

National Research Vessels

SHIP-TIME PROGRAMME 2010

RESEARCH SURVEY REPORT

Survey Code:	Survey Name:	Chief Scientist/ Institution

Section A: Award Summary

Title of Research Survey and Survey Code:	<u>Climate change oceanography, biogeochemistry and geology sections: Cruise CE10002</u>	
Co-Ordinator/ Chief Scientist:	Dr. Glenn Nolan	
Vessel used for ship-time:	<i>RV Celtic Voyager</i> <input type="checkbox"/>	<i>RV Celtic Explorer</i> <input checked="" type="checkbox"/>
Total number of days at sea:	13 days	
Total number of grant-aided ship-time days awarded:	12 days	
Dates of survey:	February 5 th to 17 th 2010	
Mobilisation/Demobilisation Ports	Mobilisation: Cobh Demobilisation: Galway	
Survey Personnel:	<i>No. of Scientists</i> 9	<i>No. of Students</i> 3
Final Report Completed by:		Date:

Section B: Description of the Research Survey

B1 Overview of survey personnel

<i>Names</i>	<i>Institute/ Department/ Course</i>	<i>Position (undergraduate/ post graduate etc)</i>	<i>Number of Days</i>
Glenn Nolan	M.I, OSS	Ch. Scientist	12
Shenna Fennell	M.I, OSS	Scientist	12
Kieran Lyons	M.I, OSS	Scientist	12
Tom Szumski	M.I, MEFS	Scientist	12
Micheal Roper	POMS	Scientist	12
Xavier Monteys	G.S.I	Scientist	12
Charise Mc Keon	G.S.I	Scientist	12
Joanne O'Brien	IWDG (GMIT)	Mammal Obs.	12
Triona Mc Grath	M.I.	Postgrad	12
Caroline Kivimae	NUIG, DEOS	Scientist	12
Damien Guihen	NUIG, DEOS	Post grad	12
Eoin Mc Aleer	NUIG , DEOS	Undergrad	12

Note: Students highlighted in green text above

B2 Objectives

Briefly outline the overall objectives of the research survey.

Please state if objectives have changed from the original proposal. If survey included a training element please outline clearly.

Cruise objectives:

- Collect CTD profile data along the standard offshore sections to include:
 - Nutrient sampling
 - Phytoplankton and chlorophyll samples
 - Salinity samples
 - DIC, TA, DOC, TOC ,DO samples
- Collect grab samples at key locations on the Irish shelf
- Collect opportunistic Vibrocores at sites in the vicinity of Porcupine and Rockall Bank.
- Deploy 4 ARGO floats in the Rockall Trough
- Acquire ADCP data at the shelf break to validate model output
- Collect zooplankton net hauls from around the Rockall Trough

B3 Overview of research survey

Provide a narrative overview of the research survey including survey timelines

The information provided in this section should not exceed 5 pages (excluding tables and maps)

PORTS OF MOBILISATION AND DE-MOBILISATION

Mobilisation: Cobh: February 5th 2010

De-mobilisation: Galway: February 17th 2010.

DAILY LOG DURING CRUISE

Feb 5th: Cleared port at 1600 and proceeded nutrient sampling stations in the southern Irish Sea. All buoys fully prepped and ready for deployment. Safety briefing and muster conducted PM.

Feb 6th: Arrived on CTD section east of Rosslare at 0400 and commenced nutrient sampling stations in an easterly direction. 1200: Proceeded on new CTD section in a south-westerly direction. Diverted from CTD line at 1600 to deploy M5 weather buoy which was successfully deployed by 1800. Restarted CTD line at 1900. Completed 2nd nutrient section at 20:30 and proceeded with nutrient section running South-North to Hook Head.

Heavy swell forecast for SW coast over next 2 days so agreed to go through Irish Sea sampling nutrient stations and starting on the Erris section first.

Feb 7th: Completed Hook Head section at 0300 and proceeded to nutrient section off Arklow, arriving there at 1015. Section completed by 1400.

Started Dublin section at 1830 and proceeded in a westerly direction towards Dublin port. Section completed at 2330. Proceeded towards northernmost section in the Irish Sea sampling one additional underway nutrients station en route.

Feb 8th: Arrived at 0130 on the Drogheda section and completed CTD and underway stations by 0600. Proceeded on passage from N. Irish Sea to Erris Head.

