

ABSTRACT

Skeletal Density Banding in the Stony Coral *Montastraea annularis* (Ellis and Solander, 1789)

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Skeletal density banding and reproduction were investigated in 15 colonies of *Montastraea annularis* by means of a long-term field study. With the commencement of a bleaching event in 1995, the duration of the study was extended in order to examine the effect of bleaching. Spawning occurred between the sixth and eighth day after August's and/or September's full moon, prior to the period of heaviest annual rainfall, when temperatures were at their maximum. A meta-analysis of spawning time and climatic conditions at 19 other geographical locations also showed that spawning occurs in those periods without heavy rainfall in which temperatures are warmest. Annual high density (HD) band formation occurred between August and October. Time of HD band formation was most strongly and inversely correlated with skeletal extension rate. In normal, unbleached corals, the best predictor of skeletal extension rate was found to be gonad development. Bleaching affected all the coral parameters investigated; i.e., tissue depth, skeletal extension, reproduction and density banding. The speed of recovery of each of these parameters to pre-bleaching values differed, with tissue depth and then skeletal extension rate recovering the fastest. Reproductive failure occurred in severely bleached colonies one year after bleaching. Even after two years, reproductive output remained reduced in previously bleached colonies when compared with previously unbleached ones, although all colonies had successfully completed gametogenesis and spawning. In all colonies, the 1995 HD band (which formed at the time of the bleaching event) appeared more prominent than the HD bands for the years that preceded and succeeded bleaching. Additionally, the period over which the HD band formed coincided with the period of bleaching. In 1996, the year following the bleaching event, colonies that had been severely bleached produced no distinct HD band, while those that had not bleached or had been mildly

bleached produced a distinct HD band. These findings have led to the proposal of a new model for skeletal density band formation, the Skeletal Extension Depression Model.

Keywords

Montastraea annularis, coral reproduction, skeletal density banding, coral bleaching, environmental cues, skeletal extension rate, polyp tissue depth.