Molecular Ecology and Photo-Physiology of Symbiodinium Harboured by Tanzanian Reef Building Corals

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Abstract

Establishment of symbiosis with thermal tolerant Symbiodinium type is widely believed to be amongst the functional adaptation mechanism employed by reef-building corals (RBCs) to bleaching. In this study, Symbiodinium types found in 66 most common RBC species have been studied together with photo-physiology of the selected corals and their respective Symbiodinium with a view to evaluate Tanzanian reefs' capacity to adapt to current trends of climate change. Internal transcribed spacer two (ITS-2) region of nuclear ribosomal DNA genes (rDNA) was used to identify the symbiont types. In addition, changes in photosynthetic pigment concentrations and ratios, synthesis of ultra violet absorbing substances, changes in Symbiodinium types and abundances, maximum quantum yield (Fv/Fm) and excitation pressure on PS II (Qm) were used to assess responses of corals and/or their associated Symbiodinium types to both thermal and photo-radiations in situ and/or ex-situ. It was found that, Symbiodinium cells harboured by RBC from Tanzania do not constitute a distinct genetic group from those in other parts of the world. Although they were found to be thermal and irradiance susceptible, Symbiodinium C3u and C3z dominate in Tanzanian reef-building corals. Shuffling of algal symbionts that hypothetically provide corals with thermal resistance is limited to few Tanzanian RBCs. The renown high bleaching resistance of Porites cylindrica as compared with other species was found to be contributed by its Symbiodinium C15's ability to synthesize significantly higher concentrations of both carotenoids and UV-absorbing compounds. Besides, this study recognizes the contribution of the host to this ability. It is generally concluded that the rate at which Tanzanian RBC develop adaptations to current trends of climate change is not enough to survive from devastating effects of bleaching. Because a reverse of current trends of climate change is not a possibility, this thesis recommends useful management information and an urgent need of alleviating local anthropogenic threats on Tanzanian coral reef ecosystems to enhance their resilience