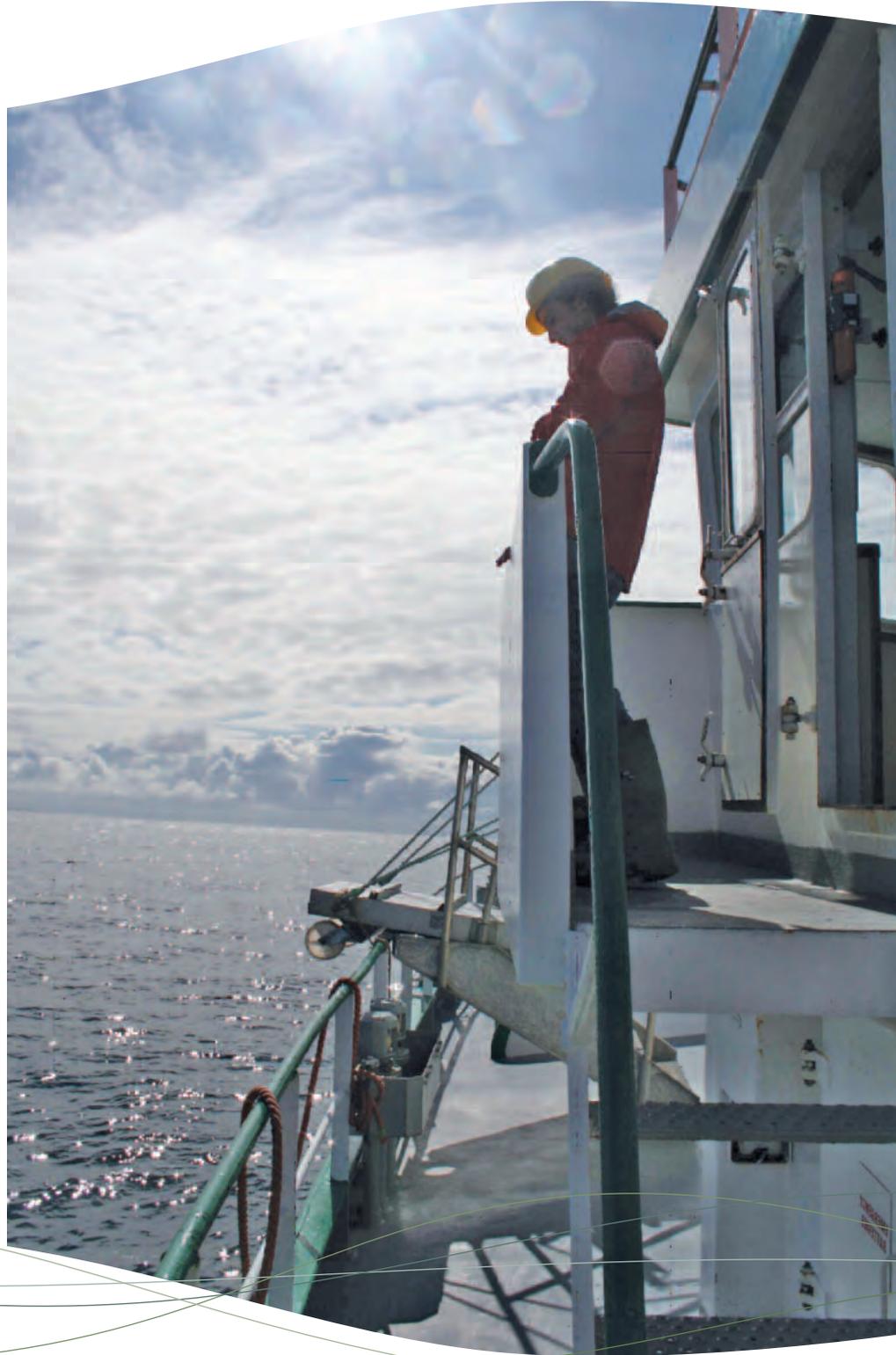




# Research Surveys and Dedicated Training

Compendium of Shiptime Awards 2008



The Marine Institute is the national agency which has the following functions:

“to undertake, to co-ordinate, to promote and to assist in marine research and development and to provide such services related to research and development that, in the opinion of the Institute, will promote economic development and create employment and protect the marine environment” Marine Institute Act 1991.

### Sea Change: A Marine Knowledge, Research & Innovation Strategy for Ireland

Sea Change—A Marine Knowledge, Research & Innovation Strategy for Ireland 2007-2013—was launched in early 2007 and was the outcome of extensive analysis and consultation with government departments, state agencies, industry and the third-level sector. It outlines a vision for the development of Ireland’s marine sector and sets clear objectives aimed at achieving this vision, namely to:

1. Assist existing, and largely indigenous, marine sub-sectors to improve their overall competitiveness and engage in activity that adds value to their outputs by utilising knowledge and technology arising from research.
2. Build new research capacity and capability and utilise fundamental knowledge and technology to create new marine-related commercial opportunities and companies.
3. Inform public policy, governance and regulation by applying the knowledge derived from marine research and monitoring.
4. Increase the marine sector’s competitiveness and stimulate the commercialisation of the marine resource in a manner that ensures its sustainability and protects marine biodiversity and ecosystems.
5. Strengthen the economic, social and cultural base of marine dependant regional/rural communities.

The Sea Change strategy was developed as an integral part of the government’s Strategy for Science, Technology and Innovation (SSTI) and the Marine Institute as the lead implementation agency is working within SSTI policy and with government departments and agencies to deliver on the Strategy.

The Marine Institute managed Marine Research Sub-Programme, one of eight sub-programmes within the Science, Technology and Innovation (STI) Programme of the National Development Plan 2007—2013, targets funding to meet the objectives of the Sea Change strategy.

