**Coral resilience to unprecedented heat stress**

Danielle C. Claar1, Kristina L. Tietjen1, Ruth D. Gates2, Julia K. Baum1,2

Institute: 1 Department of Biology, University of Victoria, PO Box 1700 Station CSC, Victoria, British Columbia, V8W 2Y2, Canada; 2 Hawaii Institute of Marine Biology, 46-007b Lilipuna Road, Kaneohe, HI 96744, USA

Corresponding Author: Danielle C. Claar, Tel: (208) 250-0161, Email: [dclaar@uvic.ca](mailto:dclaar@uvic.ca)

Keywords: coral bleaching, El Niño, heat stress, climate change, resilience, Symbiodinium, symbiosis

**Summary**

**Main text**

**Acknowledgements** Thanks to……..

**Author Contributions**:

**Author Information**:

**[input figure 1 file here when we are ready to submit]**

**Figure 1 | Thermal stress experienced by corals, and the transition of one such coral from healthy – bleached – recovered, at the epicentre of the 2015-2016 El Niño event. a.** Degree Heating Weeks (DHW), on Kiritimati Island over the course of the 2015-2016 El Niño event. Corals are sensitive to temperatures warmer than 1°C above their normal highest summertime mean sea surface temperature (SST), known as the bleaching threshold. DHW shows how much heat stress has accumulated in an area over the past twelve weeks by summing any temperature exceeding the bleaching threshold during that period. Horizontal lines show expected bleaching severity levels: 4°C (yellow line), NOAA Coral Reef Watch (CRW) Bleaching Alert Level 1 (significant bleaching likely); 8°C (light orange line), Bleaching Alert Level 2 (widespread bleaching and mortality may occur); 12°C (dark orange line), ‘mass coral mortality’ expected to occur (Hoegh-Guldberg 2011); 24°C (dark red line) ‘not experienced by reefs yet’ (Hoegh-Guldberg 2011). Solid black line indicates *in situ* calculated DHW, and fill colors correspond to bleaching severity levels. Dashed vertical gray lines show the six sampling time points. **b.** Photographs of the same tagged *Platygyra* coral colony (#99), from the six time points (dashed grey lines), showing the initially healthy colony (i-ii) bleached after two months of heat stress (iv), ‘recovered’ to a normal brown colour after ten months of heat stress (v), and still alive six months post heat stress (vi).

**[input figure 1 file here when we are ready to submit]**

Figure 2 |

[Figure 2. *Symbiodinium* community composition at each of five time points, showing the shift in dominance from clade C to clade D over the course of the 2015-2016 El Niño event, for A. the entire pool of tagged *Platygyra* coral colonies at each of the five sampling time points (n= X - Y colonies per time point), B. the same individual tagged *Platygyra* coral colony (#99). – This figure illustrates non-preferential explusion of clades c and d; and that symbiodinium that ar einitially extremely rare can play a critical role in coral resilience to heat stress.]

[Figure 3. A. [Danielle to write this one: - will be the Constrained ordination plot showing groupings of *Symbiodinium* communities from individual *Platygyra* colonies, grouping into two distinct areas according to level of local disturbance….]; B. Bar plots showing *Symbiodinium*community composition for individual *Platygya* colonies at a single time point prior to the heat stress, from sites with high (top) and low (bottom) levels of local disturbance levels.] Figure 4. Potentially the symbiodinium network plot. Figure 5. Potentially the rank abundance plot for Platy…..