

Planktic foraminiferal biostratigraphy across the mid-Cretaceous Oceanic Anoxic Events

Soichi Shirakawa³, Ryo Nakanishi², *Kazuyoshi Moriya¹

1. Department of Earth Sciences, Faculty of Education and Integrated Arts and Sciences, Waseda University, 2. Department of Earth Sciences, School of Education, Waseda University, 3. Department of Earth Sciences, Resources and Environmental Engineering, Graduate School of Creative Science and Engineering, Waseda University

Massive deposition of carbon-rich black shales in the mid-Cretaceous is widely known as Oceanic Anoxic Event (OAE). OAE is identified as a negative feedback cooling mechanism at the Cretaceous thermal maximum. In fact, a sudden temperature drop and southward migration of Boreal fauna have been reported just after the beginning of the OAE at the Cenomanian/Turonian boundary (OAE2). Distinctive faunal turnovers in pelagic taxa, such as calcareous nannofossils, planktic foraminifers, radiolarians, etc., have also been found at OAE2. Among these taxa, planktic foraminifers show an interesting pattern in extinction. Deep dwelling species went extinct at the beginning of the OAE2, followed by the extinction of thermocline dwelling species. The rest of mixed layer dwelling species survived. These observations have been reported from rather expanded outcrops distributed around North Atlantic, and possibly indicate shoaling of the top depth of the oxygen minimum zone in a water column.

In this study, we report planktic foraminiferal biostratigraphy from the Cenomanian through the Campanian at Newfoundland margin to identify planktic foraminiferal diversity change against some environmental perturbations in this age. Samples were recovered by Integrated Ocean Drilling Program Expedition 342. Semi-glassy preserved individuals with open-aperture occurred throughout the sequences analyzed. We found two intervals showing faunal turnover in planktic foraminifers. The first, lower interval is correlated to the Cenomanian/Turonian boundary. Sediment of this interval is composed of black shale, which indicates that this faunal turnover represent the extinction event at OAE2. The second, upper interval can be correlated to the Santonian/Campanian boundary or lower Campanian. At this interval, fluxes of both benthic and planktic foraminiferal individuals become almost zero. Sediments turn into darker in color, but no sign of black shale. On the other hand, abundant foraminiferal test fragments have been found in smear slides. These facts indicate planktic foraminifers did inhabit within a water column, but their test were not well preserved in sediments, implying bottom water acidification at this interval. We possibly found two different types of biotic response against the environmental perturbations in the mid- to late Cretaceous.

Keywords: Cretaceous, planktic foraminifers, Stratigraphy