

モンゴル国ゴビ砂漠上部白亜系産の巨大オビラプトロサウルス類 (恐竜類: 獣脚類) について

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

對比地 孝亘^{1*}; 渡部 真人²; バルスbold リンチェン³; ツオクトバートル キシゲジャブ³
TSUIHIMI, Takanobu^{1*}; WATABE, Mahito²; BARSBOLD, Rinchen³; TSOGTBAATAR, Khishigjav³

¹ 東京大学理学系研究科地球惑星科学専攻, ² 大阪市立大学理学部地球教室, ³ モンゴル古生物学センター
¹The University of Tokyo, ²Osaka City University, ³Mongolian Paleontological Center

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.

キーワード: モンゴル, ゴビ砂漠, オビラプトロサウルス類, 白亜紀, 恐竜
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Desmostylian phylogenetic relationship revisited Desmostylian phylogenetic relationship revisited

松井 久美子^{1*}
MATSUI, Kumiko^{1*}

¹ 東京大学大学院理学系研究科地球惑星科学専攻
¹Department of Earth and Planetary Science, University of Tokyo

Desmostylian 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, Desmostylian 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 Desmostylian 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 Desmostylian. 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 Desmostylian 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

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

鳥類の翼と足跡の形態学的研究～足跡化石の“かたちと大きさ”から絶滅鳥類をどこまで復元できるのか？～
Avian wing loading and aspect ratio correlate with track

田中 郁子^{1*}
TANAKA, Ikuko^{1*}

¹ 神戸大学大学院理学研究科

¹ Graduate School of Science, Kobe University

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.

キーワード: 鳥類学, 翼形態, 飛行生態, 鳥類移動様式, 重回帰分析, 古生物学

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

化石オウムガイ類に固有な埋没後破壊の解明 Implication of peculiar internal fracturing in fossil nautiloids

唐沢 與希^{1*}; 前田 晴良²

KARASAWA, Tomoki^{1*}; MAEDA, Haruyoshi²

¹ 京都大学大学院理学研究科, ² 九州大学総合研究博物館

¹Graduate school of Science, Kyoto University, ²The Kyushu University Museum

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, siphuncles 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.

キーワード: タフォノミー, オウムガイ類, 中新世, 続成作用

Keywords: taphonomy, nautiloid, Miocene, diagenesis

湖沼堆積物のアルケノン組成にみられる化学分類学的特徴：南極スカルブスネス地域、長池のアルケノン生産種推定 Chemotaxonomic fingerprints of alkenones and alkenoates in sediments of Lake Naga-ike on the Skarvsnes, Antarctica

中村 英人^{1*}; 竹田 真由美¹; 沢田 健¹; 高野 淑識²
NAKAMURA, Hideto^{1*}; TAKEDA, Mayumi¹; SAWADA, Ken¹; TAKANO, Yoshinori²

¹北海道大学, ²海洋研究開発機構
¹Hokkaido Univ., ²JAMSTEC

長鎖不飽和アルキルケトン (アルケノン) やアルケノエイトは海洋堆積物中に広く分布し、アルケノン不飽和度 (U^{K}_{37} , U^{K}_{37}) は海洋表層水温の復元に応用されている。アルケノンは世界中の湖沼からも検出され、陸域の古水温指標としての応用が検討されているが、海洋におけるアルケノン不飽和度-水温換算式 (1) が世界中の海洋表層水温をよく復元するのに対して、湖のアルケノン組成や水温換算式は湖ごとに多様であり、これは湖沼のアルケノン生産者の多様性を反映していると考えられている。実際、海洋のアルケノン生産者はハプト藻 Noelaerhabdaceae 科の汎存種である *Emiliana huxleyi* が主であるのに対して、湖沼のアルケノン生産者は Isochrysidaceae 科に属する *Chrysotila lamellosa* をはじめ、未記載種を含む複数の系統のハプト藻がアルケノン生産に関与していることが分かってきた (2-3)。Isochrysidaceae 科のアルケノン生産種の水温換算式の検討例は少ないが、*Isochrysis garbana* (4)、*Pseudoisochrysis paradoxa* (5)、*C. lamellosa* (6) の培養実験から、アルケノン生産者の系統による検量線の違いが顕著であることが示唆されている。したがって、湖沼における古水温計としての精度を高めるためには、生産種に応じて最適な検量線を選択する必要があると考えられる。

生産種の推定に役立つアルケノン組成の化学分類学的特徴を明らかにするため、これまでに、Isochrysidaceae 科の 3 属 (*Chrysotila* 属, *Isochrysis* 属, *Tisochrysis* 属) の培養実験により、*Tisochrysis* 属が 4 不飽和アルケノンを持たないことで他の 2 属と区別されることを指摘した (7)。本研究では、中極性カラムによる新しいアルケノン分析手法 (8) を用いてこれらの培養株のアルケノン組成を解析したところ、*Isochrysis* 属と *Chrysotila* 属から新規 C₃₈ アルケノエイトを見いだした。加えて、*Chrysotila* 属は C₃₈ 3 不飽和アルケノンの異性体も含んでいた。3 不飽和アルケノン異性体は、天然では北半球高緯度の湖沼 (Braya Sø, Toolik Lake) から報告されているが、これらの湖では C₃₇?C₃₉ の 3 不飽和アルケノンのいずれについても異性体が含まれるのに対し、*Chrysotila* 属で検出された 3 不飽和アルケノンの異性体は C₃₈ のみである点が異なっていた。新規 C₃₈ アルケノエイトの含有は *Isochrysis* 属と *Chrysotila* 属に共通の、3 不飽和アルケノン異性体の C₃₈ に限った含有は *Chrysotila* 属に特有の組成である可能性がある。

さらに、南極スカルブスネス露岩地域に位置する長池の堆積物のアルケノン組成を中極性カラムを用いて解析したところ、新規 C₃₈ アルケノエイトが検出され、3 不飽和アルケノン異性体は C₃₈ のみが検出された。長池ではこれまでに過去約 3000 年間にわたるアルケノン不飽和度の変遷を含むバイオマーカー分析が行われている (9)。長池堆積物のアルケノン組成のパターンが既知の培養株の特徴のうち *C. lamellosa* に類似していたことから、*C. lamellosa* の U^{K}_{37} -水温換算式 (6) を用いて表層堆積物の古水温を計算したところ、9.2-15° C となり、これは長池で観測される夏の湖水温と調和的であった。湖沼のアルケノン生産者に関連した種の培養株の温度換算式はまだ少ないが、他の株の換算式では極端に低い温度が復元されてしまうことも、長池で *C. lamellosa* がアルケノン生産に寄与していたことの傍証となると考えられる。

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キーワード: アルケノン, ハプト藻, 化学分類, 湖沼堆積物, 古水温復元
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地質年代境界における形態的回転の評価法 An index of morphological turnover across a chronological boundary

生形 貴男^{1*}
UBUKATA, Takao^{1*}

¹ 京都大学
¹ Kyoto University

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.

キーワード: 形態空間, 異質性, 大量絶滅と回復
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