

## A fossil cold-seep assemblage from the Pleistocene Shioda Formation, Nakatsu Group, central Japan

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Lucinid and thyasirid bivalves-dominated fossil cold-seep assemblage occur in the Pleistocene Shioda Formation, Nakatsu Group, central Japan. In the studied outcrop (11.4 m in total thickness), sandy mudstones with intercalated muddy sandstones (tens of cm in thickness) and pumice-rich lapilli tuff beds (several cm to tens of cm in thickness) are dominated, and mudstones are exposed in the uppermost part (1.4 m in thickness). The fossils occur sporadically in the muddy sandstones, sandy mudstones and mudstones. They are composed of *Lucinoma* sp. and *Conchocele* sp. which are major component members of Neogene chemosynthetic fossil assemblages in Japan. Most of the large bivalves are articulated (85% articulation ratio) in the interval from the base of the outcrop to 2.86 m-upper horizon, which indicate that these bivalves had not been transported long distances from their living places.

Authigenic carbonate concretions are developed sporadically in the sandy mudstones, muddy sandstones and pumice-rich tuffs. Three carbonate concretions were sampled: A) a bedded concretion immediately above pumice-rich tuff, which locates at 3.7 m above from the base of the outcrop (ABO); B) a nodular concretion at 2.9 m ABO; C) a nodular concretion at 1.7 m ABO. In terms of carbonate mineral composition, A-1, A-2 (both from sample A) are composed of high-Mg calcite, B, high-Mg calcite (88.6 wt%) and dolomite (11.4 wt%) and C, dolomite. Stable isotope values ( $d^{13}C$  and  $d^{18}O$  per mill vs PDB) of the samples are following: A1, -31.2 and 1.3; A-2, -33.3 and 1.3; B, -30.6 and 1.2; C, -22.6 and 2.6, respectively. The  $d^{13}C$  values indicate that the high-Mg calcites had been precipitated under the influence of anaerobic methane oxidation and also indicate that the co-occurring fossil *Lucinoma* sp. and *Conchocele* sp. depended upon methane-containing cold seep.

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