Resilience dynamics of marine protected areas to coral bleaching extremes in the South Pacific Ocean: insights from passive acoustic monitoring

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Marine Protected Areas (MPAs) can increase the resilience of coral reef communities to natural disturbances, playing a role in sheltering biodiversity from climate-related impacts and in the recovery of corals from bleaching events. The objective of this study is to determine if Passive Acoustic Monitoring (PAM) can assess a resilience effect of MPAs to coral bleaching events. To reach this goal, the biophony of the external slope of the coral reefs of different longstanding MPAs in Moorea Island were recorded in 2021 and compared to the one of adjacent zones outside the MPAs. Then, acoustic data from 2021 were compared to those from the same locations sampled in 2015, i.e., after and before two bleaching events (2016 and 2019). Our hypothesis is that the difference of the biophony between these two periods varies within and outside MPAs. The main result of this study is an increase in the nocturnal high-frequency (2 – 22 kHz) mass-phenomena of benthic invertebrates, observed only at sites with higher coral cover post-bleaching compared to the pre-bleaching periods. When assessing the mass-phenomena with PAM, the observed effect in 2021 is not a global effect of the MPAs. Instead, it reflects an interaction between time and the protection effect, associated with an east-west gradient in coral cover resulting from bleaching events. Therefore, PAM is not only effective in correlating coral cover with sounds but also in assessing the resilience effect of MPAs to bleaching events.