Both modern and archaic crocodilian elements are present in the Lothagam fauna, matching the faunal mixture indicated by mammalian fossils, and reflecting the important stratigraphic position of the site, i.e., immediately prior to the end-Miocene extinction/embryonic turnover.

A NEW EARLIEST WASATCHIAN (W0) LOCALITY FROM THE BIGHORN BASIN, WYOMING.


The Oligocene Wasatchian biochron W0 was described by Gingrich in 1989 as the earliest mammal-bearing Eocene zone in North America. Unfortunately, this crucial interval in mammalian evolution is very poorly known. Only 334 mammalian specimens have been previously described. A new W0 locality named Castle Gardens, southeast of Worland in the Bighorn Basin, was discovered by our field crew in 1992 and recollected in 1998. During these field seasons over 100 identifiable mammalian remains were recovered, making it the second richest W0 locality known. Representatives from at least 14 mammalian genera have been recovered thus far (including Eucyptodon, Coryphodon, Eoconus, Dicyomis, Acanthodrampus, Chircus, Distacus, Hyopsodus, Eoecodon, Phacodus, Copex, Diacodexis, Hyracotherium, and Palaeohippomodon). The most common faunal elements in this assemblage are Copex denovi and Eoecodon parvus, which are also common at other W0 localities. However, the most abundant species at Gingrich's localities, Hyopsodus loomisi, is only represented by a single tooth at Castle Gardens. The Castle Gardens site is also distinguished from other W0 localities by the presence of two insectivore species. From Castle Gardens also comes additional support for the distinctiveness of W0 with the discovery of a new species of rodent. Three jaws recovered from Castle Gardens demonstrate morphology of the lower molars, such as unique hypohelid structure, which differentiate it from previously described rodents.


Until recently, the structure of the skull of Spinosaurus, a clade of basal tetanuran theropods of Cretaceous age, has been poorly known. Several authors have interpreted the greatly elongated but narrow snouts of these unusual predatory dinosaurs as reflecting piscivorous habits. Irritator challengereri is based on an incomplete skull with partially articulated mandible (Staatsliches Museum fuer Naturkunde Stuttgart, no. 58022) from the Romualdo Member of the Lower Cretaceous Santana Formation of northeastern Brazil. Detailed preparation of the holotype has significantly clarified the cranial structure of spinosaurid theropods. The elongated snout is very narrow transversely but deep dorsoventrally. The nasals and frontals form a median crest. There exists no evidence for a parietal crest as originally claimed. The long axes of the large antorbital fenestra and orbit are inclined posteriorly. The braincase is short anteroposteriorly but deep dorsoventrally. The conical teeth have almost straight crowns with distinct but unserrated carinae and are deeply imprinted in the jaws. The cranial features of Irritator challengereri indicate rapid and forceful jaw closure and prey items of limited size. Piscivory cannot be ruled out, but the transversely narrow and dorsoventrally deep (osseirostral) snout differs significantly from the tubular (platyrostral) snout in piscivorous crocodyliform archosaurs.

The Puget lowland deposits at the Dolese Brothers limestone quarry near Richards Spur, Oklahoma, represent the oldest known vertebrate-bearing terrestrial fissure fills. They have yielded the most diverse tetrapod fauna so far recovered from the Lower Permian, comprising 25 annuata and anannuata species, most of which were small and terrestrial. The vast majority of skeletal material, however, can be attributed to a single species, the early annuata Captorhinus aquiti. The strong contrast between this assemblage and most of its contemporary counterparts, which included large terrestrial and aquatic forms, suggests that the Richards Spur deposits represent an unusual palaeoenvironment. Recent discoveries of complete femora of large diapsids at this locality demonstrate that the uniqueness of the assemblage is not simply an artifact of depositional bias against the remains of large organisms. Geological studies showing that the deposits were possibly formed in a highland region where conditions would have differed greatly from those in the deltaic lowlands that characterize most other Early Permian tetrapod localities. The Richards Spur paleofauna thus provides clear evidence for an ecological and environmental dichotomy in southwestern North America during Early Permian time. The exact age of the deposits, however, remains uncertain, as different species suggest different biogeographical correlations. The overall morphology of the fissures enclosing the sediments has not been studied in detail, but it appears that some fissures form underground caverns rather than open vertical rifts.

'DISSECTING' A LATE PALEOZOIC VERTEBRATE PALEOENVIRONMENT: IDENTIFICATION OF A TRULY TERRESTRIAL ECOSYSTEM COMPONENT.

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The Lower Permian Bromacker locality in central Germany has yielded numerous well-preserved bones of vertebrates. The vertebrate assemblage of which we report is the best-preserved from North America. However, study of the stratigraphy, sedimentology, and basin context reveals that the overall depositional setting and history of this locality differ strongly from those generally accepted for Early Permian sites in the southwestern USA. Instead of a seasonally wet and dry, semi-arid to arid alluvial plain environments typical of the southwestern USA, Bromacker appears to preserve what was a non-seasonal, hot-and-humid, internally-drained microbasin or graben. Although there is some overlap between the Bromacker assemblage and typical redbed faunas of North America, it is dramatically devoid of any evidence of aquatic taxa. Remains of true amphibians and reptiles are rare and phacodontid pelvises are completely absent. It is dominated by the terrestrially adapted, high-fiber herbivore Diadectes. All other taxa recovered are terrestrially adapted: the Seymouriamorph amphibian Seymouria, a trematod amphibian Tambachia, a captorhinomorph Tharingothyra, an additional diacodexid, a holosaur reptile, and a possible microsaur. As in typical upland environments, large predatory carnivores (in this case carnivorous pelosauromorphs) are conspicuously rare. These data appear to present the first complete terrestrially assemblage known from the Late Paleozoic and suggest the faunal composition and taxonomic ratios of this component of terrestrial ecosystems, independent of aquatic components.

THE AGE, DEPOSITIONAL ENVIRONMENT AND TETRAPOD PALEOFAUNA OF THE LOWER PERMIAN FISSURE FILLS AT RICHARDS SPUR, OKLAHOMA.

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In 1998 a new bird of Late Cretaceous (Campanian) age has been recovered from eolian dune deposits of the Djadokhta Formation, exposed at Tagurkin Shire, central Gobi desert, Mongolia. The specimen is a moderately well articulated skeleton, that consists of the wing and shoulder girdle, including humeri, ulnae, radii, carpometacarpus, coracoid, scapulae, sternum, several vertebrae and pedal digits including terminal claws.

The specimen shares several synapomorphous characters with the Enantiornithes. Among these are: coracoid with dorsal depression and convex lateral margin; deep fossa on the cranial end of scapula; humeral head convex caudally and concave cranially; distal end of humerus strongly compressed craniocaudally; shaft of radius with a longitudinal groove on its...