Feb 9th: Arrived on Wave Scan deployment station off Annagh Head at 0930 and proceeded to deploy buoy. Buoy deployed on station at Berth a (54 17.145N, 10 16.981W) at 1030. Proceeded to first CTD station on N. Rockall line. Completed CTD stations 41-46 during this day.

Feb 10th: Continued across N. Rockall line completing stations 47-50. Successfully took a box core sample (second attempt) after station 50 for GSI. Commenced station 51 at 2300.

Feb 11th: Continued along N.Rockall line completing the section on Rockall Bank at 1400. Took a box core sample at the final CTD station on the transect before proceeding to Argo float deployment position (55 17.1N, 15 48.6W). Proceeded to S.Rockall CTD section.

Feb 12th: Started S.Rockall section (station 59) at 0619 after taking a grab sample on route. Weather deteriorated slightly, ship's speed knocked back to 7 knots. Completed stations 60 to 63 throughout the day.

Feb 13th: Continued in a south eastward direction towards Porcupine Bank completing stations 64-71 throughout the day.

Feb 14th: Completed CTD no. 72 on Porcupine and diverted course southward to commence Vibro-coring operations. After 3 successful cores, the corer became stuck on the seabed and the mechanical dynex work wire parted. The electrical umbilical was potted and the corer was buoyed off to mark its position on the seabed for recovery (see separate incident report). Box core and grab sampling ensued at the remaining 21 stations requested by GSI.

Feb 15th: Continued with grab sampling and box coring in the upper Porcupine Seabight. Completed grab samples at 1600 and proceeded to 53N CTD line on Porcupine Bank. Arrived on station 73 at 2200.

Feb 16th: Continued eastward on 53N line completing stations 74-79.

Proceeded to Galway docks for demobilisation.

INITIAL RESULTS

A map of the station positions occupied during cruise CE010002 is provided below.

