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A holistic approach towards understanding population demographics and dynamics of an intertidal sponge

Muhammad moved from Singapore to Australia in 2006 to gain his BSc in Aquaculture at JCU. After which, he worked as a research assistant, developing methods to extend the shelf-life of a commercially important seaweed, green caviar (*Caulerpa lentillifera*). His honours project investigated reproduction, larval behaviour, settlement cues, and post-settlement processes (i.e. survival and growth) in the commercial bath sponge *Coscinoderma matthewsi*.

Despite the abundance, diversity and significant functional roles of sponges, very little is known about their biology and ecology in the Great Barrier Reef (GBR). Understanding processes that contribute to population maintenance is critical to the management and conservation of species.

Muhammad's PhD project aims to develop a holistic approach to the population dynamics of GBR sponges, using the foliose Phyllospongiiniid sponge *Carteriospongia foliascens*, as a model species. To achieve this, Muhammad investigated;

- the long-term reproductive biology and phenology;
- in-situ recruitment;
- mortality and growth rates;
- larval behaviours relating to phototaxis;
- dispersal; and
- settlement

Which allowed him to understand influential processes at each of the sponge life history stages. As many groups of sponges exhibit extreme morphological plasticity induced by environmental conditions, Muhammad also conducted a comprehensive systematics and phylogeographic study of tropical foliose sponges in the sub-family Phyllospongiinae from the GBR and Western Australia, integrating both molecular data and morphometrics, to establish robust taxonomical units used in his research.

Muhammad has found a number of exciting results:

- There is an underestimation of sponge diversity in tropical Australia, Muhammad discovery three new species once thought to be synonymous to already described species.
- *C. foliascens*, one of the most abundant and conspicuous sponges in the GBR, has been taxonomically misclassified.
- There was a two-fold reduction of larval production in *C. foliascens* over the study period due to a particularly strong La Niña event. This, taken in light of the low dispersal potential in this species, identifies a real risk to *C. foliascens* populations under predicted climate change scenarios.



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- Wahab, M.A., 2013. Insights into population dynamics of the intertidal *Carteriospongia foliascens* in central Great Barrier Reef. Oral presentation. In *AIMS@JCU Seminar Day*. Townsville.
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