

Effects on larger benthic foraminiferal shell density under global warming

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On the recent ocean environment, due to progresses of global warming and ocean acidification, it is concerned that calcifying organisms will be seriously affected from these environmental changes. Larger benthic foraminifers (LBFs) build calcium carbonate shells. Their carbonate productivity is the third highest rate in coral reef area next to reef corals and calcareous algae. Therefore, it is important to clarify the relationship between ocean environmental changes and the response of LBFs for predicting future ocean environment including carbon cycle. Based upon test diameter and shell weight, previous studies expected how foraminifers react to sea water conditions where they are living. However, in those reports, it is still not clear whether the changing of shell weight is due to changing of shell thickness (shell volume) or shell density, also whether that changing is depending sea water temperature or acidity. Thus, this study was performed for clarifying the relationships between water temperature and LBFs shell parameters with laboratory experiments and means of micro computed tomography (CT).

In this study, we cultured the LBF *Sorites orbiculus* in filtered sea water until reproduction. Soon after *S. orbiculus* reproduced, clonal individuals from same mother individual were picked and separated into seven groups. One group was selected as initial stage sample, and other six groups were provided for culture experiments. We cultured each groups under six different temperature conditions (19, 21, 23, 25, 27 and 29 °C). Because clonal specimens were reproduced asexually from same individual, it was expected the genetic factors were kept to a minimum. We used micro CT to investigate mean CT number (proxy of density), shell volume, test diameter and chamber number of every clonal specimen after culturing. The results show the high correlation of mean CT number with temperature in contrast to the correlation of shell volume and temperature. This suggests changing in temperature of sea water causes shell density difference, furthermore, LBFs build the higher density shell in the higher temperature as long as they lives in 19 to 29 C° environment.

Keywords: Larger benthic foraminifer, shell density, micro CT, laboratory experiments, global warming