MEETING PROGRAM & ABSTRACTS

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flapping frequencies (Strouhal numbers), and flapping amplitudes that plesiosaurs are likely to have used.

Grant Information
EPSRC, Ginko investments

Colbert Prize (Wednesday–Saturday, October 26–29, 20164:15–6:15 PM)

WHAT IS 'NATURAL' AFTER 10,000 YEARS OF EXTINCTIONS AND INVASIONS? CONSERVATION PALEOBIOLOGICAL APPROACHES IN PARQUE NACIONAL JARAGUA, DOMINICAN REPUBLIC

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Paleontologists are increasingly sharing geohistorical data with conservation practitioners to inform management decisions. This approach is of particular relevance to island systems, where recent extinctions and invasions have obscured our understanding of pre-human ecosystem conditions. Here, we apply a conservation paleobiological approach on the Caribbean island of Hispaniola as part of a multi-year collaboration between researchers, the Museo Nacional de Historia Natural of the Dominican Republic, and members of the grassroots conservation group Grupo Jaragua.

We combine paleontological excavations with ecological surveys in Parque Nacional Jaragua, located in the southwestern Dominican Republic, to 1) contrast the past vertebrate diversity of the park with its modern constituents, 2) elucidate the interactions of native-invasive species, and 3) provide temporal baselines of ecosystem change. Our paleontological work has revealed a network of 20+ limestone karst caves, which allowed us to create faunal inventories that document the recent loss of biodiversity in the region. For example, Jaragua is home to two native small mammal species today, but we recovered 11+ species, including extinct sloths, primates, and large-bodied rodents. Abundance data reveals that the Hispaniolan solenodon, an endemic insectivorous mammal, has been rare throughout the Holocene, in contrast with the past high abundance and subsequent modern endangerment of the endemic rodent, the Hispaniolan hutia.

We augment these paleontological data with transect and camera-trapping studies that reveal the mechanisms underlying interactions of native species with invasive species, including spatial and temporal partitioning of resources within the Jaragua. By combining paleontological and modern data, we provide a unique perspective for managing grazing by non-native herbivores and affirm the need for a broader understanding of what constitutes 'natural' in an island system.

Grant Information
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Technical Sesssion X (Friday, October 28, 2016, 11:15 AM)

A NEW CHELONIOID TURTLE FROM THE PALEOCENE OF CABINDA, ANGOLA

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We report a new chelonioid turtle on the basis of a nearly complete skull collected in lower Paleocene, shallow marine deposits, equivalent to the offshore Landana Formation, near the town of Landana in Cabinda Province, Angola. Chelonioid material previously reported from this locality is likely referable to this new taxon. The well-preserved skull is missing the left quadrate, squamosal, and prootic, both opisthotics, and the mandible. The skull possesses a rod-like basisphenoid rostrum, which is a synapomorphy of Chelonioidea, but it differs from other chelonioid skulls in that the contact between the parietal and squamosal is absent, and the posterior palatine foramen is present. Phylogenetic analysis recovers the new taxon as a basal chelonioid. The Paleocene–Eocene strata near Landana have produced a wealth of turtle fossils, including the holotype of the pleurodire *Taphrosphys congolensis*. A turtle humerus collected from the Landana locality differs morphologically from the humeri of chelonioids and *Taphrosphys*, indicating the presence of a third taxon. Chelonioid fossil material in the Landana assemblage is rare compared to the abundant fragmentary remains of *Taphrosphys* that are found throughout the stratigraphic section. This disparity in abundance suggests the new chelonioid taxon preferred open marine habitats, whereas *Taphrosphys* frequented nearshore environments.

Technical Session XIV (Friday, October 28, 2016, 3:45 PM)

THE EVOLUTION OF JAW MECHANICS AND CRANIAL MUSCULATURE IN DICYNODONTS (THERAPSIDA, ANOMODONTIA)

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Dicynodont therapsids were arguably the most successful herbivorous amniotes spanning the Permian–Triassic boundary, although the detailed evolution of dicynodont jaw mechanics remains largely unexplored. Here, we integrate key functional cranial traits and muscular mechanical advantage (MA) in a phylogenetic context for a synthesis of dicynodont feeding evolution. We mapped lateral origins and insertions of m. adductor mandibulae externus medialis (mAMEM), a temporalis homologue, and m. adductor mandibulae externus lateralis (mAMEL), a masseter analogue, in 32 dicynodonts and basal anomodonts. We then reconstructed muscle vectors by connecting centroids of each origin and insertion to calculate MA relative to a mesial bite point at the beak. With sliding quadrate-articular joints, blunt snouts, intramandibular kinesis, and a transition to toothless, keratinous beaks, dicynodont skulls are highly modified to allow variable degrees of palinal feeding. A transition is seen to an emarginated temporal bar and a laterally facing squamosal adductor fossa, relocating mAMEL lateral to the temporal bar outside of the adductor chamber, with mAMEM remaining within the adductor chamber originating at the sagittal crest. Dicynodonts score higher in MA values than more basal anomodonts, indicating increased efficiency in herbivorous feeding. Among dicynodonts, MA was highly variable depending on craniomandibular proportions while still indicating strong palinal feeding in a majority of dicynodont taxa. Many dicynodonts with larger muscle attachments and dorsoventrally deeper mandibles, such as *Angonisaurus*, *Daptocephalus*, and *Lystrosaurus,* present relatively high MA values. Notably, emydopoids exhibit a more pronounced lateral dentary shelf for greater muscular support for the insertion of mAMEL, also enhancing palinal performance. A secondary transition to relatively lower MA values and more orthal feeding is seen among the derived kannemeyeriiforms, but stahleckeriids and kannemeyeriids accomplish this in different ways; whereas stahleckeriids possess higher adductor angles, kannemeyeriids possess rostrally displaced muscle insertions and lower adductor angles. Lower MA values in kannemeyeriiforms suggest a likely enhancement of pterygoideus musculature inducing a secondarily stronger orthal feeding stroke. These results demonstrate that the dicynodont radiation was facilitated by functional diversification of their highly derived feeding systems.

