HABMAP survey leg 1

R/V Celtic Voyager

14-27 June 2005

Report prepared on Celtic Voyager.

Cruise scientific participants

- Simon Bicknell (Marine Institute, Galway)
- Charles Lindenbaum (Countryside Council for Wales)
- Fionnuala McBreen (Trinity College Dublin)
- Neil Mitchell (Cardiff University)
- Derek Sheridan (independent consultant)
- Slava Sobolev (independent consultant)
- Jim White (Fugro)
- Katrien van Landeghem (University College Cork/Cardiff University)

Principal responsibilities

- Multibeam sonar configuration, calibration and operations - Simon Bicknell.
- Differential GPS corrections - Jim White.
- Multibeam data processing - Slava Sobolev, Katrien van Landeghem.
- Coda profiler watchkeepers - Charles Lindenbaum, Fionnuala McBreen.
- Multibeam & navigation watchkeepers - Simon Bicknell., Jim White.
- Grab samples - Fionnuala McBreen, Charles Lindenbaum.
- Survey setup - Derek Sheridan.
- Management - Neil Mitchell.
- Survey preparations - Andy Wheeler, UCC.

Overview

This cruise was intended to collect geophysical data supported with some grab sampling for characterising biological habitats in three areas of the Celtic Sea (around Arklow Bank, the Celtic Deep and Caernarfon Bay). The main geophysical data were collected with a Simrad EM1002 multibeam echo-sounder (bathymetry and acoustic backscatter), Coda 3.5 kHz sediment profiler and Simrad dual frequency single beam echo-sounder.

Diary

This is not complete regarding all events such as CTDs, but these can be found in the appropriate tables below. For a complete diary, see survey log returned to the Marine Institute, Galway.

- June 14th. Mobilise in Howth. Sailing delayed because of bearing failure in boat davit (safety critical because needed if man over board).
- June 15th. Sailing shortly after 16:00. Calibration of the single beam echo-sounder in Dublin Empress Docks (bar check) followed by calibration of the multibeam sonar ("patch test") outside Dublin. Proceed to the first survey area (north of Arklow Bank), install tide gauge and take sound velocity profile with CTD.
- June 16th 01:00 (local) begin survey with first north to south line west of Arklow Bank.
- June 17th. Continuing survey.
- June 18th. Continuing survey, followed by grab sampling and fill-in survey lines. Drop Derek Sheridan in Arklow. Further survey lines, primarily cross-lines to the west of Arklow Bank, two further lines in main area, then recover tide gauge and head towards next survey area.

- June 19th 02:30 (local) reach Celtic Deep survey area and take sound velocity profile, begin survey.
- June 20th. Continue Celtic Deep survey (long SW-NE lines).
- June 21st. Continue Celtic Deep survey (long SW-NE lines).
- June 22nd. Completing Celtic Deep survey (tie lines and filling out to cover two Biomar grab sites). Continuing survey across southern Celtic Sea shipping lanes and two sections crossing central sand patch into Carmarthen Bay. Lines chosen to connect existing Biomar grab sites and cross diamicton and sand bottom types.
- June 23rd 12:30 reach Caernarfon Bay and take sound velocity profile at start of survey.
- June 24th. Continuing Caernarfon Bay survey, lines running from seaward edge of the L-shaped block, stepping shorewards. 12:00 - survey has to be adjusted somewhat because of foggy weather and need to avoid fishing pots and boat deploying/retrieving them. Working in southern part of area.
- June 25th. Continuing Caernarfon Bay survey. Late morning - break off seaward survey lines to run lines on near-shore side of the survey area, both on east and north sides. Then return to main survey block. During evening, break off to map small wreck to north side.
- June 26th. Continuing Caernarfon Bay survey, mainly to the southeast corner (SAC). 10:30 attempt two grabs over a small symmetrical sand dune (recovery of sand and shells), return to main survey again. Break off briefly to investigate mayday distress.
- June 27th. Finishing Caernarfon Bay survey, surveying in specified field area until 11:00, then transiting to west (running multibeam during transit). Due in port 5 pm.

