Coral Primary Polyp Settlement on Crustose Coralline Algae from India

Kashyap Kumar, Venu Sasidharan*, Kalita Samrat, Kripa S. and Lakshmanan Sreelakshmi
Department of Ocean Studies and Marine Biology, Pondicherry University, Brookshabad, Port Blair – 744112, Andaman and Nicobar Islands, INDIA
*svenu.omb@pondiuni.ac.in

Abstract

Crustose coralline algae (CCA) are calcareous red algae belonging to the diverse group Rhodophyta. They are known to play numerous important ecological roles in the coral reef ecosystems such as various invertebrate larval settlement, cementing the reef together, participating effectively in primary productivity. One of the most important ecological roles these algae play, are the settlement and metamorphosis of coral larvae.

Though lots of observations have been made on a juvenile coral being settled on CCA, there has not been any study on the initial settlement of coral larvae on CCA. The present study was carried out in the intertidal regions of South Andaman district. During intertidal survey, a single thin layered CCA was observed to house four different coral recruits which had settled and metamorphosed to form a single polyp coral.

Keywords: Coral primary polyp, crustose coralline algae, coral larval settlement, metamorphosis.

Introduction

Calcareous red algae belonging to the group Rhodophyta are a group of coralline algae known widely for their ecological role as ecosystem engineers[3,4,5,6]. Among them, the non-geniculate coralline shows a worldwide distribution from tropical to polar Regions[14]. They are also one of the deepest occurring marine algae occurring from the intertidal regions to a depth exceeding 200 m[15]. In tropical coral reef environment, CCA serves as one of the primary reef builders[1,20]. In tropical reefs, they are known to construct algal ridges[26] and contribute significantly to primary productivity[7]. By cementing them, they are known to bond the reef together[14,20]. CCA is also known to induce larval settlement in various marine invertebrates[8,12,19,23,24].

The natural regeneration and revival of coral reefs depend mostly on the successful settlement and metamorphosis of coral recruits[18,21]. For coral planula settlement and metamorphosis, CCA are the most preferred substrates[11,12,16,22,27-29]. International field and laboratory studies have observed coral primary polyp settled on CCA[2,10,13,21,30].

In Indian context, Malakar and Venu[17], Singh et al[25] and Venu et al[28] have reported the substrate preference of juvenile coral recruits from Andaman and Nicobar Islands, India.

Material and Methods

Survey was carried out in the shallow intertidal regions of Burmanallah, South Andaman, India (Fig. 1). Intertidal region at this study site extends up to approximate 200 m from the beach during low tides. Line intercept transect method[9] was used to estimate the benthic substrate coverage. CCA specimens were photographed in the field to observe associated organisms attached to it using Canon Powershot G1 X Mark II camera with Canon WP-DC53 waterproof case prior to collection.

Results and Discussion

Benthic substrate was sandy in nature with various rocks dominated by macro algal and filamentous algal growth (Fig. 2), dead corals and CCA (Table 1). The substrate was dominated by sandy bottom (27.66 %) followed by dead corals (26.46 %), CCA (17.99 %), seaweed (13.34 %), sea grass (10.47 %) and filamentous algae (4.08 %) respectively. Macro algae present included *Halimida* sp., *Padina* sp. (Fig. 3) etc. Most of the intertidal regions (approximately 50 m from the beach) were always submerged in water and almost never get exposed. Crustose coralline algae of various morphological forms were observed during the study. They were observed to be growing on different substrates like rocks, dead corals, coral rubbles and artificial structures. These CCA specimens were free to roll around along with the wave actions during high tides. Sand was the major component at the study site where these CCA were observed. Specimen of interest, a CCA grown on a rock, was observed to have coral larval attachment (Fig. 3 and 4). The coral larvae had settled on the CCA and metamorphosed to form a single polyp coral (coral primary polyp). The polyps measured on an average of 1.9 mm in diameter. They were shaped as circular to slightly oval.

Coral polyps could not be identified because of its too small structures. Two different species of CCA were observed to be growing on the same rock with distinct edges. Four distinct coral primary polyp were observed on this specimen. These coral primary polyps were not equally distributed on both CCA species. Instead, all four of them had preferred one species over the other for settlement and subsequent metamorphosis. CCA crust was so thin that it could not be collected for taxonomic identification. CCA was also not collected to avoid any damage to the newly settled coral primary polyp. The CCA specimen could be photographed for two continuous days only. Because of high wave action during high tides, it got displaced.

