BPO02-07 Room:103 Time:May 25 11:00-11:15

Seasonal changes in shell microstructures of the bloody clam, Scapharca broughtonii (Mollusca: Bivalvia)

NISHIDA, Kozue[1*], SASAKI, Takenori[2], ISHIMURA, Toyoho[3]

[1]The University of Tokyo, [2]The University Museum, The University of Tokyo, [3]Geological Survey of Japan, AIST

Molluscan shells have various shapes, sizes of crystals, and their arrangement, and these variable characters are called as shell microstructure. Shell microstructure has been studied mainly in the light of taxonomy and phylogeny, and its function, however, the formation of shell microstructure is also affected by environmental and phylogenetic factors. If we can detect environments from the microstructure of fossil specimens, we can establish new paleoenvironmental or paleoecological proxies. This study demonstrated seasonally controlled changes in shell microstructures in *Scapharca broughtonii* (Mollusca: Bivalvia). We conducted the observations of shell microstructures and stable oxygen isotope analyses to reveal the factors controlling cyclical microstructural changes in *S. broughtonii*. We used recent specimens collected in Aomori, Miyagi, Ishikawa, Fukui, Yamaguchi, and Nagasaki Prefectures around Japan to compare geographic variation. Shell microstructure was observed by light microscopy of acetate peels and scanning electron microscope. The stable carbon and oxygen isotopic composition ($d^{13}C$ and $d^{18}O$) of *S. broughtonii* shells were measured, using an isotope ratio mass spectrometer (Micromass ISOPRIME, Manchester, UK) at the National Institute of Advanced Industrial Science and Technology (AIST).

Scapharca broughtonii has outer and inner layers that are divided by the myostracum. The outer layer is subdivided into composite prismatic structure on the exterior side and crossed lamellar structure on the interior side with a transitional boundary. The proportion of two structures in the outer layer changes cyclically with ontogeny. After the positions of the peaks where the crossed lamellar structure is thickened, growth breaks are observed in most specimens. From the oxygen isotope profiles, the fluctuations of the proportions of the thickness of two microstructures are synchronized with the fluctuations of the shell $d^{18}O$. Crossed lamellar structure is thickened at high water temperatures in summer.

Annual shell growth rate that was estimated based on oxygen isotopic and shell microstructural fluctuation. Southern specimens have longer cycles of the proportion of the thickness of two structures than northern specimens. From shell isotopic records, it appears that the clams can form their shells at over about 12 ^{o}C. Annual shell growth rate was decreased in around three-year-old specimens. The change in shell growth is probably caused by sexual maturity. Growth breaks are observed after the peaks of high water temperatures may be formed as spawning break, since they correspond to spawning season.

The proportion of the thickness of shell microstructures can directly indicate the fluctuation of water temperature. This method contributes to age determination, criteria of seasons of shell growth, and understanding paleo-climate.

Keywords: Bivalve, shell microstructure, SEM, stable oxygen isotope, Seasonal change