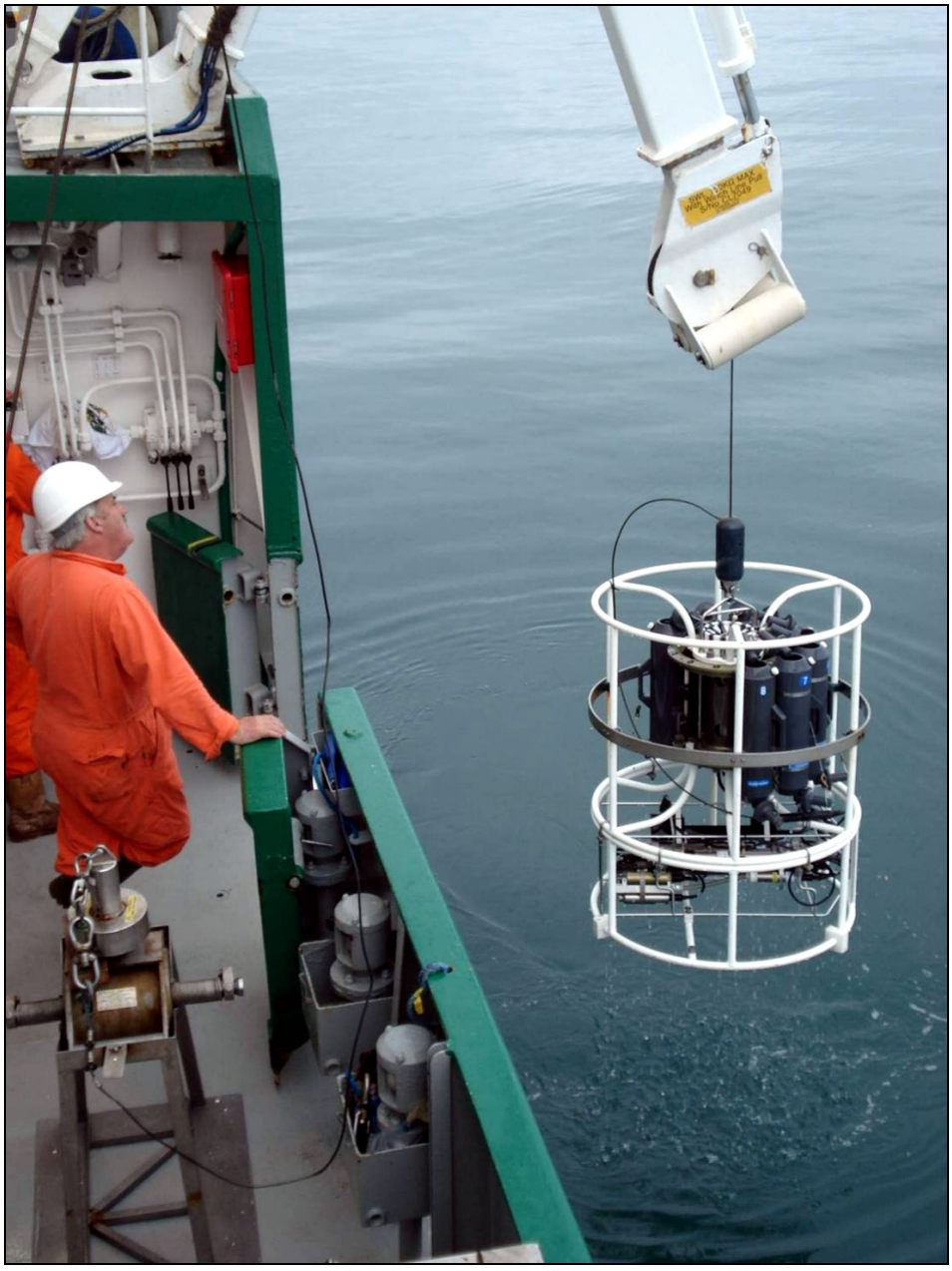


Figure 5. Sea-Bird SBE 9plus CTD profiler being deployed

Acoustic Doppler Current Profiler (ADCP)

A TRDI 600 kHz Workhorse Sentinel ADCP (depth rated to 200 m) was deployed on the seabed to profile changes in current speed throughout the water column. The ADCP is housed with in TRDI Workhorse Sentinel ADCP Seabed Gimballed Frame with a Sonardyne LRT, pop-up buoy and rope canister that can be acoustically released for recovery. Communication with the ADCP is with a Sonardyne LRT Command Unit with Dunking Transducer. The ADCP was deployed through the A-frame. Near the ADCP, a weight was deployed and attached by chain to the ADCP. Attached to the weight was Dan buoy with a winky light and radar reflector. In addition, a navigation warning issued.

Figure 6. The TRDI 600 kHz Workhorse Sentinel ADCP

Shipek sediment sampler

A Duncan & Associates Shipek sampler was used to take the majority of sediment and biological samples in both muddy and gravelly substrates. The sampler scoops a sediment sample from the top 10 cm of the seabed. The Shipek was deployed on the starboard winch mid-ship.

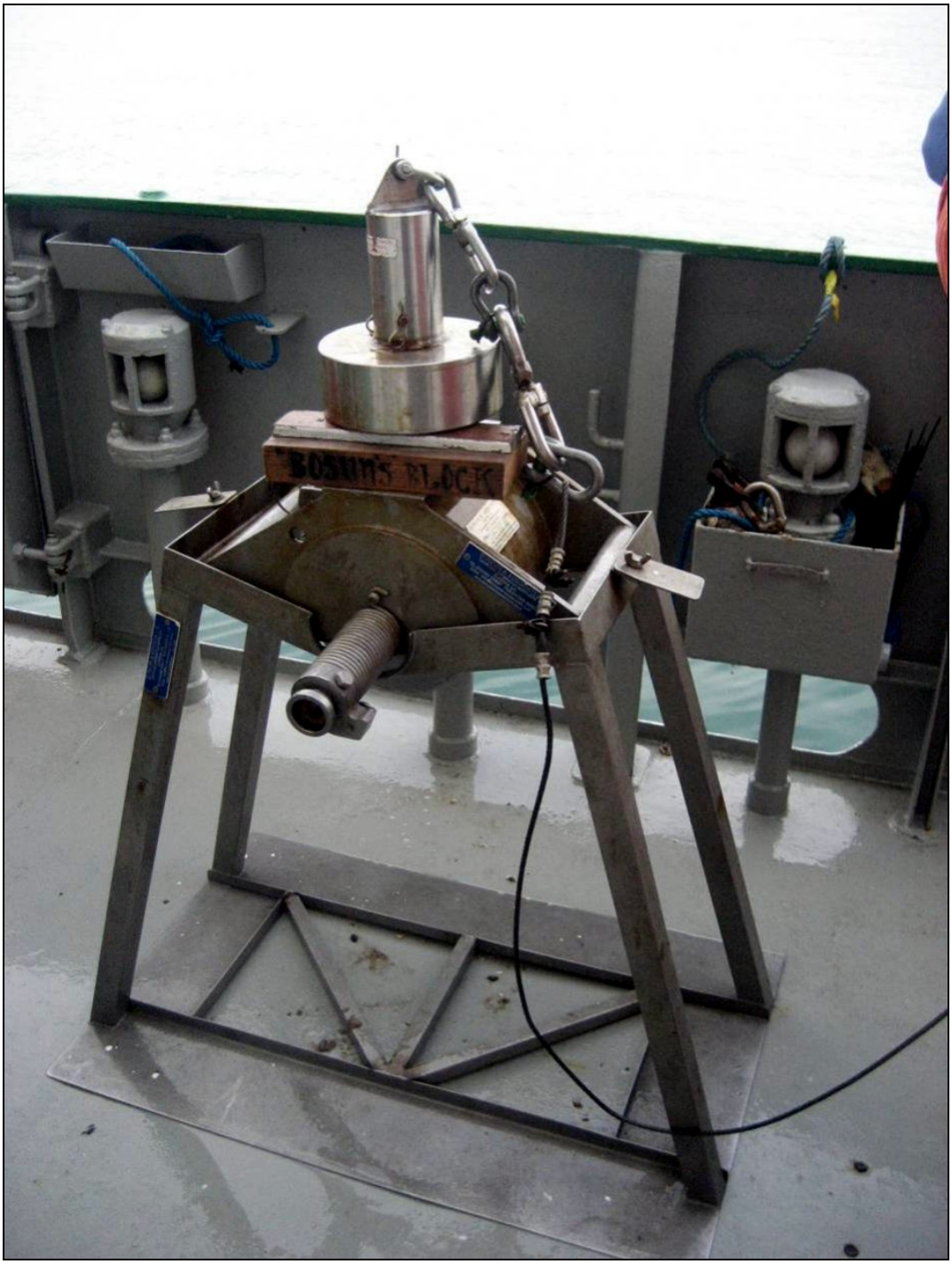


Figure 7. Shipek sampler on stand

Reineck box core

A Reineck box-corer was used to take undisturbed sediment samples from the upper 30 cm of the seabed. These were then sub-samples using a push core.

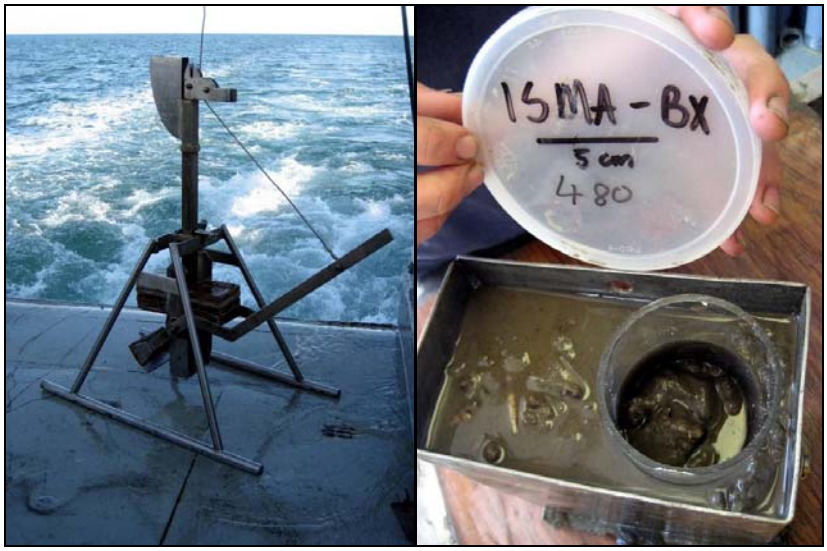


Figure 8. The Reineck box-corer and retrieved sample showing the push-core inserted.

Gravity Corer

A 1 m Marine Institute gravity corer was used as an alternative coring device to the vibrocore. Although shorter, it has the advantage that it can be deployed at any state of the tide although penetration is limited in sands and gravels but excellent in mud. The gravity corer was deployed through the A-frame. Note that it was used only once but did not produce a sample due to the nature of the seabed. It is therefore not included in the station list.

Figure 9. Gravity corer with 1 m core barrel

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 could only be 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, labelled, sealed with end caps, taped and wax sealed. They were stored at 2^{o}C.

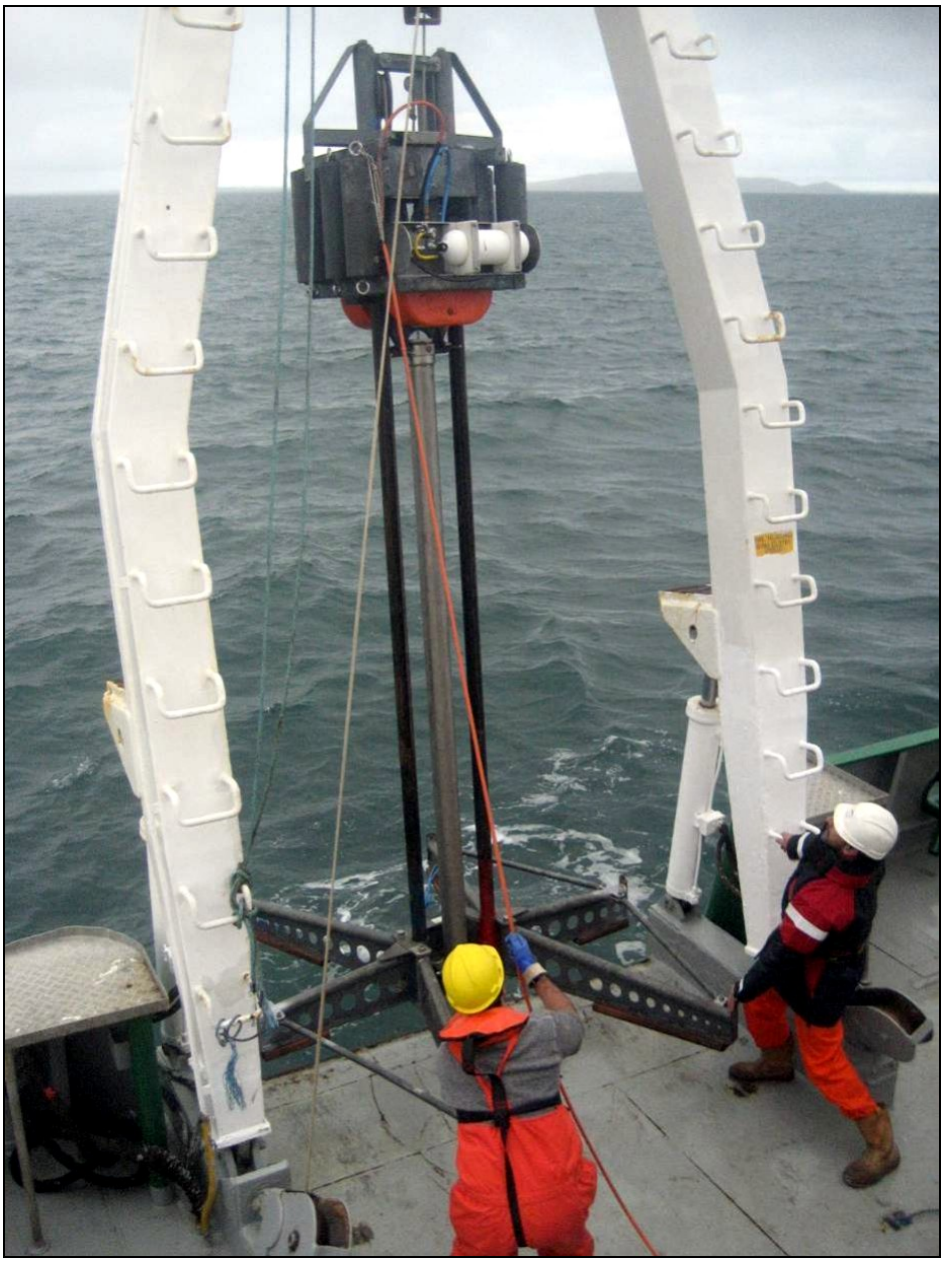


Figure 10. The Geo-resources 6000 vibrocore being deployed

Digital stills camera

Imagery of the seabed was collected by a Konsberg Simrad OE14-208 Digital Stills Camera System with a flash unit housed within a Seatronics stainless steel seabed camera frame. The camera was winched to the seabed, a photo was taken, then lifted up, moved a few metres and set back on the bottom again for the next photo to be taken. In this way, transects of high resolution digital still images were generated. A live video feed was also relayed to the ship and viewed on a 14" Sony/JVC Colour Video Monitor for the selection of sites to be photographed. In the video mode, the seabed was illuminated by four 24 V dc Seatronics SeaLed MKII Subsea LED lamps. Photography and illumination was controlled from the surface in real-time. Video data was logged in real-time to a Datavideo DN-300 Hard Disk Video Recorder. Digital stills imagery was stored in the camera and downloaded after recovery. The camera system was deployed on the starboard winch mid-ship. The position of the camera at the seabed was generated from the vessel dGPS.

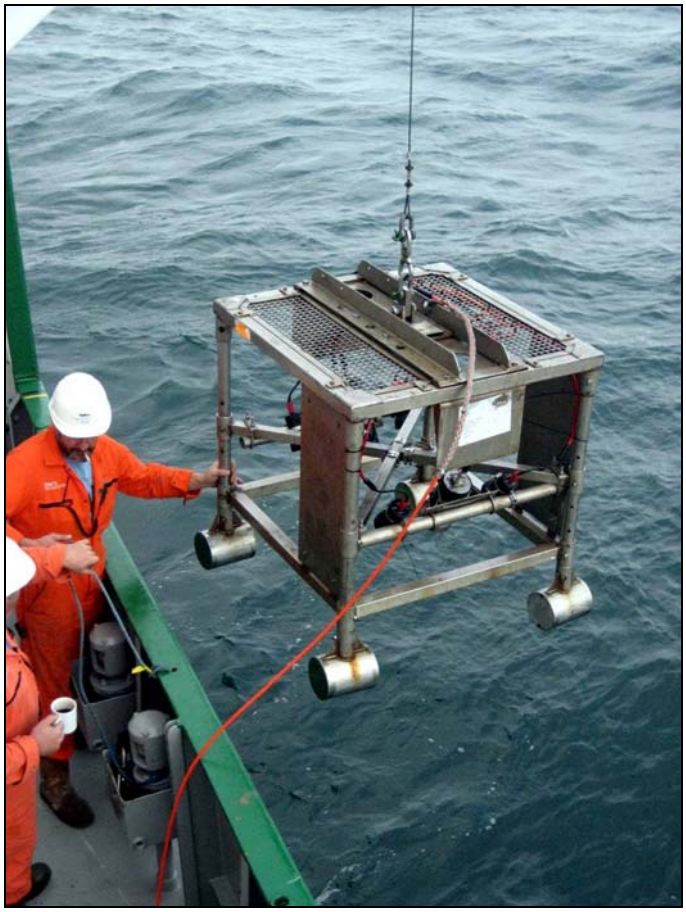


Figure 11. The digital stills camera, flash and LED lamps housed in the camera frame being deployed off the starboard winch during the survey

Technical difficulties

Vessel RV Celtic Voyager

For Leg 1, ship navigation and the weather station were not logged into the Seapath as underway data. This was corrected at the start of Leg 2. No other technical difficulties were encountered with the vessel.

The lack of a dynamic positioning system did make navigating camera runs on prescribed course difficult in strong currents and limited deployment of the vibrocorer to slack water. These limitations were however anticipated and the survey planned accordingly.

Simrad EM3002D multibeam echosounder

The quality of data from the EM3002D multibeam echosounder has remarkably deteriorated on water depth deeper then 60 m in comparison with previous surveys using the same system on the same vessel. This is in particular due to soft, muddy sediment where “bottom lock” is more difficult. The EM3002D has never been great on soft sediment (like any multibeam) and we always observed minor artefacts on outer beams on muddy sediment.

Both heads showed evident and consistent artefacts but the starboard head was the one with the worst performances.

Both Fabio and Slava had a look at all the settings which all looked to be in order. All data input, including real time SVP were up to specifications and the system parameters looked normal.

The reasons for reduced data quality in deep waters could be various potentially including:

- algal growth on the head’s surface
- scratched or damaged heads
- issues with connections
- issues with software or firmware

Simrad is aware of similar issues on other systems and they are just about to release an update of both SIS and the EM3002D firmware.

AMS Smart probe

No technical difficulties were encountered.

Geo-Source 400 Sparker Seismic system

No technical difficulties were encountered.

Sea-Bird SBE 9plus conductivity-temperature-depth (CTD) profiler

No technical difficulties were encountered.

Acoustic Doppler Current Profiler (ADCP)

No technical difficulties were encountered. The ADCP was deployed with a Dan buoy equipped with a radar reflector and winky light.

Shipek sediment sampler

No technical difficulties were encountered. The Shipek took minimal samples in the Lambay area although this appears to be due to the ?lithified nature of the underlying seabed.

Reineck box core

No technical difficulties were encountered.

Gravity Corer

No technical difficulties were encountered. The gravity corer failed to retrieve any sample in the Lambay area although this appears to be due to the lithified nature of the underlying seabed. It was not deployed elsewhere.

Geo-Resources 6000 vibrocore

The vibrocore performed very well and better than anticipated. Taking a vibrocore sample from the Codling Deep in 75 m of water is a first and a credit to the Master of the vessel. Due to a lack of dynamic positioning for the vessel, vibrocore deployments were associated with a level of calculated risk.

Deployments could only occur during slack water and the core could only stay on the seabed for a 1 minute or less at the discretion of the Master.

It should be noted that on this vessel, vibrocoring is not possible if the tide is strong, if waves are too big (above 1 m) and if there is any significant wind unless it is in a favourable direction to the tide. Nevertheless, we proved that vibrocoring was possible on the RV Celtic Voyager but only in optimal weather conditions. One vibrocore station was abandoned due to windage.

Digital stills camera

On the whole, the digital stills camera performed well. About one in twenty images was over-exposed (light-out) due to an undefined problem probably with camera/flash triggering system. A second photograph could often be taken at the same place. The video feed to the surface was unstable during strong current and would flicker between colour and black & white but with no loss of view to the seabed. This did not cause any real operational problems. The camera performed well in strong currents although mobility of the seabed obscured views under these circumstances. On muddy and sandy bottoms, the impact of the camera landing generated sediment plumes which obscured some photographs however it was possible to take the photo before the plume drifted into focus if taken quickly enough.

Survey Narrative

Leg 1 (all times UTC)

Monday 28th September 2009 – *weather sunny, calm.*
Mobilisation and setting up of equipment (sparker and multibeam) commenced at 09:00.
Set sail at 16:10 from Howth out to the Codling Deep.
Arrival at the Codling Deep at approximately 19:00.
First tide gauge deployed in Codling Deep at 19:09. Start of multibeaming at 20:15.

Tuesday 29th September 2009 – *weather sunny, calm.*
Multibeaming for Codling Deep completed at 08:00.
ADCP deployed at 52˚57.31'N / 005˚54.0415'W from 08:20 to 08:30.
Prior to the seismic survey the MMO started his watch at 08:09. A soft start for the sparker system was initiated at 09:14 and the system operating at full power at 10:02. The seismic survey of the Codling Deep continued until 19:26. At 19:40 sparker and streamer were recovered and we transited to the Lambay area. We arrived in the Lambay area at 23:00 and commenced the multibeam survey after deploying the second tide gauge.

Wednesday 30th September 2009 – *weather sunny, calm.*
The multibeam survey continued until the coverage of the Lambay area was completed at 10:16. After a soft start (08:54 – 09:14) a sparker seismic survey was performed in the Lambay area until completion at 18:53.
Transit to the Northern Mudbelt area and deployment of third tide gauge. Start of multibeam survey at 22:03.

Thursday 1st October 2009 – *weather misty, calm.*
The multibeam survey commenced until 07:05. After a soft start, a sparker seismic survey started at 07:56.

Friday 2nd October 2009 – *weather increasing winds.*
The seismic survey commenced until decreasing weather conditions (increasing winds) terminated the operation of the sparker system at 07:47. After recovery of the sparker system, multibeaming continued until bubbles under hull due to increased waves and winds also terminated the operation of the multibeam system at 23:29.
Return to Howth to shelter from the gale.

Saturday 3rd October 2009 – *weather gale force.*
Sheltering in Howth.

Sunday 4th October 2009 – *weather sunny, calm.*
Recommenced seismic sparker survey in Northern Mudbelt area and Rockabill area after a soft start at 08:07.

Monday 5th October 2009 – *weather sunny, calm.*
Seismic sparker survey commenced. At 21:26 the seismic survey for the Northern Mudbelt and Rockabill area was completed.

Tuesday 6th October 2009 – *weather sunny, calm.*
Completion of multibeam survey in the Rockabilly area and continuation of multibeam survey in the Northern Mudbelt area.

Wednesday 7th October 2009 – *weather sunny, calm.*
Continuation of multibeam survey in the Northern Mudbelt area. Due to bad weather forecasted to move in from the south east, we decided to recover the southernmost tide gauge in the Codling Deep. The tide gauge was recovered at 12:00 and we transited back to the Lambay area to extend the multibeam coverage to a ship wreck in the northeast of the area. After this, we commenced the multibeam survey in the Northern Mudbelt.

Thursday 8th October 2009 – *weather winds picking up.*
Continuation of multibeam survey in the Northern Mudbelt area. Due to decreasing weather conditions, we recovered the northernmost tide gauge at 20:30 and transited to the tide gauge in the Lambay area.

Friday 9th October 2009 – *weather winds picking up.*
The Lambay area tide gauge was recovered at 02:00 and we commenced our transit back to Howth.

Leg 2 (all times GMT)

Saturday 10th October 2009 – *weather sunny, calm.*
Mobilisation started at 10:00 (vibrocore and sampling gear).
Set sail at 18:15 from Howth out to the Lambay area.
We arrived at the Lambay area 19:15 and start sampling by set up a southern drift of vessel with the tide and sampled on the way as we transited the area. We subsequently opted to put vessel ahead slow as drift was only 0.7 kts.
We sampled fine sand but not a lot of recovery in the Shipek; we suspected compacted sands hindering penetration (latter proved to be due to lithified sediment near to the surface).

Sunday 11th October 2009 – *calm, some chop, picking up to 1m swell, sunny with northerly fresh winds.*
Still sampling the Lambay area.
Started transit to Rockabill area at 3:54 and arrived at south-east of the Rockabill area and began sampling at 4:33. Sediment very similar to the Lambay area.
At 08:05 we headed back down to Lambay area to take some more samples and then vibrocored during slack water.
At 10:35 we stopped sampling and transited to the first vibrocore site on western edge of Lambay area. We took 2 vibrocores (ISMA_V_063 & 064) on eastern edge of area. All went well.
At 11:45 we commenced the transit to the Northern Mudbelt to do more sediment/biological sampling.
At 12:50 a northerly wind picked up creating a small 0.5 m swell.
By 13:05 we started sampling in Northern Mudbelt area. Sea was OK even though the wind was against the tide.
At 15:30 we arrived on station to take vibrocores in Rockabill. Waves were now at 1 m and the wind fresh. Consensus was that there was too much windage on the vessel to hold station safely. This could be overcome by putting the vessel to steer but then we would have too much heave at the stern for safe deployment. Vibrocoring was abandoned for this slack tide.
So at 15:45 we start sampling again for sediments and biology working our way north again, going to the top of the Northern Mudbelt area then coming back down. Completed 3 lines of sampling in Northern Mudbelt area from the southern to the northern limits. We found mud all the way with limited biology.

Monday 12th October 2009 – *calm, sunny.*
By 08:55 we stopped sampling in Northern Mudbelt area with 2 more north-south lines completed and started our transit to a vibrocore station in Rockabill.
Between 10:18 and 12:00 we successfully collected two vibrocores (ISMA_V_159 & 160). The last one got stuck in the barrel so we could not take a third. This core (ISMA_V_160) was lost as we could not get it out of the barrel without destroying it but we managed to collect samples from the top and the base. The deck crew was busy trying to clear the core barrel so we stopped sampling and transited to Howth to catch the tide.
Arrived at Howth at 1:45. Mobilised the Seatronics camera system, Day grab (not used in the end but mobilised as a back-up sampling solution) and the Reineck box-core. We also changed some crew members by taking on the first mate - Brandon McGovern - whose duties have been covered by the

Officer of the Watch, and relieving the Chief Engineer from Leg 1 who stayed on to provide cover). We also put a smaller block on the A-frame for the vibrocore to allow better deck clearance and rigged a new block for the gravity core/Reineck box-core so we can sling this out the A-frame.
Sailed back out from Howth for Codling Deep at 20:30 and made a fast transit with a strong current behind.
Started sampling at the northern end of the Codling Deep by 22:20.

Tuesday 13th October 2009 - *calm, sunny.*
Continued sampling at northern Codling Deep for biology and sediments creating dense coverage to determine the variation and main backscatter facies in this area. This allowed us to decrease sampling density further south once a general understanding of the area had been created.
Arrived at the first Codling Deep vibrocore site at 07:00 and took a grab sample to test the bottom.
Vibrocore successfully taken at 7:23 (ISMA_V_207)
Continued sampling for biology and sediments south of vibrocore site from 8:50 onwards. In general, we got a poor grab recovery due to the coarse sand and gravel surface sediments from sampling stations ISMA_S_208 and subsequent stations to the south. A maximum of 3 attempts at recovery were made before sample stations were abandoned and we transited to next station.
At 11:25 we twisted the starboard winch cable which we then respooled.
Problem solved and at 12:50 we started our first camera run (ISMA_TV_217). We saw lots of biology on gravelly and cobblely ground ending up on rippled sands by 14:00. The cobblely seabed explained why we were having such problem sampling. We have no device to sample this bottom which would require a large hydraulic grab.
At 15:30 we started sampling again at south of the area running north with the tide to the vibrocore stations ISMA_V_234 & 235. Started vibrocoring at 19:11 and recovered two 0.76 m & 2.86 m sandy sediments respectively. Then we continued sediment sampling through the night.

Wednesday 14 October 2009 – *calm, dry, mild.*
Started our second camera line in Codling Deep at 01:12 imaging a mainly gravely/cobbley terrain (ISM_TV_264) with minor variations in terrain. Less biology present than on our camera run (ISMA_TV_217). Finished the camera run at 02:44 limited tidal influence in operations.

At 03:00 we began grab sampling south of camera line end-of-line position (ISM_TV_265). We often got poor recovery due to coarse/hard substrate of probable cobbles at the sample sites.
Transited to the third camera line position and started of ISMA_V_281 at 7:22. Repositioned of ship due to changing tides at 7:30. ISMA_V_281 revealed minor variations in the terrain, with mostly gravel to cobble/boulder sizes present and moderate variation and amounts of biology. Winch cable slipped off the block at 08:10 due to excess slack cable out when on the bottom and strong vessel drift in the increasing tide. Cable was re-blocked immediately (few minutes downtime) and problem noted. Continued line and ended at 8:42.
Transited to ADCP site and a CTD profile taken at 9:30 (ISMA_CTD_783), showed a uniform water mass profile at this site. Continued grab sampling at the southern end of Codling Deep heading north. Stopped sampling at 13:15 and headed to the vibrocore location in the middle of Codling Deep where a channel fill is seen on the sparker with shells at the surface.
We took 2 vibrocores at 13:50 and 14:25. Both cores were sandy, ISMA-V-296 had 1 m recovery and ISMA-V-297 had 2.80 m recovery.
We then took final 8 shipeks (sediment and biology samples) from the area completing our coverage and left the Codling Deep at 16:20 transiting to Lambay area.
Arrived at Lambay at 19:00 with the intention of completing our sampling coverage overnight with a further 10 samples and vibrocores. The first sample with the shipek gave a poor return (as before) so we tried to stab the bottom with the 1m gravity corer to get a short sample. The gravity core had no recovery (and was therefore not recorded as station). We concluded that although the shipek gives a poor recovery, other samplers fail. The vibrocore, however, should penetrate so we attempted this at slack water. Vibrocore ISMA_V_306 was taken at 20:30 and penetrated lithified sandy gravels to a depth of 40 cm. We have reached the limit of the vibrocore capability here and were basically on weak rock as opposed to sediment. This explained it all.
At 22:00 we started sampling the 10 shipek samples to complete the Lambay area coverage.

Thursday 15 October 2009 - *Calm, Dry, Mild, some fog.*
Finished shipek sampling in the Lambay area around 00:41 and started transit to the Rockabill area.
Arrived at the Rockabill area and started sampling the remaining 8 locations at 01:24. Finished sampling in the Rockabill area at 03:05. We experienced small sample sizes due to the hard substrate underneath (as shown by previous vibrocoring).

We then transited to the southwest section of the Northern Mudbelt area to continue shipek sampling in this area. Arrived on location at 04:07 and continued shipek sampling (for biological and sediment samples) in south-north transect lines through this area. Mainly clayey silty sediments recovered – very uniform samples in all locations. Last sample was taken at 07:52 and started the transit to vibrocore site in SE section of the Northern Mudbelt area.
Arrival at first vibrocore site (ISMA_V_356) and completed vibrocoring by 09:35. Coring through muddy silt into more sandy material below. A second vibrocore was taken at the same location (ISMA_V_357) at 09:56 as we thought we may had hit a stone first time.
We then transited to the second vibrocore location and cored at 10:25 (ISMA_V_358) through silty clay-clayey silt.
We transited to third vibrocore site in the Northern Mudbelt area and cored at 11:12, through mud (ISMA_V_359).
We then undertook a series of digital still lines. ISMA_TV_360 was in the northern mud belt and revealed a muddy seabed with numerous burrows including *Nephrops*. ISMA_TV_362, 364 and 366 were in the Rockabill area and revealed a fine sandy seabed with ripples and burrows. Grain-size and ripples decreased from NE to SW. Some fish.
Sampling resumed in the Northern Mudbelt at 21:00.

Friday 16 October 2009 - *Force 2-4 NE, some chop and 0.5 – 1.0 m swell. Cloudy. Wind dying off by late evening.*
Continued grab sampling in Northern Mudbelt area, completing the western-most block, filling in a few sample gaps and then started sampling along the remaining eastern north-south transects in the area.
We transited to vibrocore site started at 08:56. Arrived on location and first successful vibrocore taken at 09:38 (ISMA_V_417) retrieving muddy sediments, followed by a second vibrocore in a second location in the area (ISMA_V_418) at 10:19, also through muddy sediment.
We started a camera run (ISMA_TV_419) at 11.10 in the vicinity of the last vibrocore site, visualising a very similar sediment to yesterday's ISMA_TV_360 run (muddy seabed with numerous burrows and trawl-marks). After a short transit, a second camera run took place in the Northern Mudbelt area, starting at 12:47, again showing a very similar, muddy and burrowed seabed (ISMA_TV_421).
We then transited to the Lambay area at 13:27 to commence one of four camera runs at 15:00.
The area showed a seabed covered by sandy ripples with shell in the troughs (ISMA_TV_423). In the NW, it became more muddy

in the troughs. Main fauna were red fish and some sponges (known as “dead man’s fingers”). By the end of the second run (ISMA_TV_425) the tide was strong and it was difficult to hold the ship’s course and reach the end of the line. However, we completed the third run (ISMA_TV_427) by readjusting our heading to the current drift. At the end of this run, more camera work was not possible due to the speed of the tidal flow.
As tide picked up at 19:09, we left the area to fill in some sampling gaps in the coverage to the north and east in the Northern Mudbelt. We continued sampling through the night.

Saturday 17th October 2009 - *Calm, dry, mild*
We finished sampling in the eastern section of the Northern Mudbelt at 08:38 and started transiting to the start of the camera run site in the southwest of the area where we found a large suspected pockmark (ISMA_TV_464 & 466). Tidal current meant that the first camera run missed the target (ISMA_TV_464) so we did a second which crossed the pockmark (ISMA_TV_466). We then collected vibrocores in the pockmark (ISMA_V_470 & 471) at 09:54 and 10:17 respectively.
We then cleared the aft deck of the vibrocore to make room for the Reineck box-core that we slung through the A-frame. The Reineck gave us an undisturbed sample of the upper seabed that we then sub-sampled with a short core liner. These samples will be useful for both geotechnical and palaeoenvironmental studies.
At 12:30 we started a transit to the Northern Mudbelt area to take our first Reineck box-core.
Started box-coring at 13:30 and finish 5 box-cores by 15:23 (ISMA_BX_472, 474, 476, 478 & 480).
We then transited down to the Lambay area again to do a final camera line (ISMA_TV_482) which we could not collect earlier because of adverse tides.
Commenced camera run at 17:05 until 17:53.
The quantity and quality of the data collected exceeded all expectations. We had factored in for downtime due to weather and technical failures. The weather downtime over 3 weeks was 2 days in leg 1 and none in leg 2 which is really lucky. The exceptional weather meant that transit times were quicker than anticipated, station keeping was easier, survey line holding was more efficient and data quality optimal. By 18:00 we had not only completed the leg 2 objectives but done so with a greater sampling density than anticipated. At this stage, there were no more priority or secondary data to collect and, rather than collecting data for the sake of it, we decided to head in to port in the evening so that everyone could get a well earned rest before starting demobilisation at 08:00 the next day. Considering the crew had worked the vessel for 24 hours constant for 8 days

with quick turn around I felt justified in calling for an evening, rather than dawn, port call.
At 18:05 we transited to Howth and tied up at 19:15.

Sunday 18th October 2009 – *Calm, cloudy*
Started demobilisation at 08:00 including demobing the camera system and vibro-core and all the samples and cores.
Completed demobilisation of the scientific party by 15:00 and started the drive back to UCC where the samples are now stored. End of survey.

Summary of Areas

Northern Mudbelt

The Northern Mudbelt is a very large area about 26 by 20 km and is very uniform. The area is covered by about 10 m of silty mud which is heavily bioturbated by shrimp including the commercial *Nephrop* sp. or Dublin Bay prawn. We saw little change in burrow density although trawl marks on the seabed were clearly visible especially on the backscatter data and increase in density to the north-east. Some live *Nephrops* were observed by the camera. In some areas the vibrocores were able to sample into the underlying glacial tills and below these at about 20 m is bedrock. There are numerous evidences of accumulations of biogenic gas including pockmarks and reduced and partially concreted sediments. At the southern limit of the area, a band of dark backscatter may also be related to gas.

Data highlights are presented below:

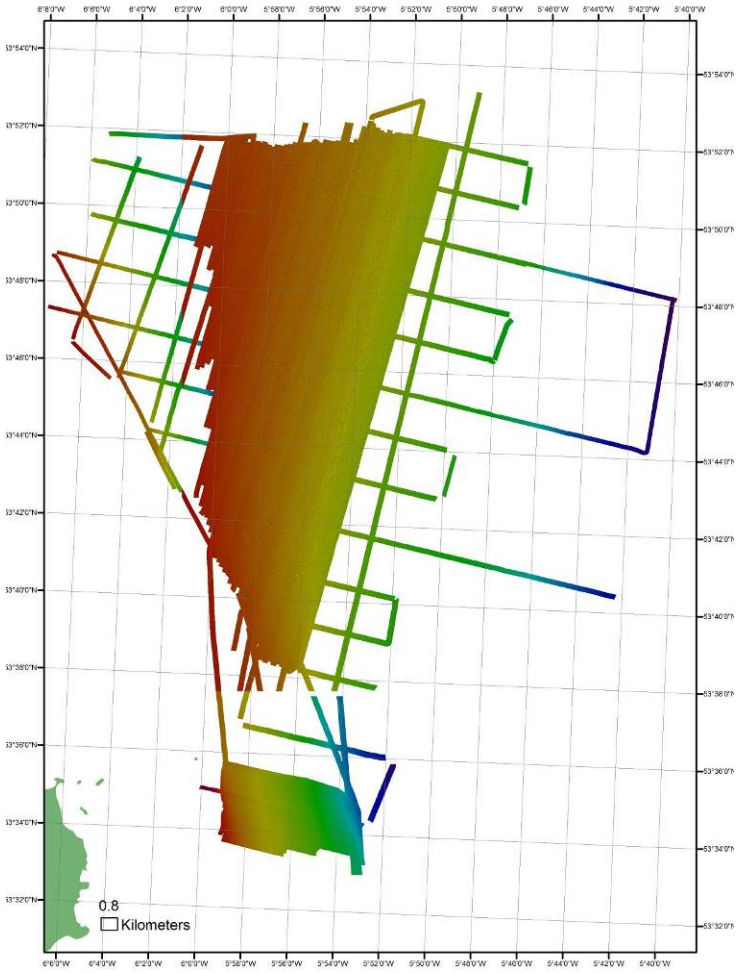


Figure 12. Multibeam bathymetric coverage in the Northern Mudbelt (northern and central coverage) and the Rockabill area (southern coverage). The image shows a smooth seabed, gentle sloping to the east.

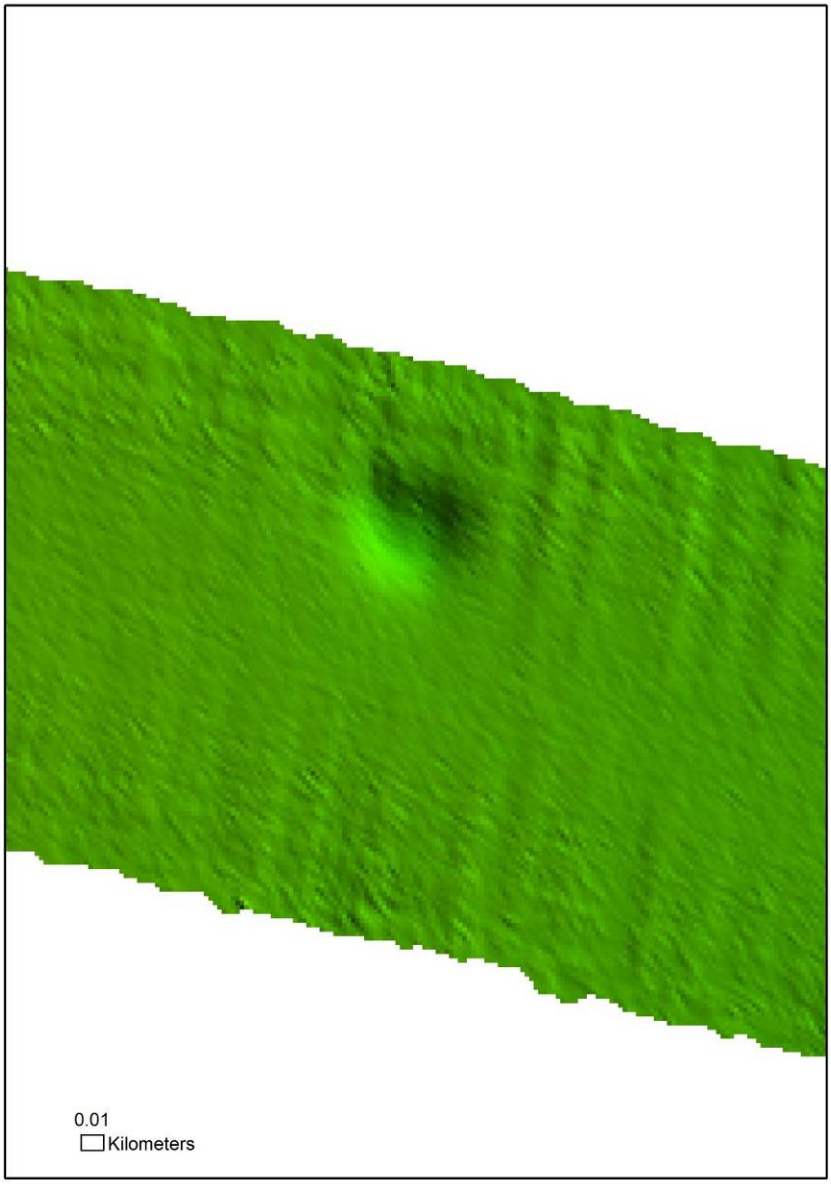


Figure 13. Multibeam bathymetry showing a pockmark formed by shallow gas escape of which there were several in the area.