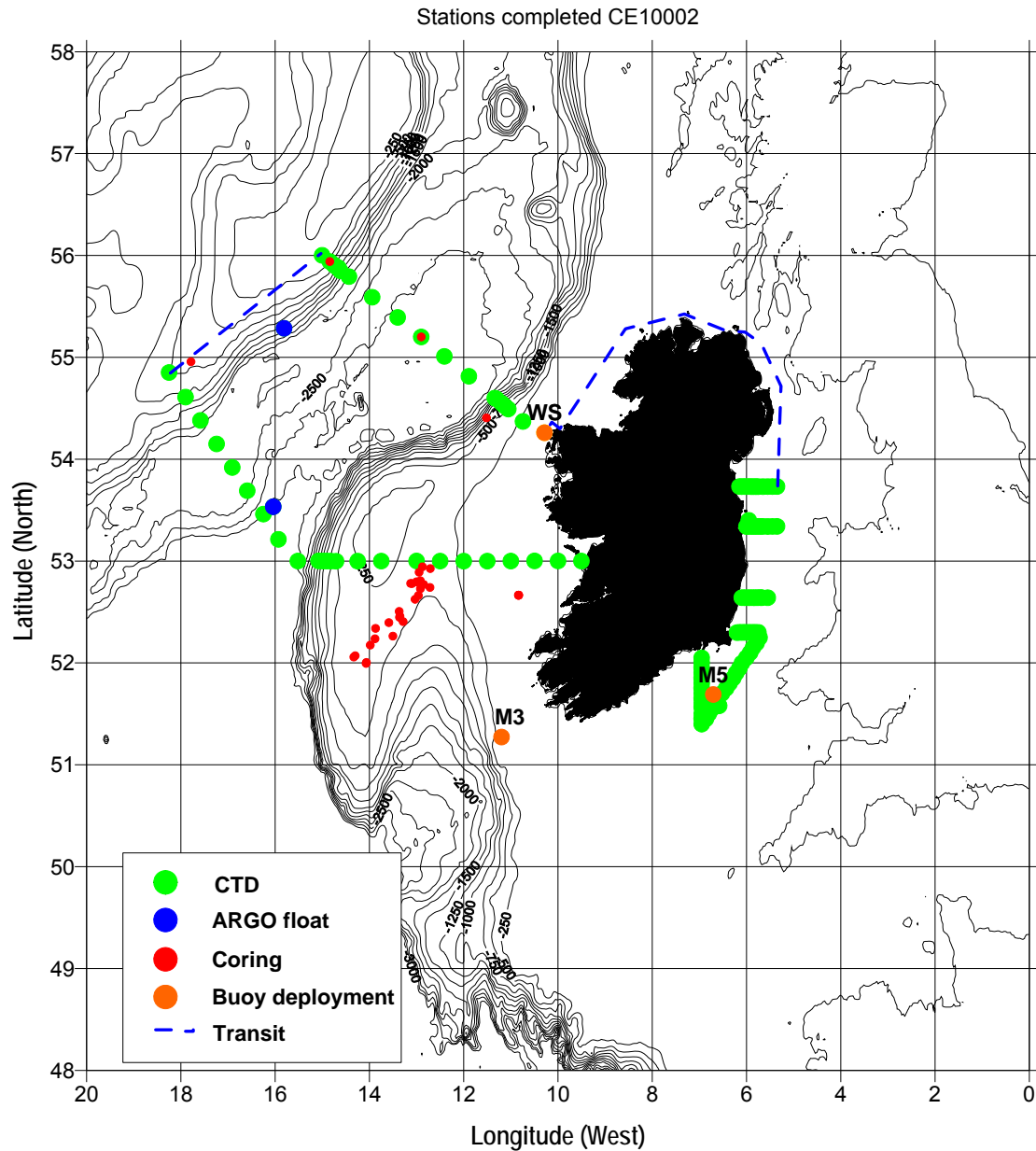


Figure 1 Stations occupied on cruise CE10002 (February 2010)

A total of 82 sampling stations were occupied for a variety of parameters including CTDs, nutrients, salinity, and carbon measurements. Vibrocoring was conducted at an additional 3 stations, while 21 stations were occupied for either box cores or day grabs. Two Argo floats were deployed in the Rockall Trough.

Buoy and float deployments

Weather Buoys

M5 was recovered by the R.V. Celtic Explorer on the 1st of Feb on return from a survey in Germany. A replacement buoy was mobilised in Cobh and the existing moorings were serviced. The buoy was redeployed on the 6/02/2010 at 17:30 at position 51 41.41N 6 42.24 and was transmitting on the GTS shortly after.

Wave Energy Test Site Buoy Deployment

A Fugro Oceanor Wavescan buoy was purchased by SEI to deploy at the new offshore wave energy testing facility close to Bellmullet. Preparations were completed by a Fugro Engineer prior to sailing and deployment took place in position 54 17.145N 10 16.981W on the 9/02/2010. The data is being stored locally and transmitted via Iridium to the base station within the Marine Institute.

Argo Floats

Two Argo floats were deployed at 55 17.1N 15 48.6W on the 11/02/2010 at 19:15 and the second one at and 53.533 16.04W on the 13/02/2010 at 07:40. The data is being transmitted to and managed by BODC and will contribute to the global array of floats.

Ocean chemistry

At the beginning of the cruise, nutrient and salinity samples were taken at 11 underway stations between Cobh and Rosslare. 3 transects were completed in the Celtic Sea and 4 transects were then completed in the Irish Sea (info). Along each of these transects, the CTD was deployed at every second station, and underway samples were collected at the stations in between. At the underway stations, the bridge notified us when we were on position, the station log was recorded in the dry lab, and an acid-cleaned 1L HDPE was filled for nutrients and salinity samples from the underway tap in the wet lab.

At each of the CTD stations, a surface and bottom sample was taken. At a few stations close to the coast, when the water column had some stratification, a middle sample was also taken. 40 CTD stations and 39 underway stations were completed in the Celtic and Irish Sea, where 100 nutrient and salinity samples were taken. 21 surface DO samples were also taken at the CTD stations along the 4 transects through the Irish Sea.

Along the northern transect across Rockall, 17 CTD stations were completed. Crossing the shelf, from stations 41-45, all parameters were sampled (DIC, TA, DO, nutrients, salinity, DOC and TOC). DO, nutrient and salinity samples were then taken every 2nd station for the rest of this transect. DIC, TA, DOC and TOC were not sampled however due to limited number of bottles. Samples were taken at every station along the shelf (station 55-57) on the western side of the Trough. In total 102 DO, nutrients and salinity, and 29 DIC, TA, DOC and TOC samples were taken along this northern transect.