Survey equipment and setup

The equipment used was largely as normally run by the Marine Institute on Celtic Voyager so only a general summary is provided here. A more detailed description of the typical survey setup can be found in Marine Institute reports, e.g., see CE 04_04 of the Irish National Seabed Survey. Sonar and sediment profiler data are to be archived at the Marine Institute.

Multibeam echo-sounder

Data were acquired with a Simrad EM1002 95 kHz multibeam sonar, with vessel orientation provided by a SEATEX Seapath 200 GPS-aided inertial motion sensor. Sound velocity profiles were measured by deployment of an AML sound velocity probe and by conductivity-temperature profiles from a CTD. The system was calibrated (verifying correct heading, pitch, roll and timing (latency) offsets of the motion sensor relative to the multibeam transducers) by running lines over two areas of ground, one with a sharp gradient to derive heave and latency and another with characteristic topography to resolve heading. The only problem associated with this system was a change needed to the heave settings in the southern area because of the Atlantic Ocean swell.

Single-beam echo-sounder

Data were acquired with a dual frequency Simrad EK 400 system (200 and 38 kHz). Some deterioration of the low frequency channel but not the high frequency channel was observed during pitching motions, presumably because one transducer is located farther forward. The echo-sounder was calibrated using a bar check in Dublin harbour before proceeding to the first survey area. This calibrated sonar then provides verification of the multibeam sonar data. The system was set to record the echo traces of this system for potential use in seabed classification.

Sub-bottom profiler

A Coda sub-bottom profiler was run at 3.5 kHz. Data were written directly to DAT tape in Coda format while simultaneously plotted. Some difficulty with maintaining bottom tracking was encountered for the display but otherwise no problems were encountered.

Navigation

GPS differential corrections were provided via Fugro satellite broadcasts (Starfix system).

Acoustic ground discrimination system (Roxanne)

No details available.

Multibeam data processing

Data were processed using a standard Caris/HIPS package. The processing procedure involved filtering motion sensor and navigation data. Erroneous sounding data (i.e. the raw range and bearing data recorded by the sonar) were corrected manually on a screen that allows multiple views to help isolate outliers. Finally, the different data types (soundings, motion sensor, navigation and tides) are combined to provide geographically positioned clean soundings. These were then gridded to facilitate display, contouring, etc, which can be provided in common image formats (e.g., Tiff) or as x,y,z to be read into other mapping packages. Depths have been reduced to "Chart Datum", i.e. the level of lowest astronomical tide.

Tides were provided primarily by a Proudman Oceanographic Laboratory tidal model, but supplemented with portable tide gauge records taken near Arklow Bank. Further corrections are due for the Caenarfon Bay bathymetry using tidal data from a gauge at Menai Strait.

Acoustic backscatter data were projected into map coordinates using Caris/SIPS and provided as further Tiff images of the survey areas.