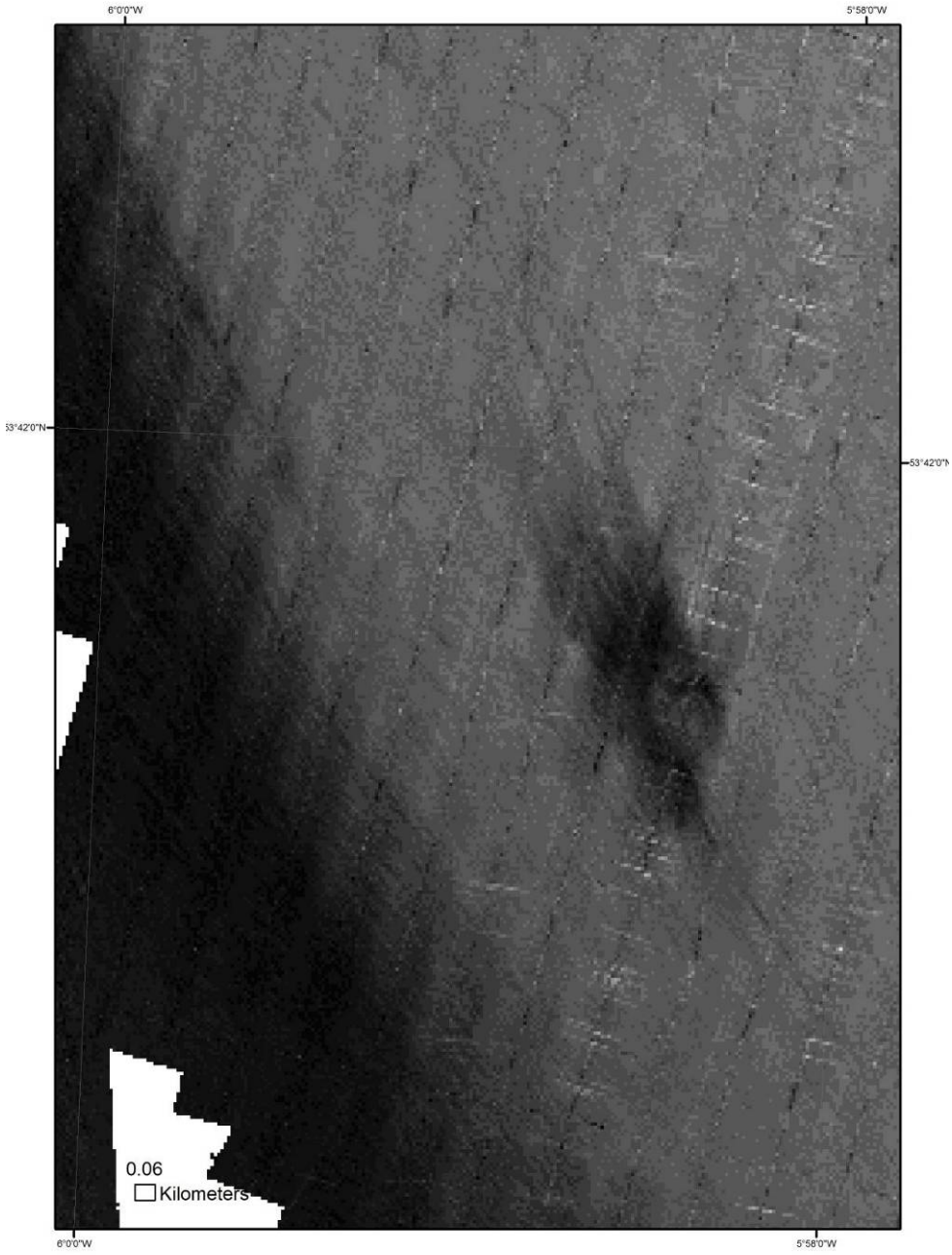


Figure 14. Multibeam backscatter image showing another pockmark (dark irregular backscatter in the central image) and a zone of high backscatter in the south of the area. The reason for the change in backscatter may be due to an increase in silt content in the pockmark or cementation. The zone of dark backscatter to the southwest may also be due to gas although this is unclear at present.

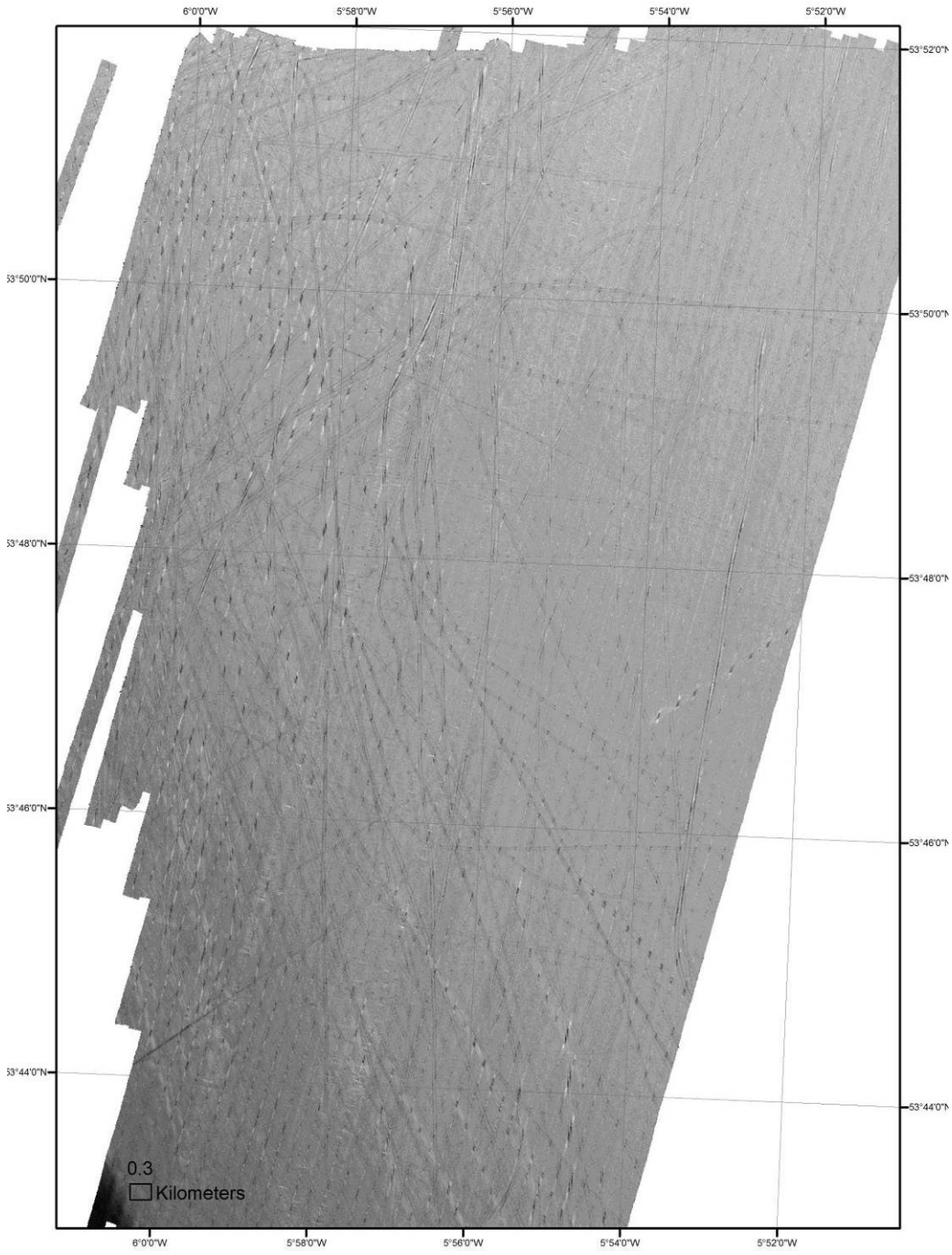


Figure 15. Multibeam backscatter in most of the Northern Mudbelt showing trawl-marks caused by prawn fishing. Areas of more intense trawling are apparent. It is not known how long a trawl marks remains visible on the seabed in this area.

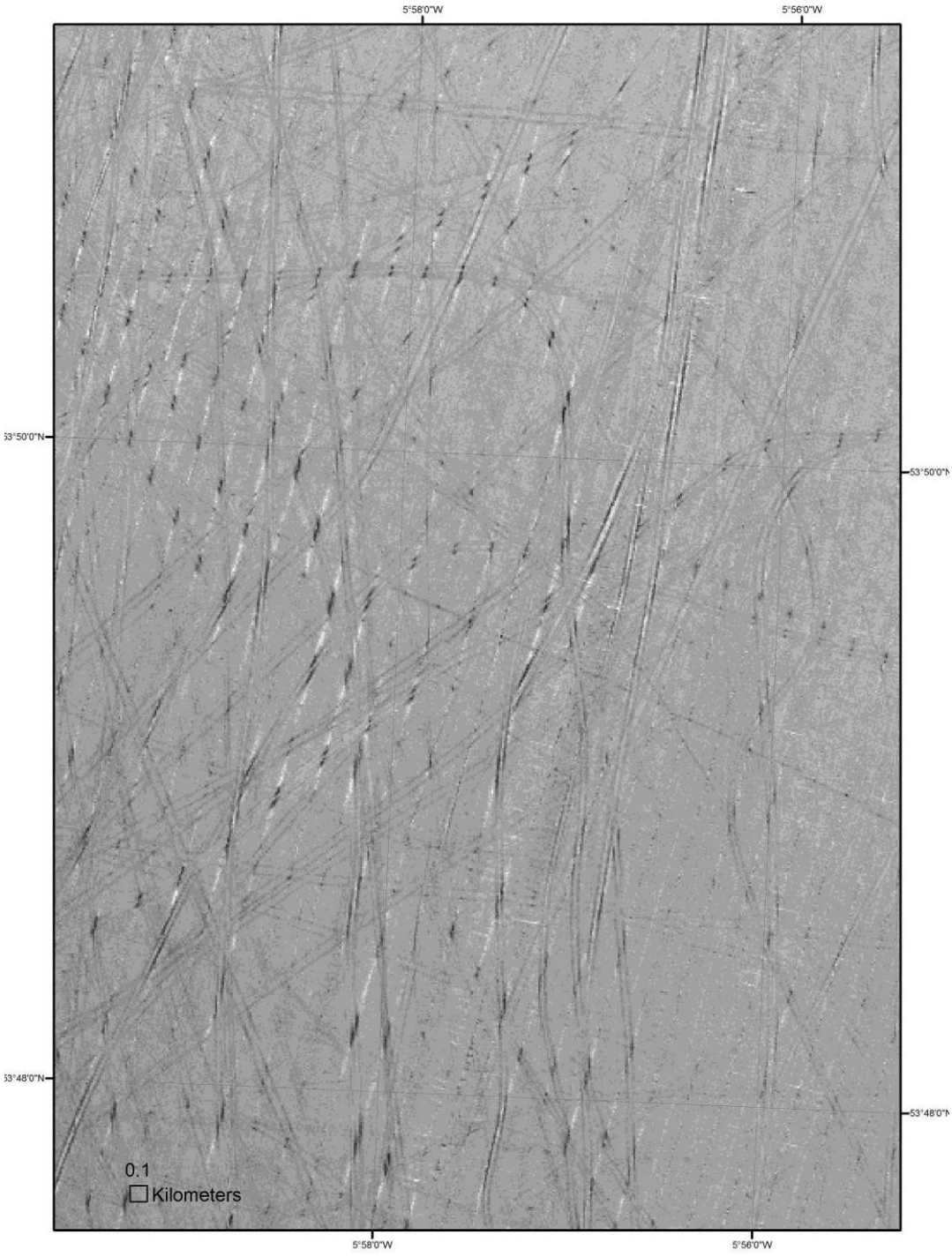


Figure 16. A close-up of a heavily trawled area.

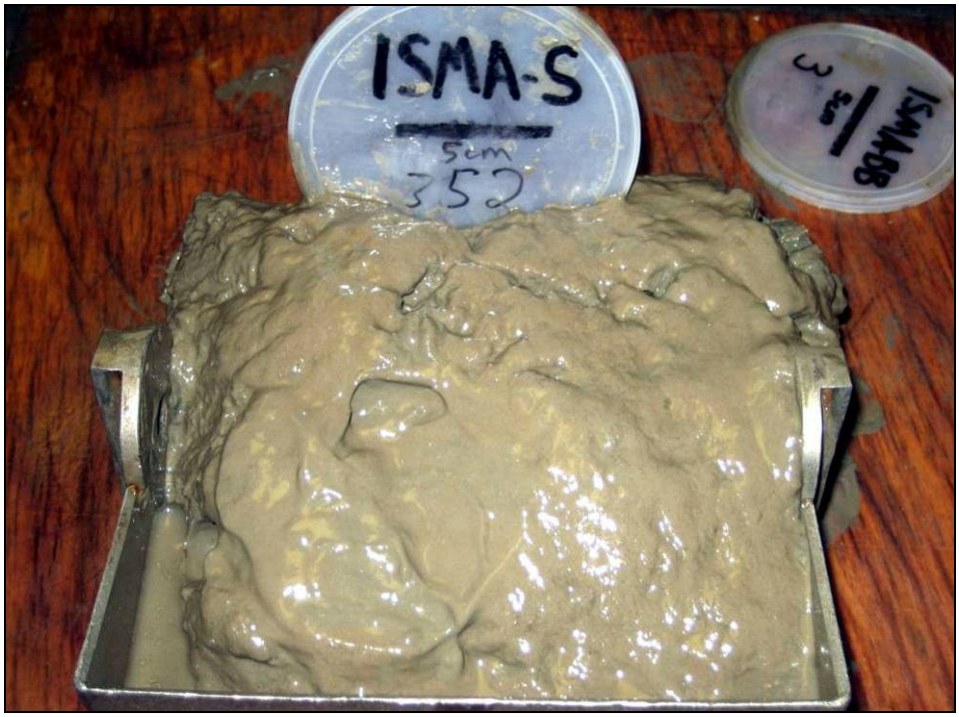


Figure 17. A typical sediment sample from the Northern Mudbelt showing soft gloopy mud. Significant silt contents are common.

Figure 18. A typical shot of the seabed in the Northern Mudbelt showing the irregular microtopography and active bioturbation by worms and larger prawn burrows. Scale of view approximately 50 cm across.

Figure 19. Another typical shot of the seabed in the Northern Mudbelt showing a Nephrop prawn burrow. Nephrop *prawns are the focus of the commercial fishery. Scale of view approximately 50 cm across.*

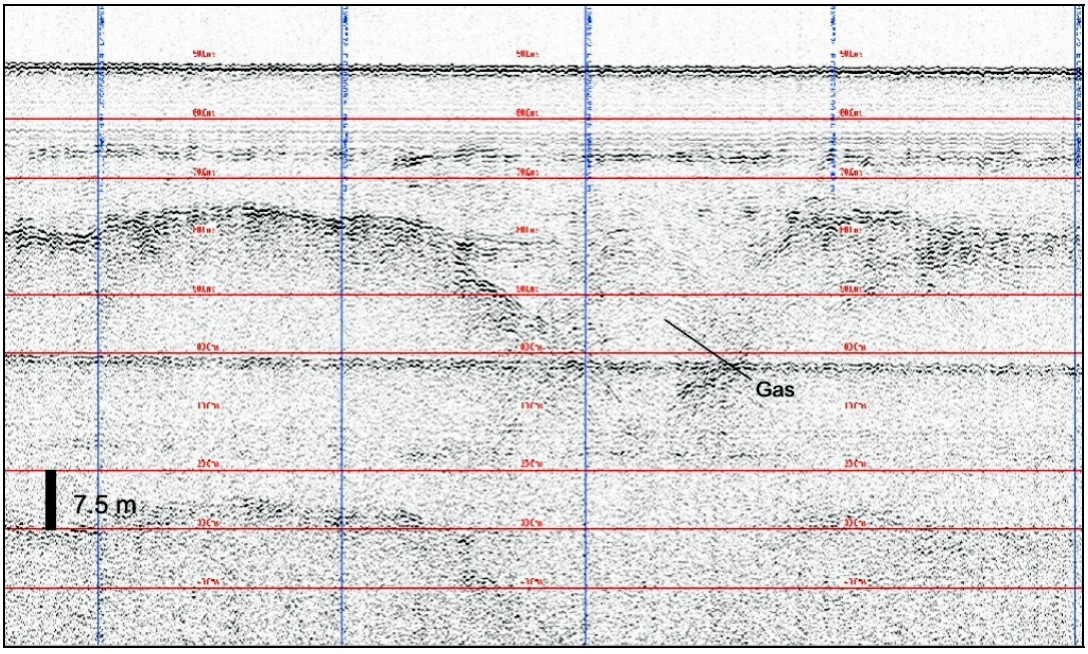


Figure 20. Seismic image from the Northern Mudbelt showing the accumulation of shallow gas.

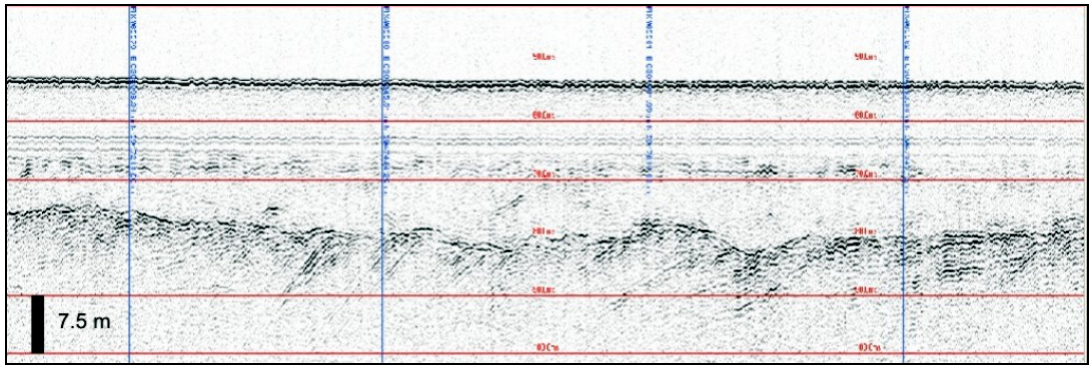


Figure 21. Seismic image showing bedrock 20 m below the surface. Dipping bedding is clearly discernable.

Rockabill area

The Rockabill area is a relatively smooth area of seabed gently sloping to the east. Fine grained rippled sand cover the seabed with some seaweed but limited megafauna. Subtle differences in acoustic backscatter probably represent grain-size changes but these were hard to determine by eye from samples or camera imagery. Vibrocores showed the upper few metres consisted of compacted sands overlying till. The till is imaged on the sparker seismics running underlying the area at about 4 m.

Data highlights are presented below:

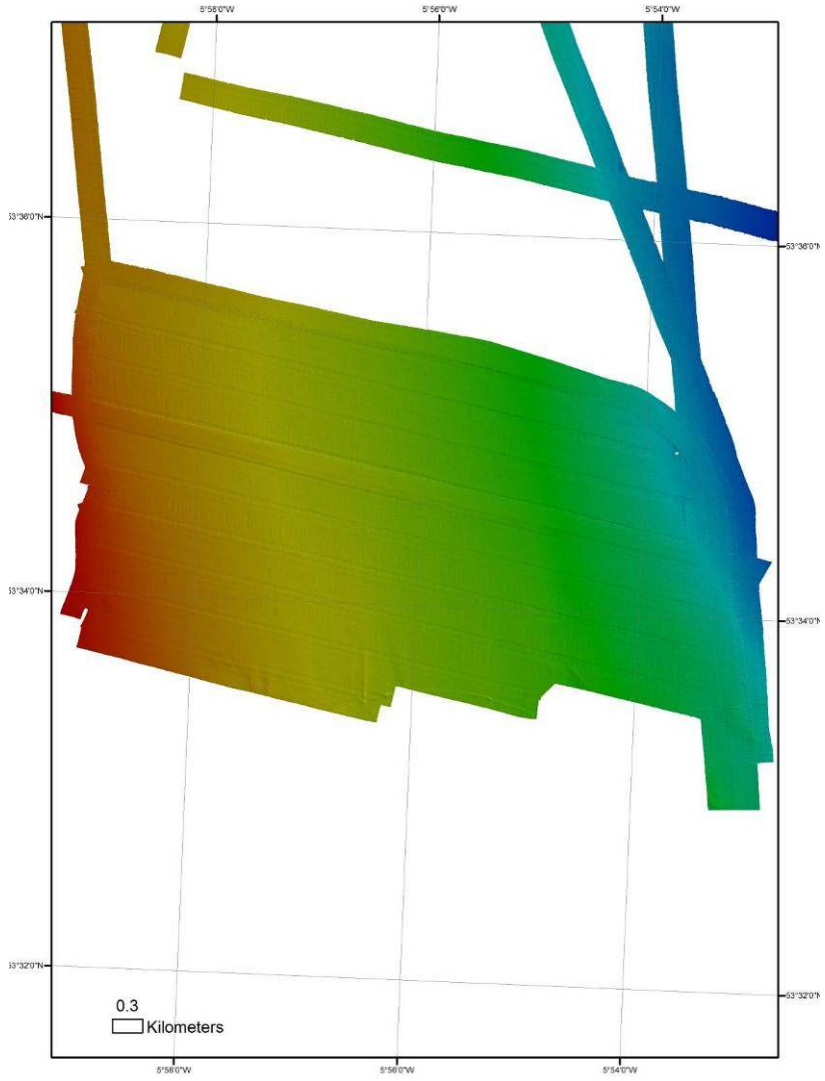


Figure 22. Multibeam bathymetry image showing the seabed sloping from west to east.

Figure 23. Typical muddy sand sediment sample from the Rockabill area.

Figure 24. Typical seabed image showing rippled muddy sands. Scale of view approximately 50 cm across.

Figure 25. Typical seabed image showing bioturbated muddy sands. Scale of view approximately 50 cm across.

Figure 26. Red fish and seaweed are the most common biota in the area. Scale of view approximately 50 cm across.

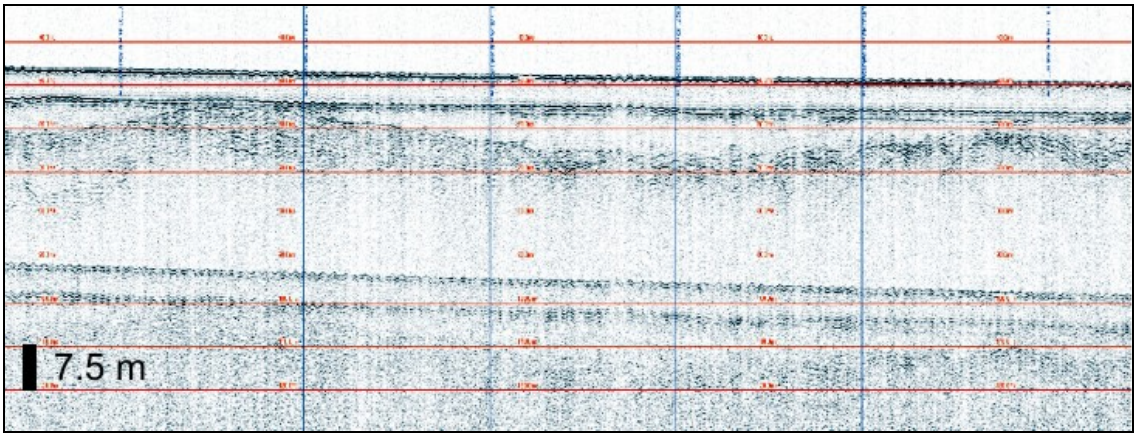


Figure 27. Seabed gently dipping from west to east. Horizontally layered sediments unconformably overlying deeper successions..

Lambay area

This is a relatively smooth area of seabed sloping gently to the east with a deep (the Lambay Deep) bordering the eastern margin of the area. The seabed is smooth except for some small bedforms in the south indicating a north-south orientated tidal current flow, and an area of irregular raised topography in the middle. Camera stills from the seabed show that the area is covered by small sand ripples with shell fragments in the troughs. These sediments were sampled by the Shipek although we had difficulties penetrating the sediment to depth. Coring revealed that the upper sequence was composed of compacted sand and in one area this was lithified (explaining our sampling problems). Shear strength in the underlying sediments was expected to be exceptionally high. The lithified sequences were exposed at the surface in the central area and overlain by an onlapping sandy draft. Camera stills showed some megafauna including red fish and sponges.

Data highlights are presented below:

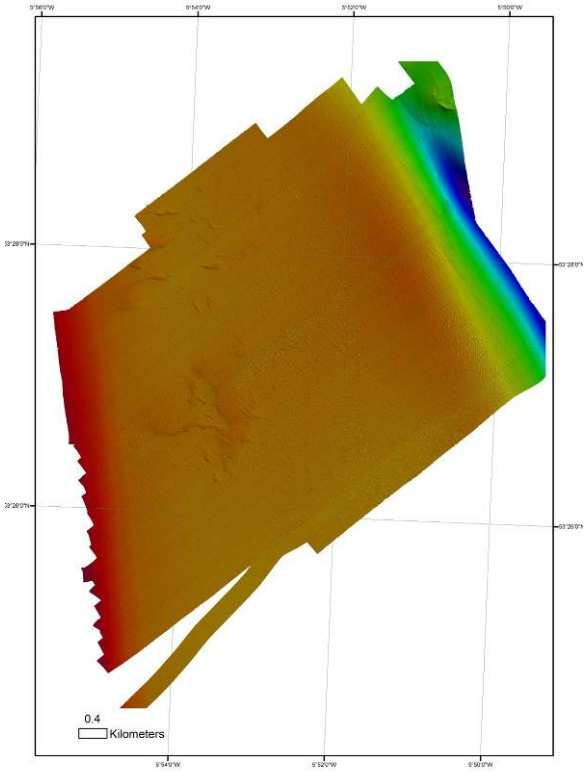


Figure 28. Bathymetry showing gently sloping seabed and the Lambay deep to the east.

Figure 29. Bathymetric close-up showing small scale sand waves on the seabed.

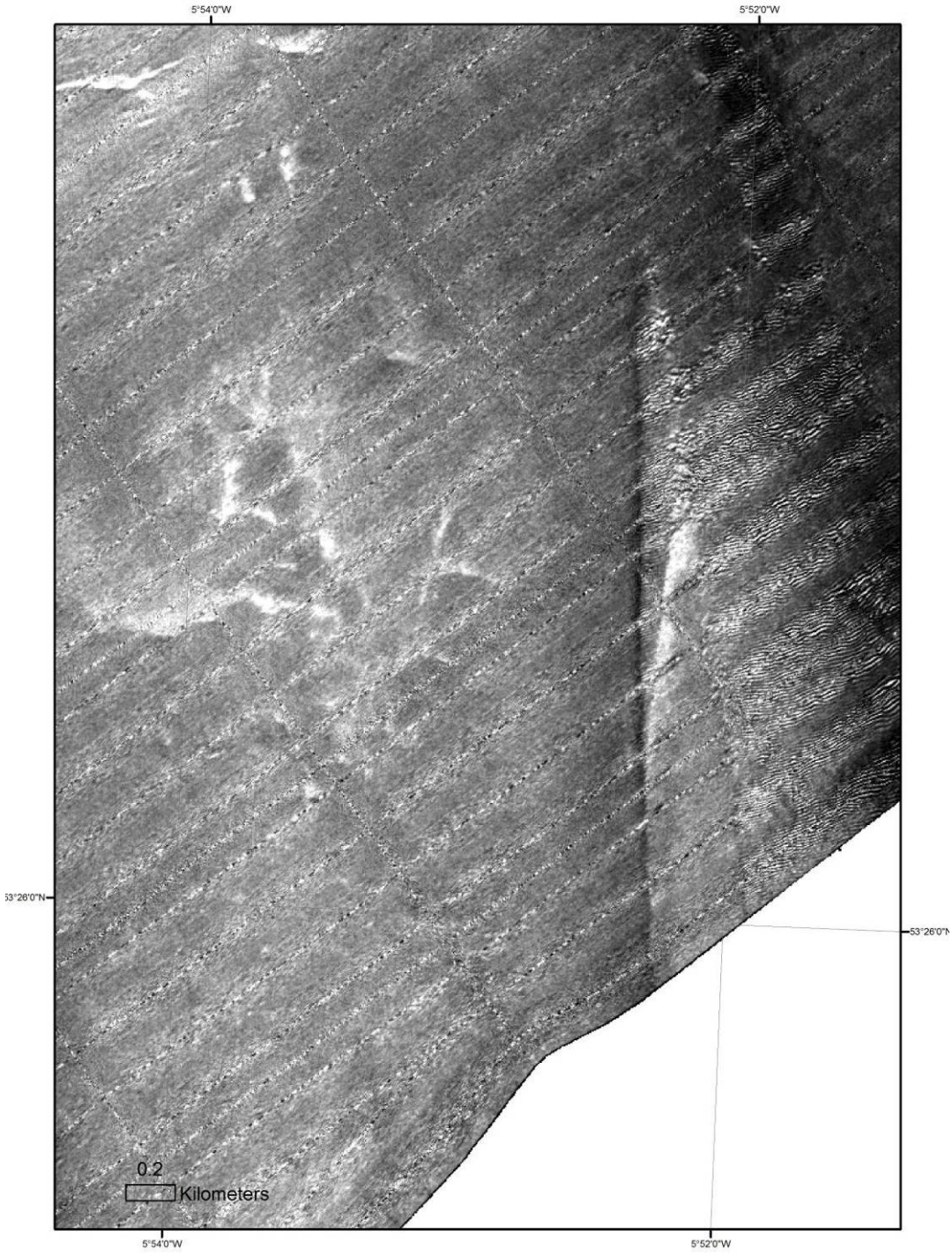


Figure 30. Multibeam backscatter detail showing strong return (white) indicating lithified sediment outcropping and a linear north-south feature possibly a fault.

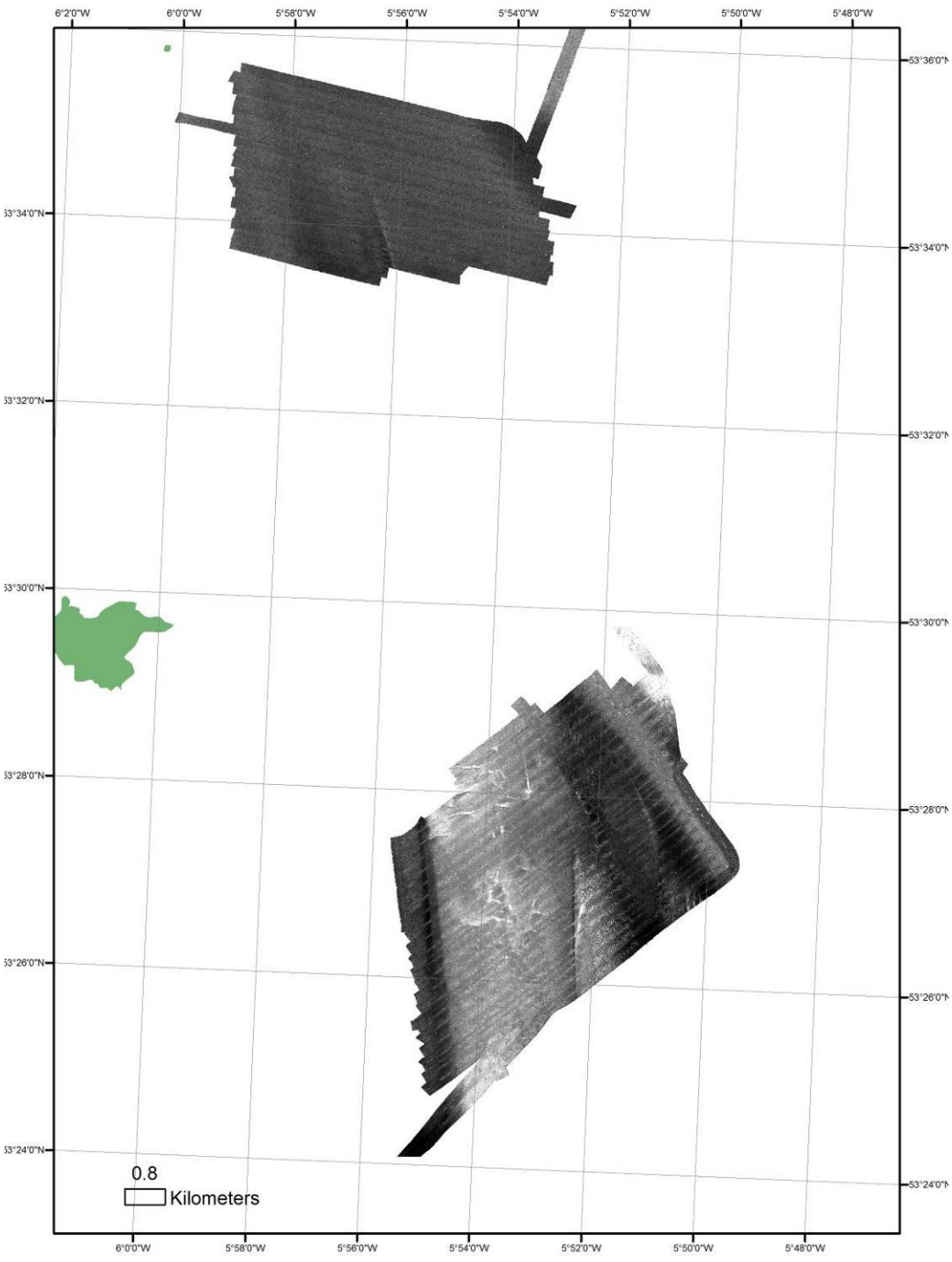


Figure 31. Contrasting backscatter from the Rockabill (north) and Lambay (south) areas due to difference in grain-size (sandier in Lambay) and exposure of lithified sediments in Lambay.

Figure 32. Typical sandy sediment sample with shells.

Figure 33. Typical seabed image showing rippled sands and red fish. Scale of view approximately 50 cm across.

Figure 34. Seabed showing well developed sand ripples. Scale of view approximately 50 cm across.

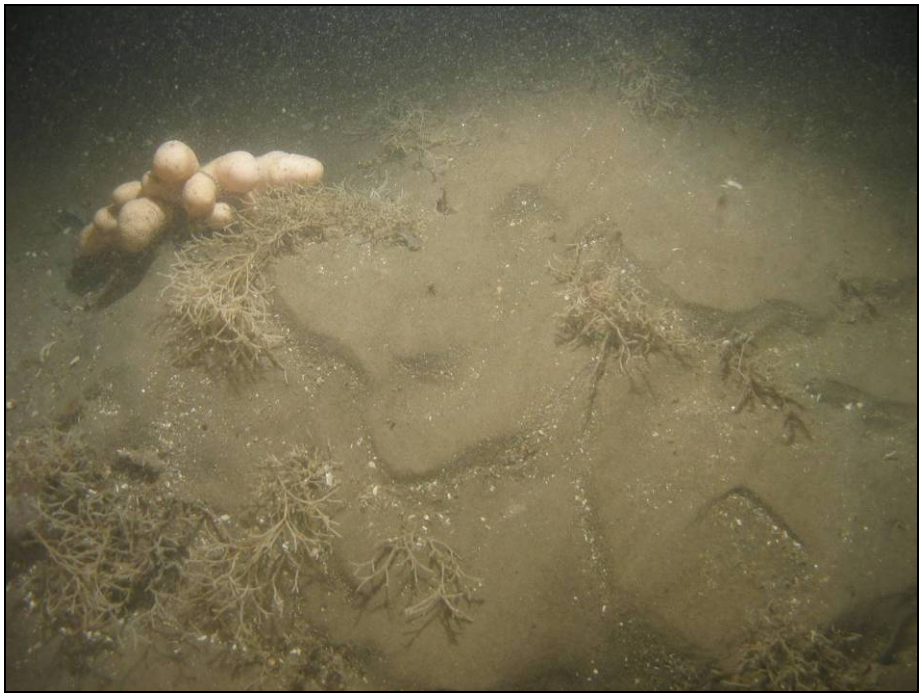


Figure 35. Biota including sponges and seaweed. Scale of view approximately 50 cm across.

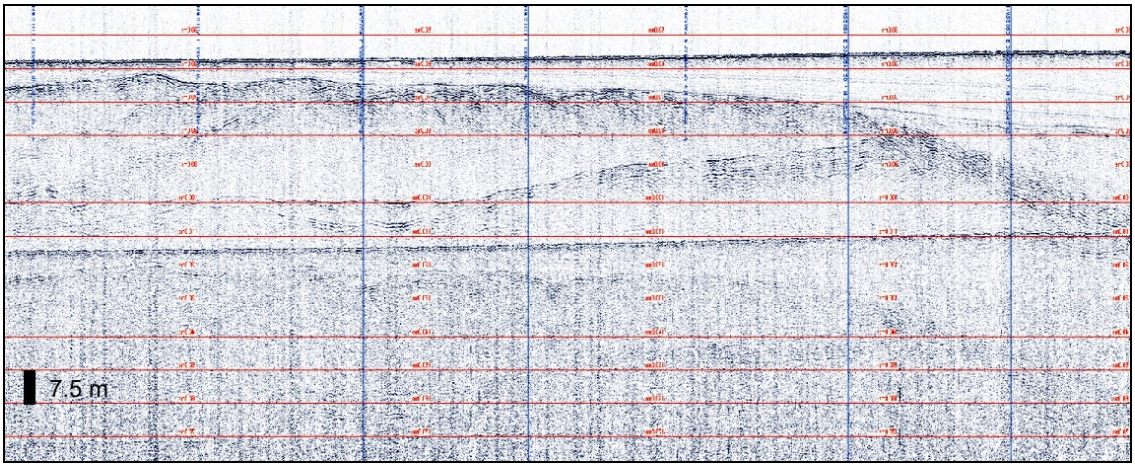


Figure 36. Horizontally layered sediments overlying unconformably the successions below.

Codling Deep

The Codling Deep was the most varied of the areas surveyed in terms of sediment types, topography and biology. It experiences strong current that affects not just the nature of the seabed but also vessel operations. It comprises a long linear irregular depression up to 82 m deep with mobile sand and gravel waves as well as mobile shell hash. These areas have a limited fauna. In contrast, deeper areas are characterised by cobblely ground that was difficult to sample and was covered in a rich diverse fauna. The sub-seabed has complex stratigraphy with numerous erosional surfaces.

Data highlights are presented below:

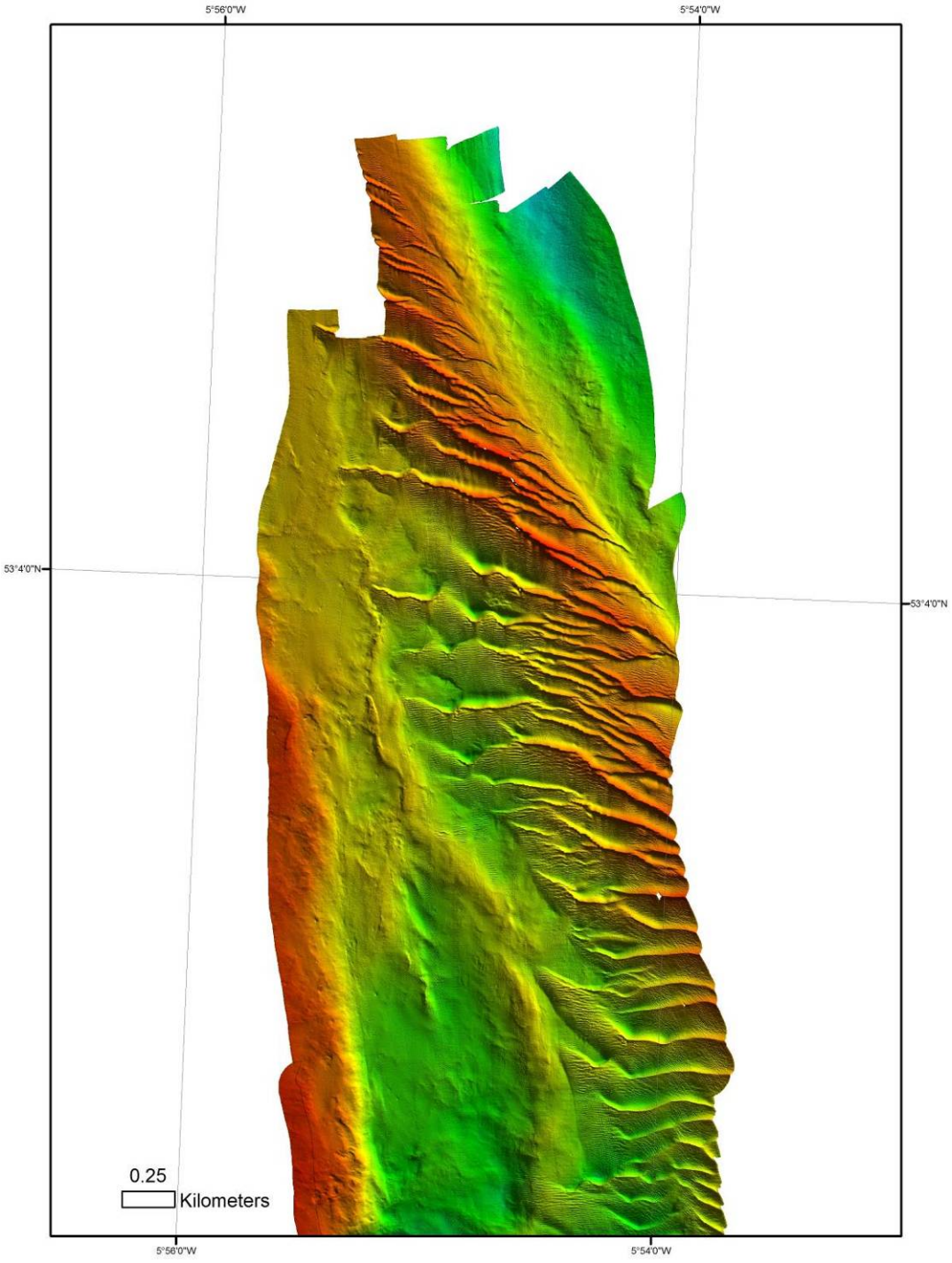


Figure 37. Bathymetry map showing sediment waves on the edge of the India Bank.