Over the lifetime of Sea Change, funding will be provided for:

- Project-Based Awards
  - o Strategic Research Projects
  - o Applied Research Projects
  - o Demonstration Projects
  - o Desk/Feasibility Studies
- Researcher Awards
  - o Strategic Research Appointments
  - o Research Capacity/Competency Building
  - o Post-Doctoral Fellowships
  - o PhD Scholarships
- Industry-Led Research Awards
  - o Company Awards
  - o Collaborative Awards
- Infrastructure Awards
  - o Infrastructure Acquisition
  - o Access to Infrastructure

Further copies of this publication can be obtained from:

Marine Institute, Rinville, Oranmore, Co. Galway, Ireland or [www.marine.ie](http://www.marine.ie).

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# Marine Research Sub-Programme 2007–2013

## Shiptime Programme 2008 Awardees

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*Integrated Research Surveys*

*Dedicated Training Programmes*

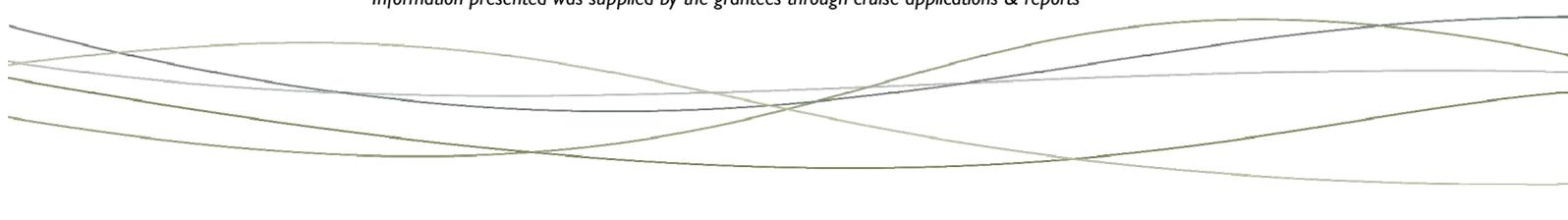
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Compendium compiled by\*:  
Rebecca Corless  
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Ireland



The Integrated Marine Exploration Programme, funded under the National Strategy for Science, Technology & Innovation (SSTI) was carried out under the Sea Change strategy with the support of the Marine Institute and the Marine Research Sub-Programme of the National Development Plan 2007–2013.

*\*Information presented was supplied by the grantees through cruise applications & reports*





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### Dedicated Training Programmes

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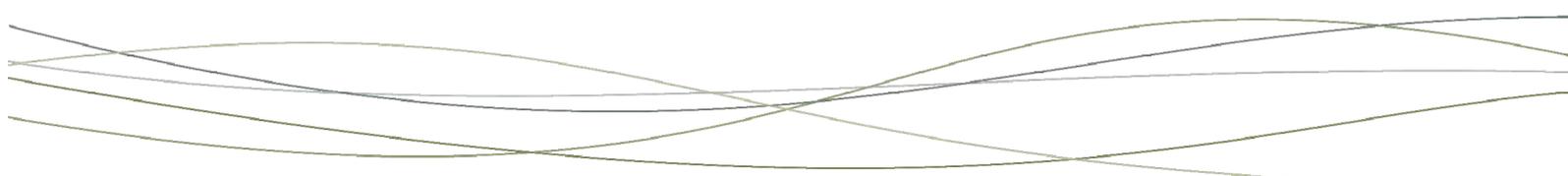
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## Introduction

### Background

*Sea Change, A Marine Knowledge, Research & Innovation Strategy for Ireland 2007–2013*, identified the need for a dedicated competitive Research Vessel Grant-Aid Programme, to make grant-aid available to researchers on a competitive basis, enabling them access to shiptime as part of institutional and co-operative international marine research and training programmes. The benefits of the provision of funding for ship-time include:

- significantly improving the competitiveness of Irish researchers in applying for EU research funding, putting Irish researchers on an equal footing with their EU counterparts;
- maximising the value for money and return on investment by the state in world-class research infrastructure and its' use on strategic projects consistent with the objectives of *Sea Change*; and
- provision of training to undergraduate and postgraduate students on world-class research vessels.

In 2007, the Marine Institute received grant-aid under the Government's Strategy for Science, Technology and Innovation (SSTI) 2006–'13, funded via the Marine Research Sub-programme of the 2007–'13 NDP, to operate a two-year Integrated Marine Exploration Programme (IMEP). The aim of the IMEP was to develop Irish research capacity and capability in marine exploration by developing a pool of trained personnel who can utilise national assets and increase the quantum and nature of information gathered on surveys. In addition, in order to expand existing marine research capabilities and build research potential, the programme provided grant-aid, on a competitive basis, for access to the national research vessels for:

- Higher education institutions on the island of Ireland, to provide dedicated training programmes at sea; and
- Higher education institutions and R&D institutions on the island of Ireland to carry out integrated research surveys of a multidisciplinary nature.

2008 marked the second year of the shiptime programme under the IMEP.

### National Marine Research Vessels

The Marine Institute operates the national marine researcher fleet (RV *Celtic Explorer* and RV *Celtic Voyager*), on behalf of the Irish Government and the Irish marine research community, on a charter basis. The vessels are used for research and development, monitoring and training programmes by government departments and agencies, research institutions (including the higher education sector) and industry.



