SYMBIOSIS IN LARGER FORAMINIFERA

LEE, John J., Department of Biology, City College of CUNY, Convent Avenue at 138 St., New York New York 10031 and Department of Invertebrates, American Museum of Natural History, Central Park West at 79th St. New York, NY 10024, USA.

Numerous times in the world's oceanic history, from the Paleozoic to the present, there have been evolutionary bursts which have given rise to organisms 10-100 x the size of their ancestors and which became extremely complex in their cellular organization. All of today's larger foraminifera ("living sands") are hosts to symbiotic algae. In fact they are hosts to a greater diversity of algal endosymbionts than any other marine group. What is the biological basis for this broad adaptation to symbiosis?

Larger foraminifera share habitats with hermatypic corals and are particularly adapted for the euphotic zones of oligotrophic tropical and semi-tropical seas where their algal symbionts are major primary producers. Often there is more chlorophyll in a single larger foraminifer than in a m^3 of the water column above them. In such oligotrophic habitats they are major sinks of nutrients and CO_2 which they use both in primary production and deposit in their $CaCO_3$ skeletons.

Members of various soritacean families (Peneroplidae, Archaiasinae, Soritinae, Alveolinidae) in contemporary tropical and semitropical seas are the hosts respectively for unicellular red , chlorophyte, dinoflagellate, and diatom endosymbiotic algae. A cladistic analysis of the Soritidae based solely on 50 morphplogical characteristics led to a dendrogram which split the family into 3 clades (Gudmundsson 1994). Each clade is a host to a different algal type (red, green. dinoflagellate), but the biological basis for this evolutionary divergence is unknown. This symbiont diversity is in sharp contrast to the scleractinian corals, in the same warm, well illuminated, seas, which are the hosts of *Symbiodinium* and 6 other genera of dinoflagellates. Since most of today's scleractinian orders and families originated at various times in the Mesozoic, and since they are all hosts to dinoflagellates, it is reasonable to assume that the later evolving soritids acquire(d) their zooxanthellae from the corals in their habitat. The question of acquisition is an intriguing one. Was it a one shot event for each new foraminiferan species, or is it an ongoing process, as it seems to be in the diatom-bearing hosts? Diatom-bearing larger foraminifera are not absolutely finical about their endosymbionts. The same host species may harbor any one or two species of small (<10μm) penate diatoms. While over 20 species of endosymbiotic diatoms have been described, 6 species are most common and are involved in >75% of of all diatom-bearing larger foraminifera examined.

Studies of various aspects of the specificities, the establishment, and maintenance, of symbiosis in larger foraminifera could provide new insights into environmentally driven evolutionary processes in oligotrophic seimtropical and tropical seas.

https://doi.org/10.1017/S2475262200002355 Published online by Cambridge University Press