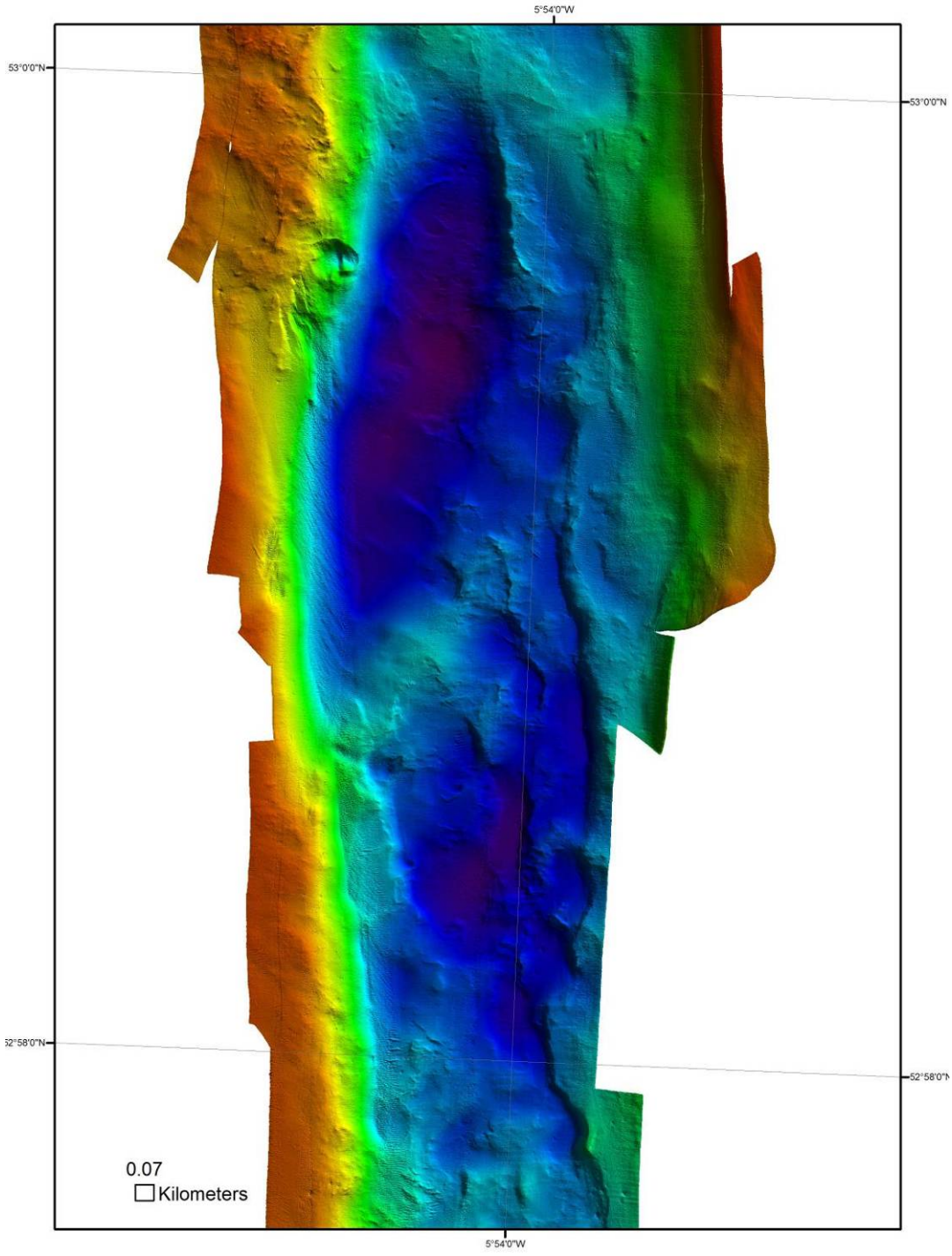


Figure 38. Bathymetry map showing erosional surfaces in the deep.

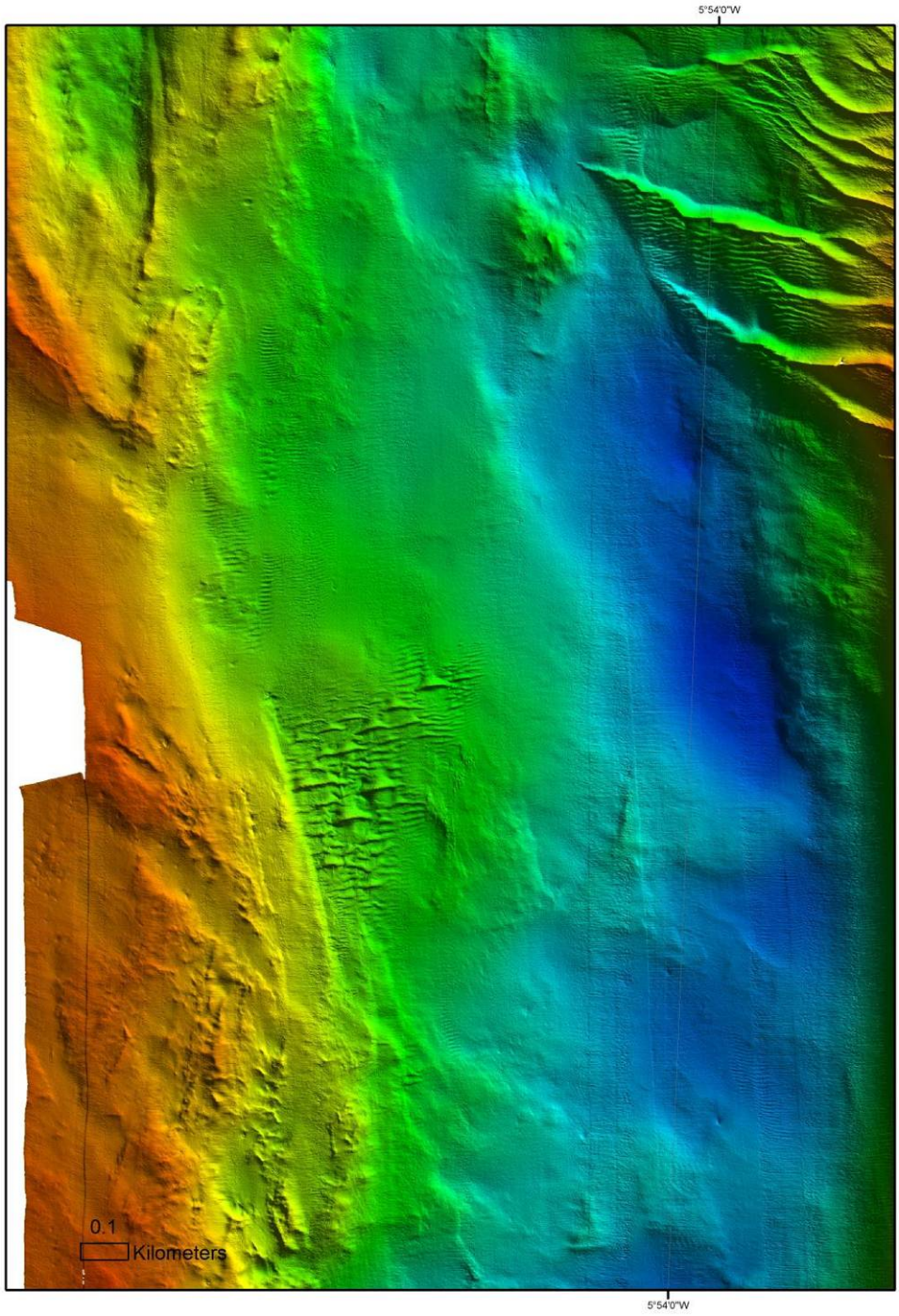


Figure 39. Bathymetry map showing sediment waves of various sizes.

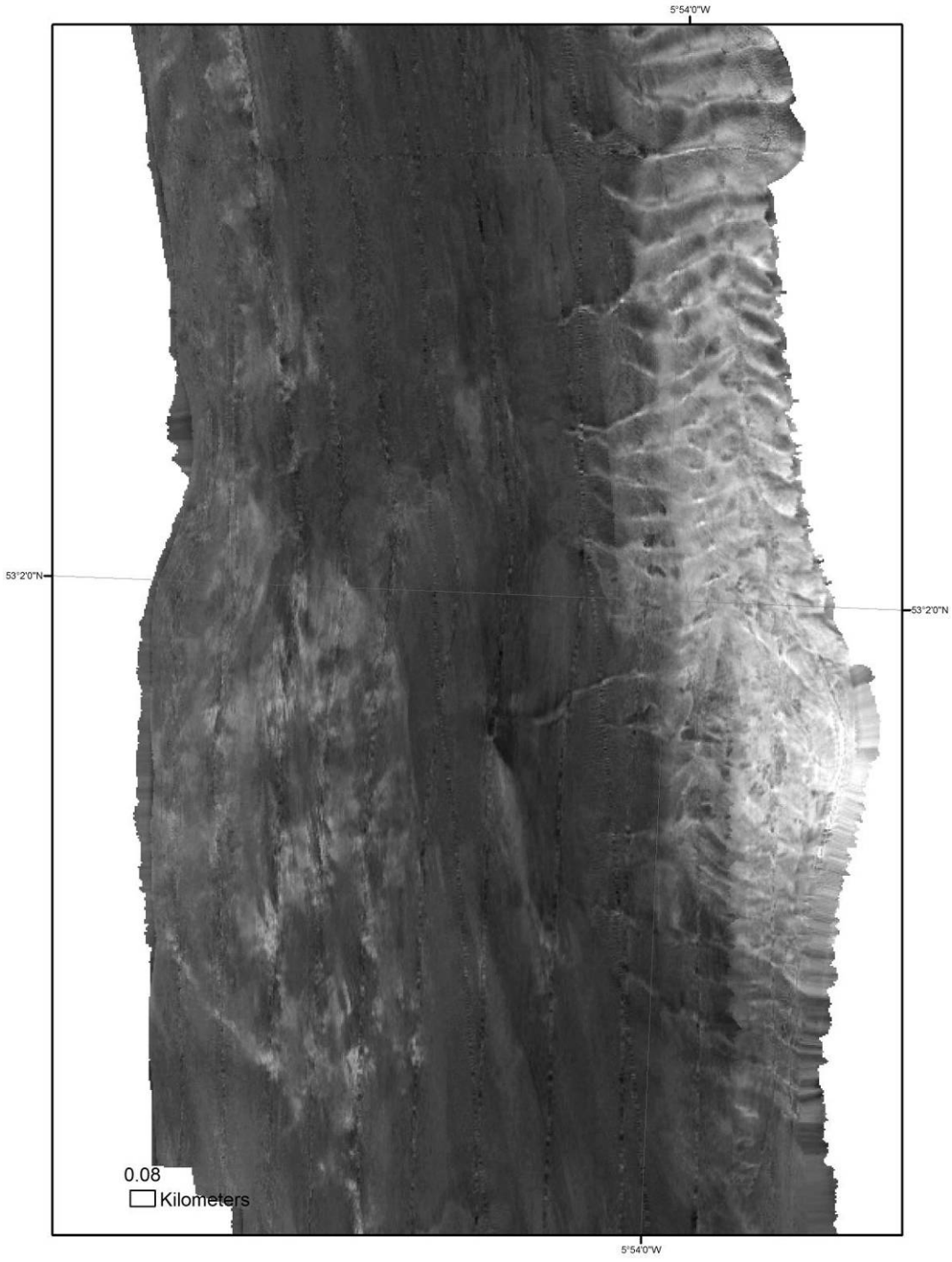


Figure 40. Backscatter map showing sediment waves (right hand side) and mottled seabed covered with cobbles (left hand side).

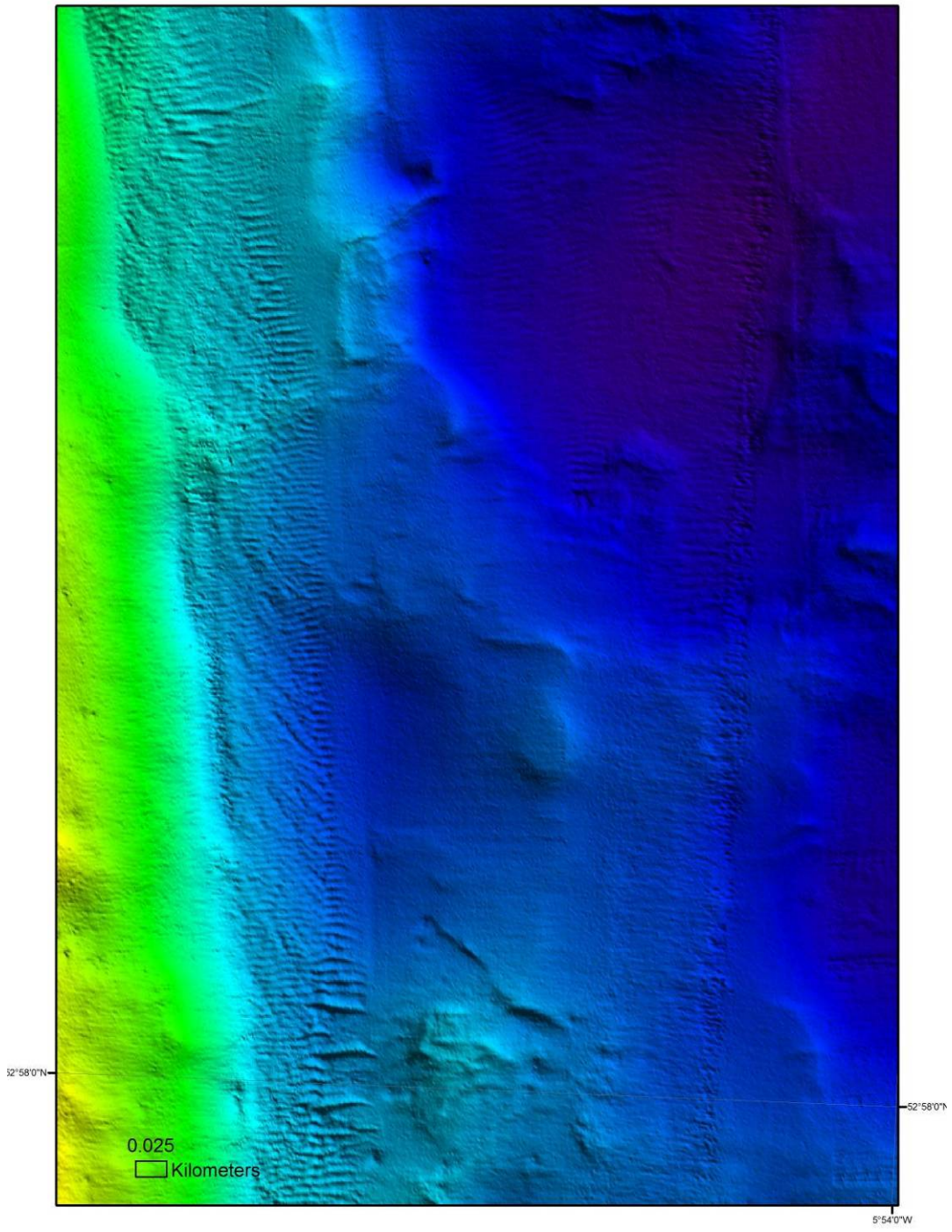


Figure 41. Bathymetry map showing small scale sediment waves on the edge of the Codling Deep.

Figure 42. A typical sediment sample of cobbles and shell.

Figure 43. A typical sediment sample of well sorted coarse sands and shell hash.

Figure 44. Typical seabed image showing sorted course sands and shell hash from the sediment wave area. Scale of view approximately 50 cm across.

Figure 45. Typical seabed image showing course sands, pebbles, shell and an anemone. Scale of view approximately 50 cm across.

Figure 46. Typical seabed image showing cobbles covered in barnacles and starfish. Scale of view approximately 50 cm across.

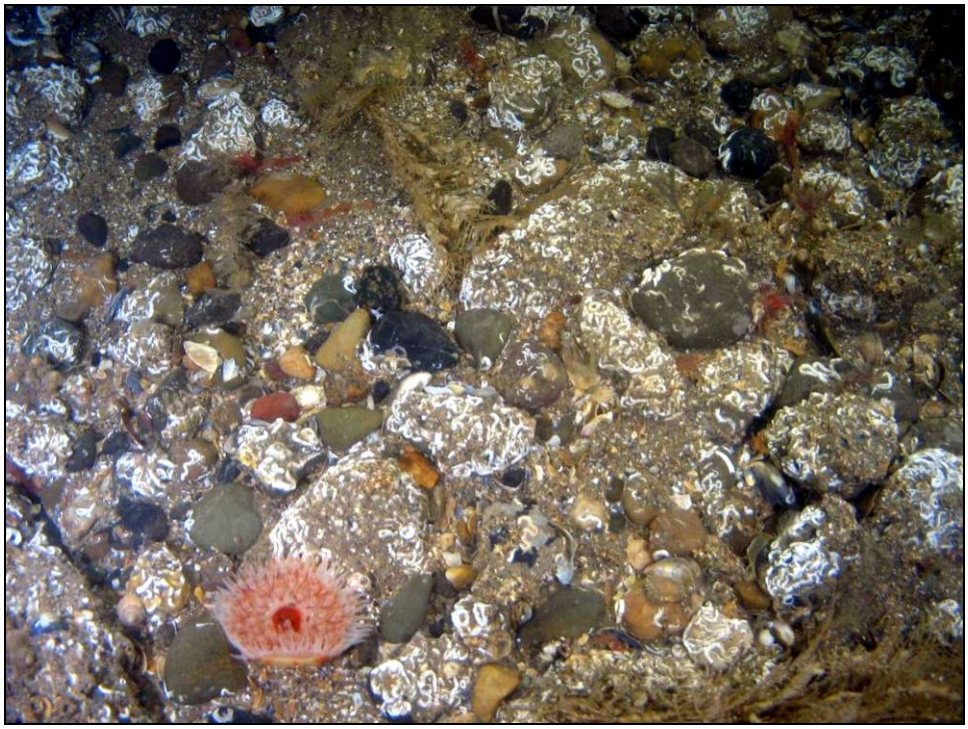


Figure 47. Typical seabed image showing cobbles covered in serpulid worm tubes and an anemone. Scale of view approximately 50 cm across.

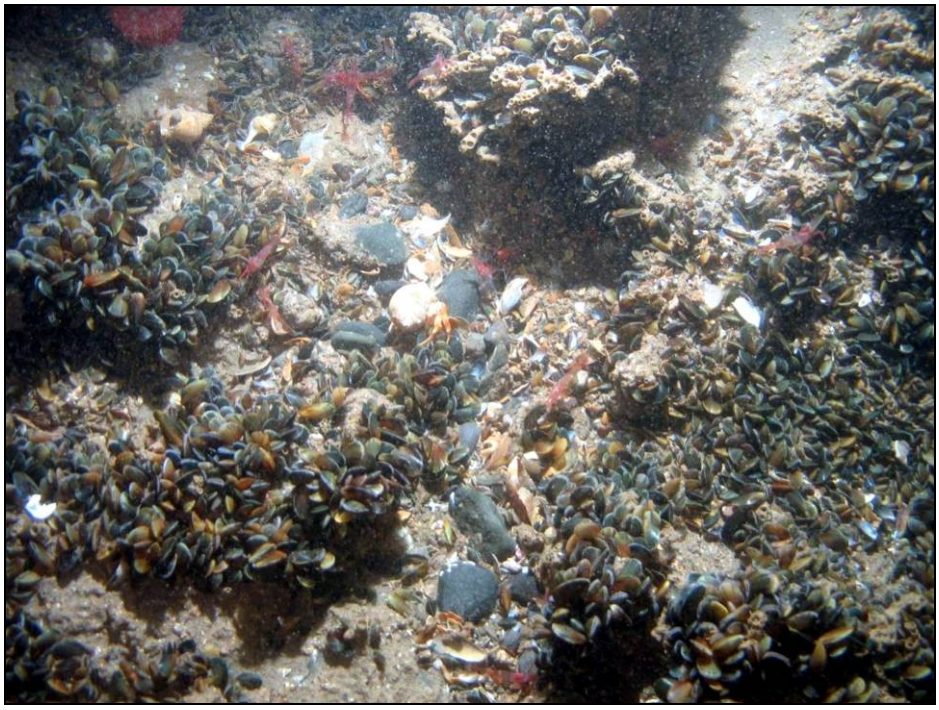


Figure 48. Typical seabed image showing mussel beds with shrimp, a hermit crab and an anemone. Scale of view approximately 50 cm across.

Figure 49. Typical seabed image showing seaweed, feather stars, a sponge, shrimp, anemones and agglutinated worm tubes. Scale of view approximately 50 cm across.

Figure 50. Typical seabed image showing agglutinated worm tubes and seaweed on a sandy seabed. Scale of view approximately 50 cm across.

Figure 51. Typical seabed image showing rippled sands. Scale of view approximately 50 cm across.

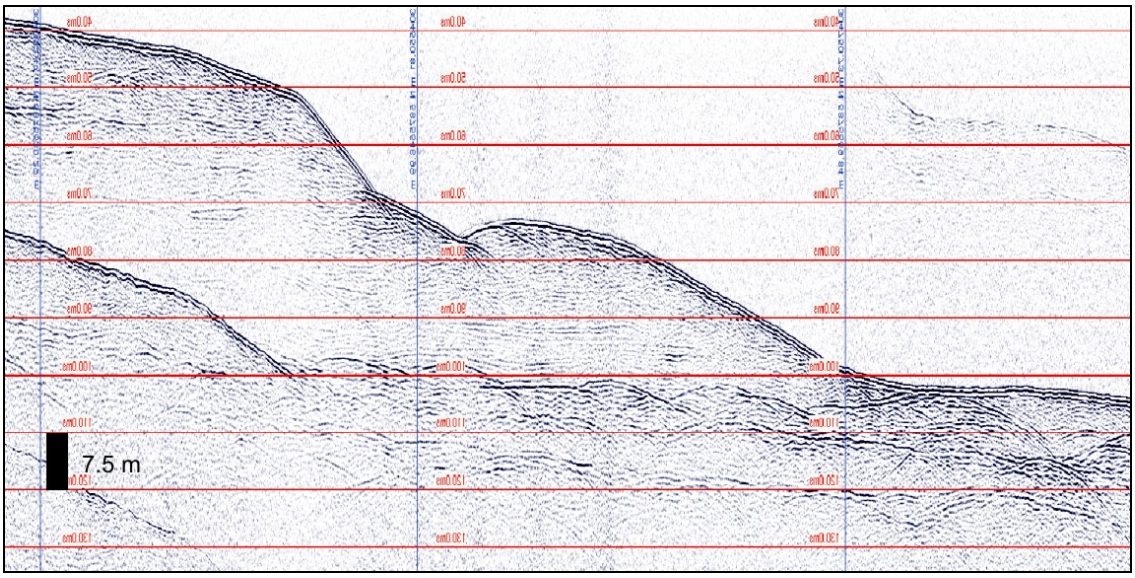


Figure 52. Seismic profile across the western slope of the Codling Deep.

Weather Report

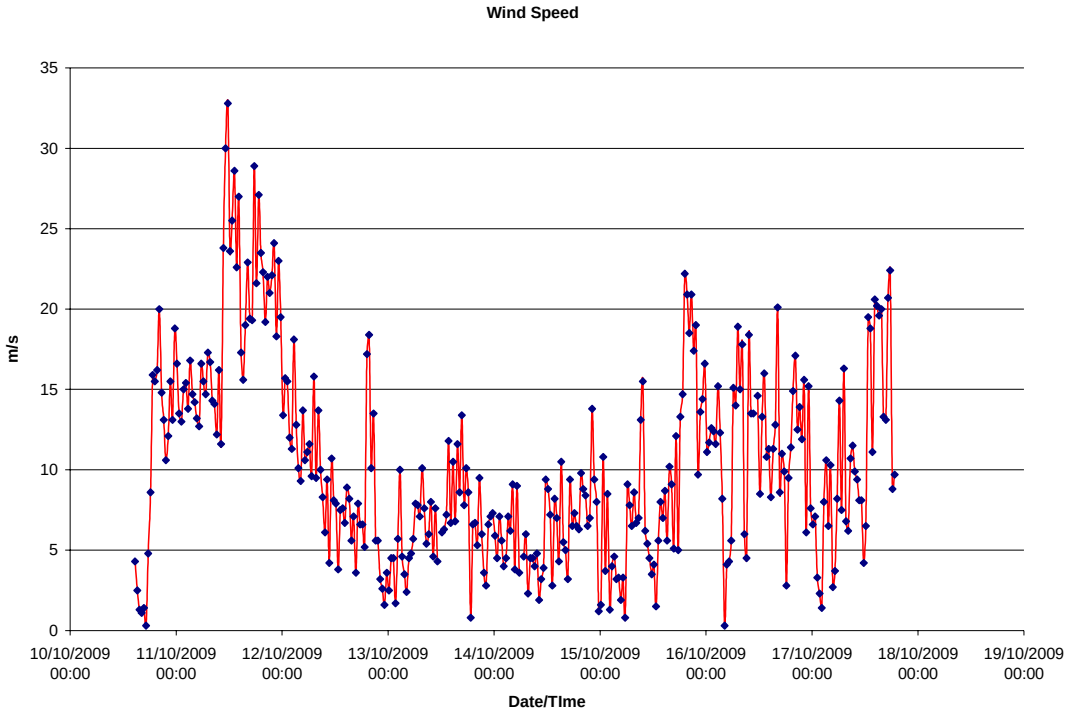
Note: due to the failure of the Seapath to log the weather station, weather keeping was performed differently during both legs.

Leg 1

Date	Start	Stop	Wind	Sea state	Swell	Visibility
29-Sep-09	08:09	09:14	2 W	3	0	3
29-Sep-09	11:40	12:15	2 NW	3	0	3
29-Sep-09	13:50	14:50	1 N	1	0	3
29-Sep-09	16:50	17:30	0	0	0	3
30-Sep-09	08:23	09:08	4 W	4	0	3
30-Sep-09	11:25	14:30	4 W	4	0	3
30-Sep-09	17:15	18:00	3 W	3	0	3
1-Oct-09	07:57	10:58	3 NW	3	0	3
1-Oct-09	12:37	13:44	3 NW	4	0	3
1-Oct-09	15:01	16:14	4 NW	4	0	3
2-Oct-09	13:54	15:31	4 SW	4	0	3
4-Oct-09	6:27	8:17	2 SW	2	0	3
4-Oct-09	9:00	10:29	4 W	3	0	3
4-Oct-09	11:00	12:01	4 W	4	0	3
4-Oct-09	13:50	15:59	2 W	4	0	3
4-Oct-09	17:35	17:59	2 N	3	0	3
5-Oct-09	6:55	8:30	0	0	0	3
5-Oct-09	9:19	10:31	1 N	1	0	3
5-Oct-09	11:09	12:44	2 S	2	0	3
5-Oct-09	14:44	15:59	4 SW	4	0	3
5-Oct-09	16:55	17:32	5 S	5	1	3
6-Oct-09	16:30	17:30	4 N	4	1	3
7-Oct-09	6:57	8:31	2 E	2	0	3
7-Oct-09	9:01	10:31	3 SE	3	0	3
7-Oct-09	11:57	14:02	4 N	2	0	3
7-Oct-09	15:13	16:39	1 N	1	0	3
8-Oct-09	7:03	8:53	4 NW	3	0	3
8-Oct-09	9:16	10:30	4 NW	4	0	3
8-Oct-09	11:37	13:15	2 W	3	0	3
8-Oct-09	14:05	15:57	1 W	0	0	3

Leg 2

10th October 2009 –*sunny, calm.*
11th October 2009 – *calm, some chop, picking up to 1m swell, sunny with northerly fresh winds. Blowing by late evening.*
12th October 2009 – *calm, sunny.*
13th October 2009 - *calm, sunny.*
14 October 2009 - *calm, dry, mild.*
15 October 2009 - *calm, Dry, Mild, some fog.*
16 October 2009 - *force 2-4 NE, some chop and 0.5 – 1.0 m swell. Cloudy. Wind dying off by late evening.*
17th October 2009 - *calm, dry, mild*
18th October 2009 – *calm, cloudy*



Appendices

Appendix I

Personnel

Ship's Crew	**Scientific Party**
Philip Baugh – Master	*Leg 1*
Brandon McGovern- 1st Mate	Dr. Boris Dorschel – Chief Scientist (UCC)
Damien McCallig – Chief Engineer (Leg 1)	Dr. Katrien Van Landeghem – Scientist (Uni. Bangor)
Brendan Barry - – Chief Engineer/Bosun (Leg 1)	Slava Sobolev – Scientist (INFOMAR)
Thomas Byrne – 2nd Engineer	Fabio Sacchetti – Scientist (INFOMAR)
Peter Greening – Officer of the Watch	Brian Cohen – Scientist (INFOMAR)
Mark Toner – Officer of the Watch	Vince Kelly – Scientist (INFOMAR)
Philip Gunnip – AB	Conor Ryan – Marine Mammal Observer (UCC)
Martin Goggin – AB	
Ollie Murphy – Cook	*Leg 2*
	Dr. Andy Wheeler – Chief Scientist (UCC)
	Xavier Monteys – Scientist (GSI)
	Mieke Thierens – Scientist (UCC)
	Anna Cole – Scientist (Gaelectric)
	Mark Coughlan – Scientist (UCC)
	Rory O Donnell – Scientist (UCC)
	Cormac Ryan – Scientist (UCC)