Poster Session IV (Friday, October 28, 2016, 4:15–6:15 PM)

FIRST RECORD OF *PROTEROZETES ULYSSES* (CARNIVORA, OTARIIDAE) FROM THE WESTERN NORTH PACIFIC, AND ITS IMPLICATIONS FOR PALEOBIOGEOGRAPHY OF THE PLEISTOCENE OTARIID PINNIPEDS IN THE NORTH PACIFIC

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The Otariidae belong to the Pinnipedia (Carnivora) and consist of seven extant genera and 14 extant species. Today, they are more diverse in the Southern Hemisphere (4 genera and 11 species) than in the Northern Hemisphere (3 genera and 3 species), but the fossil record suggests that they evolved and diversified in the Northern Hemisphere. However, the otariid fossil record is too insufficient in preservation to accurately discuss their taxonomic validity and evolutionary relationships. Recently, almost complete skulls of otariids were found from the middle Pleistocene Mandano Formation (0.6 Ma) on the Boso Peninsula, central Japan, which are the first to be reported from the western North Pacific realm. The middle Pleistocene is a transitional period for the Otariidae due to the changes in climate and sea-level stands that occurred during this time, and therefore, the information gathered from these new finds from the middle Pleistocene is significant. Determination of the taxonomic and phylogenetic positions of the above-mentioned new specimens bring us new insights into their evolutionary processes in the North Pacific Ocean. For this purpose, we investigated almost all of the morphological characters and taxa of the otariids, including fossil taxa, with backbone constraint by the molecular information for their phylogenetic relationships.

Our analysis revealed that the new fossils belonged in the family Otariidae, and one of them was almost identical to the middle Pleistocene extinct sea lion *Proterozetes ulysses* that was previously known only from the eastern North Pacific. In addition, *P. ulysses* was confirmed to be closely related to the Steller sea lion *Eumetopias jubatus*. Our results also revealed that the number of otariid species in the middle Pleistocene of the western North Pacific was much more than in the present-day western North Pacific, and their distribution during that time was extended southerly along the coast of the western North Pacific. Although *P. ulysses* is only known in the short period (middle Pleistocene) and restricted area (mid-latitude of both sides of the North Pacific), the circum-North Pacific distribution of all the northern otariids suggests that their diversification in the Northern Hemisphere was much higher until the late Pleistocene.

Poster Session II (Thursday, October 27, 2016, 4:15–6:15 PM)

MORPHOLOGICALLY AND HISTOLOGICALLY DIAGNOSTIC SOFTSHELL TURTLES FROM THE LOWER CRETACEOUS OF JAPAN

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Softshell turtles (Trionychidae) are highly aquatic, freshwater turtles that currently have a global distribution. The group has been present in Asia since the late Early Cretaceous (Aptian, 125.0–113.0 Ma). A possibly older, single fragment of turtle shell from Japan (FPDM-0127) has been suggested to belong to this family; however, that material preserves only a few characteristics of Trionychidae. Here we report four morphologically and histologically diagnostic trionychid specimens from the Barremian–Aptian (129.4–113.0 Ma) of Japan. One specimen (FPDM-V9487) is an associated skeleton, which consists of a scapula, a humerus, an ischium and hypoplastra. The limb and girdle bones are similar in morphology to those of modern trionychids. The hypoplastra resemble that of modern trionychids, but distinctive from other known trionychids in totally lacking callosities. The other three specimens are fragmentary costals. These costals show flat shape, reduction of sutural contact with peripherals and absence of scute sulci, suggesting a flexible shell without keratinous shields. Two of the newly reported costals and FPDM-0127 were examined histologically. As a result, bone fiber bundles organized as a plywood-like structure, which is unique to Aptian–recent trionychids was found. Fossil occurrence data indicate that morphologically and histologically typical trionychids have already inhabited coastal region of Asia as early as the Aptian. On the other hand, the Hauterivian–Aptian stem trionychid *Kappachelys okurai* did not show plywood-like shell microstructure, suggesting that *K. okurai* could be the basal-most taxon of known stem trionychids. Our paleobiogeographical compilation suggested that the spread of wetlands in the Northern Hemisphere and high global temperature during the mid-Cretaceous (Aptian–Turonian, 125.0–89.8 Ma) might have contributed to the high frequency of trionychids, which exemplifies the