Along the southern transect across Rockall, nutrient, salinity and DO samples were taken at every station, 111 were taken in total. DIC, TA, DOC and TOC samples were at stations 60, 62, 64, 66, 67, 68, 70 and 72; 70 samples were taken in total.

Along the shelf, the water column was very well mixed so between stations 73-79 DIC, TA, DO and nutrient samples were taken at the surface and bottom depth at every 2nd station, and at the surface at the stations in between. 1 salinity sample was taken at each station. From station 80, only surface samples were taken as the water column was shallow and well mixed.

Geological Survey work

Three different instruments for seabed sampling were used in this cruise:

1. Grab sampler (GSI): Day- grab
2. Box Corer (GSI): 0.5x0.5x1m (sampling volume) (Fig. 4&5)
3. Vibrocorer (GSI) (Geo-resources 3,000): The 3 meters set up was used during all the survey. Figure 3 depict the instrument during operations. (Fig. 2&3)

Instrument performance and incidences:

The Day-Grab worked very good in all the stations used (17)

The Box Corer performed reasonably well in all the stations it was deployed (8), with recovery from few cm up to near 40cm.

In general the performance of the vibrocorer was good in the three stations prior to the loss of the system in station number 8 on the 14th of February at 13:30 pm. The Dynex cable broke up when starting to recover the instrument from the seabed at 360m. The electrical cable was cut from the reel, sealed and deployed off board attached to buoys at c. 17h (see separate report for detailed description of the accident)

28 stations were occupied during this cruise in water depths between 280 m and 2900 m. In total, 3 vibrocores (5m of core), 8 boxcores and 16 Grabs-samples were recovered.

Cetacean monitoring

94 hours of survey time were logged with 20% (19 hrs) of this at Beaufort sea state three or less; and 80% (75 hrs) at Beaufort sea state \geq four. 29 sightings of at least four cetacean species, totalling 450 individuals were recorded (fig. 2).

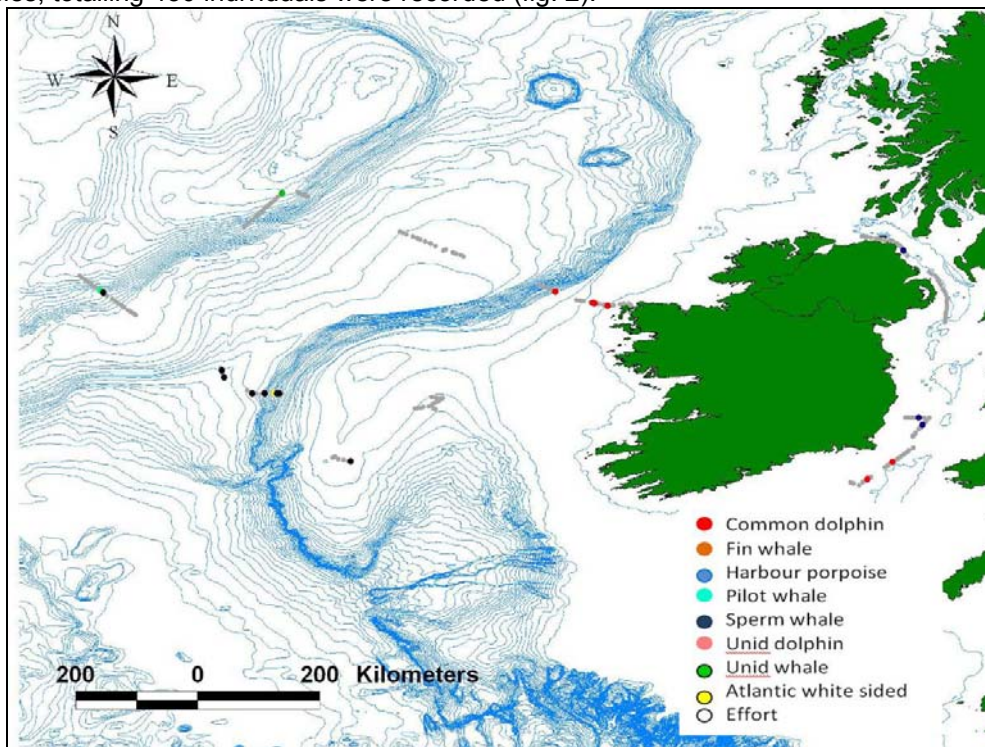


Fig. 2 Distribution of cetacean species recorded during the survey.

