consistent morphological differences, but both closely resemble tarsals of *Cryptotopos*. Finally, many of the very smallest elements show substantial water wear which makes clear delineation of morphotypes difficult, but at least three astragalar and calcaneal morphologies are present. These very small tarsal morphs likely include tarsals pertaining to the diminutive "insectivores" known dentally from Castle Gardens, *Batodonoides* and *Parapternodus*. The presence of at least one additional morph may indicate the presence of a taxon at Castle Gardens that is not yet documented dentally. All of the very small elements differ substantially from tarsals of *Macrocranion* and Nyctitheriidae, indicating that the taxa they represent are unlikely to be closely allied to these forms.

Poster Session IV (Saturday, November 2, 2013, 4:15 - 6:15 PM)

USING MESOWEAR AND MICROWEAR TO INFER THE DIET OF *ASTRAPOTHERIUM* FROM THE LATE EARLY MIOCENE OF SANTA CRUZ, ARGENTINA

PEREZ, Nicole M., Case Western Reserve University, Cleveland, OH, United States, 44106; CROFT, Darin A., Case Western Reserve University, Cleveland, OH, United States; KELLOWAY, Tara L., Case Western Reserve University, Cleveland, OH, United States; PRYBYLA, Alix, Hawken School, Gates Mills, OH, United States; TOWNSEND, K.E. Beth, Midwestern University, Glendale, AZ, United States

Astrapotheres are an extinct group of ungulates that lived in South America from the Paleocene to at least the middle Miocene. Neogene astrapotheres, which are placed in the family Astrapotheriidae, are characterized by their large size (one to several tons), retracted nasal bones (suggestive of a proboscis), canine tusks, and low-crowned, lophodont cheek teeth. Based on craniodental and postcranial morphology, ecological habits of astrapotheres have generally been compared to living tapirs (Tapiridae), rhinos (Rhinocerotidae), elephants (Elephantidae), and/or hippos (*Hippopotamus*). The goal of this study was to use dental mesowear and low-magnification enamel microwear to infer astrapothere feeding ecology relative to these possible modern analogs. Our study was based on 38 specimens of *Astrapotherium* from the late early Miocene (Burdigalian Age) Santa Cruz Formation of southern Argentina (Santacrucian SALMA).

Dental mesowear and low-magnification stereomicrowear are two well-established, taxon-independent methods of paleodietary reconstruction that have been used by many investigators to assess diet in ungulates. Mesowear uses tooth cusp shape to gauge accumulated dietary abrasion (food-on-tooth wear) relative to attrition (tooth-on-tooth wear). We used a mesowear "ruler" based on modern ungulate teeth to score mesowear of astrapothere upper molars on a scale from 0 (high, sharp cusps) to 3 (flat, blunt cusps). Microwear reflects small scars left on tooth enamel by food. We scored astrapothere microwear on clear epoxy casts using low magnification (35x) on a Leica MZ 12.5 stereomicroscope with an ocular reticle that delineated a standard measuring area (0.4 x 0.4 mm). The microwear variables scored included numbers of pits, scratches, and gouges. The size and depth of pits were assessed qualitatively as was the texture of scratches (i.e., fine, coarse, hypercoarse).

Our results indicate that *Astrapotherium* was most likely a leaf browser. *Astrapotherium* microwear is characterized by intermediate pit densities and few or no gouges or puncture pits. Scratch densities are low and scratches are mainly of fine texture. The low mesowear scores observed in *Astrapotherium* (average <0.5) fall outside the range of modern grazers and fruit browsers but are near the middle of the distribution of modern leaf browsers. These findings suggest that a browsing rhinoceros such as *Dicerorhinus* may be the most appropriate modern analog for *Astrapotherium* in terms of diet and body size.

