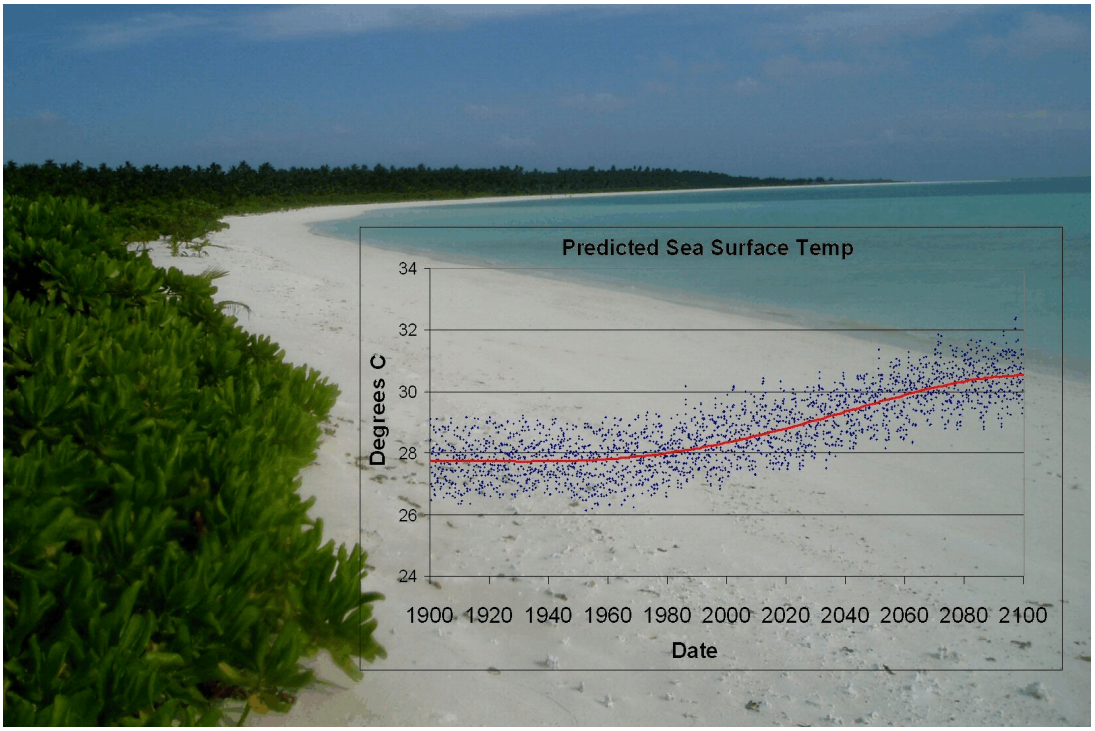

Egmont Island. Sea surface temperatures for BIOT seas.
Each dot is a monthly average and the thick red line is the fourth-order polynomial line of best fit[3].

Warming sea water and Chagos reefs

Sea water temperatures began to rise in Chagos from the 1970s. This pattern is consistent across the tropics and is a consequence of global climate change. In the 1970s the reef condition in Chagos was found to be exceptionally good [1]. No scientific research then took place in Chagos for the next 17 years, but when it was, in 1996, several changes were seen which indicated that some shallow coral death had been taking place [2]. The cause was unexplained at the time, but it is now suspected that moderate warming events were the cause.

In 1998, the most severe warming spike affected the tropics. In Chagos, surface temperatures nudged 30°C and massive quantities of corals were killed. Mortality was very severe and followed on from the severe bleaching that warm temperatures induced. The depth to which mortality extended varied along a curious North-South axis; down to 15m deep in northern atolls, to 20–25m in central locations, to over 30m in the southernmost Diego Garcia [3]. In all cases, corals mortality was very extensive throughout these depth spans. Soft corals likewise died but, unlike the stony reef-building corals, they leave little trace.

Recovery is taking place rapidly in some parts of the archipelago, while in others recovery is very limited to date. Reasons for the patchiness are likely to include simple randomness together with patterns of local currents that convey coral larvae from surviving and breeding adults to substrate where they can attach and grow. However, the first decade of the 2000s has seen further warming episodes, which, while not as severe as 1998, have been sufficient to kill off many new juvenile corals.

The graph shows sea surface temperature for Chagos over 200 years (1900–2100) blended from historical data and forecast model output using the latest Hadley Centre data [4]. Warming events will increase and, unless corals can effectively acclimatise, more mortalities can be expected. Major consequences of this in Chagos is a decline of the natural breakwaters that healthy coral reefs build, which are essential in protecting the islands from erosion, and a marked change, even collapse, of the marine ecosystems. The latter is now the subject of several further investigations into ecological structure and functioning.

[1] Sheppard, C.R.C. 1980. Coral cover, zonation and diversity on reef slopes of Chagos atolls, and population structures of the major species. Marine Ecology Progress Series 2:193–205.

[2] Sheppard, C.R.C. 1999. Changes in Coral Cover on Reefs of Chagos over 18 years. In: Ecology of the Chagos Archipelago. Sheppard, C.R.C. and Seaward, M.R.D. (eds.). Occasional Publications of the Linnean Society of London. Vol 2. pp 91–100.

[3] Sheppard C.R.C., Spalding M, Bradshaw C, Wilson S. 2002. Erosion vs. recovery of coral reefs after 1998 El Niño: Chagos reefs, Indian Ocean. Ambio. 31:40–48.

[4] Sheppard, C.R.C. 2003. Predicted recurrences of mass coral mortality in the Indian Ocean. *Nature* 425:294–297.