

NOTE ON THE WIDESPREAD BLEACHING OBSERVED AT THE MANUEL LUIZ MARINE STATE PARK, MARANHÃO, BRAZIL

Nota sobre o extenso branqueamento observado no Parque Estadual Marinho do Parcel do Manuel Luiz, Estado do Maranhão, Brasil

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RESUMO

Neste trabalho é apresentado um primeiro registro de branqueamento extenso na costa norte brasileira, no Parque Estadual Marinho do Parcel do Manuel Luiz. Durante uma expedição de levantamento de cnidários em junho de 1998, foi encontrada grande diversidade de corais escleractínios e hidróides calcários, uma riqueza que, no Brasil, pode ser comparada apenas à região de Abrolhos (Bahia): quatro espécies de hidróides calcários e doze espécies de corais escleractínios, além de duas espécies de anêmonas, uma espécie de zoantídeo e uma espécie de octocoral. No entanto, três das quatro espécies de hidróides calcários observadas (*Millepora alcicornis*, *M. braziliensis*, e *Millepora* sp.) encontravam-se branqueadas ou mortas e cobertas por algas e/ou invertebrados. Similarmente, entre os corais escleractínios, foi observado branqueamento em espécimes de onze das doze espécies registradas (*Madracis decactis*, *Agaricia agaricites*, *A. fragilis*, *Siderastrea stellata*, *Porites astreoides*, *P. branneri*, *Favia gravida*, *F. leptophylla*, *Montastrea cavernosa*, *Meandrina braziliensis*, *Mussismilia hispida* e *Scolymia wellsi*). O branqueamento foi associado à elevada média mensal da temperatura da superfície do mar para aquele ano, que, segundo dados de sensoriamento remoto do NOAA (National Oceanic and Atmospheric Administration), foi de pelo menos 1°C acima da média mensal do ano anterior, além de pelo menos 1°C acima da média máxima mensal esperada.

Palavras-chaves: branqueamento, corais escleractínios, hidróides calcários, Parcel do Manuel Luiz, Brasil.

ABSTRACT

Here we present a first record of widespread coral bleaching off the northern coast of Brazil, in the Manuel Luiz Marine State Park. During an expedition to find cnidarians in June 1998 high scleractinian and calcified hydroid diversity was encountered, a richness that in Brazil can only be compared to the Abrolhos, Bahia State): four species of calcified hydroids, twelve species of scleractinian corals, two species of sea-anemones, one species of zoanthid, and one species of octocoral. However, three of the four species of calcified hydroids observed (*Millepora alcicornis*, *M. braziliensis*, and *Millepora* sp.) were bleached or dead and covered by algae and/or invertebrates. Similarly, among the scleractinian corals, bleaching was observed in specimens of eleven of the twelve species recorded (*Madracis decactis*, *Agaricia agaricites*, *A. fragilis*, *Siderastrea stellata*, *Porites astreoides*, *P. branneri*, *Favia gravida*, *F. leptophylla*, *Montastrea cavernosa*, *Meandrina braziliensis*, *Mussismilia hispida*, and *Scolymia wellsi*). Bleaching was associated with elevated average monthly sea surface temperatures, which was at least 1°C higher than the previous year, and at least 1°C above the expected maximum monthly mean, according to remotely sensed data available online from NOAA (National Oceanic and Atmospheric Administration).

Key words: bleaching, scleractinian corals, calcified hydroids, Manuel Luiz Marine State Park, Brazil.

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INTRODUCTION

Coral bleaching involves the loss of chlorophyll pigments from coral tissue when zooxanthellae are lost from vacuoles in the host gastrodermis or their photosynthetic pigment is reduced (Fitt *et al.*, 2001; Costa *et al.* 2001). Owing to its severe consequences to coral reef ecosystems, bleaching is of serious concern (Glynn 1993) and poses a threat to the existence of reefs throughout their ranges (Hoegh-Guldberg 1999; Berkelmans and Oliver 1999). The role of temperature in coral bleaching has been extensively investigated and is widely accepted as an important stressor (Michael and Schleyer 2002). Buddemeier and Fautin (1993) identified three key temperature-related characteristics of coral bleaching: the upper temperature limit beyond which coral bleaching is defined locally; differences between habitats influencing species susceptibility to bleaching; and taxonomic differences affecting species vulnerabilities to environmental stress-related bleaching, despite adaptations.

Here we present a first record of widespread coral bleaching off the Manuel Luiz Marine State Park (Parcel do Manuel Luiz), located 179 km off the coast of Maranhão State (00° 46'S, 44° 15'W), Brazil. During surveys to find cnidarians in June 1998 high diversity was encountered, including: four species of calcified hydroids, twelve species of scleractinian corals, two species of sea-anemones, one species of zoanthid, and one species of octocoral, a richness that in Brazil can only be compared to the Abrolhos region.

