In this issue
[1] Archaeological applications of the Joint Irish Bathymetric Survey
[2] SLAN @ WAC-6
[3] Publication news

[1] Archaeological applications of the Joint Irish Bathymetric Survey (JIBS) data

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Under the Irish National Strategic Archaeological Research Programme (2008), SLAN researchers were awarded funding to assess the Joint Irish Bathymetric Survey (JIBS) data for archaeological applications. JIBS was instigated as a partnership between the Maritime and Coastguard Agency (MCA) and the Marine Institute (MI), under INTERREG IIIA (€2,133,508) to address the need for high-resolution bathymetric data off the north coast of Ireland. The JIBS project commenced in April 2007 and was completed in September 2008, providing 100% multi-beam bathymetry coverage within the 3nm coastal strip from the Fanad (Co. Donegal) to Fair head (Co. Antrim).
This feasibility study is proving that the archaeological applications of the JIBS sonar data are numerous, having successfully catalogued and identified palaeo-landscape features (including a series of geomorphic signatures relating to submerged palaeo-landscapes) and simulated coarse palaeo-geographic reconstructions for the entire study area.

Ireland has experienced a complex pattern of sea-level change stemming from its glaciation during the last Ice Age. In areas situated on the margins of the ice sheet (including the JIBS study area) the removal of ice during deglaciation caused the underlying crust to rebound, resulting in the emergence of large areas of continental shelf. Crustal rebound eventually slowed and the exposed shelves were flooded by the rise in global sea-level induced by vast quantities of meltwater released from the decaying ice sheets.

Importantly, the emergence, and subsequent flooding of the continental shelf coincided with earliest periods of Irish prehistory. During the earliest known Mesolithic (dated to c. 10,000 BP by the Mount Sandel site in Co. Derry) sea-levels along the north coast of Ireland were lowered by 5-30m depending on the local patterns of glaciation and crustal rebound (Brooks et al, 2008; Kelley et al 2006).

These emergent shelves provided an extension of the terrestrial environment and its resources and, crucially, were bounded by the past coastline. They provided access to important marine resources, coastal lithic raw materials and migration/transportation corridors along the coast and into the interior via estuaries. Through the early Holocene sea-level remained low, to the extent that Neolithic and early Bronze Age landscapes might also be submerged in the JIBS area.

For further details, see the project web-site at:
http://www.science.ulster.ac.uk/cma/instar/
[2] SLAN @ WAC6

The World Archaeology Congress (WAC-6) was hosted by the Archaeology Department at University College Dublin in June/July 2008. Trevor Bell (MUN) was organiser for the ‘Geoarchaeology of submerged archaeological sites’ and ‘Rising Seas’ sessions, Aidan O’ Sullivan (UCD) was organiser for the ‘Living in Island Worlds’ and ‘Wetland Archaeology’ themes and Rory Quinn was session organiser for ‘Geoarchaeology of submerged archaeological sites: studies in site characterization and formation process’. SLAN presentations included:

A research strategy for mapping prehistoric archaeological potential on the seabed off Newfoundland and Ireland [Trevor Bell, John Anderson, Denise Brushett, Christine Bussey, Robin Edwards, Aidan O'Sullivan, Ruth Plets, Rory Quinn, Priscilla Renouf, John Shaw, Kieran Westley]

Impact assessment of ongoing and future sea-level change on coastal archaeological resources around Newfoundland [Kieran Westley, Trevor Bell, Priscilla Renouf, Lev Tarasov]

Reconstruction of the postglacial palaeo-geography of Newfoundland for submerged landscape investigation [Kieran Westley, Trevor Bell, Priscilla Renouf, Lev Tarasov, Art Dyke, Ruth Plets, Rory Quinn, John Shaw]


Trevor Bell¹, Ruth Plets¹, Kieran Westley¹, Alison Copeland², Rory Quinn³ and John Anderson⁴
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A successful scientific cruise was conducted onboard CCGS Shamook in support of SLAN research activities off northeast Newfoundland in mid-August 2008. The goals of the cruise were to: [1] document the nature of coastal landforms and sediments associated with submerged shorelines; [2] investigate the seismic structure of submerged coastal features identified from multibeam bathymetry and published bathymetric charts; [3] determine the palaeo-sea level elevation associated with submerged features, and [4] retrieve sediment samples and record video imagery of the seabed to ground-truth seabed substrates.