The RV *Celtic Explorer* is a 65.5m, multipurpose, ocean-going research vessel, capable of carrying out fisheries, acoustic, oceanographic, buoy handling, environmental, geological and hydrographic work. It has a maximum endurance of 30 days, accommodates 31 personnel, including up to 18 scientists, and hosts large laboratory spaces, IT rooms fitted with scientific equipment, a full complement of survey equipment and winches, wet and dry laboratories and a full workshop. The vessel is acoustically silent, which minimises fish avoidance and provides an ideal environment for the collection of high quality acoustic data with minimal interference. It is adapted to accommodate a variety of Remotely Operated Vehicles including the Marine Institute's deepwater ROV *Holland I*.

The RV *Celtic Voyager* is a 31.4m multi-purpose research vessel suited to coastal research and offshore survey operations, with a maximum endurance of 14 days. The vessel has wet, dry and chemical laboratories, which are permanently fitted with standard scientific equipment, and can accommodate 15, including up to 8 scientists. The *Voyager* facilitates the collection of fisheries, geophysical, oceanographic and environmental data and is the dedicated vessel for the provision of training at sea for students.

## Summary of Awardees 2008

In 2008, a total of €1,397,000 was provided in grant-aid to support 124 vessel days (*Celtic Explorer* 89 days; *Celtic Voyager* 35 days)<sup>1</sup>. This represents an almost doubling in the level of support provided in 2007. This was made possible through co-funding of the 2008 programme by the Higher Education Authority, who contributed 50% of the grant-aid (€700,000), supporting training programmes and research surveys carried out by Irish higher education institutions.

This grant-aid supported:

- Five research surveys, totalling 82 days at sea (€980,000), led by four Irish public research performers, with a total of 18 participating institutions, including three Northern Ireland partners and six other European partners;
- Eight ship-based postgraduate and undergraduate training programmes, totalling 37 days at sea (€377,000) and providing training for over 134 students from six higher education institutions; and
- One 'Bright Sparks' award, consisting of the provision of the *Celtic Voyager* for a student-led, five-day research/training programme (€40,000).

The five grant-aided research surveys contributed to ongoing research projects that are addressing objectives within a number of *Sea Change* research programmes (e.g. Aquaculture, Marine Environment, Fisheries Resources, Seabed & Resource Mapping and Climate Change). In addition to the research carried out, 13 student places were provided during these surveys, providing valuable, practical student training. A summary of each survey is provided below.

Two of the funded surveys—focusing on salmon smolt survival at sea and bathymetric mapping in the mid-Atlantic Ridge—provided funding, from externally funded projects, for additional ship days. These contributions amounted to €292,000.

The ship-based training programmes and 'Bright Sparks' award provided training for 138 students (undergraduate and postgraduate) from six higher education institutions. These students came from a range of disciplines, including marine geology, marine biology, fisheries, oceanography, environmental science and trainee deck/engineering officers. A summary of each of the training programmes is provided below.

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<sup>1</sup> 104.5 days of this was funded through the programme. The remaining days were funded by the grantees through externally funded projects.

# Integrated Research Surveys

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## Ground-Truthing Seismic Images of Ocean Structure in Rockall Trough, Part II: Probing Meso-Scale Eddies West of Porcupine Bank

Year Awarded:	2008
Value of the Shiptime:	€400,000
Total Number of Days:	25
Student Participation:	6 PhD students
Lead Partner:	Department of Geography, Trinity College Dublin (TCD)
Partners:	Department of Earth & Ocean Sciences, NUI Galway Department of Geology, TCD

### Background

Seismic reflection data, of the type routinely collected by the hydrocarbon industry, provide a new method to map oceanic temperature, salinity and current structure. This use of seismic reflection data is a very young subject, and ground-truthing studies are required that directly compare ocean features mapped using both traditional oceanographic and new seismic techniques.

*Meso-scale eddies along the SE margin of Rockall Trough, west of Porcupine Ridge:*

An oceanographic study at NUI Galway, based on float tracks and satellite altimeter data, had shown that an eddy of diameter ~100 km is a semi-permanent feature of this region. A separate study at TCD had reprocessed legacy seismic reflection data from the same area and mapped a seismic response that might represent the same eddy.

### Activities undertaken

This survey tested a new method of mapping meso-scale eddies using seismic reflection data. A detailed mapping of the physical oceanographic characteristics of a ~100 km diameter eddy west of Porcupine Ridge was firstly carried out. This eddy has been previously identified using Argo float and satellite data.

The survey firstly located the eddy using an ADCP and satellite data, and then probed it using both oceanographic and seismic techniques. By providing a clear example of the relationship between physical oceanographic properties and seismic response, this facilitated interpretation of seismic reflectivity maps of the Irish deep water region and beyond, that are currently being produced at TCD.

The following summarises the key activities:

- The eddy west of Porcupine Ridge was located using an ADCP and satellite altimeter images.
- Onboard processing of the ADCP data was performed to provide real-time current measurements, and the satellite data downloaded via the Celtic Explorer's broadband connection.
- The eddy was mapped using oceanographic probes mounted on CTD rosette (CTD, dissolved oxygen, turbidity, current velocity, water samples, etc.).



## Integrated National Strategic Deep-Water Seabed Drilling Campaign (INS\_DeepDrill)

Year Awarded:	2008
Value of the Shiptime:	€272,000 <sup>2</sup>
Total Number of Days:	29 (17 Funded)
Student Participation:	2 Students
Lead Partner:	Department of Geography, ERI, University College Cork
Partners:	CSA Group Ltd.; Department of Earth & Ocean Sciences, NUI Galway; MARUM, University of Bremen; University of Erlangen University of Leuven; Royal Netherlands Institute for Sea Research

### Background

INS-DeepDrill fulfils Ireland's national strategic needs for deep-water seabed drilling and full core recovery at intermediate seabed penetration (down to 80m). This is accomplished through the mobilisation of the advanced portable seafloor drilling rig which is financially facilitated through European funding. MeBo, developed by MARUM – University of Bremen, is a remotely (surface) controlled, seabed mounted portable drilling platform with a capacity to push-core soft sediments and rotary-drilling consolidated and cemented successions down to 80m below seafloor. This advance in marine technology now allows for the complete penetration of selected carbonate mound sedimentary sequences (and the associated upper part of the underlying sequence) Mesozoic/ Palaeozoic rock sequences exposed on the Porcupine bank, and unconsolidated to lithified sequences in Galway Bay. Furthermore, MeBo's ability for on-site vertical adjustment allows for coring the steep flanks of mound/rock outcrops thus recovering previously inaccessible sediments.

