

## **Bivalves from the Lower Cretaceous Khok Kruat Formation at the dinosaur excavation site in Nakhon Ratchasima, NE Thailand**

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From 2007 through 2009, Northeastern Research Institute of Petrified Wood and Mineral Resources, Nakhon Ratchasima Rajabhat University and Fukui Prefectural Dinosaur Museum had a project to excavate dinosaur fossils from the Khok Kruat Formation distributed in Suranaree Subdistrict, Mueang District, Nakhon Ratchasima, northeastern Thailand. Not only dinosaur fossils but a lot of vertebrate fossils such as sharks, turtles, crocodiles and fishes were yielded from calcareous conglomerate and coarse- to medium-grained sandstone of the uppermost facies. Invertebrate remains and plant remains were very rare in that facies.

To examine sedimentary facies and structure, holes were burrowed vertically. Conglomerate and sandstone layers were developed in the upper part. Below that thin-laminated fine-grained sandstone to siltstone with tiny ripples, fine-grained sandstone sometimes with granules and mudstone, in descending order, were observed. A lot of molluscan remains and fish scales occurred in the fine-grained sandstone.

Almost all specimens of molluscan remains are bivalves which are oysters, *Trigonioides*, *Plicatounio*, *Nippononaiu* and unnamed bivalves. No conjoined shells were observed. Shells were whole dissolved probably by underground water.

Molluscan fossils from the Khok Kruat Formation were also collected from another site of Ban Hin Dad, Hin Dad Subdistrict, Dan Khun Thod District, Nakhon Ratchasima. They are so-called oyster bank in which non-marine bivalves such as *Trigonioides* co-occurred.

Oysters are considered to have lived in marine to brackish water, and other bivalves suggest freshwater paleoenvironments. Oysters making a bank are considered to be autochthonous, and it is simply indicating brackish water condition, although the Khok Kruat Formation is noted to be non-marine sediments in many papers. On the other hand, other non-marine bivalve fossils are not autochthonous and are supposed to have trapped in the oyster bank, but some *Trigonioides* had grown larger to be more than 15cm in the bank. These larger *Trigonioides* are considered to have adapted and lived in the brackish water.

Kobayashi and Suzuki (1936) and Kobayashi (1956, 1963, 1968) noted origin of *Trigonioides* was trigoniids. However, Cox (1952, 1955) referred *Trigonioides* and *Hoffetrigonia* to the unionids rather than the trigoniids, and Guo (1981) mentioned that the Trigonioidoidea originated from ancient unionids in



Middle-Late Jurassic lakes of the Asian continent. Larger *Trigonioides* in the oyster bank of the Khok Kruat Formation adapted in lower salinity condition might mean *Trigonioides* was originated from trigoniids.

When the oyster bank developed, how far the sea was? The oyster bank and oyster fossils of the dinosaur site of the Khok Kruat Formation indicate that marine waters invaded inland.