

Radiolarian fossils occurred from Neogene Manganese deposit, Fukaura District, Aomori, Japan

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We described the litho- and biostratigraphy of the Neogene strata distributed in the Fukaura area, western Tsugaru Peninsula. The Neogene sequence in this area is subdivided into the Odose, Tanosawa, and Akaishi Formations in ascending order. The Odose Formation is composed mainly of andesite lava and rhyolite. The Tanosawa Formation consists of acid pumice tuff, conglomerate, and sandstone with Mn nodule beds. The Akaishi Formation is characterized by acid pumice tuff, conglomerate, silt and sandstones.

Radiolarian biostratigraphy was studied for the Tanosawa and Akaishi Formations. The Tanosawa Formation was assigned to the upper part of the *Eucyrtidium inflatum* Zone (13.1 to 11.7 Ma) during the middle Miocene within the framework of North Pacific radiolarian zonation. The Akaishi Formation yield radiolarian assemblages that is indicative from the *Larcopyle pylomaticus* Zone to the lower part of the *Cycladophora sakaii* Zone (5.2 to 2.7 Ma) during the Pliocene. The radiolarian assemblages of the studied section contained cosmopolitan or mid-to-high latitude species such as *Axoprunum acqulonium*, *Calocyclus motoyamai*, *Cycladophora sakaii*, *Hexacontium parviakitaensis*, *L. pylomaticus* and *Thecosphaera pseudojaponica*, and lack such as low latitude species as *Calocycletta costata*, *Diartus hughesi*, *Didymocyrtis penultima*, *Dorcadospyris alata*, *Phormostichoartus doliolum*, *Phormostichoartus fistula*, *Pterocanium audax* and *Stichocorys wolffii*. Since these characters resemble to those of radiolarian assemblages recognized from the North Pacific Ocean Drilling Program Sites 884 and 887, the Fukaura area was under boreal cool water environments during that interval.

Based on the radiolarian biostratigraphy, this work newly placed the boundary between the Tanosawa and Akaishi Formations of the studied section on the top of a gravelly sand stone bed with Mn nodule. This boundary horizon was lying 5 m below the previously indicated one in the same section and characterized by the absence from the *Lychnocanoma magnacornuta* to *A. acqulonium* Zone (11.7 to 5.2 Ma). This result indicated a time gap of 6.5 million years between the two formations. This unconformity was correlated to the widespread unconformity recognized in the northeastern Japan.

Keywords: manganese deposit, radiolaria, Neogene, Miocene, Pliocene