Grab samples

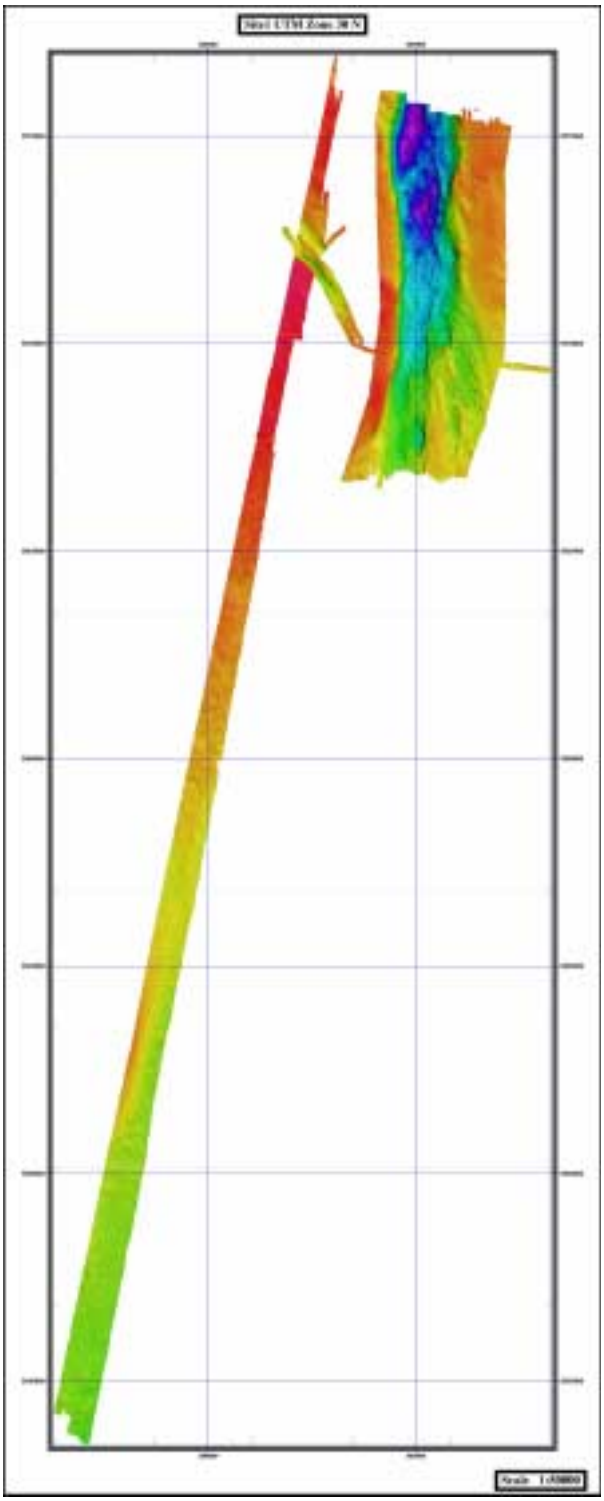
Sediment and biological samples were separated. Sediment was bagged up, while biological samples were preserved or frozen. Biological samples are being kept at Trinity College Dublin and sediment samples at University College Cork.

The following data table was taken from the table of the GIS (to reconcile any confusion with the second row of each station, see the original GIS):

