High latitude, deeper water coral bleaching at Rottnest Island, Western Australia

Fig. 1 Coral bleaching in a water depth of 28 m at Rottnest Island (May 2011). **a** bleached colonies of *Coscinaraea marshallae* adjacent to an unbleached colony of *Montipora* sp., **b** close-up of a bleached colony of *C. marshallae*, **c** flatworms on a bleached colony of *C. marshallae*

Coral bleaching is well documented on shallow, tropical reefs; however, there are few published records of coral bleaching on high latitude ($>26^{\circ}$), deeper (>20 m) reefs (see Harrison et al. 2011 for a recent example of bleaching on a high latitude, shallow reef). High latitude, deeper reefs are thought to be less affected by thermal stress and therefore may act as potential refuge sites from the adverse impacts of global warming (Bongaerts et al. 2010). Here, we observed extensive species-specific coral bleaching in May 2011 at two high latitude, deeper (24–28 m) reefs located on the western side of Rottnest Island, Western Australia ($32^{\circ}00'S$, $115^{\circ}31'E$). Rottnest Island has well-developed coral assemblages that include 25 species in 16 genera (Veron and Marsh 1988). Most colonies of *Coscinaraea marshallae* ($n \approx 100$), a species endemic to southern Australia, were completely bleached and colonized by flatworms, while all other coral genera were unbleached (Fig. 1). Ninety-five percent of bleached colonies of *C. marshallae* remained alive after 4 weeks, although partial mortality was evident in approximately 20% of colonies. Water temperatures between December 2010 and May 2011 at these sites were higher than average and NOAA SST records reveal 16-degree heating weeks (DHW) for the region (<http://www.osdpd.noaa.gov/data/cb/dhw/2011/dhwg.5.30.2011.gif>). In situ measurements recorded hourly by HoboTM loggers confirmed temperatures were up to 4°C higher (maximum = 26.4°C) than the long-term monthly average (21.5 – 21.9°C) for the 150 days prior to surveys (December 27, 2010 to May 25, 2011), and these above average temperatures extended to a depth of greater than 50 m. Our observations confirm that corals located on deeper, high latitude reefs are susceptible to thermal bleaching. Interestingly, at this location, *C. marshallae* is close to the northern limit of its range (Veron and Marsh 1988), which may explain why it is more susceptible to thermal stress than the other species at Rottnest Island, most of which have distributions extending further north (Veron and Marsh 1988).

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