The relationship of seasonal changes and depth with the clade diversity of symbiotic algae in the Persian Gulf corals (Case study of Kish Island)

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Abstract

The location of the Persian Gulf in the vicinity of arid lands, high air temperatures, high light intensity, and high water salinity, has created a hard condition for most aquatic organisms, including corals. Coral reefs are one of the most important and productive biological ecosystems in the world which have a symbiotic relationship with algae of the species Zooxanthellae for improving their growth and survival. In some cases, the quantity and quality of this symbiosis can be affected by environmental factors and conditions so that sometimes the principle of this symbiosis and the composition of Zooxanthellae species that are symbiosis of a certain coral species may be affected. The present study has attempted to investigate the relationships of seasonal variations and seawater depth with the composition and density of algal clades that are symbiotic for two main coral species (*Acropora* and *Porites*) around Kish Island. For this purpose, samples were taken from a northwestern station of Kish Island, from the two main depths of coral dispersion, namely shallow depth (5 meters) and high depth (1 meter) during March and July, 2019. In addition, real-time PCR method was used to simultaneously detect the composition and density of symbiotic algae with each coral sample. The results confirmed that the clade composition of symbiotic algae was constant in both coral species, at both depths, and in both sampling seasons. Clade D had a completely higher density in all the samples tested than the other two clades (A and C), and the density of this clade was significantly higher in *Acropora* coral than that in *Porites*. However, the density of clades and the abundance of dominant clades in the region (clade D) presented in both species were significantly affected both by season and depth. While during summer, the highest density of Zooxanthellae D was observed in *Acropora* coral at a depth of 10 meters, the ratios of clade D to other clades in this species showed to decreased by increasing the depth during winter. Among the clades, a higher density of clade D observed in *Porites* at deeper water during winter. In summer, this trend was reversed by decreasing the ratio of clade D to other clades, by increasing depth. Overall, despite the fact that both corals have an identical clade composition, *Porites* seems to have a more balanced clade variety than *Acropora*, in which clade D is completely predominant. This fact seems to explain the greater exposure of clades to the impact of environmental factors.

Keywords: Coral reefs, Persian Gulf, Kish Island, Zooxanthellae.