

IH274: Association between fish and host anemones, Indonesia

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One of the more conspicuous groups of fish on tropical reefs is the anemone fish. Anemone fish are heavily collected for the aquarium trade and have a mutualistic relationship with their host anemones. However, preliminary investigations have shown that this relationship is much more plastic than first thought, and may be dependent on the availability of different anemone species across different reef sites, with dominant anemone fish species being more selective. Further investigations have also shown that some species co-inhabit single host anemones, but what dictates this dual association? Surprisingly little research has been carried out that adequately details the association between fish and anemones and at present it is not possible to identify the key ecological drivers of the partnership. One project could aim to fully characterize the association between hosts and fish using snorkelling, scuba or a combination of both.

The *Amphiprion* sp. are commonly known as clownfish; their niche within the environment is quite unique and very interesting, in that they live within sea anemones (Actiniaria), surrounded by their tentacles. Particularly interesting is that they are able to prevent the discharge of the nematocysts (Nybakken and Bertness 2005) which would otherwise result in stinging. This unique aspect of their symbiosis comes from the fact that clownfish are not born with this resistance, but initially have to acclimatise by covering themselves in the mucus of the anemone (Fautin 1991).

The symbiosis of these animals is mutualistic, meaning there are benefits to both parties. It appears that *Amphiprion* sp. offer protection to the anemone against predatory fish (Fautin 1991). In addition, waste ammonia released by the fish may be used as a nutrient source for the zooxanthellae which are also symbiotic within the cells of the anemone (Ollerton et al. 2007). In return, the Actiniaria provide a level of direct protection both to the fish themselves, but also to their eggs, which are laid within the anemone surrounded by nematocyst covered tentacles (Ollerton et al. 2007).

Clownfish have become increasingly well publicised; resulting in a devastating impact upon population numbers requisitioned for the aquarium trade. The high number of fisheries associated with coral reefs (Sodhi et al. 2007), as well as the highly unselective methods of artisanal fishing utilised (Patzner 2008), all impact the fish and the sea anemone populations, both directly and indirectly. Classifying the level of interaction between these species and their dependence on each other will provide improved information to predict the effect of continued pressures on their existence. It will also highlight whether there is a need for increased protection in the form of management, to prevent the extinction of one or both species.

The findings of a study like this can help improve awareness of the impacts of continued anthropogenic pressure on these fragile ecosystems. Groups such as clownfish are considered charismatic species, due to their widespread popularity amongst the general public, meaning their survival is key to improving levels of ecotourism on many remote reefs, which could be vital in

reducing current direct resource extraction pressures. Determining the level of association between species that live in such a close state of mutualism will be crucial to predict the impacts of future habitat deterioration.

Significant information has already been collected on this interesting example of mutualism. A recent paper by Ricciardi et al. (2010) assessed the numbers and species of individuals of both anemone fish and their host anemones. The study took place in the Manado area of Sulawesi, Indonesia, which is in the north at the edge of the Celebes Sea, focusing mainly on the nesting of species. Studies in the Wakatobi could develop these findings further by bringing in behavioural events, but also to localise the study to Hoga Island, in the South of Sulawesi. A difference in results between two sites of close proximity would mean an increased probability of significant differences worldwide.

Reading List

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Patzner, R.A. (2008). Ecological Studies on Two *Amphiprion* Species in Maldivian Coral Reefs. *The Open Fish Science Journal* **1**: 8-10

Ricciardi, F., Boyer, M., Ollerton, J. (2010). Assemblage and interaction structure of the anemonefish-anemone mutualism across the Manado region of Sulawesi, Indonesia. *Environmental Biology of Fishes* **87**: 333-347

Sodhi, N.S., Brook, B.W., Bradshaw, C.J.A. (2007). Tropical Conservation Biology. *Blackwell Publishing, Oxford, UK*