APPLICATION FOR THE CONSENT TO CONDUCT MARINE SCIENTIFIC RESEARCH IN AREAS UNDER NATIONAL JURISDICTION OF THE UNITED KINGDOM

Date: 25/02/2008

1. General information

1.1 Cruise name and/or number: CE0803

1.2 **Sponsoring institution:**

Name: Marine Institute

Address: Rinville
Oranmore
Co. Galway
Ireland

Name of Chief Executive: Dr. Peter Heffernan

1.3 **Scientist in charge of the project:**

Name: Dr. Craig Brown

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1.4 **Scientist(s) from UNITED KINGDOM involved in the planning of the project**

Name(s): Dr. Rory Quinn
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1.5 Submitting officer: Bernadette Ní Chonghaile

Name and address: Marine Institute
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2. Description of project (Attach additional pages as necessary)

Proposal for student training shiptime attached.

2.1 Nature of objectives of the project:

The over-arching scientific objective of the training programme is to provide 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. In recent years Ireland has experienced rapid growth in this area with initiatives such as the Irish National Seabed Survey, INFOMAR and the JIBS projects generating enormous data sets and a demand for skilled personnel/graduates to process and interpret data.

Specifically, the proposed training programme can be divided into two main sets of objectives; a) field-based survey skills training and b) post-cruise data processing and interpretation skills training.

a) Field-based survey skills training

Field-based training will focus on acoustic and biological benthic survey techniques. The training will provide a solid understanding and experience in the acquisition and processing of data whilst at sea in the following area:

- Multibeam sonar (MBES) data collection and processing
- Sidescan sonar (SSS) data collection and processing
- Seismic (pinger) data collection and processing
- Single-beam sonar (SBES) (ground discrimination) data collection and processing
- Benthic grab sample collection and processing (sediments and biology)
- Benthic corer sample collection and processing (sediments and biology)
- Beam-trawl sample collection and processing (epifauna and demersal fish)
- Underwater video surveys using a passive dropdown video system

b) Post-cruise data processing and interpretation skills training

The data generated from the field exercises will be used to meet scientific training objectives in taught modules at the University in subsequent semesters/years. Post-cruise training objectives will include:

- Acoustic (MBES, SSS and SBES) data processing and interpretation
- Benthic grab sample processing and community analysis
- Particle grain-size analysis

  Underwater video assessment of benthic habitats and communities

2.2 Relevant previous or future research cruises:

Both Dr. Brown and Dr. Quinn have taken part in numerous cruises in connection with the objectives stated above as part of Marine Science field schools in previous years. Dr. Brown has also been involved in research cruises aboard the RV Lough Foyle and RV Corystes at the

proposed study sites. The proposed sites have been selected for the training exercises to fit in with research interests at these areas. Data generated as part of the exercises will feed into undergraduate dissertation projects, therefore the sites have been selected where some data already exists to maximise the benefits of the data collected.

The exercises undertaken as part of the training-cruise will play to the strength of the academic staff within the University of Ulster. Specifically, the focus will be on seafloor systems (benthic ecology and seafloor dynamics/processes) and benthic mapping (physical and biological components of the seafloor). Marine science staff have a strong research record in this area, and the Marine Science degree modules currently incorporate a significant amount of taught material in this field.

The two members of academic staff involved in the off-shore training exercises, Dr. Craig Brown and Dr. Rory Quinn, are experience off-shore research scientists. Dr. Brown has experience of running off-shore training exercises in seafloor habitat mapping and benthic sampling at post-graduate level (PhD student training at SAMS and UU) and Dr. Quinn has experience of running boat based undergraduate and post-graduate training in the use of geophysical survey techniques, particularly the use of sidescan sonar and sub-bottom profilers.

2.3 Previously published research data relating to the project:

The following are 5 selected papers from Dr. Brown and Dr. Quinn demonstrating the research interests of relevance for the student training exercises at the proposed study areas:

Brown:

1. **Brown, C.J.** and Collier, J. (in press) Mapping benthic habitat in regions of gradational substrata: An automated approach exploring geophysical, geological, and biological relationships. Estuarine, Coastal and Shelf Science.
2. Roberts, J.M., **Brown, C.J.**, Long, D. and Bates, C.R. (2005) Acoustic mapping using multibeam echosounder reveals deep-water coral reefs and surrounding habitats. Coral Reefs. 25: 654-669.
3. **Brown, C.J.**, Mitchell, A., Limpenny, D., Robertson, M., Service, M. and Golding, N. (2005) Mapping seabed habitats in the Firth of Lorn, west coast of Scotland: Evaluation and comparison of habitat maps produced using the acoustic ground discrimination system, RoxAnn, and sidescan sonar. ICES Journal of Marine Science. 62 (4):790-802
4. **Brown, C.J.**, Hewer, A.J., Meadows, W.J., Limpenny, D.S. Cooper, K.M., and Rees, H.L. (2004) Mapping seabed biotopes at Hastings Shingle Bank, Eastern English Channel. Part 1: Assessment using Sidescan sonar. Journal of the Marine Biological Association of the United Kingdom. 84: 481-488.
5. **Brown, C.J.**, Cooper, K.M., Meadows, W.J., Limpenny, D.S. and Rees, H.L. (2002) Small-scale mapping of seabed assemblages in the eastern English Channel using sidescan sonar and remote sampling techniques. Estuarine, Coastal and Shelf Science 54 (2): 263-278.

Quinn:

1. **Quinn, R.**, Forsythe, W., Breen, C., Boland, D., Lane, P. and Lali Omar, A., 2007, Process-based models for port evolution and wreck site formation at Mombasa, Kenya, *Journal of Archaeological Science*, 34 (9): 1449-1460.
2. **Quinn, R.,** 2006, The Role of Scour in Shipwreck Site Formation Processes and the Preservation of Wreck-Associated Scour Signatures in the Sedimentary Record - Evidence from Seabed and Sub-surface Data. *The Journal of Archaeological Science*, 33 (10): 1419-1432.
3. **Quinn, R.**, Dean, M., Lawrence, M., Liscoe, S. and Boland, D., 2005, Backscatter responses and resolution considerations in archaeological side-scan sonar surveys: a control experiment, *The Journal of Archaeological Science*, 32: 1252-1264.

4. **Quinn, R.**, Breen, C., Forsythe, W., Barton, K., Rooney, S. and O' Hara, D., 2002, Integrated Geophysical Surveys of The French Frigate La Surveillante (1797), Bantry Bay, Co. Cork, Ireland, *The Journal of Archaeological Science*, 29: 413-422.
5. **Quinn, R.**, Forsythe, W., Breen, C., Dean, M., Lawrence, M. and Liscoe, S., 2002, Comparison of the Maritime Sites and Monuments Record with side-scan sonar and diver surveys: A case study from Rathlin Island, Ireland. *Geoarchaeology*, 17 (5): 441-451.

3. Methods and means to be used

3.1 Particulars of vessel

Name: Celtic Explorer
Nationality: Irish

Owner: Marine Institute

Overall length: 65.5m
Maximum draught: 5.7m
Net tonnage: 727
Propulsion: 2 x 1530 KW, 1000Rpm, 1 x 1020 KW, 1000 Rpm
Cruising speed: 10 Kts
Call sign: EI
Method and capability of communication –

Name of master: Ciaran Flannagan/ Phillip Baugh
Number of crew: 12
Number of scientists on board: 19 max

3.2 Aircraft or other craft to be used in the project: N/A

3.3 Particulars of methods and scientific instruments

Types of samples and data	Methods to be used	Instruments to be used
Acoustic data	Hull-mounted acoustic survey methodology	Multibeam sonar, Single beam sonar, Pinger
Biological samples (infauna and epifauna)	Grabs, cores and trawls	Day grab, Hamon grab, Shipek grab, Box core, 2m beam trawl
Sediment grain size samples	Grabs, cores and trawls	Day grab, Hamon grab, Shipek grab, Box core, 2m beam trawl
Video data	Underwater video surveys	Drop-down and towed video frames

3.4 Indicate whether harmful substances will be used:

Biological samples will be preserved in 4% Formaldehyde solution. No other harmful substances will be used.

3.5 Indicate whether drilling will be carried out:
No drilling will be carried out

3.6 Indicate whether explosives will be used
No explosives will be used

4. Installations and equipment

Details of installations and equipment (dates of laying, servicing, recovery, exact locations and depth):

No equipment will be installed at the survey site

5. Geographical areas

5.1 Indicate geographical areas in which the project is to be conducted (with reference in latitude and longitude):

Surveys will be conducted at one of the following proposed areas (See Figure 1 – final choice of site, and size of survey site will depend on weather/sea state conditions):