Appendix II

Area maps: coverages and sample locations

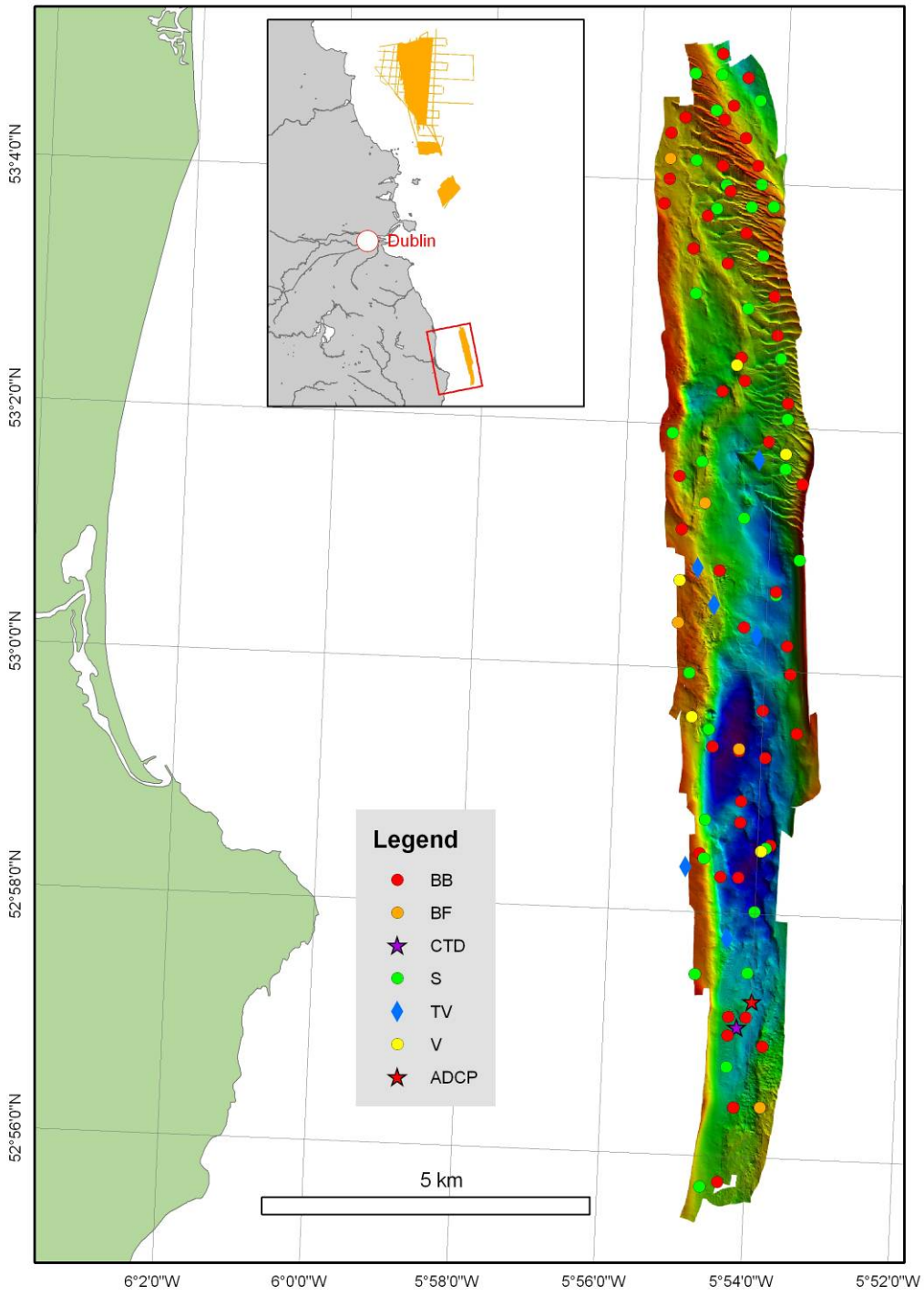


Figure AIIa. Codling Deep stations

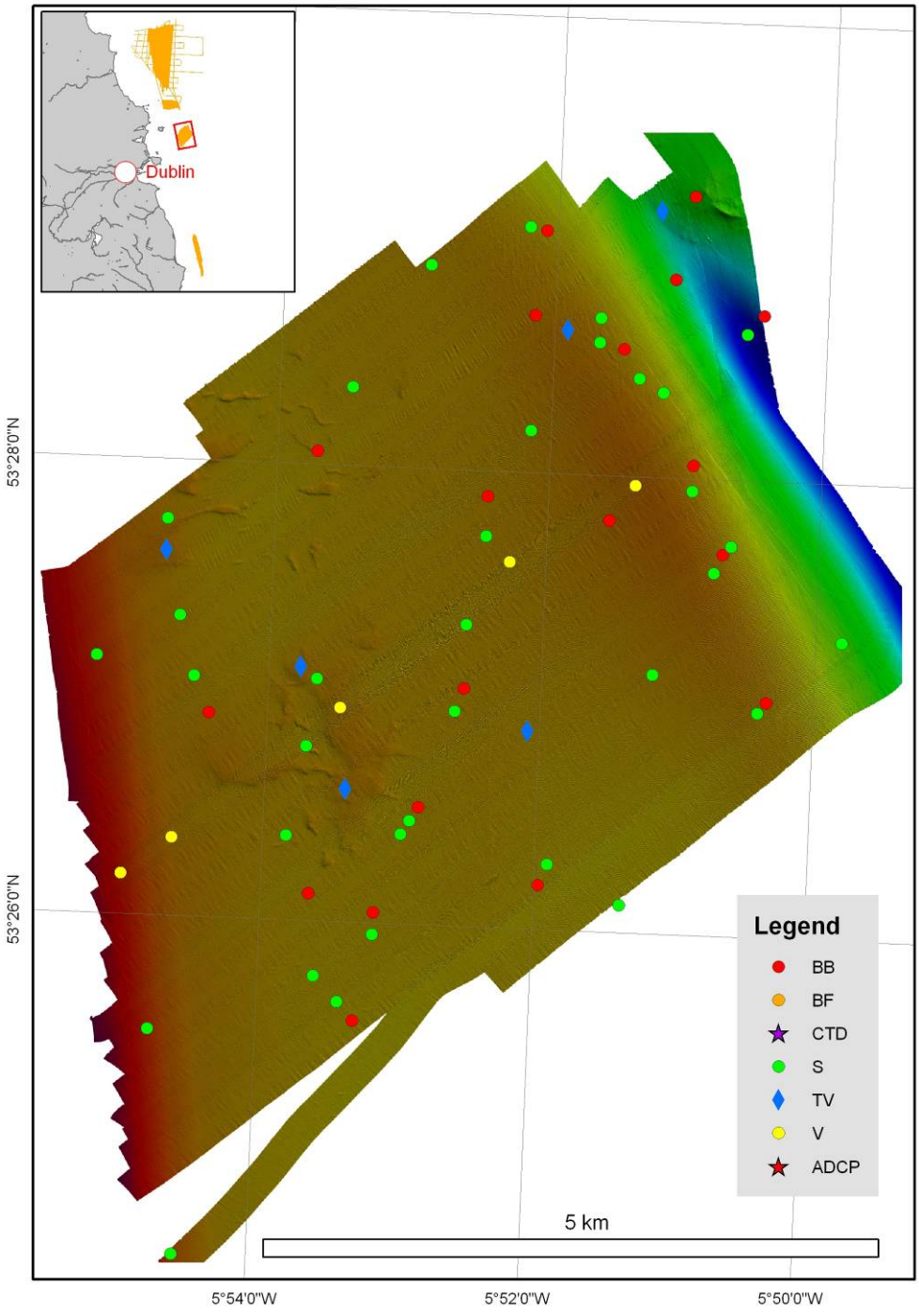


Figure AIIb. Lambay area stations

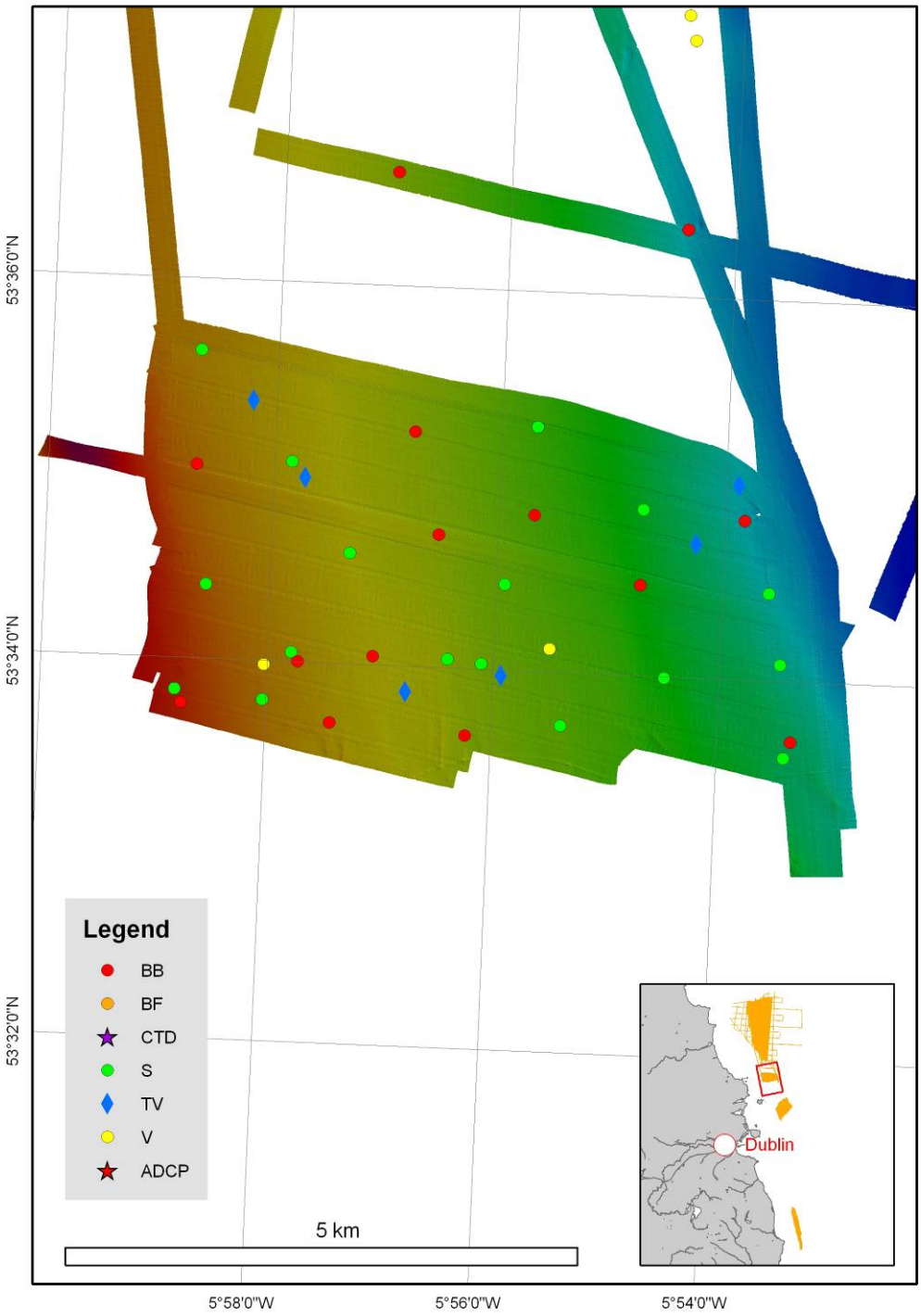


Figure AIIc. Rockabill area stations

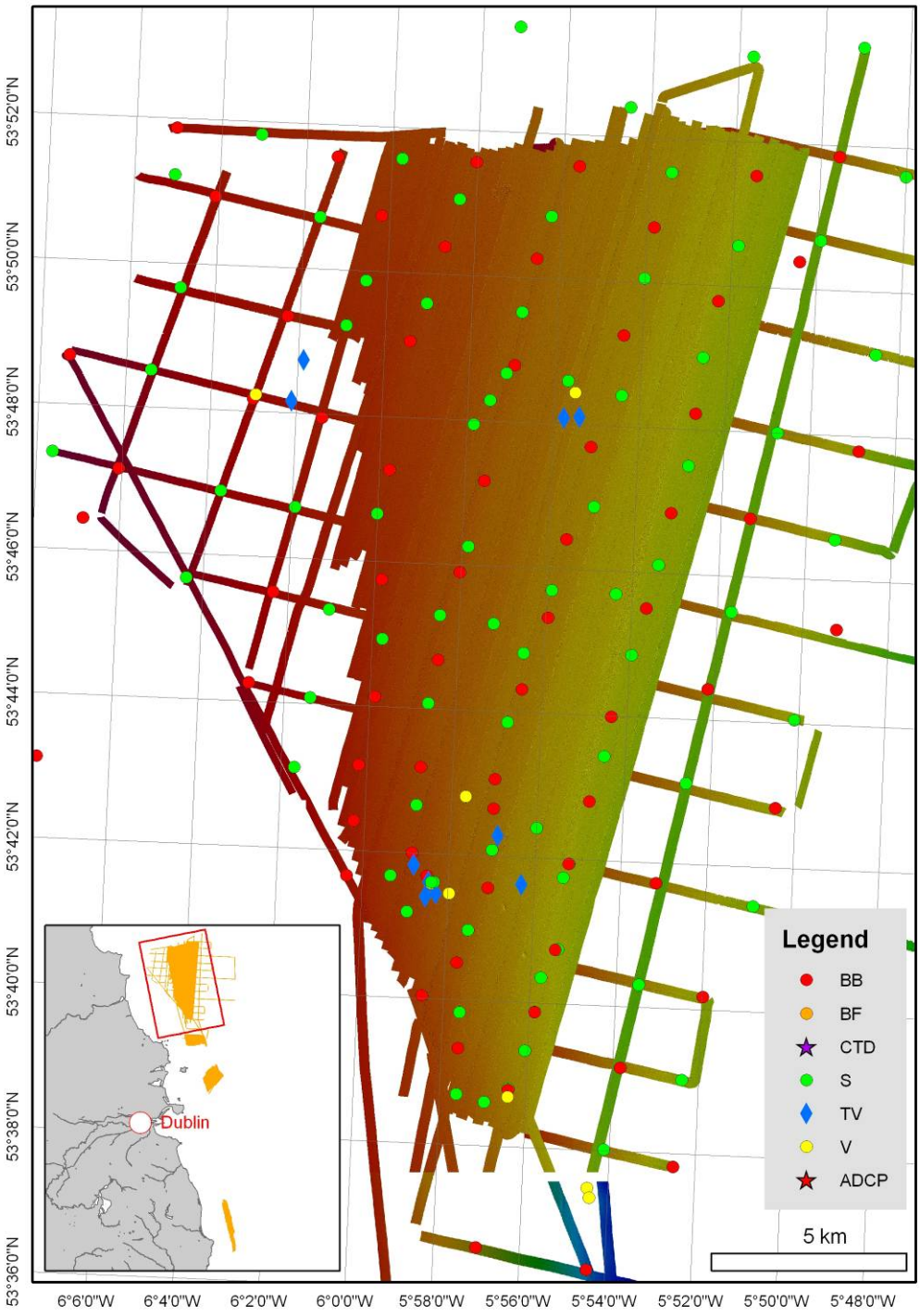


Figure AIId. Northern Mudbelt stations

Appendix III

Multibeam echosounder lines

Survey	Area	LineID	Line_Type	Date-Time SOL	Long_SOL (dd)	Lat_SOL (dd)	Fix_No_SOL	Date-Time EOL	Long_EOL (dd)	Lat_EOL (dd)	Fix_No_EOL
CV09_UCC_ISMA	CODLING_DEEP	1	Mainline	28/09/2009 20:15	-5.913425325	53.08205026	60863	28/09/2009 21:23	-5.909003696	52.92812368	60949
CV09_UCC_ISMA	CODLING_DEEP	2	Mainline	28/09/2009 21:27	-5.911865043	52.92597396	60950	28/09/2009 22:47	-5.915563839	53.08170829	61037
CV09_UCC_ISMA	CODLING_DEEP	3	Mainline	28/09/2009 22:52	-5.917478641	53.08264587	61038	28/09/2009 23:48	-5.910257336	52.95738617	61108
CV09_UCC_ISMA	CODLING_DEEP	4	Mainline	29/09/2009 00:10	-5.911976615	52.95550674	61109	29/09/2009 01:07	-5.919361827	53.08430588	61181
CV09_UCC_ISMA	CODLING_DEEP	5	Mainline	29/09/2009 01:11	-5.922270048	53.08501231	61182	29/09/2009 01:56	-5.91509447	52.98496542	61238
CV09_UCC_ISMA	CODLING_DEEP	6	Mainline	29/09/2009 01:59	-5.917188506	52.98268891	61239	29/09/2009 02:40	-5.920638825	53.07566451	61291
CV09_UCC_ISMA	CODLING_DEEP	7	Mainline	29/09/2009 02:44	-5.923454958	53.0766186	61292	29/09/2009 03:15	-5.920339289	53.01951301	61324
CV09_UCC_ISMA	CODLING_DEEP	8	Mainline	29/09/2009 03:18	-5.922189535	53.01671109	61325	29/09/2009 03:40	-5.926020525	53.07545464	61358
CV09_UCC_ISMA	CODLING_DEEP	9	Mainline	29/09/2009 03:48	-5.909687792	53.07791176	61359	29/09/2009 03:58	-5.90613546	53.05830563	61370
CV09_UCC_ISMA	CODLING_DEEP	10	Mainline	29/09/2009 04:09	-5.907719315	53.06147544	61371	29/09/2009 05:16	-5.905129692	52.93085096	61444
CV09_UCC_ISMA	CODLING_DEEP	11	Mainline	29/09/2009 05:18	-5.901566614	52.93152686	61445	29/09/2009 06:00	-5.897904337	53.03379405	61502
CV09_UCC_ISMA	CODLING_DEEP	12	Mainline	29/09/2009 06:02	-5.89453877	53.03359797	61503	29/09/2009 06:25	-5.893416961	52.98329893	61531
CV09_UCC_ISMA	CODLING_DEEP	13	Mainline	29/09/2009 06:27	-5.89024852	52.98490887	61532	29/09/2009 07:10	-5.910976685	53.08179798	61587
CV09_UCC_ISMA	CODLING_DEEP	14	Mainline	29/09/2009 07:16	-5.90899393	53.08257295	61588	29/09/2009 07:40	-5.891317586	53.02858918	61619
CV09_UCC_ISMA	CODLING_DEEP	15	Mainline	29/09/2009 07:52	-5.899819097	52.99907163	61620	29/09/2009 12:07	-5.910779778	53.08233167	61705
CV09_UCC_ISMA	CODLING_DEEP	16	Mainline	29/09/2009 12:20	-5.917102039	53.07347386	61706	29/09/2009 14:37	-5.907185869	52.930468	61786
CV09_UCC_ISMA	CODLING_DEEP	17	Mainline	29/09/2009 14:41	-5.90418821	52.92780199	61787	29/09/2009 15:15	-5.894708857	52.96489487	61809
CV09_UCC_ISMA	CODLING_DEEP	18	Mainline	29/09/2009 15:23	-5.897161532	52.96574076	61810	29/09/2009 15:36	-5.912026193	52.965474	61815
CV09_UCC_ISMA	CODLING_DEEP	19	Mainline	29/09/2009 15:42	-5.913969331	52.96810014	61816	29/09/2009 15:49	-5.914626686	52.97706387	61821
CV09_UCC_ISMA	CODLING_DEEP	20	Mainline	29/09/2009 15:56	-5.914340858	52.97712359	61822	29/09/2009 16:09	-5.896513869	52.97756642	61828
CV09_UCC_ISMA	CODLING_DEEP	21	Mainline	29/09/2009 16:12	-5.893874812	52.9791635	61829	29/09/2009 16:26	-5.888349207	52.99291528	61838
CV09_UCC_ISMA	CODLING_DEEP	22	Mainline	29/09/2009 16:31	-5.891415042	52.99430842	61839	29/09/2009 16:50	-5.918129157	52.99332366	61848
CV09_UCC_ISMA	CODLING_DEEP	23	Mainline	29/09/2009 16:55	-5.919708661	52.99438806	61849	29/09/2009 17:11	-5.919807888	53.01229272	61859
CV09_UCC_ISMA	CODLING_DEEP	24	Mainline	29/09/2009 17:15	-5.919493781	53.01165449	61860	29/09/2009 17:31	-5.899578609	53.01366308	61867
CV09_UCC_ISMA	CODLING_DEEP	25	Mainline	29/09/2009 17:37	-5.894333871	53.01754667	61868	29/09/2009 17:45	-5.891184987	53.02815457	61874
CV09_UCC_ISMA	CODLING_DEEP	26	Mainline	29/09/2009 17:48	-5.894055695	53.02962527	61875	29/09/2009 18:09	-5.923783705	53.02950415	61885

Survey	Area	LineID	Line_Type	Date-Time SOL	Long_SOL (dd)	Lat_SOL (dd)	Fix_No_SOL	Date-Time EOL	Long_EOL (dd)	Lat_EOL (dd)	Fix_No_EOL
CV09_UCC_ISMA	CODLING_DEEP	27	Mainline	29/09/2009 18:11	-5.925112336	53.03132091	61886	29/09/2009 18:22	-5.925081017	53.04367849	61893
CV09_UCC_ISMA	CODLING_DEEP	28	Mainline	29/09/2009 18:27	-5.922825243	53.04551668	61894	29/09/2009 18:43	-5.899020176	53.04635088	61902
CV09_UCC_ISMA	CODLING_DEEP	29	Mainline	29/09/2009 18:48	-5.896504822	53.04811858	61903	29/09/2009 19:08	-5.90178888	53.06925404	61915
CV09_UCC_ISMA	CODLING_DEEP	30	Mainline	29/09/2009 19:11	-5.90459541	53.07057031	61916	29/09/2009 19:26	-5.928396653	53.07000287	61924
CV09_UCC_ISMA	LAMBAY DEEP	31	Transit	29/09/2009 19:40	-5.937246135	53.07587331	61925	29/09/2009 22:29	-5.880481136	53.43113427	62139
CV09_UCC_ISMA	LAMBAY DEEP	32	Mainline	29/09/2009 23:00	-5.912906888	53.41402093	62140	29/09/2009 23:30	-5.829609352	53.45540642	62176
CV09_UCC_ISMA	LAMBAY DEEP	33	Mainline	29/09/2009 23:32	-5.830811398	53.45703216	62177	29/09/2009 23:59	-5.911810044	53.41688808	62212
CV09_UCC_ISMA	LAMBAY DEEP	34	Mainline	30/09/2009 00:03	-5.915309675	53.41779415	62213	30/09/2009 00:33	-5.834377305	53.45801575	62248
CV09_UCC_ISMA	LAMBAY DEEP	35	Mainline	30/09/2009 00:37	-5.836778092	53.45928786	62249	30/09/2009 01:04	-5.915275778	53.42012826	62283
CV09_UCC_ISMA	LAMBAY DEEP	36	Mainline	30/09/2009 01:07	-5.916402335	53.42214063	62284	30/09/2009 01:36	-5.838005997	53.46136583	62318
CV09_UCC_ISMA	LAMBAY DEEP	37	Mainline	30/09/2009 01:39	-5.840535209	53.46263606	62319	30/09/2009 02:05	-5.916746845	53.42466458	62352
CV09_UCC_ISMA	LAMBAY DEEP	38	Mainline	30/09/2009 02:09	-5.916267149	53.42793946	62353	30/09/2009 02:35	-5.84202925	53.46446534	62385
CV09_UCC_ISMA	LAMBAY DEEP	39	Mainline	30/09/2009 02:37	-5.842717079	53.46660653	62386	30/09/2009 03:04	-5.916863872	53.4299156	62418
CV09_UCC_ISMA	LAMBAY DEEP	40	Mainline	30/09/2009 03:07	-5.916320567	53.4326569	62419	30/09/2009 03:31	-5.844603194	53.46829734	62450
CV09_UCC_ISMA	LAMBAY DEEP	41	Mainline	30/09/2009 03:34	-5.844840266	53.47037215	62451	30/09/2009 04:01	-5.916859139	53.43501509	62482
CV09_UCC_ISMA	LAMBAY DEEP	42	Mainline	30/09/2009 04:04	-5.918199912	53.43690885	62483	30/09/2009 04:28	-5.84648631	53.47258402	62514
CV09_UCC_ISMA	LAMBAY DEEP	43	Mainline	30/09/2009 04:30	-5.845998273	53.47524588	62515	30/09/2009 04:56	-5.917846834	53.43969202	62546
CV09_UCC_ISMA	LAMBAY DEEP	44	Mainline	30/09/2009 04:59	-5.92053505	53.44085981	62547	30/09/2009 05:24	-5.846525964	53.47769533	62579
CV09_UCC_ISMA	LAMBAY DEEP	45	Mainline	30/09/2009 05:26	-5.847780503	53.47957879	62580	30/09/2009 05:52	-5.919549468	53.44398225	62611
CV09_UCC_ISMA	LAMBAY DEEP	46	Mainline	30/09/2009 05:56	-5.920325911	53.44618	62612	30/09/2009 06:21	-5.848579369	53.48185126	62643
CV09_UCC_ISMA	LAMBAY DEEP	47	Mainline	30/09/2009 06:23	-5.84833164	53.4844834	62644	30/09/2009 06:50	-5.922386261	53.44771746	62676
CV09_UCC_ISMA	LAMBAY DEEP	48	Mainline	30/09/2009 06:52	-5.922976591	53.44984735	62677	30/09/2009 07:18	-5.849192732	53.48680092	62709
CV09_UCC_ISMA	LAMBAY DEEP	49	Mainline	30/09/2009 07:24	-5.859722731	53.48733855	62710	30/09/2009 07:48	-5.923735655	53.45464114	62738
CV09_UCC_ISMA	LAMBAY DEEP	50	Mainline	30/09/2009 07:52	-5.924641335	53.45703417	62739	30/09/2009 08:11	-5.869059169	53.4845619	62763
CV09_UCC_ISMA	LAMBAY DEEP	51	Mainline	30/09/2009 08:15	-5.871581243	53.48615292	62764	30/09/2009 08:28	-5.90597455	53.46869716	62779
CV09_UCC_ISMA	LAMBAY DEEP	52	Mainline	30/09/2009 08:32	-5.909945058	53.46981171	62780	30/09/2009 08:40	-5.886831213	53.48130742	62790
CV09_UCC_ISMA	LAMBAY DEEP	53	Mainline	30/09/2009 09:25	-5.852276565	53.48752393	62791	30/09/2009 10:16	-5.921707099	53.45301958	62821
CV09_UCC_ISMA	LAMBAY DEEP	54	Mainline	30/09/2009 10:31	-5.919502492	53.44368261	62822	30/09/2009 11:23	-5.848051104	53.47950163	62853
CV09_UCC_ISMA	LAMBAY DEEP	55	Mainline	30/09/2009 11:33	-5.842996	53.47299748	62854	30/09/2009 12:25	-5.919132468	53.43496868	62887

Survey	Area	LineID	Line_Type	Date-Time SOL	Long_SOL (dd)	Lat_SOL (dd)	Fix_No_SOL	Date-Time EOL	Long_EOL (dd)	Lat_EOL (dd)	Fix_No_EOL
CV09_UCC_ISMA	LAMBAY DEEP	56	Mainline	30/09/2009 12:37	-5.917037579	53.4254406	62888	30/09/2009 13:31	-5.841077359	53.46359978	62921
CV09_UCC_ISMA	LAMBAY DEEP	57	Mainline	30/09/2009 13:42	-5.832099367	53.45761688	62922	30/09/2009 14:39	-5.913108302	53.41748	62957
CV09_UCC_ISMA	LAMBAY DEEP	58	Mainline	30/09/2009 14:57	-5.891712664	53.41602313	62958	30/09/2009 15:22	-5.920375689	53.43906854	62974
CV09_UCC_ISMA	LAMBAY DEEP	59	Mainline	30/09/2009 15:25	-5.922238338	53.44288572	62975	30/09/2009 15:39	-5.926244833	53.45705261	62983
CV09_UCC_ISMA	LAMBAY DEEP	60	Mainline	30/09/2009 15:46	-5.919014306	53.4602752	62984	30/09/2009 16:22	-5.878868583	53.42884506	63006
CV09_UCC_ISMA	LAMBAY DEEP	61	Mainline	30/09/2009 16:34	-5.861504003	53.4375366	63007	30/09/2009 17:09	-5.90357856	53.47035183	63030
CV09_UCC_ISMA	LAMBAY DEEP	62	Mainline	30/09/2009 17:27	-5.890359162	53.48225979	63031	30/09/2009 18:07	-5.844705832	53.44654009	63056
CV09_UCC_ISMA	LAMBAY DEEP	63	Mainline	30/09/2009 18:20	-5.827414529	53.45538997	63057	30/09/2009 18:53	-5.865879569	53.4853481	63078
CV09_UCC_ISMA	DUNDALK BAY	64	Transit	30/09/2009 19:09	-5.874993996	53.49933523	63079	30/09/2009 21:31	-5.950907781	53.85764351	63280
CV09_UCC_ISMA	DUNDALK BAY	65	Mainline	30/09/2009 22:03	-5.996873316	53.86307612	63281	30/09/2009 23:00	-6.046436318	53.74278467	63350
CV09_UCC_ISMA	DUNDALK BAY	66	Mainline	30/09/2009 23:25	-6.007205559	53.70305284	63351	01/10/2009 00:45	-5.942145526	53.86171727	63388
CV09_UCC_ISMA	DUNDALK BAY	67	Mainline	01/10/2009 00:49	-5.945062466	53.86249281	63443	01/10/2009 01:59	-6.008016592	53.70702369	63532
CV09_UCC_ISMA	DUNDALK BAY	68	Mainline	01/10/2009 02:04	-6.012364068	53.71057361	63533	01/10/2009 02:55	-5.974085966	53.80854015	63589
CV09_UCC_ISMA	DUNDALK BAY	69	Mainline	01/10/2009 03:01	-5.973643037	53.8060798	63590	01/10/2009 03:24	-5.954846515	53.85329133	63617
CV09_UCC_ISMA	DUNDALK BAY	70	Mainline	01/10/2009 03:26	-5.957414811	53.8549991	63618	01/10/2009 04:20	-6.004106738	53.7397174	63684
CV09_UCC_ISMA	DUNDALK BAY	71	Mainline	01/10/2009 04:23	-6.006700644	53.74113024	63685	01/10/2009 05:18	-5.957727665	53.86165597	63754
CV09_UCC_ISMA	DUNDALK BAY	72	Mainline	01/10/2009 05:21	-5.961221031	53.86083722	63755	01/10/2009 06:09	-6.003059313	53.75774497	63814
CV09_UCC_ISMA	DUNDALK BAY	73	Mainline	01/10/2009 06:17	-6.007022782	53.75556542	63815	01/10/2009 07:05	-5.963763438	53.86213291	63876
CV09_UCC_ISMA	DUNDALK BAY	74	Mainline	01/10/2009 07:56	-5.943830848	53.8728157	63877	01/10/2009 10:18	-6.007594702	53.71558517	63967
CV09_UCC_ISMA	DUNDALK BAY	75	Mainline	01/10/2009 10:53	-6.04001072	53.72714532	63968	01/10/2009 12:56	-5.978416382	53.86235389	64046
CV09_UCC_ISMA	DUNDALK BAY	76	Mainline	01/10/2009 13:01	-5.980201527	53.86608912	64047	01/10/2009 13:51	-6.086396196	53.86436684	64082
CV09_UCC_ISMA	DUNDALK BAY	77	Mainline	01/10/2009 14:02	-6.095924704	53.85264771	64083	01/10/2009 17:55	-5.669954259	53.80264167	64226
CV09_UCC_ISMA	DUNDALK BAY	78	Mainline	01/10/2009 18:09	-5.671066136	53.80206136	64227	01/10/2009 19:07	-5.685498572	53.73794445	64263
CV09_UCC_ISMA	DUNDALK BAY	79	Mainline	01/10/2009 19:13	-5.694608321	53.73779722	64264	01/10/2009 23:13	-6.125708597	53.78881019	64409
CV09_UCC_ISMA	DUNDALK BAY	80	Mainline	01/10/2009 23:56	-6.073683458	53.76239517	64410	01/10/2009 02:07	-5.832795875	53.73427383	64491
CV09_UCC_ISMA	DUNDALK BAY	81	Mainline	02/10/2009 02:13	-5.826107172	53.73102871	64492	02/10/2009 02:28	-5.832227837	53.71527452	64501
CV09_UCC_ISMA	DUNDALK BAY	82	Mainline	02/10/2009 02:33	-5.837458069	53.71277922	64502	02/10/2009 04:27	-6.048408329	53.73771625	64573
CV09_UCC_ISMA	DUNDALK BAY	83	Mainline	02/10/2009 04:30	-6.050140494	53.73614759	64574	02/10/2009 04:51	-6.029606645	53.71414339	64588
CV09_UCC_ISMA	DUNDALK BAY	84	Mainline	02/10/2009 04:55	-6.025759234	53.71145733	64589	02/10/2009 07:47	-5.705061067	53.67372118	64697

Survey	Area	LineID	Line_Type	Date-Time SOL	Long_SOL (dd)	Lat_SOL (dd)	Fix_No_SOL	Date-Time EOL	Long_EOL (dd)	Lat_EOL (dd)	Fix_No_EOL
CV09_UCC_ISMA	DUNDALK BAY	85	Mainline	02/10/2009 09:21	-6.002946889	53.70410487	64698	02/10/2009 09:42	-5.983778072	53.75125524	64725
CV09_UCC_ISMA	DUNDALK BAY	86	Infill	02/10/2009 09:48	-5.986959757	53.75526877	64726	02/10/2009 09:55	-5.9920425	53.74120081	64734
CV09_UCC_ISMA	DUNDALK BAY	87	Infill	02/10/2009 10:04	-5.983787733	53.7514325	64735	02/10/2009 10:57	-5.938891885	53.86149101	64798
CV09_UCC_ISMA	DUNDALK BAY	88	Infill	02/10/2009 11:04	-5.950917376	53.8634599	64799	02/10/2009 11:16	-5.95439011	53.86204376	64812
CV09_UCC_ISMA	DUNDALK BAY	89	Mainline	02/10/2009 11:40	-5.96719583	53.86221593	64813	02/10/2009 12:25	-6.004462963	53.76964803	64866
CV09_UCC_ISMA	DUNDALK BAY	90	Mainline	02/10/2009 12:29	-6.007615407	53.76842862	64867	02/10/2009 13:21	-5.970426578	53.86105795	64920
CV09_UCC_ISMA	DUNDALK BAY	91	Mainline	02/10/2009 13:26	-5.972972493	53.8624168	64921	02/10/2009 14:15	-6.012061257	53.76635227	64976
CV09_UCC_ISMA	DUNDALK BAY	92	Mainline	02/10/2009 14:20	-6.015348247	53.76528378	64977	02/10/2009 15:17	-5.975780657	53.86311412	65033
CV09_UCC_ISMA	DUNDALK BAY	93	Mainline	02/10/2009 15:22	-5.98170597	53.86408888	65034	02/10/2009 15:55	-6.004992959	53.80641037	65067
CV09_UCC_ISMA	DUNDALK BAY	94	Mainline	02/10/2009 16:06	-6.007446214	53.79297629	65068	02/10/2009 16:31	-5.989447306	53.83660056	65093
CV09_UCC_ISMA	DUNDALK BAY	95	Mainline	02/10/2009 16:45	-5.985785994	53.86171322	65094	02/10/2009 17:16	-6.00683367	53.80928333	65124
CV09_UCC_ISMA	DUNDALK BAY	96	Mainline	02/10/2009 17:19	-6.010315912	53.80767948	65125	02/10/2009 17:50	-5.987537173	53.86357845	65157
CV09_UCC_ISMA	DUNDALK BAY	97	Mainline	02/10/2009 17:54	-5.990217041	53.86340803	65158	02/10/2009 18:19	-6.007914763	53.81972702	65183
CV09_UCC_ISMA	DUNDALK BAY	98	Mainline	02/10/2009 18:23	-6.011186122	53.81794868	65184	02/10/2009 18:47	-5.993043428	53.86339223	65210
CV09_UCC_ISMA	DUNDALK BAY	99	Mainline	02/10/2009 18:51	-5.995302192	53.86389521	65211	02/10/2009 19:17	-6.013665514	53.81846869	65237
CV09_UCC_ISMA	DUNDALK BAY	100	Mainline	02/10/2009 19:23	-6.019661517	53.81845487	65238	02/10/2009 19:50	-5.999999673	53.86367127	65264
CV09_UCC_ISMA	DUNDALK BAY	101	Mainline	02/10/2009 19:55	-5.987993075	53.86473637	65265	02/10/2009 20:12	-5.937392531	53.86422077	65282
CV09_UCC_ISMA	DUNDALK BAY	102	Mainline	02/10/2009 20:14	-5.935369073	53.8631912	65283	02/10/2009 21:49	-6.001929825	53.69895906	65377
CV09_UCC_ISMA	DUNDALK BAY	103	Mainline	02/10/2009 21:54	-6.000697303	53.69471098	65378	02/10/2009 23:29	-5.931697959	53.86409551	65475
CV09_UCC_ISMA	DUNDALK BAY	104	Mainline	04/10/2009 08:08	-5.999305335	53.58465035	65476	04/10/2009 09:10	-5.883792363	53.57108939	65515
CV09_UCC_ISMA	DUNDALK BAY	105	Mainline	04/10/2009 09:15	-5.876069054	53.57318355	65516	04/10/2009 09:34	-5.861533756	53.59681683	65530
CV09_UCC_ISMA	DUNDALK BAY	106	Mainline	04/10/2009 09:39	-5.868257598	53.60071488	65531	04/10/2009 10:34	-5.969257427	53.61190863	65565
CV09_UCC_ISMA	DUNDALK BAY	107	Mainline	04/10/2009 10:39	-5.973638372	53.61477047	65566	04/10/2009 11:31	-5.9783768	53.66844283	65597
CV09_UCC_ISMA	DUNDALK BAY	108	Mainline	04/10/2009 11:35	-5.978095643	53.67251703	65598	04/10/2009 11:52	-5.971178765	53.69000218	65608
CV09_UCC_ISMA	DUNDALK BAY	109	Mainline	04/10/2009 12:29	-5.973743368	53.68463926	65609	04/10/2009 15:20	-5.896679249	53.87317816	65717
CV09_UCC_ISMA	DUNDALK BAY	110	Mainline	04/10/2009 15:23	-5.894809451	53.87661505	65718	04/10/2009 15:40	-5.860554744	53.88404005	65730
CV09_UCC_ISMA	DUNDALK BAY	111	Mainline	04/10/2009 15:43	-5.859262343	53.88174403	65731	04/10/2009 20:26	-5.968823706	53.56125601	65913
CV09_UCC_ISMA	DUNDALK BAY	112	Mainline	04/10/2009 20:32	-5.966033598	53.55740901	65914	04/10/2009 20:49	-5.928656835	53.56443216	65927
CV09_UCC_ISMA	DUNDALK BAY	113	Mainline	04/10/2009 20:52	-5.925654137	53.56731417	65928	05/10/2009 01:49	-5.817873189	53.88797292	66110
CV09_UCC_ISMA	DUNDALK BAY	114	Mainline	05/10/2009 02:45	-5.907936252	53.87302053	66111	05/10/2009 03:50	-5.782463893	53.85906787	66153

Survey	Area	LineID	Line_Type	Date-Time SOL	Long_SOL (dd)	Lat_SOL (dd)	Fix_No_SOL	Date-Time EOL	Long_EOL (dd)	Lat_EOL (dd)	Fix_No_EOL
CV09_UCC_ISMA	DUNDALK BAY	115	Mainline	05/10/2009 03:53	-5.778816798	53.85666155	66154	05/10/2009 04:05	-5.781836895	53.84240802	66162
CV09_UCC_ISMA	DUNDALK BAY	116	Mainline	05/10/2009 04:08	-5.785560221	53.83979503	66163	05/10/2009 05:59	-5.994386198	53.86374209	66233
CV09_UCC_ISMA	DUNDALK BAY	117	Mainline	05/10/2009 06:14	-6.01952752	53.85982511	66234	05/10/2009 07:47	-6.072138988	53.76038868	66292
CV09_UCC_ISMA	DUNDALK BAY	118	Mainline	05/10/2009 07:51	-6.078773053	53.75934827	66293	05/10/2009 08:10	-6.106231853	53.7735006	66305
CV09_UCC_ISMA	DUNDALK BAY	119	Mainline	05/10/2009 08:12	-6.106723085	53.77585699	66306	05/10/2009 09:25	-6.064238119	53.85456776	66352
CV09_UCC_ISMA	DUNDALK BAY	120	Mainline	05/10/2009 10:00	-6.09612228	53.8292827	66353	05/10/2009 12:40	-5.792347608	53.7938467	66455
CV09_UCC_ISMA	DUNDALK BAY	121	Mainline	05/10/2009 12:45	-5.788611978	53.79086729	66456	05/10/2009 13:01	-5.799047128	53.77413318	66466
CV09_UCC_ISMA	DUNDALK BAY	122	Mainline	05/10/2009 13:04	-5.802321207	53.77381119	66467	05/10/2009 16:09	-6.120416255	53.81228238	66574
CV09_UCC_ISMA	DUNDALK BAY	123	Mainline	05/10/2009 16:17	-6.122079546	53.81051703	66575	05/10/2009 17:15	-5.997016974	53.68532533	66656
CV09_UCC_ISMA	DUNDALK BAY	124	Mainline	05/10/2009 17:32	-5.997942859	53.68448384	66657	05/10/2009 18:42	-5.867238088	53.66947227	66701
CV09_UCC_ISMA	DUNDALK BAY	125	Mainline	05/10/2009 18:46	-5.864471854	53.66747287	66702	05/10/2009 19:00	-5.867338227	53.65321365	66710
CV09_UCC_ISMA	DUNDALK BAY	126	Mainline	05/10/2009 19:04	-5.871133856	53.65005115	66711	05/10/2009 19:58	-5.972066575	53.66170089	66745
CV09_UCC_ISMA	DUNDALK BAY	127	Mainline	05/10/2009 20:01	-5.975822505	53.66097797	66746	05/10/2009 20:17	-5.980217754	53.64504697	66755
CV09_UCC_ISMA	DUNDALK BAY	128	Mainline	05/10/2009 20:21	-5.978039578	53.64249501	66756	05/10/2009 21:15	-5.877277452	53.63057509	66790
CV09_UCC_ISMA	DUNDALK BAY	129	Mainline	05/10/2009 21:26	-5.870667764	53.62322423	66791	05/10/2009 21:48	-5.894972321	53.58066274	66816
CV09_UCC_ISMA	DUNDALK BAY	130	Mainline	05/10/2009 21:49	-5.897516825	53.58165705	66817	05/10/2009 22:12	-5.978453393	53.59334586	66845
CV09_UCC_ISMA	DUNDALK BAY	131	Mainline	05/10/2009 22:15	-5.983558245	53.59220016	66846	05/10/2009 22:41	-5.900693899	53.58217232	66874
CV09_UCC_ISMA	DUNDALK BAY	132	Mainline	05/10/2009 22:45	-5.894665604	53.57976288	66875	05/10/2009 23:10	-5.983503312	53.59027121	66905
CV09_UCC_ISMA	DUNDALK BAY	133	Mainline	05/10/2009 23:12	-5.983164473	53.58840636	66906	05/10/2009 23:39	-5.894307998	53.57790925	66936
CV09_UCC_ISMA	DUNDALK BAY	134	Mainline	05/10/2009 23:42	-5.895401724	53.57615635	66937	06/10/2009 00:07	-5.981227268	53.5863288	66966
CV09_UCC_ISMA	DUNDALK BAY	135	Mainline	06/10/2009 00:11	-5.981520628	53.58444794	66967	06/10/2009 00:36	-5.892704145	53.57396284	66997
CV09_UCC_ISMA	DUNDALK BAY	136	Mainline	06/10/2009 00:41	-5.892826431	53.57031274	66998	06/10/2009 01:08	-5.98169005	53.58082826	67028
CV09_UCC_ISMA	DUNDALK BAY	137	Mainline	06/10/2009 01:10	-5.982716808	53.57917591	67029	06/10/2009 01:36	-5.890915421	53.56830078	67060
CV09_UCC_ISMA	DUNDALK BAY	138	Mainline	06/10/2009 01:42	-5.888512477	53.56607886	67061	06/10/2009 02:10	-5.980275414	53.5769339	67092
CV09_UCC_ISMA	DUNDALK BAY	139	Mainline	06/10/2009 02:14	-5.981039089	53.57481279	67093	06/10/2009 02:14	-5.981039089	53.57481279	67093
CV09_UCC_ISMA	DUNDALK BAY	140	Mainline	06/10/2009 02:18	-5.983732501	53.57535948	67094	06/10/2009 02:43	-5.888981805	53.56435614	67126
CV09_UCC_ISMA	DUNDALK BAY	141	Mainline	06/10/2009 02:47	-5.889853909	53.56250209	67127	06/10/2009 03:15	-5.981581895	53.57352573	67158
CV09_UCC_ISMA	DUNDALK BAY	142	Mainline	06/10/2009 03:17	-5.98246133	53.57172681	67159	06/10/2009 03:43	-5.887756283	53.56054501	67191
CV09_UCC_ISMA	DUNDALK BAY	143	Mainline	06/10/2009 03:45	-5.888169147	53.55866765	67192	06/10/2009 04:12	-5.982864524	53.56996122	67224
CV09_UCC_ISMA	DUNDALK BAY	144	Mainline	06/10/2009 04:15	-5.98016266	53.56780228	67225	06/10/2009 04:34	-5.915037683	53.56012697	67247

Survey	Area	LineID	Line_Type	Date-Time SOL	Long_SOL (dd)	Lat_SOL (dd)	Fix_No_SOL	Date-Time EOL	Long_EOL (dd)	Lat_EOL (dd)	Fix_No_EOL
CV09_UCC_ISMA	DUNDALK BAY	145	Mainline	06/10/2009 04:36	-5.915438963	53.55829974	67248	06/10/2009 04:55	-5.980574747	53.56605444	67270
CV09_UCC_ISMA	DUNDALK BAY	147	Mainline	06/10/2009 04:57	-5.982574463	53.56446553	67271	06/10/2009 05:10	-5.938216751	53.55910372	67286
CV09_UCC_ISMA	DUNDALK BAY	146	Mainline	06/10/2009 05:12	-5.938015567	53.55738372	67287	06/10/2009 05:25	-5.97943809	53.56226007	67301
CV09_UCC_ISMA	DUNDALK BAY	148	Transit	06/10/2009 05:27	-5.984317826	53.56529795	67302	06/10/2009 06:24	-6.000743542	53.68796396	67371
CV09_UCC_ISMA	DUNDALK BAY	149	Transit	06/10/2009 06:25	-5.999457704	53.69101934	67372	06/10/2009 07:44	-5.929094107	53.86392044	67471
CV09_UCC_ISMA	DUNDALK BAY	150	Transit	06/10/2009 07:52	-5.925818351	53.86422951	67472	06/10/2009 09:25	-5.998392587	53.68608225	67574
CV09_UCC_ISMA	DUNDALK BAY	151	Transit	06/10/2009 09:30	-5.996079597	53.6840415	67575	06/10/2009 11:04	-5.922785652	53.86395685	67678
CV09_UCC_ISMA	DUNDALK BAY	152	Mainline	06/10/2009 11:07	-5.919501632	53.86550445	67679	06/10/2009 12:49	-5.993551432	53.68209157	67784
CV09_UCC_ISMA	DUNDALK BAY	153	Mainline	06/10/2009 12:52	-5.991448267	53.68064456	67785	06/10/2009 14:47	-5.913417558	53.87272481	67895
CV09_UCC_ISMA	DUNDALK BAY	154	Mainline	06/10/2009 14:50	-5.910844663	53.87288992	67896	06/10/2009 16:26	-5.988696298	53.67889937	68007
CV09_UCC_ISMA	DUNDALK BAY	155	Mainline	06/10/2009 16:29	-5.98622	53.67730632	68008	06/10/2009 18:07	-5.910210844	53.86420664	68115
CV09_UCC_ISMA	DUNDALK BAY	156	Mainline	06/10/2009 18:14	-5.906378815	53.86590908	68116	06/10/2009 19:57	-5.984622827	53.67377811	68226
CV09_UCC_ISMA	DUNDALK BAY	157	Mainline	06/10/2009 20:01	-5.982958375	53.67019098	68227	06/10/2009 21:57	-5.901044361	53.87100533	68342
CV09_UCC_ISMA	DUNDALK BAY	158	Mainline	06/10/2009 22:01	-5.894315867	53.87280934	68343	06/10/2009 23:53	-5.976966707	53.66823976	68460
CV09_UCC_ISMA	DUNDALK BAY	159	Mainline	06/10/2009 23:57	-5.975602178	53.66449545	68461	07/10/2009 02:11	-5.891305527	53.87050253	68579
CV09_UCC_ISMA	DUNDALK BAY	160	Mainline	07/10/2009 02:14	-5.888695505	53.86934316	68580	07/10/2009 03:57	-5.973308876	53.66149616	68699
CV09_UCC_ISMA	DUNDALK BAY	161	Mainline	07/10/2009 04:00	-5.970943727	53.65958681	68700	07/10/2009 04:59	-5.924118431	53.77484527	68766
CV09_UCC_ISMA	DUNDALK BAY	162	Mainline	07/10/2009 05:01	-5.921180353	53.77482042	68767	07/10/2009 06:02	-5.96939967	53.65607505	68835
CV09_UCC_ISMA	DUNDALK BAY	163	Mainline	07/10/2009 06:03	-5.96992644	53.6541658	68836	07/10/2009 08:19	-5.949047826	53.34678735	69016
CV09_UCC_ISMA	DUNDALK BAY	164	Transit	07/10/2009 08:20	-5.95017743	53.34489758	69017	07/10/2009 11:03	-5.924295485	53.03426879	69194
CV09_UCC_ISMA	DUNDALK BAY	165	Transit	07/10/2009 12:03	-5.927463792	53.03032032	69195	07/10/2009 16:03	-5.857278744	53.49399824	64362
CV09_UCC_ISMA	DUNDALK BAY	166	Transit	07/10/2009 16:04	-5.860765981	53.49648115	64363	07/10/2009 17:10	-5.98340734	53.59555235	64444
CV09_UCC_ISMA	DUNDALK BAY	167	Mainline	07/10/2009 17:11	-5.982687602	53.59766924	64445	07/10/2009 19:23	-5.880060359	53.867461	64599
CV09_UCC_ISMA	DUNDALK BAY	168	Mainline	07/10/2009 19:27	-5.882171043	53.87021663	64600	07/10/2009 20:15	-5.920687289	53.77593745	64654
CV09_UCC_ISMA	DUNDALK BAY	169	Mainline	07/10/2009 20:19	-5.92458817	53.77415194	64655	07/10/2009 21:04	-5.885783574	53.86837453	64709
CV09_UCC_ISMA	DUNDALK BAY	170	Mainline	07/10/2009 21:09	-5.876601361	53.86916392	64710	07/10/2009 23:05	-5.966015489	53.6490683	64836
CV09_UCC_ISMA	DUNDALK BAY	171	Mainline	07/10/2009 23:07	-5.96418615	53.64859284	64837	08/10/2009 00:50	-5.87344674	53.86838612	64963
CV09_UCC_ISMA	DUNDALK BAY	172	Mainline	08/10/2009 00:53	-5.870831815	53.8686829	64964	08/10/2009 02:38	-5.962709567	53.64158278	65094
CV09_UCC_ISMA	DUNDALK BAY	174	Mainline	08/10/2009 02:40	-5.959915938	53.64123028	65095	08/10/2009 04:39	-5.867918446	53.86650272	65224
CV09_UCC_ISMA	DUNDALK BAY	173	Mainline	08/10/2009 04:42	-5.864686971	53.8663774	65225	08/10/2009 06:37	-5.95683988	53.64114079	65354

Survey	Area	LineID	Line_Type	Date-Time SOL	Long_SOL (dd)	Lat_SOL (dd)	Fix_No_SOL	Date-Time EOL	Long_EOL (dd)	Lat_EOL (dd)	Fix_No_EOL
CV09_UCC_ISMA	DUNDALK BAY	175	Mainline	08/10/2009 06:41	-5.953035566	53.64142127	65355	08/10/2009 08:35	-5.861348398	53.86667689	65484
CV09_UCC_ISMA	DUNDALK BAY	176	Mainline	08/10/2009 08:38	-5.857417577	53.86825286	65485	08/10/2009 10:40	-5.950725809	53.63952601	65616
CV09_UCC_ISMA	DUNDALK BAY	177	Mainline	08/10/2009 10:43	-5.947732304	53.63924632	65617	08/10/2009 12:27	-5.854930464	53.86627159	65747
CV09_UCC_ISMA	DUNDALK BAY	178	Mainline	08/10/2009 12:31	-5.852016817	53.86615145	65748	08/10/2009 14:19	-5.944662364	53.63916021	65878
CV09_UCC_ISMA	DUNDALK BAY	179	Mainline	08/10/2009 14:24	-5.94119953	53.6398868	65879	08/10/2009 16:21	-5.848660064	53.86689764	66009
CV09_UCC_ISMA	DUNDALK BAY	180	Mainline	08/10/2009 16:24	-5.846290578	53.86507944	66010	08/10/2009 18:18	-5.938275871	53.6398034	66139
CV09_UCC_ISMA	DUNDALK BAY	181	Mainline	08/10/2009 18:25	-5.936277099	53.6380963	66140	08/10/2009 20:19	-5.843071264	53.86499796	66270
CV09_UCC_ISMA	DUNDALK BAY	182	Mainline	08/10/2009 21:39	-5.84007446	53.86445878	66271	08/10/2009 22:37	-5.893055701	53.73528057	66345
CV09_UCC_ISMA	DUNDALK BAY	183	Mainline	08/10/2009 22:48	-5.895286757	53.72989775	66345	08/10/2009 22:54	-5.900835198	53.71591689	66353
CV09_UCC_ISMA	DUNDALK BAY	184	Mainline	08/10/2009 23:01	-5.901565161	53.71481499	64227	08/10/2009 23:38	-5.932681896	53.63799559	64271
CV09_UCC_ISMA	DUNDALK BAY	185	Mainline	08/10/2009 23:46	-5.931205161	53.63963062	64272	09/10/2009 00:29	-5.881313615	53.5556411	64322
CV09_UCC_ISMA	DUNDALK BAY	186	Mainline	09/10/2009 00:38	-5.877040589	53.53651402	64323	09/10/2009 01:37	-5.869073849	53.4307397	64394
CV09_UCC_ISMA	DUNDALK BAY	187	Mainline	09/10/2009 02:08	-5.919830445	53.42569934	64395	09/10/2009 02:45	-6.060500234	53.39456406	64445
CV09_UCC_ISMA	DUNDALK BAY	188	Mainline	09/10/2009 02:48	-6.067130409	53.39553269	64446	09/10/2009 02:52	-6.067560968	53.39207053	64448

