QRA UNDERGRADUATE DISSERTATION PRIZE 2022

It is our great pleasure to announce that the winner of this year's QRA Dissertation Prize is Yuqiao Natalie Deng (University College London) for her dissertation on "A tephropalaeoecology study investigating volcanic eruptions and tephra depositions' impacts on a lacustrine ecosystem in Northeast China, using diatoms as environmental indicators".

The study concerns a highly detailed and thorough investigation of lake response (via diatom communities) to tephra loading. It is well written and clearly explained, and it represents an outstanding amount of work for an undergraduate dissertation. Significant strengths are the level of analysis, the critical evaluation, the quality of interpretation, and a very high standard of presentation. While the discussion is mainly focused on the results, the study also has a broader significance.

We wish to commend a second student for their high-quality research that demonstrated their command of their research investigation:

Duncan Russell (Plymouth University), "Using GIS and numerical modelling to test the influence of climate change on glacial lake outburst flood risk in the Dudh Koshi Basin, Nepal Himalaya".

Judges:

Mary Edwards
Geography and Environmental Sciences
University of Southampton
m.e.edwards@soton.ac.uk

Gill Plunkett
School of Natural and Built Environment
Queens University Belfast
G.Plunkett@qub.ac.uk

The QRA wishes to extend its thanks to Mary Edwards and Gill Plunkett who this year step down as judges of the dissertation prize after fulfilling the role excellently over the last three years. Needless to say that without the efforts of the judges we could not run the prize to recognise the excellent Quaternary undergraduate research that is being undertaken by students.

We are currently looking for two (or more) new people to take on the judging role for the dissertation prize for the period 2023-2026. Potential judges should have experience with the supervision and marking of UK undergraduate dissertation projects, and be prepared to review 5-10 dissertations between September-November each year. Anyone who is interested in volunteering for the role of judge should contact the Outreach Officer (James Lea, University of Liverpool) by email at j.lea@liverpool.ac.uk before 31st March, 2023.

A TEPHROPALAEOECOLOGY STUDY INVESTIGATING VOLCANIC ERUPTIONS AND TEPHRA DEPOSITIONS' IMPACTS ON A LACUSTRINE ECOSYSTEM IN NORTH-EAST CHINA, USING DIATOMS AS ENVIRONMENTAL INDICATORS

Yuqiao Natalie Deng
University College London

Tephra layers are commonly found in lake sediments around the world and have often been used as chronology controls in tephrochronology. Limited studies have investigated past tephra depositions' impacts on lake ecosystems. The use of palaeoecological analyses across tephra layers in sediment cores to infer volcanically-induced environmental change is termed 'Tephropalaeoecology'. A diatom-based tephropalaeoecological approach was adopted in the study to infer the impacts of five tephra depositions on a lacustrine ecosystem in northeast China during the past 30,000 years. The five tephra layers (including two micro-tephras) have varying thicknesses and were deposited in different time periods under different climatic conditions. Changes in diatom communities between samples pre and post-tephra were utilised to reconstruct changes in lake conditions due to tephra depositions. In general, thicker tephras induced larger degrees of change in diatom communities and lake conditions. Tephras deposited in more eutrophic and warmer lake conditions induced more dramatic responses from diatoms and the lake system. Water column phosphorous likely decreased dramatically from reduced sediment-water phosphorous loading as the tephra layers probably formed an impermeable layer at the lake bottom. This was supported by a decrease in overall diatom concentration and a decline in sensitive, high phosphorous requirement diatom taxa e.g. Discostella stelligeroides and Stephanodiscus minutulus. Contrastingly, tephra deposited in more oligotrophic and colder lake conditions induced a smaller degree of change. Because the lake condition was already low in phosphorous, diatoms did not respond to further decline in phosphorus but rather responded to the minor increase in silica from the dissolution of tephra particles in the water column. This was inferred from the slight increase in overall diatom concentration as well as opportunistic taxa. The results outlined the importance of lake background conditions in mediating tephra's impacts. In terms of recovery, none of the tephras showed complete recovery back to their background states, possibly suggesting the long-lasting effect of tephras and a shift to new lake ecosystem equilibrium.

