

First observed severe mass bleaching in Malaysia, Greater Coral Triangle

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Malaysia contains approximately 4,000 km² of reef (Wilkinson 2008) and an estimated 500 hermatypic coral species, which constitutes more than 60% of the world's described hermatypic coral species (Veron et al. 2009). However, these reefs are exposed to numerous anthropogenic pressures and more than 40% are classified as having a high or very high Integrated Threat Index (Burke et al. 2002). Prior to 2010, severe and widespread coral bleaching had not been observed on Malaysian reefs, including during the 1997/98 global event when bleaching of Malaysian reefs was mild and occurred only in localized patches (Wilkinson 1998; Kushairi 1999). In 2010, bleaching began in mid-May along the north-western coast of Peninsular Malaysia; within three weeks, reefs around the major islands along the east coast were bleached (Fig. 1a). This event followed the peak of the third strongest El Niño event in the past 50 years (www.cgd.ucar.edu/cas/ENSO/enso.html). Around 50% of hard corals at Tioman (2°49'N, 104°10'E), Redang (5°46'N, 103°01'E) and Perhentian Islands (5°55'N, 102°44') were bleached, with two-thirds of those colonies completely white. During the underwater visual surveys (40 and 29 surveys around Tioman and Perhentian Islands, respectively), bleached corals were observed down to 20 meters depth; at Redang Islands (54 surveys) bleaching was found as deep as 25 meters. The severity and extent of the bleaching was consistent with the observed level of satellite-derived thermal stress, exceeding 8 °C-weeks (Liu et al. 2003; Fig. 2), In addition, outbreaks of an unidentified disease increased the mortality rate of corals (Fig. 1b). In contrast, minimal bleaching was observed in East

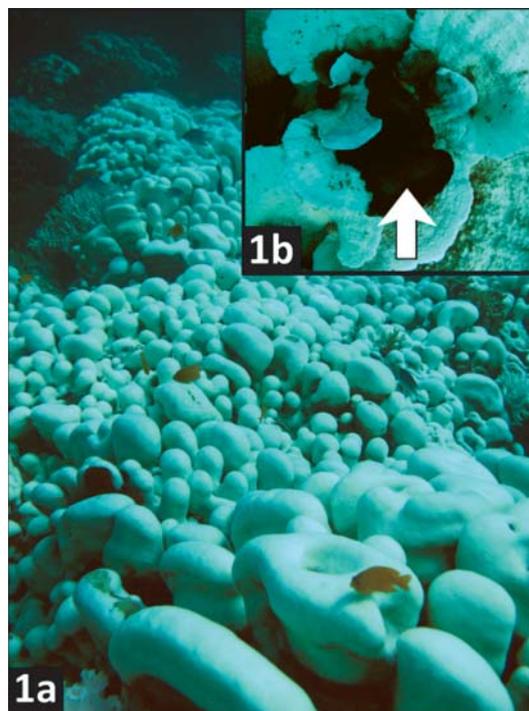


Fig. 1 a Malaysia's first-documented severe mass bleaching event affected various species of hard coral along the east coast of Peninsular Malaysia. b Some live, bleached colonies succumbed to a disease outbreak (indicated by arrow)

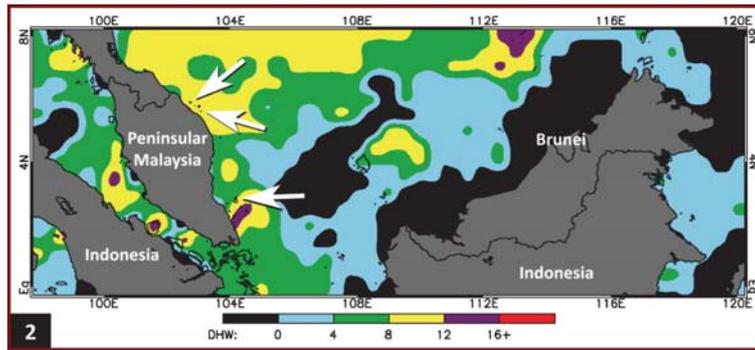


Fig. 2 Satellite-derived thermal stress patterns were consistent with observed levels of bleaching in Malaysia (coralreefwatch.noaa.gov; Enhanced-50 km data). Thermal stress is quantified by the Degree Heating Week (DHW) metric. Arrows indicate island locations referred to in text

Malaysia (Sabah and Sarawak) at this time (<10%), again consistent with the thermal stress patterns (Sabah Parks and Reef Check Miri, unpublished data). These observations suggest that the scale of bleaching events in this region may be increasing, underlying the need to undertake effective management strategies to conserve and protect reefs from natural and anthropogenic threats.

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