

HO21: The dynamics of mutualistic cleaning interactions on Caribbean coral reefs

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Mutualistic relationships between species are an integral part of the complex web of interactions in many communities and in many cases they are essential to the maintenance of ecosystem health and function. On coral reefs, cleaning interactions are classic interspecific mutualisms between cleaners (i.e. gobies, wrasse, and shrimp) and a community of client fish that span the taxonomic spectrum. The interactions between cleaners and client fish positively impact fish diversity and health as ectoparasite loads on the reef are reduced. Cleaner species occupy discreet microhabitats that serve as cleaning stations that are intentionally sought by clients; at these cleaning stations, the client fish pose motionless and are vulnerable to predation while cleaners inspect and remove parasites from gills, mouth, and scales. Cleaning interactions are risky for both parties and they often involve multiple species that differ in their sensitivity to diver presence. This, coupled with the fact that these interactions are essential for maintaining ecosystem function, means that cleaning stations represent an ideal model for testing hypotheses about community-wide impacts of human presence on the behaviour of reef organisms.

A recent study by Operation Wallacea scientists explored the impacts that anthropogenic activities have on the behaviours of coral reef organisms, using cleaning symbioses involving Pederson cleaner shrimp (*Ancylomenes pedersoni*) as a model. This study compared remotely deployed video cameras to active diver observations on a reef where SCUBA diving has taken place regularly for decades and another reef where no SCUBA diving had ever taken place. Their data clearly demonstrated a suppression of cleaning behaviour when divers were present in the water, although this impact was significantly less where reefs have experienced a high intensity of SCUBA diving. This suggests reef fish communities can partially habituate to diver presence, but that full habituation is likely to be unobtainable on Caribbean coral reefs. Similar studies are needed for other reef cleaners (e.g. cleaner fish), and at additional sites to build on this study.

Projects could include a combination of remote video footage and direct diver observations to further explore the impact of human presence on cleaning behaviour. Alternatively, projects could focus on one particular methodology to investigate ecological patterns of behaviour, for example client pool structuring, temporal variations in cleaning behaviour, and relationships between cleaning activity and size/structure of cleaning stations. Students may choose to focus on individual cleaner species (e.g. Pederson shrimp, or, cleaning gobies of the genus *Elacatinus*), or at multiple cleaners in order to explore how resources are partitioned between species occupying such similar niches. All projects will require a SCUBA diving element, while those making use of video observations will also require significant time analysing footage between dives. Two main reef systems will be used for this project, (1) the island of Utila which experiences a high intensity of recreational SCUBA divers, and (2) the mainland bay of Tela which experiences a low intensity of recreational SCUBA divers. On both reef systems multiple replicate sites will be studied.

Reading List

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