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Paleobiology of Foraminifera: Towards Better Understanding of Ecosystems and Biotic Evolution Through Foraminifera

Chaired by Hiroshi Kitazato and Joan M. Bernhard

Foraminifera are known as some of the most suitable organisms for reconstructing paleo-environments and evolutionary histories of marine organisms. However, we are not sufficiently informed about presently living foraminifera, their evolution and their response to environmental changes. What kind of information do foraminifera record within their test or cell? How do foraminifera survive and evolve during times of rapid, severe environmental change on Earth? What is the role of foraminifera in marine ecosystems? Biological approaches such as culture experiments, studies of foraminiferal anatomy and/or genetic analysis are direct ways of answering these questions. In this session, we aim to present information on biological features of foraminifera with the purpose of finding new keys to decode historical records within sediments or in the tests/cells. The following topics or approaches are covered this session:

1. Culture experiments under controlled environmental factors such as temperature, salinity, dissolved oxygen content, nutrient content, trace element concentration, or isotope values. In situ experimental studies in the field are also welcome.

2. Genetic analysis in order to understand phylogenetic relationships among foraminiferal genera or species.

3. TEM/SEM anatomy of the foraminiferal cell/test.

4. Biology and ecology of foraminifera in extreme environments, such as hydrothermal vents, cold seeps, or at abyssal to hadal depths.

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Foraminiferal growth models: Towards a fully integrated record of calcification

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Multilocular benthic foraminifera express growth by the intermittent addition of chambers and many individuals typically live for several months or longer. Foraminiferal tests therefore hold the potential to record information on changing seawater chemistry and temperature, particularly in the mid- to high-latitude shelf seas, where seasonality is most pronounced. Results from preliminary laboratory culturing experiments are presented, where field-collected individuals of *Elphidium williamsoni* were observed to have asexually reproduced and released juveniles. The growth and growth rates of these juveniles were determined over a period of 179 days in culture; growth rates, expressed as a change in maximum test diameter, were initially high (14 ì m.d^{1}) but tended to decrease asymptotically with time. Observations of growth and chamber addition in this planispirally-coiled species are used to develop a simple, generalised growth model where the amount and rate of calcification are determined over a six-month period. We compare these data with observations of growth in field-sampled populations of *E. williamsoni* and conclude that growth rates and growth models derived from culturing experiments are very similar to field data. Knowledge of the timing and rates of growth in benthic foraminifera may significantly improve our understanding of palaeoceanographic data based on whole-test measurements and, as microanalytical methods become more widely available, will help to constrain so-called 'seasonal effects' and other intra-test variability observed in shell chemistry.