

Paleolithic human activity and summer temperature recorded in oxygen isotope of *Semisulcospira* from Sakitari-do archeolo

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Sakitari-do archeological site is located in Gyokusen-do cave system in Nanjo City, Okinawa Prefecture. Since 2009, this site has yielded important remains including a 12.4-ka-old human canine (Yamasaki et al., 2012). One of the noticeable animal remains is *Eriocheir* crub. Large and uniform size of the forceps indicates individuals of autumn season when this crub grows into an adult. Paleolithic people may have stayed in this cave during autumn and eaten *Eriocheir* crub.

In order to examine this hypothesis, this study focuses on *Semisulcospira* shell that was excavated together with *Eriocheir*. *Semisulcospira* is a freshwater gastropod that grows spiral shell. It is known that change in the water temperature was recorded in oxygen isotope of a series of samples collected along the spiral growth axis (Kano et al., 2008). If the Paleolithic people ate the gastropod, the oxygen isotopic value of the outermost sample indicates when it was taken. We analyzed the gastropod shell from two Paleolithic layers (19 ka and 12.4 ka) of the Sakitari-do site, as well as modern *Semisulcospira* collected a stream 5 km east from the site in late November 2013.

Paleolithic specimens from the Sakitari-do often exhibit a sign-shaped oxygen isotopic curve. Amplitude of the change is ~2 permil that corresponds to ~8 degree temperature change under stable water isotopic composition. More importantly, the outermost value locates on an autumn position in many specimens, which support the hypothesis based on *Eriocheir* remains. In contrast, the modern *Semisulcospira* specimens that lack the sign-shaped pattern were young individuals that born in early summer. They recorded temperature change from summer to November. Comparing the summer oxygen values, the modern specimens are 1-1.5 permil lower than the Paleolithic specimens. If the oxygen isotopic value has been constant, it can be evaluated that the Paleolithic summer water was 4-6 degree cooler than the modern summer water.

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