Jurassic–Cretaceous transition sequences in Japan and their contribution to defining the Jurassic–Cretaceous boundary

Atsushi Matsuoka*†[1], Shin-Ichi Sano[2], Yojiro Taketani[3], Kentaro Nakada[4], and Tsuyoshi Ito[5]

[1]Department of Geology, Faculty of Science, Niigata University – Niigata 950-2181, Japan
[2]The University of Toyama – Japan
[3]Fukushima Museum – Japan
[4]Fukui Prefectural Dinosaur Museum – Japan
[5]Geological Survey of Japan, AIST – Japan

Abstract

The status of current knowledge including the lithology, stratigraphy, fossil contents and radiometric age data of Jurassic–Cretaceous (J–K) transition beds in Japan is reviewed. There are two types of sequences are recognized in the Japanese Islands: shallow marine-terrestrial sequences and pelagic sequences. The former includes the Torinosu Group and its equivalents in the Outer Zone of southwest Japan, the Tetori Group in the Inner Zone of southwest Japan, and the Somanakamura Group and its northern extension in northeast Japan. These strata were deposited in the eastern margin of the Asian Continent during the J–K transition time interval. The latter is typified by radiolarian-rich pelagic sequence embedded in accretionary complexes in the Southern Chichibu and Northern Shimanto belts of southwest Japan and the Tokoro and Sorachi–Yezo belts in Hokkaido.
The Torinosu Group and its equivalents are entirely marine origin and yield abundant molluscan fossils including bivalves and ammonoids of Tethyan affinity. Most ammonoid specimens from the group are indicative of Tithonian in age. The Somanakamura Group is characterized by an alternating occurrence of marine and non-marine succession. The J–K transition beds are correlated to a transitional part from non-marine to marine sequence. Marine beds yield abundant molluscan fossils including Berriasian ammonoids such as *Kilianella umazawensis*, *Dalmasiceras muneoi*, *Neocosmoceras*? *akiyamae* and others. These beds contain plant fossils and palynomorphs. The equivalent beds to the Somanakamura Group yield belemnite species belonging to the genus *Hibolithes* of Tethyan affinity. Both the Torinosu and Somanakamura groups contain radiolarian fossils of the *Pseudodictyomitra carpatica* Zone which encompasses the J–K boundary. Acidic tuff beds embedded in the terrigenous sequences have a high potential for U–Pb zircon radiometric dating.

The Tetori Group is characterized by an alternating occurrence of marine and non-marine sequences. The J–K transition sequence is correlated to a transitional part from non-marine to marine sequence. Marine beds contain abundant bivalves and yield Berriasian ammonoids

*Speaker
†Corresponding author: amatsuoka@geo.sc.niigata-u.ac.jp

such as *Neocosmoceras* sp. and others of Tethyan affinity. While they yield cylindroteuthidid belemnites such as *Cylindroteuthis* aff. *knoxvillensis* and *Arctoteuthis tehamaensis* of Boreal affinity. Thus Tetori Group can be correlated with the coeval sequences in northern California and Siberia based on the belemnite biostratigraphy.

Chert beds which represent the J–K transition are recorded on Ie Island, Okinawa, in the Southern Chichibu belt. Chert beds within mélange of the Shimanto belt in Shikoku and Kii Peninsula also include the J–K transition beds characterized by the radiolarian *Pseudodictyomitra carpatica* Zone. An accretionary complex composed mainly of basaltic rocks originated from seamounts in the Tokoro belt, east Hokkaido, contains radiolarian cherts with the J–K transition. Hemipelagic tuffaceous sequences of the Sorachi Group in central Hokkaido also include the J–K transition beds with a rich radiolarian fauna of the *Pseudodictyomitra carpatica* Zone. These pelagic and hemipelagic beds are barren of age-diagnostic megafossils such as ammonoids and belemnites. Co-occurrence of radiolarian fossils of superb preservation and calcareous nannofossils in a tuffaceous radiolarite sample (#181-R003) collected by the submergible "Shinkai 6500" from the outer slope in the Mariana Trench enables to correlate radiolarian zones directly to calcareous nannofossil zones.
The J–K transition beds in Japan represent a paleobiogeographic setting different from those in Europe which were accumulated in the western Tethys and Boreal provinces. A faunal comparison between Japan and Europe reveals similarities and differences which are related basically to paleobiogeographic settings. In addition, pelagic microbiotas including radiolarians and calcareous nannofossil in accretionary complexes and ocean bottom sediments in the northwestern Pacific enable to examine a trans-Pacific phenomenon which can be traceable in coeval sequences in the western part of South America as well. The J–K transition sequences in Japan can provide critical data in defining the J–K boundary, making a profound contribution to the selection of the Global Boundary Stratotype Section and Point.

Keywords: Jurassic, Cretaceous, ammonoid, belemnite, radiolaria, calcareous nannofossil, GSSP