Bilateral asymmetry in bleaching susceptibility within a giant clam, *Tridacna maxima*

Fig. 1 Bleaching event observed during the El Niño 2014–2016 event in Tetiaroa atoll. **a** Resistant giant clams *Tridacna maxima* compared to one sensitive *Acropora* coral colonies *A. tenuis*, and **b** bilateral asymmetry in bleaching susceptibility of a giant clam *Tridacna maxima*

Giant clams, like zooxanthellate corals, are reliant on *Symbiodinium*. The intercellular *Symbiodinium* into the giant clams can provide up to 100% of the host's energetic requirements through the photosynthetic activity (uptake and fixation of inorganic compounds) (Fisher et al. 1985). However, such associations are vulnerable to stress-induced expulsion of the algae, often associated with increased sea surface temperatures. While the physiological stress of bleaching is largely reported and studied in corals, it is rare and thus still poorly understood in giant clams.

In April 2016, the sea surface temperature within the lagoon of Tetiaroa Atoll, French Polynesia (17°0'S, 149°33'W), reached 31–32 °C. These temperatures are 2–3 °C higher than the bleaching thermal threshold historically determined for the Society archipelago (e.g. 29.2 °C for Moorea, Adjerdou et al. 2009). This positive thermal anomaly caused coral bleaching mainly of *Acropora* and partly other coral species. Conversely, despite the high density of giant clams *Tridacna maxima* in the lagoon, most of them did not display any bleaching signs (Fig. 1a). However, we did observe one individual with bilateral asymmetry in bleaching susceptibility (Fig. 1b). This suggests that the two sides of the organisms are differentially resistant and/or adapted to thermal stress. One possible explanation that could account for bilateral thermal tolerance is the occurrence of distinct *Symbiodinium* communities between both sides of giant clams, as certain clades of *Symbiodinium* are more resistant to seawater warming than others. Indeed, giant clams are known to be associated with different clades (A, C and/or D) of *Symbiodinium* (DeBoer et al. 2012), but whether *Symbiodinium* communities vary between the two hemispheres of the same individual remains to be tested.

Understanding differential susceptibility and resistance to thermal bleaching within and among coral reef organisms such as giant clams is critically important given sustained and ongoing ocean warming.

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