them an ideal system for examining how success in space and time varies with ecological strategy, specifically body size and degree of carnivory. Because less specialization enables a taxon to withstand disturbance by taking advantage of a wider resource base, we predicted that a generalist (mesocarnivorous) diet, with small or average body size, characterizes canids that have longer taxon duration and more stable range size and locality coverage over time. We compiled occurrence data for North American fossil canids from the Miocene Mammal Mapping Project and the Fossilworks database, and calculated three extrinsic properties for each species: a) stratigraphic span, b) geographic range size, and c) locality coverage. We analyzed the geographic properties (b and c) from two perspectives: 1) as a time-averaged snapshot, examining only average and maximum values of these properties; and 2) as a moving picture, considering taxon resilience–the manner in which these measures of 'success' changed–through time. In the first perspective, across all Canidae, body size showed a weak negative relationship with stratigraphic span, locality coverage, and range size. As degree of carnivory correlates with body size, carnivory also showed a negative relationship with all three properties. However, from the second perspective, we observed trophic differences in taxon resilience. Smaller, more hypocarnivorous taxa displayed more gradual changes in the two geographic properties, supporting the prediction that small size, although not necessarily a generalist diet, contribute to stability over time. However, despite this apparent ecomorphological optimum, mean size and mean carnivory increased over the 40 million years of canid history, suggesting that other factors–perhaps interactions with other carnivoran competitors –significantly shaped the canid evolutionary trajectory.

Poster Session I (Wednesday, October 14, 2015, 4:15 - 6:15)

A REASSESSMENT OF THE MIDDLE MIOCENE LAGOSTOMINE CHINCHILLIDS (RODENTIA) OF QUEBRADA HONDA, BOLIVIA

BAMBA, Kanvaly, Case Western Reserve Universiity, Cleveland, OH, United States of America, 44106; CROFT, Darin, Case Western Reserve University, Cleveland, OH, United States of America

Quebrada Honda, a middle Miocene locality in Bolivia, represents an important interval in the history of the Cenozoic mammals of South America. Lying between the northern locality of La Venta, Colombia and southern localities in Patagonia, Quebrada Honda fills an important biogeographical gap in the midsection of the continent. Due to the intrinsic connection between an environment and its inhabitants, a thorough understanding of the paleofauna of Quebrada Honda is required to generate an accurate paleoenvironmental reconstruction of the locality and compare the site to others similar in age and/or geographic position.

Lagostomine chinchillids are amongst the most abundant fossils present at Quebrada Honda. However, the vast majority of this material has not been identified beyond the genus level (*Prolagostomus*) due in part to questions of how to identify intraspecific versus interspecific variation. To address this problem, we performed a qualitative and quantitative analysis of variation within the modern plains viscacha (*Lagostomus maximus*), the most closely related living species. *Prolagostomus* itself is similar to modern *Lagostomus*; major dental differences include less well defined laminae, a distinctly trilaminar M3 in *Lagostomus* but not *Prolagostomus*, and laminae that are more similar in size and shape within a tooth.

Sign-rank and t-tests suggest that metric variation seen within Quebrada Honda chinchillid specimens (n = 121) exceeds that in modern *Lagostomus* and that more than one species is present at the site. Using a combination of type specimens, classic literature, and context provided by the variation of modern *Lagostomus*, we assign most of the Quebrada Honda specimens to *Prolagostomus profluens*. This species is identified by distinctive enamel reduction patterns, especially wide anterior laminae except in P4 and M3, and a short prolongation on M3. *Prolagostomus divisus* is the next most abundant species. It is similar to *Prolagostomus profluens* but differs in having more quadrangular cheek teeth, a relatively narrow P4, narrower anterior laminae across all cheek teeth, and a longer, more posteriorly oriented prolongation on M3. One lagostomine specimen is of uncertain taxonomic assignment. Both of the species identified at Quebrada Honda are also found at Santa Cruz, Argentina, a late early Miocene locality some 3,000 km to the south. This suggests a very wide temporal and geographic range for these chinchillid species.

