Poster presentation

Title: Resilient Porites corals benefit from predation protection by Stegastes fish inhabiting vulnerable Acropora: implications for restoring reefs

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Abstract
Damselfish (genus Stegastes) inhabit branching corals (genus Acropora), upon which they cultivate algal gardens which form a major part of their omnivorous diet. Stegastes are highly territorial and will attack (bite or chase) any other fish which approach their territory. This reduces piscine feeding upon algae and coral within the territory, including corals other than Acropora. The protection offered by Stegastes is particularly relevant in the case of Porites, because while branching corals e.g. Acropora are susceptible to bleaching/mortality linked to high temperatures, Porites are resilient. However, mortality of Acropora and disintegration of the structure may result in loss of associated Stegastes, and thus loss of protection from chronic predation offered to adjacent corals. This effect may be exacerbated in protected areas due to greater numbers of corallivorous fish. Despite the consequences of Acropora loss, transplantation or restoration of Acropora thickets has not been extensively used as a conservation tactic due to varying success and pressure from bodies e.g. watersports companies and fishers to keep lagoons clear. This study aims 1) to test whether Porites lutea corals within Stegastes territories experience associational protection; 2) to assess whether protection varies between protected and unprotected areas; and 3) to investigate whether the reintroduction of Acropora muricata colonies to degraded areas can facilitate recolonization of Stegastes fish and thus return protection to P. lutea colonies in the area. Surveying was undertaken at seven sites around Mauritius Island; three (Blue Bay, Pointe D’Esny, and Balaclava) within protected areas, and four (Flic en Flac, Albion, Il aux Egrets, and Belle Mare) under no legal protection. Surveying was undertaken from September 2018-March 2019. P. lutea stands were compared according to whether they occurred within Stegastes territories. Parameters analysed were bite density (BD) and percentage coral surface area damaged (AD). These were determined through photographic analysis. Fish numbers at sites were also surveyed using video transects. Additionally, ten small (5-15cm diameter) P. lutea corals at each of the unprotected sites were transplanted from degraded habitat into Stegastes territories within the same site. Control corals in the same size range were transplanted outside Stegastes territories. To each of a further ten Porites (outwith Stegastes territories) per site, four Acropora branches were transplanted. Surveyed corals outwith Stegastes territories were used as controls. Transplantation occurred in December 2018-January 2019.
Subsequent surveys in March monitored changes in BD and AD, and *Stegastes* recolonization occurred on the *Acropora* transplants. Results were analysed using the Kruskal-Wallis test. Significantly higher values of both BD (p= <2e-16) and AD (p= <2e-16) were found on surveyed *P. lutea* outside compared to within *Stegastes* territories at all sites. Protection status only had a significant impact upon corallivory outside *Stegastes* territories (BD p=7.46e-04, AD p=1.04e-03), with higher levels of corallivory in unprotected areas compared to protected. Lower corallivory was found on *P. lutea* transplants compared to controls, though only BD (p=0.02973) was significantly reduced. *Stegastes* were found to have recolonised seven *Acropora* transplants at one of the transplant sites, where *Acropora* were placed <1m from established colonies, but none at the other two, where *Acropora* were placed >1m from established colonies. Recolonization was not found to significantly affect BD or AD (BD p=0.8222; AD p=0.9198). As expected *Stegastes* were found to confer associational protection to *P. lutea* within their territories. Protected sites did not experience greater corallivory, as expected, maybe due to lack of enforcement. It is possible that the result of the *Porites* transplant was due to larger bites taking longer to heal, thus while no new bites may have occurred, AD did not significantly decrease. The recolonization of several of the *Acropora* transplants at one site shows that *Stegastes* are capable of recolonization within 3 months. The lack of recolonization of *Acropora* at other sites may be due to *Stegastes* being less willing to colonise transplants further from established colonies. The lack of a significant reduction in corallivory associated with recolonization may also be due to old scars not having healed in 3 months. It is clearly shown that *Stegastes* are capable of recolonization, although they may be distance limited, and this may encourage restoration of *Acropora* thickets, allowing fish assemblages to return and other coral species to thrive by reducing predation pressure.