Acadamh Ríoga na hÉireann
Royal Irish Academy

QUEEN'S UNIVERSITY BELFAST

Archaeology C14 Radiocarbon Dates Scheme Report

Name of Grantee:	Dr Fiona Beglane
Title of Project:	Staad Climate and Environmental Change Project

Summary of report:

The overall aim of this project was to conduct detailed environmental analysis of a peat monolith obtained during a completed excavation of an Early Bronze Age wooden trackway/platform and a series of Middle Bronze Age wooden stakes (SL005-193) found adjacent to the medieval Staad Abbey (SL005-022) in Co. Sligo. Radiocarbon dating of the uppermost and lowermost levels of peat demonstrated that it had been deposited between the late Mesolithic and the late Bronze Age periods. This grant funded four additional radiocarbon dates on plant macrofossils and bulk peat.
There were delays in sample submission/analysis due to Covid-19 and two small macrofossil samples that failed dating. There has not yet been time to integrate the new and pre-existing results and further develop the interpretation. However, initial indications are that the dates obtained fit well with the previous dates and will be extremely useful in developing a richer interpretation of the pollen, macrofossil and insect results. The main objective of this phase has therefore been achieved.
The project included analysis of insects (Coleopteran, Trichopteran and Chironomid remains), pollen and fungal spores, microscopic charcoal and Loss On Ignition (LOI). Results indicated changing environmental and climatic conditions over time. There were periodic episodes of woodland clearance and regeneration, with evidence that some clearances may have been made using fire. Another indicator of human activity was evidence for the grazing of livestock in the landscape. There were changes in the hydrological landscape over time with the peat surface varying between dry and wet, and with wet conditions varying between well-oxygenated and stagnant conditions.

Please outline the objectives of the Project:

The aim of this project was to conduct detailed environmental analysis of a peat monolith obtained during a completed excavation of an Early Bronze Age wooden trackway/platform and a series of Middle Bronze Age wooden stakes (SL005-193) found adjacent to the medieval Staad Abbey (SL005-022) in Co. Sligo (Beglane 2018). Radiocarbon dating of the uppermost and lowermost levels of peat demonstrated that it had been deposited between the late Mesolithic and the late Bronze Age periods. This phase of the project funded four additional radiocarbon dates. Although dating of the top and bottom of the peat monolith was undertaken as part of the post-excavation process, four further dates have been obtained in order to create a chronological curve within which the archaeological results and changes in the wider landscape can be interpreted. When combined, these multiple strands of evidence provide a unique picture of an exciting landscape.
The project included analysis of insects (Coleopteran, Trichopteran and Chironomid remains), pollen and fungal spores, microscopic charcoal and Loss On Ignition (LOI). It sought to establish the environment of deposition, anthropogenic indicators and possible marine proximity and to obtain a high resolution record of vegetation and land use change through time. Data was compared with the pre-existing plant macrofossil analysis and sought to address the following research questions:

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- Does the sequence indicate any significant environmental change other than that indicated by the plant macrofossils? E.g. changes in vegetation, climate etc.
- Is there any indication of anthropogenic activity such as crop cultivation or the keeping of large herbivores?
- Is there any evidence of marine proximity or inundation or of changes in the freshwater hydrological landscape?

Please describe the methodology used in conducting the research:

The research was led by Dr Fiona Beglane, supported by Dr Lynda Howard (independent researcher) and Dr Marta Perez-Fernandez (Royal Holloway University of London).

This phase of the project funded additional radiocarbon dates on plant macrofossils and bulk peat. AMS dating was carried out by 14Chrono Centre at QUB. Dates were obtained at 26, 50, 70 and 90cm depth in the peat monolith. These were in addition to original post-excavation results from the top (0cm) and base (261cm).

