BPT25-P01 Room:Convention Hall Time:May 24 18:15-19:30

A remain of a gigantic oviraptorosaurian (Dinosauria: Theropoda) from the Upper Cretaceous of the Gobi Desert

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A large, isolated symphyseal region of fused contralateral dentaries belonging to a caenagnathid oviraptorosaurian was found in the lower Upper Cretaceous Bays Shire Formation cropping out at Tsagaan Teg in the Mongolian Gobi Desert. This specimen is comparable in size and morphology to the gigantic caenagnathid *Gigantoraptor erlianensis* known from the Iren Dabasu Formation in China, and may be closely related to the latter species. The occurrence of the specimen of a possible affinity with *G. erlianensis* in the Bays Shire Formation is consistent with the hypothesized correlation between the Bayn Shire and Iren Dabasu formations proposed based on vertebrate fossils, especially turtles.

Keywords: Mongolia, Gobi Desert, Oviraptorosauria, Cretaceous, Dinosauria

BPT25-P02 Room:Convention Hall Time:May 24 18:15-19:30

Desmostylian phylogenetic relationship revisited

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Desmostylia is an extinct clade of marine mammals. They belong to Tethytheria or possibly Perissodactyla. They lived in North Pacific Rim from earliest Oligocene to earliest Late Miocene and are already extinct at the order level. Traditionally, Desmostylia has been divided into two families, Desmostylidae and Paleoparadoxiidae, based on their teeth morphology, with the former including 4 or 5 genera (*Ashoroa*, *Cornwallius*, *Kronotherium*, *"Vanderhoofius"*, and *Desmostylus*) and the latter 4 genera (*Behemotops*, *Archaeoparadoxia*, *Paleoparadoxia*, *Neoparadoxia*). Although the phylogenetic relationships within Desmostylia have been mostly unclear, two hypotheses were proposed: either both Desmostylidae and Paleoparadoxiidae are monophyletic groups, or Paleoparadoxiidae comprise paraphyletic outgroups for Desmostylidae. One factor contributing to such difference in the hypothesis was the lack of well-preserved specimens that can be used as suitable outgroups for phylogenetic analyses. Cooper et al. (2014), however, described a well-preserved skull of *Anthracobne* that is considered as an appropriate outgroup of Desmostylia. In this study, at first, I ran analyses on data matrices on the desmostylian interrelationship published in previous studies to examine reproducibility of the results, i.e., whether or not tree topologies reported in these studies could be recovered. Second, I analyzed the Desmostylian relationship by newly adding *Anthracobne* as an out-group to such data sets after examining the accuracy of their character coding. Phylogenetic analysis was conducted with equally weighted parsimony using TNT v. 1.1 (Goloboff et al. 2008). One thousand replicates of tree bisection reconnection branch swapping were run holding ten trees per replicate with all zero-lengths branches collapsed. For this analysis, published data sets were combined and revised to include 5 species of Desmostylia and 5 species of Paleoparadoxiidae. A whole data matrix including both cranial and postcranial characters and a culled matrix including cranial characters only were separately analyzed. In this analysis, analyses on both the whole and culled data sets resulted in Paleoparadoxiidae forming paraphyletic, successive outgroups for the monophyletic Desmostylidae. This result provides a phylogenetic framework for discussing various aspects of Desmostylian evolution.

Reference

Cooper et al. (2014). Anthracobunids from the Middle Eocene of India and Pakistan Are Stem Perissodactyls. PLoS One 9(10): e109232.

Goloboff et al. (2008). TNT, a free program for phylogenetic analysis. Cladistics 24: 1-13.

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Avian wing loading and aspect ratio correlate with track

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Avian have two completely different styles of locomotion, flight and bipedal walking, and use them properly depending on situations. Avian track shapes are divided into three groups corresponding to habitat types, suggesting bipedal walking is controlled by habitats. Is flight, another locomotion type, controlled the same? To investigate it, we obtained data of wing shapes and bodyweights from modern birds, and examined if they showed similar groupings related to habitats. Multiple regression analyses reveal that wing loadings and wing aspect ratios for birds in each group defined by track shapes exhibit separate clusters that do not overlap with each other. This result shows that wings are also divided into three groups corresponding to habitat types, the same with track shapes. Thus, habitats unambiguously affect avian flight as well as walking. Past avian wings are seldom remained as fossils, whereas past avian tracks are often preserved fossilized. The correspondence relation between wing aspect ratio/wing loading and track shapes may constrain the past avian flight ecology and behavior from fossilized track records.

Keywords: ornithology, wing morphology, flight ecology, avian locomotion, multiple regression analysis, paleobiology

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Implication of peculiar internal fracturing in fossil nautiloids

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Extinct Miocene nautiloid *Aturia cubaensis* from Uchiura Group (Fukui Prefecture) shows internal septa fragmentation though the outer wall is intact. Similar broken nautiloids fossils with intact outer walls and fragmented septa have been reported since 1980s and were interpreted as 'implosion', the fragmentation by increasing ambient water pressure during a dead shell sinks. In these *A. cubaensis*, however, sipluncles are filled with mud and mangled. This indicates this fragmentation occurred after a burial of the empty shell.