The primary target for survey and sampling was the submerged lowstand shoreline, which corresponds approximately to the -18 m bathymetric contour. This is of importance to submerged archaeological landscape reconstruction because marine-adapted prehistoric hunters and gatherers are believed to have occupied this palaeo-shoreline around 9000 years ago. It is also of interest to fisheries research since demersal capelin spawning sites are generally associated with such water depths and fine gravelly substrate, which may be littoral in origin. Consequently, additional goals of the cruise were to: [1] establish the broader sedimentary context for demersal capelin spawning sites; [2] refine the nature and origin of demersal capelin spawning substrates, and [3] clarify the relationship between capelin spawning sites and the postglacial sea-level lowstand.
Numerous coastal features associated with lower sea-level positions were tentatively identified from acoustic profiles, including wave-cut benches, beaches, truncated glacial landforms (e.g. drumlins), sea cliffs, and barriers and lagoons. Shallow, sediment-filled depressions located on the landward side of the lowstand shoreline are interpreted to be former lake basins, which potentially preserve proxy records of environmental conditions on the 9000-year-old subaerial landscape. River channels with partial sediment fills were observed at bedrock-controlled topographic lows or pinch-points landward of the sea-level lowstand. Using seabed bathymetry, they have been roughly traced to river valleys on the modern landscape. Both the former lake basins and river valley fills will be coring targets during future cruises. Finally, truncated glacial landforms, interpreted to be drumlins, were identified on sub-bottom profiles and are regarded as good estimates of the sea-level lowstand depth.

Unprocessed seismic profile showing infilled sedimentary basins on the palaeo-land surface which may represent former freshwater lakes during the lowstand.

Seismic survey at Back Harbour.

CCGS Shamook tied up at Twillingate Harbour.

Our thanks to the captain and crew of CCGS Shamook for their outstanding contribution to the success of the cruise, and to Mr. Curtis Strickland, Fugro Jacques Geosurvey Ltd., St. John’s, who operated the geophysical equipment. Cruise support was provided by Fisheries and Oceans Canada (Newfoundland and Labrador Region), Coracle Irish-Newfoundland Fellowships (TB and RQ), and Natural Science and Engineering Research Council of Canada (TB).
At the Last Glacial Maximum (LGM) c26000 calendar years ago, global sea levels were around 120m lower than present due to the storage of water on land in the form of large, high-latitude ice sheets. This lowering of sea level exposed portions of the modern seafloor surrounding north-west Europe, forming ‘land-bridges that joined Britain and Ireland to the rest of the continent. Sometime later, these land-bridges were drowned by rising sea levels as the ice sheets melted in response to a warming climate. Precisely when these land connections were severed has been a subject of debate for several decades, driven in part by the desire to understand the postglacial recolonization of Ireland by plants and animals.

The level of the sea relative to the land surface (relative sea-level) results from the interplay between vertical changes in both land and sea level. These processes can be simulated by computer models that describe the response of the solid Earth to the loading and unloading of glacial ice (glacial rebound models).

In addition to simulating relative sea-levels, the output from these models can, when combined with bathymetric and topographic data, be used to produce first-order palaeogeographic reconstructions. This paper uses palaeogeographic reconstructions of this kind to investigate the location and duration of possible land-bridges joining Ireland to Britain. These reconstructions are derived from a recently developed glacial rebound model for Ireland that incorporates an updated British-Irish Ice Sheet component and is trained by geological sea-level indicators from around the Irish coast. The resulting reconstructions suggest that Ireland was separated from Britain by c16 000 calendar years ago, at which time climate was still cold and local ice caps persisted in parts of the country. No support is found for the idea that a Holocene land-bridge was instrumental in the migration of temperate flora and fauna into Ireland.