### Activities undertaken

The cruise cost-effectively collected full-recovery core sequences in lithified substrates to support national strategic requires. These needs arose from three initiatives, namely the CARBONATE project, the ISPSG Rock Drilling Programme, and the Galway Bay Drilling Programme, that came together to share the platform of the RV Celtic Explorer as an effective and proven vessel of operation for MeBo. The activities undertaken fed into the objectives of the CARBONATE project, the ISPSG Rock Drilling Programme, and the Galway Bay Drilling Programme (listed below). Three scientific places were provided specifically to PhD students in the CARBONATE Programme.

#### Overall objectives of CARBONATE:

- To recover complete mound sequences.
- To elucidate the timing and factors controlling carbonate mound genesis.
- To generate a carbonate mound development model for different environmental settings.
- To estimate the influence of climate change in carbonate mound development.
- To assess the role of cold-water coral carbonate mounds in the global carbon cycle.

#### Overall objectives of the ISPSG Rock Drilling Programme:

- To obtain length cores in hard rock at five proposed sites on the porcupine Bank.

#### Overall objective of the Galway Bay Drilling Programme:

- To collect deep cores (<30m) at 3 sites in water depths >15m on the north of Galway Bay would help to understand the record of rapid climate changes that have taken place.

<sup>2</sup> The survey lasted 29 days in total with the cost of the additional 12 days (€192,000) covered by the grantee through externally-funded projects.



## Standard Oceanographic Section Cruises: Leg 1) Irish Offshore waters January 2008<sup>3</sup> Leg 2) Irish Shelf Region May 2008

Year Awarded:	2008
Value of the Shiptime:	€80,000
Total Number of Days:	5
Student Participation:	6
Lead Partner:	Department of Earth & Ocean Sciences, NUI Galway
Partners:	Oceanography Services, Marine Institute

### Background

The generation of long-term time series to monitor ocean climate is at the heart of understanding the likely impact of future ocean climate scenarios on key marine sectors e.g. fishing, aquaculture, wave energy, environmental protection and coastal flood defence. While not glamorous in its own right, it is widely accepted that re-occupying hydrographic sections to examine year-to-year changes in ocean climate is one of the key elements required in climate change programmes. This forms the basis of climate change research funded under the NDP Marine Research Sub-Programme and is essential in preparing the marine sector as our ocean climate is modified. 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.

### Activities undertaken

Both of these cruises contributed to Ireland's data to the ICES working group on oceanic hydrography (WGOH). WGOH produce the ICES Report on Ocean Climate (IROC) each year which summarises oceanic variability from year to year in the ICES region. The cruise helped deliver this data to the IROC effort. The survey helped to define the likely future ocean climate these marine sectors will have to contend with in terms of water temperatures, wave heights, tidal surges and nutrient and plankton concentrations

The following summarises the key activities undertaken:

- Collection of CTD profile data using a CTD Rosette sampling system along the standard offshore and shelf sections to include: Nutrient sampling, Phytoplankton samples, Salinity samples.
- Continuous Plankton Recorder Tows in Irish waters to contribute to the SAHFOS CPR Global effort (analysis by NUI, Galway).
- Grab samples at key locations on the Irish shelf to ground-truth bathymetric data acquired under the Irish national seabed survey (now INFOMAR) were collected.
- Collection of multi-beam bathymetric data on the western Irish Shelf and in the Celtic Sea to fill gap areas not previously surveyed. This data was acquired primarily between CTD station transects and in coastal bays where bad weather hampers the work programme on the shelf.
- Acquisition of ADCP data on the shelf to validate model output.
- Collection of size-fractionated baseline data on marine plankton in order to assess whether it can be used in monitoring of trophic status (different phytoplankton net mesh sizes were used to achieve this).

<sup>3</sup> Leg 1 of this survey (10 days) was funded directly through project resources.

## SALSEA Merge

Year Awarded:	2008
Value of the Shiptime:	€100,000 <sup>4</sup>
Total Number of Days:	15 (7.5 funded)
Student Participation:	1
Lead Partner:	Aquaculture and Catchment Management Services, Marine Institute
Partners:	Salmon Biology, Central Fisheries Board

### Background

SALSEA offers a unique opportunity to find out how salmon use the oceans: where they go, how they exploit currents and food resources, what critical factors affect migration and distribution, and what factors determine salmon survival at sea. Data can be used to develop predictive models of salmon abundance such that appropriate management measures (including river specific TACs) can be developed and applied such that fisheries will only take place on single river stocks meeting conservation limits. Recent evidence shows strong regional and local structuring of Atlantic salmon stocks in Europe and North America which indicates that it will be possible to develop a stock identification methodology for Atlantic salmon, as has been done successfully for Pacific salmonids (Beacham et al., 2006). With recent developments in molecular marker identification and screening technology, it is now possible to develop accurate diagnostic and cost effective methods for identifying the origin or proportional contributions of individual stocks from congregations of salmon, sampled at sea.