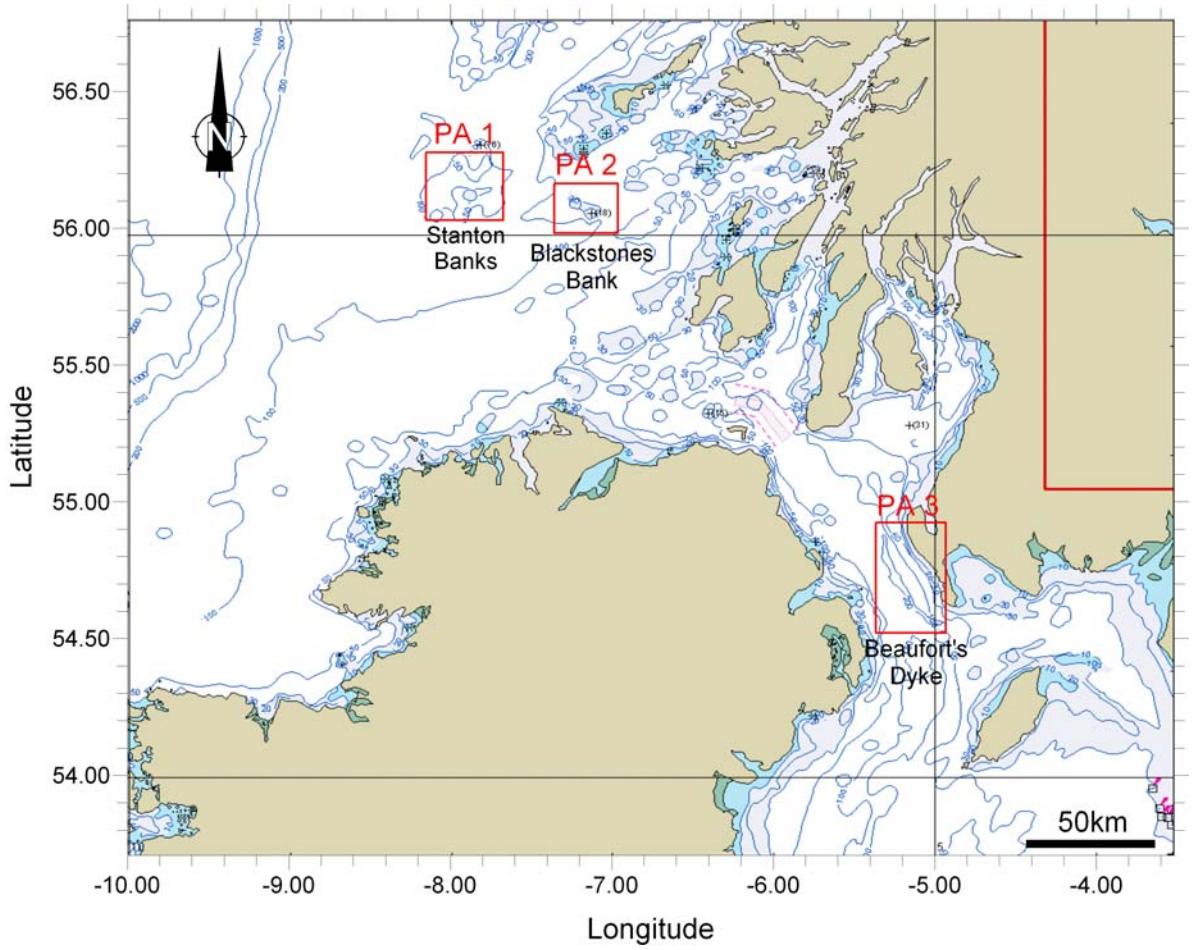
1) *Stanton Banks* (preferred site).
   56° 10.6727N, 07° 52.9859W
   Surveys to cover the reef complex as a whole. This reef complex is an ideal training ground for students. Water depths are relatively shallow (40-100m) and the reefs encompass a diverse range of substrate types and benthic habitats. This is an off-shore reef system and will provide students with first-hand experience of a habitat they have not encountered in previous field work exercises.

2) *Blackstone Bank.*
   56° 06.3688N, 07° 09.7741W
   Surveys to cover the reef complex as a whole. This complex is similar to Stanton Banks but smaller in geographical coverage. Water depths are relatively shallow (40-100m) and the reefs encompass a diverse range of substrate types and benthic habitats. This is an off-shore reef system and will provide students with first-hand experience of a habitat they have not encountered in previous field work exercises.

3) *Beaufort Dyke.*
   54° 45.46587N, 05° 15.8044W
   Surveys to cover the seafloor adjacent to the Dyke –no physical sampling within the Dyke itself. This geological feature has been surveyed in 2007 by AFBI and is currently being studied as part of a PhD project at the University of Ulster. However, acoustic and ground-truthing data are limited to the Dyke feature, with no existing information relating to the surround seafloor. This site will provide a very interesting and diverse training area for undergraduate students, and will be suitable should weather conditions prevent surveys at the two exposed sites detailed above.