Dr Howard examined the insect remains. Samples were weighed and volumes measured. After soaking in hot water to aid disaggregation, the samples were wet sieved at 90 µm to remove small silt and clay fractions and paraffin floated (Coope 1986). A 90µm sieve was used instead of 250 µm to catch the smaller chironomid larval heads. Each sample was floated at least twice to ensure all insect remains had been extracted. The resultant float was stored in propanol and insect sclerites picked out using a stereo microscope at 15-40 x magnification.

Chironomid heads were mounted in pairs in Euparal and identified using standard texts (Wiederholm, 1983; Brooks et al., 2007 and Oliver and Roussel, 1983). The nomenclature used is after Brooks et al., 2007 i.e. to type. Each head capsule was assumed to represent 1 chironomid. Coleoptera were stored in propanol for later identification using standard texts (Hansen, 1987; Holmen, 1987; Nilsson and Holmen, 1995; Harde, 1998; Friday, 1988) and the reference collection in Birmingham University under the supervision of Dr David Smith. The classification and nomenclature of Coleoptera follows Duff, 2008. Coleoptera were counted according to the maximum number of any given sclerite - the Minimum Number of Individuals (MNI). Trichoptera were identified by comparison with photographs taken of the PD Hiley collection by Malcolm Greenwood (unpublished) and Wallace et al. 2003. Palaeoenvironmental interpretation was made using the BUGS database (Buckland and Buckland, 2006) for the Coleoptera, Wiederholm, 1983 and Brooks et al., 2007 for the Chironomidae and Wallace et al., 2003 for the Trichoptera.

Dr Marta Perez-Fernandez analysed the pollen, fungal spores, microscopic charcoal and LOI. Samples were prepared in accordance with the laboratory procedures set out by Royal Holloway University of London, and followed the methods of Birks and Birks, (1980), Faegri and Iversen (1989) and Moore et al (1991). Two Lycopodium tablets containing a total of 19,332 spores (batch number: 3862) were added to each sample to allow pollen percentage concentration values to be calculated. Samples were mounted using glycerol jelly to prepare them for optical analysis which was undertaken using an Olympus CX-41 high powered, light microscope at 400x magnification. Taxa and spore identification were aided by Reille (1992), Moore et al (1991) and Blackford et al (in review). Once percentage data was obtained, a pollen diagram was created using C2. Statistical zonation was applied by using the application of constrained cluster analysis by sum-of-squares (CONISS) (Grimm, 1987). Charcoal, being more of a suitable comparative to spores than pollen, was zoned according to spore data.

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Please outline the findings of your research and/or milestones achieved:

This phase of the project was to obtain four further radiocarbon dates. There were delays in sample submission/analysis due to Covid-19 and two small macrofossil samples that failed dating. There has not yet been time to integrate the new and pre-existing results and further develop the interpretation. However, initial indications are that the dates obtained fit well with the previous dates and will be extremely useful in developing a richer interpretation of the pollen, macrofossil and insect results. The main objective of this phase has therefore been achieved.

Results indicate significant changes in environmental conditions over time. Initially, mineral levels were relatively high in the peat at c.60%, decreasing with increasing peat deposition to c.25%, before rising at the top of the monolith to c.80%, consistent with the peat becoming covered by an inundation of sand that formed a now-eroding dune system.

At the base of the monolith there is scant preservation of insect material in these mineral-rich deposits. Initially there is a decrease in tree pollen, suggesting that a move from semi -deciduous woodland to an open landscape, with indicators of pastureland becoming evident, and charcoal indicating intentional clearance. Subsequently, there is woodland recovery, but with livestock still present on the landscape. Another reduction in woodland is then seen, however elm appears in the pollen record, supported by the presence of Scolytus scolytus beetles, which lay their eggs in dead elm wood. This beetle may have carried the Dutch Elm Disease fungus, which would have contributed to tree decline in the area. There is then a subsequent period of woodland recovery and dry climate, in which herbaceous and wetland plant taxa are minimal, supported by the insect evidence. Finally, the pollen and spores indicate a return to open landscape. Sedges once again dominate the herbaceous species and weed pollen associated with human farming activity shows a small resurgence. Aquatic plants also reappear, indicating wetter conditions. Unlike previous periods, there is virtually no charcoal, however some spore types do indicate that there were grazing animals still on the landscape.

