



Predation of corallivorous snail (*Drupella* sp.) on the hard corals of Chetlat Atoll, Lakshadweep, India

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Abstract

Coral reefs around the globe are deteriorating at an alarming rate due to anthropogenic and natural stresses, and predation by corallivorous snail is one of them. Coral predation by gastropod snail of the genus *Drupella* can cause damage to coral reefs. We observed *Drupella* snail predation on lagoon corals of Chetlat reef, Lakshadweep, India. Our study was to investigate the percentage of damage caused by *Drupella* sp. to corals, and its feeding preferences at three selected reef stations. We found that the percentage of *Drupella* affected colonies were more in Station-1 with (21.2%), followed by Station-2 (18.5%) and in Station-3 (10.5%) which was the least affected site. We also found that the *Drupella* snails were feeding on Scleractinian corals of four genera-*Acropora*, *Pocillopora*, *Isopora* and *Porites*. Lastly our surveys revealed that *Acropora* as the most preferred prey species of *Drupella* on this reef followed by *Pocillopora*, *Isopora* and *Porites*. Our observations give evidence for the presence of corallivorous snail *Drupella* in declining coral reefs in Lakshadweep archipelago.

Keywords: *Drupella*, *Acropora*, *Pocillopora*, *Isopora*, *Porites*, Chetlat reef

Introduction

The significance of coral reefs cannot be questioned. They provide food and habitat to many marine organisms. They contribute to coastal protection, income and livelihood to millions of people living in coastal areas across the globe. The Scleractinian hard corals are considered the back bones of the reef ecosystem. The coral polyps live in a mutual symbiosis with the photosynthetic algae zooxanthellae. This simple relationship is fundamental in making this ecosystem possible (Cesar, 2000). The Scleractinian corals are reef builders and without them there will be no reef that supports one of the most biodiverse ecosystems on the planet (Knowlton *et al.*, 2010) and hence no natural support system to sustain coastal human livelihoods.

Coral reefs around the world have been deteriorating at an increasing rate due to multitude of threats and stresses (Pandolfi *et al.*, 2003; Wilkinson, 2008). Coral reefs are sensitive to many factors which directly or indirectly affect their health (Graham *et al.*, 2006). The factors are either man made, for example: pollution (Todd *et al.*, 2010), eutrophication (Fabricius, 2011) debris (Gregory, 2009) unregulated tourism (Krieger, 2012) damaging fishing practices or they are natural, including storms and tsunamis (Witt *et al.*, 2011) bleaching, (Miller *et al.*, 2006) and disease

(Sutherland *et al.*, 2004). Direct consumption of live coral, or corallivory, represents another biotic stressor that can adversely affect coral fitness and accelerate rates of coral decline (Knowlton *et al.*, 1990).

Some of the reef-dwelling species, such as corallivorous snails, consume live coral, which may contribute to the decline in coral reefs (Rotjan and Lewis, 2008). *Drupella* is a genus of marine gastropods (Class: Gastropoda, Order: Neogastropoda, Family: Muricidae) that feeds exclusively on live coral tissue (Taylor, 1980), stripping it from the calcium carbonate skeleton and leaving distinctive, white feeding scars which become discolored by settling turf algae after a few days (Cumming and McCorry, 1998). These generalist corallivores occur throughout the shallow waters of the Indo-Pacific (Claremont *et al.*, 2011). *Drupella* snails are perceived as a serious destructive force, like the crown-of-thorns starfish, *Acanthaster planci* (Birkeland and Lucas, 1990). *Drupella* are capable of inflicting heavy coral damage in large areas of the reef, as seen in many areas of the Indo-Pacific and beyond, Hong Kong (Turner, 1994), Kenya (McClanahan, 1997), the Great Barrier Reef in Australia (Cumming, 2009), Israel (Shafir *et al.*, 2008), and Koh Tao, Thailand (Hoeksema *et al.*, 2013) where *Drupella* outbreaks and the resulting damages are observed and recorded.

However, not much detailed and reliable scientific information is currently available about the presence of gastropod snails in the coastal waters of India, except *Drupella* predation on corals at Vaan Island, Gulf of Mannar reported by (Raj *et al.*, 2014), and the presence of *Drupella cornus* reported by (Marimuthu *et al.*, 2018) from Minicoy Island, Lakshadweep, India. During snorkeling along the coastal lagoon of Chetlat atoll, one of the inhabited island of Lakshadweep in November 2018, we spotted *Drupella* predation scars on several coral colonies at a maximum depths of 2 m. We conducted surveys to investigate the damage inflicted by *Drupella* on corals and their prey preferences that would contribute to predict future decline of coral cover and thereby help the managers to evolve better management plan for the conservation of this pristine reef.