Poster Session III (Friday, October 16, 2015, 4:15 - 6:15)

NOTABLE CRETACEOUS–PALEOGENE (K–PG) BOUNDARY EXPOSURES IN SOUTHWEST SASKATCHEWAN, CANADA: A WINDOW ONTO EXTINCTION

BAMFORTH, Emily L., Royal Saskatchewan Museum, Eastend, SK, Canada, S0N 0T0; TOKARYK, Tim T., Royal Saskatchewan Museum, Eastend, SK, Canada; FENDLEY, Isabel M., McGill University, Montreal, QC, Canada

The latest Mesozoic and earliest Cenozoic rocks of southwest Saskatchewan contain some of the finest exposures of the Cretaceous–Paleogene (K–Pg) Boundary in North America. The upper Maastrichtian ('Lancian') Frenchman Formation, coeval with the Hell Creek and Lance formations in the USA, and the overlying Paleocene Ravenscrag Formation preserve a complete and continuous sequence of time immediately before, during, and after the end-Cretaceous mass extinction event. These fluvial-deltaic deposits are fossiliferous, contain a wealth of vertebrate, invertebrate, and plant fossil data on both sides of the boundary. The continuous, fine-scale sequence of strata up to and across the Boundary also renders these sites ideal for geochemical studies of the extinction. Here we present three notable K–Pg Boundary sites from southwest Saskatchewan, found in Grasslands National Park (GNP), Chambery Coulee, and along Highway 37. Ongoing research into the abundant vertebrate microsites in the Frenchman Formation at GNP and Chambery Coulee has provided insights into pre-extinction paleoecological patterns during the latest Maastrichtian, and into the nature of paleobiodiversity drivers in the region. Plant macrofossil (leaf) data from GNP and Chambery Coulee have provided new paleoclimate estimates for central Canada, and have elucidated the role of forest fires in structuring Cretaceous forest ecosystem. The Highway 37 K–Pg Boundary site, in addition to being highly fossiliferous, contains geochemical clues about the nature of the extinction. Sediment samples from one meter below and one meter above the K–Pg Boundary clay were analyzed for sulphur concentration. The isotopic composition ($\delta^{34}S$) of the samples is currently being compared to values found in Chicxulub impact target rocks and rocks from volcanic sources. The stratigraphic relationship between any observed changes is suggested to constrain a relative timeline for the Deccan Traps volcanism and the Chicxulub impact, thus helping to elucidate the relationship each event had with the mass extinction and its recovery period. The K–Pg Boundary sites in Saskatchewan are one of the best places in North America to study the nature of the world's second-largest terrestrial mass extinction, and lend insight into the ecological patterns post-extinction recovery. The Royal Saskatchewan Museum, in collaboration with other institutions, continues to explore these unique and intriguing localities.

Poster Session IV (Saturday, October 17, 2015, 4:15 - 6:15)

DISCUSSION ON PARSIMONY ANALYSIS OF ENDEMICITY (PAE) METHODOLOGY WITH PHILOSOPHICAL PERSPECTIVES

BANDEIRA, Kamila L., Museu Nacional/UFRJ, Rio de Janeiro, Brazil; SOUZA, Rafael G., Museu Nacional/UFRJ, Rio de Janeiro, Brazil; RIFF, Douglas, Universidade Federal de Uberlândia, Uberlandia, Brazil

