Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

BPT27-P01 Room:Convention Hall Time:May 25 15:30-17:00

Taphonomy and geology of dinosaur fossil localities in the Gobi desert, Mongolia

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Many dinosaur fossil localities of Mesozoic age are distributed in the Gobi desert, Mongolia. The geologic age of these localities is mainly late Cretaceous, however, there are those with early Cretaceous and late Jurassic age. The sedimentological environments of these localities have been clearly understood by joint expeditions between Mongolia and Japan, or with U.S. In addition to the results, taphonomy of those localities and dinosaurs there has also been understood. The localities are all continental. The upper Cretaceous is of mainly fluvial and partially alluvial origin. In Campanian period, the wide distribution of eolian beds with dinosaur fossils, by development of arid environments is observed. Those two different environments existed in the same time. From those coexisting fluvial and eolian beds, mass burial sites of dinosaurs were found.This mass burial events are occurred in sandstorm in the eolian condition, and in flood and mud-trap in the fluvial. The eolian beds yield lizard, turtle, and Mesozoic mammals, bird, and dinosaur footprints. In the terminal Cretaceous, the eolian environments became minor, and fluvial environments were widely distributed. From the fluvial beds, mainly flood plain and channel deposits, isolated and partially articulated dinosaur bones, turtle, lizard, crocodiles, fish, and pterosaur are found. The footprints of dinosaurs are preserved on the food plain deposits. In early Cretaceous, fluvial and lacustrine environments are dominant. The former yields rich dinosaur fossils, and the latter rich plant and insect fossils, together with bird feathers. The oldest dinosaur bearing beds, the upper Jurassic, deposited in fluvial condition, yields sauropod dinosaur, crocodiles, and synapsid reptile. The reconstruction of sedimentary environments of those localities in the Gobi desert provides important information for understanding of ecology, behavior, habitat, and kinetics of dinosaurs. For this, taphonomy of those fossils should be correctly interpreted.

Keywords: dinosaur, Mongolia, Mesozoic, taphonomy

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The trionychian turtles from the Middle Miocene to Lower Pleistocene in Myanmar and its paleobiogeographic implications

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The Irrawaddy Group, the latest Middle Miocene to Early Pleistocene fluvial sediments widely distributed in central Myanmar, yields a number of terrestrial vertebrate fossils such as mammals and turtles. A nearly complete carapace of large Trionychidae and three peripherals of Carettochelyidae were newly discovered from the Gwebin and Magwe areas.

The nearly complete carapace of the Trionychidae is 60cm long and wide, suggesting its total shell length as about 90cm long when living. Trionychid synapomorphies such as losses of scute sulcus, peripherals, pygal and suprapygals, and well-developed pocked mark sculptures on the dorsal surface, are observable. The nuchal is much wider than long, with a nearly straight anterior margin. Its distal ends bend toward latero-posteriorly, nearly attaching to the distal parts of the first costals. The first neural is elongated and hexagonal, with curved anterior border with nuchal. The first and second costals have distinct rib ridges on the proximal ventral surface. Ventral surfaces of the first to third thoracic vertebrae are flat, without median ridges. These characters are shared by the genus Chitra, and are quite similar to Chitra chitra that is distributed in Thailand and Malaysia. However, this specimen has a few unique characters such as a sinuous margin at the distal end of the second costals and the well developed eighth costal.

The left first, second and the right ninth peripherals can be determined as a turtle of the family Carettochelyidae based on the distinct sculpture on their surfaces, consisting of fine tubercles. There is no sulcus on their surfaces. Carapace is estimated as about 70cm long at maximum. These specimens are the first record of carettochelyids from the Neogene in Asia. Carettochelyids first appeared during Albian in Asia, and extended its geographical distribution to North America, Europe and Africa during Paleogene. However, their fossil records are very sparse in Neogene. Only two peripherals are known from the Miocene sediments of Germany and Zaire.

All specimens except for the left second peripheral have yielded from the upper Pliocene in the Gwebin area. The Pliocene carettochelyid from Myanmar are the latest known record of this family except for a living species (Carettochelys insculpta) in New Guinea and Northern Australia. They seem extinct during Pleistocene as well as pleurodilan turtles such as Shweboemys pilgrimii. Fossil turtles from Myanmar should be important to make a contribution to the paleobiogeographic history of tropical Asia.

Keywords: Myanmar, Cenozoic, Irrawaddy Group, Fossil turtles, Trionychia

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Rodents from the upper Miocene to the lower Pleistocene of central Myanmar

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Here we report some rodent fossils (Hystricidae, Spalacidae, and Muridae) were newly discovered from the upper Miocene to the lower Pleistocene Irrawaddy sediments of central Myanmar.