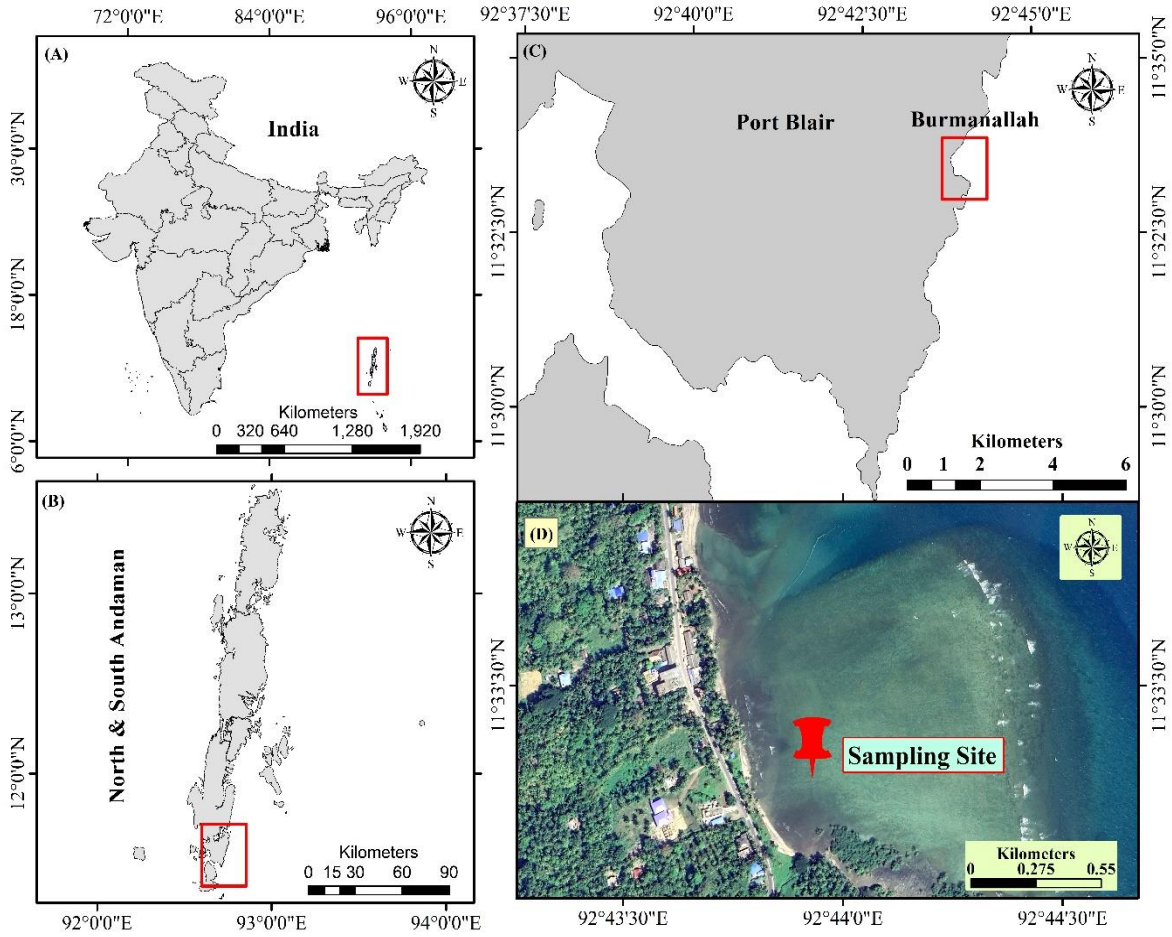

Figure 1: Map showing the survey site (D) in the Burmanallah intertidal region.

Figure 2: Filamentous algae growing on dead rocks and dead corals

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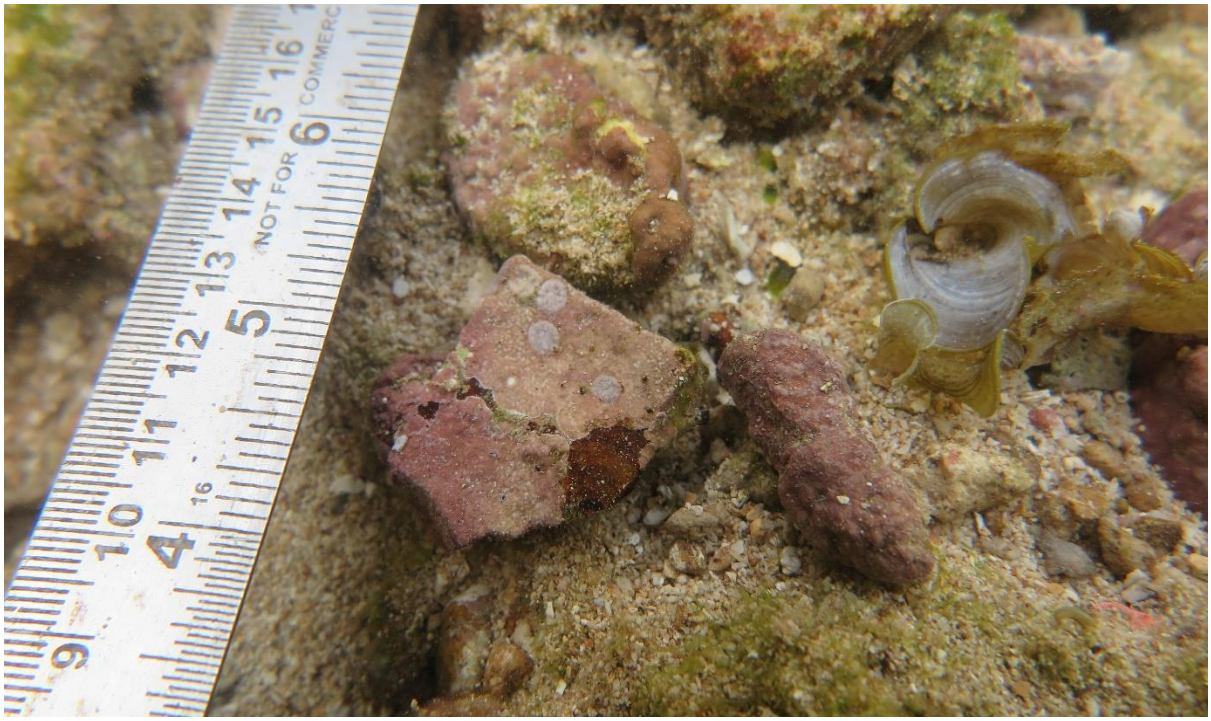