STUDIED AREA

The Marine State Park of the Manuel Luiz was the first Brazilian marine state park, established in June 1991 to preserve one of the major South American offshore coral pinnacles (Coura, 1994). It is located in the state of Maranhão, and is influenced by the South Equatorial Current (SEC), North Brazil Current (NBC), and Equatorial Undercurrent (EUC) (Travassos *et al.* 1999). Visual observations have revealed an area of numerous "coral pillars" up to 20 m high that emerge at low tide and make navigation quite difficult. According to Coura (1994), thirteen shipwrecks have already been found from the estimated 200 that may lie in the region (Maida and Ferreira 1997). Due to the widely ranging bathymetry and very strong currents, few studies have been done and there is still little geological and physical-chemical data for the offshore coral pinnacles.

MATERIALS AND METHODS

An expedition to the Marine State Park of the Manuel Luiz occurred in period June 25th-28th, 1998. All specimens were collected by SCUBA diving with the aid of chisels and hammers in depths ranging from 0 to 30 m. At the surface, specimens were numbered and photographed, and pertinent data (date and depth of collection, color, and substrate) were recorded. Specimens were transported to the Laboratório de Ambientes Recifais da Universidade Federal Rural de Pernambuco (LAR/UFRPE). Observations were later associated with relevant remotely sensed sea surface temperatures obtained from NOAA (National Oceanic and Atmospheric Administration – www.noaa.gov).

RESULTS AND REMARKS

Following Amaral *et al.* (1998 and 2000) and Hudson (2000), the following corals and calcified hydroids were observed and their sample quantities follow each entry: *Agaricia agaricites* (Linnaeus 1758) - 3, *A. fragilis* (Dana 1846) - 3, *Favia gravida* Verrill 1868 - 1, *F. leptophylla* Verrill 1868 - 7, *Madracis decactis* (Lyman 1859) - 12, *Meandrina braziliensis* Milne Edwards and Haime 1848 - 5, *Montastraea cavernosa* (Linnaeus 1767) - 3, *Mussismilia hispida* (Verrill 1902) - 6, *Porites astreoides* Lamarck 1816 - 5, *P. branneri* Rathbun 1888 - 5, *Scolymia wellsii* Laborel 1967 - 8, *Siderastrea stellata* Verrill 1868 - 8; *Millepora alcicornis* Linnaeus 1758 - 5, *M. braziliensis* Verrill 1868 - 11, *M. sp.* - 12 and *Stylaster roseus* (Pallas 1766) - 1. Among other cnidarian groups, two species of sea anemones: *Condylactis gigantea* (Weiland 1860) and *Bunodosoma cangicum* Corrêa in Belém and Preslercravo 1973, one species of zoanthid (*Palythoa* sp.), and one species of octocoral (*Phyllogorgia* sp.) were also recorded.

Widespread bleaching was observed at the locations where specimens were collected. Three of the species of calcified hydroids – *Millepora braziliensis* (30 m), *M. alcicornis* (25 m), and *Millepora* sp. (30 m) (Amaral *et al.*, 2002) – were all bleached or dead, and covered by algae and/or invertebrates. Only the calcified hydroid *Stylaster roseus*, of which a single specimen was observed, was unaffected. Among the scleractinian corals, bleaching was recorded in specimens of *Madracis decactis*, *Agaricia agaricites*, *A. fragilis*, *Siderastrea stellata*, *Porites astreoides*, *P. branneri*, *Favia leptophylla*, *Montastraea cavernosa*, *Meandrina braziliensis*, *Mussismilia hispida*, and *Scolymia wellsii*. Only *Favia gravida*, of which a single colony was observed, did not show signs of bleaching.

These results are probably due to the average sea surface temperature for that month, which was at

least 1°C higher than in the previous year, and at least 1°C above the expected maximum monthly mean, according to data from NOAA.

Increasing sea temperatures caused by climate change have been identified as a contributing factor in recent coral bleaching, and have become a cause for serious concern (Warner *et al.*, 2002). According to Fitt *et al.* (2000 and 2001), coral bleaching results from at least three processes, including physiological, algal, and host-related stress.

This is the first time bleaching has been recorded on the northern coast of Brazil. A coral-cover monitoring program initiated in 1992 by Castro & Pires (1999) observed bleaching in the Abrolhos area (northeastern coast), where colonies of the *Mussismilia* genus – *M. braziliensis* (Verrill 1868), *M. hispida*, and *M. hartti* (Verrill 1868) – were studied. Maýal & Bezerra (1994) recorded a bleaching event in the Rocas Atoll (an island off Northeast Brazil), probably related with red calcareous algae. In 1994, Migotto (1997) observed a bleaching event on anthozoans of the southeastern coast, where the *Mussismilia hispida* and the zoanthid *Palythoa caribaeorum* (Duchassaing & Michelotti, 1860) were the most affected. Recently, Costa *et al.* (2001) studied the zooxanthellae density in bleached and unbleached colonies of *Siderastrea stellata* from Pernambuco State.

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