Material and methods

The present study was carried out in November 2018 at the Lagoon reef of Chetlat Island, belonging to Lakshadweep archipelago, located on the south west coast of India, in the Arabian Sea (Fig. 1). Three shallow lagoon stations with 2 m depth at South, North and Middle part of the reef were selected and surveyed by snorkeling. At each station, a belt transect of 50 m X 10 m were deployed, and 75 colonies within the transect were observed. *Drupella* affected colonies at each

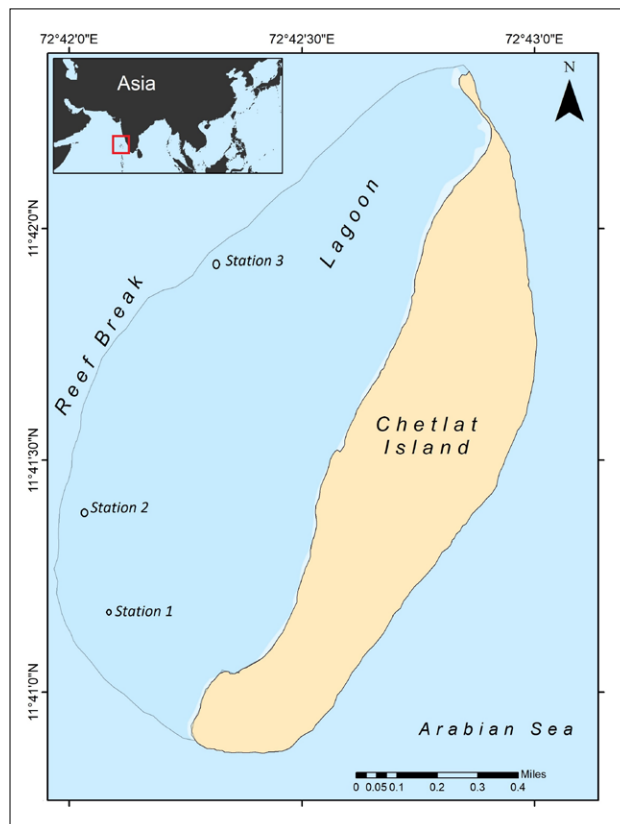


Fig. 1. Map of Study area – Chetlat Island.

station were counted separately to calculate the percentage of damage caused by it on the reefs. *Drupella* with feeding scars on different coral genera were also recorded separately to study their prey preferences. Photographs of coral colonies were taken using Nikon Coolpix AW130 underwater camera and identified up to generic level based on Veron (2000). The percentage of *Drupella* affected colonies were calculated as follows:

$$\frac{\text{(Number of } Drupella \text{ affected colonies)}}{\text{(Number of total observed colonies)}} \times 100.$$

Results and discussion

The present investigation revealed that the corals of all three reef stations have been affected by *Drupella* snails and feeding scars were found on four different coral genera *i.e* *Acropora*, *Pocillopora*, *Isopora* and *Porites*. The corals in Station-1 were most affected with *Drupella* predation (21.2%), followed by Station-2 (18.5%) and lowest predation in Station-3 (10.5%) (Fig. 3). *Acropora* was the most preferred prey in Station-1 and 2, but *Porites* were the largely affected coral genera in Station-3. Out of 21.2% percent affected colonies in Station-1, *Acropora*, *Pocillopora*, *Isopora* and *Porites* constitute 10.6, 4%, 5.3 and 1.3%. Similarly, out of 18.5% percent affected