Overall, human activity is intermittent. Periodic charcoal peaks coincide with downturns in e.g. grass or tree pollen, or with the presence of spores associated with fire, suggestive of periodic human clearance of the landscape. There are also indications of grazing animals through most of the profile.

The various environmental proxies indicate periodic changes in the surface wetness of the peat, varying from dry surface conditions, to well-oxygenated oligotrophic water, to stagnant, eutrophic conditions. There is some indication of occasional storms or marine inundation of the bog based on the presence of salt-tolerant insect taxa, while the top of the monolith shows high mineral content consistent with the peat deposit having been finally covered by a sand dune late in the Bronze Age.

Please provide details of the dissemination of the outcomes from this project:

A peer-reviewed paper on the work at Staad is currently in press, with publication expected before the end of 2020. Funding has been acknowledged. Beglane, F. and O'Sullivan, J. In press. 'A vanishing medieval church site on Ireland's Atlantic coast: a longitudinal study of coastal erosion at Staad Abbey, Co. Sligo, 1837–2016'. Journal of Irish Archaeology 29, 177-189.
Periodic updates to the project have been provided on the IT Sligo Applied Archaeology Facebook page. For example, on 22 September 2020 and 6 February 2020 the RIA Facebook feed featured a photograph from the

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Staad excavation to advertise the grants schemes, and these were shared on the Facebook page. Heritage Week events were publicised on a national basis.

A public lecture was given at Grange Courthouse, Co. Sligo on 20 August 2019 as part of Heritage Week. This was organised through Grange and Armada Development Association in conjunction with Co. Sligo Heritage Office. The lecture, Staad Co. Sligo: A good place is a good place is a good place! played to a packed house of approximately 50 people (see attached photo). Funding of the previous phase of this project was acknowledged.

A public lecture was given on 14 March 2019 at IT Sligo organised by the Stones and Bones IT Sligo student archaeology society. The lecture, Staad Co. Sligo: A good place is a good place is a good place! attracted approximately 40 people. This took place prior to the award of funding.
The site and project feature on a 2018 radio documentary Stones and Bones, episode 8 – Middens, produced by OceanFM. https://www.oceanfm.ie/2018/06/19/stones-and-bones-podcasts/ This took place prior to the award of funding.
A conference paper on coastal erosion at Staad was given in March 2015 at IT Sligo as part of the Weatherbeaten Archaeology International Conference. The paper was A shore chapel at Staad, County Sligo and was co-authored by Jerry O'Sullivan. This took place prior to the award of funding.

How will you continue to communicate the results of your project and what are your publication plans?

In addition to the academic paper currently in press, a further paper is planned, examining the excavation and palaeoenvironmental results. With the receipt of the radiocarbon dates development of this paper can progress. Subject to public health restrictions, it is anticipated that a further public talk will be arranged for the near future, updating the findings of the project. It is also proposed that an article suitable for the general reader will be prepared for the local and national media.

How did the award enhance your professional development?

This award has enabled me to continue my work with two palaeoenvironmental specialists that I had not dealt with prior to the receipt of funding in 2019. International collaborations such as this are invaluable in gaining new insights and approaches to research, for example by challenging accepted opinions and being exposed to different methodologies and research philosophies. Having made these contacts, we intend to continue working on this project and to develop future partnerships.

What plans (if any) do you have to further this project?

Having established the environmental changes that took place over the timescale of peat deposition, and obtaining additional radiocarbon dates it is now possible to move on to the detailed interpretation of the project data. These additional radiocarbon dates will enable us to create a chronological curve within which the archaeological results and changes in the wider landscape can be interpreted. When combined, these multiple strands of evidence will provide a unique picture of an exciting landscape.

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