Appendix IV

Sparker seismic lines

Survey	Area	LineID	Line_Type	Date-Time SOL	Long_SOL (dd)	Lat_SOL (dd)	Fix_No_SOL	Date-Time EOL	Long_EOL (dd)	Lat_EOL (dd)	Fix_No_EOL
CV09_UCC_ISMA	CODLING_DEEP	15	Sparker	29/09/2009 07:52	-5.899819097	52.99907163	61620	29/09/2009 12:07	-5.910779778	53.08233167	61705
CV09_UCC_ISMA	CODLING_DEEP	16	Sparker	29/09/2009 12:20	-5.917102039	53.07347386	61706	29/09/2009 14:37	-5.907185869	52.930468	61786
CV09_UCC_ISMA	CODLING_DEEP	17	Sparker	29/09/2009 14:41	-5.90418821	52.92780199	61787	29/09/2009 15:15	-5.894708857	52.96489487	61809
CV09_UCC_ISMA	CODLING_DEEP	18	Sparker	29/09/2009 15:23	-5.897161532	52.96574076	61810	29/09/2009 15:36	-5.912026193	52.965474	61815
CV09_UCC_ISMA	CODLING_DEEP	19	Sparker	29/09/2009 15:42	-5.913969331	52.96810014	61816	29/09/2009 15:49	-5.914626686	52.97706387	61821
CV09_UCC_ISMA	CODLING_DEEP	20	Sparker	29/09/2009 15:56	-5.914340858	52.97712359	61822	29/09/2009 16:09	-5.896513869	52.97756642	61828
CV09_UCC_ISMA	CODLING_DEEP	21	Sparker	29/09/2009 16:12	-5.893874812	52.9791635	61829	29/09/2009 16:26	-5.888349207	52.99291528	61838
CV09_UCC_ISMA	CODLING_DEEP	22	Sparker	29/09/2009 16:31	-5.891415042	52.99430842	61839	29/09/2009 16:50	-5.918129157	52.99332366	61848
CV09_UCC_ISMA	CODLING_DEEP	23	Sparker	29/09/2009 16:55	-5.919708661	52.99438806	61849	29/09/2009 17:11	-5.919807888	53.01229272	61859
CV09_UCC_ISMA	CODLING_DEEP	24	Sparker	29/09/2009 17:15	-5.919493781	53.01165449	61860	29/09/2009 17:31	-5.899578609	53.01366308	61867
CV09_UCC_ISMA	CODLING_DEEP	25	Sparker	29/09/2009 17:37	-5.894333871	53.01754667	61868	29/09/2009 17:45	-5.891184987	53.02815457	61874
CV09_UCC_ISMA	CODLING_DEEP	26	Sparker	29/09/2009 17:48	-5.894055695	53.02962527	61875	29/09/2009 18:09	-5.923783705	53.02950415	61885
CV09_UCC_ISMA	CODLING_DEEP	27	Sparker	29/09/2009 18:11	-5.925112336	53.03132091	61886	29/09/2009 18:22	-5.925081017	53.04367849	61893
CV09_UCC_ISMA	CODLING_DEEP	28	Sparker	29/09/2009 18:27	-5.922825243	53.04551668	61894	29/09/2009 18:43	-5.899020176	53.04635088	61902
CV09_UCC_ISMA	LAMBAY DEEP	31	Sparker	29/09/2009 19:40	-5.937246135	53.07587331	61925	29/09/2009 22:29	-5.880481136	53.43113427	62139
CV09_UCC_ISMA	LAMBAY DEEP	32	Sparker	29/09/2009 23:00	-5.912906888	53.41402093	62140	29/09/2009 23:30	-5.829609352	53.45540642	62176
CV09_UCC_ISMA	LAMBAY DEEP	33	Sparker	29/09/2009 23:32	-5.830811398	53.45703216	62177	29/09/2009 23:59	-5.911810044	53.41688808	62212
CV09_UCC_ISMA	LAMBAY DEEP	34	Sparker	30/09/2009 00:03	-5.915309675	53.41779415	62213	30/09/2009 00:33	-5.834377305	53.45801575	62248
CV09_UCC_ISMA	LAMBAY DEEP	35	Sparker	30/09/2009 00:37	-5.836778092	53.45928786	62249	30/09/2009 01:04	-5.915275778	53.42012826	62283
CV09_UCC_ISMA	LAMBAY DEEP	36	Sparker	30/09/2009 01:07	-5.916402335	53.42214063	62284	30/09/2009 01:36	-5.838005997	53.46136583	62318
CV09_UCC_ISMA	LAMBAY DEEP	37	Sparker	30/09/2009 01:39	-5.840535209	53.46263606	62319	30/09/2009 02:05	-5.916746845	53.42466458	62352
CV09_UCC_ISMA	LAMBAY DEEP	38	Sparker	30/09/2009 02:09	-5.916267149	53.42793946	62353	30/09/2009 02:35	-5.84202925	53.46446534	62385
CV09_UCC_ISMA	LAMBAY DEEP	39	Sparker	30/09/2009 02:37	-5.842717079	53.46660653	62386	30/09/2009 03:04	-5.916863872	53.4299156	62418
CV09_UCC_ISMA	LAMBAY DEEP	40	Sparker	30/09/2009 03:07	-5.916320567	53.4326569	62419	30/09/2009 03:31	-5.844603194	53.46829734	62450
CV09_UCC_ISMA	LAMBAY DEEP	41	Sparker	30/09/2009 03:34	-5.844840266	53.47037215	62451	30/09/2009 04:01	-5.916859139	53.43501509	62482

Survey	Area	LineID	Line_Type	Date-Time SOL	Long_SOL (dd)	Lat_SOL (dd)	Fix_No_SOL	Date-Time EOL	Long_EOL (dd)	Lat_EOL (dd)	Fix_No_EOL
CV09_UCC_ISMA	LAMBAY DEEP	42	Sparker	30/09/2009 04:04	-5.918199912	53.43690885	62483	30/09/2009 04:28	-5.84648631	53.47258402	62514
CV09_UCC_ISMA	LAMBAY DEEP	43	Sparker	30/09/2009 04:30	-5.845998273	53.47524588	62515	30/09/2009 04:56	-5.917846834	53.43969202	62546
CV09_UCC_ISMA	LAMBAY DEEP	44	Sparker	30/09/2009 04:59	-5.92053505	53.44085981	62547	30/09/2009 05:24	-5.846525964	53.47769533	62579
CV09_UCC_ISMA	LAMBAY DEEP	45	Sparker	30/09/2009 05:26	-5.847780503	53.47957879	62580	30/09/2009 05:52	-5.919549468	53.44398225	62611
CV09_UCC_ISMA	LAMBAY DEEP	46	Sparker	30/09/2009 05:56	-5.920325911	53.44618	62612	30/09/2009 06:21	-5.848579369	53.48185126	62643
CV09_UCC_ISMA	LAMBAY DEEP	47	Sparker	30/09/2009 06:23	-5.84833164	53.4844834	62644	30/09/2009 06:50	-5.922386261	53.44771746	62676
CV09_UCC_ISMA	LAMBAY DEEP	48	Sparker	30/09/2009 06:52	-5.922976591	53.44984735	62677	30/09/2009 07:18	-5.849192732	53.48680092	62709
CV09_UCC_ISMA	LAMBAY DEEP	49	Sparker	30/09/2009 07:24	-5.859722731	53.48733855	62710	30/09/2009 07:48	-5.923735655	53.45464114	62738
CV09_UCC_ISMA	LAMBAY DEEP	50	Sparker	30/09/2009 07:52	-5.924641335	53.45703417	62739	30/09/2009 08:11	-5.869059169	53.4845619	62763
CV09_UCC_ISMA	LAMBAY DEEP	51	Sparker	30/09/2009 08:15	-5.871581243	53.48615292	62764	30/09/2009 08:28	-5.90597455	53.46869716	62779
CV09_UCC_ISMA	LAMBAY DEEP	52	Sparker	30/09/2009 08:32	-5.909945058	53.46981171	62780	30/09/2009 08:40	-5.886831213	53.48130742	62790
CV09_UCC_ISMA	LAMBAY DEEP	53	Sparker	30/09/2009 09:25	-5.852276565	53.48752393	62791	30/09/2009 10:16	-5.921707099	53.45301958	62821
CV09_UCC_ISMA	LAMBAY DEEP	54	Sparker	30/09/2009 10:31	-5.919502492	53.44368261	62822	30/09/2009 11:23	-5.848051104	53.47950163	62853
CV09_UCC_ISMA	LAMBAY DEEP	55	Sparker	30/09/2009 11:33	-5.842996	53.47299748	62854	30/09/2009 12:25	-5.919132468	53.43496868	62887
CV09_UCC_ISMA	LAMBAY DEEP	56	Sparker	30/09/2009 12:37	-5.917037579	53.4254406	62888	30/09/2009 13:31	-5.841077359	53.46359978	62921
CV09_UCC_ISMA	LAMBAY DEEP	57	Sparker	30/09/2009 13:42	-5.832099367	53.45761688	62922	30/09/2009 14:39	-5.913108302	53.41748	62957
CV09_UCC_ISMA	LAMBAY DEEP	58	Sparker	30/09/2009 14:57	-5.891712664	53.41602313	62958	30/09/2009 15:22	-5.920375689	53.43906854	62974
CV09_UCC_ISMA	LAMBAY DEEP	59	Sparker	30/09/2009 15:25	-5.922238338	53.44288572	62975	30/09/2009 15:39	-5.926244833	53.45705261	62983
CV09_UCC_ISMA	LAMBAY DEEP	60	Sparker	30/09/2009 15:46	-5.919014306	53.4602752	62984	30/09/2009 16:22	-5.878868583	53.42884506	63006
CV09_UCC_ISMA	LAMBAY DEEP	61	Sparker	30/09/2009 16:34	-5.861504003	53.4375366	63007	30/09/2009 17:09	-5.90357856	53.47035183	63030
CV09_UCC_ISMA	LAMBAY DEEP	62	Sparker	30/09/2009 17:27	-5.890359162	53.48225979	63031	30/09/2009 18:07	-5.844705832	53.44654009	63056
CV09_UCC_ISMA	LAMBAY DEEP	63	Sparker	30/09/2009 18:20	-5.827414529	53.45538997	63057	30/09/2009 18:53	-5.865879569	53.4853481	63078
CV09_UCC_ISMA	DUNDALK BAY	74	Sparker	01/10/2009 07:56	-5.943830848	53.8728157	63877	01/10/2009 10:18	-6.007594702	53.71558517	63967
CV09_UCC_ISMA	DUNDALK BAY	75	Sparker	01/10/2009 10:53	-6.04001072	53.72714532	63968	01/10/2009 12:56	-5.978416382	53.86235389	64046
CV09_UCC_ISMA	DUNDALK BAY	76	Sparker	01/10/2009 13:01	-5.980201527	53.86608912	64047	01/10/2009 13:51	-6.086396196	53.86436684	64082
CV09_UCC_ISMA	DUNDALK BAY	77	Sparker	01/10/2009 14:02	-6.095924704	53.85264771	64083	01/10/2009 17:55	-5.669954259	53.80264167	64226
CV09_UCC_ISMA	DUNDALK BAY	78	Sparker	01/10/2009 18:09	-5.671066136	53.80206136	64227	01/10/2009 19:07	-5.685498572	53.73794445	64263
CV09_UCC_ISMA	DUNDALK BAY	79	Sparker	01/10/2009 19:13	-5.694608321	53.73779722	64264	01/10/2009 23:13	-6.125708597	53.78881019	64409
CV09_UCC_ISMA	DUNDALK BAY	80	Sparker	01/10/2009 23:56	-6.073683458	53.76239517	64410	01/10/2009 02:07	-5.832795875	53.73427383	64491

Survey	Area	LineID	Line_Type	Date-Time SOL	Long_SOL (dd)	Lat_SOL (dd)	Fix_No_SOL	Date-Time EOL	Long_EOL (dd)	Lat_EOL (dd)	Fix_No_EOL
CV09_UCC_ISMA	DUNDALK BAY	81	Sparker	02/10/2009 02:13	-5.826107172	53.73102871	64492	02/10/2009 02:28	-5.832227837	53.71527452	64501
CV09_UCC_ISMA	DUNDALK BAY	82	Sparker	02/10/2009 02:33	-5.837458069	53.71277922	64502	02/10/2009 04:27	-6.048408329	53.73771625	64573
CV09_UCC_ISMA	DUNDALK BAY	83	Sparker	02/10/2009 04:30	-6.050140494	53.73614759	64574	02/10/2009 04:51	-6.029606645	53.71414339	64588
CV09_UCC_ISMA	DUNDALK BAY	84	Sparker	02/10/2009 04:55	-6.025759234	53.71145733	64589	02/10/2009 07:47	-5.705061067	53.67372118	64697
CV09_UCC_ISMA	DUNDALK BAY	104	Sparker	04/10/2009 08:08	-5.999305335	53.58465035	65476	04/10/2009 09:10	-5.883792363	53.57108939	65515
CV09_UCC_ISMA	DUNDALK BAY	105	Sparker	04/10/2009 09:15	-5.876069054	53.57318355	65516	04/10/2009 09:34	-5.861533756	53.59681683	65530
CV09_UCC_ISMA	DUNDALK BAY	106	Sparker	04/10/2009 09:39	-5.868257598	53.60071488	65531	04/10/2009 10:34	-5.969257427	53.61190863	65565
CV09_UCC_ISMA	DUNDALK BAY	107	Sparker	04/10/2009 10:39	-5.973638372	53.61477047	65566	04/10/2009 11:31	-5.9783768	53.66844283	65597
CV09_UCC_ISMA	DUNDALK BAY	108	Sparker	04/10/2009 11:35	-5.978095643	53.67251703	65598	04/10/2009 11:52	-5.971178765	53.69000218	65608
CV09_UCC_ISMA	DUNDALK BAY	109	Sparker	04/10/2009 12:29	-5.973743368	53.68463926	65609	04/10/2009 15:20	-5.896679249	53.87317816	65717
CV09_UCC_ISMA	DUNDALK BAY	110	Sparker	04/10/2009 15:23	-5.894809451	53.87661505	65718	04/10/2009 15:40	-5.860554744	53.88404005	65730
CV09_UCC_ISMA	DUNDALK BAY	111	Sparker	04/10/2009 15:43	-5.859262343	53.88174403	65731	04/10/2009 20:26	-5.968823706	53.56125601	65913
CV09_UCC_ISMA	DUNDALK BAY	112	Sparker	04/10/2009 20:32	-5.966033598	53.55740901	65914	04/10/2009 20:49	-5.928656835	53.56443216	65927
CV09_UCC_ISMA	DUNDALK BAY	113	Sparker	04/10/2009 20:52	-5.925654137	53.56731417	65928	05/10/2009 01:49	-5.817873189	53.88797292	66110
CV09_UCC_ISMA	DUNDALK BAY	114	Sparker	05/10/2009 02:45	-5.907936252	53.87302053	66111	05/10/2009 03:50	-5.782463893	53.85906787	66153
CV09_UCC_ISMA	DUNDALK BAY	115	Sparker	05/10/2009 03:53	-5.778816798	53.85666155	66154	05/10/2009 04:05	-5.781836895	53.84240802	66162
CV09_UCC_ISMA	DUNDALK BAY	116	Sparker	05/10/2009 04:08	-5.785560221	53.83979503	66163	05/10/2009 05:59	-5.994386198	53.86374209	66233
CV09_UCC_ISMA	DUNDALK BAY	117	Sparker	05/10/2009 06:14	-6.01952752	53.85982511	66234	05/10/2009 07:47	-6.072138988	53.76038868	66292
CV09_UCC_ISMA	DUNDALK BAY	118	Sparker	05/10/2009 07:51	-6.078773053	53.75934827	66293	05/10/2009 08:10	-6.106231853	53.7735006	66305
CV09_UCC_ISMA	DUNDALK BAY	119	Sparker	05/10/2009 08:12	-6.106723085	53.77585699	66306	05/10/2009 09:25	-6.064238119	53.85456776	66352
CV09_UCC_ISMA	DUNDALK BAY	120	Sparker	05/10/2009 10:00	-6.09612228	53.8292827	66353	05/10/2009 12:40	-5.792347608	53.7938467	66455
CV09_UCC_ISMA	DUNDALK BAY	121	Sparker	05/10/2009 12:45	-5.788611978	53.79086729	66456	05/10/2009 13:01	-5.799047128	53.77413318	66466
CV09_UCC_ISMA	DUNDALK BAY	122	Sparker	05/10/2009 13:04	-5.802321207	53.77381119	66467	05/10/2009 16:09	-6.120416255	53.81228238	66574
CV09_UCC_ISMA	DUNDALK BAY	123	Sparker	05/10/2009 16:17	-6.122079546	53.81051703	66575	05/10/2009 17:15	-5.997016974	53.68532533	66656
CV09_UCC_ISMA	DUNDALK BAY	124	Sparker	05/10/2009 17:32	-5.997942859	53.68448384	66657	05/10/2009 18:42	-5.867238088	53.66947227	66701
CV09_UCC_ISMA	DUNDALK BAY	125	Sparker	05/10/2009 18:46	-5.864471854	53.66747287	66702	05/10/2009 19:00	-5.867338227	53.65321365	66710
CV09_UCC_ISMA	DUNDALK BAY	126	Sparker	05/10/2009 19:04	-5.871133856	53.65005115	66711	05/10/2009 19:58	-5.972066575	53.66170089	66745
CV09_UCC_ISMA	DUNDALK BAY	127	Sparker	05/10/2009 20:01	-5.975822505	53.66097797	66746	05/10/2009 20:17	-5.980217754	53.64504697	66755
CV09_UCC_ISMA	DUNDALK BAY	128	Sparker	05/10/2009 20:21	-5.978039578	53.64249501	66756	05/10/2009 21:15	-5.877277452	53.63057509	66790

Appendix V

Acoustic doppler current profiler (ADCP) deployment

Type	Date	Time_utc	Lat_dd	Long_dd	Comments
ADCP	29.09.2009	08:21	52.957	-5.901166667	proposed
ADCP	29.09.2009	08:22	52.95601	-5.90135	ADCP at bottom
ADCP	29.09.2009	08:25	52.95517	-5.900691667	weight over board
ADCP	29.09.2009	08:28	52.95468	-5.899858333	Dan buoy in water

Appendix VI

Tide gauge deployments

Type	Area	Date	Time_utc	Lat_dd	Long_dd	Comments
Tide gauge 1	Codling Deep	28.09.2009	19:09	53.0112	-005.9071	deployed
Tide gauge 2	Lambay Area	29.09.2009	22:35	53.4347	-005.8764	deployed
Tide gauge 3	Mudbelt Area	01.10.2009	21:45	53.8579	-005.9513	deployed
Tide gauge 1	Codling Deep	07.10.2009	11:42	53.0112	-005.9071	recovered
Tide gauge 3	Mudbelt Area	08.10.2009	21:00	53.8579	-005.9513	recovered
Tide gauge 2	Lambay Area	09.10.2009	01:55	53.4347	-005.8764	recovered

Appendix VII

Shipek sampler stations S = sediment sample BB = biological sample BF = DNA sample

Station No	Type	Lat		Long		Date	Time	Comments
		Deg	Min	Deg	Min		UTC	
ISMA001	S	53	27.739	5	54.758	10.10.09	18.25	Fine sand - small sample
ISMA002	S	53	27.318	5	54.658	10.10.09	18.35	Fine sand - small sample
ISMA003	S	53	27.055	5	54.550	10.10.09	1.46	Fine sand - small sample
ISMA004	BB	53	26.895	5	54.427	10.10.09	18.53	Fine sand - small sample
ISMA005	S	53	26.371	5	53.837	10.10.09	19.17	Fine sand - small sample
ISMA006	BB	53	26.121	5	53.668	10.10.09	19.31	Fine sand - small sample
ISMA007	S	53	25.760	5	53.554	10.10.09	19.48	Fine sand - small sample
ISMA008	S	53	25.651	5	53.392	10.10.09	19.57	Fine sand - small sample
ISMA009	BB	53	25.571	5	53.282	10.10.09	20.03	Fine sand - small sample
ISMA010	S	53	29.077	5	52.174	10.10.09	20.38	Fine sand - small sample
ISMA011	BB	53	29.063	5	52.068	10.10.09	20.44	Fine sand - small sample
ISMA012	S	53	28.690	5	51.655	10.10.09	21.03	Fine sand - small sample
ISMA013	S	53	28.583	5	51.651	10.10.09	21.11	Fine sand - small sample
ISMA014	BB	53	28.557	5	51.481	10.10.09	21.16	Fine sand - small sample
ISMA015	S	53	28.430	5	51.358	10.10.09	21.25	Fine sand - small sample
ISMA016	S	53	28.372	5	51.185	10.10.09	21.33	Fine sand - small sample
ISMA017	BB	53	28.058	5	50.967	10.10.09	21.49	Fine sand - small sample
ISMA018	S	53	27.946	5	50.926	10.10.09	21.59	Medium fine sand
ISMA019	S	53	28.641	5	50.565	10.10.09	22.21	In deep muddy sand
ISMA020	BB	53	28.726	5	50.461	10.10.09	22.29	In deep muddy sand
ISMA021	S	53	27.590	5	50.771	10.10.09	22.52	Sandy
ISMA022	BB	53	27.673	5	50.688	10.10.09	23.00	Nematode
ISMA023	S	53	27.710	5	50.656	10.10.09	23.03	
ISMA024	S	53	27.306	5	49.802	10.10.09	23.18	
ISMA025	S	53	26.984	5	50.373	10.10.09	23.32	Fine Sand

Station No	Type	Lat		Long		Date	Time	Comments
		Deg	Min	Deg	Min		UTC	
ISMA026	BB	53	27.032	5	50.347	10.10.09	23.37	Fine Sand 1 shell
ISMA027	S	53	26.122	5	51.362	10.10.09	23.58	Fine sand
ISMA028	BB	53	26.197	5	51.938	11.10.09	0.02	Fine sand with shells and biofragments
ISMA029	S	53	26.289	5	51.895	11.10.09	0.06	Fine Sand
ISMA030	S	53	25.952	5	53.1837	11.10.09	0.22	Fine Sand
ISMA31	BB	53	26.048	5	53.1314	11.10.09	0.27	Fine Sand
ISMA032	S	53	26.3958	5	52.9522	11.10.09	0.46	Fine Sand
ISMA033	S	53	26.456	5	52.918	11.10.09	0.49	Fine Sand Fine Biofragments
ISMA034	BB	53	26.516	5	52.886	11.10.09	0.53	Fine Sand Fine Biofragments
ISMA035	S	53	26.942	5	52.643	11.10.09	1.18	Fine Sand Fine Biofragments
ISMA036	BB	53	27.0447	5	52.576	11.10.09	1.25	Fine Sand Fine Biofragments
ISMA037	S	53	27.325	5	52.577	11.10.09	1.38	Fine Sand Fine Biofragments
ISMA038	S	53	27.715	5	52.447	11.10.09	1.56	Fine Sand Fine Biofragments
ISMA039	BB	53	27.890	5	52.421	11.10.09	2.04	Fine Sand Fine Biofragments
ISMA040	S	53	28.185	5	52.115	11.10.09	2.16	Fine Sand
ISMA041	BB	53	28.691	5	52.115	11.10.09	2.39	Fine Sand
ISMA042	S	53	28.894	5	52.899	11.10.09	2.52	Fine Sand
ISMA043	S	53	33.5968	5	53.3917	11.10.09	3.33	Clayey and Fine Sand
ISMA044	BB	53	33.683	5	53.364	11.10.09	3.41	
ISMA045	S	53	34.0855	5	53.4825	11.10.09	3.57	
ISMA046	S	53	34.4597	5	53.5974	11.10.09	4.10	Fine Sand
ISMA047	BB	53	34.8389	5	53.8261	11.10.09	4.21	Fine Sand
ISMA048	BB	53	33.651	5	56.2264	11.10.09	4.44	Fine Sand
ISMA049	S	53	34.0302	5	56.0906	11.10.09	4.52	Fine Sand
ISMA050	S	53	34.453	5	55.9321	11.10.09	5.02	Fine Sand
ISMA051	BB	53	34.824	5	55.708	11.10.09	5.27	Fine Sand
ISMA052	S	53	35.2882	5	55.7084	11.10.09	5.40	Fine Sand
ISMA053	BB	53	35.2371	5	56.7829	11.10.09	5.57	Fine Sand
ISMA054	S	53	34.586	5	57.325	11.10.09	6.10	Fine Sand

Station No	Type	Lat		Long		Date	Time	Comments
		Deg	Min	Deg	Min		UTC	
ISMA055	BB	53	34.048	5	57.064	11.10.09	6.23	Fine sand, bio fragents, seastar and sea urchin
ISMA056	S	53	33.797	5	58.023	11.10.09	6.41	
ISMA057	S	53	34.3914	5	58.585	11.10.09	7.23	Coarse silt - fine sand and fines in the surface layer
ISMA058	BB	53	35.02	5	58.684	11.10.09	7.38	Fine silty sand
ISMA059	S	53	35.6228	5	58.6625	11.10.09	7.52	Fine silty sand
ISMA060	S	53	28.346	5	53.442	11.10.09	9.00	Fine sand
ISMA061	BB	53	28.059	5	53.700	11.10.09	9.11	Fine sand
ISMA062	S	53	27.062	5	53.658	11.10.09	9.28	Fine sand
ISMA065	S	53	38.810	5	56.416	11.10.09	12.04	Mud, fine silt and sand
ISMA066	BB	53	38.795	5	56.386	11.10.09	12.08	Mud- filled bucket
ISMA067	S	53	39.346	5	56.065	11.10.09	12.21	Silty Clay
ISMA068	S	53	39.346	5	56.065	11.10.09	12.24	
ISMA069	S	53	39.888	5	55.868	11.10.09	12.35	Silty Clay - Soft to stiff
ISMA070	BB	53	39.878	5	55.839	11.10.09	12.38	Silty Clay - Soft to stiff
ISMA071	S	53	40.359	5	55.711	11.10.09	12.49	Muddy
ISMA072	S	53	40.758	5	55.408	11.10.09	13.01	Clayey Mud
ISMA073	BB	53	40.752	5	55.442	11.10.09	13.04	Mud
ISMA074	S	53	41.752	5	55.342	11.10.09	13.18	Mud
ISMA075	S	53	41.948	5	55.209	11.10.09	13.31	Mud
ISMA076	BB	53	41.945	5	55.172	11.10.09	13.34	Mud
ISMA077	S	53	42.423	5	55.959	11.10.09	13.47	Silt and Mud
ISMA078	BB	53	42.820	5	54.751	11.10.09	13.59	
ISMA079	S	53	43.071	5	56.987	11.10.09	14.26	Silt and Clay
ISMA080	BB	53	43.071	5	56.987	11.10.09	14.26	Sample taken from same grab as ISMA079
ISMA081	S	53	34.052	5	57.767	11.10.09	15.44	
ISMA082	BB	53	34.003	5	57.741	11.10.09	15.48	
ISMA083	S	53	33.834	5	58.795	11.10.09	16.03	
ISMA084	BB	53	33.765	5	58.755	11.10.09	16.07	

Station No	Type	Lat		Long		Date	Time	Comments
		Deg	Min	Deg	Min		UTC	
ISMA085	S	53	36.599	5	56.988	11.10.09	17.15	Mainly silts
ISMA086	BB	53	36.599	5	56.988	11.10.09	17.15	Mainly silts
ISMA087	S	53	39.341	5	57.595	11.10.09	17.52	
ISMA088	BB	53	39.341	5	57.595	11.10.09	17.52	
ISMA089	S	53	39.836	5	57.592	11.10.09	18.17	
ISMA090	S	53	40.520	5	57.716	11.10.09	18.35	
ISMA091	BB	53	40.520	5	57.716	11.10.09	18.35	
ISMA092	S	53	40.976	5	57.467	11.10.09	18.48	
ISMA093	S	53	41.568	5	57.072	11.10.09	19.04	
ISMA094	BB	53	41.568	5	57.072	11.10.09	19.04	
ISMA095	S	53	42.094	5	57.017	11.10.09	19.23	
ISMA096	S	53	42.664	5	57.022	11.10.09	19.38	
ISMA097	BB	53	42.664	5	57.022	11.10.09	19.38	
ISMA098	S	53	43.863	5	56.739	11.10.09	19.58	
ISMA099	S	53	44.327	5	56.431	11.10.09	20.13	
ISMA100	BB	53	44.327	5	56.431	11.10.09	20.13	
ISMA101	S	53	44.828	5	56.440	11.10.09	20.35	Mud
ISMA102	S	53	45.329	5	55.931	11.10.09	20.42	
ISMA103	BB	53	45.329	5	55.931	11.10.09	20.42	
ISMA104	S	53	45.711	5	55.861	11.10.09	21.02	
ISMA105	S	53	46.419	5	55.575	11.10.09	21.21	
ISMA106	BB	53	46.419	5	55.575	11.10.09	21.21	
ISMA107	S	53	46.885	5	54.954	11.10.09	21.37	
ISMA108	S	53	47.711	5	55.085	11.10.09	21.57	
ISMA109	BB	53	47.711	5	55.085	11.10.09	21.57	
ISMA110	S	53	48.436	5	54.397	11.10.09	22.39	
ISMA111	S	53	49.266	5	54.397	11.10.09	22.39	
ISMA112	BB	53	49.266	5	54.397	11.10.09	22.39	
ISMA113	S	53	50.066	5	53.974	11.10.09	22.59	

Station No	Type	Lat		Long		Date	Time	Comments
		Deg	Min	Deg	Min		UTC	
ISMA114	S	53	50.774	5	53.817	11.10.09	23.18	
ISMA115	BB	53	50.774	5	53.817	11.10.09	23.18	
ISMA116	S	53	51.539	5	53.473	11.10.09	23.38	Mud
ISMA117	S	53	51.572	5	55.638	12.10.09	0.04	
ISMA118	BB	53	51.572	5	55.638	12.10.09	0.04	
ISMA119	S	53	50.869	5	56.218	12.10.09	0.22	
ISMA120	S	53	50.277	5	56.531	12.10.09	0.39	
ISMA121	BB	53	50.277	5	56.531	12.10.09	0.39	
ISMA122	S	53	49.532	5	56.834	12.10.09	0.56	
ISMA123	S	53	48.795	5	56.960	12.10.09	1.13	
ISMA124	BB	53	48.795	5	56.960	12.10.09	1.13	
ISMA125	S	53	48.680	5	57.135	12.10.09	1.31	
ISMA126	S	53	47.185	5	57.516	12.10.09	1.52	
ISMA127	BB	53	47.185	5	57.516	12.10.09	1.52	
ISMA128	S	53	46.265	5	57.842	12.10.09	2.08	
ISMA129	S	53	45.909	5	58.035	12.10.09	2.26	
ISMA130	BB	53	45.909	5	58.035	12.10.09	2.26	
ISMA131	S	53	45.302	5	58.410	12.10.09	2.42	
ISMA132	S	53	44.685	5	58.410	12.10.09	2.58	
ISMA133	BB	53	44.685	5	58.410	12.10.09	2.58	
ISMA134	S	53	44.078	5	58.592	12.10.09	3.14	
ISMA135	S	53	43.200	5	58.758	12.10.09	3.36	
ISMA136	BB	53	43.200	5	58.758	12.10.09	3.36	
ISMA137	S	53	42.672	5	58.791	12.10.09	3.51	
ISMA138	S	53	42.012	5	58.880	12.10.09	4.08	
ISMA139	BB	53	42.012	5	58.880	12.10.09	4.08	
ISMA140	S	53	41.196	5	58.9244	12.10.09	4.270	
ISMA141	S	53	43.4502	5	54.483	12.10.09	5.12	
ISMA142	S	53	43.9995	5	54.332	12.10.09	5.26	

Station No	Type	Lat		Long		Date	Time	Comments
		Deg	Min	Deg	Min		UTC	
ISMA143	BB	53	44.000	5	54.332	12.10.09	5.26	
ISMA144	S	53	44.858	5	53.925	12.10.09	5.45	
ISMA145	S	53	45.512	5	53.654	12.10.09	5.57	
ISMA146	BB	53	45.512	5	53.654	12.10.09	5.57	
ISMA147	S	53	46.122	5	53.388	12.10.09	6.10	
ISMA148	S	53	46.843	5	53.152	12.10.09	6.25	
ISMA149	BB	53	46.843	5	53.152	12.10.09	6.25	
ISMA150	S	53	47.501	5	52.816	12.10.09	6.36	
ISMA151	S	53	48.227	5	52.700	12.10.09	7.10	
ISMA152	BB	53	48.227	5	52.700	12.10.09	7.10	
ISMA153	S	53	49.003	5	52.563	12.10.09	7.20	
ISMA154	S	53	49.793	5	52.272	12.10.09	7.30	
ISMA155	BB	53	49.793	5	52.272	12.10.09	7.30	
ISMA156	S	53	50.568	5	51.812	12.10.09	7.41	
ISMA157	S	53	51.543	5	51.475	12.10.09	7.53	
ISMA158	BB	53	51.543	5	51.475	12.10.09	7.53	
ISMA161	BB	53	4.890	5	55.273	12.10.09	21.20	Gravel
ISMA162	S	53	4.890	5	55.273	12.10.09	21.20	Gravel
ISMA163	S	53	5.059	5	54.921	12.10.09	21.29	
ISMA164	BB	53	5.059	5	54.921	12.10.09	21.29	
ISMA165	S	53	4.886	5	54.884	12.10.09	21.35	
ISMA166	S	53	4.635	5	54.706	12.10.09	21.43	
ISMA167	BB	53	4.635	5	54.706	12.10.09	21.43	
ISMA168	S	53	4.868	5	54.520	12.10.09	21.59	
ISMA169	BB	53	4.868	5	54.520	12.10.09	21.59	
ISMA170	S	53	4.684	5	54.373	12.10.09	22.08	
ISMA171	S	53	4.150	5	54.339	12.10.09	23.18	Sand Gravel Bioclasts
ISMA172	BB	53	4.150	5	54.339	12.10.09	23.18	Sand Gravel Bioclasts
ISMA173	S	53	4.374	5	54.523	12.10.09	23.31	Sandy

Station No	Type	Lat		Long		Date	Time	Comments
		Deg	Min	Deg	Min		UTC	
ISMA174	BB	53	4.374	5	54.523	12.10.09	23.31	Sandy
ISMA175	S	53	4.515	5	54.838	12.10.09	23.43	Sand , Pebbles and Bioclasts
ISMA176	BB	53	4.515	5	54.838	12.10.09	23.43	Sand , Pebbles and Bioclasts
ISMA177	S	53	4.593	5	54.932	12.10.09	23.51	Sand, Pebbles, Bioclasts and Gastropods
ISMA178	S	53	4.523	5	55.368	13.10.09	0.03	Sand, Pebbles, Bioclasts and Gastropods
ISMA179	BB	53	4.523	5	55.368	13.10.09	0.03	Sand, Pebbles, Bioclasts and Gastropods
ISMA180	S	53	4.394	5	55.567	13.10.09	0.18	Sand, Gravel. Bio-encrustation on gravel clasts
ISMA181	BB	53	4.394	5	55.567	13.10.09	0.18	Sand, Gravel. Bio-encrustation on gravel clasts
ISMA182	S	53	4.181	5	55.548	13.10.09	0.30	Sand, Gravel. Bio-encrustation on gravel clasts
ISMA183	BF	53	4.181	5	55.548	13.10.09	0.30	Sand, Gravel. Bio-encrustation on gravel clasts
ISMA184	S	53	4.177	5	55.228	13.10.09	0.41	Sand, Gravel. Bio-encrustation on gravel clasts
ISMA185	S	53	4.136	5	54.839	13.10.09	0.54	Sand, Gravel. Bio-encrustation on gravel clasts
ISMA186	BB	53	4.136	5	54.839	13.10.09	0.54	Sand, Gravel. Bio-encrustation on gravel clasts
ISMA187	S	53	3.981	5	54.770	13.10.09	1.52	Sand, Pebbles and Gravel
ISMA188	S	53	3.931	5	54.712	13.10.09	2.00	Sand and Large Gravel
ISMA189	BB	53	3.931	5	54.712	13.10.09	2.00	Sand and Large Gravel
ISMA190	S	53	3.998	5	54.272	13.10.09	2.13	Sand and Gravel
ISMA191	S	53	3.816	5	54.108	13.10.09	2.26	Sand, Pebbles and Bioclasts
ISMA192	S	53	3.816	5	54.108	13.10.09	2.26	Sand, Pebbles and Bioclasts
ISMA193	S	53	3.810	5	54.411	13.10.09	2.38	Sand, Gravel, Gastropods and Bioclasts
ISMA194	S	53	3.786	5	54.878	13.10.09	2.52	Sand, Gravel, Gastropods and Bioclasts
ISMA195	S	53	3.724	5	55.031	13.10.09	2.57	Sand, Gravel, Gastropods and Bioclasts
ISMA196	BB	53	3.724	5	55.031	13.10.09	2.57	Sand, Gravel, Gastropods and Bioclasts
ISMA197	S	53	4.013	5	55.547	13.10.09	3.24	Gravel (+ Sand) Starfish,Barnacles on Large Clasts
ISMA198	BB	53	4.013	5	55.547	13.10.09	3.24	Gravel (+ Sand) Starfish,Barnacles on Large Clasts
ISMA199	S	53	3.812	5	55.633	13.10.09	3.43	
ISMA200	BB	53	3.812	5	55.633	13.10.09	3.43	Gravel, Pebbles and Cobbles barnacles on larger clasts

Station No	Type	Lat		Long		Date	Time	Comments
		Deg	Min	Deg	Min		UTC	
ISMA201	BB	53	3.812	5	55.611	13.10.09	3.55	Gravel, Pebbles and Cobbles barnacles on larger clasts
ISMA202	S	53	3.448	5	55.213	13.10.09	4.54	Gravel, Pebbles and Cobbles barnacles on larger clasts
ISMA203	BB	53	3.448	5	55.213	13.10.09	4.54	Gravel, Pebbles and Cobbles barnacles on larger clasts
ISMA204	S	53	3.081	5	55.147	13.10.09	5.45	Sand, gravel, bio fragments; correct lat coordinate??
ISMA205	S	53	2.569	5	54.489	13.10.09	6.03	Coarse sandy gravel
ISMA206	BB	53	2.569	5	54.489	13.10.09	6.03	Coarse sandy gravel
ISMA208	S	53	2.380	5	54.395	13.10.09	7.50	Sandy, lots of bioclasts
ISMA209	BB	53	2.380	5	54.395	13.10.09	7.50	Sandy, lots of bioclasts
ISMA210	S	53	1.251	5	54.357	13.10.09	8.15	Sandy gravel
ISMA211	BF	52	59.673	5	54.029	13.10.09	8.54	Gravel with abundant biomatter
ISMA212	BB	52	59.673	5	54.029	13.10.09	8.54	Gravel with abundant biomatter
ISMA213	S	52	59.288	5	53.954	13.10.09	9.20	Sandy gravel
ISMA214	BB	52	59.288	5	53.954	13.10.09	9.20	Sandy gravel
ISMA215	S	52	58.762	5	54.697	13.10.09	9.56	Well sorted fine to medium sand
ISMA216	BB	52	58.483	5	54.781	13.10.09	10.20	Sandy gravel + abundant worm tubes
ISMA219	BB	52	55.790	5	54.389	13.10.09	14.28	
ISMA220	S	52	55.745	5	54.598	13.10.09	14.44	
ISMA221	S	52	56.404	5	54.192	13.10.09	14.59	Cobbles
ISMA222	BB	52	56.404	5	54.192	13.10.09	14.59	
ISMA223	S	52	55.080	5	54.037	13.10.09	15.13	Cobbles, gravel, crabs, worms and barnacles
ISMA224	BB	52	55.080	5	54.037	13.10.09	15.13	
ISMA225	BF	52	56.414	5	53.837	13.10.09	15.26	
ISMA226	S	52	57.491	5	54.759	13.10.09	15.52	
ISMA227	S	52	57.516	5	54.036	13.10.09	16.13	
ISMA228	S	52	58.017	5	53.973	13.10.09	16.28	Pebbles, gravels and shells
ISMA229	S	52	58.017	5	53.973	13.10.09	16.28	

Station No	Type	Lat		Long		Date	Time	Comments
		Deg	Min	Deg	Min		UTC	
ISMA230	S	52	58.297	5	54.487	13.10.09	17.23	
ISMA231	BB	52	58.297	5	54.487	13.10.09	17.23	
ISMA232	BB	52	58.295	5	54.221	13.10.09	17.31	
ISMA233	BF	52	59.605	5	54.971	13.10.09	18.01	
ISMA236	S	53	3.337	5	54.7476	13.10.09	20.08	Shelly gravel
ISMA237	BB	53	3.337	5	54.7476	13.10.09	20.08	Shelly gravel
ISMA238	S	53	3.592	5	54.465	13.10.09	20.20	
ISMA239	BB	53	3.592	5	54.465	13.10.09	20.20	
ISMA240	S	53	3.410	5	54.226	13.10.09	20.30	
ISMA241	S	53	3.080	5	54.062	13.10.09	20.38	
ISMA242	BB	53	3.080	5	54.062	13.10.09	20.38	
ISMA243	S	53	2.975	5	54.406	13.10.09	20.46	
ISMA244	S	53	2.762	5	53.972	13.10.09	20.58	
ISMA245	BB	53	2.762	5	53.972	13.10.09	20.58	
ISMA246	S	53	2.571	5	53.934	13.10.09	21.04	
ISMA247	S	53	2.206	5	53.834	13.10.09	21.14	
ISMA248	BB	53	2.206	5	53.834	13.10.09	21.14	
ISMA249	S	53	2.075	5	53.817	13.10.09	21.18	
ISMA250	S	53	1.887	5	54.086	13.10.09	21.51	
ISMA251	BB	53	1.887	5	54.086	13.10.09	21.51	
ISMA252	S	53	1.667	5	53.836	13.10.09	22.09	
ISMA253	S	53	1.545	5	53.603	13.10.09	22.22	
ISMA254	BB	53	1.545	5	53.603	13.10.09	22.22	
ISMA255	S	53	0.922	5	53.591	13.10.09	22.32	
ISMA256	S	53	0.626	5	53.862	13.10.09	22.53	
ISMA257	BB	53	0.653	5	53.862	13.10.09	22.53	
ISMA258	S	53	0.210	5	53.729	13.10.09	23.11	
ISMA259	BB	53	0.210	5	53.729	13.10.09	23.11	
ISMA260	S	52	59.981	5	53.636	13.10.09	23.22	

Station No	Type	Lat		Long		Date	Time	Comments
		Deg	Min	Deg	Min		UTC	
ISMA261	BB	52	59.981	5	53.636	13.10.09	23.22	
ISMA262	S	52	59.497	5	53.526	13.10.09	23.41	
ISMA263	BB	52	59.497	5	53.526	13.10.09	23.41	
ISMA266	BB	53	0.355	5	54.328	14.10.09	3.03	Too coarse for sediment sample, Mussels!!!
ISMA267	BF	53	0.371	5	55.180	14.10.09	3.29	Shrimp, crabs and wormtubes and no sediment
ISMA268	S	52	59.337	5	54.304	14.10.09	4.00	Gravel, Sand, Wormtubes and Shells
ISMA269	BB	52	59.337	5	54.304	14.10.09	4.00	Gravel, Sand, Wormtubes and Shells
ISMA270	S	52	59.508	5	54.691	14.10.09	4.30	Sand and Mud. Organic matter concretions?
ISMA271	S	52	59.366	5	54.678	14.10.09	4.38	Sand , gravel clasts and shells
ISMA272	BB	52	59.366	5	54.678	14.10.09	4.38	Sand , gravel clasts and shells
ISMA273	BB	52	58.924	5	54.268	14.10.09	4.57	Wormtubes, shells, small amount of sand
ISMA274	S	52	58.569	5	53.791	14.10.09	5.20	Large pebble+ sand-gravel, lots of shells
ISMA275	BB	52	58.569	5	53.791	14.10.09	5.20	Large pebble+ sand-gravel, lots of shells
ISMA276	BB	53	1.141	5	55.184	14.10.09	5.43	Shell, gastropods, pebbles with sand-gravel (small amount of sediment)
ISMA277	S	53	1.364	5	54.909	14.10.09	5.52	Cobbles+encrusted bio, shells, gravel - sand
ISMA278	BB	53	1.364	5	54.909	14.10.09	5.52	Cobbles+encrusted bio, shells, gravel - sand
ISMA279	BF	53	1.364	5	54.909	14.10.09	5.52	Cobbles+encrusted bio, shells, gravel - sand
ISMA280	BB	53	1.576	5	55.268	14.10.09	6.01	Wormtubes
ISMA284	BB	52	57.150	5	54.044	14.10.09	9.14	Fine sand and bivalves
ISMA285	S	52	56.738	5	54.277	14.10.09	9.26	Fine sand and bivalves
ISMA286	BB	52	56.916	5	53.811	14.10.09	9.39	Mussels, worms
ISMA287	S	52	56.997	5	54.300	14.10.09	9.52	Sand, gastropods, shells
ISMA288	BB	52	56.997	5	54.300	14.10.09	9.52	Sand, gastropods, shells
ISMA289	S	52	57.150	5	54.285	14.10.09	10.08	Coarse sand, gravel, bivalve shells
ISMA290	BB	52	57.150	5	54.285	14.10.09	10.08	Coarse sand, gravel, bivalve shells
ISMA291	S	52	58.446	5	54.707	14.10.09	11.10	Wormtubes, crabs and asnd
ISMA292	S	52	58.540	5	53.873	14.10.09	11.20	Shells, gravel ,pebbles
ISMA293	S	52	58.544	5	53.879	14.10.09	11.29	Shells, gravel ,pebbles

