



## The secondary calcification of *Neogloboquadrina pachyderma* assemblages in Arabian Sea waters and surface sediments

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The planktic foraminifer *Neogloboquadrina pachyderma* (*N. pachyderma* (sin); Darling et al., 2006) has been recently considered as a (paleo) climatic index in Arabian Sea waters, where increased abundance correlates to the South West monsoon upwelling. Genetic characterization of living specimens collected in multinetts off the Oman margin and in the central Arabian Sea indicate the presence of a new genotype of *N. pachyderma* (Type VIII) (Darling et al., submitted) in the northwestern Indian Ocean. Ecological investigation on these samples reveals that this new genotype, which is the only one to date found in this region, can tolerate warm water temperatures of up to 28°C. It was also found alive below the photic zone within the prominent oxygen minimum zone (OMZ) of the Arabian Sea.

To extend our knowledge and understanding of this *N. pachyderma* Type VIII genotype, we have focused on a morphological analysis of randomly picked specimens (live and dead) from the multinetts collected from 200 m down to 700 m water column and from core top sediments distributed over a wide range of water depths (607-3951 m) off the Oman margin in the Arabian Sea. We here use Scanning Electron Microscopy (SEM) to determine the size, shape variation and test wall structure of the penultimate chamber. High resolution measurements confirm the model of chamber growth in non-spinose bilamellar foraminifera of a three or four-layered test wall. As ontogenetic calcite, we were able to visualize the inner lining, the outer layer and the outermost layer formed during the growth of the ultimate chamber. Some of the specimens also showed a fourth layer, which can be attributed to encrustation, observed in higher-latitude specimens of both hemispheres to result from secondary calcification as a terminal step in ontogenetic maturation. To verify the test wall growth and secondary calcification the measurements of the layers were related to the maximum test diameter of the shell. The measurement data were calculated with a one-way ANOVA statistic method.

Test sizes of measured *N. pachyderma* from both multinetts and surface sediments varied from 123  $\mu\text{m}$  to 283  $\mu\text{m}$ . The mean test size of plankton samples was 150  $\mu\text{m}$  and of sediment samples 174  $\mu\text{m}$ , respectively. In total, secondary calcification was found on 80 % of the investigated specimens. We found no significant correlation between shell size and secondary calcification. Rather, encrustation is most pronounced for the sea floor specimens, where that ratio is from 0.46 % to 0.72 %, much higher than for the plankton tows with ratio between 0.46 % and 0.49 %. Further analysis will be required to better understand chamber formation and the process of secondary calcification in the Arabian Sea *N. pachyderma* population.

Darling, K. F., Kucera, M., Kroon, D. and Wade, C. M., 2006. A resolution for the coiling direction paradox in *Neogloboquadrina*. *Paleoceanography*, 21, PA2011.