



In Situ Observation on the Mass Aggregation of Edible Sea Urchin *Stomopneustes variolaris* in Shingle Island, Gulf of Mannar

Sadhukhan Koushik¹

Ch. Ramesh²

T. Shunmugaraj³

M.V. Ramana Murthy⁴



(✉ Corresponding Author)

^{1,2,3}National Centre for Coastal Research (NCCR), Ministry of Earth Sciences (MoES), NCCR Field Office, Mandapam camp, Ramnathapuram District, Tamil Nadu, India.

¹Email: Sadhukhan.1985@gmail.com Tel: 91- 9025251632

²Email: chrameshp@gmail.com Tel: 91- 9474227148

³Email: raj@nccr.gov.in Tel: 91- 8056081193

⁴National Centre for Coastal Research (NCCR), Ministry of Earth Sciences (MoES), Pallikaranai, Chennai, Tamil Nadu, India.

Email: mvr@nccr.gov.in Tel: 91-(044) 66783586

Abstract

This study report significant observation on the mass aggregation of sea urchin species *Stomopneustes variolaris* from Shingle Island. *S. variolaris* is well known edible sea urchin species to coastal population. Intensive underwater surveys were conducted during the period of January and February, 2019 at different sites of Mandapam group of Islands in Gulf of Mannar. *S. variolaris* were found underneath and periphery of the dead reef, on the algal bed and on the exposed substratum. The density of the species 6-9 individuals / m² was observed during the survey. Adult and young *S. variolaris* were recorded during the survey but juvenile was not observed as they usually hide within the dead rocks. The mass aggregation appears to be due to seasonal occurrence that exploit intensive grazing on macroalgae during the post monsoon in Gulf of Mannar. This study also discussed the commercial importance of this edible sea urchin species which could be an important food sources for the coastal population of Gulf of Mannar.

Keywords: Sea urchin, *Stomopneustes variolaris*, Aggregation, Behavior, Shingle Island, Gulf of Mannar.

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1. Introduction

Sea urchins belonging to the phylum Echinodermata and class Echinoidea are uniformly distributed in all tropical and subtropical environments. These are benthic organism occur at all the ocean depths. These marine animals acts as biological indicators to assess the environmental health by their sensitivity to the environmental changes or stresses in their habitat [1]. *S. variolaris* commonly known as black sea urchin belonging to the family Stomopneuidae, are dark blackish with blue sheen on spines, omnivorous and shallow water inhabitants which reside upto a depth of 18m [2, 3]. They usually found underneath of rocks or crevices that provide protection against predators, and they are more abundant in zones where waves are less strong [4]. This edible black sea urchin commonly found in Gulf of Mannar which are being consumed as delicious food items from the ancient time by the fishermen communities of Mandapam and Pamban village under Ramnathapuram district of Tamil Nadu [5]. Among the echinoderms, sea cucumber and sea urchins are commercially exploited by Southeast Asian countries, Western Europe, Mediterranean countries, Chile and Pacific North America. The gonads or roe of black sea urchin *S. variolaris* is nutritionally rich in protein (18%), essential fatty acids, carbohydrates, carotenoids, vitamins and some important trace elements like Fe, Zn, Cu, Ni, Cr [6, 7]. In Gulf of Mannar, a total of 264 echinoderms were reported among which 24 species of sea urchin so far recorded from here Saravanan, et al. [8]. Distributional records of echinoids in Gulf of Mannar was mainly carried out from the fish landing centre. Despite of several studies concentrated on commercial important of sea urchin, very few research studies were carried out on sea urchin ecology and aggregation patterns in coral reef environment [9-11]. Therefore, the present study aimed to report photographic evidence of mass aggregation of *S. variolaris* in Shingle Island of Gulf of Mannar and provide information on the favorable habitat of sea urchin *S. variolaris* aggregation.

2. Materials and Methods

Field observations on *S. variolaris* were made by skin diving in South-western part of the Shingle Island during an extensive coral reef monitoring survey carried out in the month of January-February, 2019. Locations of the observation sites (N09°14.402', E79°14.212'; Site2: N09°14.443', E79°14.052'; Site3: N09°14.415', E79°14.096') were marked with GPS and underwater photographs of the specimens were obtained with Nikon coolpix underwater camera Figure 1. The habitat of the sites consisted of sand, dead corals and rubbles with abundant macrophyte communities.

3. Results and Discussion

S. variolaris Figure 2a was intensively aggregated at the south western part of Shingle Island at a depth range between 0.5m- 1.5m. Habitat of the locations consists of exposed rocky intertidal area and zone of coral reefs with abundant algal cover. Sea waves were not so strong that it swifts rubbles and sand from the substratum. Substratum is mainly composed of sand and rubbles with excessive algal growth. *Halimeda* sp., and *Sargassum* sp. was abundantly distributed in the observation sites Figure 2e & 2f. Average density of the occurrence of *S. variolaris* was 6-9 individuals/ m². Most individual has a test diameter of 7-11cm. During the survey, two or more specimens were closely staying on each other Figure 2b. Single individual were hiding themselves within the crevices or underneath the rocks Figure 2c & 2d. Many individuals were also lying exposed on the algal bed Figure 2f. No juveniles were sighted on the study sites. Average numbers of 5-10 individuals were recorded in each aggregated colony Figure 2f. They waved their spines slowly, touching and crossing the spines of neighboring sea urchin. To avoid the predator and unwanted objects, all individuals trying to hold the substratum hard and move spines more frequently.