All fossils of Hystricidae was identified as *Hystrix*, including two species, *Hystrix paukensis* and *Hy*. cf. *brachyura*. The former was continuously occurred from the upper Miocene to lower Pleistocene, while the latter was found only from the upper Pliocene to the lower Pleistocene. The comparisons of cheek teeth indicates *Hy*. *paukensis* has much larger and lower teeth than *Hy*. cf. *brachyura*. The occurrence of *Hy*. cf. *brachyura* from the Irrawaddy sediments indicates the lineage of *Hy*. *brachyura* likely appeared in Inland Southeast Asia as early as the late Pliocene.

The fossils of Spalacidae includes an indeterminate species, but it is surely assigned to Rhizomyinae represented by *Rhizomys* and *Cannomys*, both presently exist in central Myanmar. Rhizomyinae is known from the lower Miocene of Asia. Here, we compare the fossils from the Irrawaddy with ancestral genera such as *Kanisamys* and *Brachyrhizomys* from the middle Miocene Siwaliks in Indo-Pakistan and *Rhizomys* from the Plio/Pleistocene of China.

The fossils of Muridae include at least four species, a large-, two medium-, and a small-sized forms. The large one is reffered to *Hapalomys* that is a common arboreal rat presently exist in Southeast Asia. The specimens from the Irrawaddy sediments are similar to *Ha*. *longicaudatus* presently lives in a southern part of Myanmar, but there are slight differences between them in the occlusal pattern of the first lower molar. One of the medium species is reffered to cf. *Ratchaburimys* that is an extinct genus occurred from the upper Pliocene to the lower Pleistocene of Thailand. Thus, the rodent assemblage during Plio/Pleistocene from Myanmar is correlated with that from Thailand. Another medium-sized and small-sized murids are now in identification.

Keywords: Rodentia, Myanmar, Neogene, Paleontology

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Effects of dietary difference in sympatric environment on mesowear analysis

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Mesowear analysis is one of the methods for reconstructing diets based on facet development on the occlusal surface of cheek teeth. It has been applied mainly to reconstruct the food habit of extinct species and paleoenvironments they live in. However, there was little knowledge about the effect of paleodiet difference in sympatric environment. This limitation cause troublesome when apply this method to fossil assemblage. The aim of this study was to determine the sensitivity of mesowear analysis.

Intraspecific comparison was conducted by using the wild population of sika deer (*Cervus nippon*) in the Kinkazan Island, northern Japan. Then, there were significant differences between the sex (Fisher's exact test (FET): $P < 0.05$) and hierarchical cluster analysis (HCA) with other the reference data classified doe deer into mixed feeders and stag deer into grazers.

Interspecific comparison was conducted by using the wild populations of the Japanese serow (*Capricornis crispus*) and the sika deer in Nikko National Park, central Japan. Mesowear variables frequencies of them were also significantly different (FET: $P < 0.05$), and the population of Japanese serow was classified into browsers and the population of sika deer was classifed into mixed feeders by HCA.

As previous ecological surveys well supported these results, we concluded that mesowear analysis detected dietary difference in sympatric area with high precision.

Keywords: paleodiet, Cervus nippon, Capricornis crispus, teeth, mesowear analysis

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The relationship between astragalar size and body mass in land mammals: Estimating body mass of fossil species

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Astragalus is a compact and easily handleable bone. Astragalar fossils have been well studied as an indicator of the functional morphology and phyletic relationships of many mammals. However, few studies have investigated the relationship between astragalar size and body mass, even though the body mass of animals strongly correlates with their ecology and physiology and the body mass of fossil taxa has been intensively estimated by several methods.

In this study, I examined the allometric relationship between body mass and astragalar size in extensive extant land mammals (11 orders, 48 species, 80 individuals; body mass ranging from 18 g to 3.4 metric tons) using regression analysis. The results indicate that the best body mass estimator for extensive land mammals is the tibial trochlear size rather than the total size of the astragalus. For example, the body mass is estimated using the width of the tibial trochlea by the following formula (R^2 = 0.985; %SEE = 42.0; %PE = 28.8): ln (body mass [g]) = 2.789 X ln (width of tibial trochlea [mm]) + 2.078.

Then, the body masses of several Paleogene land mammals were estimated using the results of the regression analysis. The estimated body masses are consistent with the results by previous studies. For example, the body mass of the largest terrestrial mammal that ever lived, '*Indricotherium*,' was estimated to be about 10-15 metric tons. Therefore, the regression equations by this study using the astragalus are useful for estimating body masses of fossil land mammals and have the potential to be widely applied to quantitative ecological and physiological studies of fossil mammals.

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Rhinocerotid (Mammalia, Perissodactyla) fossil from Takashima Island, Nagasaki, Kyusyu, Japan

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Mammalian fossil was discovered from Takashima Island, Nagasaki, Kyusyu, Japan. This material consist of six cervicals including axis, eight thoracic vertebrae, three lumbar vertebrae, a sacrum, right ilium, 17 libs, a metacarpal, right tibia, right fibula, right and left astragali, left calcaneum, right and left naviculars, right ectocuneiform, three right metatarsals, and four phalanges. This character of tibia, astragali, calcaneum, and metatarsals of this materials fossil suggests Family Rhinocerotidae.