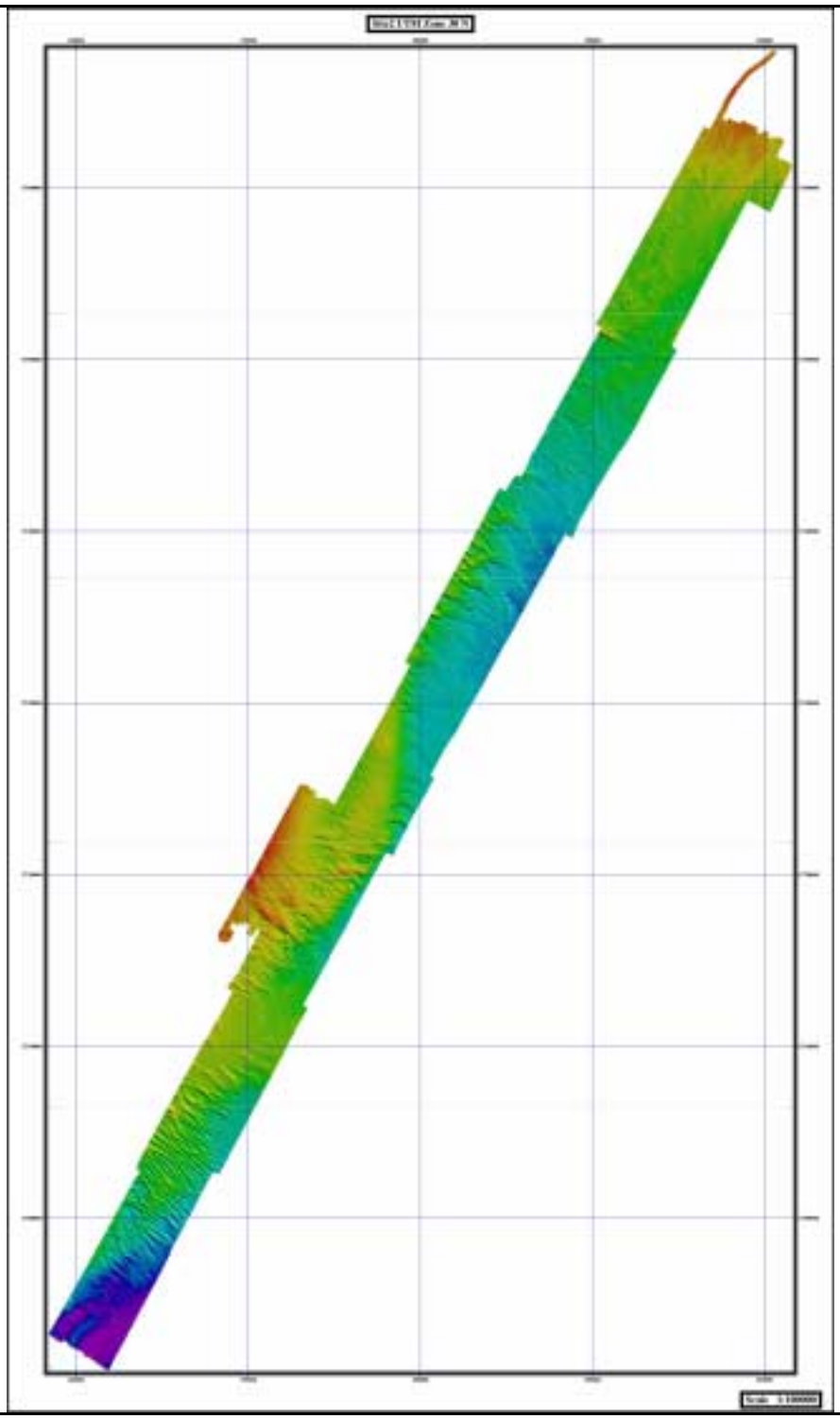
Reference	Date	Depth	Latitude (deg, mins)	Longitude W (deg, min)	Easting (m)	Northing (m)	Location	Sampler	sediment?	forams?	macrofauna?	General comments.
1AB	2005.06.17	81.0	52 59.3438	5 54.2818	304418	5875830	Arklow Bank	DG	Y	N	N	sediment only large shells (look like mussel shells)
2AB	2005.06.18	20.6	52 58.6100	5 52.7920	306650	5873575	Arklow Bank	DG	Y			Mostly cobbles, some coarse sands - starfish
3AB	2005.06.18	72.5	52 58.1963	5 53.8934	305386	5872858	Arklow Bank	DG	Y			Mostly cobbles, some coarse sands
4AB	2005.06.18	17.0	52 56.6387	5 54.7875	304269	5870011	Arklow Bank	DG	Y			Mostly cobbles, some coarse sands
5AB-a	2005.06.18	21.5	52 51.8229	5 58.2482	300025	5861245	Arklow Bank	DG	Y			Mostly cobbles, some coarse sands
5AB-b	2005.06.18	no_depth	52 51.7098	5 58.2423	300023	5861035	Arklow Bank	DG	Y			Mostly cobbles, some coarse sands