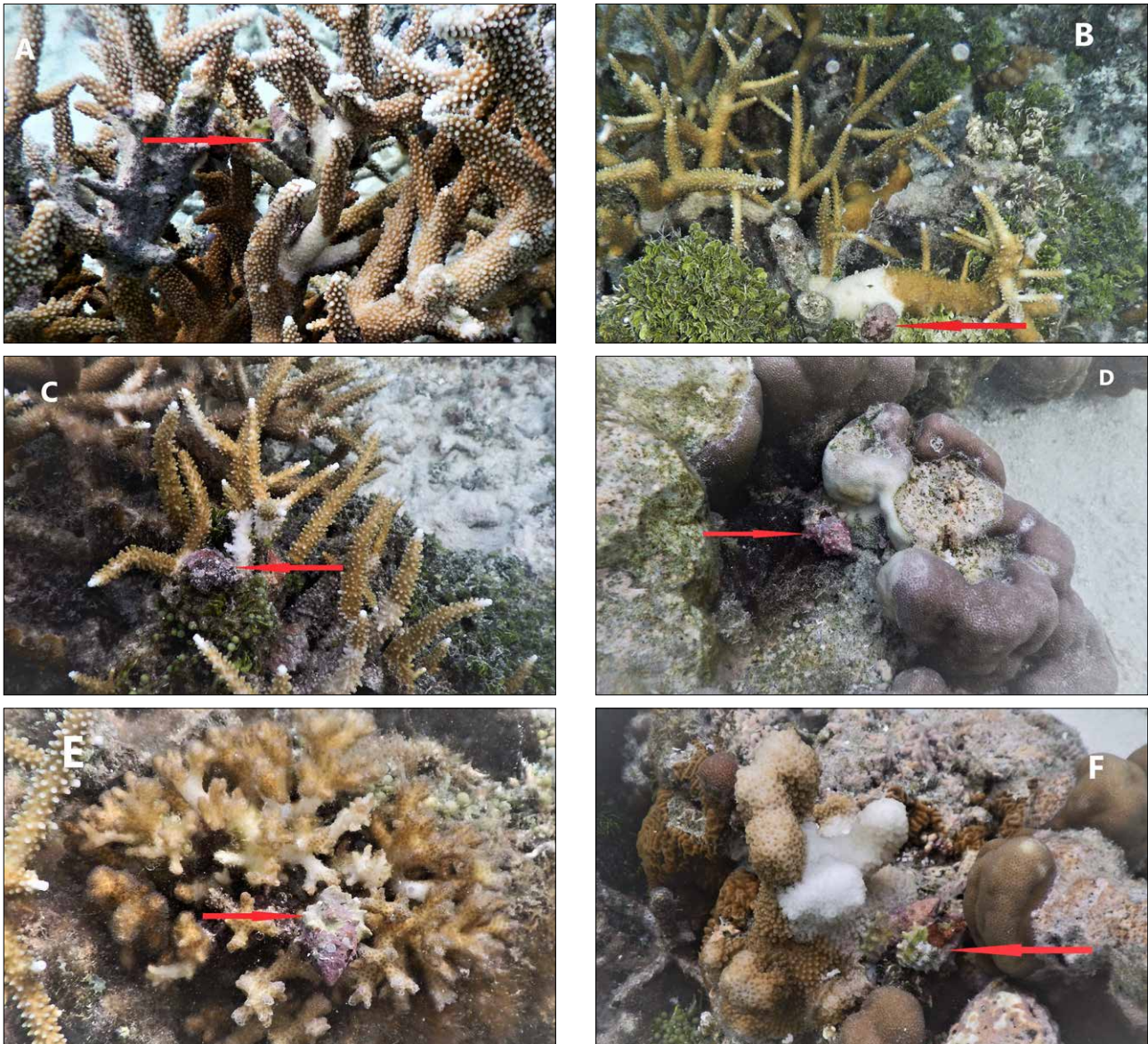


Fig. 2. *Drupella* fed coral colonies from Chetlat reef (Arrow shows *Drupella* on corals). A, B and C. *Drupella* with feeding scars on *Acropora* colonies, D. *Drupella* feeding *Porites* colony, E. *Drupella* snail on *Pocillopora* colony, and F. *Drupella* feeding *Isopora* colony

colonies in Station-2, *Acropora* represents 9.3%, *Pocillopora* 5.3%, *Isopora* 2.6% and *Porites* 1.3%. But an opposite pattern was seen in Station-3, where *Porites* was dominant and highly affected coral genera.

Out of 10.5% percent affected colonies, *Porites* cover 5.3%, followed by *Pocillopora* (2.6%), and *Acropora* and *Isopora* were least affected with 1.3% (Fig. 4).

In *Acropora*, snails were mostly found on coral branches (Fig. 2 A-C), but in *Porites*, it was found at the base of the colony (Fig. 2D). Damage on coral tissue seemed minimal for

some host species (Fig. 2E), but causing severe loss to coral tissue in other species leaving bare skeleton behind (Fig. 2F).

Drupella are extremely resilient in terms of food, and their most preferred prey are branching corals, most notably *Acropora*, followed by *Pocillopora*, (Turner, 1994; Hoeksema *et al.*, 2013). In Station-1 and 2, *Acropora* was the dominant coral, and since it is the most preferred prey species of *Drupella*, this may probably be the reason for highest predation and loss of coral cover in Station-1 followed by Station-2. *Drupella* will go for other prey species if their preferred preys are unavailable (Schoepf *et al.*, 2010). *Drupella* were found on *Porites* after branching corals were killed in Gulf of Eilat, in Israel (Shafir

