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Benthic foraminiferal assemblages associated with chemosynthetic bivalves from the Plio-Pleistocene in the Leyte Island

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We studied benthic foraminiferal assemblages that are associated with vesicomyid communities from massive mudstones at the Cambuntug Point and lucinid community from massive sandy mudstones at the Antipolo Point, northwestern parts of Leyte Island, Philippines. The ages of both fossil horizons are 3.97-1.77 Ma based on nanofossils and planktic foraminifers.

At the Cambuntug Point, we examined 10 sediment samples: four samples from the matrix sediments around the vesicomyid bivalve fossils (S551 and S556 from locality 1 of Majima et al., 2010; and B2-B3 and C2-C3 from locality 3 of Majima et al., 2010), and six samples from the locations where no vesicomyid bivalve occurs (B1, C1, B4, C4, S605, and S606 from locality 3). At the Antipolo Point, we observed five sediment samples: three samples (S703, S704, and S707) from the matrix sediments around the lucinid bivalve fossils, and two samples (S701 and S702) from the locations where no lucinid occurs. From each sample, about 200-300 benthic foraminiferal fossils (larger than 125 micrometer), were picked up and analyzed.

The results of Q-mode cluster analysis indicate that the examined 15 samples are clearly divided into the two groups: one is composed of the samples from the Cambuntug Point (S551, S556, B1, C1, B2-B3, C2-C3, B4, C4, S605, and S606) and the other is composed of the samples from the Antipolo Point (S701, S702, S703, S704 and S707). This result suggests that the benthic foraminiferal assemblages were primarily controlled by the lithology of the examined horizons (mudstones and sandy mudstones), which would be related to the depositional environments. The samples from the Cambuntug Point are subdivided into two subgroups: (1) B4, C4, S605, and S606, and (2) S551, S556, B2-B3, C2-C3, B1, and C1. The samples of S551, S556, B2-B3 and C2-C3 were collected from matrix sediments around the vesicomyid bivalve fossils, although the samples of B1 and C1 were not associated with the vesicomyid fossils. The vesicomyid occurrence gradually changes from the absence in B1 and C1 horizons into the abundance in B2-B3 and C2-C3 horizons. Therefore, we infer that the methane seepage had already begun at the B1 and C1 horizons. At the Antipolo Point, however, there is no difference of the benthic foraminiferal assemblages, irrespective of the occurrences of lucinid bivalves.

We consider that the benthic foraminiferal assemblages associated with vesicomyid fossils in the Cambuntug Point had been influenced by hydrogen sulfide, diet of chemosynthetic bivalves, originated in the anaerobic oxidation of methane. However, in the Antipolo Point, where lucinid fossils ocuur, the benthic foraminiferal assemblages had not been influenced by hydrogen sulfide. Living Vesicomyids are half buried in the sea bottom sediments with hydrogen sulfide, although living lucinids burrow deeply in the sediments, so that hydrogen sulfide are possibly limited in the deeper sediments. Therefore, the benthic foraminiferal assemblages of sediment surface were not possibly affected by the hydrogen sulfide.

Keywords: benthic foraminifera, methane seepage, chemosynthetic assemblages, Philippines, Pliocene, Pleistocene