These sites have been selected based on current research activities at the University of Ulster. A small amount of acoustic and ground-truthing data has been collected at each of these areas as part of previous and ongoing research projects (e.g. MESH). Surveys will be expanded at each of

these sites to cover a larger area of seafloor. The data generated as part of the training exercise will feed into ongoing Postgraduate research projects, maximising the benefits of the survey work.



5.2 Attach chart(s) at an appropriate scale showing the geographical areas of the intended work and, as far as practicable, the positions of intended stations, the tracks of survey lines, and the locations of installations and equipment.

At the chosen survey site acoustic survey lines will be plotted prior to survey and will depend on sea state and water depth over the area. Night-time working on the cruise will be utilized for acoustic data collection to maximise value-for-money in terms of use of ship-time. Ground-truthing stations will be selected based on the acoustic data sets. The following is a guide for the approximate number of proposed samples using each of the sampling techniques. The number of stations has been kept low to maximise training time and allow students to learn the various skills without the time pressures of a normal commercial or research focused cruise:

- Grab samples - Day grab (10 stations)
- Grab samples – Shipek grab (10 stations)
- Core samples – Box core (10 stations)
- 2m beam trawl (10 stations)
- Under water video (10 stations)

Survey lines and grab station coordinates will be decided at the time of survey depending on weather conditions and time retraints.

6. Dates

6.1 Expected dates of first entry into and final departure from research area of the research vessel:

11^{th} – 17^{th} December

6.2 Indicate if multiple entry is expected:

Multiple entries not expected

7. Port calls

7.1 Dates and names of intended ports of calls in UNITED KINGDOM:

No port calls in the UK

7.2 Any special logistical at ports of call:

N/A

7.3 Names/ Address / Telephone of shipping agent (if available)

N/A

8. Participation

8.1 Extent to which UNITED KINGDOM will be enable to participate to be represented in research project:

The cruise will be run by UK scientists and data will feed into UK Higher Education via the University of Ulster BSc Marine Science degree programme.

8.2 Proposed dates and ports for embarkation / disembarkation:

Embarkation: 11^{th} Dec 2008 – Galway
Disembarkation: 17^{th} Dec 2008 - Killybegs

9. Access to data, samples and research results

9.1 Expected dates of submission to UNITED KINGDOM preliminary reports which should include the expected dates of submission of the final results:

CRUISE REPORT AVAILABLE BY THE END OF FEBRUARY 2008.

9.2 Proposed means for access by UNITED KINGDOM to data and samples:

UNIVERSITY OF ULSTER (UK) STAFF AND STUDENTS WILL HAVE IMMEDIATE ACCESS TO DATA AND SAMPLES

9.3 Proposed means to provide UNITED KINGDOM with assessment of data, samples and research results or provide assistance in their assessment or interpretation:

Data and samples will be processed by University of Ulster undergraduate and post-graduate students. Results will be published, if appropriate, in leading marine science journals. Data will be freely available to UK government agencies (DEFRA, SNH, EHS, AFBI, FRS etc.)

9.4 Proposed means of making research results internationally available:

Research results will be published in leading marine science journals.

10. Scientific Equipment

COMPLETE THE FOLLOWING TABLE-
SEPARATE PAGE FOR EACH COSTAL STATE:

INDICATE YES OR NO

LIST SCIENTIFIC WORK BY FUNCTION Eg: MAGNETOMETRY: GRAVITY DIVING SEISMICS BATHYMETRY SEABED SAMPLING TRAWLING ECHO SOUNDING WATER SAMPLING U/W TV MOORED INSTRUMENTS TRAWLING ECHO SOUNDING WATER SAMPLING	Water column including sediment sampling of the Seabed	Fisheries research within fishing limits	Research concerning the natural resources of the continental shelf or its physical characteri-stics	DISTANCE FROM COAST ~70km (unless site 3 surveyed due to weather restrictions)		
				Within 12nms	Between 12-200nms	(Continental shelf work only) Beyond 200nm but within the continental margin
SEISMICS BATHYMETRY ECHO SOUNDING	yes	no	No	Yes (if poor weather)	Yes	No
SEABED SAMPLING TRAWLING	Yes	No	No	Yes (if poor weather)	Yes	No
U/W TV	yes	no	no	Yes (if poor weather)	yes	No

(On behalf of the Principle Scientist)

Dated ----------