USING GIS AND NUMERICAL MODELLING TO TEST THE INFLUENCE OF CLIMATE CHANGE ON GLACIAL LAKE OUTBURST FLOOD RISK IN THE DUDH KOSHI BASIN, NEPAL HIMALAYA

Duncan Russell
Plymouth University

For centuries, farming communities have occupied the valleys and foot slopes of the world's mountain ranges; living and working in a harsh environment that is defined by climate, hydrology and threat of natural hazards. Despite this history, and the lessons learned, the populations that occupy these spaces today are experiencing change to all three of those elements at a rate and intensity never seen before. Increasing global temperatures have caused glacial recession since the 1940s and will continue in doing so for the rest of this century, regardless of the emission pathway taken. For the people of the Himalaya, glacial ice is a resource that proves its value across all facets of life; providing, a store of freshwater that maintains flow through dry seasons, irrigation of crops, renewable energy and attractions for tourism. In this paper, I show that the loss of glaciers in the Dudh Koshi basin, as a result of climate warming, has caused the expansion of glacial lakes in the area and the creation of new ones. This by-product of glacier diminishment; along with growing pressures on food, energy and water; has increased the threat of glacial lake outburst floods (GLOFs) to a critical level. With over 500 glacial lakes covering an area of almost 4000 km^2, identifying which lakes pose the largest threats and which areas are most at risk is an essential first step in hazard management. Therefore, this study develops a multi-criteria hazard assessment on lakes within the Dudh Koshi basin, which remotely measures influences on both GLOF susceptibility and downstream vulnerability. The seven largest moraine dammed lakes in the basin were identified and ranked in order of hazard level. For the three most hazardous lakes, Imja tsho, Lumding tsho and Dig tsho; calculated volumes and GIS techniques were used to model inundation extent for three GLOF scenarios. The first represented a GLOF under a lake volume calculated for 2020. Two theoretical increases in lake volume, by 15 and 25%, provided future GLOF scenarios to be tested. The models were used to analyse the influence that climate change might have on future GLOF events and highlighted which downstream settlements will be impacted the most. Results found climate change scenarios to have varying levels of influence on inundation zone, with a major control being the topography surrounding settlements.

Quaternary Newsletter
Outstanding Paper in JQS by ECR
QRA Quaternary Research Association

AN EARLY PLEISTOCENE HIPPOPOTAMUS FROM WESTBURY CAVE, SOMERSET, ENGLAND: SUPPORT FOR A PREVIOUSLY UNRECOGNISED TEMPERATE INTERVAL IN THE BRITISH QUATERNARY RECORD

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Neil Adams, Ian Candy and Danielle Schreve

Although fossil assemblages from the late Early Pleistocene are very rare in Britain, the site of Westbury Cave in Somerset, England, has the potential to address this gap. The mammal fossils recovered previously from the Siliceous Member in Westbury Cave, though few in number, have hinted at an age for the deposits that is as yet unparalleled in Britain. Here, we describe the first bona fide occurrence of Hippopotamus in the British Early Pleistocene, discovered during recent reinvestigation of the Siliceous Member. The hippo fossil indicates a refined biochronological age of ca. 1.5–1.07 Ma for the Siliceous Member and a palaeoclimate that was warm and humid, which accords well with previous palaeoenvironmental inferences. A synthesis of late Early Pleistocene hippo occurrences suggests that the Siliceous Member hippo may have been part of an early colonization of north-west Europe by these megaherbivores, possibly during MIS (Marine Oxygen Isotope Stage) 31. Alternatively, it evidences a currently cryptic northward migration during an even earlier temperate phase. In either case, the Siliceous Member is likely to represent a warm period that has not been recognized previously in the British Quaternary record.