

Spatial and seasonal distribution of planktonic foraminifera *Neogloboquadrina pachyderma* and reconstruction of paleoceanography off Shimokita

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Planktonic foraminifera live in the upper ocean, and they can record a surrounding environment in their assemblages and individual shells. For the purpose of the better understanding of the subpolar-polar species *Neogloboquadrina pachyderma*, we evaluated the factors controlling the distribution of this species using plankton tow samples and applied this result to core sediments. Furthermore, we examined the different distribution of each coiling form of *N. pachyderma* using sediment trap experiment. Plankton tow results indicate that *N. pachyderma* mainly inhabits below the pycnocline ($> \sim 20$ m). On the other hand, *Neogloboquadrina incompta*, subpolar species prefers shallower and warmer waters than *N. pachyderma*, and its abundance is correlated with the chlorophyll-*a* concentration around the Japanese Islands. Based on this spatial distribution, we reconstructed the palaeoenvironment and water column structure off the Shimokita (41°33.9'N, 141°52.1'E) during the last 26,900 years. The Oyashio current affected the surface and subsurface waters in 26.9-10.6 thousand calendar years before present (cal. kyr BP) with subsurface slight warming at ~ 14 cal. kyr BP. The Tsugaru current started to enter the Pacific about 11.1-10.6 cal. kyr BP and led to the baroclinic conditions that surface and subsurface layers were under the influence of the Tsugaru and Oyashio currents, respectively. Water column stratification developed with increasing inflow of the Tsushima current and finally the subsurface layer started to warm at 6.2 cal. kyr BP. Time-series sediment trap study was conducted in the northwestern North Pacific in 1998-2000. Seasonal flux profile of right-coiling *N. pachyderma* is consistent with that of the left-coiling one at the relatively northern area (50 °N), while they are different at the southern area (40 °N). It would be caused by the genetic variation of right-coiling *N. pachyderma* observed in the North Atlantic, and this boundary seems to be 5% of right-coiling ratio of *N. pachyderma*.

Keywords: Planktonic foraminifera; *Neogloboquadrina pachyderma*; coiling direction; vertical distribution; plankton tow; core sediment; seasonal distribution; sediment trap.