The overall objective of SALSEA-Merge was, by merging genetic and ecological investigations, to advance understanding of stock specific migration and distribution patterns and overall ecology of the marine life of Atlantic salmon and gain an insight into the factors, resulting in recent significant increases in marine mortality. The scientific and technical objectives of SALSEA-Merge focus on elucidating, at a regional and population specific level, the distribution and migration patterns during the marine phase of the salmon's life cycle. The results obtained represent essential understanding for the effective formulation of mitigation policies to guide the rational future management of individual salmon populations. This is critical with regard to the potential impacts of a rapidly changing marine environment, particularly with regards to climate change.

### Activities undertaken

The information gained from the cruise was essential for the identification of areas critical to the species life cycle and needed for the designation of marine protected areas, the regulation of large pelagic fisheries to avoid mortality from by-catches, the regulation of fisheries for key prey species such as sandeel, herring and blue whiting the targeted regulation of inshore commercial salmon fisheries, and to maximise natural sustainable freshwater production.

The following activities were carried out on the cruise:

- Catalogue and assemble archival tissues for genetic typing.
- Catalogue and assemble archival scale material for age and growth determinations.
- A full range of biological samples were taken from each salmon captured.
- Collection of stomachs from post-smolts.
- Synchronous plankton trawls taken to collect information on available food items (the material to be preserved for analysis in a future IASRB funded programme).
- Associated historical oceanographic information acquired.

<sup>4</sup> The survey lasted 15 days in total with the cost of the additional 7.5 days (€100,000) covered by the partners through externally-funded projects.

## Reconstruction of the Extent and Dynamics of the British-Irish Ice Sheet on the Continental Margin off Northwest Ireland – An Analogue for Present-Day Ice Sheet Dynamics and Effects of Ice Melting on Oceanic Circulation and Climate Change

Year Awarded:	2008
Value of the Shiptime:	€128,000
Total Number of Days:	8
Student Participation:	1
Lead Partner:	Ocean Science Services, Marine Institute
Partners:	School of Environmental Sciences, University of Ulster Durham University

### Background

Present day glaciers and ice sheets are recognised as one of the most sensitive indicators of climate change, advancing substantially during climate cooling and retreating during climate warming on time-scales ranging from years to thousands of years. Therefore, oscillations that occur in contemporary ice masses provide direct evidence of short term climate change and the geological imprint of former ice masses provides critical information on the global climate system over millennial time-scales. The volume, extent and dynamics of former Quaternary ice sheets can be mapped using marine geological and geophysical geological data. Such 'palaeo-' data provide important constraints for modelling investigations that are attempting to predict the future response of ice sheets to external forcing via sea level rise and ocean warming. However, although such 'field' data are recognised as a vital calibration tool for models seeking to predict changes in ice sheet stability large gaps in data coverage remain and where our understanding is therefore limited. One such area is the margin of the last British-Irish Ice Sheet (BIIS) on the western Irish continental shelf and slope. Despite over a century of research into Quaternary ice sheet history in Ireland and Britain there is still great uncertainty concerning the ice sheet dimensions, dynamics and history. This is mainly because the ice sheet extended offshore onto the continental shelf meaning that significant portions of the glacial record are below present sea level. Unravelling this marine record of past glaciations is challenging but will provide a major step forward in our understanding of both ice sheet extent and subsequent deglacial history of the BIIS and, more broadly, will help to constrain predictive modelling investigations of ice sheet-ocean-climate interactions in the North Atlantic region.

The overall objectives of the research are:

- To reconstruct the pattern and timing of ice sheet retreat across the continental shelf, thereby allowing quantification of the ice sheet volume change during de-glaciation and the relative roles of iceberg calving and melt water release.
- To determine and quantify the sedimentary processes, both glacially- and non-glacially influenced, that affected the evolution and stability of the northwest Irish margin.
- To investigate the role of BIIS dynamics on the climate and ocean circulation of the North Atlantic through changes in the chemistry and biogenic content of the sediment cores.

### Activities undertaken

This project acquired a series of short and long sediment cores by gravity- and vibro-coring on the northern Irish continental margin. The sediment record obtained in these cores has allowed the researchers to reconstruct a comprehensive history of the behaviour of the British-Irish Ice Sheet during the last glaciations and possibly earlier glaciations.

# Dedicated Training Programmes

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## Advanced Techniques in Oceanography; A Joint NUIG/GMIT Training Course for Early Stage Postgraduate and Final Year Undergraduate Students

Year Awarded:	2008
Value of the Shiptime:	€16,000
Total Number of Days:	2
Student Participation:	10
Lead Partner:	Department of Earth & Ocean Sciences, NUI Galway
Partners:	Department of Life and Physical Sciences, Galway Mayo IT

### Background

The cruise trained first year postgraduate and final year undergraduate students in advanced techniques in oceanography. It focused on the Shannon Plume and used both water sampling and electronic data collection methods on board the Celtic Explorer to characterise the plume and to plot its extent along the Galway/Clare coast. Plankton sampling was also carried out using neuston and sub-surface nets at a series of stations where vertical CTD profiles were generated. Seabed data was collected from echo-sounder, sub-bottom profiler and multibeam systems on board.

It is envisaged that this cruise will become an annual event as an integral part of the final year courses, contributing significantly to a final year module in both institutions. The dataset will be archived in electronic format and copies lodged at the Marine Institute, NUIG and GMIT libraries allowing open access to the data. It will lay the foundation for an important long-term dataset on the impacts of the river Shannon plume on coastal water on the west coast of Ireland, which can be built up year by year, contributing to much-needed long term monitoring of Ireland's marine environment.

The cruise was intended in part as a shakedown cruise to prepare for a more detailed cruise programme later in the year.

### Students Trained

- 10, including 1<sup>st</sup> year postgraduate and final year undergraduate students.

