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The effects of disease and stress on the microbial community of the sponge *lanthella basta*: sponge disease on the Great Barrier Reef and Torres Strait

Heidi, originally from Colorado, completed her Masters of Applied Science in 2006 at JCU, where she studied the effects of size and spatial competition on the bioactivity of a thin encrusting sponge. This project sparked an ongoing interest in sponges, which led her to apply for an AIMS@JCU PhD Scholarship investigating sponge disease.

Disease outbreaks can have far reaching impacts on sponge populations. The majority of disease reports have been restricted to the Caribbean and Mediterranean; however, anecdotal reports of sponge disease on the GBR have been increasing over the last decade. Despite the increased observations, there is a notable lack of baseline data establishing the extent of disease and potential causative agents.

The aims of Heidi's project were to determine the prevalence and etiological agents of disease in a common GBR sponge (*lanthella basta*) and to examine the effects of environmental stressors on the sponge-microbe symbioses.

Results from Heidi's project have revealed that a disease-like syndrome is affecting a large percentage of *I. basta* in Torres Strait (66%) and the Palm Islands, central GBR (44%). Symptoms of the disease-like syndrome include discoloured, necrotic spots leading to tissue degradation, exposure of the skeletal fibres and disruption of the choanocyte chambers. Despite a comprehensive comparison of bacteria, viruses, fungi and other eukaryotes, no putative pathogen(s) could be implicated in the formation of brown spot lesions and necrosis. In addition, neither increased temperatures nor sedimentation was successful at inducing the disease-like symptoms observed in the field; therefore, an environmental origin of the syndrome is also unlikely. Another major outcome of this project is that the microbial community of *I. basta* is stable across a latitudinal gradient and under varying stressors, with three dominant symbionts always observed (Alphaproteobacteria, Gammaproteobacteria & Thaumarchaea). Given the apparent stability, these results indicate that *I. basta's* associated microbes' likely play an important functional role(s) in this sponge.



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Publications

- Andreakis, N., Luter, H.M. & Webster, N.S., 2012. Cryptic speciation and phylogeographic relationships in the elephant ear sponge *lanthella basta* (Porifera, *lanthellidae*) from northern Australia. *Zoological Journal of the Linnean Society*, 166(2), pp.225–235. Available at: <http://doi.wiley.com/10.1111/j.1096-3642.2012.00848.x>
- Freckelton, M.L. et al., 2011. Qualitative variation in colour morphotypes of *lanthella basta* (Porifera: Verongida). *Hydrobiologia*, 687(1), pp.191–203. Available at: <http://link.springer.com/10.1007/s10750-011-0818-x> [
- Luter, H.M. & Duckworth, A.R., 2010. Influence of size and spatial competition on the bioactivity of coral reef sponges. *Biochemical Systematics and Ecology*, 38(2), pp.146–153. Available at: <http://linkinghub.elsevier.com/retrieve/pii/S030519780900194X>
- Luter, H.M., Whalan, S. & Webster, N.S., 2010. Exploring the role of microorganisms in the disease-like syndrome affecting the sponge *lanthella basta*. *Applied and environmental microbiology*, 76(17), pp.5736–44. Available at: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2935071&tool=pmcentrez&rendertype=abstract>.
- Luter, H.M., Whalan, S. & Webster, N.S., 2010a. Microorganisms are not responsible for the disease-like symptom affecting the marine sponge *lanthella basta*. In *13th International Symposium on Microbial Ecology, Seattle, WA, 22-27th August*.
- Luter, H.M., Whalan, S. & Webster, N.S., 2010b. Microorganisms: an unlikely cause of the disease-like syndrome affecting the marine sponge *lanthella basta*. In *9th International Marine Biotechnology Conference, Qingdao, China, 8-12th October*.
- Luter, H.M., Whalan, S. & Webster, N.S., 2010c. Microorganisms: an unlikely cause of the disease-like syndrome affecting the marine sponge *lanthella basta*. And 'Extraordinary tissue regeneration in the marine sponge *lanthella basta*. In *VIII World Sponge Conference, Girona, Spain, 20-24th September*.
- Luter, H.M., Whalan, S. & Webster, N.S., 2010d. Prevalence of tissue necrosis and brown spot lesions in a common marine sponge. *Marine and Freshwater Research*, 61(4), p.484. Available at: <http://www.publish.csiro.au/?paper=MF09200>.
- Luter, H.M., Whalan, S. & Webster, N.S., 2011. The marine sponge *lanthella basta* can recover from stress-induced tissue regression. *Hydrobiologia*, 687(1), pp.227–235. Available at: <http://link.springer.com/10.1007/s10750-011-0887-x>
- Luter, H.M., Whalan, S. & Webster, N.S., 2012. Thermal and sedimentation stress are unlikely causes of brown spot syndrome in the coral reef sponge, *lanthella basta*. *PloS one*, 7(6), p.e39779. Available at: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3382149&tool=pmcentrez&rendertype=abstract>.