Light and Heat Stress Adaptation of the Symbionts of Temperate and Coral Reef Foraminifers Probed *in Hospite* by the Chlorophyll *a* Fluorescence Kinetics

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Since the early 80's massive bleaching affects the reef ecosystem. It involves, besides corals, several other species among which large foraminifers, and it corresponds to the loss of their photosynthetic symbionts or the symbionts' pigments. The cause is unclear, though temperature elevation and strong irradiation have been considered to be primary factors. In this work we investigated in two genera of coral reef foraminifers (*Amphistegina lobifera* and *Amphisorus heimprichii*) and in the temperate foraminifer *Sorites variabilis* the response of photosystem II (PSII) of their symbionts *in hospite* upon light stress (white light of 550 μE m^{-2} s^{-1} and red light of 3200 μE m^{-2} s^{-1}) and heat stress (up to 32 °C), by means of the Chla fluorescence transients O-J-I-P they exhibit upon illumination. The transients were analysed according to the JIP-test which leads to the calculation of several structural and functional parameters providing a quantification of PSII behaviour. We observed that the various parameters undergo modifications that differ concerning both their extent and their degree of elasticity, thus indicating that different adaptive strategies are employed in response to stress. The most pronounced of these regulatory changes is a wide decrease of the quantum yield of electron transport. However, the extent of the changes, different for the three studied species, was in general smaller when the cultures were kept under low light (70 μE m^{-2} s^{-1}) than in darkness. By the applied stressors, PSII was not damaged and, except for some cells in which an expulsion of symbionts was initiated, no bleaching was observed. This can be well correlated with the observed adaptability of PSII. As a working hypothesis, it is proposed that the decrease of the capacity for electron transport activity might be among the factors triggering bleaching in the field.