Poster Session III (Friday, November 1, 2013, 4:15 - 6:15 PM)

A MORPHOMETRIC CHARACTERIZATION OF CRANIAL SHAPE IN TERRESTRIAL CARNIVORANS BASED ON FOURIER ANALYSIS

PEREZ-CLAROS, Juan, University of Malaga, Malaga, Spain; MARTIN-SERRA, Alberto, Universidad de Malaga, Malaga, Spain; FIGUEIRIDO, Borja, University of Malaga, Malaga, Spain; JANIS, Christine, Brown Univ, Providence, RI, United States; PALMQVIST, Paul, University of Malaga, Malaga, Spain

A number of studies have shown that skull morphology reflects the ecological adaptations of terrestrial carnivores as well as their phylogenetic legacy. Here we use Fourier shape analysis for describing the dorsal outline of the cranium in a number of extant and extinct species in the order Carnivora. To evaluate to what extent the shapes of the outlines analyzed reflect phylogeny and/or adaptation, a principal components analysis was performed with the harmonic amplitudes of the Fourier analyses. Results obtained show that cranial morphology is highly constrained by the phylogenetic legacy of each carnivoran family, as those species belonging to the same family tend to be placed in the same region of the morphospace. However, a functional signal is also present. In particular, after controlling for size effects, there is a weak but significant correlation between an axis of morphological variation and the estimates of bite force at the level of the upper canine, while another independent axis is related to bite force measurements at the carnassial. The wide distribution of canids in the empirical morphospace reflects their ecological disparity, while the restricted dispersal on the plot of saber-tooth predators probably results from biomechanical constraints posed by their highly specialized, hypertrophied upper canines. Moreover, there is a general allometric trend for all carnivoran families, which is associated with the lateral expansion of the zygomatic arches, and two different allometric trends exclusive to canids and felids, respectively, which are linked to snout length. Our results show that phylogeny constrains to a large extent the morphological adaptive zone which carnivoran species can inhabit.

Poster Session IV (Saturday, November 2, 2013, 4:15 - 6:15 PM)

NEW DATA ON THE PHYLOGENETIC POSITION AND EVOLUTION OF DORTOKIDAE, THE ONLY PAN-PLEURODIRAN CLADE OF TURTLES RECOGNIZED IN THE EARLY CRETACEOUS OF EUROPE

PÉREZ-GARCÍA, Adán, Universidad Complutense de Madrid, Madrid, Spain; ORTEGA, Francisco, UNED, Madrid, Spain; GASULLA, José Miguel, Universidad Autónoma de Madrid, Madrid, Spain

Pan-pleurodiran turtles are poorly represented in the European pre-Santonian record. *Proterochersis robusta*, from the Late Triassic of Germany, is considered by several authors to be a representative of that lineage, while others identify it as a member of Testudinata outside crown-group Testudines. Platychelyidae is represented in the European record by the shell taxon *Platychelys oberndorferi* from the Late Jurassic of Germany and Switzerland. At the end of the Mesozoic, two pan-pleurodiran groups coexisted in Europe: Pelomedusoides and Dortokidae. Pelomedusoides was a lineage of Gondwanic origin very abundant and diverse during the Campanian and Maastrichtian of Europe. Dortokidae was an endemic European group. The systematic position of Dortokidae is currently in discussion, having being identified as the sister taxon of Eupleurodira (Chelidae + Pelomedusoides) or as the sister taxon of Pelomedusoides.

Dortokidae are relatively abundant in Campano-Maastrichtian sites of southwestern Europe, where the type species, *Dortoka vasconica*, was described. Dortokidae are also represented in the Maastrichtian of Romania, where "*Muehlbachia nopcsai*" was defined; and in the late Paleocene of that country, represented by *Ronella botanica*. The presence of this group has been reported in the Santonian of Hungary and the Campanian of Austria. Despite that Late Cretaceous record, Dortokidae were preliminarily indentified, based on scarce and fragmentary plates, from the Barremian of Spain (Vallipón, Teruel, Castellote Sub-basin, Maestrazgo Basin, Iberian Range).

