

Corals Through the Light - How do corals spanning large depth ranges thrive across acute light gradients?

The nutrient-poor tropical waters surrounding coral reefs impose that light is the main energy source in the ecosystem. Furthermore, light intensity is dramatically reduced with increasing depth. What are the properties that allow corals distributed over large depth ranges to cope with such acute light gradients?

Reef-building corals are highly sensitive symbioses between animal hosts and photosynthetic unicellular algal symbionts. Coral response to light is hypothesised to be determined by the occurrence of taxonomically and functionally diverse algal symbionts, establishing more or less specific associations with the numerous coral species that form a reef.

We investigate the *in situ* phylogenetic diversity and photobiology of coral host and algal symbiont and their adaptive strategies to cope with extreme light gradients, across a large depth range (5-40 m) in a reef site at Curaçao. The research involved unravelling the phylogenetic relationships within each of the symbiotic partners, further addressing the distribution and ecological zonation of host-symbiont combinations and finally the functional and physiological mechanisms that regulate the interactions between partners and between the whole association and the environment. Unravelling the biology of coral-symbiont associations under extreme environmental gradients contributes to a better understanding of coral responses to climatic changes, and offers new insights on coral reef conservation.

Results on symbiont distribution show host specificity and depth zonation, suggesting ecological niche partitioning. Besides total light irradiance, light spectral niches appear to have a role in determining symbiont distribution. There were unambiguous functional differences between symbiont lineages that, however, do not appear to explain overall coral host distributional patterns. Instead, the research suggests a crucial role of the host in the adjustment of its own internal environment, upon which the endosymbionts thrive. These and other results are interpreted in the scope of coral reef resilience to a rapidly changing climate. For example, a very sensible tuning between genetic strains of the two symbiotic partners found in one of the coral species, does not support optimistic interpretations in terms of coral response to climate change.