

## Molecular mechanism which controls the shell microstructure depending on environmental changes in the Japanese pearl oyster

\*Kei Sato<sup>1</sup>, Davin H.E. Setiamarga<sup>2</sup>, Hiroshi Yonemitsu<sup>2</sup>, Keita Higuchi<sup>3</sup>, Yasunori Iwahashi<sup>3</sup>, Kiyohito Nagai<sup>3</sup>

1. Faculty of Education and Integrated Arts and Sciences, Waseda University, 2. National Institute of Technology, Wakayama College, 3. MIKIMOTO Pearl REsearch Laboratory

The shell microstructure is the micro-scale morphological trait of molluscan shells and this character closely links to the shell property such as the mechanical strength and production cost of the shell. Some studies pointed out that shell microstructural evolutions may have contributed as driving force for adaptive radiations in some molluscan taxa (e.g. Vendrasco et al., 2013; Sato & Sasaki, 2015). In addition to the paleobiological study, assessing how genetic constraints and environmental factors affect the expression of shell microstructural characters is an intriguing research topic to understand the evolution of molluscan biomineralization.

In this study, we focused on the phenotypic plasticity in Japanese pearl oyster's shell microstructure. Pearl oysters form unusual microstructures within their nacreous shell layer during the time they restart their shell formations (Wada, 1990). Therefore, we collected living specimens in three times; the period when animals stop their shell formations (January), the period animals restarting shell formation (April), and the normal shell formation period (August). The shell microstructures of each specimen were described using scanning electron microscopy, and also their mantle gene expressions of seven known shell matrix proteins were quantified by realtime PCR. We anew recognized the unusual microstructure which is consist of fine granular crystals from the samples collected in April. Besides, we identified the gene expression increasing of a shell matrix protein which inhibits CaCO<sub>3</sub> precipitation in the April specimens. These microstructural and molecular results are consistent with each other and imply that molluscs regulate their shell microstructure by controlling the shell matrix gene expression depending on environmental conditions.

Keywords: shell microstructure, shell matrix protein, gene expression, nacreous structure, pearl oyster