

Technical Session XV, Saturday 9:15

MAMMALS FROM RED OWM QUARRY, FOX HILLS FORMATION, SOUTH DAKOTA: AN "EDMONTONIAN" LOCAL FAUNA?

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Mammals from the Fox Hills Formation have been known for four decades and have been regarded as a Lancian-aged assemblage even though the Fox Hills Formation underlies both the Lance and Hell Creek Formations. Analysis of this local fauna indicates that marsupial taxa present are not the typical Lancian species and may in fact be the progenitors of the Lancian marsupial species. From Red Owl Q. comes a herpetotheriid marsupial, which is more plesiomorphic in its dental morphology than the widespread Lancian genus *Nortedelphys*. Two species of *Alphadon* are both more dentally plesiomorphic than either *A. marshi* or *A. wilsoni* which are Lancian in age. This local fauna also contains taxa, which are more typical of earlier NALMAs *Iqualadelphis* (Aquilian) and *Varalphadon* (Judithian). The Hell Creek Formation has an estimated duration of 1.46 million years prior to the K/T boundary age of 65.5 Ma (middle of Chron 29r). Thus the base of the Hell Creek Formation dates at about 66.71 Ma to 66.87 Ma. Lancian-aged assemblages also occur in the Scollard Formation in Alberta that occurs above the Kneehills Tuff, which has been dated at 66.8 Ma. Thus, Lancian assemblages are younger than 66.9 Ma and appear to be restricted to Chron 30n and 29r. The upper portion of the Fox Hills Formation correlates to the early portion of Chron 30n and a date of 67 Ma. The Timberlake Member of the Fox Hills Formation, which represents a lower unit of the formation in North Dakota and is equivalent to the level for Red Owl Quarry, has produced specimens of both marine and terrestrial vertebrates, which are associated with invertebrate taxa representing the *Jeletzkytes nebrascensis* Western Interior Ammonite Zone. This correlates all of the specimens (vertebrate and invertebrates alike) with the *Gansserina gansseri* Foraminiferal Zone suggesting an early late Maastrichtian age of 68 to 67 Ma for the unit. The Red Owl Q. Local Fauna resides in the temporal gap between Judithian and Lancian-aged paleofaunas; the Red Owl marsupial species could be used to help define an Edmontonian NALMA.

Poster Session I (Wednesday)

A REVIEW ON THE MARINE REPTILES OF PORTUGAL: ICHTHYOSAURS, PLESIOSAURS AND MOSASAURS

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The presence of marine reptiles from Portugal was reported as early as 1897. Ichthyosaurs have been reported from the Lower and Middle Jurassic (Sinemurian to the Aalenian). *Ichthyosaurus* sp., was recognized from Cádima, Murte, Cantanhede and Figueira da Foz. *Ichthyosaurus intermedius* was reported from São Pedro de Muel (Lower Toarcian), Alvaizere, Casal Lomba, and Praia da Nossa Senhora da Vitória (Sinemurian) and *Stenopterygius* aff. *unitis* is present in Alhadas, Pentalheira, Praia de Nossa Senhora da Vitória and Tomar (Aalenian). The genus *Stenopterygius* was also reported in Condeixa and Tomar. In addition, we report two new ichthyosaur specimens from the Pliensbachian of Água de Madeiros (São Pedro de Muel), one from the Domerian preserving a forelimb, vertebrae and teeth and a juvenile specimen dated as Carixian that preserves the cranial material and dorsal vertebrae and ribs. *Plesiosaurus* material includes a partial skull of *Plesiosaurus* sp. and part of jaw ascribed to aff. *Plesiosaurus*, both from the Toarcian of Alhadas, near Figueira da Foz and an unpublished tooth from the Middle Cretaceous of São Pedro do Estoril. The Kimmeridgian/Tithonian of Lourinhã Formation yielded a possible plesiosaur vertebra (ML813). An isolated vertebra from the Late Cretaceous Cenomanian of Alcântara is assigned to "*Cimoliasaurus*". Mosasaurs are known from two teeth from the Late Cretaceous of Aveiro. One was ascribed to the genus *Mosasaurus* and the relatively large size may support that referral; however, it is difficult to assign teeth to genus but based on its general form and possession of smooth enamel surface it is possible to conservatively refer the specimen to the subfamily Mosasaurinae. Marine crocodiles and chelonians have also been recognized from the Late Jurassic of Portugal.

