

## **Radiolarians and diatoms from the Hiraiso Formation of the Nakaminato Group (late Campanian to early Maastrichtian) in the northern Kanto Region of Japan**

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The Nakaminato Group in the northern Kanto Region of Japan is composed of the Hiraiso, Isoai and Chikko formations to the upward, and has been dated to be late Campanian to early Maastrichtian due to some ammonites and inoceramid (Tanaka, 1970; Sakamoto et al., 1972; Ando, 2006). The Hiraiso Formation is composed mainly of dark gray siltstone with frequent intercalations of thin fine- to very fine-grained sandstone beds and occasional thick massive medium-grained sandstone layers with sharp erosion base. The overlying Isoai Formation is mainly sandstone-dominated, sandstone and mudstone alternations with some intercalations of conglomerate and pebbly mudstone beds. The Chikko Formation is now not exposed owing to the fishery port and town artificial cover. Here we report radiolarians and diatoms from a calcareous nodule in the Hiraiso Formation. Also, an outline of this study has been already reported preliminarily in Ando et al. (2014).

Radiolarians (22 individuals identified) are all spumellarians, and include *Orbiculiforma* spp. (16), *Actinomma* ? spp. (3), spherical morphotype (2), and ellipsoidal morphotype (1). Also there are no nassellarians in the studied sample. Radiolarian age can't be determined due to no age-assignable species.

Diatom fossils (50 specimens examined) are poorly-preserved, and mostly populated by disc form (43) with small amount of cylindrical form (7). All specimens occur as solitary forms. Although most of them show internal mold, some of disc form remain the circular valve with fine pores on some extent. The valve diameter varies from 45-124  $\mu\text{m}$ . Because residue treated for microfossil analysis is from 63-425  $\mu\text{m}$  in grain size, individuals less than 63  $\mu\text{m}$  are only 2 specimens (45 and 55  $\mu\text{m}$  in diameter of circular valve). The cylindrical form shows 35-51  $\mu\text{m}$  in width and 68-226  $\mu\text{m}$  in length. The diatom assemblage from the Hiraiso Formation shows low diversification

in the present study.

Radiolarian faunal composition should be noticed: spumellarian-dominated assemblage and abundant occurrence of the genus *Orbiculiforma*. The similar assemblages have been reported from the Middle and Late Jurassic shallow marine strata of the Tetori Group in central Japan. So the radiolarians from the Hiraiso Formation probably indicate the shallow marine assemblage. In Japan, Cretaceous diatom fossils have been reported from the Upper Cretaceous marine strata (Takahashi et al., 1996; Iwata et al., 1998; Shimada et al., 2013). Among them, Shimada et al. (2013) demonstrated well-diversified diatom assemblage ranging mainly from 10-40  $\mu\text{m}$  in size from the Santonian – lower Campanian in Hokkaido. Thus the low diversification of diatoms from the Hiraiso Formation is probably due to examined residue size with poor preservation. Additional examination of smaller diatoms less than 63  $\mu\text{m}$  will be necessary for reconstructing more precise composition of the diatom assemblage.

## References

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