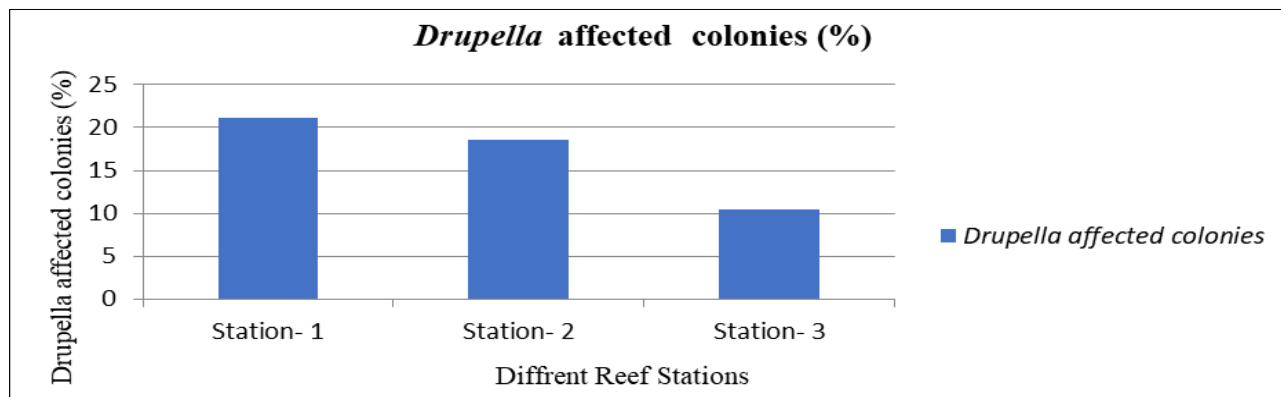


Fig. 3. Percentage of coral in different reef stations at Chetlat during the study period

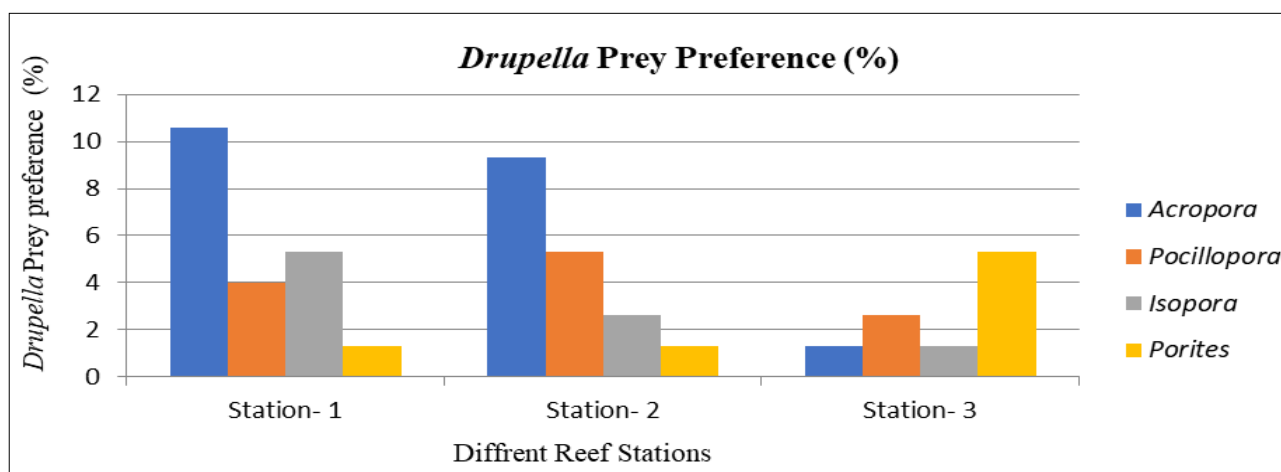


Fig. 4. Prey choice of *Drupella* snail in different reef stations at Chetlat during the study period.

et al., 2008). Our study shows that the lowest damage was in Station-3 where *Acropora* and *Pocillopora*, the preferred prey species of *Drupella*, are limited in number and *Porites* was abundant. This may be the reason for lowest predation in Station-3, and *Drupella* choosing other prey species, here *Porites*, in addition to their usually preferred prey *Acropora*.

Globally, coral reefs are threatened by a number of anthropogenic and natural stresses that can fundamentally ruin the reef ecosystems. Predation of corals by corallivores snail *Drupella* can cause damage to reef structure as they directly consume hard corals, the building blocks of the reef, and therefore reduce the overall reef resilience. *Drupella* preying on *Porites* corals in addition to the preferred branching corals suggest that *Drupella* may be able to take up new dietary preferences and continued monitoring in larger scales are required to get a clear picture of the ecological dynamics of this coral predator. Though this study was carried out in small areas of the reef, it provides valuable baseline information for monitoring, research and development of strategies for the conservation of coral reefs around Lakshadweep Islands.

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