TITLE: SPECTRAL REFLECTANCE OF NEOTROPICAL CORAL *MUSSISMILIA HISPIDA* (VERRILL, 1902) SUBMITTED TO THERMAL STRESS AS AN INDICATOR OF ZOOXANTHELLA DISBIOSIS

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ABSTRACT:
Spectral reflectance (SR) of corals is a variable useful to coral reef remote sensing and has been explored as a tool to characterize species and to differentiate between healthy and diseased corals. In this work we register the spectral characteristics of *Mussimilia hispida*, a Brazilian endemic coral, before and after it undergoes thermal stresses induced in a marine mesocosm. SR is related to the color of the coral; it is the sum of pigmented components such as zooxanthellae, host tissues and skeletons. Several scientific methodologies have been developed in order to relate the color of corals with their state of health, to diagnose, characterize and follow its evolution with environmental factors.
The most characterized coral zooxanthellae are dinoflagellates of the genus *Symbiodinium*, a group related to *Gymnodinium*, with a variety of clades. However most species of photosynthetic dinoflagellates contain approximately equal amounts of two classes of pigments; carotenoids and chlorophyll. Studies on the identity of pigments in coral zooxanthellae report broadly similar results. The spectral changes that occur after disbiosis, known as coral bleaching, have consequences on the goal of monitoring reef health. The loss of this symbiosis can result in coral mortality. The zooxanthellar pigment contribution to the SR has a predictable spectrum, but with unpredictable intensity and it changes with the environmental factors. Coral also can present self-produced pigments, known as Green Fluorescent Proteins (GFP), more useful for spectral discrimination between coral species.
We defined *Mussismilia hispida* as a brown coral because of the triple-peaked pattern. The derivatives graphics show that the most significant difference is between 540 nm and 600 nm, a typical area of probable loss of fucoxanthin and peridinin (540 nm), red fluorescent protein (572 nm), phycocyanin, chlorophyll-*a* (617, 626 nm).
This suggests that in addition to the loss of characteristic pigments of the zooxanthella, that is, a loss of zooxanthella population density due to thermal stress; it may also have had loss of GFP. Future studies that characterize the pigment composition may bring further information on these interactions between the pigments of zooxanthella, coral, and the rest of the autotrophic microbiota being useful for future bio-optical modeling and monitoring tool development.

Keywords: zooxanthellae, spectral reflectance, coral, bleaching, pigment

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