Identified cetacean species were common dolphin (*Delphinus delphis*), harbour porpoise (*Phocoena phocoena*) pilot whale (*Globicephala melas*), sperm whale (*Physeter macrocephalus*), Atlantic white-sided dolphin (*Lagenorhynchus actus*) and fin whale (*Balaenoptera physalus*). Two sightings were downgraded to unidentified dolphin and unidentified whale, according to the IWDG's cetacean sightings database classification scheme (IWDG 2009), as a positive id of these animals could not be made. Sperm whales were the most commonly encountered and during the survey, while the common dolphin was the most abundant.

A total of 34.5 hours PAM data were acquired, and cetacean detections were registered on several occasions, including common dolphins and pilot whales. Post-processing of this data will take place back in the lab as it takes hours to analyse the data in preparation for mapping detections according to species. The PAM track is presented in figure 3.

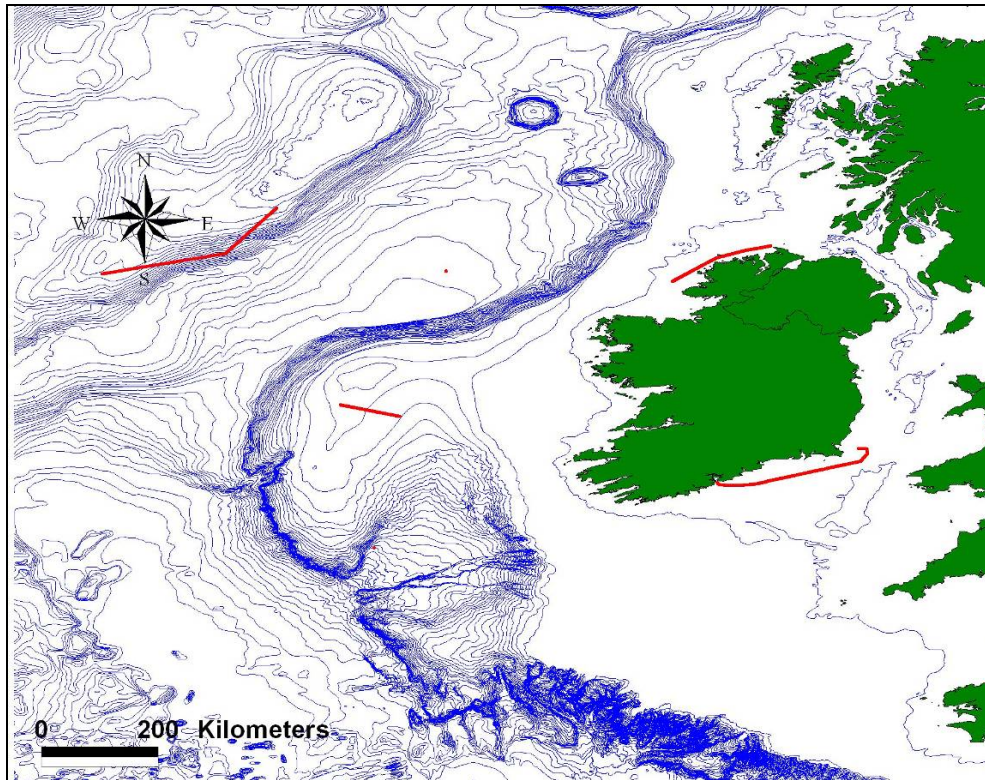


Fig. 3 PAM track via towed hydrophone.

Table 1: Sightings, counts and group size ranges for cetaceans sighted during the survey.

Species	No. Sightings	No. Individuals	Range of Group Size
<i>Common dolphin</i>	6	116	5-50
<i>Harbour porpoise</i>	3	6	1-3
<i>Sperm whale</i>	8	9	
<i>Pilot whale</i>	2	7	
<i>Atlantic-white sided dolphin</i>	1	12	
<i>Fin whale</i>	1	1	
<i>Unidentified dolphin</i>	1	15	15
<i>Unidentified whale</i>	1	3	3

B4 Benefits, impact and contribution of the outputs to marine research and the marine sector in general.

