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Using stable isotope analyses of Sphagna moss as palaeoclimatic proxy data: An Irish scenario.

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Species specific stable isotope analysis of biological materials has become increasingly important as an effective and powerful tool, especially in the investigation of palaeoclimatic and environmental studies. Previous work has shown the value of these types of analyses alongside compound specific stable isotope ratio analysis. This study presents species specific stable isotope analysis of *Sphagnum* moss specifically *S. imbricatum* from Longford Pass, an ombrotrophic raised bog in Co. Tipperary, Ireland for δ^2H, δ^{18}O and δ^{13}C. The analysis was performed on single species to test the sensitivity of these as proxy indicators of climate and environmental change. The Longford Pass bog is also important as preserved ancient track ways have recently been discovered dating to the Bronze Age (3140 – 2850 cal BP (1190 – 900 cal BC)) and Iron Age periods (2340 – 1530 cal BP (390 cal BC – 420 cal AD)) as well as those that are undated. One key question resulting from their discovery is did people construct these features in response to specific climatic changes, and if so is there a correlation between the climate signal recorded in the plants and trackway construction?

The results obtained from the stable isotope analysis of the plant macrofossils show that because of the unique physiology of *Sphagnum* mosses the stable isotopic content of the samples appear to reflect changes in the palaeoclimate. The δ^2H values in *Sphagnum* mosses ranged from -51.2 to -95.7 , δ^{18}O from 23.1 to 30.1 , and δ^{13}C from -22.5 to -29.2 . All three isotope ratios showed distinctive changes at 2.8 and 3.2 cal BP, and the trends compare favourably with the speleotherm data from Crag Cave on the south west coast of Ireland. These data in conjunction with other palaeoclimatic indicators such as humification and testate amoeba from the same site show the value of these types of analyses as environmental indicators. Furthermore, they indicate that at periods of track way construction the climate was fluctuating. In the Bronze Age the trackways were constructed at a time of economic strength but worsening climate as the results indicate the climate was initially colder and wetter and remained so until the construction ceased when there was amelioration and a warming. This also coincides with the increased effect of the agricultural practice prevalent on the environment and the spread of blanket bogs. The 500 year gap before construction of the Iron Age pathways coincides with stagnation in the archaeological record and recommence of trackway use started when the water table was higher and was followed by a colder and wetter Dark Age Cold Period.