

Providing a baseline for BACI design seabed monitoring and classification programmes

Adrian Patterson, Louise Allcock, Mark Johnson
School of Natural Sciences, Ryan Institute, NUI Galway.

INTRODUCTION

The exploration, drilling and extraction activities of the petroleum industry have a direct impact on biodiversity, habitats and ecosystem health in the marine benthic environment (O'Rourke & Connolly, 2003) with the greatest source of disturbance coming from discharged drill cuttings (Kingston, 1992). The organisation of benthic invertebrate communities changes gradually and in predictable ways along gradients of pollution (Swartz et al., 1986), organic enrichment (Pearson & Rosenberg, 1978) and physical disturbance (Rhoads & Germano, 1982). Kingston (1992) reported that the response of the benthos to disturbance followed established patterns of ecological succession (Pearson & Rosenberg, 1976, 1978).

BACI

EU Directive 2001/42/EC requires Member States to undertake a Strategic Environmental Assessment prior to granting exploration licences. This assessment should take the form of an Environmental Impact Assessment (EIA). Part of this requirement is to implement an environment monitoring programme for exploration activities. Before-After-Control-Impact (BACI) designs are commonly employed to monitor for potential environmental impacts (Ellis & Schneider, 1997). BACI designs are good for large potential changes after impact, situations where changes are permanent after impact and in monitoring to protect against disasters. There are four standard BACI designs, all of which require that pre-impact environmental/biological conditions are known. This requires a baseline of replicated samples against which impacts can be measured.

DATA SUITABILITY

BACI monitoring programmes are based on a replicated sampling design. To this end, multiple observations (samples) are taken at any one location to take account of the variability in benthic community composition. Typically, three-five random samples are taken at a particular station and stations are distributed throughout both the target area and the surrounding environs.

While the petroleum licensed areas are clearly defined it is imperative that we recognize that these areas are going to be impacted by exploration activity. The role of environmental managers is not only to mitigate impacts within licensed areas but also to manage the environment surrounding these licensed areas. Therefore, any baseline survey and subsequent monitoring programme needs to include the exploration areas and the surrounding seabed to ensure that activities are not having an impact that may otherwise be ignored.

While there is generally good coverage of the benthic habitats of the Atlantic Margin, much of the available data may not be immediately suitable for setting an environmental baseline or monitoring impacts. Robust benthic monitoring requires quantitative, replicated sampling. Much of the survey work carried out to date relies on a variety of techniques including trawls, dredges, box-cores, grabs and video. Trawls and dredges are semi-quantitative at best and much of the data is out-of-date. Video data is concentrated on the epibenthos which is of limited value for monitoring environmental disturbance.

The box-core and grab samples collected are the most useful. While the relative areas sampled by these methods may differ, because they are quantitative results can be scaled to make them comparable. However, most of the surveys from which box-cores and grabs were returned did not employ a replicated sampling design.

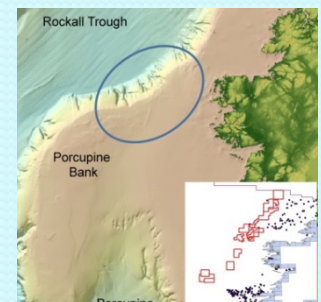
POSSIBLE SOLUTIONS

It is proposed that to overcome the lack of replicated sampling in historic surveys, the available data be used to develop a habitat map of the Atlantic Margin based on EUNIS habitats types and Ecological Status. This approach may allow us to use the historical data as replicate samples within a proxy station (habitat type or Ecological Status). While this may not be ideal, it may allow environmental managers to make informed decisions of potential impacts. This method will also allow us to make the best use of all the available data taken in recent times.

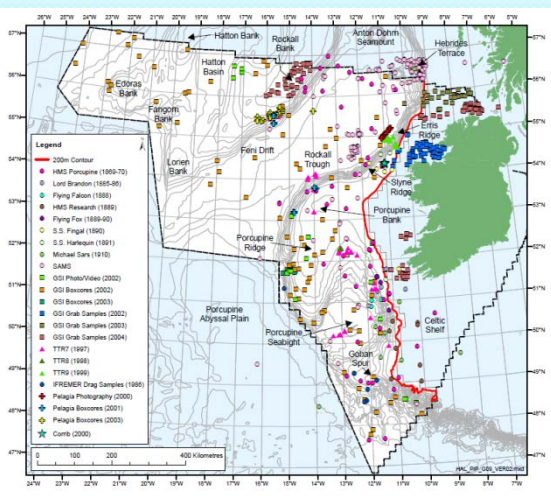
The applicability of this approach will be tested using a replicated sampling design survey being undertaken from 7th-16th October 2014.

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In October 2014 a cruise to conduct a replicated box-core sampling survey across the shelf, down the slope and onto the plains of the northeast Porcupine Bank will be undertaken. A total of 4 transects will be run down the slope with 4 stations per transect. Macrofauna, sediment PSA and organic content samples will be taken at each station. The samples will be processed at NUI Galway. The survey will result in a robust baseline of environmental conditions for this area.



DATA SOURCES



Map from Report to the Irish Shelf Petroleum Studies Group Project ISO3/21.

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