IH323: The behaviour of cleaner fish and mimics – does this affect the resilience of reef fish communities?

Dan Exton

Cleaning behaviour exists in fish from a range of ecosystems, but one of the most publicised examples is that of cleaner fish on coral reefs. These fish have evolved to specialise in the removal of ectoparasites, diseased and injured tissue, and unwanted food particles from other fish. This behaviour not only acts as a source of food for the cleaners themselves, but also provides a valuable ecosystem service, helping to maintain the health of the nearby fish community. Because of this, cleaner fish have become a classic example of symbiotic mutualism and cooperation.

On coral reefs, a small number of wrasse species (Family: Labridae) provide this service. They operate on small areas of reef known as cleaning stations, which client fish will visit in order to be cleaned. Many behavioural studies have observed advertising by cleaner wrasse at their stations, as well as posing behaviour on the part of the client, in the form of fin fanning and body orientation amongst others, to demonstrate to the cleaner that they pose no threat. This is particularly important as predatory species visit cleaning stations on top of other functional groups.

However, this relationship between client and cleaner is further complicated on reefs by the presence of aggressive mimicry. The predatory fangblenny (Family: Blenniidae) resembles the harmless model cleaner wrasse, and poses as them on the reef. Once they have attracted a client under the pretence of cleaning, these imposters exploit the mutualistic relationship by taking a bite of tissue. This deception affects the future decision making of cheated clients, thus acting as a cost to cleaner wrasse. The population density of mimics on reefs is therefore typically low compared to cleaner wrasse, so as not to compromise the long term relationship.

Ecosystem resilience is the capacity for an ecological system to cope with disturbances, both natural and anthropogenic, and thus resist the transition to an alternative stable state. On coral reefs, the natural state of a hard coral dominated ecosystem is crucial in supporting the vast levels of biodiversity and productivity found there. A move away from this natural state, for example to algal dominated reefs as a consequence of severe eutrophication or herbivore depletion, can have severe impacts on their supported fisheries, and the health of linked habitats.

The diverse communities on coral reefs exist in a complex matrix of ecological interactions, and changes to these interactions can potentially have severe knock on effects on other species. In severe cases this can lead to a cascade effect, whereby the loss of one species ultimately causes the loss of further species.

With the important role of cleaner wrasse on ecosystem health and function, as well as the potentially damaging impact of mimics, changes in their behaviour in response to changing habitat quality could have serious consequences for other aspects of the reef community. By better understanding how habitat influences the abundance and distribution of cleaner and mimic populations, and also how their behavioural patterns differ, we can begin to identify the long term impacts on reef community health.

These projects will be behavioural based, meaning students will need to adopt ethological methods. These include producing an ethogram to carefully define a full set of independent behavioural traits, as well as carrying out a time assessment to highlight the optimal observation time to accurately characterise the behaviours exhibited. Observations will take place at randomly selected cleaning stations in the reef zone which is of interest to the study.

Snorkelling is best suited to this project, to enable longer observation periods compared to diving, whilst minimising the human impact on behaviour which can be caused by loud SCUBA equipment. This means that projects should focus on the shallower reef flat environment, of which there is much around Hoga Island. The specific data collected will vary depending on the dissertation being carried out, but could include either cleaner/mimic time budgets, or client pool assemblage and preferential cleaning behaviour.

Students undertaking this project would require:

1. Suitable waterproof watch with stopwatch facility
2. Dive slate or waterproof notebook with adequate pencil supply

Reading List

Cheneya, K.L., Bsharyb, R., Gruttera, A.S. 2008. Cleaner fish cause predators to reduce aggression toward bystanders at cleaning stations. *Behavioural Ecology* **19(5):** 1063-1067

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Randall, J.E. 2005. A review of mimicry in marine fishes. *Zoological Studies* **44(3):** 299-328

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