INTERNATIONAL GRADUATE STUDENT ONLINE SEMINAR SERIES

MARCH 9 - 13, 2020

MONDAY MARCH 9, 2020 – 9:00 AM (EST)

Mg/Ca based sea surface temperature reconstruction of the western Arabian Sea from Heinrich Event 2-6

Jennifer Scott

Masters by Research Candidate, University of Edinburgh, School of Geosciences

In this study a record of sea surface temperature (SST) for the Western Arabian Sea is presented, spanning 20-70 ka BP. Presently, the area is dominated by the seasonal SW and NE monsoon wind systems, the western part of the overarching Asian monsoon system. In summer the SW monsoon winds induce upwelling of cold water along the coast of the Western Arabian Sea, leading to lower SSTs than during the winter NE monsoon when no upwelling occurs. However, this may not have always been the case, with previous work covering the last 20 ka BP and Heinrich Event 1 indicating that during glacial periods weakened summer upwelling and increased cooling by the winter NE monsoon could have caused lowest SST during the winter. The record presented here further explores the teleconnections between the polar northern hemisphere and the monsoon in the Arabian Sea over Heinrich Event 2-6. The record is produced from Mg/Ca-derived palaeothermometry of the shallow dwelling foraminiferal species Globigerinoides ruber, which calcifies throughout the year, and Globigerina bulloides, which calcifies mainly during the summer SW monsoon.

***Jennifer Scott** is a Masters by Research student at the University of Edinburgh specialising in oceanography and past climate reconstructions. She has an undergraduate degree in Environmental Geoscience and has previous research experience investigating the links between El Nino Southern Oscillation and nutrients in the Peruvian Upwelling system from an internship at the University of Tokyo. Her current research focuses on reconstructing sea surface temperatures in the Western Arabian Sea to investigate the links between northern hemisphere glacial cycles and monsoon dynamics and it is this research that she presents today.*

TUESDAY MARCH 10, 2020 – 9:00 AM (EST)

Nutrient composition of stream animal urine in brown vs. clearer waters

Sandra Klemet-N'Guessan

PhD Candidate, Trent University, Environmental and Life Sciences

Nutrient recycling in aquatic ecosystems is a key biogeochemical process that can be influenced by biological communities including microbes and aquatic animals. The importance and the characteristics of nutrient recycling by aquatic animals may vary relative to the trophic position (primary to tertiary consumer) and abiotic factors such as dissolved organic carbon (DOC). With climate change, DOC concentrations have been on the rise globally in many aquatic ecosystems thereby turning our waters browner. In this study, we examined the effect of dissolved organic carbon on the nutrient release by fish and mayflies and on their contribution to ecosystem recycling in streams in southcentral Ontario. Preliminary results point toward a non-linear relationship between mayfly SRP excretion and a positive linear relationship between mayfly NH4 excretion and DOC. Ongoing analyses will help determine whether the several fish species tested for excretion show a similar trend with DOC or not. Ultimately, assessing the contribution of aquatic animals to ecosystem recycling along a stream DOC gradient will allow to predict the role that these animals will play in the cycling of nutrient as our waters become murkier. Considering that the nutrient state of an aquatic ecosystem is an essential driver of its productivity, this work will help draw the contours of the future biodiversity state of our waters.

***Sandra Klemet-N'Guessan** is a graduate student at Trent University in Dr. Maggie Xenopoulos' lab. Passionate about science and traveling, Sandra has had the opportunity to participate and lead research projects in six countries and in three languages. From terrestrial insects to aquatic animals, Sandra is fascinated by the interactions among species and between species and their environment at the land-water interface; an ecosystem approach she also takes in her science outreach activities.*

WEDNESDAY MARCH 11, 2020 – 9:00 AM (EST)

Hope for Hawaiian Reefs: Temporal and Spatial Resilience of Porites compressa and Montipora capitata in Kāneʻohe Bay, Oʻahu

Kelsey Archer Barnhill

PhD Student, University of Edinburgh

Coral reefs around the world are undergoing significant ecological decline; however, corals in Kāne'ohe Bay have repeatedly shown resistance to ongoing environmental change. Benthic cover (i.e. coral, algae, other) from 2000 was compared to 2018 to estimate species composition changes along a 600m fringing reef. While percent cover of several non-reef forming species (Pocillopora damicornis, Pocillopora meandrina, and Lobactis scutaria) decreased significantly over 18 years, the dominant reef-building corals Porites compressa and Montipora capitata retained their 2000 coverage, indicating temporal resilience. However, a shift in species composition did occur as two coral species were lost (Pocillopora meandrina and Porites lobata) and one new species was gained (Leptastrea purpurea) over the 18 years. To investigate spatial resilience, a reciprocal transplant experiment was conducted to determine if coral growth (calcification) for the dominant reef-building corals varied across the reef and whether or not genetics and/or environmental factors were responsible for the differences. Two sites representing distinct environmental conditions with significant differences between temperature, salinity, and aragonite saturation were selected for the comparison. Primary calcification (linear extension) did not vary between sites for either species, suggesting the reef-building corals were able to acclimatize to the different environments. However, secondary calcification (accretion) was significantly different between sites for P. compressa. Differences in accretion following transplantation suggest both environment and genetics impact secondary calcification of P. compressa in Kāne'ohe Bay. These findings support both temporal and spatial resilience of Hawaiian corals, which may be capable of continuing to acclimatize to climate change and bleaching events.

