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Saltmarsh Archives of Late Holocene Relative Sea-Level Change in Ulster, the North of Ireland: Some Preliminary Data

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Abstract

Holocene relative sea-level (RSL) change remains predominantly unknown throughout the north of Ireland. Although attempts have been made to reconstruct Irish RSL over the Quaternary, data is lacking for approximately the last 2-3ka, or the Late Holocene.

This is a particularly important period to reconstruct due to its recent occurrence, possibly being the most accurate basis for predicting future sea-level movements due to the changing interaction between isostasy, eustasy and local factors over time.

Research into the RSL history of the north of Ireland has concentrated on using qualitative methods such as lithostratigraphic description and the inference of index points to represent changes in tidal influence.

Figure 1. Cullintraw Marsh, Strangford Lough

Although evidence such as coastal peats (e.g. Shaw and Carter, 1994), Holocene sand dunes (e.g. Wilson and Braley, 1997) and the reconstruction of shorelines (e.g. Devoy, 1983) has been studied, no research specifically focussed on the Late Holocene or on using the saltmarsh RSL record has as yet occurred.

Predicted sea-level curves such as that of Lambeck (1996) suggest an early Holocene rise across the north of Ireland, although this is more accentuated in the northwest, where it rises to almost reach present RSL, whereas in the northeast, it rises to almost 8m above the present level. The northwest then experiences a very slight rise, levelling off to the current level, whilst the northeast undergoes a fall towards the contemporary value. Both Carter's (1982) RSL curve and Lambeck's (1996) predicted curve for northeast Ireland are of similar shape, although the predicted values are more extreme, showing a rising RSL from the start of the Holocene peaking at approximately 6ka radiocarbon BP, falling more gradually towards the present. However, the lack of data for the Late Holocene is apparent from these curves, highlighting the importance of this research.

Saltmarshes have frequently been used in North America and Great Britain to reconstruct RSL changes through the use of microfossils, which have proven to be well-preserved in this environment. An attempt is made here to apply this methodology to the north of Ireland within a PhD study.

The research considers both spatial and temporal variations, by analysing several sites throughout Ulster, in order to discern whether an east-west pattern is evident, and by utilising ^{210}Pb, ^{137}Cs and radiocarbon dating methods to create a chronological reconstruction.

A number of pristine saltmarshes situated around Ulster will be analysed for microfossils and environmental data. Contemporary surface samples of microfossils (principally foraminifera and diatoms, but with potential for additional testate amoebae data) and environmental data (altitude, vegetation composition and cover, pH, conductivity, particle size and tidal inundation) in order to develop a transfer function.

Thus, the relationship between the microfossils and environmental data will be analysed, with statistical tests such as Canonical Correspondence

Analysis (CCA) used to imply the influencing factors on microfossil assemblages. A transfer function will then be developed and subsequently used to predict palaeoenvironments based on fossil assemblages, taken throughout a sample core from each site. Sites include: Cullintraw Marsh (see Fig. 1), northwest Strangford Lough, located in the east of Northern Ireland; Maas Marsh (see Fig. 2), located near Ardara in western Donegal; and Straths Farm, near Malin on the north coast of Ulster. Detailed

Figure 2. Maas Marsh, County Donegal

contemporary, surface study work will be undertaken on these three sites to develop the transfer function, thus taking into account regional variations, allowing modern samples to cover a wider range of environments and enabling comparison of the benefits of local versus regional transfer functions.

Matching Analogue Technique (MAT) will be used to determine whether fossil. assemblages are accurately represented by modern sample assemblages, and thus whether the fossil record can accurately be predicted using contemporary data. Once the statistical robustness of the transfer function has been determined, it will be used on fossil samples in order to reconstruct palaeo-RSL at each of the sites.

Thus, it will be used to give an initial indication of RSL variations over both space and time in Ulster, following the successful application in producing high-resolution, high-quality Late Holocene RSL records in North America (e.g. Gehrels, 1994, 1997, 2000; Gehrels and Van de Plassche, 1999; Gehrels *et al*., 2001) and Great Britain (e.g. Edwards, 1998, 2001; Edwards and Horton, 2001; Horton, 1997, 1999; Horton and Edwards, 2001; Horton *et al*. 1999a, 1999b, Zong and Horton, 1999).

Thus, the PhD project outlined here aims to reconstruct Late Holocene RSL change both spatially and temporally around Ulster through the microfossil record preserved in saltmarshes. The methods used will be analysed in terms of their precision and accuracy and recommendations for future work in terms of both techniques and locations for more detailed study can be made on the basis of the results produced.

Thus, as well as attempting to reconstruct Late Holocene RSL in Ulster, the project aims to test techniques successfully used in both Great Britain and North America and to assess the extent of their usefulness in future RSL reconstructions in Ireland.

As the research is part of an ongoing PhD project, the details of the presentation are uncertain. It is hoped that research from both Cullintraw Marsh and Maas Marsh will be presented and compared, possibly with some initial data collected from Strath's Farm.

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