Biogeography methodologies were created to hypothesize the biogeographical history of taxa. The Parsimony Analysis of Endemicity (PAE) method classifies areas by their shared taxa in data composed of area vs. taxon matrices. The Most Parsimonious Cladogram (MPC), under the application of the parsimony algorithm, is generated in order to detect areas of endemism. The MPC is made rooting the PAE cladogram on a hypothetical 'all-zero' outgroup. Several critiques of this method can be partially summarized in: (1) the random area chosen, usually by geometrical divisions, not reflecting patterns or a historical approach; (2) use of a hypothetical outgroup for the rooting process; (3) the ingroup is considered to always be monophyletic, sharing the same biogeographic history; (4) the criterion of tree evaluation considers common ancestry, which is inapplicable to endemism; (5) the link between biogeographic processes (e.g., dispersion, vicariance, extinction) and the revealed pattern and; (6) the problem of taxon sampling that obscures the real distribution of a taxa. In the present work we defend PAE, answering the critics by proposing some changes in methodology. We propose a different confection and data treatment: (1) the area needs to be clearly chosen by methodology, prioritizing areas with the same history (e.g., same or compatible geological formation); (2) the analysis must be made without a root, then choose it based on the next node starting from the area that shares less taxa with others, making the ingroup not monophyletic a priori; (3) areas of endemism do not descend from each other; the MPC made by areas vs. taxa create a signal that some species share or not the same biogeographical history; (4) the biogeographic answer to the distribution can be found answering the question "Why does area X ...+ n have taxon A in contrast to area W ...+ n that does not have this taxon?"; we suggest that taxa must be selected at least at species level; finally, (5) taxon sampling will be a recurrent problem like missing data in phylogenetic analyses. We conclude that PAE can be helpful to find shared biogeographical history with the suggested modifications. We also conclude that taxa incongruently shared as parallelisms represent dispersal events and reversions represent local extinctions. Finally, the taxa congruently shared by two or more areas (synendemic), will represent synapomorphies and vicariance events.

Grant Information

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Poster Session II (Thursday, October 15, 2015, 4:15 - 6:15)

VERTEBRATE FAUNA AND UNGULATE BIOSTRATIGRAPHY OF THE HIGHLY FOSSILIFEROUS OSO SAND MEMBER, CAPISTRANO FORMATION, ORANGE COUNTY, CA

BARBOZA, Michelle, California State University, Fullerton, CA, United States of America, 92831; PARHAM, James F., John D. Cooper Archaeology and Paleontology Center, California State University, Fullerton, CA, United States of America; KUSSMAN, Brian N., California State University, Fullerton, CA, United States of America

The Oso Sand Member is the highly fossiliferous, nearshore facies of the Capistrano Formation, which spans the southwestern rim of the Los Angeles Basin in Orange County, California. Over 20 vertebrate taxa have been identified from this unit, including well preserved fossils of marine taxa, such as a nearly complete skull of a blue marlin and the most complete fossil walrus found to date. In addition to other marine mammals (whales and seacows), terrestrial mammals are also known from the Oso Sand Member including gomphotheriids, rhinocerotids, antelocaprids, canids, cricetids, and lagomorphs. Despite the abundance of material from Oso Sand Member sites, just three papers have reported on this unit: one paper focused on the skull of the blue marlin mentioned above, the other two mentioned mammal fossils in passing. We provide an overview of all known vertebrate fossils from Oso Sand Member, and establish a more refined age for the Oso Sand Member, which will help provide a temporal framework for ongoing paleontological studies. Based on stratigraphic correlation, the Capistrano Formation is reported as Upper Miocene to Lower Pliocene. Previous workers have referred to undescribed specimens to place the Oso Sand Member in the Hemphillian North American Land Mammal Age. Partial camelid teeth are identified as *Alforjas*, known from the late early to latest Hemphillian (Hh2 to Hh4). Horse teeth previously referred to *Pliohippus* (Barstovian to Hemphillian) are reidentified as *Dinohippus interpolatus*, which is characteristic of the early late Hemphillian (Hh3). Based on these identifications, we can constrain the age of the Oso Sand Member to the early late Hemphillian (Hh3). By better defining the age of the Oso Sand Member, we can place the marine and terrestrial vertebrate fossils from this unit into a more precise chronostratigraphic framework that allows us to make more detailed comparisons to other late Neogene faunas in California.

Grant Information

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