Septal fragmentation occurs at adapically half from a last septum. Intact air chambers are filled with grayish white mudstone though a fossil matrix is dark gray mudstone. Former is composed of matrix-supported and high porosity (about 25 - 35 %) and latter is grain-supported and low porosity (below 20 %). On the other hand, porosity of mudstone infilling of the siphuncle has usually high (more than 40 %). Especially it is highest at the collapse boundary between intact air chambers and fragmented septa (up to 70 %). In addition, clay minerals concentrates in the siphuncle near the collapse boundary. These lines suggest that the siphuncle-infilling soaks up the water in air chambers in diagenesis. This depressurizes insides of air chambers and thus makes considerable pressure difference between inside and outside of a buried nautilus shell, and finally septa collapse.

This internal fragmentation has not been found from ammonoids. Deformation of ammonoids occurs in outer walls mainly and can be explained by simple compactional process except for dissolution. This suggests difference of strength of structure between shells of nautiloids and ammonoids. Detailed taphonomic analysis could be a clue to structural mechanics of cephalopods shells.

Keywords: taphonomy, nautiloid, Miocene, diagenesis

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Chemotaxonomic fingerprints of alkenones and alkenoates in sediments of Lake Naga-ike on the Skarvsnes, Antarctica

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Long chain alkenones and alkenoates are widely distributed in marine sediments and their extent of unsaturation ($U^{K}{}_{37}$, $U^{K'}{}_{37}$) is extensively used for reconstruction of paleo sea surface temperature. Alkenones and related compounds have also been detected in various lakes, although there is a wide variation in alkenone compositions and the temperature calibrations between individual settings. These variations probably reflect the difference in alkenone producing species (strains) in lakes. Indeed, recent DNA analysis revealed that multiple lineages of the order Isochrysidales are distributed among alkenone containing lakes, and is considered to be engaged in the alkenone production (2-3). Culture based investigation on temperature calibrations suggested the significant variation of calibrations among Isochrysidaceae species (*Isochrysis galbana* (4), *Pseudoisochrysis paradoxa* (5) and *Chrysotila lamellosa* (6)). Therefore, taxonomic identification of alkenone producers is essential to the proper selection of calibrations and thus lead to better application of alkenone paleothermometer in lakes.

To elucidate chemotaxonomic characteristics of the compositions of alkenone and related compounds, we have been cultured 9 strains covering all 3 genera (*Chrysotila*, *Isochrysis*, *Tisochrysis*) of the family Isochrysidaceae, and proposed that the lack of tetraunsaturated alkenones are common characteristic for genus *Tisochrysis* (7). In this study, cultured Isochrysidaceae strains as well as sediments of antarctic lake Naga-ike were examined further into the compositions of alkenones and alkenoates. We discuss chemotaxonomic feature of triunsaturated alkenone isomers and novel C_{38} alkenoate which could be identified by a recently-developed method (8) using gas chromatography column with dipole selective stationary phase. Isomer of triunsaturated alkenones have previously identified from high latitude lakes (BrayaSø, Toolik Lake), which are characterized by a significant proportion of triunsaturated isomers ranging C_{37}-C_{39}(8). Meanwhile, triunsaturated alkenone isomer detected from *C. lamellasa* were solely C_{38}. Occurrence of C_{38} triunsaturated isomers along with novel C_{38} alkenoate are proposed as characteristics of *C. lamellosa* in the family Isochrysidaceae.

Lake Naga-ike is a freshwater lake on the Skarvsnes, Antarctica, and biomarker analysis has been carried out by (9) revealing ca. 3000 yrs record of alkenone compositions. Examination of the sediment of Lake Naga-ike by a new method (8) revealed that the co-occurence of C_{38} triunsaturated alkenone isomers and novel C_{38} alienate, suggesting a possible contribution of *C. lamellosa*. By using a calibration obtained from a culture strain *C. lamellosa* calibration (6), paleotemperature are calculated to be 9.2-15 ℃ in surface sediments of Lake Naga-ike. The estimated temperatures are concordant with a summer temperature of lake waters observed in Naga-ike, while other known culture based calibrations estimated extremely-low temperatures. This result may afford collateral evidence for the occurrence of alkenone producer closely related to *C. lamellasa*.

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Keywords: alkenone, Haptophytes, chemotaxonomy, lake sediments, paleothermomater

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An index of morphological turnover across a chronological boundary

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Study on morphological diversity over geologic time has been conventionally based on the patterns of disparity change. Change in disparity across a mass extinction event is determined by the relationship between a temporary decrease in morphological variation and subsequent introduction of new variation after the event. In the case of a balanced relationship, the disparity remains constant throughout the interval, even if the morphology was totally changed. An alternative approach is an analysis of morphological turnover in which appearance patterns of morphospace occupation are compared between the adjacent geochronological units. However, conventional morphospace analyses have omitted abundance of each species. Here, I would introduce an index representing how drastically the pattern of morphospace occupation changes. The index takes into account the abundance of each species based on the collection-based occurrence data deposited in the Paleobiology Database. The analysis of the morphological turnover begins with depicting the landscape of the probability density of data in a morphospace for each chronological bin using multi-dimensional kernel density estimation. The similarity between a pair of the landscapes can be represented by a correlation coefficient of the probability density computed for each point in the multi-dimensional morphospace. The value of 1 minus the correlation coefficient is defined as an index of morphological turnover. This index is sensitive to change in morphospace occupation pattern.

Keywords: morphospace, disparity, mass extinction and recovery