6AB	2005.06.18	26.1000	52 50.5680	5 58.5981	299536	5858935	Arklow Bank	DG	Y			Mostly cobbles, some coarse sands
7AB-a	2005.06.18	28.8000	52 46.7376	5 59.5257	298200	5851880	Arklow Bank	DG	Y		N	Sand
7AB-b	2005.06.18	no_depth	52 46.6625	5 59.6217	289086	5851745	Arklow Bank	DG	Y		1	Sand
8AB-a	2005.06.18	34.7000	52 45.1500	5 59.9090	297646	5848955	Arklow Bank	DG	Y			Sand
8AB-b	2005.06.18	no_depth	52 45.9847	6 0.0452	297488	5848840	Arklow Bank	DG	Y		1	Sand
9CB-b	2005.06.24	41.0000	52 55.0960	4 43.0796	384505	5865112	Caernarfon Bay	VV	2			sandy muddy gravel
10CB-a	2005.06.25	26.0000	53 11.3187	4 34.3522	394931	5894319	Caernarfon Bay	VV	2	2		muddy sand
10CB-b	2005.06.25	27.0000	53 11.4103	4 34.5967	394663	5894586	Caernarfon Bay	VV	2	2		muddy sand
11CB-a	2005.06.26	37.0000	52 55.1891	4 41.5088	386256	5864691	Caernarfon Bay	VV	2	2		coarse shelly sand
11CB-b	2005.06.26	37.0000	52 55.1814	4 41.5193	386244	5864677	Caernarfon Bay	VV	2	2		coarse shelly sand

