

VERTEBRATE FAUNA FROM THE EARLY CRETACEOUS
KUWAJIMA FORMATION OF SHIRAMINE VILLAGE, ISHIKAWA
PREFECTURE, CENTRAL JAPAN

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The Kuwajima Formation of the Tetori Group exposed at the Kaseki-kabe of Shiramine Village, Ishikawa Prefecture, north-central Honshu has yielded a diverse freshwater and terrestrial assemblage that includes abundant plants, invertebrates and vertebrates (Natural History Museum and Institute Chiba, 2002). Combination of biostratigraphical correlations based on invertebrates and radiometric dates suggests a basal Cretaceous (Neocomian) age for the Kuwajima Formation (Isaji, 1993, 2000).

The vertebrate fauna includes the following taxa: semionotid, sinamiid, pachycormid and unidentified teleostean fishes (Yabumoto, 2000); three types of semiaquatic turtles (a trionychoid, a testudinoid, and a sinemydid; Hirayama, 2000); at least seven squamate genera (a paramacellodid, several other scincomorphs, an anguimorph, and a possible herbivorous iguanian); a choristodere; dinosaurs (hypsilophodontid and iguanodontian ornithopods, a titanosauriform sauropod, various theropods; Manabe et al., 2000, Barrett et al., 2002); pterosaurs (a ctenochasmatid, an ornithocheirid and a ?dsungaripterid); an indeterminate bird (?enantiornithine); non-mammalian synapsids (tritylodontids); and two mammals (a triconodont and a multituberculata: Takada et al., 2001). The remains vary from isolated teeth to fully articulated three-dimensional specimens, though both a size filter and ecological factors appear to be operating as only relatively small or aquatic taxa are represented by more complete skeletons. There are numerous vertebrate trace fossils, including dinosaur footprints and chelonian and dinosaur eggshells.

The diverse Shiramine fauna includes relict taxa (the tritylodontid and the triconodontid mammals), dinosaurian groups representing their earliest known occurrences in eastern Asia (an iguanodontian ornithopod and a titanosauriform sauropod) and earliest known advanced taxa such as “modern” turtles (the trionychoid and the testudinoid). The earliest known occurrence of “modern” turtles, which were originated from the Jurassic xinjiangchelyids, endemic taxa of eastern and western Asia, suggests that the isolation of eastern Asia from the rest of Laurasia might be fundamentally remained since the Middle Jurassic (Hirayama et al., 2000).

REFERENCES

- Barrett, P. M., Y. Hasegawa, M. Manabe, S. Isaji and H. Matsuoka. 2002. Sauropod dinosaurs from the Lower Cretaceous of eastern Asia: taxonomic and biogeographical Implications. *Palaeontology*, 45: 1197–1217.
- Hirayama, R. 2000. Fossil turtles; pp. 75–92, pls. 28–37 in H. Matsuoka (ed.), *Fossils of Kuwajima “Kaseki-kabe” (Fossil-bluff): Scientific report on a Neocomian (Early Cretaceous) fossil assemblage from the Kuwajima Formation, Teori Group, Shiramine, Ishikawa, Japan*. Shiramine Village Board of Education, Ishikawa Prefecture, Japan. (in Japanese with English abstract)
- Hirayama, R., D. B. Brinkman and I. G. Danilov. 2000. Distribution and biogeography of non-marine Cretaceous turtles. *Russian Journal of Herpetology*, 7: 181–198.
- Isaji, S. 1993. *Nippononaia ryosekiana* (Bivalvia, Mollusca) from the Tetori Group in central Japan. *Bulletin of the National Science Museum, Series C (Geology &*

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- Paleontology), 19: 65–71.
- Isaji, S. 2000. Geological setting of the Kuwajima “Kaseki-kabe”, the Kuwajima Formation; pp.14–16 *in* H. Matsuoka (ed.), Fossils of Kuwajima “Kaseki-kabe” (Fossil-bluff): Scientific report on a Neocomian (Early Cretaceous) fossil assemblage from the Kuwajima Formation, Teori Group, Shiramine, Ishikawa, Japan. Shiramine Village Board of Education, Ishikawa Prefecture, Japan. (in Japanese)
- Manabe, M., P. M. Barrett and S. Isaji. 2000. A refugium for relicts? *Nature*, 404: 953.
- Natural History Museum and Institute Chiba (ed.) 2002. *Lives of the age of dinosaurs: a time tunnel from the fossil-cliff of Kuwajima, Central Japan*. Shibun-Sha, Tokyo, 111 pp. (in Japanese)
- Takada, T., H. Matsuoka, and T. Setoguchi. 2001. The first multituberculate from Japan; pp. 55–58 *in* T. Deng (ed.), *Proceedings of the Eighth Annual Meeting of the Chinese Society of Vertebrate*.
- Yabumoto, Y. 2000. Fossil fishes; pp. 75–92, pls. 28–37 *in* H. Matsuoka (ed.), Fossils of Kuwajima “Kaseki-kabe” (Fossil-bluff): Scientific report on a Neocomian (Early Cretaceous) fossil assemblage from the Kuwajima Formation, Teori Group, Shiramine, Ishikawa, Japan. Shiramine Village Board of Education, Ishikawa Prefecture, Japan. (in Japanese with English abstract)