

Paleontological analysis of the environmental change in the late Neogene of central Myanmar

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In central Myanmar the continental Neogene sediments (Irrawaddy Group) are widely distributed along the Irrawaddy (= Ayeyarwaddy) and Chindwin Rivers. A number of mammal fossils have been reported from the Irrawaddy Group since the beginning of 20th century. Since 2001 Primate Research Institute, Kyoto University, has carried out the paleontological investigations at the Irrawaddy Group of central Myanmar in cooperation with Myanmar researchers, and discovered many mammal fossils including primates. Here we report the late Miocene/early Pliocene Chaingzauk mammal fauna, central Myanmar, with discussing the environmental change in the late Neogene of Southeast Asia.

The Neogene mammal fauna of Myanmar consists of 6 orders, 21 families and 48 genera of mammals, such as Primate (4 genera), Carnivora (4 genera), Artiodactyla (25 genera), Perissodactyla (6 genera), and Proboscidea (8 genera). From the Chaingzauk local fauna we have discovered 6 orders, 14 families and 19 genera of mammals, that is nearly half of the Neogene mammal fauna of Myanmar. However, most of the recovered specimens are medium to large sized artiodactyls (bovids and hippopotamids), rhinoceroses, and proboscideans, whereas small mammals (rodents, insectivores, lagomorphs and monkeys) are rare, probably due to the collection bias as well as the depositional and environmental factors.

The Neogene Myanmar fauna is more similar to the South Asian fauna (Siwalik) than to the East Asian fauna (southern China) until the Pliocene. Faunal interchange between Myanmar and East Asia seems to have increased in the middle to late Pleistocene. The chronological distribution patterns of some animals such as suids (Propotamochoerus and Sivachoerus), 'dog bear' (Agriotherium), porcupine (Hystrix), and leaf monkeys (Colobinae), strongly indicate that the Chaingzauk fauna corresponds to the latest Miocene through the earliest Pliocene.

On the other hand, we have estimated the paleoenvironment of the Chaingzauk fauna using the carbon and oxygen isotope of tooth enamel. The stable carbon isotopes values of Chaingzauk mammals indicate that they lived in the wide range of habitat from the closed habitat (forests) to the open habitat (grasslands). The stable carbon isotope values of porcupine (Hystrix), tragulid (Dorcabone), rhinoceros (Rhinoceros), suids (Propotamochoerus and Sivachoerus), elephants (Stegodon and Sinomastodon) show that they were forest dwelling browsers, while the stable carbon isotope values of bovids (cf. Tragoportax and cf. Selenoportax) and hippopotamid (Hexaprotodon) indicate that they were grassland-adapted grazers to mix feeders. The considerable variations in the serial stable oxygen isotope values of bovids, elephants, rhinoceroses and hippopotamuses suggest that the Chaingzauk fauna experienced the seasonal variation, corresponding to the development of the monsoon system in the Miocene/Pliocene boundary of central Myanmar.

The present central Myanmar including Chaingzauk area is a relatively dry, semi-desert region covered with thorn shrubs and grasses probably due to the rain shadow effect of Indo-Burman (= Arakan) Mountain Range (1500 mm to 4000 mm) in the west, which has uplifted in the Miocene to Pliocene in correlation to the Himalayan Orogeny. However, the carbon isotope results indicate that Chaingzauk mammals inhabited the open forests in contrast to the present day vegetation of

central Myanmar. Furthermore, the oxygen isotope results suggest that they did not experience the effect of aridity, although a seasonal variation with wet and dry cycle was existed in a certain extent. The relatively dry climate in the present central Myanmar may have been formed by the rapid uplift of the Indo-Burman Range around the late Miocene through early Pliocene as well as the regression of the seashores in the south Myanmar during the Miocene to Pliocene.

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