

## TOPIC BOX 12

### Death of a Coalmine Canary

*Only four years after an important report<sup>59</sup> vastly underestimated the threat of global climate change, the world woke up after a sixth of all its corals had bleached during an 18-month climatic event. It was the death of a coalmine canary.*

*When the ocean in the eastern Pacific started to heat up during early 1997, computer models around the globe were unanimous in their predictions: El Nino was on its way. The ensuing and exceptionally strong El Nino conditions of the next 12 months sparked a sequence of events that affected many reef systems around the globe. The areas where corals were bleaching showed up as 'hot-spots' in the ocean following the zenith of the sun with a lag of 4-6 weeks.*

*Mild coral bleaching started in the eastern Pacific: Colombia (May '97); Mexico (July – September '97); Panama (September '97); and the Galapagos Islands (December '97)<sup>155</sup>. As the waters in the western Pacific and the Indian Ocean started to heat up severe bleaching was observed in: eastern Australia (January – February '98); Indonesia (January – April '98); Kenya and Tanzania (March – May '98); Maldives and Sri Lanka (April – May '98); Western Australia (April – June '98); and India (May – June '98). As La Nina took over coral bleaching continued in the northern hemisphere from June – October '98 in most areas from South-East Asia to the Arabian/Persian Gulf and the Red Sea<sup>155</sup>. Minor bleaching occurred simultaneously in the Caribbean and the western Atlantic.*

*When coral bleaching hit the reefs of northwest Australia it caused severe damage at Seringapatam and Scott Reefs. Acropora mortality was as high as 90% in some areas and at Scott Reef almost all Millepora colonies had died; Porites cover was reduced by half; and 50-80% of soft corals were destroyed<sup>155</sup>. The destruction was not restricted to shallow reefs either – up to 80% of corals were bleached at 30 m depth. Minor and/or patchy bleaching had further occurred at Ashmore Reef, Dampier Archipelago, the Rowley Shoals and the islands off Onslow. However, Ningaloo Reef and the coral reefs further south showed no measurable impact.*

*So, what did really happen? The crucial factor in this event was the particularly strong El Nino of 1997-98 that vastly reduced the strength of the tradewinds and currents around the equator. These static conditions lasted throughout SH summer*

*and allowed waters to heat up more than normal in many regions, starting in the central and eastern Pacific, but spreading to the western Pacific and the tropical Indian Ocean. As summer progressed, the patches of warm water grew into hot-spots thousands of kilometres wide that occupied specific regions for months. We now know that coral reef systems live at or near their maximum temperature tolerance levels. Even an increase of as little as 1°C during the hottest part of the year may cause many widespread and dominant corals to bleach<sup>58</sup>. The large hot-spots that developed during the El Nino of 1997-98 meant that whole regions had elevated water temperatures in the vicinity of 1-3 °C for months while local anomalies were as high as 4-5°C – causing even a proportion of the more resistant species to bleach<sup>155</sup>.*

*As the hot-spots moved north with the zenith of the sun during SH autumn and El Nino conditions weakened, restoring the tradewinds and currents, coral bleaching stopped in the SH. In the NH, however, it was just beginning. As the summer set in, mass coral bleaching began to take its toll in the NH. This was unexpected as the ENSO cycle had, by this time, arrived at its other extreme: strong La Nina conditions. But even the powerful tradewinds and currents of this La Nina episode were not able to dissipate the hot-spots<sup>155</sup>. In some regions, in fact, the La Nina conditions caused less cloud cover than normal allowing further heating through increased sunlight. Eventually, after lasting throughout NH summer, the mass coral-bleaching event came to an end during October 1998.*

*The mass coral bleaching of 1997-98 was responsible for the bleaching of 65% of all reefs in South Asia and 16% of the world's reefs in total (although, fortunately, 40% of these had recovered to some extent by 2004)<sup>155,68</sup>. At some locations corals over 1000 years old were destroyed. Yet, it would be wrong to regard it as a freak event of one in a thousand years. It followed five other mass bleachings since 1979 – a strong indication that we are beginning to pay the bill for sparking off an unusually rapid change in the global climate<sup>122</sup>. As the effects of our greenhouse gasses continue to fuel climate change, mass coral bleaching events are predicted to no longer be dependent on unusual environmental conditions such as those during an El Nino episode but become a regular occurrence within 50 years – eventually decimating biodiversity by systematically destroying the more sensitive genera<sup>122</sup>.*