Outline clearly the specific outcomes and benefits of the research survey.

The information provided in this section should not exceed 1/2 page (excluding tables and maps)

This work has already enabled Ireland to be part of large EU programmes on collapse of the thermohaline circulation in the NE Atlantic and in the international ARGO float programme.

Capacity building

The team involved have spent the past decade developing the capacity to acquire this standard section data and to ensure that the data is utilised as rapidly after collection as is feasible. Capacity will be developed further by training upcoming undergraduate and postgraduate students on this cruise so that in time they will be in a position to lead such programmes and provide assessments of ocean climate on an ongoing basis.

Dissemination

In the first instance the data will be provided to the ICES Working Group on Oceanic Hydrography of which Ireland is a member (and co-chair). This group produces the ICES Report on Ocean Climate which is widely disseminated among the ICES fisheries and environment communities. The report is available on the ICES website (www.ices.dk)

Improved understanding of ocean climate

The data are considered in combination with time series from 6 offshore buoys (SST, wave height, wind), coastal tide gauges at 18 locations and other coastal monitoring stations for both weather and oceanic conditions (eg. Malin Head station). It is in this overall context that we can establish the oceanic baseline from which future changes can be assessed.

Promoting multi-disciplinary and inter-institutional research collaboration

These cruises have had a climate focus since 2006 and the Marine Geology team from the Geological Survey of Ireland collected cores for climate purposes during this programme. This provides a link between palaeoceanography and modern measurements of ocean currents and water masses. The team also hopes to collect hydrographic data from the Irish shelf region filling gaps in the INFORMAR data coverage

The cruise also enables baseline cetacean sightings to be made in the deep water west of Ireland.

The cruise incorporates physical, chemical and biological data gathering. In summary this cruise has active participation of a government agency (MI), a government department (DCENR-GSI), a 3rd level research group (NUIG) and a Non-governmental Organisation (IWDG) fulfilling a truly inter-institutional role and includes oceanographers, plankton ecologists, fisheries scientists (migratory and key commercial species) and marine technicians, thus fulfilling a truly multi-disciplinary role.

B5 Data

Provide a description of the data collected from the research survey, the usage of the data and how it will be stored.

The information provided in this section should not exceed 1/2 page (excluding tables and maps)

A total of 82 sampling stations were occupied for a variety of parameters including CTDs, nutrients, salinity, and carbon measurements. Vibrocoreing was conducted at an additional 3 stations, while 21 stations were occupied for either box cores or day grabs. Two Argo floats were deployed in the Rockall Trough.

CTD data are analysed within the Oceanographic Services team at the Marine Institute and submitted to the ICES and MI data centres. Chemical analysis of samples is undertaken at the Marine Institute and NUI, Galway with results transposed onto spreadsheets that are stored in both locations.

Vibrocores are sent for further analysis at TCD, NUI, Maynooth and University of Ulster. The results are archived by the Geological Survey of Ireland.

Cetacean data collected under the PreCast project is analysed and archived at GMIT, Galway.

B6 Contribution to marine research programmes

Outline specific National/EU/International research programmes this survey supported. Please include the funding sources for these programmes as well as the total amount of funding leveraged (Repeat the table below, if necessary).

National/EU/International Research programme(s):	EASYCO Project
Total Programme cost:	€3m
Value to Irish partners:	€400k
Project duration:	3 years
Contract no.:	
Project partners:	IST, Portugal, Ifremer, IEO, CEFAS, MI
Project web address:	http://www.project-easy.info/

National/EU/International Research programme(s):	ASIMUTH Project
Total Programme cost:	€2.5m
Value to Irish partners:	€1m
Project duration:	3 years

Contract no.:	
Project partners:	<i>SAMS, DOMMRS, Nowcasting, Numerics Warehouse, Ifremer, IEO, CEFAS, MI, Startlab</i>
Project web address:	

National/EU/International Research programme(s):	INFOMAR
Total Programme cost:	<i>€2 M / annum</i>
Value to Irish partners:	
Project duration:	<i>3 years</i>
Contract no.:	
Project partners:	<i>Geological Survey of Ireland and Marine Institute</i>
Project web address:	<i>http://www.infomar.ie/</i>

Appendices

Please number and attach any relevant Appendices here.