Station No	Type	Lat		Long		Date	Time	Comments
		Deg	Min	Deg	Min		UTC	
ISMA294	BB	52	58.752	5	54.233	14.10.09	11.56	
ISMA295	BF	52	59.353	5	54.307	14.10.09	12.11	Mussels, Shells and Gravel
ISMA298	S	52	59.963	5	55.040	14.10.09	14.12	Worm Tubes. Sand taken for sampling
ISMA299	S	53	0.811	5	54.685	14.10.09	14.40	Shells and Gravel
ISMA300	BB	53	0.811	5	54.685	14.10.09	14.40	
ISMA301	S	53	1.702	5	54.945	14.10.09	14.55	
ISMA302	S	53	1.929	5	55.387	14.10.09	15.05	Gravel and Shells
ISMA303	S	53	2.288	5	54.693	14.10.09	15.17	Pebbles Gravel and Shells
ISMA304	BB	53	2.288	5	54.693	14.10.09	15.17	Pebbles Gravel and Shells
ISMA305	S	53	24.518	5	54.551	14.10.09	18.02	
ISMA309	S	53	27.135	5	51.205	14.10.09	21.13	
ISMA310	BB	53	27.805	5	51.550	14.10.09	21.26	
ISMA311	S	53	28.871	5	51.140	14.10.09	21.43	Silty mud
ISMA312	BB	53	28.871	5	51.140	14.10.09	21.43	
ISMA313	S	53	29.236	5	51.024	14.10.09	21.53	Silty mud with large worm
ISMA314	BB	53	29.236	5	51.024	14.10.09	21.53	
ISMA315	S	53	27.129	5	55.254	14.10.09	22.22	
ISMA316	S	53	25.500	5	54.808	14.10.09	22.39	
ISMA317	S	53	26.765	5	53.724	14.10.09	23.41	Fine Sand and 1 Crab
ISMA318	S	53	33.689	5	57.392	15.10.09	0.24	Fine Sand
ISMA319	BB	53	33.689	5	57.392	15.10.09	0.24	Fine Sand
ISMA320	S	53	34.049	5	56.374	15.10.09	0.37	Fine Sand
ISMA321	S	53	33.721	5	55.388	15.10.09	0.50	Fine Sand
ISMA322	S	53	33.995	5	54.478	15.10.09	1.02	Fine Sand
ISMA323	S	53	34.479	5	54.699	15.10.09	1.16	Fine Sand
ISMA324	BB	53	34.479	5	54.699	15.10.09	1.16	Fine Sand
ISMA325	S	53	34.877	5	54.721	15.10.09	1.27	Fine Sand
ISMA326	S	53	34.701	5	56.519	15.10.09	1.55	Fine Sand
ISMA327	BB	53	34.701	5	56.519	15.10.09	1.55	Fine Sand

Station No	Type	Lat		Long		Date	Time	Comments
		Deg	Min	Deg	Min		UTC	
ISMA328	S	53	35.054	5	57.816	15.10.09	2.02	Fine Sand
ISMA329	S	53	41.662	6	0.365	15.10.09	3.07	Clayey, Very Fine Sand
ISMA330	BB	53	41.662	6	0.365	15.10.09	3.07	Clayey, Very Fine Sand
ISMA331	S	53	42.423	6	0.229	15.10.09	3.19	Clayey. Silt
ISMA332	BB	53	42.423	6	0.229	15.10.09	3.19	Clayey. Silt
ISMA333	S	53	43.193	6	0.167	15.10.09	3.36	Clayey Silt Below Sandy Surface
ISMA334	BB	53	43.193	6	0.167	15.10.09	3.36	Clayey Silt Below Sandy Surface
ISMA335	S	53	44.144	5	59.883	15.10.09	3.50	Clayey Silt Below Sandy Surface
ISMA335	BB	53	44.144	5	59.883	15.10.09	3.50	Clayey Silt Below Sandy Surface
ISMA337	S	53	44.943	5	59.742	15.10.09	4.03	Clayey Silt Below Sandy Surface
ISMA338	S	53	45.766	5	59.819	15.10.09	4.15	Clayey Silt Below Sandy Surface
ISMA339	BB	53	45.766	5	59.819	15.10.09	4.15	Clayey Silt Below Sandy Surface
ISMA340	S	53	46.666	5	59.990	15.10.09	4.29	Clayey Silt Below Sandy Surface
ISMA341	S	53	47.278	5	59.774	15.10.09	4.40	Clayey Silt Below Sandy Surface
ISMA342	BB	53	47.278	5	59.774	15.10.09	4.40	Clayey Silt Below Sandy Surface
ISMA343	S	53	48.296	5	57.486	15.10.09	4.53	Clayey Silt Below Sandy Surface
ISMA344	S	53	49.063	5	59.403	15.10.09	5.17	Clayey Silt Below Sandy Surface
ISMA345	BB	53	49.063	5	59.403	15.10.09	5.17	Clayey Silt Below Sandy Surface
ISMA346	S	53	49.595	5	59.045	15.10.09	5.31	Clayey Silt Below Sandy Surface
ISMA347	S	53	50.388	5	58.650	15.10.09	5.45	Clayey Silt Below Sandy Surface
ISMA348	BB	53	50.388	5	58.650	15.10.09	5.45	Clayey Silt Below Sandy Surface
ISMA349	S	53	51.051	5	58.396	15.10.09	5.57	Clayey Silt Below Sandy Surface
ISMA350	S	53	51.574	5	58.006	15.10.09	6.08	Clayey Silt Below Sandy Surface
ISMA351	BB	53	51.574	5	58.006	15.10.09	6.08	Clayey Silt Below Sandy Surface
ISMA352	S	53	51.575	5	59.779	15.10.09	6.23	Clayey Silt Below Sandy Surface
ISMA353	S	53	50.781	6	0.178	15.10.09	6.38	Clayey Silt Below Sandy Surface
ISMA354	BB	53	50.781	6	0.178	15.10.09	6.38	Clayey Silt Below Sandy Surface
ISMA355	S	53	49.878	6	0.495	15.10.09	6.52	Clayey Silt Below Sandy Surface

Station No	Type	Lat		Long		Date	Time	Comments
		Deg	Min	Deg	Min		UTC	
ISMA368	S	53	43.126	6	1.700	15.10.09	19.59	
ISMA369	BB	53	43.126	6	7.700	15.10.09	19.59	
ISMA370	S	53	44.095	6	1.373	15.10.09	20.13	
ISMA371	S	53	44.266	6	2.832	15.10.09	20.32	
ISMA372	BB	53	44.266	6	2.832	15.10.09	20.32	
ISMA373	S	53	45.320	6	1.012	15.10.09	20.55	
ISMA374	S	53	45.530	6	2.320	15.10.09	21.11	
ISMA375	BB	53	45.530	6	2.320	15.10.09	21.11	
ISMA376	S	53	46.711	6	1.896	15.10.09	21.29	
ISMA377	S	53	47.959	6	1.399	15.10.09	21.51	
ISMA378	BB	53	47.959	6	1.399	15.10.09	21.51	
ISMA379	S	53	49.248	6	0.905	15.10.09	22.13	
ISMA380	S	53	49.342	6	2.302	15.10.09	22.30	
ISMA381	BB	53	49.342	6	2.302	15.10.09	22.30	
ISMA382	S	53	50.727	6	1.600	15.10.09	22.59	
ISMA383	S	53	51.571	6	1.251	15.10.09	23.18	
ISMA384	BB	53	51.571	6	1.251	15.10.09	23.18	
ISMA385	S	53	51.833	6	3.042	15.10.09	23.36	Silt Mud
ISMA386	S	53	51.875	6	5.034	15.10.09	23.54	Silt Mud
ISMA387	BB	53	51.875	6	5.034	15.10.09	23.54	Silt Mud
ISMA388	S	53	51.225	6	5.068	16.10.09	0.13	Silt Mud
ISMA389	S	53	50.947	6	4.081	16.10.09	0.27	Silt Mud
ISMA390	BB	53	50.947	6	4.081	16.10.09	0.27	Silt Mud
ISMA391	S	53	49.674	6	4.798	16.10.09	0.45	Silt Mud
ISMA392	S	53	48.682	6	7.296	16.10.09	1.11	Silt Mud
ISMA393	BB	53	48.682	6	7.296	16.10.09	1.11	Silt Mud
ISMA394	S	53	48.524	6	5.404	16.10.09	1.28	Silt Mud
ISMA395	S	53	48.180	6	2.996	16.10.09	1.49	Silt Mud
ISMA396	BB	53	48.180	6	2.996	16.10.10	2.49	Silt Mud

Station No	Type	Lat		Long		Date	Time	Comments
		Deg	Min	Deg	Min		UTC	
ISMA397	S	53	46.893	6	3.646	16.10.09	2.10	Silt Mud
ISMA398	S	53	47.139	6	6.033	16.10.09	2.33	Silt Mud
ISMA399	BB	53	47.139	6	6.033	16.10.09	2.33	Silt Mud
ISMA400	S	53	47.338	6	7.643	16.10.09	2.52	Silt Mud
ISMA401	S	53	46.439	6	6.851	16.10.09	3.13	Silt Mud
ISMA402	BB	53	46.439	6	6.851	16.10.09	3.13	Silt Mud
ISMA403	S	53	45.675	6	4.381	16.10.09	3.40	Silt Mud
ISMA404	S	53	41.689	5	59.352	16.10.09	4.34	Silt Mud
ISMA405	S	53	40.048	5	58.500	16.10.09	5.07	Silt Mud
ISMA406	BB	53	40.048	5	58.500	16.10.09	5.07	Silt Mud
ISMA407	S	53	38.708	5	57.577	16.10.09	5.27	Silt Mud
ISMA408	S	53	38.023	5	54.100	16.10.09	5.54	Silt Mud
ISMA409	S	53	39.160	5	53.841	16.10.09	6.10	Silt Mud
ISMA410	BB	53	39.160	5	53.841	16.10.09	6.10	Silt Mud
ISMA411	S	53	40.314	5	53.474	16.10.09	6.23	Silt Mud
ISMA412	S	53	41.725	5	53.160	16.10.09	7.04	Silt Mud
ISMA413	BB	53	41.725	5	53.160	16.10.09	7.04	Silt Mud
ISMA414	S	53	43.125	5	52.587	16.10.09	7.30	Silt Mud
ISMA415	S	53	44.428	5	52.144	16.10.09	7.51	Silt Mud
ISMA416	BB	53	44.428	5	52.144	16.10.09	7.51	Silt Mud
ISMA429	S	53	36.357	5	54.409	16.10.09	20.27	
ISMA430	BB	53	36.357	5	54.409	16.10.09	20.27	
ISMA431	S	53	41.700	5	58.523	16.10.09	21.21	
ISMA432	BB	53	41.700	5	58.523	16.10.09	21.21	
ISMA433	S	53	45.696	5	54.335	16.10.09	21.59	
ISMA434	S	53	47.953	5	57.848	16.10.09	22.40	
ISMA435	S	53	53.468	5	57.092	16.10.09	23.23	Silt and Mud
ISMA436	S	53	52.417	5	54.483	16.10.09	23.48	Silt and Mud
ISMA437	S	53	53.183	5	51.664	17.10.09	0.13	Silt and Mud

Station No	Type	Lat		Long		Date	Time	Comments
		Deg	Min	Deg	Min		UTC	
ISMA438	S	53	53.367	5	49.101	17.10.09	0.34	Silt and Mud
ISMA439	S	53	51.847	5	49.552	17.10.09	0.56	Silt and Mud
ISMA440	BB	53	51.847	5	49.552	17.10.09	0.56	Silt and Mud
ISMA441	S	53	51.605	5	48.008	17.10.09	1.13	Silt and Mud
ISMA442	S	53	58.566	5	48.230	17.10.09	1.32	Silt and Mud
ISMA443	BB	53	58.566	5	48.230	17.10.09	1.32	Silt and Mud
ISMA444	S	53	50.678	5	49.908	17.10.09	1.52	Silt and Mud
ISMA445	S	53	50.377	5	50.424	17.10.09	2.13	Silt and Mud
ISMA446	BB	53	50.377	5	50.424	17.10.09	2.13	Silt and Mud
ISMA447	S	53	49.137	5	48.530	17.10.09	2.52	Silt and Mud
ISMA448	S	53	47.793	5	48.818	17.10.09	3.22	Silt and Mud
ISMA449	BB	53	47.793	5	48.818	17.10.09	3.22	Silt and Mud
ISMA450	S	53	48.006	5	50.785	17.10.09	3.41	Silt and Mud
ISMA451	S	53	46.809	5	51.315	17.10.09	4.02	Silt and Mud
ISMA452	BB	53	46.809	5	51.315	17.10.09	4.02	Silt and Mud
ISMA453	S	53	46.560	5	49.346	17.10.09	4.20	Silt and Mud
ISMA454	S	53	45.324	5	49.181	17.10.09	4.42	Silt and Mud
ISMA455	BB	53	45.324	5	49.181	17.10.09	4.42	Silt and Mud
ISMA456	S	53	45.511	5	51.655	17.10.09	5.20	Silt and Mud
ISMA457	S	53	44.054	5	50.108	17.10.09	5.44	Silt and Mud
ISMA458	S	53	42.829	5	50.467	17.10.09	6.03	Silt and Mud
ISMA459	BB	53	42.829	5	50.467	17.10.09	6.03	Silt and Mud
ISMA460	S	53	41.4619	5	50.8927	17.10.09	6.23	Silt and Mud
ISMA461	S	53	40.1829	5	51.9642	17.10.09	7.04	Silt and Mud
ISMA462	BB	53	40.1829	5	51.9642	17.10.09	7.04	Silt and Mud
ISMA463	S	53	39.0236	5	52.3755	17.10.09	7.23	Silt and Mud
ISMA464	S	53	37.8254	5	52.4795	17.10.09	7.38	Silt and Mud
ISMA465	BB	53	37.8254	5	52.4795	17.10.09	7.38	Silt and Mud
ISMA473	S	53	48.608	5	55.689	17.10.09	12.30	Intact Burrow

Station No	Type	Lat		Long		Date	Time	Comments
		Deg	Min	Deg	Min		UTC	
ISMA475	S	53	45.216	5	57.199	17.10.09	13.04	
ISMA477	S	53	41.617	5	58.309	17.10.09	13.36	
ISMA479	S	53	41.617	5	58.402	17.10.09	13.51	
ISMA481	S	53	38.611	5	56.964	17.10.09	14.23	

Appendix VIII

Reineck box-core stations

Station No	Type	Lat		Long		Date	Time	Comments
		Deg	Min	Deg	Min		UTC	
ISMA472	BX	53	48.608	5	55.689	17.10.09	12.30	22cm core
ISMA474	BX	53	45.216	5	57.199	17.10.09	13.04	26cm Mud Core
ISMA476	BX	53	41.543	5	58.309	17.10.09	13.36	
ISMA478	BX	53	41.617	5	58.402	17.10.09	13.51	
ISMA480	BX	53	38.611	5	56.964	17.10.09	14.23	

Appendix IX

Vibro-core stations

Station	Lat		Long		Date/Time	Depth	Sections	Comments
	Deg	Min	Deg	Min	UTC	m		
ISMA_V_063	53	26.3432	5	54.646	9.54 11.10.09		3: 0-1m	Muddy with gravel layers, mainly glacial
							2: 1-2m	Muddy with gravel layers, mainly glacial
							1: 2-3m	Muddy with gravel layers, mainly glacial
							core catcher	Muddy with gravel layers, mainly glacial
ISMA_V_064	53	26.1784	5	55.02	10.25 11.10.09		3: 0- 0.95m	Fine sand??
							2: 0.95 - 1.95m	Fine sand??
							1: 1.95-2.95m	Fine sand??
ISMA_V_159	53	33.9809	5	58.0021	10.18 12.10.09		3: 0 - 0.83m	
							2: 0.83 - 1.83m	
							1: 1.83 - 2.83m	
ISMA_V_160	53	34.123	5	55.511	12.10.09 10.43		surface	top sample
							3.00m	sample from base (rest of core lost)
ISMA_V_207	53	2.5055	5	54.5101	6.23 13/10/09		3:0 - 0.7m	well sorted gravel
							2: 0.7 - 1.7m	upper 30 cm is sandy; reminder muddy
							1: 1.7 - 2.7m	muddy
ISMA_V_234	52	59.6031	5	54.9843	18.11 13/10/09	26.8	1: 0-0.76m	Sand at top, hard bottom (stiff clay)
ISMA_V_235	53	1.7895	5	53.8067	18.38 13/10/09	41m	3: 0-0.86m	
							2:0.86-1.86m	
							1:1.86-2.86m	Sandy

Station	Lat		Long		Time	Depth	Sections	Comments
	Deg	Min	Deg	Min	UTC	m		
ISMA_V_296	52	58.517	5	53.944	14.10.09 12.52	71.72	1: 0 - 1m	1 section (sand)
ISMA_V_297	53	0.7217	5	55.1803	13.24 14.10.09	22.9	3: 0 - 0.9m	sand with cobble at the top
							2: 0.9 - 1.9m	v coarse sand
							1: 1.9 - 2.9m	sand
ISMA_V_306	53	26.939	5	53.4628	19.32 14.10.09	43.3	1: 0-0.40cm	Lithified sandy gravel
							core catcher	Lithified sandy gravel
ISMA_V_307	53	27.9625	5	51.3669	19.56 14.10.10	42.05	3: 0 - 0.98 m	Sand and silt
							2: 0.98 - 2.00 m	Sand
							1: 2.00 - 3.02 m	Sand
ISMA_V_308	53	27.6058	5	52.2355	20.15 14.10.09	44.1	3: 0 - 1.04 m	Silty mud
							2: 1.04 - 2.06 m	Silty mud
							1: 2.06 - 3.04 m	Silty mud
ISMA_V_356	53	37.485	5	54.508	15.10.09 8.35	50.5	3: 0 - 0.95m	silty
							2: 0.95 - 1.95m	gradually more sandy
							1: 1.95 - 2.95m	more sandy
ISMA_V_357	53	37.353	5	54.424	15.10.09 8.56	50.5	2:0 - 0.9m	muddy silt
							1: 0.9 - 1.9m	
							core catcher	stiff mud
ISMA_V_358	53	38.6974	5	56.4116	15.10.09 9.25	44.8	3: 0 - 0.85m	silt
							2: 0.85 - 1.85m	
							1: 1.85 - 2.85m	
							core catcher	silty clay
ISMA_V_359	53	42.8173	5	57.664	15.10.09 10.12	42	3: 0 - 0.6m	silty mud at top; mud underneath
							2: 0.6 - 1.6m	mud
							1: 1.6 - 2.6m	mud
							core catcher	mud

Station	Lat		Long		Time	Depth	Sections	Comments
	Deg	Min	Deg	Min	UTC	m		
ISMA_V_417	53	48.4528	5	55.5041	16.10.09 08.38	44.5	3: 0 - 0.72 m	mud
							2: 0.72 - 1.72 m	mud
							1: 1.72 - 2.72 m	mud
							core catcher	mud
ISMA _V_418	53	48.2333	6	2.9527	16.10.09 09.19	33.5	3: 0 - 0.49 m	mud
							2: 0.49 - 1.49 m	mud
							3: 1.49 - 2.49 m	mud
							core catcher	mud
ISMA_V_470	53	41.597	5	58.3665	17.10.09 9.54	41	3: 0 - 1m	
							2: 1 - 2m	
							1: 2 - 3m	
							core catcher	clay (in 2 bags)
ISMA_V_471	53	41.4692	5	57.9566	17.10.09 10.17	41.7	3: 0 - 0.3m	
							2: 0.3 - 1.3m	
							1: 1.3 - 2.3m	
							core catcher	clay (in 2 bags)

Appendix X

Drop camera stations

ISMA_TV_217

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
1	16.04	53	26.6743	5	52.5432	Seaweed in left centre, Fine sand-undulated Surface
2	16.05	53	26.6769	5	52.5426	Fine sand-silt and shell-undulated surface
3	16.06	53	26.6792	5	52.5397	Seaweed in bottom left- fine sand ripples
4	16.07	53	26.6819	5	52.5352	White Out
5	16.07	53	26.6819	5	52.5352	Brittle Star in bottom centre. Fine Sand Ripples
6	16.08	53	26.6853	5	52.5288	Fine Sand, Ripples
7	16.09	53	26.6862	5	52.5243	Fine Sand, Ripples, Seaweed- No Flash
8	16.09	53	26.6899	5	52.5205	Fine Sand Ripples- Some Pebbles
9	16.1	53	26.6922	5	52.5163	Fine Sand, Straight Crested Ripples- Shell Hash in Troughs
10	16.11	53	26.6945	5	52.5114	Fine Sand Cuspate Ripples, Seaweed on Stone on bottom left
11	16.12	53	26.6968	5	52.5079	Fine Sand Straight Crested Ripples
12	16.13	53	26.6998	5	52.5031	Fine Sand Cuspate Ripples, Shell Fragments in Troughs
13	16.13	53	26.7033	5	52.4982	Fine Sand Cuspate Ripples, Shell Fragments in Troughs
14	16.14	53	26.7075	5	52.4904	White Out
15	16.15	53	26.7105	5	52.4849	Fine Sand, Straight Crested Ripples, Cloudy due to fish
16	16.15	53	26.7132	5	52.4811	Fine Sand, Cuspate Ripples-No Flash
17	16.17	53	26.7170	5	52.4765	Fine Sand, Ripples- Shell Hash in Troughs- No Flash
18	16.18	53	26.7223	5	52.4695	Fine Sand. 3-D Flow Ripples- Seaweed in Centre
19	16.18	53	26.7273	5	52.4661	Fine Sand. 3-D Flow Ripples- Seaweed in Centre and Shells in Troughs
20	16.19	53	26.7342	5	52.4583	Fine Sand, Cuspate Ripples, Small Monk Centre Left
21	16.2	53	26.7387	5	52.4531	Fine Sand- Wider Based Ripples
22	16.21	53	26.7437	5	52.4488	Fine Sand and Ripples

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
23	16.22	53	26.7487	5	52.4445	Fine Sand Cuspate Ripples, Shells in Troughs
24	16.22	53	26.7551	5	52.4378	Fine Sand- Bedforms- some Silt, Burrow in bottom Left
25	16.23	53	26.7597	5	52.4321	Some weed- Fine Sand Ripples
26	16.24	53	26.7662	5	52.4257	White Out
27	16.26	53	26.7769	5	52.4167	Fine Sand And Straight Crested Ripples
28	16.27	53	26.7891	5	52.5074	White Out
29	16.29	53	26.8013	5	52.399	Fine Sand Ripples, Brittle Star in Right of View
30	16.3	53	26.8131	5	52.3854	Fine Sand
31	16.31	53	26.8158	5	52.3698	Fine Sand, Undulated Seabed
32	16.32	53	26.8154	5	52.3558	Fine Sand, Undulated Seabed
33	16.32	53	26.5139	5	52.345	Fine Sand, Straight Crested ripples
34	16.33	53	26.8147	5	52.3363	2 Grain Sizes, Fine sand building Ripples, Finer Grains Settling in Troughs
35	16.34	53	26.8158	5	52.3231	White Out
36	16.35	53	26.8143	5	52.5159	Sand- Coarser- Ripples Shells in Troughs
37	16.36	53	26.8150	5	52.3075	White Out
38	16.37	53	26.8185	5	52.3023	White Out
39	16.38	53	26.8122	5	52.2926	White Out
40	16.39	53	26.8230	5	52.2855	2 Grain Sizes, Ripple Builders and Trough Fillers
41	16.39	53	26.8257	5	52.2736	Sand and Shell- Wide Wave Length
42	16.4	53	26.8284	5	52.2584	2 Grain Sizes- No Flash
43	16.41	53	26.8318	5	52.251	2 Grain Sizes
44	16.41	53	26.8349	5	52.2466	Sand - Ripple Troughs filled with Shells
45	16.42	53	26.3790	5	52.2396	Sand - Ripple Troughs filled with Shells
46	16.42	53	26.8410	5	52.2296	Seaweed, Sand and Ripples
47	16.43	53	26.8429	5	52.2134	3 Clumps of Seaweed
48	16.44	53	26.8467	5	52.1918	Finer, No Ripples, Undulated- No flash
49	16.45	53	26.8565	5	52.185	Sand Form Ripples- Troughs Filled with Finer Grains
50	16.46	53	26.8539	5	52.1664	Sand Form Ripples- Troughs Filled with Finer Grains

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
51	16.47	53	26.8555	5	52.1451	Sand Form Ripples- Troughs Filled with Finer Grains Fish in Right of Field
52	16.48	53	26.8574	5	52.1223	Fine Sand- Silt in Troughs
53	16.5	53	26.8581	5	52.1027	Sand and Silt- Ripples and Trough Fill
54	16.51	53	26.8650	5	52.0896	Sand and Shells in Troughs
55	16.52	53	26.8673	5	52.0821	Sand and Shells in Troughs
56	16.53	53	26.8684	5	52.0672	Sand and Shells in Troughs

ISMA_TV_264

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
1	0.12	53	1.7338	5	54.1506	Coarse Sand and Shell Hash
2	0.13	53	1.7273	5	54.1788	Sand Pebbles and Shells
3	0.13	53	1.7227	5	54.1754	Sand, Pebbles, Gravel and few Shells
4	0.14	53	1.7166	5	54.1706	Gravel and Pebbles
5	0.15	53	1.709	5	54.1641	Sand and Gravel
6	0.15	53	1.7025	5	54.1586	Sand Gravel and Gastropod Shells
7	0.16	53	1.693	5	54.1524	Sand Gravel and Gastropod Shells
8	0.17	53	1.6838	5	54.1482	Sand and Gravel
9	0.18	53	1.6758	5	54.1451	Sand and Gravel
10	0.19	53	1.667	5	54.1422	Sand and Gravel
11	0.19	53	1.6594	5	54.1407	Gravel, Sand and Shells
12	0.2	53	1.6525	5	54.1404	Gravel, Sand and Shells
13	0.2	53	1.6438	5	54.143	Gravel, Sand and Shells
14	0.21	53	1.6369	5	54.147	Sand and Gravel
15	0.22	53	1.6304	5	54.1523	Sand and Gravel-More Sand- Becoming Finer
16	0.23	53	1.6262	5	54.1572	Pebbles, Mostly Sandy-Shell Hash
17	0.24	53	1.622	5	54.1631	Sand with some Pebbles
18	0.25	53	1.6191	5	54.1735	Mostly Sand some Gravel

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
19	0.25	53	1.6178	5	54.1895	Gravel and Pebbles on mostly Sandy Seabed
20	0.26	53	1.6155	5	54.1998	Gravel and Shell Fragments on Sandy Bed
21	0.27	53	1.6132	5	54.2121	Pebbles, Gravel and Sand
22	0.27	53	1.609	5	54.2258	Gravel and Sand - Becoming Coarser
23	0.28	53	1.6322	5	54.237	Finer- Mostly Sand
24	0.29	53	1.5976	5	54.2439	Pebbles, Gravel and Clam Shells
25	0.29	53	1.5915	5	54.256	Pebbles, Sand and Shells
26	0.3	53	1.5862	5	54.269	Pebbles, Sand and Shells
27	0.3	53	1.5823	5	54.2781	Sand and Pebbles
28	0.31	53	1.5781	5	54.2849	Cobbles, Pebbles and Sand
29	0.32	53	1.5732	5	54.2933	Cobbles Gravel - Sea Urchins
30	0.32	53	1.5694	5	54.3008	Coarse Gravel- Seaweed
31	0.33	53	1.5659	5	54.3067	Seaweed Clams, Cobbles and Boulders
32	0.33	53	1.5629	5	54.3142	Boulders, Pebbles and Cobbles- Very Coarse
33	0.34	53	1.5591	5	54.3245	Boulders, Pebbles, Sand-Poor Sorting shells
34	0.34	53	1.5553	5	54.3336	Anemones , Crabs, Boulders, Pebbles Poorly Sorted - Barnacles on Large Clasts
35	0.35	53	1.549	5	54.3409	Boulders, Pebbles and Sand- Poorly Sorted- Barnacles on Large Clasts
36	0.36	53	1.5419	5	54.3464	Fish, Seaweed, Sponges- Pebbles and Cobbles
37	0.36	53	1.535	5	54.3514	Starfish, Seaweed, Boulders, Cobbles and Peebles, Poorly Sorted
38	0.37	53	1.5278	5	54.3586	Starfish, Crab, Barnacles, Cobbles, Boulders and Pebbles
39	0.37	53	1.5232	5	54.3678	Lots of Starfish, Shrimp, Hermit- Boulders and Cobbles
40	0.38	53	1.5209	5	54.3793	Starfish, Shrimp, Anemones, Worm tubes, Boulders and Cobbles
41	0.38	53	1.519	5	54.389	Wormtubes Shrimp, Boulders and Cobbles Poor sorting
42	0.39	53	1.5152	5	54.3984	Pebbles, cobbles, Sponges and Wormtubes
43	0.4	53	1.5106	5	54.4055	Mussel Colony Pebbles and Clams
44	0.4	53	1.5045	5	54.4127	Pebbles, Well Sorted - Seaweed and Clams
45	0.41	53	1.498	5	54.4205	Pebbles Gravel, Cobbles, Starfish and Seaweed
46	0.41	53	1.4912	5	54.4301	Pebbles Seaweed and Starfish

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
47	0.42	53	1.487	5	54.4389	Pebbles and Gravel
48	0.42	53	1.4843	5	54.4466	Pebbles Gravel and Barnacles
49	0.43	53	1.4835	5	54.4565	Starfish, Shellfish - Pebbles Better Sorting
50	0.44	53	1.4828	5	54.4686	Pebbles Gravel, Shells and Seaweed
51	0.44	53	1.4812	5	54.4773	Pebbles Gravel, Disarticulated Shells
52	0.45	53	1.4782	5	54.4852	Pebbles, Gravel and Seaweed
53	0.45	53	1.4744	5	54.4918	Pebbles, Gravel and Seaweed
54	0.46	53	1.4621	5	54.4959	Pebbles, Gravel and Seaweed
55	0.46	53	1.4591	5	54.4976	Pebbles, Gravel and Seaweed - Hermit Crabs
56	0.47	53	1.4511	5	54.4983	Pebbles, Gravel Seaweed barnacles on Pebbles
57	0.48	53	1.4416	5	54.4997	Pebbles Gravel, Seaweed, Starfish, Barnacles and Crabs
58	0.48	53	1.4309	5	54.5032	Pebbles Gravel, Seaweed, Starfish, Barnacles and Crabs
59	0.49	53	1.421	5	54.5084	Seaweed , Mussels, Pebbles and Gravel
60	0.5	53	1.4137	5	54.5185	Sponges, Starfish, Pebbles and Gravel
61	0.51	53	1.4086	5	54.5219	Pebbles - Well Sorted- Seaweed
62	0.51	53	1.4034	5	54.5306	Pebbles Gravel, Sponges and Anemones
63	0.52	53	1.3981	5	54.5411	Pebbles, Grave, Sponges and Hermit Crabs
64	0.52	53	1.3939	5	54.5481	Wormtubes, Pebbles and Gravel
65	0.53	53	1.3878	5	54.556	Anemone, Starfish, Pebbles and Cobbles
66	0.54	53	1.3817	5	54.5619	Crab, Mussels wormtubes, pebbles and cobbles
67	0.54	53	1.3756	5	54.5658	Cobbles, Gravel-Poor sorting-- Sponges Anemones
68	0.55	53	1.3695	5	54.5673	Starfish, Pebbles, Gravel and an Anemone
69	0.56	53	1.3626	5	54.5638	Poorly Sorted Pebbles and Gravel
70	0.56	53	1.3538	5	54.5551	Pebbles Gravel sponges, poorly Sorted
71	0.57	53	1.3432	5	54.5541	Pebbles Gravel, Poorly Sorted- Sponges and Mussels
72	0.58	53	1.3367	5	54.5573	Starfish (10Legs) Barnacles, Pebbles and Gravel
73	0.58	53	1.3313	5	54.562	Starfish , Barnacles, Pebbles and Gravel Poor Sorting
74	0.59	53	1.3252	5	54.5678	Crabs, Seaweed, Pebbles and Cobbles
75	0.59	53	1.3199	5	54.5738	Pebbles, Gravel, Sponges and Shells

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
76	1	53	1.3149	5	54.5809	Sponges, Crabs, Barnacles- Boulders and Cobbles - Poor Sorting
77	1	53	1.3096	5	54.5902	Pebbles, Gravel, Shells, Crabs, Barnacles, Poor Sorting
78	1.01	53	1.605	5	54.5987	Anemone, Seaweed , Gravel and Pebbles
79	1.02	53	1.2978	5	54.6167	Cobbles, Pebbles , Shells fragments and Starfish
80	1.02	53	1.2943	5	54.6254	Starfish, Pebbles, Mussels- Poorly Sorted
81	1.03	53	1.2917	5	54.6316	Poorly Sorted Pebbles, Sand and Gravel
82	1.03	53	1.2882	5	54.6381	Pebbles Gravel and Shells
83	1.04	53	1.2848	5	54.6429	Cobbles Gravel and Shell Fragments
84	1.04	53	1.2806	5	54.6468	Cobbles Gravel Poorly Sorted- Some Sponges
85	1.05	53	1.2749	5	54.648	Pebbles, Gravel- Poorly Sorted- Anemones and Crabs
86	1.05	53	1.268	5	54.6459	Seaweed, Barnacles, Pebbles and Gravel
87	1.06	53	1.2611	5	54.6468	Shell Hash, Seaweed, Pebbles and Gravel
88	1.06	53	1.2535	5	54.6512	Sponges, Anemones, Pebbles and Gravel
89	1.07	53	1.2478	5	54.6554	Pebbles, Cobbles, Shrimps and Crabs
90	1.07	53	1.2405	5	54.6549	Sponges, Shrimp and Pebbles
91	1.08	53	1.2333	5	54.6557	Anemones, Wormtubes, Barnacles- Gravel and Pebbles Bed
92	1.09	53	1.2268	5	54.657	Wormtubes, Shrimp, Starfish- Gravel
93	1.09	53	1.2173	5	54.6603	Abundant wormtubes, shrimp and gravel
94	1.1	53	1.2108	5	54.6639	Abundant wormtubes, shrimp,seastars- Gravel Bed
95	1.1	53	1.2043	5	54.6668	Anemone, Seaweed, Pebbles and Gravel
96	1.11	53	1.1978	5	54.6743	Cobbles, Seaweed and Shells
97	1.12	53	1.913	5	54.6822	Starfish, Urchins, Pebbles and Gravel
98	1.12	53	1.86	5	54.6896	Starfish, sand and barnacle encrusted pebbles
99	1.13	53	1.1818	5	54.6951	Wormtubes, Sand, Shrimp and Gravel
100	1.13	53	1.1757	5	54.7006	Anemone, Sand, Encrusted Pebbles and Cobbles
101	1.14	53	1.17	5	54.7043	Anemone, Sponge, Sand and Pebbles
102	1.15	53	1.162	5	54.7082	Pebbles, Shells and Gravel
103	1.15	53	1.1551	5	54.7122	Pebbles, Sand and Gravel Poorly Sorted
104	1.16	53	1.1459	5	54.7178	Pebbles, Gravel and Sand Poorly Sorted

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
105	1.16	53	1.1368	5	54.7231	Pebbles, Gravel and Sand Poorly Sorted and Hermit Crabs
106	1.17	53	1.1295	5	54.7287	Pebbles and Some Sand
107	1.17	53	1.1223	5	54.7344	Starfish and Pebbles- Well Sorted
108	1.18	53	1.1169	5	54.7401	Poorly Sorted, Pebbles, Gravel and Sand
109	1.19	53	1.1124	5	54.7473	Poorly Sorted, Pebbles, Gravel and Sand and Crabs
110	1.19	53	1.1086	5	54.7562	Pebbles and Gravel
111	1.2	53	1.1059	5	54.7612	Coarse Sand and Gravel
112	1.2	53	1.1017	5	54.768	Finer- Sand, Gravel and Pebbles - Crabs
113	1.21	53	1.0967	5	54.7771	Finer- Sand, Gravel and Pebbles - Crabs
114	1.22	53	1.0895	5	54.77434	Pebbles and Coarse Sand
115	1.22	53	1.0822	5	54.7766	Sand, Pebbles and Seaweed
116	1.23	53	1.0742	5	54.78	Coarse Sand, Pebbles and Seaweed
117	1.23	53	1.0639	5	54.784	Anemones, Pebbles and Shell Hash
118	1.24	53	1.0536	5	54.7883	Pebbles, Coarse Sand- Poorly Sorted - Sea Weed
119	1.25	53	1.0445	5	54.7936	Much Finer, Some Pebbles, Mostly Sand, Shell Hash and Seaweed
120	1.25	53	1.0368	5	54.7977	Pebbles, Mostly Sand- Anemones and Hermit Crabs
121	1.26	53	1.0311	5	54.8025	Kelp, Anemones, Pebbles, Sand Poor Sorting
122	1.26	53	1.0254	5	54.8069	Smaller Pebbles and Sand, Poorly Sorted
123	1.27	53	1.0193	5	54.8115	Anemone, Seaweed, Wormtubes, Sand and some Pebbles
124	1.28	53	1.0124	5	54.8149	Coarser-cobbles, sand and Anemones- Fish
125	1.28	53	1.0044	5	54.8197	Poorly Sorted-Worm tubes, Shrimp, Pebbles and Sand
126	1.29	53	0.9953	5	54.8264	Poorly Sorted- Pebbles and Sand- Worm tubes and Barnacles
127	1.3	53	0.9865	5	54.8303	Poorly Sorted Pebbles and Sand
128	1.31	53	0.9785	5	54.8352	Shrimp, Wormtubes- Sand and Shell Hash
129	1.31	53	0.9689	5	54.8401	Pebbles, Gravel and Shrimp,
130	1.32	53	0.959	5	54.8468	Crab, Pebbles and Cobbles- Poorly sorted
131	1.33	53	0.9502	5	54.833	Pebbles and Mussels
132	1.34	53	0.9422	5	54.8593	Cobbles and Pebbles- Poorly Sorted
133	1.35	53	0.9346	5	54.8647	Pebble, Cobbles, Hermit Crabs and Disarticulated Shells

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
134	1.36	53	0.9243	5	54.8713	Shell, Sand and Pebbles- Poorly sorted- Crabs
135	1.36	53	0.9151	5	54.8772	Anemone- Pebbles and Sand- Poorly Sorted
136	1.37	53	0.9079	5	54.8825	Poorly Sorted Pebbles, gravel and Sand, Starfish, Anemone
137	1.38	53	0.8976	5	54.8908	Starfish and Sponges- Pebbles, Sand- Poorly Sorted
138	1.39	53	0.89	5	54.8878	Starfish, Crab, Anemone, Sponges- Poorly Sorted Sand and Gravel
139	1.4	53	0.8823	5	54.9056	Sponges, Anemones- poorly Sorted Sand and Gravel
140	1.41	53	0.8793	5	54.9156	Cobbles, Pebbles, Sponges and Starfish
141	1.41	53	0.8663	5	54.9252	Anemone, Sponges, Poorly Sorted Sand And Gravel
142	1.43	53	0.8461	5	54.944	Sponges Gravel and Pebbles
143	1.44	53	0.8305	5	54.966	Pebbles and Sponges

ISMA_TV_281

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
1	6.22	53	0.5302	5	54.7263	mixed sand and gravel
2	6.22	53	0.5211	5	54.7259	shelly death assemblage
3	6.23	53	0.5333	5	54.7156	dropstones and gravels
4	6.24	53	0.5462	5	54.6952	bivalve encrusted gravel
5	6.26	53	0.5589	5	54.6693	wormtubes on a sandy surface
6	6.26	53	0.5554	5	54.6581	wormtubes on a sandy surface
7	6.39	53	0.5264	5	54.609	large cobbles on coarse sand
8	6.4	53	0.5257	5	54.6089	well sorted coarse sand
9	6.41	53	0.5257	5	54.6104	well sorted coarse sand
10	6.43	53	0.518	5	54.6042	well sorted coarse sand
11	6.43	53	0.5089	5	54.595	well sorted sand, starfish, gastropods
12	6.44	53	0.4902	5	54.5777	FALSE SNAP SHOT (picture irrelevant)
13	6.45	53	0.486	5	54.5729	moderately sorted cobbles
14	6.46	53	0.4818	5	54.5689	colonised cobbles
15	6.47	53	0.48784	5	54.572	coarse sand, starfish, anemones

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
16	6.48	53	0.4738	5	54.5734	sand, pebbles, 7 hermit crabs, anemones
17	6.5	53	0.4684	5	54.5619	well sorted sands
18	6.51	53	0.4639	5	54.5541	well rounded gravel and coarse sand
19	6.52	53	0.4381	5	54.5446	gravel and cobbles
20	6.53	53	0.4513	5	54.5337	shelly coarse sand, anemones
21	6.54	53	0.4498	5	54.5312	shelly coarse sand, anemones
22	6.54	53	0.4444	5	54.5239	wormtubes, anemones, starfish, pebbles
23	6.55	53	0.4379	5	54.5155	starfish and bivalve encrusted boulder
24	6.56	53	0.4314	5	54.5047	coarse sand, starfish
25	6.57	53	0.4234	5	54.4942	coarse sand and gravel
26	6.59	53	0.4108	5	54.479	well-sorted coarse sand
27	7	53	0.4059	5	54.4727	well-sorted coarse sand
28	7.01	53	0.4028	5	54.4684	gravel
29	7.01	53	0.3986	5	54.4642	well-rounded gravel
30	7.02	53	0.3952	5	54.4616	poorly sorted pebbles and cobbles
31	7.03	53	0.3922	5	54.4604	poorly sorted gravel
32	7.04	53	0.3872	5	54.4615	pebbles, mussels, starfish
33	7.05	53	0.383	5	54.4639	gravel with bivalve shells
34	7.05	53	0.3788	5	54.4613	poorly sorted gravel
35	7.06	53	0.3754	5	54.456	well rounded pebbles, starfish
36	7.07	53	0.37	5	54.4529	poorly sorted gravel
37	7.08	53	0.3639	5	54.4516	bivalves and starfish
38	7.09	53	0.354	5	54.4477	bivalves on rounded gravel
39	7.09	53	0.346	5	54.4426	bivalves on rounded gravel
40	7.14	53	0.3201	5	54.3872	cobbles with bivalves
41	7.15	53	0.2949	5	54.3756	gravel, anemones
42	7.15	53	0.2914	5	54.3694	gravel, anemones
43	7.15	53	0.2872	5	54.3635	bivalves on gravel
44	7.16	53	0.2808	5	54.3551	abundant bivalves on gravel

