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## Getting it Together: Combining plant and mammal DNA with Lipid Biomarkers from Irish and Scottish Lakes

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Lowland lakes in Scotland and Ireland have been heavily impacted by human activity since the Neolithic due to forest clearance, agriculture and lakeside settlement. Whilst plant macrofossils, pollen and other microfossils, especially diatoms, have been able to outline these changes many uncertainties remain about the origin and exact nature of these impacts. Obtaining independent measures of both vascular plants and mammals (and other animals) allows for more taxonomically precise reconstructions and the study of long-term biotic interactions. Lipid biomarkers, such as faecal steroids and bile acids, can both validate the mammal DNA, and also indicate the magnitude of agricultural and human lake inputs into the lake ecosystem. Our initial work focused on small artificial islands (crannogs) common in the Celtic parts of the UK. Unusually strong sedaDNA and lipid biomarker results from both plants and animals are believed to result from the creation of a biogeochemical halo around the crannogs due to the direct input of bone and viscera, rapid organic and clastic sedimentation, and a lack of disturbance. The human activities on the artificial islands, such as slaughter, butchery and feasting, caused severe eutrophication of the smaller lakes, which only partially recovered after the abandonment of the sites. Similar but less pronounced effects can be seen at lake-side settlement sites in larger lakes and away from archaeological sites which reflect catchment-wide influences. This paper will present data from crannogs, lake-side sites and from a new study of lakes on small islands on the Celtic Seaboard. These island sites are being studied to test the narrative of 'marginality' and a perceived lack of resilience in small islands during the last two thousand years. Overall our sedaDNA and steroid results complement data from both archaeological excavation, survey and traditional palaeoenvironmental proxies to provide a more detailed and comprehensive image of the environment in which our ancestors were operating, the changes they had on their ecosystems and our inheritance of this today.