Life and death after super typhoon Haiyan

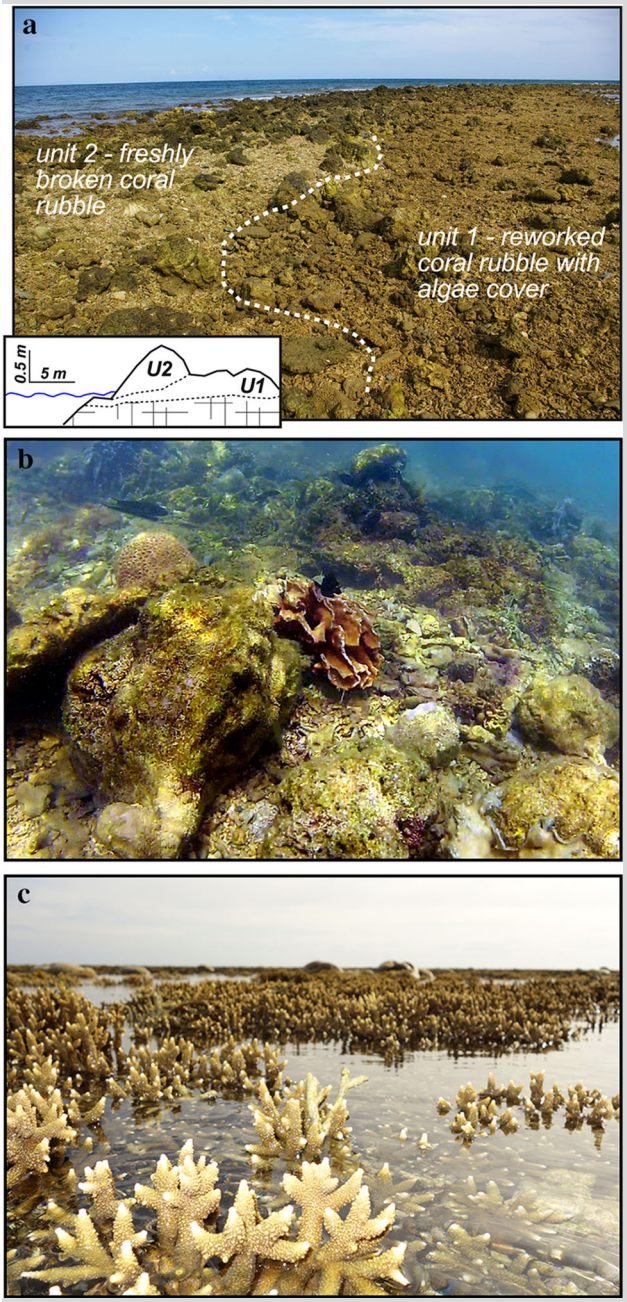

Fig. 1 **a** Photograph and cross section of ridge exposed at low tide. **b** Broken and overturned corals on Carbin's western slope. **c** Live *Acropora* in the intertidal area

Super typhoon Haiyan, packing sustained winds >300 kph, wrought immense damage on the Philippines in November 2013. Haiyan displaced large boulders in some areas (Engel et al. 2014) and generated an estimated 5 m surge in the Sagay Marine Reserve (10°58′57.58″N, 123°27′50.00″E), central Philippines.

Immediately after, a coral boulder and rubble ridge several hundred meters long was exposed at low tide on Carbin Reef within the reserve (Fig. 1a). It was either newly established or heightened by the typhoon, but the presence of at least two different depositional units of rubble suggests the latter may be more likely.

We present an exhibition of extremes: a heavily damaged subtidal reef area (Fig. 1b) and a largely untouched intertidal coral community (Fig. 1c) separated only by the 20 m-wide ridge. On Carbin's western slope, the typhoon displaced boulders, sheared stands of *Heliopora*, and overturned massive colonies down to 10 m. Landwards of the ridge, in the shallow intertidal, many branching acroporids and massive faviids and poritids remained alive and structurally intact, consistent with observations and model predictions of Hongo et al. (2012).

Haiyan may still take its toll here, however. By February 2014, partial mortality was evident on the tips of some branching acroporids where they remain above water at low tide. Future surveys will document if the newly established or significantly heightened ridge wrought physical/hydrological changes that could cause delayed mortality (Harmelin-Vivien 1994). However, the observable immediate effects of super typhoon Haiyan on Carbin demonstrate that even a category five storm is not a universal death sentence for corals in shallow habitats. Local geomorphology, exposure, and sediment dynamics merit consideration in assessing storm vulnerability, even in the shallowest of reef areas.

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M. Reyes (✉)
Marine Science Institute, University of the Philippines, 1101 Quezon City, Philippines
e-mail: michellezreyes@yahoo.com

M. Engel · S. M. May · D. Brill · H. Brueckner
Institute of Geography, University of Cologne, 50923 Cologne, Germany

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