



## **A review of the paleoenvironments and ecosystem of Early Cretaceous lacustrine deposits (Jinju Formation), Jinju, Korea**

In Sung Paik and Hyun Joo Kim

Department of Earth and Environmental Sciences, Pukyong National University, Busan, Korea, Republic Of  
(paikis@pknu.ac.kr)

The paleoenvironments and ecosystem of the Early Cretaceous (Albian) Jinju Formation (about 1,000–1,800 m thick) are reviewed focusing on the lithofacies, fossil occurrences, and diverse records of sedimentary features. The Jinju Formation, which overlies the fluvial Hasandong Formation and underlies fluvial Chilgok Formation, is composed of a variety of lacustrine facies from sublacustrine to lake margin and deltaic facies. In the sublacustrine facies, dark-gray to black shales are the prevailing lithology, and fine-grained turbidites and shore deposits are often intercalated within them. Oolitic grainstones and stromatolites are intermittently associated in the shore deposits. The lake margin facies is composed mostly of sheetflood deposits with some intercalated channel deposits. Whereas the sublacustrine and lake margin deposits occur extensively in the southern part of the basin, the deltaic facies is restricted spatially in the northern part.

Body fossils and invertebrate trace fossils generally occur in restricted horizons, and various vertebrate tracks have been documented from the lake margin deposits of the upper part of the formation. In the sublacustrine deposits, fossils of fishes (Alburiformes, Jinjuichthys, Mesoclupea, Wachinoichthys, and Lepidotes), pelecypods (Nagdongia), gastropods (Brotiopsis and Viviparus), insects (dragonflies, beetles, cockroaches, earwigs, stinkbugs, mosquitos, etc.), spiders, ostracods, and estherids occur. The invertebrate traces include Beaconites, Cochlichnus, Diplichnites, Helminthopsis, Palaeophycus, Planolites, Protovirgularia, Skolithos, and Taenidium. The vertebrate traces are tracks and trackways of sauropod, ornithopod, and theropod dinosaurs, crocodiles, lizards, turtles, frogs, mammals, and birds. Stromatolites are very rare, and the oldest microbial-caddisfly bioherms have been documented. Gymnosperm fossils are present in places in both the lake margin and sublacustrine deposits. In general plant fossil deposits decrease stratigraphically upwards. Paleoseismic records, including liquefaction structures and clastic dikes, are observed occasionally. Palustrine pedogenic carbonates are present in places, and beef structures occur intermittently in the black shales.

The overall sedimentary and paleontological records of the Jinju Formation indicate that Jinju Lake persisted in a balanced-fill lake basin under generally warm and subhumid to semiarid climatic conditions. The lateral changes of lithofacies suggest that the relief of the lake margin decreases from north to south. The stratigraphically upward increase of the lake margin deposits and decrease of the plant fossil beds imply that the Jinju Lake retreated gradually due to increase of aridity with time. The restricted occurrences of body fossils of subaquatic invertebrates and vertebrates with low diversity suggest that dysaerobic conditions prevailed in Jinju Lake, which may be partially attributable to the volcanic activity in the eastward arc area inducing intermittent earthquakes. Jinju Lake might have provided a vital ecosite for resident animals, including dinosaurs, reptiles, amphibians, mammals, and migrating birds, as in modern savanna lakes, during drought seasons. In conclusion, the diverse paleolimnological records of the Jinju Formation could provide us with an understanding of the variety of paleoenvironments and terrestrial ecosystem during the Early Cretaceous.