Overviews of survey areas

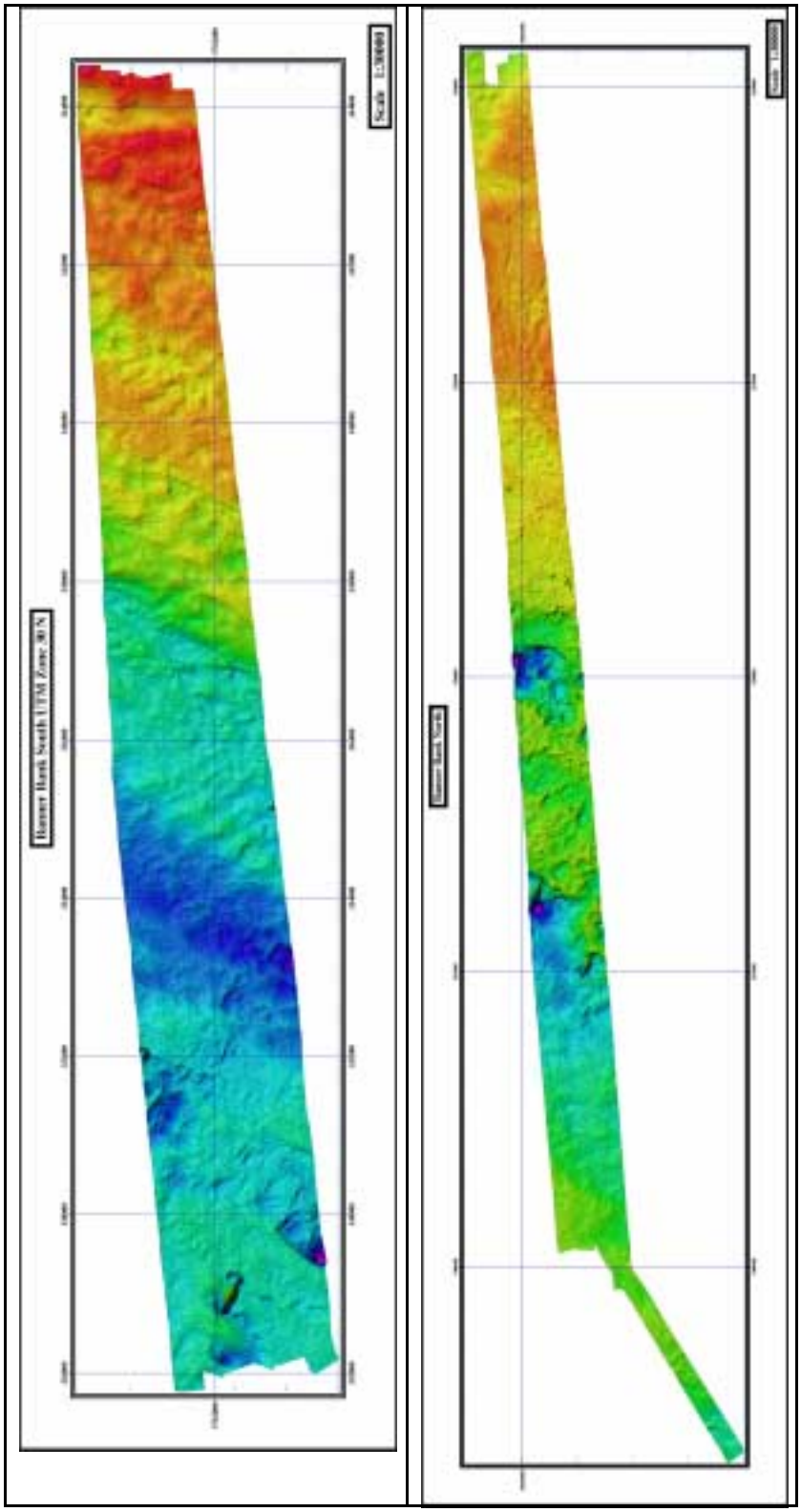
1. *North and west of Arklow Bank*



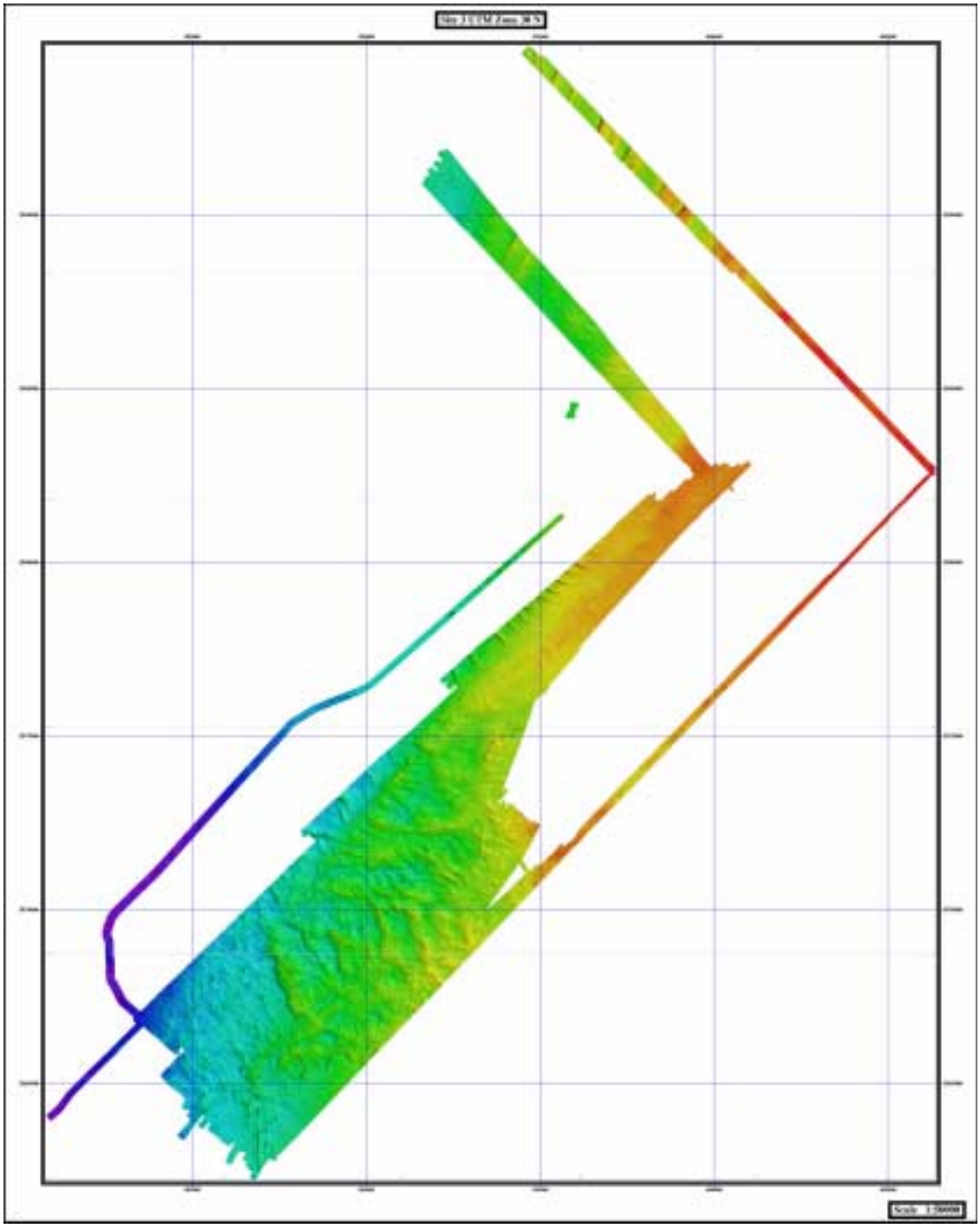
