

Study of Epiphytic Microalgae on Macrophytic Red Algae in Artificial Rocky Seashore (Chlorophyll *d* Is Not of Red Algal Origin but from an Epiphytic Cyanobacterium)

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Photosynthetic pigments including chlorophyll *d* (3-desvinyl-3-formyl chlorophyll *a*) were studied in macrophytic seaweeds and their epiphytic microalgae harvested at artificial rocky seashore in Awaji island (Hyogo, Japan). Three red algae, *Ahnfeltiopsis flabelliformis*, *Callophyllis japonica* and *Carpopeltis prolifera*, contained a very large amount of chlorophyll *d*. Microscopic observation revealed several types of pigmented colonies on thallus surface of the red alga *Ahnfeltiopsis flabelliformis* comprising cyanobacteria, diatom and other eukaryotic microalgae. Typical cyanobacterial colony shows a specific fluorescence at 729 nm at room temperature, characteristic of chlorophyll *d*. Phylogenetic position analyzed by SSU rDNA sequences indicates that this epiphytic cyanobacteria is closely related to *Acaryochloris marina*, strange symbiont of colonial ascidian in tropical sea water.

We verified that the putative Chlorophyll *d* of red algae originates from the epiphytic cyanobacterium *Acaryochloris* sp. strain Awaji on red algal thalli, and settled the chlorophyll *d* distribution in photosynthetic organisms (**Murakami et al. (2004) Science 303:1633**). We have thus solved the 60-year-old enigma since the discovery of chlorophyll *d*. *Acaryochloris*, which is unique in its use of far-red light and its habitat, is widely distributed in unexplored niches and is suggested to contribute to primary production in the coastal water.