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EDITORIAL

# The importance of serpulid reefs and their vulnerability to ocean acidification: editorial comment on the feature article by Smith et al.

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Tube-building annelid worms from the family Serpulidae (Fig. 1) significantly contribute to calcium carbonate deposition on temperate reefs. These frame-builders modify the physical environment and enhance biodiversity by providing shelter, food and substrate (Bosence 1979). Despite their ecological importance, there has been little research into the skeletal carbonate mineralogy of serpulid worm tubes, with the limited available data originating from the northern hemisphere (Bornhold and Milliman 1973; Vinn et al. 2008). Characterising the potential for mineralogical variation in skeleton calcification within an individual, between species or over a temporal scale would be especially useful in understanding how serpulids will respond to environmental change.

A major threat to marine calcifiers is ocean acidification where shifts in ocean carbonate chemistry will reduce the ability for growth, weaken tube integrity and potentially lead to skeletal dissolution in serpulids (Chan et al. 2012). Given their role in shaping many temperate marine ecosystems and their vulnerability to environmental change, the study by Smith et al. (2013) provides a timely review of existing literature integrated with new data from the southern hemisphere. The aim was to characterise the carbonate geochemistry of serpulid worm tubes from around the globe in order to understand the potential effects of changing seawater chemistry on temperate reef ecosystems. For the first time, the authors demonstrated a correlation between the phylogeny and mineral composition of serpulid tubes. Skeletal mineralogy was also found to vary from entirely aragonite to entirely high-Mg calcite to various mixtures of the two. As aragonite and high-Mg calcite are among the most vulnerable minerals to decreasing pH and saturation states (Ries 2011), it was concluded that serpulids are highly vulnerable to changes in ocean chemistry predicted for the near-future. Importantly, however, examples of skeletal mineralogy adjustment in response to changes in seawater chemistry were found, but to the detriment of tube strength and elasticity.

In conclusion, the outcomes of Smith et al. (2013) provide important insights into phenotypic and environmental causes of variation in serpulid worm tubes, as well as highlighting the vulnerability of species within the

**Fig. 1** *Protula bispiralis* from Heron Island reef flat, Great Barrier Reef, Australia. In the study of Smith et al. (2013), all individuals of this species were found to have an entirely aragonitic tube. Photograph: Ross Hill

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Serpulidae family to ocean acidification. Impacts of populations of serpulids are also likely to have profound implications on the function of temperate benthic communities which depend upon the biogenic habitat formed by calcifying worms.

## References

Bornhold BD, Milliman JD (1973) Generic and environmental control of carbonate mineralogy in serpulid (Polychaete) tubes. J Geol 81:363–373

Bosence DWJ (1979) The factors leading to aggregation and reef formation in *Serpula vermicularis* L. In: Larwood G, Rosen BR (eds) Biology and systematics of colonial organisms. Academic Press, London

Chan VBS, Li C, Lane AC, Wang Y, Lu X, Shih K, Zhang T, Thiyagarajan V (2012) $CO_2$-driven ocean acidification alters and weakens integrity of the calcareous tubes produced by the serpulid tubeworm, *Hydroides elegans*. PLoS One 7:e42718

Ries JB (2011) Skeletal mineralogy in a high-$CO_2$ world. J Exp Mar Biol Ecol 403:54–64

Smith AM, Riedi MA, Winter DJ (2013) Temperate reefs in a changing ocean: skeletal carbonate mineralogy of serpulids. Mar Biol. doi:10.1007/s00227-013-2210-z

Vinn O, ten Hove HA, Mutvei H (2008) On the tube ultrastructure and origin of calcification in sabellids (Annelida, Polychaeta). Palaeontology 51:295–301