### Activities undertaken

- Training of students from the NUI Galway and GMIT in various oceanographic and fisheries sampling methods at sea.
- Planning, project management and sea-going skills of graduates of NUI Galway and GMIT enhanced.
- Training of students to become competent in station position fixing and data logging at sea, the use of a range of sampling devices, and on-board sampling processing at sea.
- The deployment of equipment and sample collection by research students and staff
- The importance of accurate sampling and logging of data for follow-up reports taught.
- How to estimate the abundances of seabirds and cetaceans at sea using visual line transect techniques and the computer programme 'Distance' and will also monitor cetacean activity using a towed hydrophone (GMIT) taught.
- Collaboration between students and staff from the two institutions, providing opportunities to discuss learning, teaching and research.



## Undergraduate Basic Training in Oceanographic and Fisheries Sampling at Sea

Year Awarded:	2008
Value of the Shiptime:	€42,000
Total Number of Days:	6
Student Participation:	48
Lead Partner:	Department of Earth & Ocean Sciences, NUI Galway
Partners:	Department of Life and Physical Sciences, Galway-Mayo IT

### Background

The cruise was the latest in a series of such cruises which have been carried out to train third year students at NUI Galway and GMIT. At NUI Galway these included students on the Marine Science degree, and at GMIT students on the course in Applied Marine and Freshwater ecology. In total this cruise provided basic training in oceanographic and fisheries sampling at sea in 2008. Students worked in small groups on some of the data and samples collected on the cruise, and produced a cruise report for the day as well as a data report from samples/data they had worked on, giving them some practical experience in report writing, and teaching them the importance of keeping detailed and accurate activity logs on board.

### Students Trained

- 48 undergraduate students from NUI Galway and GMIT participated.

### Activities undertaken

This NUI Galway-GMIT jointly operated training cruise provided undergraduate and early-stage postgraduate students with training in a range of hands-on skills required for seagoing research.

In summary the cruise included:

- Training third year undergraduate students from the NUI Galway degree programme in Marine Science and Earth and Ocean Science, and the GMIT degree programme in Applied Marine and Freshwater Biology, in various oceanographic and fisheries sampling methods at sea.
- Enhancing the planning, project management and sea-going skills of graduates of NUI Galway and GMIT.
- Enabling students to become competent in station position fixing and data logging at sea, the use of a range of sampling devices, and on-board sampling processing at sea.
- Facilitating the deployment of equipment and sample collection by research students and staff.
- Teaching the students the importance of accurate sampling and logging of data for follow-up reports.
- Collaboration between students and staff from the two institutions, providing opportunities to discuss learning, teaching and research.



## Undergraduate Training in Basic Fisheries and Oceanographic Sampling Techniques at Sea

Year Awarded:	2008
Value of the Shiptime:	€14,000
Total Number of Days:	2
Student Participation:	16
Lead Partner:	Department of Life and Physical Sciences, Galway Mayo IT
Partners:	-

### Background

These cruises provide training to third year degree students on the GMIT course, Applied Marine and Freshwater Biology, in various fisheries and oceanographic sampling methods at sea. The cruise was carried out in inner Galway Bay, between Galway Harbour and the Inverin- Black Head line to minimise steaming time. Students received training and became competent in station position fixing and data logging at sea and the use a range of sampling devices and on-board sampling processing at sea.

### Students Trained

- 16 3<sup>rd</sup> year undergraduate students.

### Activities undertaken

The training cruises enhanced the skills of graduates at GMIT. These skills are very relevant for biologists intending to work in the marine and freshwater sectors in academic institutions, the Marine Institute and the private sector. They will also benefit those intending to go on the post-graduate training in aquatic research areas. The skills obtained and the additional training received in third year at GMIT in sea-survival training and small boat handling facilitate the graduates in acting as on-board observers and volunteers for seagoing cruises.

In summary the cruise included:

- Training students from GMIT in various oceanographic and fisheries sampling methods at sea.
- Enhancing the planning, project management and sea-going skills of graduates of GMIT.
- Enabling students to become competent in station position fixing and data logging at sea, the use of a range of sampling devices, and on-board sampling processing at sea.
- Facilitating the deployment of equipment and sample collection by research students and staff where this has a clear education value for the undergraduate students.
- Teaching students the importance of accurate sampling and logging of data for follow-up reports.
- Teaching students how to estimate the abundances of seabirds and cetaceans at sea using visual line transect techniques and the computer programme 'Distance' and will also monitor cetacean activity using a towed hydrophone.



## Advanced Techniques in Oceanography; A Joint NUIG/GMIT Training Course for Early Stage Postgraduate and Final Year Undergraduate Students

Year Awarded:	2008
Value of the Shiptime:	€64,000
Total Number of Days:	8
Student Participation:	10
Lead Partner:	Department of Life and Physical Sciences, GMIT
Partners:	Department of Earth & Ocean Sciences, NUI Galway

### Background

The cruise trained final year students in advanced techniques in oceanography. This built upon the training these students had previously received on the *R.V. Celtic Voyager* in third year where more basic techniques were used. This cruise focused on the Shannon Plume and used both water sampling and the electronic data collection methods on board the *Celtic Explorer* to characterise this and to plot its extent along the Galway/Clare coast. Plankton sampling was also carried out using neuston and sub-surface nets at a series of stations where vertical CTD profiles were generated. The students benefited considerably by receiving training from the MI personnel on board. During the training programme, each student gathered samples/data for his/her final year research project which was based partly or wholly on the fieldwork carried out during the cruise.

The final year undergraduates on the cruise were those who expressed an interest in carrying out a final year project related to the cruise and who had completed the appropriate taught modules. A list of such projects were offered to the students in advance of the cruise at the end of their third year. Students attended cruise planning and post cruise meetings and contributed to the cruise report. Students were required to carry out a risk assessment for their individual projects and to provide chemical safety data sheets where appropriate.

