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Pigment Composition in Different-colored Scleractinian Corals before and during the Bleaching Process

Lee-Shing Fang[1,2,*], Chih-Wei Liao[1] and Ming-Chin Liu[2]

[1]*Institute of Marine Resources, National Sun Yat-sen University, Kaohsiung, Taiwan 804, R.O.C.*
[2]*National Museum of Marine Biology/Aquarium, Preparatory office, Kaohsiung, Taiwan 804, R.O.C.*

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Lee-Shing Fang, Chih-Wei Liao and Ming-Chin Liu (1995) Pigment composition in different-colored scleractinian corals before and during the bleaching process. *Zoological Studies* **34**(1): 10-17. Scleractinian corals have many different color types in water. All the colors become bleached when the coral is under stress. The pigment changes behind these phenomena were investigated in the study. Analysis of pigment composition in four color types of seven stony coral species showed chl. a, chl. c_2, peridinin, diadinoxanthin and dinoxanthin comprised more than 95% of the total amount of pigments. There was little compositional difference between these pigments in corals of different color. During bleaching caused by salinity change, both the number of zooxanthella in each polyp and the amount of total pigment in each zooxanthellae decreased with time. The rate of decline of porphyrins coincided with the level of stress that was created by lowering the salinity of the incubation sea water. The rate of decline of carotenoids was less sensitive. This suggests that the rate of change of porphyrins could reflect the bleaching status of stony coral.

Key words: Scleractinian coral, Pigments, Bleaching, Salinity.

Corals are very colorful organism. Many colors can be seen on coral in situ including brown, green, yellow, red, orange, blue, purple, and black. The coloration of Gorgonacea, Coenothecalia, and Stolonifera is particularly rich and it has been suggested that the coloration results from carotenoid or chromoproteins in their skeletons (Goodwin 1968, Kennedy 1979). However, the skeletons of most corals are white and their colors are due to the presence of photopigments of zooxanthellae in the polyps (Jaap 1979, Sumich 1980). Zooxanthellae in scleractinian corals were generally regarded as the species *Symbiodinium microadriaticum* (Freudenthal) (Taylor 1969, Falkowski and Dubinsky 1981, Blank and Trench 1985), although, there was evidence of different physiological, biochemical, and genetic variations among varieties of this symbiotic alga (Chang and Trench 1982, Chang et al. 1983, Blank and Trench 1985). Could the photopigments in this single species of zooxanthellae have such drastic variations which would account for the numerous color appearances of scleractinian coral? If so, what is the pigment corresponding to each particular coloration? Or is it just the variation of the ratio between different pigments in the zooxanthellae that result in color changes? Furthermore, since bleaching of coral has become more common recently due to various environmental impacts. Accordingly, measuring the amount of photosynthetic pigment per unit of zooxanthellae in bleaching corals could offer new insights into these events in nature (Hoegh-Guldberg and Smith 1989). It is thus of interest to investigating the process of pigment change during bleaching. In this study, pigment composition in zooxanthellae of stony corals with different colorations was analyzed first. The relative amounts of each pigment were determined in order to look for the possible mechanism of their color differences. Bleaching experiments were performed and the daily pigment changes in the samples were monitored with respect to the variation in the number of zooxanthellae and the amount of photopigment in each unit of zooxanthellae. The findings of this

*To whom correspondence and reprint request should be addressed.