New material of turtles from the early Aptian of Spain (Arcillas de Morella Formation), from Morella (Castellón, Morella Sub-basin, Maestrazgo Basin), is presented. That formation is well-known due to the high diversity of vertebrates, corresponding to terrestrial, freshwater and marine taxa. Several turtle taxa have been hitherto identified there, corresponding to a member of Solemydidae (stem Testudines) closely related to the British *Helochelydra nopcsai*, the xinjiangchelyid *Brodiechelys royoi* (stem Cryptodira) and, at least, an indeterminate member of the crown Cryptodira. The new specimens share many of the synapomorphies of Dortokidae, allowing their assignment to that clade, and also present a unique combination of characters that will be further analyzed. Therefore, this finding allows confirming the presence of Pan-Pleurodira in the Early Cretaceous, and shed light on the early evolution of Dortokidae.

Poster Session II (Thursday, October 31, 2013, 4:15 - 6:15 PM)

RECONSTRUCTIONS OF THE CHEWING MUSCLES IN EUROPEAN ADAPIDS AND SUBFOSSIL LEMURS

PERRY, Jonathan, The Johns Hopkins University School of Medicine, Baltimore, MD, United States, 21205; MACNEILL, Kristen, Pennsylvania State University, University Park, PA, United States; HECKLER, Amanda, Pennsylvania State University, University Park, PA, United States; HARTSTONE-ROSE, Adam, University of South Carolina School of Medicine, Columbia, SC, United States

Osteological correlates of chewing muscle size in extant strepsirrhines provide an opportunity for reconstructing chewing muscle size in extinct primates. The most reliable osteological correlates are those that most accurately represent muscle attachment areas. Here we reconstruct physiological cross-sectional area (PCSA) of temporalis, masseter, and medial pterygoid muscles from their attachment areas – measured from the skulls of subfossil lemurs of Madagascar and European adapids. We use regressions of attachment area against muscle PCSA from dissections of extant lemurs to obtain these reconstructed values for the extinct taxa. PCSA is of value as a correlate of maximum potential muscle force. Some members of each of the two extinct groups likely possessed very great chewing muscle PCSA relative to skull size. Overall chewing muscle PCSA is great for both extinct groups compared to extant strepsirrhines. Relative temporalis PCSA is especially great only in European adapids, not in subfossil lemurs. Relative masseter and medial pterygoid PCSA are especially great in both extinct groups, but more so in subfossil lemurs. Increase in PCSA of masseter and medial pterygoid in subfossil lemurs follows a trend seen in folivorous extant strepsirrhines: these muscles are emphasized in folivores relative to the temporalis. Gape might explain patterns in division of labor among the chewing muscles. The masseter and medial pterygoid are less susceptible to loss of leverage at gape than is temporalis, but they are also more vulnerable to stretch. It is more likely that the increasing emphasis on masseter and medial pterygoid in folivorous strepsirrhines (extant and extinct) is related to the need for powerful horizontal mastication. These data are used to create estimates of bite force at different gape angles. Such estimates are useful for incorporating food properties into dietary inferences.

Technical Session IX (Friday, November 1, 2013, 10:45 AM)

NEW DIRECT AND MORPHOLOGICALLY-INFERRED EVIDENCE OF PISCIVORY IN *MICRORAPTOR*

PERSONS, Walter, University of Alberta, Edmonton, AB, Canada, T5B 4VP; XING, Lida, China University of Geosciences, Beijing, China; BELL, Phil, Pipestone Creek Dinosaur Initiative, Clairmont, AB, Canada; CURRIE, Philip, University of Alberta, Edmonton, AB, Canada; MIYASHITA, Tetsuto, University of Alberta, Edmonton, AB, Canada

Since its original description, the four-winged dromaeosaur *Microraptor* has remained central to debates over the phylogenetic origins of modern Aves and the functional origins of avian flight. As such, the life habits of *Microraptor* have enticed much speculation, and this speculation has been frequently used to support broader theories. A new, fully articulated and nearly complete specimen of *Microraptor gui*