2. *Celtic Deep*



3. Cardigan Bay transects (2)



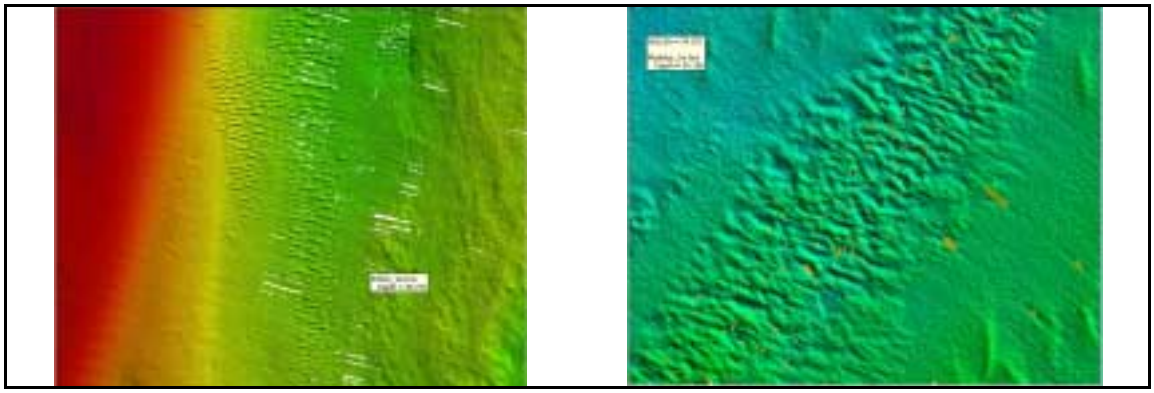
4. Caernarfon Bay.