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
45	7.17	53	0.2754	5	54.3507	bivalves, anemones, gravel
46	7.18	53	0.2697	5	54.3496	bivalves colonising gravel, small crab
47	7.19	53	0.2646	5	54.3522	bivalves, gravel, anemones
48	7.19	53	0.2586	5	54.3574	bivalves, starfish
49	7.23	53	0.2449	5	54.3358	rounded gravel, bivalves, anemones
50	7.24	53	0.2499	5	54.3336	bivalves colonising gravel
51	7.25	53	0.2544	5	54.3315	bivalves colonising gravel, anemone
52	7.25	53	0.2598	5	54.3302	bivalves encrusted poorly sorted gravel
53	7.27	53	0.2724	5	54.3132	gravel, bivalve, anemone, starfish
54	7.27	53	0.2769	5	54.295	gravel, anemones
55	7.28	53	0.2808	5	54.282	gravel, anemones
56	7.29	53	0.2864	5	54.2614	well rounded gravel, bivalve shells
57	7.29	53	0.2903	5	54.2479	gravel, anemones
58	7.3	53	0.2926	5	54.2338	poorly sorted gravel, starfish, anemone
59	7.31	53	0.293	5	54.2223	poorly sorted gravel, starfish, anemone
60	7.31	53	0.2914	5	54.211	poorly sorted gravel, bryozoans/hydrozoans?
61	7.32	53	0.2888	5	54.2025	poorly sorted gravel, bryozoans/hydrozoans?
62	7.33	53	0.2869	5	54.197	poorly sorted well rounded gravel, bivalve shells
63	7.34	53	0.2838	5	54.1929	poorly sorted well rounded gravel, bivalve shells
64	7.35	53	0.2819	5	54.1846	poorly sorted well rounded gravel, bivalve shells, bryozoans/hydrozoans?
65	7.35	53	0.2777	5	54.1803	poorly sorted well rounded gravel
66	7.36	53	0.2712	5	54.1663	poorly sorted well rounded gravel, starfish
67	7.37	53	0.2647	5	54.1585	poorly sorted well rounded gravel, starfish
68	7.38	53	0.2579	5	54.1523	poorly sorted well rounded gravel, starfish, sponges, hermit crab
69	7.39	53	0.2506	5	54.1466	gravel, bivalve shell fragments
70	7.4	53	0.2426	5	54.1411	moderately sorted gravel, bivalve shell fragments
71	7.41	53	0.2369	5	54.1382	moderately sorted gravel, bivalve shell fragments
72	7.42	53	0.2312	5	54.1371	moderately sorted gravel, bivalve shell fragments

ISMA_TV_360

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
1	11.29	53	42.298	5	56.8925	Mud. Prawn burrows and small holes
2	11.30	53	42.2824	5	56.8846	Mud. Prawn burrows and small holes
3	11.31	53	42.2768	5	56.8777	Silt/mud prawn burrows
4	11.32	53	42.2661	5	56.8672	Silt/mud prawn burrows
5	11.34	53	42.2436	5	56.8305	Silt/mud prawn burrows
6	11.35	53	42.2375	5	56.8227	Silt/mud prawn burrows
7	11.36	53	42.2298	5	56.8147	Silt/mud prawn burrows
8	11.36	53	42.2245	5	56.908	Silt/mud prawn burrows
9	11.37	53	42.4218	5	56.7989	Silt/mud prawn burrows
10	11.38	53	42.2142	5	56.792	Silt/mud prawn burrows
11	11.39	53	42.2092	5	56.7839	Silt/mud prawn burrows
12	11.39	53	42.205	5	56.7785	Silt/mud prawn burrows
13	11.40	53	42.2005	5	56.7725	Silt/mud prawn burrows
14	11.41	53	42.1947	5	56.7675	Silt/mud prawn burrows
15	11.41	53	42.189	5	56.7592	Silt/mud prawn burrows
16	11.42	53	42.1833	5	56.7518	Silt/mud prawn burrows
17	11.43	53	42.1783	5	56.746	Silt/mud prawn burrows
18	11.44	53	42.1719	5	56.7393	Silt/mud prawn burrows
19	11.44	53	42.1677	5	56.7344	Silt/mud prawn burrows
20	11.45	53	42.1635	5	56.7293	Silt/mud prawn burrows
21	11.46	53	42.1534	5	56.7234	Silt/mud prawn burrows
22	11.46	53	42.1535	5	56.7186	Silt/mud prawn burrows
23	11.47	53	42.1427	5	56.712	Silt/mud prawn burrows
24	11.48	53	42.1432	5	56.706	Silt/mud prawn burrows plus small fish
25	11.48	53	42.1368	5	56.699	Silt/mud prawn burrows
26	11.49	53	42.131	5	56.693	Silt/mud prawn burrows

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
27	11.50	53	42.1261	5	56.6873	Silt/mud prawn burrows + 2 prawns
28	11.51	53	42.1207	5	56.6813	Silt/mud prawn burrows
29	11.51	53	42.1558	5	56.6757	Silt/mud prawn burrows
30	11.52	53	42.1101	5	56.6694	Silt/mud prawn burrows
31	11.52	53	42.1066	5	56.6654	Silt/mud prawn burrows
32	11.53	53	42.1024	5	56.6607	Silt/mud prawn burrows
33	11.53	53	42.0982	5	56.6568	Silt/mud prawn burrows
34	11.54	53	42.0933	5	56.6502	Silt/mud prawn burrows
35	11.55	53	42.0895	5	56.6452	Silt/mud prawn burrows
36	11.55	53	42.0141	5	56.6393	Silt/mud prawn burrows
37	11.56	53	42.0769	5	56.6163	Silt/mud prawn burrows
38	11.57	53	42.0715	5	56.6232	Silt/mud prawn burrows
39	11.58	53	42.0651	5	56.6171	Silt/mud prawn burrows (small and large holes)
40	11.59	53	42.0582	5	56.6083	Silt/mud prawn burrows
41	12.00	53	42.044	5	56.5666	Silt/mud prawn burrows
42	12.00	53	42.0432	5	56.5882	Silt/mud prawn burrows
43	12.01	53	42.038	5	56.5803	Silt/mud prawn burrows
44	12.02	53	42.0338	5	56.5714	Silt/mud prawn burrows
45	12.03	53	42.0307	5	56	Silt/mud prawn burrows
46	12.04	53	42.0284	5	56.5608	Silt/mud prawn burrows
47	12.05	53	42.0265	5	56.55	Silt/mud prawn burrows
48	12.05	53	42.0254	5	56.5423	Silt/mud prawn burrows
49	12.06	53	42.0223	5	56.5395	Silt/mud prawn burrows
50	12.07	53	42.0166	5	56.5331	Silt/mud prawn burrows - bumpy bed possibly trawl mark
51	12.07	53	42.0113	5	56.5302	WHITE OUT
52	12.08	53	42.0071	5	56.5273	Silt/mud prawn burrows
53	12.08	53	42.0029	5	56.5244	Silt/mud prawn burrows
54	12.09	53	42.9971	5	56.52	Irregular surface
55	12.10	53	41.9969	5	56.5146	Silt/mud prawn burrows

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
56	12.11	53	41.9834	5	56.51	WHITE OUT
57	12.11	53	41.9781	5	56.5058	Silt/mud prawn burrows
58	12.12	53	41.9708	5	56.4994	Silt/mud prawn burrows
59	12.13	53	41.9651	5	56.495	Silt/mud prawn burrows, cloudy photo, fish swam out of view
60	12.14	53	41.9579	5	56.4888	Silt/mud prawn burrows
61	12.15	53	41.9483	5	56.4809	WHITE OUT
62	12.15	53	41.9426	5	56.476	Channels through mud
63	12.16	53	41.9357	5	56.4703	Silt/mud prawn burrows
64	12.17	53	41.9319	5	56.4673	Silt/mud prawn burrows
65	12.18	53	41.927	5	56.4637	Silt/mud prawn burrows
66	12.18	53	41.9159	5	56.4547	WHITE OUT
67	12.19	53	41.909	5	56.45	Mud - less burrows
68	12.20	53	41.9022	5	56.4454	Silt/mud prawn burrows
69	12.21	53	41.8949	5	56.4405	Silt/mud prawn burrows
70	12.21	53	41.8888	5	56.4368	Silt/mud prawn burrows + fish
71	12.22	53	41.8819	5	56.4325	Silt/mud prawn burrows
72	12.23	53	41.8756	5	56.4285	Silt/mud prawn burrows
73	12.24	53	41.8897	5	56.4299	Silt/mud prawn burrows
74	12.25	53	41.8644	5	56.4211	Silt/mud prawn burrows
75	12.25	53	41.8594	5	56.4174	Silt/mud prawn burrows
76	12.26	53	41.8537	5	56.4131	Silt/mud prawn burrows
77	12.27	53	41.8453	5	56.407	Silt/mud prawn burrows
78	12.28	53	41.8396	5	56.4026	Silt/mud prawn burrows
79	12.29	53	41.8339	5	56.3976	Silt/mud prawn burrows
80	12.30	53	41.8274	5	56.3927	Silt/mud prawn burrows
81	12.31	53	41.819	5	56.3857	WHITE OUT
82	12.31	53	41.814	5	56.3831	Silt/mud prawn burrows
83	12.32	53	41.8064	5	56.3781	Silt/mud prawn burrows
84	12.33	53	41.798	5	56.3731	Silt/mud prawn burrows

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
85	12.34	53	41.7919	5	56.3688	WHITE OUT
86	12.35	53	41.7858	5	56.3658	Silt/mud prawn burrows
87	12.36	53	41.7781	5	56.364	Silt/mud prawn burrows
88	12.37	53	41.7751	5	56.3631	Silt/mud prawn burrows
89	12.38	53	41.7656	5	56.3514	Silt/mud prawn burrows
90	12.38	53	41.7591	5	56.3474	Silt/mud prawn burrows
91	12.39	53	41.7522	5	56.3431	Silt/mud prawn burrows
92	12.40	53	41.7454	5	56.3397	Silt/mud prawn burrows
93	12.41	53	41.7374	5	56.3339	Silt/mud prawn burrows
94	12.42	53	41.7309	5	56.3309	Silt/mud prawn burrows
95	12.43	53	41.7252	5	56.3285	Silt/mud prawn burrows
96	12.44	53	41.7164	5	56.3256	Silt/mud prawn burrows
97	12.45	53	41.7095	5	56.3216	Silt/mud prawn burrows
98	12.46	53	41.7027	5	56.3187	Silt/mud prawn burrows
99	12.46	53	41.6969	5	56.3137	Silt/mud prawn burrows
100	12.47	53	41.6901	5	56.314	Silt/mud prawn burrows
101	12.48	53	41.6832	5	56.3109	Silt/mud prawn burrows
102	12.49	53	41.6763	5	56.3083	Silt/mud prawn burrows
103	12.49	53	41.6706	5	56.3065	Silt/mud prawn burrows
104	12.50	53	41.6641	5	56.3041	Silt/mud prawn burrows
105	12.51	53	41.655	5	56.3011	Possibly missed fix here
106	12.52	53	41.6492	5	56.2985	Silt/mud prawn burrows
107	12.52	53	41.6345	5	56.297	Silt/mud prawn burrows

ISMA_TV_362

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
1	14.25	53	33.8684	5	56.7674	sand, shells
2	14.26	53	33.8699	5	56.7604	sand, rippled seabed
3	14.26	53	33.8707	5	56.7546	
4	14.27	53	33.8718	5	56.7454	compacted sand, sand waves
5	14.27	53	33.8726	5	56.7381	shell fragments
6	14.28	53	33.3734	5	56.8313	
7	14.28	53	33.8734	5	56.7246	
8	14.29	53	33.873	5	56.7126	worm tracks
9	14.3	53	33.8722	5	56.7002	sand, burrows, shell fragments
10	14.3	53	33.8715	5	56.6898	
11	14.31	53	33.8707	5	56.679	prawn hole, fine sand, shell frags
12	14.32	53	33.8707	5	56.6669	
13	14.32	53	33.8711	5	56.6652	coarse to fine sand, silt, shell, hollows
14	14.33	53	33.8715	5	56.6506	
15	14.33	53	33.8715	5	56.6411	sand, silt,fish
16	14.34	53	33.8718	5	56.632	sand, hollows, shell frags
17	14.35	53	33.8715	5	56.6232	
18	14.35	53	33.8718	5	56.6413	
19	14.36	53	33.8722	5	56.598	sand, sand waves, shell frags
20	14.37	53	33.873	5	56.5883	as above with hollows
21	14.38	53	33.8734	5	56.5774	
22	14.38	53	33.8741	5	56.5702	coarse to medium sand, sand waves, shell frags
23	14.39	53	33.8757	5	56.561	sand, shells, starfish, sponge
24	14.4	53	33.8783	5	56.5511	sand, ripples, shell
25	14.4	53	33.8825	5	56.5411	sand, fish (Cod)
26	14.41	53	53.8852	5	56.5319	sand, starfish, shell frags

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
27	14.42	53	33.8799	5	56.5196	
28	14.42	53	33.8882	5	56.5088	sand, small hollows
29	14.43	53	33.889	5	56.4983	sand, starfish
30	14.44	53	33.8898	5	56.4848	sand ripples, shell frags
31	14.44	53	33.8702	5	56.4702	
32	14.45	53	33.8921	5	56.4601	seaweed
33	14.46	53	33.8943	5	56.4503	
34	14.47	53	33.8982	5	56.4401	
35	14.48	53	33.9008	5	56.4307	
36	14.48	53	33.9031	5	56.4172	sand ripples, hollows, bits of shells
37	14.49	53	33.905	5	56.4069	sand, holes and worm tracks
38	14.5	53	33.9073	5	56.3963	
39	14.51	53	33.9115	5	56.3858	
40	14.51	53	33.9146	5	56.3748	
41	14.52	53	33.9161	5	56.3671	
42	14.53	53	33.9191	5	56.3569	
43	14.53	53	33.9199	5	56.3483	fine sands, burrow and some shell frags
44	14.54	53	33.9214	5	56.34	fine sand, channel
45	14.55	53	33.9237	5	56.33	fine sand, seaweed, fish (red)
46	14.56	53	33.9266	5	56.3189	fine sand, shell frags, some burrows
47	14.56	53	33.9294	5	56.3113	fine sand, shell frags
48	14.57	53	33.9314	5	56.3041	sand, shell frags, seaweed
49	14.57	53	33.9336	5	56.2972	fine sand, ripples, some burrows
50	14.58	53	33.9355	5	56.2925	fine sand, shell frags
51	14.59	53	33.9397	5	56.2848	nest of starfish, fine sand, shells
52	15	53	33.9447	5	56.2718	fine sand, shell frags, old ripples
53	15	53	33.947	5	56.262	fine sand, shell frags, old ripples
54	15.01	53	33.9485	5	56.2497	straight crested ripples
55	15.02	53	33.9497	5	56.2384	straight crested ripples

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
56	15.03	53	33.9596	5	56.2263	fine sandy ripples
57	15.04	53	33.9584	5	56.2215	fine sandy ripples
58	15.04	53	33.9653	5	56.2166	fine sand, straight crested ripples
59	15.05	53	33.9733	5	56.2069	fine sand, shell frags
60	15.06	53	33.9748	5	56.1896	fine sand, ripples and burrows
61	15.07	53	33.976	5	56.179	fine sand, ripples and burrows
62	15.08	53	33.9828	5	56.164	fine sand, shell frags
63	15.08	53	33.9828	5	56.164	
64	15.09	53	33.983	5	56.149	straight crested sand ripples and pebbles
65	15.09	53	33.9806	5	56.1359	fine sand and shell frags
66	15.1	53	33.9798	5	56.1256	fine sand and shell frags, old ripples
67	15.11	53	33.9802	5	56.111	fine sand and shell frags, burrows
68	15.11	53	33.9809	5	56.0992	fine sand and shell frags, burrows
69	15.12	53	33.9817	5	56.0857	fine sand, ripples and shells
70	15.13	53	33.9825	5	56.076	fine sand, shells
71	15.13	53	33.9836	5	56.0646	fine sand, red fish, poor photo - obscured
72	15.14	53	33.9844	5	56.0532	fine sand, ripples - WHITE-OUT
73	15.14	53	33.9844	5	56.0451	fine sand, shell frags, straight crested ripples
74	15.15	53	33.9848	5	56.0328	
75	15.16	53	33.9898	5	56.0223	
76	15.16	53	33.984	5	56.0118	
77	15.17	53	33.9825	5	56.0008	fine sand, shell frags and ripples
78	15.18	53	33.9806	5	55.999	fine sand, shell frags and ripples
79	15.18	53	33.9779	5	55.9797	fine sand, shell frags and ripples
80	15.19	53	33.9745	5	55.9688	fine sand, shell frags and ripples
81	15.2	53	33.9725	5	55.9595	fine sand, shell frags and ripples
82	15.2	53	33.9733	5	55.9496	fine sand, shell frags, ripples and wormcasts
83	15.21	53	33.9756	5	55.9401	fine sand, shells, seaweed
84	15.22	53	33.979	5	55.9321	fine sand, shell frags, ripples

ISMA_TV_364

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
1	15.57	53	34.7061	5	54.3661	sand, shells, burrows, ripples
2	15.58	53	34.7111	5	54.3642	sand, burrows
3	15.59	53	34.7145	5	54.3623	sand, ripples, shells
4	15.59	53	34.7191	5	54.3591	sand, ripples, shells
5	16	53	34.7248	5	54.3536	sand, ripples, shells, WHITE OUT!
6	16.01	53	34.7301	5	54.3461	sand, ripples, shells
7	16.02	53	34.7343	5	54.3318	sand, ripples, shells
8	16.03	53	34.7347	5	54.3181	sand, ripples, shells
9	16.04	53	34.7363	5	54.3037	sand, ripples, shells, WHITE OUT!
10	16.05	53	34.7393	5	54.282	sand, ripples
11	16.06	53	34.7435	5	54.2615	sand, ripples, fish
12	16.07	53	34.7477	5	54.245	sand, ripples, WHITE OUT!
13	16.08	53	34.7515	5	54.2317	sand, ripples
14	16.08	53	34.7557	5	54.2218	sand, ripples, burrows
15	16.09	53	34.7633	5	54.2062	sand, ripples, burrows
16	16.1	53	34.7683	5	54.2016	
17	16.11	53	34.7721	5	54.1995	sand, ripples, 8 burrows
18	16.11	53	34.7759	5	54.1986	fine sand, shells, burrows
19	16.12	53	34.7794	5	54.1966	fine sand, shells, burrows, few fish
20	16.13	53	34.7866	5	54.1921	fine sand and shell bits
21	16.13	53	34.7946	5	54.1839	fine sand and shell bits
22	16.14	53	34.8011	5	54.1742	fine sand and shell bits, fish
23	16.15	53	34.8064	5	54.165	fine sand, shells
24	16.16	53	34.8122	5	54.1547	fine sand, shells
25	16.17	53	34.819	5	54.142	fine sand, shells, worm tubes (?)
26	16.18	53	34.8225	5	54.1297	WHITE OUT!

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
27	16.18	53	34.8255	5	54.1223	WHITE OUT!
28	16.19	53	34.8293	5	54.1162	fine sand, bits of shell, fish
29	16.19	53	34.8339	5	54.111	fine sand, shell fragments, burrows
30	16.2	53	34.8396	5	54.1029	fine sand, shell fragments, burrows
31	16.21	53	34.845	5	54.0966	
32	16.21	53	34.8526	5	54.0889	
33	16.22	53	34.8614	5	54.0823	fine sand, bits of shell, small holes, fish
34	16.23	53	34.8701	5	54.0752	
35	16.24	53	34.8816	5	54.0694	sand, shell, 2 fish
36	16.24	53	34.8904	5	54.0651	
37	16.25	53	34.9026	5	54.052	
38	16.26	53	34.911	5	54.0408	fine sand, hollows, shells
39	16.27	53	34.914	5	54.0346	
40	16.28	53	34.9148	5	54.0302	sand, burrows
41	16.29	53	34.9155	5	54.025	sand, debris, burrows
42	16.3	53	34.919	5	54.015	
43	16.31	53	34.922	5	54.007	sand, shells, burrows, ripples
44	16.32	53	34.9266	5	53.9931	fine sand, shells
45	16.33	53	34.9289	5	53.9835	
46	16.34	53	34.9308	5	53.9703	No Flash
47	16.35	53	34.9358	5	53.9592	WHITE OUT!
48	16.35	53	34.9415	5	53.9514	fine sand, burrows
49	16.36	53	34.9472	5	53.9442	fine sand, burrows, shell fragments
50	16.37	53	34.9556	5	53.9345	
51	16.38	53	34.967	5	53.9236	
52	16.39	53	34.98	5	53.9132	
53	16.4	53	34.9882	5	53.9043	
54	16.41	53	35.001	5	53.8951	finer sand, mud burrows
55	16.42	53	35.0121	5	53.8853	finer sand, mud burrows, fish, eddys, burrows

56	16.43	53	35.0185	5	53.8761	finer sand, fish, burrows, mud, shell fragments
57	16.44	53	35.0227	5	53.8716	finer sand, fish, burrows

ISMA_TV_366

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
1	18.02	53	34.9742	5	57.7025	silty to sandy seabed with shell fragments
2	18.03	53	34.988	5	57.112	As above
3	18.04	53	34.9987	5	57.7229	Silty - sandy seabed with ripples, shell frags
4	18.04	53	35.0048	5	57.73	As above
5	18.05	53	35.0113	5	57.7374	As above with shell frags in ripple troughs
6	18.06	53	55.0224	5	57.7991	As above
7	18.07	53	35.0334	5	57.7604	As above abundant ripples = fast current speeds
8	18.08	53	35.0437	5	57.7707	As above - sand ripples and larger shell frags
9	18.09	53	35.0578	5	57.7847	Sandy ripples with larger shell frags
10	18.1	53	35.0697	5	57.7971	Fast currents
11	18.11	53	35.0792	5	57.808	Fast currents distorting seabed flora
12	18.12	53	35.0891	5	57.8193	Rippled sands
13	18.13	53	35.1081	5	57.8341	Clear sinuous sand ripples
14	18.14	53	35.1147	5	57.8492	WHITE OUT
15	18.15	53	35.1231	5	57.8586	Sandy ripples - shell frags of various sizes
16	18.16	53	35.1316	5	57.8695	As above with flatfish in view
17	18.17	53	35.1406	5	57.8795	Sandy ripples with rare gravel clasts
18	18.18	53	35.1524	5	57.8917	ripple crests appear slightly more parallel
19	18.19	53	35.165	5	57.907	Sandy ripples
20	18.21	53	35.1772	5	57.9196	As above with sponge?
21	18.22	53	35.1898	5	57.9325	Sandy seabed with ripples
22	18.23	53	35.1986	5	57.9431	As above with various sizes of shell fragments
23	18.24	53	35.2085	5	57.9546	WHITE OUT
24	18.25	53	35.2196	5	57.9678	Sandy rippled seabed
25	18.26	53	35.2264	5	57.9769	As above

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
26	18.27	53	35.2356	5	57.989	As above with burrows
27	18.28	53	35.244	5	57.9997	Sand with shell fragments and rare gravel
28	18.29	53	35.2535	5	58.0132	Sand with shell fragments and rare gravel
29	18.3	53	35.2627	5	58.0252	Sand with shell fragments and rare gravel
30	18.31	53	35.2715	5	58.0375	Sand with shell fragments and rare gravel
31	18.32	53	35.2779	5	58.0459	Rippled sand - strong currents
32	18.33	53	35.289	5	58.0586	Rippled sand - strong currents
33	18.35	53	35.2993	5	58.0726	Rippled sand and shell fragments of various sizes
34	18.36	53	35.3081	5	58.0839	Rippled sand and shell fragments of various sizes
35	18.37	53	35.3165	5	58.0953	Rippled sand and shell fragments of various sizes
36	18.38	53	35.323	5	58.1049	WHITE OUT
37	18.39	53	35.3321	5	58.1171	Sandy ripples with shell fragments and rare gravel
38	18.4	53	35.3394	5	58.1278	Sandy ripples with shell fragments and rare gravel
39	18.41	53	35.3455	5	58.1377	Sandy ripples with shell fragments and rare gravel - photo obscured by sediment plume
40	18.42	53	35.3527	5	58.1493	Sandy ripples with shell fragments and rare gravel
41	18.43	53	35.3596	5	58.1596	WHITE OUT
42	18.44	53	35.3642	5	56.1674	Sandy ripples with shell fragments and possible cobble
43	18.45	53	35.3691	5	58.1749	Sandy ripples with shell fragments and rare gravel

ISMA_TV_419

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
1	10.1	53	48.7438	6	1.8884	silty seabed and prawn? Borrows
2	10.11	53	48.7331	6	1.8939	as above (silt obstructing photo view)
3	10.12	53	48.7228	6	1.9007	as above - clear borrows
4	10.13	53	48.7125	6	1.9058	WHITE OUT
5	10.13	53	48.7053	6	1.9091	silty seabed with scattered borrows
6	10.14	53	48.6901	6	1.9125	as above

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
7	10.15	53	48.6831	6	1.9166	as above
8	10.16	53	48.6763	6	1.9205	as above with a borrow
9	10.17	53	48.6652	6	1.9243	as above
10	10.17	53	48.653	6	1.9285	as above
11	10.18	53	48.6423	6	1.934	as above
12	10.19	53	48.6332	6	1.9304	as above
13	10.2	53	48.6233	6	1.9448	as above
14	10.21	53	48.6103	6	1.9547	as above with possible feeding crabs
15	10.22	53	48.5985	6	1.9561	as above
16	10.23	53	48.5889	6	1.9663	as above
17	10.23	53	48.5809	6	1.9667	as above and large borrow in the center
18	10.24	53	48.5699	6	1.9737	as above
19	10.25	53	48.5607	6	1.9794	WHITE OUT
20	10.25	53	48.5485	6	1.9865	silty seabed with borrow entrances of various sizes
21	10.27	53	48.5386	6	1.9894	as above plus frequent trails
22	10.28	53	48.5287	6	1.9912	WHITE OUT
23	10.28	53	48.5176	6	1.9938	hollows of different dimensions
24	10.29	53	48.5085	6	1.9967	as above
25	10.3	53	48.5004	6	1.9996	as above
26	10.31	53	48.4905	6	2.0034	as above
27	10.32	53	48.4806	6	2.0103	as above
28	10.32	53	48.4695	6	2.0144	as above
29	10.33	53	48.4592	6	2.0162	as above
30	10.34	53	48.4489	6	2.0176	fast current stirs up sediments - loss of view
31	10.35	53	48.4394	6	2.0192	2 good examples of seabed collapses
32	10.36	53	48.4219	6	2.0226	silty seabed with borows
33	10.36	53	48.4177	6	2.0269	as above plus possibly straight ripples
34	10.37	53	48.4081	6	2.0304	possible feeding crabs
35	10.38	53	48.3963	6	2.0344	as above

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
36	10.39	53	48.3863	6	2.0388	as above
37	10.4	53	48.3735	6	2.0429	starfish
38	10.4	53	48.3643	6	2.046	silty seabed and borrows
39	10.41	53	48.3617	6	2.0489	as above
40	10.42	53	48.3414	6	2.052	as above
41	10.43	53	48.3285	6	2.0549	as above
42	10.44	53	48.3166	6	2.0572	as above
43	10.45	53	48.3017	6	2.0613	numerrous borrows at various entrance sizes
44	10.46	53	48.2887	6	2.0663	silty seabed with borrows
45	10.47	53	48.2765	6	2.0679	as above
46	10.48	53	48.2665	6	2.0726	as above
47	10.49	53	48.2452	6	2.0766	as above
48	10.5	53	48.2357	6	2.0801	as above
49	10.51	53	48.2216	6	2.0852	as above
50	10.52	53	48.2075	6	2.0917	as above
51	10.53	53	48.188	6	2.0991	as above
52	10.54	53	48.178	6	2.1019	silty seabed with a number of borrows with entrances of various sizes

ISMA_TV_421

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
1	11.47	53	48.4138	5	55.3911	fine sand, prawn holes
2	11.48	53	48.4066	5	55.401	silty sea bed, borrows of various sizes
3	11.49	53	48.4016	5	55.4038	as above
4	11.5	53	48.3952	5	55.4189	as above
5	11.51	53	48.3981	5	554294	as above
6	11.52	53	48.3822	5	55.4371	as above, few very large borrowing holes
7	11.52	53	48.3738	5	55.4482	muddy seabed and prawn holes

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
8	11.53	53	48.3662	5	55.4585	as above
9	11.53	53	48.352	5	55.4704	as above, borrows of various sizes
10	11.54	53	48.3501	5	55.4798	as above, and a prawn
11	11.55	53	48.3429	5	55.4892	WHITE OUT
12	11.57	53	48.336	5	55.4962	as above, trawling track marks
13	11.58	53	48.3292	5	55.5082	fine sand/silt, prawn holes
14	11.59	53	48.3223	5	55.5151	as above
15	11.59	53	48.3162	5	55.5234	as above
16	12	53	48.3097	5	55.5321	as above, and a worm trail
17	12.01	53	48.3032	5	55.5399	as above, some borrow holes are very large
18	12.02	53	48.296	5	55.5482	as above, and a crawing trail
19	12.03	53	48.288	5	55.5553	as above
20	12.03	53	48.28	5	55.563	as above
21	12.04	53	48.2731	5	55.5707	as above
22	12.05	53	48.2662	5	55.5798	as above
23	12.06	53	48.2609	5	55.5883	as above, and a fish/prawn
24	12.07	53	48.2536	5	55.5934	silty mud, various holes and trawling track marks
25	12.08	53	48.2437	5	55.6101	silty mud and borrows
26	12.09	53	48.238	5	55.6164	as above
27	12.1	53	48.2292	5	55.6259	as above
28	12.11	53	48.2235	5	55.6321	as above
29	12.11	53	48.2162	5	55.6392	as above
30	12.12	53	48.2092	5	55.6476	as above, and a trawling track mark
31	12.13	53	48.204	5	55.655	silty mud
32	12.13	53	48.1998	5	55.661	as above, holes and a trail
33	12.14	53	48.1949	5	55.6674	as above
34	12.14	53	48.1949	5	55.6674	as above
35	12.15	53	48.1963	5	55.6726	as above, right on the trawling track mark

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
36	12.16	53	48.1853	5	55.6771	silty mud
37	12.16	53	48.1808	5	55.681	as above
38	12.17	53	48.175	5	55.6865	as above
39	12.18	53	48.1682	5	55.6928	as above
40	12.19	53	48.164	5	55.6979	fine sand and snail borrows
41	12.2	53	48.1594	5	55.7023	silty sand and prawn borrows
42	12.2	53	48.1525	5	55.7089	as above
43	12.21	53	48.1422	5	55.7205	as above
44	12.22	53	48.1339	5	55.7287	as above, prawn borrows and V mark, crawling, borrows, strong current
45	12.23	53	48.1251	5	55.7359	silty sand and borrows
46	12.24	53	48.1171	5	55.7431	as above
47	12.25	53	48.1087	5	55.7527	fine sand and mud
48	12.26	53	48.1041	5	55.7574	mud and borrows (prawns)
49	12.26	53	48.0991	5	55.7632	mud and snail? Borrows
50	12.27	53	48.0938	5	55.7627	mud and prawn borrows

ISMA_TV_423

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
1	15.03	53	29.293	5	55.2747	sandy ripples, shells, worm tubes
2	15.04	53	29.293	5	55.2713	sandy ripples, shell fragments
3	15.04	53	29.2976	5	55.2655	as above
4	15.05	53	29.3045	5	55.2571	as above
5	15.06	53	29.3071	5	55.2538	sand ripples, urchin, shell fragments
6	15.07	53	29.3087	5	55.2528	as above (no urchin)
7	15.08	53	29.3125	5	55.2476	as above plus a borrow
8	15.09	53	29.3197	5	55.2337	sand ripples, a fish, shell fragments
9	15.09	53	29.3254	5	55.2162	as above (large fish - redgunard?)

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
10	15.1	53	29.3285	5	55.21	fine sand, shell fragments
11	15.11	53	29.3293	5	55.2046	sand, shell fragments, small borrows
12	15.12	53	29.3281	5	55.1997	sand, shell fragments, borrows, a starfish, possibly an urchin
13	15.13	53	27.3308	5	55.1928	undulated sand, borrows, fragments of shell
14	15.14	53	27.3361	5	55.1853	as above, a large borrow hole
15	15.14	53	27.3417	5	55.1767	fine sand, shell fragments, a star fish
16	15.15	53	27.3468	5	55.1672	sand ripples and shell fragments
17	15.16	53	27.3518	5	55.1594	as above
18	15.16	53	27.359	5	55.1486	sand, shell fragments and 2 starfish
19	15.17	53	27.3651	5	55.1382	sand and shell fragments
20	15.18	53	27.3689	5	55.1299	cuspate ripples
21	15.18	53	27.3716	5	55.1224	sand, seaweed and flatfish
22	15.19	53	27.3717	5	55.1187	WHITE OUT
23	15.19	53	27.3769	5	55.1109	sand, fish and starfish
24	15.2	53	27.3846	5	55.0944	sandy wavy ripples (no flash)
25	15.21	53	27.3921	5	55.0811	sand and shell fragments, a starfish
26	15.22	53	27.3968	5	55.0772	sand ripples (no flash)
27	15.23	53	27.3987	5	55.0812	sand, shell fragments, and a sponge
28	15.24	53	27.4017	5	55.0819	WHITE OUT
29	15.24	53	27.4086	5	55.0716	sand ripples, shell fragments
30	15.25	53	27.4139	5	55.0579	as above
31	15.26	53	27.42	5	55.0427	as above
32	15.27	53	27.4242	5	55.0356	sand, lots of shell fragments and sea weed
33	15.28	53	27.4277	5	55.0314	as above
34	15.29	53	27.4315	5	55.027	as above
35	15.3	53	27.4344	5	55.0282	as above
36	15.31	53	27.4384	5	55.0267	as above
37	15.31	53	27.4437	5	35.0221	as above
38	15.32	53	27.4515	5	55.0124	sand wavy ripples, lots of shell fragments

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
39	15.33	53	27.4612	5	55.0004	WHITE OUT
40	15.34	53	27.4704	5	54.9901	fine sand, shel fragments, urchin
41	15.35	53	27.478	5	54.9832	fine sand, shell fragments
42	15.35	53	27.4841	5	54.9715	as above, less shell
43	15.36	53	27.4895	5	54.956	fine sand, shell fragments
44	15.37	53	27.4956	5	54.9455	sand ripples and shell fragments in troughs
45	15.38	53	27.499	5	54.9398	sand ripples and shell fragments in troughs with fish (hake?)
46	15.38	53	27.504	5	54.933	sand ripples and shell fragments in troughs with sponge
47	15.39	53	27.5074	5	54.9276	sand ripples and shell fragments in troughs
48	15.4	53	27.5084	5	54.9263	sand, shell fragments and seaweed
49	15.41	53	27.5124	5	54.9258	sand, shell fragments and seaweed
50	15.42	53	27.5204	5	54.9148	sand, shell fragments and seaweed, red fish in sediment cloud
51	15.43	53	27.5299	5	54.896	sand and shell fragments in ripple trough
52	15.44	53	27.5391	5	54.8772	sand and shell fragments in ripple trough and seaweed
53	15.45	53	27.5444	5	54.8685	sand and shell fragments in ripple trough and seaweed - no flash
54	15.46	53	27.5497	5	54.8656	sand, shell and seaweed
55	15.47	53	27.5524	5	54.8501	sand, shell and seaweed, fish and 2 dead man's finger sponges
56	15.48	53	27.5566	5	54.8446	sand and shell _WHITE OUT
57	15.49	53	27.5627	5	54.8372	fine sand, few shells and weeds
58	15.5	53	27.5696	5	54.8319	fine sand and seaweed
59	15.5	53	27.5696	5	54.8319	water column
60	15.51	53	27.5722	5	54.8298	sand ripples, shell fragments in trough
61	15.52	53	27.5841	5	54.8255	sand ripples, shell fragments in trough
62	15.53	53	27.5904	5	54.817	WHITE OUT
63	15.54	53	27.5963	5	54.8107	Fine sand, shell fragments and seaweed
64	15.55	53	27.6009	5	54.8029	sand, less shell - seaweed

ISMA_TV_425

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
1	16.24	53	28.632	5	51.8977	Sand, starfish
2	16.25	53	28.6285	5	51.902	Fine sand, ripples, wavy crests
3	16.26	53	28.6266	5	51.9027	2 different grain sizes; one for crest, one filling trough
4	16.27	53	28.6278	5	51.9001	Fine sand as above WHITE OUT
5	16.27	53	28.632	5	51.8915	WHITE OUT
6	16.28	53	28.6385	5	51.8726	Fine sand, ripples, 3D flow
7	16.29	53	28.6453	5	51.8574	fine sand, some shell frags
8	16.3	53	28.6579	5	51.8427	Fine to very fine sand, straight crested ripples
9	16.31	53	28.6625	5	51.8401	As above with shell frags
10	16.32	53	28.6648	5	51.8345	Fine sand, 3D flow ripples
11	16.33	53	28.6716	5	51.8217	As above
12	16.33	53	28.6812	5	51.8066	As above
13	16.34	53	28.688	5	51.7429	WHITE OUT
14	16.35	53	28.6957	5	51.785	Fine sand, cloudy picture
15	16.36	53	28.698	5	51.7832	Fine sand, shelly frags Retaken
16	16.37	53	28.7006	5	51.7799	Fine sand, red fish
17	16.38	53	28.7014	5	51.7684	Fine sand, seaweed, shrimp, flatfish
18	16.39	53	28.7079	5	51.754	Fine-sand
19	16.4	53	28.7216	5	51.7395	
20	16.4	53	28.7243	5	51.7395	
21	16.41	53	28.7304	5	51.7412	Large Hermit crab
22	16.42	53	28.7376	5	51.7267	Burrows
23	16.43	53	28.7468	5	51.7097	Fine sand, lunate ripple
24	16.44	53	28.7609	5	51.6856	WHITE OUT
25	16.45	53	28.7731	5	51.6813	No flash
26	16.46	53	28.7824	5	51.6448	WHITE OUT

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
27	16.46	53	28.7891	5	51.6373	Sand, ripples and burrows
28	16.47	53	28.7933	5	51.6333	WHITE OUT
29	16.48	53	28.7971	5	51.6202	Fish in cloud
30	16.49	53	28.8021	5	51.6015	
31	16.49	53	28.804	5	51.5958	
32	16.5	53	28.8101	5	51.5826	
33	16.51	53	28.8147	5	51.5774	WHITE OUT
34	16.51	53	28.8158	5	51.5764	Sand, ripples, relatively wide wavelength
35	16.52	53	28.8193	5	51.5736	Sand, ripples and burrows
36	16.54	53	28.8235	5	51.5684	Sand, ripples and burrows
37	16.55	53	28.8288	5	51.5649	Sand, ripples and burrows
38	16.56	53	28.8345	5	51.552	Sand ripples, fine sand
39	16.56	53	28.8361	5	51.5472	WHITE OUT
40	16.56	53	28.8361	5	51.5472	Some shell frags and a fish
41	16.57	53	28.8429	5	51.5285	Sand, burrows
42	16.58	53	28.8483	5	51.5216	Sand, straight crested ripples; 2 trends
43	16.58	53	28.8555	5	51.5125	
44	16.59	53	28.7	5	51.4978	Sand, large burrows
45	17.01	53	28.8841	5	51.4899	No flash
46	17.02	53	28.9009	5	51.4854	Finer grained, large burrows
47	17.03	53	28.907	5	51.468	Rippled silts, shell frags
48	17.04	53	28.9291	5	51.4586	As above
49	17.05	53	28.9242	5	51.4668	As above, scattered shell frags
50	17.06	53	28.9318	5	51.4278	As above, scattered shell frags
51	17.07	53	28.9406	5	51.4235	As above, scattered shell frags with fish in View
52	17.07	53	28.9406	5	51.4235	Silty Sea-Bed-No Flash
53	17.09	53	28.9543	5	51.425	Silty Sea-Bed
54	17.1	53	28.9619	5	51.4164	Silty Sea-Bed with Scattered Burrows
55	17.11	53	28.9722	5	51.4162	Silty Sea-Bed with Scattered Burrows, Some Shell Frags.