The cruise was innovative in that (i) it was the first training cruise of its type between two third level institutions in Ireland (ii) it was clearly interdisciplinary, involving physical, chemical and biological oceanography, covering both pelagic and benthic ecosystems (iii) It enhanced and expanded the research and teaching collaboration between the two institutions and the MI (iv) it acted as a model for the development of post-graduate accredited training programmes within the proposed Marine Graduate Programme.

### Students Trained

- 10 undergraduate students, five from each institute.

### Activities undertaken

- To build knowledge on previously taught methods from an earlier cruise.
- To train students in various oceanographic and fisheries sampling methods at sea.
- To enhance the planning, project management and sea-going skills of graduates.
- To enable students to become competent in station position fixing and data logging at sea, the use of a range of sampling devices, and on-board sampling processing at sea.
- To facilitate the deployment of equipment and sample collection by research students and staff.
- To aid collaboration between students and staff from the two institutions, providing opportunities to discuss learning, teaching and research.

## NMCI Vessels Familiarisation 2008

Year Awarded:	2008
Value of the Shiptime:	€80,000
Total Number of Days:	5
Student Participation:	17
Lead Partner:	Nautical Studies, National Maritime College of Ireland
Partners:	Irish Maritime Development Office, Marine Institute

### Background

Ireland's reliance on seaborne trade to move the vast majority of goods both into and out of the country, underlines the strategic importance of port infrastructure and merchant shipping to the country's economic growth and stability. Unless Ireland has a trained pool of professional mariners with the skills and expertise to manage and develop its port and shipping infrastructure, it will become exposed to a dependency on foreign expertise to ensure the safe movement of its imports and exports. This training programme brought together two of the states leading maritime bodies (MI & NMCI) to enhance the training and development of its professional mariners, and contribute to the expansion of the maritime knowledge pool at a national level.

### Students Trained

- 17 students from the NMCI.

### Activities undertaken

- Practical, structured onboard training for Trainee deck officers undertaking the BSc in Nautical Science at the National Maritime college of Ireland in a realistic environment, having regard to the IMO convention on standards of training, certification and watch keeping for seafarers (STCW95).
- Practical, structured onboard training for Trainee engineering officers undertaking the BEng in Marine and Plant engineering at the NMCI, in a realistic environment, paying particular attention to the RV Celtic Explorer's innovative diesel electric drive and having regard to the IMO convention on standards of training, certification and watch keeping for seafarers (STCW95).
- Introduction to the students to the safety familiarisation regime as required under Section A-VI/1 paragraph 1 of the STCW code, so that they know how to respond in emergency, and to the shipboard familiarisation regime as required under Regulation 1/14 of the STCW convention.



## Student Training in Dublin Bay

Year Awarded:	2008
Value of the Shiptime:	€42,000
Total Number of Days:	6
Student Participation:	9
Lead Partner:	Department of Zoology, Trinity College Dublin
Partners:	-

### Background

This cruise contributes to the achievement of key national objectives in climate change, biodiversity and fisheries; while demonstrating selected undergraduate and postgraduate students a working research vessel, and a variety of sampling methodologies for fish, for benthos, for plankton, and for physical and chemical water properties. The methods used provided a sub-sample of the biodiversity in the Dublin Bay ecosystem.

The data that was obtained on the cruise will be used for future process and system models of Dublin Bay, which can then be integrated into the Bay Management Plan. These models can also be used as the basis for similar ICZM plans.

Scientifically, the programme filled in and formed part of international collaboration with groups in UK, France, Spain, Ukraine and Georgia.

The cruise demonstrated a multidisciplinary study of physical, chemical and biological oceanography.

### Students Trained

- 9 students.

### Activities undertaken:

- Students were trained in the logistics of RV operation, field experience of sampling and working on a RV, and the processing and integration of data.
- Planning, project management and sea-going skills of graduates of TCD were enhanced.
- Students were taught the importance of accurate sampling and logging of data for follow-up reports.
- Students gained experience in station position fixing, data logging at sea, the use of a range of sampling devices, and on-board sampling processing at sea.

The data which was collected will be used for process and system models of Dublin Bay, which can then be integrated into the Bay Management Plans. The models can also be used as the basis for similar ICZM plans.

The cruise helped the students by greatly broadening their experience; it provided practical training of major benefit in job market; provided a learning experience otherwise unavailable; broadening their understanding of marine ecosystem; and providing them exposure to field taxonomy.



## 21<sup>st</sup> Century Graduate: Integrated Marine Training for the Next Generation of Marine Scientists

Year Awarded:	2008
Value of the Shiptime:	€112,000
Total Number of Days:	7
Student Participation:	12
Lead Partner:	Environmental Science Research Institute, University of Ulster
Partners:	-

### Background

As integrated marine surveys utilizing modern acoustic survey techniques become more widely used for a diverse range of applications in the marine sector, the need for trained graduates with the skills to collect, process, interpret and apply the information collected from such surveys will steadily increase.

The training exercises were designed to equip undergraduate marine science students with a broad range of survey skills and off-shore survey experience on which to build a career in the marine sector. Focusing on new technological survey methodology addressed the urgent need within Ireland to increase the skill base in this area and provided a pool of skilled graduates from which individuals can be drawn to undertake further training to work on the enormous quantities of data generated through past and current National seabed survey initiatives (e.g. INSS, INFOMAR, JIBS etc.).