Preparators' Session, Thursday 9:15

AIR ABRASIVE 101

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Air abrasive machines have become common tools in paleontological preparation laboratories. These are tabletop "sand blasters" and can be used to effectively remove matrix from large dinosaur bones to small delicate vertebrate fossils. They work on the principle that matrix is often softer than the enclosed fossil. This presentation will discuss many aspects of air abrasive use in the prep lab including purchasing and setting up such a machine, the pros and cons and limitations of using one in fossil preparation, safety aspects, and a primer on how to use it which will be useful for novices as well as seasoned professionals. Air abrasive use in conjunction with other tools of the trade will also be discussed.

Poster Session III (Friday)

PRELIMINARY INTERPRETATIONS OF THE ANDREW'S SITE QUARRIES AND THE INTERRELATION OF VERTEBRATE FOSSIL SITES IN THE CEDAR MOUNTAIN FORMATION IN THE YELLOW CAT TYPE AREA OF EAST-CENTRAL, UTAH

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The Andrew's Site quarries are in the upper part of the Yellow Cat Member of the Cedar Mountain Formation. Two superimposed bone horizons are separated by a 1 - 1.5 m interval that includes a sandstone splay around 25 cm thick, which laterally preserves iguanodontid and theropod tracks. In the lower horizon, scattered bone can be observed over a distance of more than 100 meters. Roughly 4m<sup>2</sup> of the lower horizon was excavated. The lower site predominantly preserves isolated scutes and spines of an ankylosaur, most likely *Gastonia*, in a purplish mudstone matrix. A hypsilophodontid foot was also found at this level about 100 meters away from the main quarry. The upper bone horizon is more restricted laterally than the lower, and the approximately eleven square meters of the upper horizon that was excavated may represent its entire extent. A large adult iguanodontid skeleton, cut by a drainage, was excavated from the upper site. After some months of preparation, the blocks collected from the upper site, in addition to the adult iguanodontid material, yielded remains of a juvenile iguanodontid (skull), a terrestrial crocodile (skull and skeleton), and a third skull, to be described in a later publication. With many months of preparation left, we are optimistic about possible future finds. The Yellow Cat type area is a hotbed of vertebrate paleontological sites. Within one square mile of the Andrew's Site quarries, five other sites containing five type specimens have been discovered. These sites are closely related stratigraphically and span the interval from the Lower Yellow Cat member to the basal-most Ruby Ranch member of the Cedar Mountain Formation. A future study will electronically map the vertebrate paleontological sites and their facies relationships in the Yellow Cat type area, using several correlative beds to stratigraphically tie the sites together. Mapping these sites is giving us a larger vision of what occurred here to preserve such a multitude of unique, important sites.

Technical Session VII, Thursday 1:30

MESOMYZON MENGAE: NEW SPECIMENS AND MORE INFORMATION

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More specimens of *Mesomyzon mengae* have been obtained from the same locality (Liutiaogou, Ningcheng, Inner Mongolia) where it was originally discovered. The new specimens provided new characters, confirmed a few characters we noticed before, and revealed new details of known characters. The new observations may help us better understand this Cretaceous lamprey. In the new specimens we were able to see the full body shape, the complete dorsal and caudal fins, the sucker and its structure in detail, the braincase, the nasal sac, and other characters. We also have specimens of amocoets on which we saw several special characters. Our further detailed study of these specimens will shed light on the ontogeny of this Mesozoic lamprey as well as the relationships between jawless and jawed animals, both extant and extinct, and add another exquisitely preserved rare taxon onto the list of extraordinary fossil finds. In addition, it may be possible for us to look into the preservation processes of the soft parts.

Technical Session IV, Wednesday 1:30

THE PERLS OF PINOCCHIO: ROBUSTNESS AND METHOD SELECTION IN GEOMETRIC MORPHOMETRICS

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Over the past fifteen years, landmark-based geometric morphometrics has become the de facto standard for morphometric studies in the natural sciences. This is largely due to the adaptation of a series of powerful methods for studying and visualizing morphological variation, and the dissemination of these methods by its practitioners in a series of workshops. The default approaches utilize thin-plate spline analyses and eigenvector analyses (relative warp analyses) after the specimen landmarks are superimposed using the generalized least-squares Procrustes (GLS) algorithm. Often overlooked, GLS is the pivotal element in this approach as all subsequent work depends on the veracity of this superimposition. If this fit is nonsensical, then subsequent analyses provide a very elegant solution devoid of useful information for the hypotheses being studied. As a small group of researchers have pointed-out for over twenty years, the GLS algorithm is severely flawed when analyzing shape in many biological situations. By relying on a weak statistic (the mean), the GLS algorithm generates landmark superimpositions that are variable and biologically unrealistic when localized landmark variation is present. We show that this effect, dubbed the Pinocchio Effect, is grossly underappreciated by morphometricians who fail to recognize how common it is in biological examples. Further, we report on simulations that show that the GLS fit is also problematic when landmark numbers are degraded in simulated morphologies. We suggest that a critical