

MASTS DPMS Grant report:

Understanding 400 years of Pacific coral reef bleaching; will corals adapt to future climate change?

Background: Coral bleaching is the loss of symbiotic zooxanthellae (*Symbiodinium* sp.) from corals. Mass coral bleaching events during the last 20 years have caused major concern over the future of coral reefs worldwide. Despite such losses to coral reefs, which are key ecosystem service providers (Hennessy *et al.*, 2007), little is known about bleaching frequency prior to 1979 when regular scientific observations in the Pacific began (e.g. Maldives and Australia). These show recent increased bleaching prevalence (Brown, 1997, Cantin & Lough, 2014). The underlying mechanisms of coral bleaching are known to cause a breakdown of the coral-algae symbiosis and can be caused by stressors including thermal perturbations, disease and freshwater runoff (Fabricius, 2005, Hendy *et al.*, 2003, Wiedenmann *et al.*, 2013). Certain symbiont clades are more susceptible to bleaching, and during sub-lethal bleaching events, corals re-populate their symbiont community with clades less susceptible to bleaching. In this respect, sub-lethal bleaching, may act as a 'safety valve' allowing coral hosts to survive periods of thermal stress in warmer waters (Suggett & Smith, 2011) and represent capacity for coral-symbiont adaptation to a changing environment.

Advanced made with during the MASTS grant: To understand the relevance of current bleaching trajectories and the likelihood of future coral adaptation, records of natural pre-industrial bleaching are needed. During a sampling campaign to the Maldives we collected three cores from separate *Porites* sp. colonies using SCUBA. The cores were sectioned using a band saw and sectioned slabs have been imaged using x-ray analysis. This enabled us to determine annual growth bands within each coral core and pin-point historical bleaching events which left signatures in the corresponding year's growth band.

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