

Possible hidden damage on reproduction of blue coral, *Heliopora coerulea*, that survived through mass bleaching event

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Abstract

The mortality of corals caused by elevated water temperature is species specific. Some species are easily bleached by high water temperatures and die, while the other species has relatively high tolerance against high water temperature. Blue corals, *Heliopora* spp. are relatively resistant to thermal stress, and indeed their coverage in the field has not been greatly changed before and after coral mass bleaching event in the summer of 2016 caused by elevated water temperature. Even though blue corals often survived through bleaching event and the species is often referred to as strong winner species, there has been no information as to whether such strong corals have any hidden damage from high water temperature such as reduction in reproduction or not. Thus, in this study, we observed the tissue of the blue coral before and after the coral bleaching event to examine reproduction of blue coral have been changed or not. We counted the number of female colonies that have eggs/oocytes before brooding period in a blue coral population. Then, we compared the proportion of female colonies have eggs/oocytes between the first three years (2014-2016) (before the event) and the last two years (2017-2016) (after the event). A total of 222 coral samples were collected from Nuval, which is located north of Iriomote Island in Okinawa, southwest Japan during pre-reproductive season. We decalcified the skeleton using sodium acetate, and soft tissue have stored in a conical tube with ethanol (70%). We used a microscope and dedicated camera to observe polyps placed at back side of the tissue to determine if they have eggs/oocytes or not. Before the bleaching event, 10 individuals are observed and 4 of them (40%) had eggs in 2014. Likewise, 5 individuals out of 12 (41%) in 2016, 7 individuals out of 12 (58%) in 2016, indicating more than 40% of the populations are female with eggs/oocytes. In contrast, after the mass bleaching event, 3 individuals out of 20 (15%) in 2017, and 39 individuals out of 168 (23%) had eggs during pre-brooding period. These results indicate there is a clear gap in the number of female colonies contributing reproduction between 2016 and 2017, before and after the mass bleaching. The number of eggs/oocytes is drop downed 58% to 15%. The reduction in egg production of blue corals came up as a “hidden damage” from the bleaching effect have been occurred in 2016 after spawning season.