

Pseudocryptic speciation of living *Braarudosphaera bigelowii*

Kyoko Hagino, Yoshihito Takano, Takeo Horiguchi

Notable size variations have been reported from living and fossil populations of *Braarudosphaera bigelowii* (Gran & Braarud, 1935) Deflandre (1947), however, size factor has not been integrated in the taxonomy of *B. bigelowii* due to lack of genetic evidence (Hagino, 1997; Svábenická, 1999; Konno *et al.*, 2007). Takano *et al.* (2006) subdivided the living *B. bigelowii* population into three morphotypes; Small forms, Intermediate forms –A and –B, based on size of the pentoliths. They obtained SSU rDNA sequences of two natural cells of *B. bigelowii* based on the single-cell PCR technique, and found 16-bp differences, including indels between the cells belonging to Intermediate form-A and Intermediate form-B. However, they did not emend their taxonomic position, since the size range of these two forms overlapped.

To examine the taxonomic position of morphotypes of living *B. bigelowii*, we studied sufficient number of living cells of *B. bigelowii* from various parts of Japan, genetically. In this study, partial SSU rDNA sequences (>1600-bp) of 14 cells of *B. bigelowii*, which were different in size, were obtained using the single-cell PCR technique. In addition to the previously reported three morphotypes by Takano *et al.* (2006), a new morphotype, Intermediate form –C (>7.0µm in side length of pentolith), was recognized. Together with the sequences reported by Takano *et al.* (2006), the number of specimens of Intermediate forms –A, –B and –C sequenced increased to six, seven and three, respectively. Signature sequences that represent Intermediate forms –A, –B and –C were found; ten substitutions separate Intermediate forms –A and –B from each other, and an additional one substitution separates Intermediate form–C from Intermediate form–B. SSU rDNA sequences of seven specimens belonging to the Intermediate form-B were consistent. However, one additional substitution was found from one of the Intermediate form–A cells and also from one of the Intermediate form–C cells, regardless of sampling area.

SSU rDNA sequence types were correlated with morphotypes classified based on size, not on sampling area. Therefore, it is evident that the Intermediate forms A-C are genetically distinct species. Since the Intermediate form-B corresponds in size to the original description by Gran & Braarud (1935), Intermediate forms –A and –C should be raised to species rank.

References

- Deflandre, G. 1947. *Braarudosphaera* nov. gen., type d'une famille nouvelle de Coccolithophoridés actuels à elements composites. *C. R. Hébd. Séances Acad. Sci., Paris*, **225**: 439–441.
- Gran, H.H. & Braarud, T. 1935. A quantitative study of the phytoplankton in the Bay of Fundy and the Gulf of Maine (including observations on hydrography, chemistry and turbidity). *J. Biol. Board Can.*, **1**(5): 279–467.
- Hagino, K. 1997. Distribution of living coccolithophores in the western Pacific Ocean off the coast of Northeast Japan. *Fossils*, **63**: 1-19.
- Konno, S., Harada, N., Narita, H. & Jordan, R.W. 2007. Living *Braarudosphaera bigelowii* (Gran & Braarud) Deflandre in the Bering Sea. *J. Nannoplankton Res.*, **29**(2): 78-87.
- Svábenická, L. 1999. *Braarudosphaera*-rich sediments in the Turonian of the Bohemian Cretaceous Basin, Czech Republic. *Cretaceous Res.*, **20**: 773-782.
- Takano, Y., Hagino, K., Tanaka, Y., Horiguchi, T. & Okada, H. 2006. Phylogenetic affinities of an enigmatic nannoplankton, *Braarudosphaera bigelowii* based on the SSU rDNA sequences. *Mar. Micropaleontol.*, **60**: 145-156.