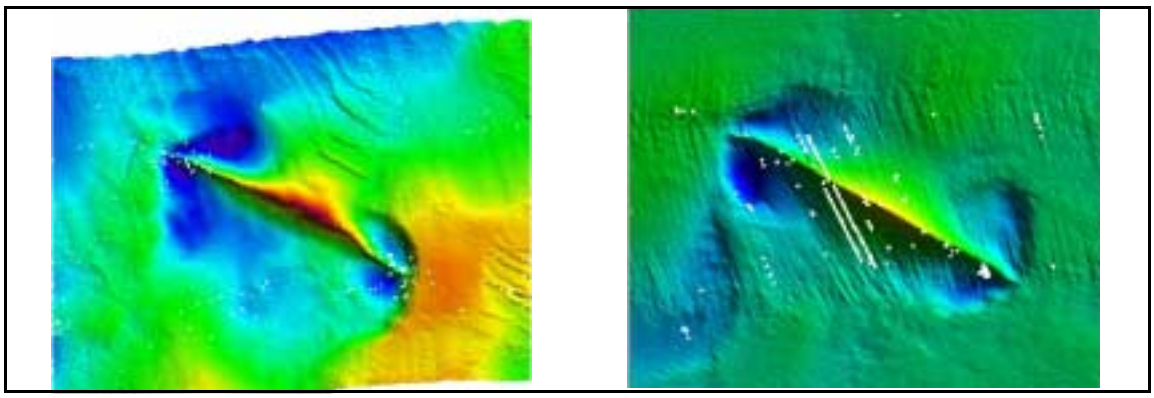
Example features

W Arklow Bank

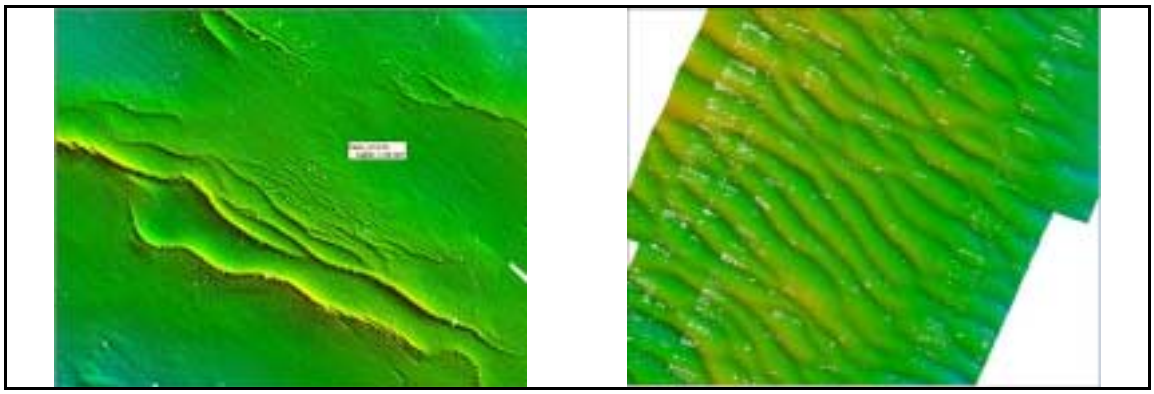
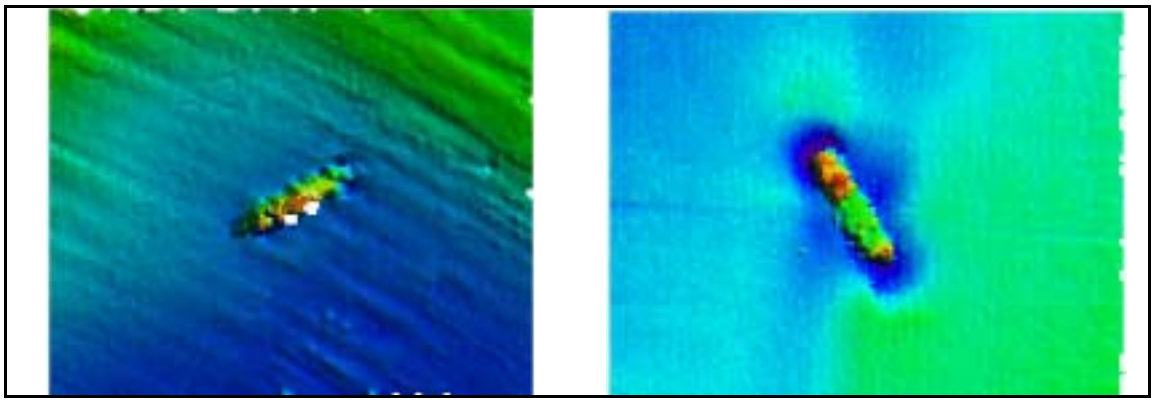
Modiolus *reefs (Arklow and Caernarfon Bay)*



Sharp ridges with scours (central Cardigan Bay). Dykes?



Sand waves (Caernarfon Bay, Celtic Deep)



Shipwrecks (Celtic Deep, Caernarfon Bay)