***Kelsey Archer Barnhill** is a first year PhD student at the University of Edinburgh specializing in deep sea ecology. She will be presenting work from her Masters in Tropical Ecology and Management of Natural Resources from the Norwegian University of Life Sciences. Kelsey has a Bachelors in Geological Sciences from the University of North Carolina at Chapel Hill and has research experience ranging from invertebrate palaeontology to rainforest ecology. She is currently designing methodology for running long-term laboratory mesocosms to understand impacts of ocean acidification on cold-water corals for her PhD research.*

THURSDAY MARCH 12, 2020 – 9:00 AM (EST)

Stability of the gravel-sand transition of the Ganga Plains recorded in Siwalik stratigraphy; implications for extreme floods

Laura Quick

PhD Candidate, University of Edinburgh

Rivers of the Indo-Gangetic Plain are prone to abrupt switching of channel courses causing devastating floods over some of the world's poorest and densely populated regions. Recent work has identified the gravel-sand transition as an avulsion node for the channels. The gravel-sand transition is a geomorphic feature observed within all major mountain-fed, and foothill-fed Himalayan rivers ranging from 10 to 20 km downstream from the mountain front. It is characterised by an abrupt downstream reduction in grain size from gravel to sand and is often associated with a break in channel gradient, which suggests it is a relatively stable feature over the last few thousands of years.

However, new subsurface data from the Kosi mega-fan in eastern Nepal reveals 10-20 Ka gravels located ~50 km downstream from the current gravel-sand transition. The implication is that this key geomorphic boundary can periodically prograde considerably further into the Ganga Plains. A greater long-term (>106 yrs) understanding of the controls on the gravel-sand transition is achieved by studying the stratigraphic record of the Miocene Siwalik Group, which is exhumed as a series of thrusted fault blocks at the Himalayan mountain front. The Siwalik succession is divided into three lithofacies units that coarsen upwards from siltstones and sandstones to coarse conglomerates. The units are termed the Lower, Middle and Upper Siwaliks respectively and reflect the current depositional environments found on the Ganga Plains.

The gravel-sand transition is recorded as the contact between the Middle and Upper Siwaliks. Significant gravel pulses have been identified directly below the Middle to Upper Siwalik contact and suggests that the gravel-sand transition is mobile and can prograde far into the plains. Sedimentological characteristics of the gravel pulses and sediment entrainment calculations suggest that extreme events (e.g. enhanced monsoon and GLOFS) can force gravel far into the Plains, impacting the position the gravel-sand transition. These episodes of gravel progradation must represent extreme floods from which the sedimentological system must take many years to recover. Such events are beyond the historic timescales of human narrative, and hence have not been recognised as a risk to the populations of the plains.

Laura Quick *is a 4th year PhD student at the University of Edinburgh. Her research focuses on Himalayan river systems in Nepal and India. Laura uses a combination of ancient geological data and observations from the present day Himalayan river systems to better understand how extreme events (GLOFs, earthquakes, etc) can impact the flood risk in the Ganga Plains; a region home to 10% of the world's population.*

FRIDAY MARCH 13, 2020 – 9:00 AM (EST)

Understanding the role of legumes in the African savanna

Elizabeth Telford

PhD Candidate, University of Edinburgh, School of Geosciences

Legumes are an ancient, diverse and ecologically successful plant family. However, most research examining their dynamics and distributions has focussed on forests despite legumes being a plant family common across tropical savannas. Little is understood of the dynamics of this important plant group and how their unique functional characteristic of nitrogen (N) fixation relates to savanna ecosystem dynamics. Some legume groups have the unique ability to fix atmospheric N via root symbioses. Root nodules harbour N-fixing bacteria (rhizobia) capable of converting atmospheric N into a form available for plant growth. N-fixation provides a competitive advantage in areas where high environmental stress (e.g. low rainfall) and/or frequent disturbances (e.g. fire and herbivory) make an ability to exploit limited resources and grow quickly advantageous. Therefore, understanding the limits and dynamics of plant species and their functional responses to key savanna aspects (such as fire, herbivory, drought) can allow us to estimate the vulnerability of this ecosystem to global change.

Elizabeth Telford *is a first year PhD student at the University of Edinburgh, she is interested in understanding the dominance of the legume family in the understudied tropical savanna. Her research hopes to explore the link between Nitrogen fixation and the woody encroachment phenomenon currently occurring in the African savanna.*