

# Spatio-temporal variations in fossil coral assemblages in late Middle Pleistocene limestones of the Minatogawa Formation, southern Okinawa-jima, Japan

\*Riho Tomatsu<sup>1</sup>, Marc Humblet<sup>1</sup>, Kazuhiko Fujita<sup>2</sup>, Yui Kouketsu<sup>1</sup>, Yasufumi Iryu<sup>3</sup>

1. Graduate School of Environmental Studies, Nagoya University, 2. Department of Physics and Earth Sciences, University of the Ryukyus, 3. Institute of Geology and Paleontology Graduate School of Science Tohoku University

Quaternary reef-complex deposits crop out extensively in the Ryukyu Islands, southwestern Japan, providing a unique record of reef growth history close to the northern limit of modern coral reef distribution. The late Middle Pleistocene Minatogawa Formation (<0.4 Ma) is exposed along the coast of southern Okinawa Island and on nearby islets. The Minatogawa Formation is 20 m thick in the study area and is composed of four units (in ascending order: Unit 1–4) separated by unconformities. The main lithologies are coral-rich limestone (coral boundstone and rudstone) and well-sorted detrital limestone (mainly foraminifer-rich grainstone). In this study, we examine the taxonomic compositions and the spatio-temporal distribution of fossil coral assemblages in the Minatogawa Formation to achieve the following goals: (1) to clarify the depositional history of the Minatogawa Formation and (2) to reconstruct relative sea-level changes and their impact on coral communities. To reach these objectives, field work was carried out in a large quarry in southern Okinawa Island. Results reveal six distinct coral assemblages in Unit 2 and 3, each indicating a particular reef environment, from shallow (<5 m) exposed and protected settings to deeper (up to 25–30 m) reef-slope settings. The coral assemblage found in Unit 2 suggests that the coral boundstone and well-sorted detrital limestone in this unit formed concomitantly in a lower reef slope setting, or perhaps, a shallower but turbid environment. In contrast, the analysis of coral assemblages of Unit 3 and of the boundary between the coral boundstone and adjacent well-sorted detrital limestone in this unit suggest a relative sea-level history more complex than previously thought, as attested by the occurrence of a subaerial exposure surface between the coral boundstone and adjacent well-sorted detrital limestone. Temporal (vertical) variations in coral assemblages within Unit 3 reflect the various stages of reef growth, from reef initiation at the base of the unit to reef demise at the top due to exposure during relative sea-level fall. In addition, crustal movements have influenced reef growth during the deposition of the Minatogawa Formation. A syn-depositional fault intersecting the boundary between Unit 2 and 3 attests of small-amplitude sea-level changes caused by tectonic activity. Ongoing efforts are being made to constrain the age of the Minatogawa Formation in order to clarify the relationship between its depositional history and global eustatic sea-level changes.

Keywords: fossil coral communities, late middle Pleistocene, environmental and sea level changes, tectonic uplift, Minatogawa Formation, Okinawa-jima