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Palaeonummulites venosus: Natural growth rates and quantification by means of CT investigation

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Symbiont-bearing larger benthic Foraminifera (LBF) are long-living marine (possibly >1 year), single-celled organisms with complex calcium carbonate shells.

Reproduction period, longevity and chamber building rate of LBF are important for population dynamics studies. It was expected that growth experiments in laboratory cultures cannot be used for estimation of chamber building rates and longevity studies although the laboratory conditions were simulated to natural conditions. Therefore, it is necessary to study individual and population growth under natural conditions for getting natural information. Therefore, the 'natural laboratory' method was developed to calculate the averaged chamber building rate and averaged longevity of species based on monthly sampling at fixed sampling stations and to compare with laboratory cultures simulating environmental conditions as close as possible to the natural environment.

Thus, in this study, samples of living individuals were collected in 16 monthly intervals at 50m depth in front of Sesoko Island, Okinawa, Japan. We used micro-computed tomography (microCT) to investigate the chamber number of every specimen from the samples immediately dried after sampling. Single non dried specimens were cultured and the time of chamber building was obtained using microphotographs counted for every specimen at 2 to 4 days time intervals.

The investigation using the natural laboratory method of *Palaeonummulites venosus* is based on the decomposition of the monthly frequency distributions into normally distributed components. Then the shift of the component parameters mean and standard deviation was used to calculate the necessary character of maximum chamber number and the Michaelis Menten function was applied to estimate the chamber building rate under natural conditions.

This resulted in two reproduction periods, the first starting in May and the second in September, both showing the same chamber building rates, where the first shows a slightly stronger increase in the initial part. Longevity seems to be round about one year. Due to the several reproduction periods, the existence of small and large specimens in the same sample and the bimodal distributions can be explained.

The cultured individuals shows a much lower chamber building rate, often demonstrating a longer period with no chamber production just after sampling, the results of sampling shock.

This is the first time that it can be shown that chamber building rates and longevities cannot be based on laboratory investigations.