

Growth patterns and oxygen isotopic ratios of fossil shells of the long-lived bivalve *Mercenaria stimpsoni* from the Middle to Late Pleistocene Warm Period, MIS 5, 7, and 9.

*Shiono Miki¹, Kaoru Kubota², Kotaro Shirai³, Rei Nakashima⁴, Kazushige Tanabe⁵

1. The University of Tokyo, 2. JAMSTEC, 3. AORI, The University of Tokyo, 4. GSJ, AIST, 5. The Univ. Museum, The Univ. of Tokyo

The past interglacial periods MIS 5e, MIS 7, and MIS 9 are considered past analogs of post-global warming. Ice cores, stalactites, and foraminifera in marine sediments are typical archives for paleoclimatic reconstructions, but they can not achieve high temporal resolution as daily to annual scale. The distribution of corals, as representative high temporal resolution archive, are only limited to shallow waters in tropical and subtropical regions. Therefore, there is a lack of data for high-resolution marine paleoclimate reconstructions of the mid- to high-latitude.

In recent years, long-lived bivalves have been attracting attention as a high temporal resolution paleoclimate archive in mid to high latitude ocean. Bivalves are adapted in a wide range of environments. They are characterized by accretional growth, so they can record a paleoclimate change as time series with a high temporal resolution of days to years. Using long-life bivalves, we can expect to understand the paleoclimate.

In Japan, the cold-water bivalve *Mercenaria stimpsoni* has recently been reported as a long-lived species, living up to 100 years (Kubota *et al.*, 2017; 2021, Tanabe *et al.*, 2017). The shell grows from spring to autumn, and in winter, when the water temperature drops below about 10°C, they stop growth. Although fossil shells of this species are abundantly found from shallow marine deposits in Japan, no paleoclimatic evaluation has been performed. The past environment of the Northwest Pacific is still poorly understood, and the high temporal resolution nature of the fossil *Mercenaria stimpsoni* can fill the knowledge gap (Shirai *et al.*, 2018). The purpose of this study is to reconstruct the paleoclimate at MIS 5e, 7, and 9, by growth pattern and oxygen isotope ratio analyses of fossil *M. stimpsoni* shell for clarifying the paleoenvironment of Paleo-Tokyo Bay.

In this study, seven specimens of fossil bivalves from the mid-to-late Pleistocene Shimousa Group (MIS 5e, 7, and 9) were chosen from the collection of Chiba Prefectural Central Museum. Firstly, the fossils were cut along the maximum growth axis to make cross-sections, and then analyzed growth patterns and oxygen isotope ratios. Finally, to examine the paleoenvironment of the coast of Paleo-Tokyo Bay, we compared the growth pattern and reconstructed water temperatures of six modern specimens with fossil shells.

The results showed that the fossil species had a lifespan of about 100 years, even in the past warm period. There was no significant difference in the lifespan between fossils and modern specimens. The accumulated shell height of the fossils was slightly smaller than modern shells. Water temperatures reconstructed from the fossils showed a narrower range of variability than the modern annual water temperatures, and the water temperatures were several degrees cooler. Even in MIS 5e, the warmest period, the maximum annual water temperature was about 19°C, about 8°C lower than the current maximum temperature of 27°C around the Boso Peninsula. This result suggests that the seawater temperature in the coastal areas of Paleo-Tokyo Bay was significantly lower during the examined interglacial periods than in the present.

In summary, relatively cold water masses may have existed in the shallow waters of Paleo-Tokyo Bay, and it continued for at least 100 years during the past interglacial period.

Keywords: bivalve, oxygen isotope, growth line, paleoclimate, interglacial period