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
56	17.12	53	28.9837	5	51.4236	WHITE OUT
57	17.12	53	28.9856	5	51.4196	Silt
58	17.13	53	28.9928	5	51.401	Silty Seabed
59	17.14	53	29.0066	5	51.3914	Silty Seabed with possible feeding trails
60	17.15	53	29.0207	5	51.3878	Flatfish in View
61	17.16	53	29.0276	5	51.3778	Poss. Gravel- Fish in View
62	17.18	53	29.0375	5	51.3497	Silt Mud and Large Burrows
63	17.2	53	29.0466	5	51.3466	WHITE OUT
64	17.21	53	29.0497	5	51.3437	Silt, Mud and Sand, Bedforms and Burrows
65	17.23	53	29.0646	5	51.3506	Silt, Mud and Sand, Bedforms and Burrows
66	17.24	53	29.0745	5	51.3548	Silt, Mud and Sand, 1 Starfish in View
67	17.26	53	29.084	5	51.3526	Mud and sand, Wide based, Bedforms
68	17.28	53	29.0993	5	51.3575	Mud, Sand and Burrows
69	17.28	53	29.0993	5	51.3575	Mid-Water Shot
70	17.3	53	29.1164	5	51.3145	Mud
71	17.32	53	29.1359	5	51.2921	Mud and Silt
72	17.32	53	29.1382	5	51.2912	Double Shot, same as above
73	17.33	53	29.1561	5	51.2952	Silty- Mud Shells moving in Strong Current
74	17.35	53	29.1565	5	51.2878	Mud and Sand, sandy Bedforms covered by mud
75	17.36	53	29.147	5	51.2521	Cloudy Shot
76	17.4	53	29.1683	5	51.263	Sand (Undulated Sea Bed)

ISMA_TV_427

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
1	18.43	53	26.5839	5	53.392	Sandy seabed, ripples x2 sea urchins, shell frags.
2	18.43	53	12.599	5	53.4012	White-Out
3	18.49	53	26.6197	5	53.4111	Sandy seabed, ripples
4	18.45	53	26.6308	5	53.4185	Ripples formed by coarser grainsizes

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
5	18.46	53	26.6415	5	53.4253	Shells on troughs of Ripples
6	18.46	53	26.6544	5	53.4353	Very clear example of rippled surface
7	18.47	53	26.667	5	53.4441	Very clear example of rippled surface with seaweed and shells.
8	18.48	53	26.6804	5	53.4545	large number of shell fragments in ripple troughs
9	18.48	53	26.6945	5	53.4667	Rippled Sand and shell fragments
10	18.49	53	26.7166	5	53.4847	Rippled Sand and shell fragments with Starfish
11	18.5	53	26.73	5	53.4948	Cloudy-Obscured
12	18.51	53	26.7429	5	53.5054	Excellent photo of ripples
13	15.52	53	26.7586	5	53.5166	Excellent photo of ripples and large seabed
14	18.52	53	26.7123	5	53.5264	Seaweed and possible sponge
15	18.53	53	26.7849	5	53.5355	Excellent photo of ripples and seaweed
16	18.53	53	26.8032	5	53.5477	Seaweed
17	18.54	53	26.8196	5	53.5593	Seaweed
18	18.55	53	26.8398	5	53.5737	Seaweed with some large shells
19	18.56	53	26.8555	5	53.5845	Seaweed
20	18.57	53	26.8707	5	53.5954	Clear ripple Crests and Troughs
21	18.58	53	26.8887	5	53.6093	Clear ripple Crests and Troughs
22	18.58	53	26.8887	5	53.6093	White-Out
23	18.58	53	26.9035	5	53.6186	Clear Ripples
24	18.59	53	26.9157	5	53.6274	Clear Ripples
25	19	53	26.952	5	53.6538	rippled sand and Shell fragments
26	19.02	53	26.9691	5	53.6655	Large quantity if shell fragments
27	19.02	53	26.9859	5	53.6755	Sandy Ripples
28	19.03	53	27.0058	5	53.688	Large quantity if shell fragments
29	19.04	53	27.0218	5	53.6981	Sandy Ripples
30	19.05	53	27.0405	5	53.7107	Seaweed and "Dead-Mans Fingers"
31	19.06	53	27.0554	5	53.7214	Starfish in bottom right of frame
32	19.06	53	27.0699	5	53.7314	Sandy Ripples

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
33	19.07	53	27.0847	5	53.7347	Sandy Ripples
34	19.08	53	27.1004	5	53.7538	*No Flash*
35	19.09	53	27.1133	5	53.7627	Excellent Dead-Man's Finger sponge

ISMA_TV_466

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
1	8.22	53	41.4181	5	58.4938	Silty seabed with poss prawn burrows
2	8.23	53	41.4369	5	58.503	As above - large burrow entrances
3	8.23	53	41.4447	5	58.5086	As above, poss ripples
4	8.24	53	41.4539	5	58.515	WHITE-OUT
5	8.24	53	41.4642	5	58.5215	Entrance burrows of different sizes
6	8.25	53	41.4761	5	58.5296	Silty seabed poss small holes
7	8.26	53	41.4875	5	58.5378	Poss pellets on seabed
8	8.27	53	41.5012	5	58.5486	Silty seabed with pellets
9	8.28	53	41.5154	5	58.5618	Flatfish
10	8.29	53	41.5295	5	58.5746	No flash
11	8.29	53	41.5405	5	58.5843	1 burrow in upper right corner
12	8.3	53	41.5535	5	58.5947	Poss. gravel clast in lower right hand view
13	8.31	53	41.5672	5	58.605	Holes of various sizes
14	8.32	53	41.5836	5	58.6164	As above
15	8.33	53	41.5955	5	58.623	WHITE-OUT
16	8.34	53	41.6061	5	58.6319	1 large burrow - middle right of view
17	8.34	53	41.6176	5	58.6402	1 large burrow - centre right of view
18	8.35	53	41.6286	5	58.6478	1 large burrow in lower middle view
19	8.36	53	41.6412	5	58.6577	Silty seabed
20	8.37	53	41.6534	5	58.6672	WHITE-OUT
21	8.37	53	41.6565	5	58.6696	3 burrows - Same position as Fix 20
22	8.38	53	41.6679	5	58.6783	Silty seabed and burrows

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
23	8.38	53	41.6789	5	58.6871	As above
24	8.39	53	41.691	5	58.694	As above
25	8.4	53	41.7053	5	58.7031	As above
26	8.41	53	41.7179	5	58.7114	Silty Seabed- No Burrows in View
27	8.42	53	41.7336	5	58.7218	Numerous Pellets, small, burrows in View
28	8.43	53	41.745	5	58.7304	Silty Seabed and burrows
29	8.43	53	41.7572	5	58.7395	Numerous Burrows of Diff. sizes
30	8.44	53	41.7713	5	58.7499	Numerous Burrows of Diff. sizes
31	8.45	53	41.7858	5	58.7611	WHITE-OUT
32	8.46	53	41.8018	5	58.7742	Single Burrow
33	8.47	53	41.8106	5	58.7813	silty Seabed
34	8.48	53	41.8209	5	58.7904	silty Seabed
35	8.48	53	41.8297	5	58.7988	3 Burrows in lower right hand corner
36	8.49	53	41.8427	5	58.8086	Large Burrow on Right

ISMA_TV_468

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
1	9.1	53	41.4608	5	58.2509	Silty Seabed, Number of Burrows on Left of View
2	9.1	53	41.4677	5	58.2595	Silty Seabed- 1 Burrow
3	9.11	53	41.4722	5	58.2649	Single Large Burrow in Centre
4	9.12	53	41.4761	5	58.269	Single Large Burrow in Lower right
5	9.13	53	41.4893	5	58.273	3 Medium Burrows
6	9.14	53	41.486	5	58.2748	Poss. Feeding Crab
7	9.14	53	41.4894	5	58.2737	Single Burrow left of centre
8	9.15	53	41.4921	5	58.2746	Fish- Lower right Field of View
9	9.16	53	41.4902	5	58.2792	Burrow in silty seabed
10	9.17	53	41.4917	5	58.3075	Large Burrow in lower centre
11	9.18	53	41.5062	5	58.3615	5 Large burrows

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
12	9.19	53	41.51	5	58.3795	Seabed Poss. Becoming Coarser
13	9.19	53	41.5157	5	58.3954	1 burrow in centre
14	9.2	53	41.5218	5	58.4007	Silty seabed
15	9.21	53	41.5287	5	58.4065	large burrow - Upper left
16	9.22	53	41.5367	5	58.4085	2 Large Burrows in centre View
17	9.22	53	41.5459	5	58.4099	3 Burrows
18	9.23	53	41.5527	5	58.4074	No Flash
19	9.24	53	41.5611	5	58.408	Silty seabed with a few shell frags.
20	9.24	53	41.5643	5	58.4107	Silty seabed with a few shell frags.
21	9.25	53	41.5783	5	58.4166	Silty seabed with Turitella Shells
22	9.26	53	41.5852	5	58.4227	Silty seabed with Turitella Shells - White Out
23	9.26	53	41.5901	5	58.4294	Mixture of burrows and Small Holes
24	9.27	53	41.5947	5	58.4375	Mixture of burrows and Small Holes
25	9.28	53	41.5985	5	58.4448	Few Shells and Pellets
26	9.28	53	41.6027	5	58.4528	White out
27	9.29	53	41.6046	5	58.4579	Silty seabed- Burrows
28	9.3	53	41.6065	5	58.4614	Silty seabed- Burrows
29	9.3	53	41.608	5	58.4616	Large Burrow- lower Right Hand View
30	9.31	53	41.6092	5	58.461	Pellets/ Burrows??
31	9.32	53	41.6107	5	58.4568	Pellets/ Burrows??
32	9.32	53	41.6122	5	58.4524	White out
33	9.32	53	41.6122	5	58.4514	No Flash
34	9.33	53	41.613	5	58.4473	Turitella Shells
35	9.34	53	41.6134	5	58.443	Burrow in Centre of View
36	9.34	53	41.6138	5	58.4441	lots of Turitella Shells
37	9.35	53	41.6134	5	58.4396	Lots of shell Frags.
38	9.36	53	41.6134	5	58.4383	Burrows, Shell Frags. On Silty seabed
39	9.36	53	41.613	5	58.4372	Burrows, Shell Frags. On Silty seabed
40	9.37	53	41.6134	5	58.4354	White out

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
41	9.37	53	41.6134	5	58.433	No Flash
42	9.38	53	41.6138	5	58.4334	White out
43	9.38	53	41.6138	5	58.4319	Prawn Burrow on Left
44	9.39	53	41.6134	5	58.4301	Same picture as Above

ISMA_TV_482

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
1	16.04	53	26.6743	5	52.5432	Seaweed in left centre, Fine sand-undulated Surface
2	16.05	53	26.6769	5	52.5426	Fine sand-silt and shell-undulated surface
3	16.06	53	26.6792	5	52.5397	Seaweed in bottom left- fine sand ripples
4	16.07	53	26.6819	5	52.5352	White Out
5	16.07	53	26.6819	5	52.5352	Brittle Star in bottom centre. Fine Sand Ripples
6	16.08	53	26.6853	5	52.5288	Fine Sand, Ripples
7	16.09	53	26.6862	5	52.5243	Fine Sand, Ripples, Seaweed- No Flash
8	16.09	53	26.6899	5	52.5205	Fine Sand Ripples- Some Pebbles
9	16.1	53	26.6922	5	52.5163	Fine Sand, Straight Crested Ripples- Shell Hash in Troughs
10	16.11	53	26.6945	5	52.5114	Fine Sand Cuspate Ripples, Seaweed on Stone on bottom left
11	16.12	53	26.6968	5	52.5079	Fine Sand Straight Crested Ripples
12	16.13	53	26.6998	5	52.5031	Fine Sand Cuspate Ripples, Shell Fragments in Troughs
13	16.13	53	26.7033	5	52.4982	Fine Sand Cuspate Ripples, Shell Fragments in Troughs
14	16.14	53	26.7075	5	52.4904	White Out
15	16.15	53	26.7105	5	52.4849	Fine Sand, Straight Crested Ripples, Cloudy due to fish
16	16.15	53	26.7132	5	52.4811	Fine Sand, Cuspate Ripples-No Flash
17	16.17	53	26.7170	5	52.4765	Fine Sand, Ripples- Shell Hash in Troughs- No Flash
18	16.18	53	26.7223	5	52.4695	Fine Sand. 3-D Flow Ripples- Seaweed in Centre
19	16.18	53	26.7273	5	52.4661	Fine Sand. 3-D Flow Ripples- Seaweed in Centre and Shells in Troughs
20	16.19	53	26.7342	5	52.4583	Fine Sand, Cuspate Ripples, Small Monk Centre Left
21	16.2	53	26.7387	5	52.4531	Fine Sand- Wider Based Ripples

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
22	16.21	53	26.7437	5	52.4488	Fine Sand and Ripples
23	16.22	53	26.7487	5	52.4445	Fine Sand Cuspate Ripples, Shells in Troughs
24	16.22	53	26.7551	5	52.4378	Fine Sand- Bedforms- some Silt, Burrow in bottom Left
25	16.23	53	26.7597	5	52.4321	Some weed- Fine Sand Ripples
26	16.24	53	26.7662	5	52.4257	White Out
27	16.26	53	26.7769	5	52.4167	Fine Sand And Straight Crested Ripples
28	16.27	53	26.7891	5	52.5074	White Out
29	16.29	53	26.8013	5	52.399	Fine Sand Ripples, Brittle Star in Right of View
30	16.3	53	26.8131	5	52.3854	Fine Sand
31	16.31	53	26.8158	5	52.3698	Fine Sand, Undulated Seabed
32	16.32	53	26.8154	5	52.3558	Fine Sand, Undulated Seabed
33	16.32	53	26.5139	5	52.345	Fine Sand, Straight Crested ripples
34	16.33	53	26.8147	5	52.3363	2 Grain Sizes, Fine sand building Ripples, Finer Grains Settling in Troughs
35	16.34	53	26.8158	5	52.3231	White Out
36	16.35	53	26.8143	5	52.5159	Sand- Coarser- Ripples Shells in Troughs
37	16.36	53	26.8150	5	52.3075	White Out
38	16.37	53	26.8185	5	52.3023	White Out
39	16.38	53	26.8122	5	52.2926	White Out
40	16.39	53	26.8230	5	52.2855	2 Grain Sizes, Ripple Builders and Trough Fillers
41	16.39	53	26.8257	5	52.2736	Sand and Shell- Wide Wave Length
42	16.4	53	26.8284	5	52.2584	2 Grain Sizes- No Flash
43	16.41	53	26.8318	5	52.251	2 Grain Sizes
44	16.41	53	26.8349	5	52.2466	Sand - Ripple Troughs filled with Shells
45	16.42	53	26.3790	5	52.2396	Sand - Ripple Troughs filled with Shells
46	16.42	53	26.8410	5	52.2296	Seaweed, Sand and Ripples
47	16.43	53	26.8429	5	52.2134	3 Clumps of Seaweed
48	16.44	53	26.8467	5	52.1918	Finer, No Ripples, Undulated- No flash
49	16.45	53	26.8565	5	52.185	Sand Form Ripples- Troughs Filled with Finer Grains
50	16.46	53	26.8539	5	52.1664	Sand Form Ripples- Troughs Filled with Finer Grains

Fix	Time	Lat		Long		Comments
		Deg	Min	Deg	Min	
51	16.47	53	26.8555	5	52.1451	Sand Form Ripples- Troughs Filled with Finer Grains Fish in Right of Field
52	16.48	53	26.8574	5	52.1223	Fine Sand- Silt in Troughs
53	16.5	53	26.8581	5	52.1027	Sand and Silt- Ripples and Trough Fill
54	16.51	53	26.8650	5	52.0896	Sand and Shells in Troughs
55	16.52	53	26.8673	5	52.0821	Sand and Shells in Troughs
56	16.53	53	26.8684	5	52.0672	Sand and Shells in Troughs

Appendix XI

Conductivity-Temperature-Depth (CTD) station INC PROFILE

Station No	Type	Lat		Long		Date	Time	Comments
		Deg	Min	Deg	Min		UTC	
ISMA283	CTD	52	57.066	5	54.166	14.10.09	8.30	Uniform profile (at ADCP site)

Appendix XIII

Marine Mammal Observer Report

Area: Codling Bank and Western Irish Sea Mudbelt

Dates: 28 September – 10 October 2009

CV 0926

MMO: Conor Ryan

Client: University College Cork

Ryan, C. 2009. Marine mammal observer report, October 2009, West Irish Sea. Report to University College Cork 13pp.

Introduction

In Irish waters within the EEZ (Economic Exclusion Zone), all seismic surveys require a qualified and experienced MMO (marine mammal observer) on board the vessel from which the source sound will be emitted. A code of practice published by the National Parks and Wildlife Service (Anon. 2007) stipulates exclusion zones, soft-start and line-change durations during seismic surveys.

All four of the marine mammal species listed under Annex II of the EU Habitats Directive are known to occur in the Irish Sea. Furthermore, all are known to breed there (IWDG 2007, O'Cadhla *et al.* 2005). Given that the 200m bathycline is not exceeded anywhere in the Irish Sea, deep-water cetacean species are rarely observed there, although deep-diving beaked whales have been found stranded on the Irish Sea coast (Berrow and Rogan 1997). The Irish Sea supports a seasonally high abundance of common dolphins while inshore waters in Co. Dublin were found to contain some of the highest densities of harbour porpoise in Ireland (Berrow *et al.* 2008).

The aim of the CV0926 ISMA cruise was to attain further coverage for the INFOMAR seabed-mapping project in the West Irish Sea Mudbelt and Codling Bank areas. These are shallow areas (<100m), within 15 nautical miles of the coast of counties Wicklow, Dublin, Meath and Louth. This area is of particular interest to wind and tidal energy developers given the suitable wind and tidal conditions and the proximity to a large electricity demand in Dublin City.

Materials and Methods

Marine Mammal Observations

Observations for marine mammals were carried out from both bridge-wings (outdoors). This gave a panoramic view of 210^{o} (180^{o} abeam of the ship and 30^{o} either side of the bow). During pre-shooting searches, observations were carried out for 15 minutes on each bridge wing. All other observations were carried out from whichever bridge-wing gave the best viewing conditions (least glare and wind). Systematic scans of the sea were undertaken using 10X50 Swarovski binoculars and also by naked eye.

Effort, sightings and the ship's track-line were recorded on a Microsoft Access database using Logger © (IFAW 2000) software on a laptop computer inside the bridge. The time and location associated with every datum (during observation effort and sightings) was continually recorded via a USB GPS feed. Ship's speed, heading and location was automatically recorded every 10 seconds by the Logger program.

Environmental data were recorded every 15 minutes. Beaufort sea state, swell height (m), cloud cover (oktas) and visibility (km) were estimated, while wind speed and direction and depth were read from the ship's instruments.

The species, number of individuals, angle and distance to the animal, behaviour and direction of travel were recorded for each marine mammal sighting. Distance to marine mammals was determined using a distance stick. For a given eye-height above sea level and hand to eye distance, the Heinemann equation was used to create a demarcated stick, which was lined up perpendicularly to the horizon, allowing the distance to be read. The angle to the sighted animals was recorded using a simple angle board.

A list of other megafauna (namely seabirds) was compiled each day, however these data were purely qualitative. All sightings were classified as either "watching" or "incidental". The former refers to those sightings made

during effort-quantified observations and the latter to sightings at other times and made by other scientists / members of crew.

Pre-Shoot Searches

As per the NPWS Code of Practice, prior to shooting the sparker, a 30-minute search for marine mammals within 1000 m of the sparker was carried out. If marine mammals were observed within these limits, recommendations to move out of the area before shooting the sparkers would be made. If no mammals were observed, a soft start commenced. A normal soft start comprises linear incremental increases in the source level of the acoustic emission, over at least 20 minutes but not greater than 40 minutes. However, the source level of the sparker used in this survey cannot be varied, i.e. it is either switched on or off. Thus the 'soft start' comprised the following sequence (as is customary for multi-beam soft starts inside bays and estuaries): one minute on, one minute off, five minutes on, one minute off, five minutes on, one minute off, five minutes on, one minute off. Thus the duration of soft starts was 20 minutes.

Turns / Line Changes

The sparker was left on during line changes and turns. The survey lines were close together, given that the swath of the sparker was limited due to the shallow water. As turns never exceeded five minutes in duration, this was not excessive noise pollution according to the code of practice (Anon. 2007)

Use of Sightings Data

The Irish Whale and Dolphin Group is the only organisation archiving cetacean sightings in Irish waters. All data were collected in the same format as used by the Irish Whale and Dolphin Group. This ensured that the data could be made available to the public, as is requested by the Code of Practice (Anon. 2007).

Acoustic Survey Equipment

Sparker

The sparker used during the survey was a *Geo-Spark 400* towed about 10m behind the ship along the surface. The power output was 200 joules every 250 ms and at a frequency range of 120 Hz to 2 kHz. Use of this equipment is subject to the codes of practice for marine mammal protection. It was only switched on during daylight hours, but occasionally was used into darkness and through to the following day. In the event of the sparker breaking down at night, it would not be restarted until daylight.

Pinger

The pinger was used throughout the survey (during day and night) functions at a frequency of between 3.5 kHz. Use of this equipment did not fall within the remit of the codes of practice during this survey.

Multi-beam

The *EM3002D* multi-beam was used throughout the survey (during day and night), which operates at a frequency of between 293 and 397 kHz. The multi-beam was used throughout the survey during day and night. As the survey was carried out exclusively outside of bays, estuaries and Special Areas of Conservation, use of this equipment did not fall within the remit of the codes of practice during this survey.

Results

Five pre-shoot watches were carried out during the survey (Appendix I). Pre-shoot watches were carried out every time the sparker was switched on (Appendix I). Occasionally use of the sparker continued into darkness and the following day, hence in some days that the sparker was used, no pre-shoot searches were required. Additional watches on nine days amounting to 42.1 hours (*circa* 252 km of track-line) were also conducted, during favourable sea

conditions (Appendices II & III). Two days (03 and 09 October) were not surveyed due to inclement weather, however pre-shoot watches were carried out in all conditions. The survey vessel moved at an average speed of four knots during sparker surveys and eight knots during multi-beam and pinger surveys. There were 41 sightings of two species of marine mammal during effort-quantified watches: fin whale *Balaenoptera physalis,* Harbour Porpoise *Phocoena phocoena* (Fig 2). Two other species were observed by crew when the MMO was off watch: Bottlenose Dolphin *Tursiops truncatus*, and Grey Seal *Halioceras grypus* (Appendix II).

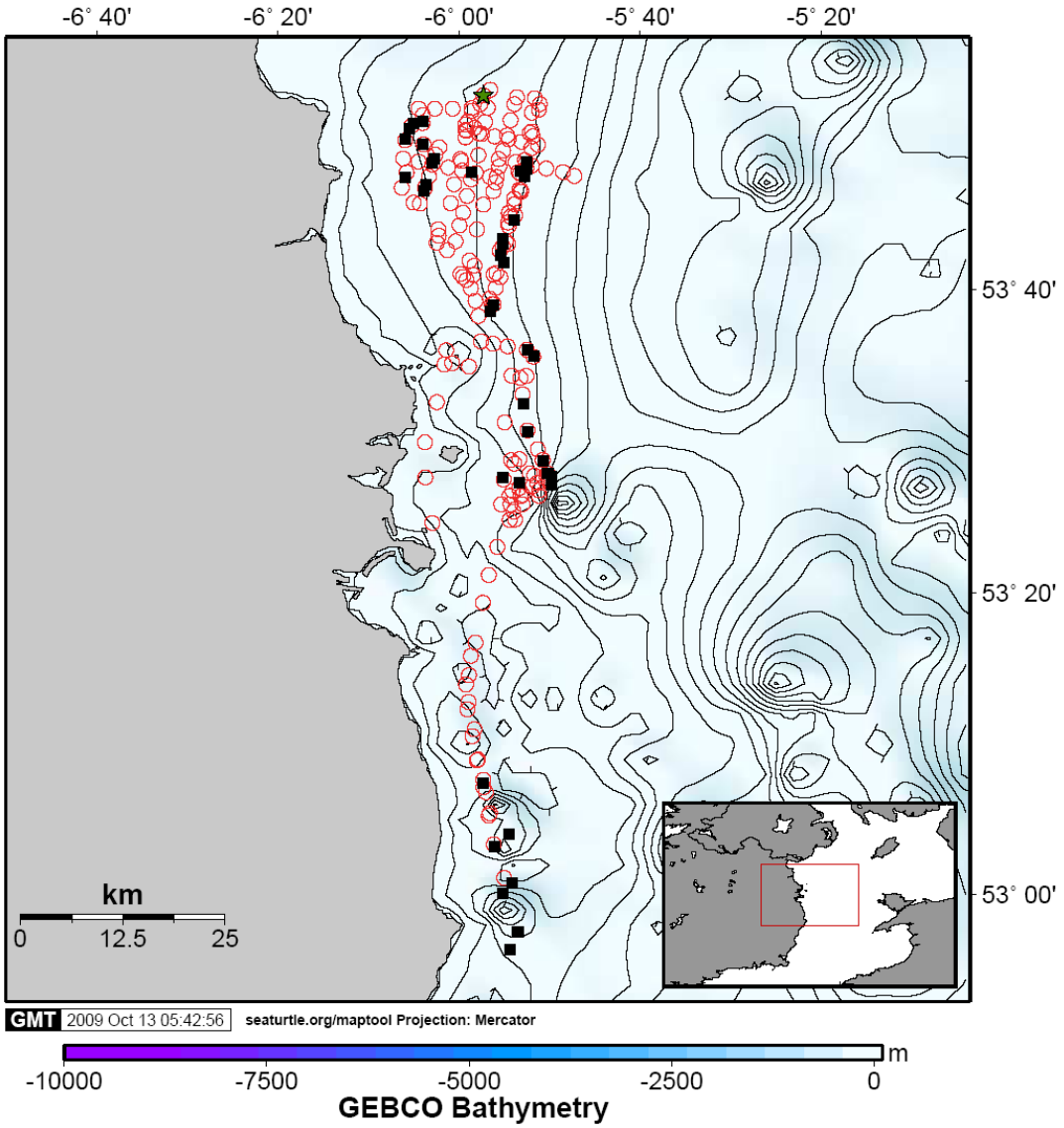


Figure 2. Map showing the locations of sightings (black square=Harbour Porpoise and green star=Fin Whale) and effort (red open circle=15 minutes effort)

Marine mammals were observed inside the 1km exclusion during a pre-shooting search on one occasion; on 29 September. Unfortunately, this sighting was not communicated immediately to the sparker engineer and the soft start commenced eight minutes later. Efforts to make communications between the MMO and the sparker engineer more effectual were made. Thus there were no further non-compliances. This was the only non-compliance with the code of practice.

Soft starts were not carried out on 29 and 30 September. This was due to the fact that the source level on sparkers cannot be ramped-up gradually. Following consultation with the sparker engineer, the inshore multi-beam soft-start protocol was adopted whereby the gear is switched on and off with gradual increases in the duration of source activity over a period of 20 minutes. Given that no protocol exists for sparker soft-starts, this was commendable initiative shown by the engineers to reduce the risk of disturbance to marine mammals.

A list of seabirds was compiled each day, however this was qualitative, not quantitative (Fig. 3).

	September		October							
Species	**29**	**30**	**1**	**2**	**4**	**5**	**6**	**7**	**8**	**9**
Arctic Skua										
Arctic Tern										
Black Headed Gull										
Black-throated Diver										
Chiffchaff										
Common Gull										
Common Scoter										
Common Tern										
Cormorant										
Curlew										
Fulmar										
Feral Pigeon										
Gannet										
Great Skua										
Great Black Back Gull										
Guillemot										
Herring Gull										
Kittiwake										
Lesser Black Back Gull										
Manx Shearwater										
Mediterranean Gull										
Pomarine Skua										
Razorbill										
Ringed Plover										
Sandwich Tern										
Shag										
Sooty Shearwater										
Swallow										
Wader sp.										

Figure 3. List of seabirds observed during watches.

Recommendations

- Continued consideration should be given to the particularly high densities of Harbour Porpoise, which occur in inshore waters of Counties Dublin, Meath and Louth and near India Bank during late September and early October.
- The creation of a Microsoft Access database compatible with Logger software for MMOs. This would allow live input of data, in a standardised format (this will standardise e.g. longitude and latitude formatting) and reduce manual data input to a minimum.
- As sea state significantly reduces the detectability of Harbour Porpoise by visual observations alone, passive acoustic monitoring should be considered.

References

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IWDG (2007). Cetacean Sightings Review 1991 to 2001. Irish Whale and Dolphin Group, Kilrush, Co. Clare. 30 pp.

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Appendix XIIIa

Record of Operations of sparker

ID	Date	Soft start	Full Power	Output Stop	Observer name	Pre-shoot search	Search end	Difficulties	PAM?	Mammals?	Observation time	Actions taken
1	29/09/2009	None	10:02	20:26	Conor Ryan	08:09	09:14	10 degrees glare	No	Yes	08:54	None
2	30/09/2009	None	09:58	19:55	Conor Ryan	09:23	10:08	None	No	No	-	-
3	01/10/2009	08:25	08:45	-	Conor Ryan	07:55	09:30	None	No	No	-	-
4	02/10/2009	-	-	-	Conor Ryan	-	-	-	-	-	-	-
5	03/10/2009	-	-	01:20	Conor Ryan	-	-	-	-	-	-	-
6	04/10/2009	08:43	09:13	-	Conor Ryan	07:27	09:17	None	-	No	-	-
7	05/10/2009	-	-	17:10	Conor Ryan	-	-	-	-	-	-	-
8	05/10/2009	18:21	18:41	-	Conor Ryan	17:50	18:32	Rough sea	-	No	-	-

Appendix XIIIb

Record of Sightings

ID	Date	Time	Sighting no.	How did this sighting occur?	Platform type/name	Observer name	Observers position	Species	Certainty	Total	Adults	Juveniles
1	29/09/2009	09:44	1	Watching	R.V. Celtic Voyager	Conor Ryan	52 57.5315 N, 005 53.6087 W	*Phocoena phocoena*	Probable	2	2	0
2	29/09/2009	09:54	2	Watching	R.V. Celtic Voyager	Conor Ryan	52 57.5112 N, 005 53.5081 W	*Phocoena phocoena*	Definite	1	1	0
3	29/09/2009	12:45	3	Incidental	R.V. Celtic Voyager	First Mate	53 04.054 N, 005 54.507 W	*Phocoena phocoena*	Definite	1	1	0
4	29/09/2009	15:26	4	Watching	R.V. Celtic Voyager	Conor Ryan	52 56.350 N, 005 54.363 W	*Phocoena phocoena*	Definite	2	1	1
5	29/09/2009	17:57	5	Watching	R.V. Celtic Voyager	Conor Ryan	53 00.111 N, 005 55.161 W	*Phocoena phocoena*	Definite	3	3	0
6	29/09/2009	18:23	6	Watching	R.V. Celtic Voyager	Conor Ryan	53 00.831 N, 005 54.196 W	*Phocoena phocoena*	Definite	1	1	0
7	30/09/2009	14:38	7	Watching	R.V. Celtic Voyager	Conor Ryan	53.46246, -5.830183	*Phocoena phocoena*	Definite	4	4	0
8	30/09/2009	16:44	8	Incidental	R.V. Celtic Voyager	Conor Ryan	53.46123, -5.920807	*Phocoena phocoena*	Probable	1	1	0
9	01/10/2009	07:28	9	Watching	R.V. Celtic Voyager	Conor Ryan	53.87835, -5.955944	*Balaenoptera physalus*	Probable	1	1	0
10	04/10/2009	9:31	10	Watching	R.V. Celtic Voyager	Conor Ryan	53.59391, -5.863401	*Phocoena phocoena*	Definite	1	1	0

11	04/10/2009	9:42	11	Watching	R.V. Celtic Voyager	Conor Ryan	53.60104, -5.873617	*Phocoena phocoena*	Definite	1	1	0
ID	**Date**	**Time**	**Sighting no.**	**How did this sighting occur?**	**Platform type/name**	**Observer name**	**Observers position**	**Species**	**Certainty**	**Total**	**Adults**	**Juveniles**
12	04/10/2009	17:15	12	Incidental	R.V. Celtic Voyager	Second Mate	53 46.260 N, 005 53.830 W	*Halioceras grypus*	Definite	1	1	0
13	05/10/2009	6:59	13	Watching	R.V. Celtic Voyager	Conor Ryan	53.80974, -6.045977	*Phocoena phocoena*	Definite	4	3	1
14	05/10/2009	7:04	14	Watching	R.V. Celtic Voyager	Conor Ryan	53.80462, -6.048598	*Phocoena phocoena*	Definite	1	1	0
15	05/10/2009	7:26	15	Watching	R.V. Celtic Voyager	Conor Ryan	53.78167, -6.060678	*Phocoena phocoena*	Definite	4	4	0
16	05/10/2009	7:32	16	Watching	R.V. Celtic Voyager	Conor Ryan	53.77509, -6.064176	*Phocoena phocoena*	Definite	3	3	0
17	05/10/2009	8:25	17	Watching	R.V. Celtic Voyager	Conor Ryan	53.78967, -6.099399	*Phocoena phocoena*	Definite	2	1	1
18	05/10/2009	9:21	18	Watching	R.V. Celtic Voyager	Conor Ryan	53.85018, -6.066657	*Phocoena phocoena*	Definite	4	4	0
19	05/10/2009	9:40	19	Watching	R.V. Celtic Voyager	Conor Ryan	53.84825, -6.084762	*Phocoena phocoena*	Probable	2	2	0
20	05/10/2009	9:47	20	Watching	R.V. Celtic Voyager	Conor Ryan	53.84242, -6.091957	*Phocoena phocoena*	Definite	2	2	0
21	05/10/2009	9:57	21	Watching	R.V. Celtic Voyager	Conor Ryan	53.83123, -6.100195	*Phocoena phocoena*	Definite	6	5	1
22	05/10/2009	10:14	22	Watching	R.V. Celtic Voyager	Conor Ryan	53.82603, -6.06752	*Phocoena phocoena*	Definite	3	3	0
23	05/10/2009	14:50	23	Watching	R.V. Celtic Voyager	Conor Ryan	53.79504, -5.977363	*Phocoena phocoena*	Definite	1	1	0
24	07/10/2009	7:25	24	Watching	R.V. Celtic Voyager	Conor Ryan	53.45536, -5.88959	*Phocoena phocoena*	Definite	1	1	0
25	07/10/2009	12:13	25	Watching	R.V. Celtic Voyager	Conor Ryan	53.0536, -5.935573	*Phocoena phocoena*	Probable	1	1	0
26	07/10/2009	12:47	26	Watching	R.V. Celtic Voyager	Conor Ryan	53.12409, -5.957328	*Phocoena phocoena*	Definite	1	1	0
27	07/10/2009	15:38	27	Watching	R.V. Celtic Voyager	Conor Ryan	53.45282, -5.829287	*Phocoena phocoena*	Definite	2	2	0
28	07/10/2009	15:45	28	Watching	R.V. Celtic Voyager	Conor Ryan	53.46553, -5.837088	*Phocoena phocoena*	Definite	1	1	0
29	07/10/2009	15:53	29	Watching	R.V. Celtic Voyager	Conor Ryan	53.48034, -5.846183	*Phocoena phocoena*	Definite	3	2	1
30	07/10/2009	16:12	30	Watching	R.V. Celtic Voyager	Conor Ryan	53.511, -5.873924	*Phocoena phocoena*	Definite	3	2	1
31	07/10/2009	16:26	31	Watching	R.V. Celtic Voyager	Conor Ryan	53.54229, -5.881321	*Phocoena phocoena*	Definite	4	3	1
32	08/10/2009	7:23	32	Watching	R.V. Celtic Voyager	Conor Ryan	53.72224, -5.92041	*Phocoena phocoena*	Probable	3	3	0
33	08/10/2009	9:15	33	Watching	R.V. Celtic Voyager	Conor Ryan	53.79624, -5.886802	*Phocoena phocoena*	Definite	1	1	0
34	08/10/2009	9:58	34	Watching	R.V. Celtic Voyager	Conor Ryan	53.71673, -5.919285	*Phocoena phocoena*	Definite	1	1	0
35	08/10/2009	10:04	35	Watching	R.V. Celtic Voyager	Conor Ryan	53.70514, -5.923932	*Phocoena phocoena*	Definite	1	1	0
36	08/10/2009	13:00	36	Watching	R.V. Celtic Voyager	Conor Ryan	53.80688, -5.87619	*Phocoena phocoena*	Definite	1	1	0
37	08/10/2009	14:17	37	Watching	R.V. Celtic Voyager	Conor Ryan	53.64321, -5.942922	*Phocoena phocoena*	Definite	2	2	0
38	08/10/2009	14:29	38	Watching	R.V. Celtic Voyager	Conor Ryan	53.64976, -5.937358	*Phocoena phocoena*	Definite	1	1	0
39	08/10/2009	14:53	39	Watching	R.V. Celtic Voyager	Conor Ryan	53.69701, -5.918004	*Phocoena phocoena*	Definite	3	3	0
40	08/10/2009	15:17	40	Watching	R.V. Celtic Voyager	Conor Ryan	53.74303, -5.899209	*Phocoena phocoena*	Definite	7	6	1

41	08/10/2009	15:17	41	Watching	R.V. Celtic Voyager	Conor Ryan	53.74321, -5.899133	*Phocoena phocoena*	Definite	2	2	0
42	08/10/2009	15:42	42	Watching	R.V. Celtic Voyager	Conor Ryan	53.79089, -5.879715	*Phocoena phocoena*	Definite	2	2	0
43	08/10/2009	15:45	43	Watching	R.V. Celtic Voyager	Conor Ryan	53.79826, -5.876673	*Phocoena phocoena*	Definite	1	1	0

Appendix XIIIc

Record of Effort and Location

ID	Ship name	Ship type	Survey	Date	Observer	Start	Stop	Duration	Time	Start Time	End Time	Wind	Sea state	Swell	Visibility
1	R.V. Celtic Voyager	Seismic	2D	29-Sep-09	Conor Ryan	08:09	09:14	65	12	52 57.5315, 005 53.6087	52 57.5315, 005 53.6087	2 W	3	0	3
2	R.V. Celtic Voyager	Seismic	2D	29-Sep-09	Conor Ryan	11:40	12:15	35	35	52 58.572, 005 54.427	52 56.414, 005 53.712	2 NW	3	0	3
3	R.V. Celtic Voyager	Seismic	2D	29-Sep-09	Conor Ryan	13:50	14:50	60	60	52 59.596, 005 55.123	53 00.823, 005 54.034	1 N	1	0	3
4	R.V. Celtic Voyager	Seismic	2D	29-Sep-09	Conor Ryan	16:50	17:30	40	40	53 00.110 , 005 55.181	53 00.110 , 005 55.181	0	0	0	3
5	R.V. Celtic Voyager	Seismic	2D	30-Sep-09	Conor Ryan	08:23	09:08	45	10	52 28.485, 005 53.667	53 29.517, 005 51.922	4 W	4	0	3
6	R.V. Celtic Voyager	Seismic	2D	30-Sep-09	Conor Ryan	11:25	14:30	185	185	53.48052, -5.846177	53.42417, -5.899635	4 W	4	0	3
7	R.V. Celtic Voyager	Seismic	2D	30-Sep-09	Conor Ryan	17:15	18:00	45	45	53.48042, -5.904515	53.45542, -5.85598	3 W	3	0	3
8	R.V. Celtic Voyager	Seismic	2D	1-Oct-09	Conor Ryan	07:57	10:58	181	153	53.84338, -5.971835	53.73288, -6.037965	3 NW	3	0	3
9	R.V. Celtic Voyager	Seismic	2D	1-Oct-09	Conor Ryan	12:37	13:44	67	67	53.84145, -5.988153	53.86462, -6.074488	3 NW	4	0	3
10	R.V. Celtic Voyager	Seismic	2D	1-Oct-09	Conor Ryan	15:01	16:14	73	73	53.84, -5.986152	53.82489, -5.855647	4 NW	4	0	3
11	R.V. Celtic Voyager	Seismic	2D	2-Oct-09	Conor Ryan	13:54	15:31	96	96	53.80721, -5.995402	53.84728, -5.988267	4 SW	4	0	3
12	R.V. Celtic Voyager	Seismic	2D	4-Oct-09	Conor Ryan	6:27	8:17	110	54	53.41124, -6.049293	53.58279, -5.98187	2 SW	2	0	3
13	R.V. Celtic Voyager	Seismic	2D	4-Oct-09	Conor Ryan	9:00	10:29	89	89	53.57341, -5.903326	53.61078, -5.96002	4 W	3	0	3
14	R.V. Celtic Voyager	Seismic	2D	4-Oct-09	Conor Ryan	11:00	12:01	61	61	53.63836, -5.964512	53.69345, -5.972352	4 W	4	0	3
15	R.V. Celtic Voyager	Seismic	2D	4-Oct-09	Conor Ryan	13:50	15:59	129	129	53.77426, -5.936999	53.86007, -5.866591	2 W	4	0	3
16	R.V. Celtic Voyager	Seismic	2D	4-Oct-09	Conor Ryan	17:35	17:59	24	24	53.74683, -5.905653	53.71965, -5.914672	2 N	3	0	3
17	R.V. Celtic Voyager	Seismic	2D	5-Oct-09	Conor Ryan	6:55	8:30	95	95	53.81405, -6.04367	53.79491, -6.09655	0	0	0	3
18	R.V. Celtic Voyager	Seismic	2D	5-Oct-09	Conor Ryan	9:19	10:31	72	72	53.84857, -6.06757	53.82236, -6.036513	1 N	1	0	3
19	R.V. Celtic Voyager	Seismic	2D	5-Oct-09	Conor Ryan	11:09	12:44	95	95	53.81404, -5.964636	53.79121, -5.78804	2 S	2	0	3
20	R.V. Celtic Voyager	Seismic	2D	5-Oct-09	Conor Ryan	14:44	15:59	75	75	53.79412, -5.968865	53.81016, -6.10302	4 SW	4	0	3
21	R.V. Celtic Voyager	Seismic	2D	5-Oct-09	Conor Ryan	16:55	17:32	37	11	53.72567, -6.037176	53.68437, -5.997094	5 S	5	1	3
22	R.V. Celtic Voyager	Seismic	2D	6-Oct-09	Conor Ryan	16:30	17:30	60	0	53.78993, -5.943992	53.67793, -5.986193	4 N	4	1	3
23	R.V. Celtic Voyager	Seismic	2D	7-Oct-09	Conor Ryan	6:57	8:31	0:00	0	53.52192, -5.91628	53.32251, -5.956815	2 E	2	0	3

ID	Ship name	Ship type	Survey	Date	Observer	Start	Stop	Duration	Time	Start Time	End Time	Wind	Sea state	Swell	Visibility
24	R.V. Celtic Voyager	Seismic	2D	7-Oct-09	Conor Ryan	9:01	10:31	90	0	53.26407, -5.978734	53.09076, -5.943487	3 SE	3	0	3
25	R.V. Celtic Voyager	Seismic	2D	7-Oct-09	Conor Ryan	11:57	14:02	125	0	53.01903, -5.917531	53.27874, -5.97027	4 N	2	0	3
26	R.V. Celtic Voyager	Seismic	2D	7-Oct-09	Conor Ryan	15:13	16:39	86	0	53.41496, -5.897651	53.57069, -5.88731	1 N	1	0	3
27	R.V. Celtic Voyager	Seismic	2D	8-Oct-09	Conor Ryan	7:03	8:53	110	0	53.68377, -5.936096	53.83791, -5.869675	4 NW	3	0	3
28	R.V. Celtic Voyager	Seismic	2D	8-Oct-09	Conor Ryan	9:16	10:30	74	0	53.79377, -5.8879	53.65736, -5.94339	4 NW	4	0	3
29	R.V. Celtic Voyager	Seismic	2D	8-Oct-09	Conor Ryan	11:37	13:15	98	0	53.76036, -5.898523	53.77584, -5.888798	2 W	3	0	3
30	R.V. Celtic Voyager	Seismic	2D	8-Oct-09	Conor Ryan	14:05	15:57	112	0	53.669, -5.932386	53.82111, -5.867476	1 W	0	0	3
					Total in hours			**42.13**	**24.68**						