Recent research programmes have developed a framework for conducting benthic seabed surveys and producing habitats maps (e.g. MESH project). Standardised methodology is now in place and there is a need to extend the teaching of these new survey and data assimilation approaches into undergraduate degree programmes. The sea-time training programme significantly strengthened this objective. Graduates from the programme are well equipped to undertake multidisciplinary research at post-graduate level at any of the Higher Education Institutions within Ireland, thus significantly contributing to research capability building in Ireland.

### Students Trained:

- 12 students from Year 2 of the Marine Science degree programme.

### Activities undertaken:

The training programme was divided into two main sets of objectives; a) field-based survey skills training and b) post-cruise data processing and interpretation skills training.

Field-based training focused on acoustic and biological benthic survey techniques. The training provided a solid understanding and experience in the acquisition and processing of data whilst at sea. The data generated from the field exercises was used to meet scientific training objectives in taught modules at the University in subsequent semesters/years.

The training provided the next generation of marine scientists graduating from the University of Ulster with the necessary offshore seabed survey and data processing skills to meet the demands of a range of employers within the marine sector within Ireland.



## Student Training in Benthic Survey and Sampling Techniques

Year Awarded:	2008
Value of the Shiptime:	€7,000
Total Number of Days:	1
Student Participation:	12
Lead Partner:	Biological Sciences, Queen's University of Belfast
Partners:	-

### Background

The students gained for the first time very valuable first-hand experience of a range of oceanographic sampling techniques in a full working environment. This experience fully complemented and cemented the theoretical components of the Marine Ecology course which the students have attended in QUB prior to joining the cruise. More specifically, QUB have not had the resources to introduce students at a practical level to benthic studies and oceanography in coastal seas: the cruise has thus fill a major gap in the degree course.

Within a broader context, it is recognised that career prospects in marine biology for QUB students taking the BSc course in Marine Biology have been restricted by the limited opportunities for either employment or research that are available locally. Recent recognition of the potential importance of marine resources to the economy of Ireland has led to major investment in the marine sciences and hence opportunities for graduates in this field. QUB, one of the UK Russell Group of Universities, is well placed to contribute quality students to the development of this base. Introduction of first-level students to a typical oceanographic research-ship environment has assisted in the training of future marine scientists and hence research capability. This will encourage quality students to remain in Ireland and will assist in the development of this major resource and hence enhance the research base.

Although the programme was designed around the QUB Marine Ecology course, the emphasis on the benthic environment also had strategic significance. The benthic environment is a major component of the marine ecosystem and is of particular significance to fisheries. Routine surveying of the benthic environment to establish temporal changes and the pollution status is a core component of monitoring programmes carried out by national statutory bodies.

### Students Trained:

- 12 Students.

### Activities undertaken:

- Oceanographic sampling and survey techniques. Oceanographic techniques were taught to undergraduate students, with an emphasis on benthic sampling and sample processing techniques. A key element within this overall objective involved conducting the training in the context of a real-time oceanographic cruise environment in order to allow the students to experience research ship operation.
- Obtaining benthic samples from five stations in the northern sector of the Irish Sea covering a range of tidal velocities.
- Demonstrating to the students some of the wider range of basic oceanographic survey techniques available on a typical research ship.



## Bright Sparks Award 2008

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The Bright Sparks Competition offers emerging marine scientists (undergraduate and postgraduate students) the opportunity to gain hands-on experience in undertaking research in Irish waters on board the *R.V. Celtic Voyager*.

The successful applicant is offered five days onboard the *R.V. Celtic Voyager* plus up to €5,000 to cover the costs of consumables, logistics etc.



## Rafts, Plankton and Jelly Fish: Their Value as Biological Indicators of Different Water Masses

Year Awarded:	2008
Value of the Shiptime:	€40,000
Total Number of Days:	5
Student Participation:	4
Lead Partner:	Ecology and Evolutionary Biology, Queen's University Belfast
Partners:	Department of Science (Marine Ecology), University College Cork Department of Oceanography & Geophysics, NUI Galway

### Background

Recent years have seen an increased appreciation of the hydrographic features on the continental shelf west of Ireland. The shelf edge is associated with a slope current while bottom fronts on the shelf itself are associated with currents that may transport harmful blooms northwards. There is undoubtedly interannual variability in this system which is likely to be reflected in the changes in productivity, fisheries yields and distributions of species from year to year. This survey has expanded the information available on the distribution of species with respect to hydrographic features, by adding rafts, zooplankton, jellyfish and marine megafauna to the range of organisms previously investigated. The question was the extent to which the front acts as a barrier between assemblages of species and the extent of aggregation of rafts and species at the front, and to what extent rafts, plankton and jellyfish are transported via the slope current.

### Student participation:

- Four students in total, three undergraduates and one postgraduate.

### Activities undertaken:

The cruise supported the provision of the following:

#### Rafts

- Baseline data on the distribution and abundance of macroalgal rafts off the West coast of Ireland as well as baseline data on their composition.
- Algal and invertebrate samples for haplotyping.
- An opportunity for the PhD student to participate in cruise organisation for personal development.

#### Zooplankton

- Baseline data on the distribution and abundance of gelatinous zooplankton and zooplankton in Irish shelf waters, and thus providing a solid baseline for monitoring future trends in abundance.
- Training in zooplankton sampling.
- Insights on the distribution and abundance of *Pelagia noctiluca*, an important species to monitor considering its wider socio-economic impacts.

#### Oceanography

- A map of the 3-D current and water mass structure at the continental shelf edge in the vicinity of the shelf front using combined ADCP/CTD measurements.
- Quantify the incursion of oceanic water from the shelf edge current onto the inner/middle shelf region which may transport rafts, jellyfish and other indicator plankton species.
- Training

#### Marine Megafauna

- Distribution and abundance for megafauna in Irish shelf waters.
- Obtaining sightings of sunfish and leatherback sea turtles to contribute to ongoing research.



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