Facing the shift: coral-associated decapods under bleaching stress and habitat decline

Ver Hoeye Killian[1], Caulier Guillaume[1] and Hedouin Laetitia[2]

[1] Biology of Marine Organisms and Biomimetics unit, University of Mons, 6 Avenue du Champs de Mars, Mons, Belgium
E-mail: killian.verhoeye@umons.ac.be
[2] Centre de Recherches Insulaires et Observatoire de l'Environnement, PSL Research University, EPHE-UPVD-CNRS, UAR 3278 CRIOBE, BP 1013, 98729 Papetoai, Moorea, French Polynesia

Coral reefs are under growing threats from different (a)biotic causes, notably causing bleaching (*i.e*., the loss of endosymbiotic zooxanthellae from coral tissue) that may lead to coral death. While much research has focused on corals' relationships with zooxanthellae to understand this phenomenon, corals also host numerous ectosymbiotic organisms that are largely understudied. Without these partners, corals may suffer from excess of stress due to diseases, predation, and bleaching. But what happens to this symbiotic community if their coral host dies or bleaches? The goal of this study is to assess the adaptive responses of ectosymbiotic decapods associated with *Pocillopora* and *Acropora* corals as they experience decline.

The scientific strategy involved measuring decapod abundance, diversity, reproduction rate, and migration patterns across healthy, bleached, and dead corals. Additionally, decapod survival and stress levels were monitored under three conditions of host separation — physical contact, chemical contact, and total separation — to explore any chemical dependency on their host that might explain potential declines in decapod populations.

The results indicate that decapods from the two host species exhibit different adaptive strategies in response to coral decline. Symbiotic decapods from *Pocillopora* show higher stress levels when in chemical contact with their host than when totally separated, suggesting that host stress in the absence of symbionts may affect ectosymbionts in the same aquarium, and that these decapods are not chemically dependent on their host. These individuals also exhibit low abundance, diversity, and reproduction rates, along with high emigration when their host begins to bleach. In contrast, bleaching of *Acropora* corals appears to have little impact on the associated decapod communities until the coral dies, at which time the decapods disappear.

In the context of coral reef degradation, understanding how these essential symbionts respond to stress becomes crucial to better assess the potential loss of coral-associated biodiversity.

Keywords
Coral Reefs; Crustaceans; Invertebrates; Symbiosis