Figure 3: Coral primary polyps settled and metamorphosed on a thin crust of crustose coralline algae (Day 1).

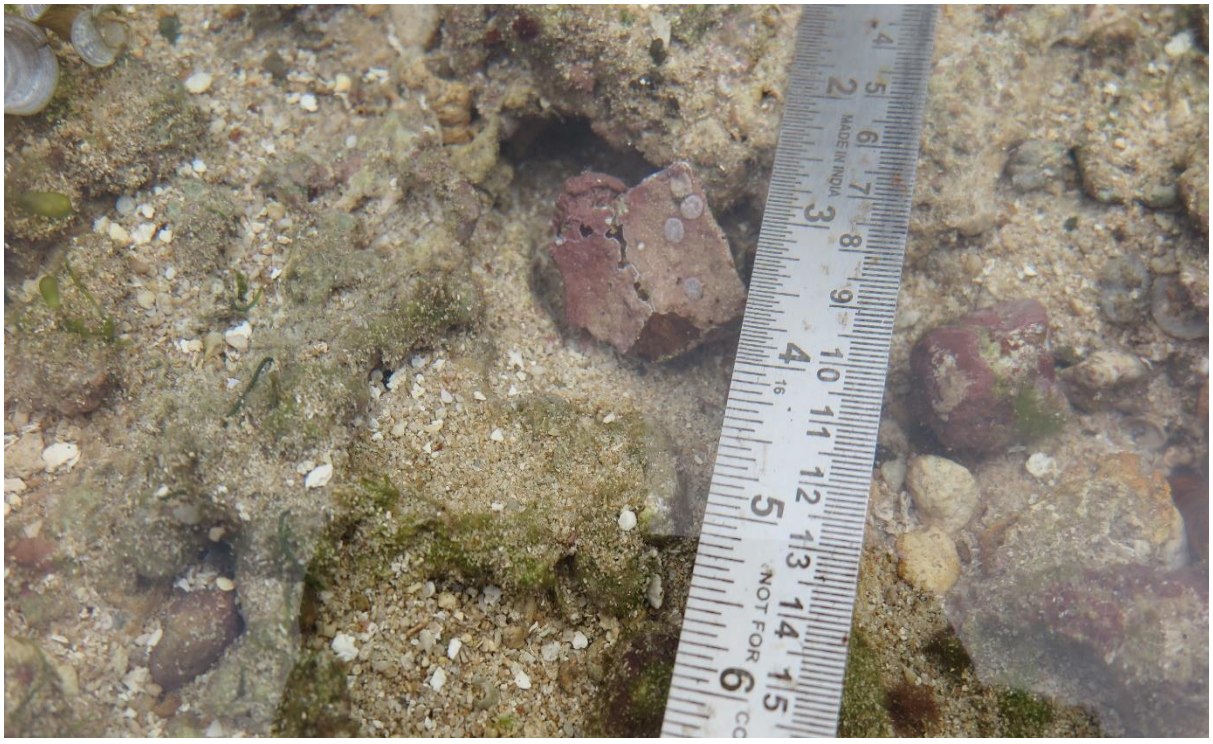

Figure 4: Coral primary polyps settled and metamorphosed on a thin crust of crustose coralline algae (Day 2).

Table 1
Benthic substrate coverage at the study site

Benthic Substrate	Percentage Coverage
CCA	17.99
Dead coral	26.46
Sand	27.66
Sea grass	10.47
Seaweed	13.34
Filamentous algae	4.08

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Conclusion

Natural revival of coral reef ecosystems largely depends on the successful recruitment of new coral recruits on the empty space on reefs. Generally empty space on reefs are colonized by crustose coralline algae. Since crustose coralline algae are potent inducers of coral larvae, their ability to occupy the empty spaces also helps in natural revival of the reefs. They also help prevent the overgrowth of macroalgae, which in turn competes with corals for sunlight and space. Various studies internationally have observed and experimented with the role of CCA in successful coral recruitments.

Nationally, various studies have observed juvenile corals settling successfully proliferating in the presence of CCA. In Indian context, there was no study highlighting the initials settlement of CCA and its post settlement metamorphosis into a coral primary polyp formation. Present study provides the field observation of a single polyp coral (coral primary polyp) using CCA as suitable substrate for settlement and growth.

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