Keywords: Kyusyu, rhinocerotids, mammal, Early Miocene

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The Late Miocene Elasmotheriini (Rhinocerotidae, Mammalia) from the Namurungule and Nakali Formations of northen Kenya

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The Japan-Kenya joint expedition team has discovered abundant large mammal fossils from the Late Miocene Namurungule and Nakali Formations, northern Kenya. We reported several rhinocerotid fossils from Namurungule and Nakali Formations.

The specimen from Namurungule Formation consists of a maxilla with upper M2 and M3, a mandibular fragment with lower P4 to M2 and isolated teeth of upper P4 and M3. This specimen was preliminary identified as Iranotheriinae sp. nov. (Nakaya et al., 1987). The specimen from Nakali Formation includes isolated teeth of upper M1 or M2 and M3.

These specimen share following characters of Elasmotheriini, crown cement, constricted protocone of upper molar and labiolingually elongated postfossette of upper P4. Therefore, the specimen from Namurungule and Nakali Formations is identified as Elasmotheriini.

We compared the specimen of Namurungule and Nakali Formation with ten genus of Elasmotheriini. As a result, these are similar to genus *Huaqingtherium* from Middle Miocene, China (Huang and Yan, 1983) in characters lingually elongated protoloph and metaloph, undeveloped enamel folding and small crochet. However, molar size of these specimen is smaller than that of *Huaqingtherium*.The specimen from the Namurungule and Nakali Formations has enamel plication in the medisinus of the upper molars. This character is not seen in the upper molars of *Huaqingtherium*. Moreover, the specimen from the Namurungule and Nakali Formations was discovered from Late Miocene. In contrast, *Huaqingtherium* was discovered from the Middle Miocene. Therefore, the specimen of the Namurungule and Nakali Formations is identified as new taxon.

Keywords: Kenya, Rhinocerotidae, Late Miocene, mammal, teeth

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New Tetraconodontinae (Suidae) from the latest Middle Miocene in the Chiang Muan Formation, the northern Thailand

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The Chiang Muan Mine is one of the most famous fossil sites in the Thailand because of the discovery of the earliest large-bodied Miocene hominoid in Southeast Asia (Kunimatsu 2002: Chaimanee et al. 2003: Kunimatsu et al. 2004). The Chiang Muan Mine is composed of the Chiang Muan Formation. Due to the lack of igneous rock layers, the age of the Chiang Muan Fm. had been controversial until the magnetostratigraphic analyses by Nagaoka et al (2002) and Suganuma et al. (2006), and the biostratigraphic comparisons by Nakaya et al (2002) and Pickford et al. (2004). Most of these studies have been derived from work of Thai-Japanese Paleontological Expedition Team (TJPET) and have revealed that the Chiang Muan Fm. belonged to the late Middle to early Late Miocene (9.8-13Ma). The Chiang Muan Fm. consists of five distinctive members from the base to top (Fukuchi et al., 2007). Among them, the Sa Tai Lignite Mem. and Kon Lignite Mem. are known as fossil-bearing layers and contain numerous vertebrate fossils: hominoids, proboscideans, rhinocerotids, suids, tragulids, cervids, bovids, avians, reptilians, and osteichthyan (Nakaya et al., 2002). Pickford et al. (2004) reports four suoid species found in the Chiang Muan Fm. up to the present. Two of them are Tetraconodontinae: Parachleuastochoerus sinensis and Conohyus sindiensis. Another is, Hippopotamodon cf. hyotherioides, which is classified into Suinae, and the other is Pecarichoerus sminthos, belongs to Tayassuidae.

The TJPET had conducted an intensive geological and paleontological investigation in the Chiang Muan Mine composed of the Chiang Muan Fm. and had excavated several suid fossils, and new fossil suid materials, CMu 050625-01, were found in 2005 (Fukuchi et al., 2006). This fossil consists of one individual, although it is not a complete skeleton. The materials contain fragments of a cranium with several isolated upper teeth (incisors, premolars, and molars), mandible with incisors and p2-m3, humeri, radius, metacarpals, carpals, femur, patellae, tibia, fibula, metatarsals, tarsals, pharanges, fragments of vertebrae, and bones assumed to be ribs. The fossil preserves morphologically characteristic structures in its lower teeth and mandible which classify itself into Subfamily Tetraconodontinae. Also, another set of lower teeth of a suid fossil from Chiang Muan Fm., CMu 201, shares the same morphological characteristics with CMu 050625-01, so presumably they are the same species. Those distinctive characters of CMu 050625-01 and CMu 201 were analyzed based on diagnoses of Pickford (1988) and Made (1999), and it was revealed that those suids were close to Conohyus sindiensis, but characters of their lower p4 were quit different from those of C. sindiensis. Consequently, they were identified as Conohyus cf. sindiensis.

Keywords: Miocene, Mammalia, Suidae, Tetraconodontinae, Thailand, Fossil