

Doctorat EPHE

Thème Général : Ecologie, évolution, Environnement

Titre proposé : Functional acoustic ecology : a tool for mapping herbivory on coral reefs

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Description et but du sujet de recherche (une page au maximum) :

Mots clés (5 au Maximum) : acoustic ecology, functional ecology, herbivory, coral reefs

Climate change has already triggered profound impacts on ecosystems that go beyond its effect on biodiversity. Concerns are emerging about the potential for impacted systems to deliver the key services that sustain human welfare and livelihoods. In the marine realm, coral reefs host the highest marine biodiversity and provide crucial services (e.g. edible biomass) that sustain 500 million people worldwide. However, reefs are degrading rapidly due to climate-induced coral bleaching events. These disturbances occur against a backdrop of chronic stress (e.g. overfishing) and already produced devastating effects in 1998 and 2010.

We just witnessed the most prolonged global coral die-off to date, due to coral bleaching (2014-ongoing), and for the first time this kind of event is repeating itself for the second time in a row. In 1998, 16% of global coral reefs perished. In 2016, 93% of the Great Barrier Reef bleached with high levels of mortality, and the latest news from Kiribati, Samoa, Fiji and Tonga is that 80% of corals are already dead. The list of Pacific coral reefs being impacted is rapidly growing while the effects of ongoing 2017 bleaching are still unknown. Understanding the mechanisms determining the resilience of coral reefs is therefore more urgent today than ever before.

Compared to their Caribbean counterparts, Indo-Pacific coral reefs have show a much higher capacity to rebound from unfavorable events. The coral reefs of Moorea (French Polynesia) are probably one of the best example of this Indo-Pacific resilience. Here, in the last 40 years the CRIOBE recorded several pulse disturbances that include coral bleaching and mortality, several cyclones and outbreaks of the Crown-Of-Thorns-Starfish (COTS). However, so far the reefs of Moorea always recovered.

Unfavorable events as those we recorded in Moorea are always correlated to a destruction of coral assemblages, and their ability to rebound has shown related to the biomass of herbivore fish. Indeed, by their grazing, herbivores keep the benthic substrate "clean" and allow corals to establish themselves and recover. Herbivores, however, are targeted by both commercial and subsistence fishing, which may represent a socio-ecological trap locking the system to an undesirable state.

The present PhD project has the main goal of developing a new tool for the high resolution spatio-temporal monitoring of herbivore on a coral reefs. Specifically, by tracking with several hydrophones the noise produced by herbivores while feeding it is possible to geo-localize individual bites and produce maps of herbivory across coral reefs. This may represent an invaluable tool for the monitoring and conservation of coral reefs. The lack, or the reduction of herbivory in certain areas may be detected thereby allowing managers to establish and temporary fishing closure to ease the recovery of coral assemblages.