Geophysical Research Abstracts, Vol. 7, 04874, 2005
SRef-ID: 1607-7962/gra/EGU05-A-04874

Insights into the Skeletal Growth Pattern of the Hypercalcified Sponge *Petrobiona massiliana*

L. Berry (1), V. Sivel (2), H. Zandbergen (2), Ph. Willenz (1) and the CALMARS group.

(1) Department of Invertebrates, Royal Belgian Institute of Natural Sciences, Brussels, B1000, Belgium

(2) Laboratory of Materials Science, Delft University of Technology, Rotterdamsweg 137, 2628 AL Delft, The Netherlands

Corresponding author: Lorraine Berry. E-mail address: l.s.berry@tnw.tudelft.nl

Interest in calcifying marine organisms, including hypercalcified sponges, has grown over the last 20 years because of their potential to provide environmental information relating to past climate [1,2]. As a result, growth rates and knowledge of skeletal development have become increasingly important. Hypercalcified sponges secrete a massive basal skeleton that can be analysed along the growth axis, providing environmental information accumulated during the lifetime of the specimen. *Petrobiona massiliana*, a hypercalcified sponge, secretes a massive calcitic basal skeleton. Although small, this species could potentially provide climatic information at different points in time. Living specimens are found in the Mediterranean, growing in submarine caves [3]. In addition, subfossil skeletons have been found, dating back 1500 years ago, and fossil remains, dating back 30 000 years [4]. However, before any geochemical analyses can be interpreted, the growth rate and development of the skeleton have to be determined.

The growth rate of *Petrobiona massiliana* was investigated using calcein, a fluorochrome that binds permanently at the site of precipitation of calcium carbonate [5]. Whole specimens were glued to plates to allow ease of *in situ* incubation with calcein. Annual growth rates were highly variable. The mean annual growth rate for the specimens allowed to recover after plating was 242.76 $\pm$ 161.42 μm. Measurements taken from the calcein labelling performed at the time of plating were significantly lower (56.66 $\pm$ 23.67 μm), suggesting that manipulations had affected growth rate. Measurements also varied significantly from one specimen to another, ranging from 111.60 $\pm$ 57.21 μm to 676.69 $\pm$ 63.80 μm for those allowed to recover, and from 9.72 $\pm$ 3.37 μm to 70.17 $\pm$ 40.81 μm for those incubated with calcein soon after plating. The growth rate of this species falls within the range observed in other hypercalcified sponges [2,5,6].

Scanning Electron Microscopy (SEM) observations of the skeleton showed multi-directional growth of the surface skeletal projections, which made the skeletal growth axis difficult to distinguish during growth measurements. High Resolution SEM was also performed to search for surface structures that may indicate centres of calcification, increasing our understanding of skeletal development and growth in this species, and their use as proxy indicators of climate change.

References

[1] Swart P., Moore M., Charles C. & Böhm F. (1998). Sclerosponges may hold new keys to marine paleoclimate. *EOS, Transactions, American Geophysical Union*, 79 (52): 633-636.

[2] Lazareth C.E., Willenz Ph., Navez J., Keppens E., Dehairs F., and André L. (2000). Sclerosponges as a new potential recorder of environmental changes: Lead in *Ceratoporella nicholsoni*. *Geology*, 28 (6): 515-518.

[3] Vacelet J., Borojevic R., Boury-Esnault N. and Manuel M. (2002). Order Lithonida Vacelet, 1981, Recent. Pp. 1185-1192. *In*: Hooper, J.N.A. & van Soest R.W.M. (Eds), Systema Porifera: A Guide to the Classification of Sponges, Volume 2. (Kluwer Academic/Plenum Publishers, New York): 1103-1708

[4] Vacelet, J. (1991). Recent Calcarea with a reinforced skeleton ('Pharetronids'). Pp. 252-265. *In*: Reitner, J. & Keupp H. (Eds), Fossil and Recent Sponges. (Springer-Verlag: Berlin, Heidelberg): i-xviii, 1-595.

[5] Willenz, Ph., and Hartman, W.D. (1999). Growth and regeneration rates of the calcareous skeleton of the Caribbean coralline sponge *Ceratoporella nicholsoni*: A long term survey. *In*: Hooper, J.N.A., (Ed), Proceedings of the 5th International Sponge Symposium "Origin and Outlook". Queensland Museum Memoirs, 44: 675–685.

[6] Rosenheim B.E., Swart P.K., Thorrold S.R., Willenz Ph., Berry L. and Latkoczy C. (2004). High-resolution Sr/Ca records in sclerosponges calibrated to temperature *in situ*. *Geology*, **32** (2): 145-148.