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## The ecology of triserial planktic foraminifera *Gallitellia vivans* based on stable isotopes and molecular evidences

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*Gallitellia vivans* (Cushman) is the only triserial coiling species among modern planktic foraminifera. Although previous studies suggested that *G. vivans* is a planktic species, it was unreported for a long time because of its small test and its low abundance in the water column and deep-sea sediments. Therefore, its distribution and ecology are poorly understood. Recently, we corrected numerous specimens of living *G. vivans* by plankton tow around the Tsushima Strait, located between the East China Sea and Japan Sea. We sequenced the small subunit ribosomal DNA (SSU rDNA) and performed stable isotopic analyses using semi-automated analytical system (MICAL) for living *G. vivans*. Our phylogenetic results suggested that *G. vivans* represents a separate lineage of planktic foraminifera and branches close to the benthic rotaliids *Stainforthia fusiformis*. This genera resemble *Gallitellia* having high trochospiral and triserial coiling. Furthermore, *S. fusiformis* is known as a phytodetrital aggregates feeder at coastal areas. *G. vivans* was also certified at least phytoplankton feeder by culture experiments in this study. These ecological features overlap between both genera and supported hypothesis that *G. vivans* did not arise from other planktic lineages and evolved directly from other benthic ancestor. Stable oxygen isotopic values of *G. vivans* ranged from -1.14 to -2.85 permil VPDB and indicated that their habitat is definitely planktic and that they may live at the surface. On the other hand, carbon isotope ratios ranged from -2.4 to -3.2 permil, distinctly lower than values for other planktic species. This may indicate isotopic disequilibrium between ambient seawater and the shells of *G. vivans* during shell formation. The geographic distribution and stable isotopic features of *G. vivans* are shared among the multiserial planktic species that have appeared in geological history, and they should also share similar ecologies and habitats. The study of the ecology of *G. vivans* is important when considering the paleoecology of primitive forms of planktic foraminifera and their surrounding environments along continental margins.

Keywords: triserial planktic foraminifer, stable isotopes, phylogeny, ecology, Tsushima Strait