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白亜紀オウムガイ類Eutrephocerasの生息水深

Habitat of the Cretaceous natiloid Eutrephoceras; isotopic evidence for depth segregation of the late Cretaceous biota

守屋 和佳[1*], 棚部 一成[2], 西 弘嗣[3], 川幡 穂高[4]

Kazuyoshi MORIYA[1*], Kazushige Tanabe[2], Hiroshi Nishi[3], hodaka kawahata[4]

[1]早稲田大・教育・地球科学, [2]東京大・理・地球惑星科学, [3]北海道大・理・自然史科学, [4]東京大・海洋研・新領域創成科学

[1]Dep. Earth Sciences, Waseda Univ., [2]Dep. Earth & Planet. Sci., Univ. Tokyo, [3]Dep. Natural History Sci., Hokkaido Univ, [4]Grad. Sch. Frontier Sci., ORI, U. Tokyo

Though early evolutionary history of Nautiloidea (Cephalopoda) within Mollusca has still been debated, the very first fossil nautiloids have been reported from the late Cambrian. After that origination, despite nautiloids have experienced many huge mass extinction events, their descendants are represented in the modern ocean by several species of Nautilusand Allonautilus. Their diversity has flourished in the early Paleozoic, and Ammonoidea and Coleoidea were derived from Nautiloidea in the mid-Paleozoic via Bactritida. Among these three groups of cephalopods, ammonoids and nautiloids share an ectocochliate body plan, whose shells consist of a phragmocone and a subsequent body chamber. Considering the fact that these two groups coexisted in the Mesozoic ocean, and only ammonoids completely disappeared in the end Cretaceous extinction event, it is hypothesized that ecological niches, such as depth habitat, food habit, and/or reproductive strategy, of these two groups were segregated within an ancient water column. Habitat depth of the Cretaceous ammonoids has been analyzed by Moriya et al. (2003), who concluded that ammonoids were demersal organisms dwelling on the bottom of the ocean. However, habitat depth of the Cretaceous nautiloids has never been systematically analyzed to date. Therefore our knowledge for depth habitat segregation of these two groups is still uncertain. Here, we present oxygen isotopic records of the Cretaceous nautiloid Eutrephoceras dekayi. Because genus Eutrephocerassurvived the end Cretaceous extinction event and belongs to the Nautilidae which include modern chambered nautilus, it is the best representative for understanding the niche segregation between the Cretaceous ammonoids and nautiloids. We calculated shell secreting temperature from isotopic records of E. dekayi. Then we discussed depth habitat of the Cretaceous nautiloid by superimposing those isotopic temperature on thermal structure of the Cretaceous water column in which the analyzed nautiloid occurred.

We utilized a well-preserved specimen of E. dekayirecovered from the late Campanian Coon Creek Formation in McNairy County, Tennessee, USA. Coon Creek Formation was deposited at a part of Western Interior Seaway, and paleo-depth of this basin is estimated at 30 degreeN. Shell diameter of a specimen analyzed is 42.4 mm. For isotopic analyses, aragonitic nacreous outer shell layer was milled with micro-drill of 300 micrometer diameter at almost every 1 mm interval. In addition with this E. dekayispecimen, we also analyzed co-occurring planktic foraminifers Rugoglobigerina rugosaand R. hexacamerata. Sea surface water temperature calculated from these foraminiferal oxygen isotopes is 30 degreeC. Isotopic temperatures of E. dekayishow almost constant through the interval analyzed at 16 degreeC. While oxygen isotopic composition stays almost constant,

carbon isotopic composition indicates sigmoidal fluctuation in the interval analyzed. d13C of the adoral end indicates -1.5 per mil (VPDB), and it is gradually decreasing toward adapical direction. Once d13C reaches at its minimum of -2.5per mil (VPDB), it is gradually increasing and showing its maximum of -1.2 per mil (VPDB). After that maximum value, d13C is decreasing toward adapical end, and it shows -1.5 per mil (VPDB) at the adapical end. Therefore we observed one cyclic fluctuation whose amplitude is 1.3 per mil within the interval analyzed.
Significant isotopic temperature offset of 14 degreeC between E. dekayiand planktic foraminifers obviously indicates that E. dekayiinhabited much cooler water mass than planktic foraminifers. This significant temperature offset and constant isotopic temperature of E. delayiimply that the late Cretaceous E. dekayidwelled near the seafloor in the interval analyzed.

キーワード:白亜紀, Coon Creek Formation, Eutrephoceras,酸素同位体,古水温,生息水深

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