Many animals commonly aggregate to protect themselves from predators, to facilitate prey capture and to reproduce [12, 13]. But Sea urchin aggregates in response to destructive grazing on algae bed or involve in social interactions [14]. Similarly, during our survey, social interactions and evidence of abundant algal growth were observed in the study area which might be indicated that mass aggregation of *S. variolaris* occurred due to the availability of huge amount of food. Sea urchin species *Diadema setosum* performed the aggregation behavior for their protection rather than reproduction success [15]. As per the study, it has been concluded that when urchins are too abundant to find shelter among rocks, individuals form aggregations for protection against predators [15]. Here in the present study, individual *S. variolaris* sighted underneath of crevices or within the holes of dead rocks. Aggregated sea urchins are mainly found on the edges of dead rocks or rubbles or on algal bed. Echinoids act as destructive grazers and combat with the invasive algae which is one of the major threat to the coral reefs of Gulf of Mannar [16]. Several studies also evaluated the role of echinoids as a keystone herbivores which could serve as an important tool for local reef conservation and management, especially the reef where overfishing is a major threat [17, 18]. Similarly, coral reefs in Gulf of Mannar faced severe disturbances from natural and anthropogenic factors including destructive fishing, shoreline operation, and bio invasive species [19]. Algal species such as *Sargassum* sp, *Halimeda* sp, *Caulerpa* sp, *Turbinaria* sp are the major threats to the degraded reef area in Gulf of Mannar. Hence, such mass aggregation of sea urchin species *Stomopneustes variolaris* can fight against these invasive algal species and reduce the chances of coral mortality in the reef. However, there is no sign of extrinsic environmental limitations which might affect the distribution of *S. variolaris* in the study area. In Gulf of Mannar, four species of echinoids are used in Souvenir industry [20]. People of Managudi village near Uchipuli of Ramnathapuram district eat the gonads of *S. variolaris* by frying or grilling the gonad Saravanan, et al. [5]. Saravanan, et al. [5] inferred that this villagers consider the gonad of *S. variolaris* as delicacy and their way of cooking is unique. Though, no echinoid species have the commercial value in India but the eating of *S. variolaris* by the local coastal communities brings the sustainable way of improving the food security in Gulf of Mannar villages. However, this observation on mass aggregation of *S. variolaris* in Gulf of Mannar provides both the ecological and commercial significance to the coastal population as well as to coral reefs of Gulf of Mannar. More extensive underwater surveys are required to investigate and evaluate important marine faunal resources that can help in coral reef conservation and sustainable livelihood to coastal population.

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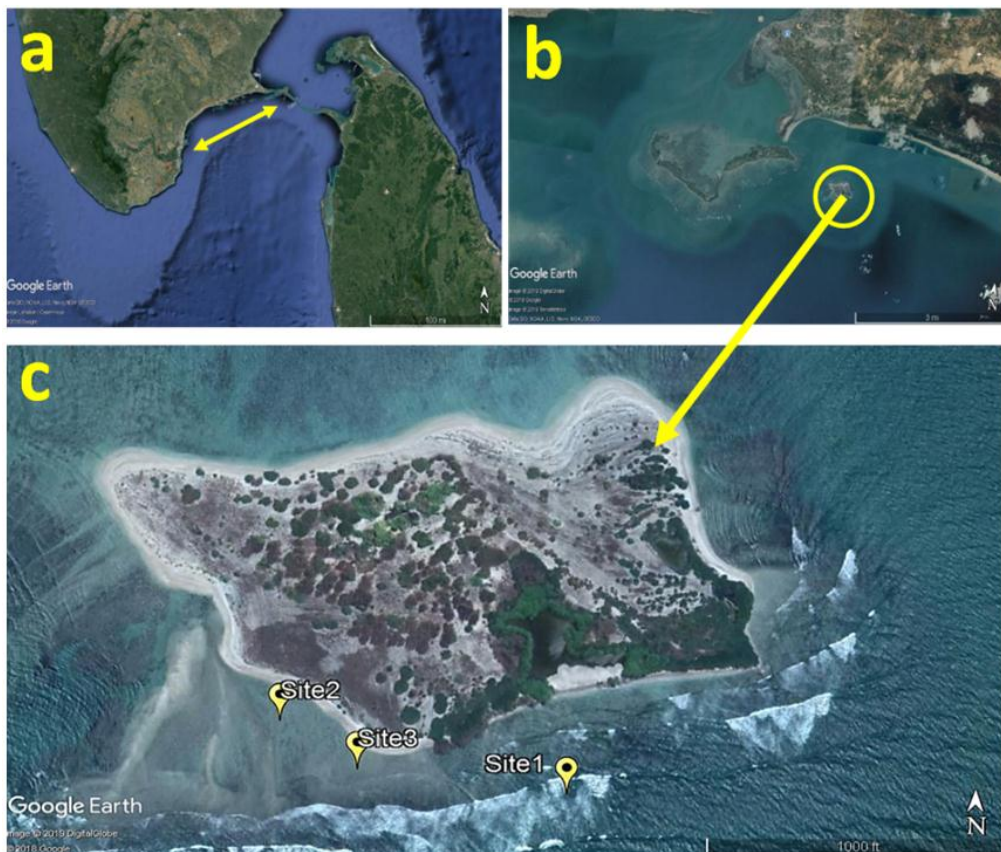


Figure-1. a. Arrow showing the Gulf of Mannar region; b. Shingle Island along with neighboring island of Gulf of Mannar; c. Observation sites in Shingle Island.
Source: Google Earth.

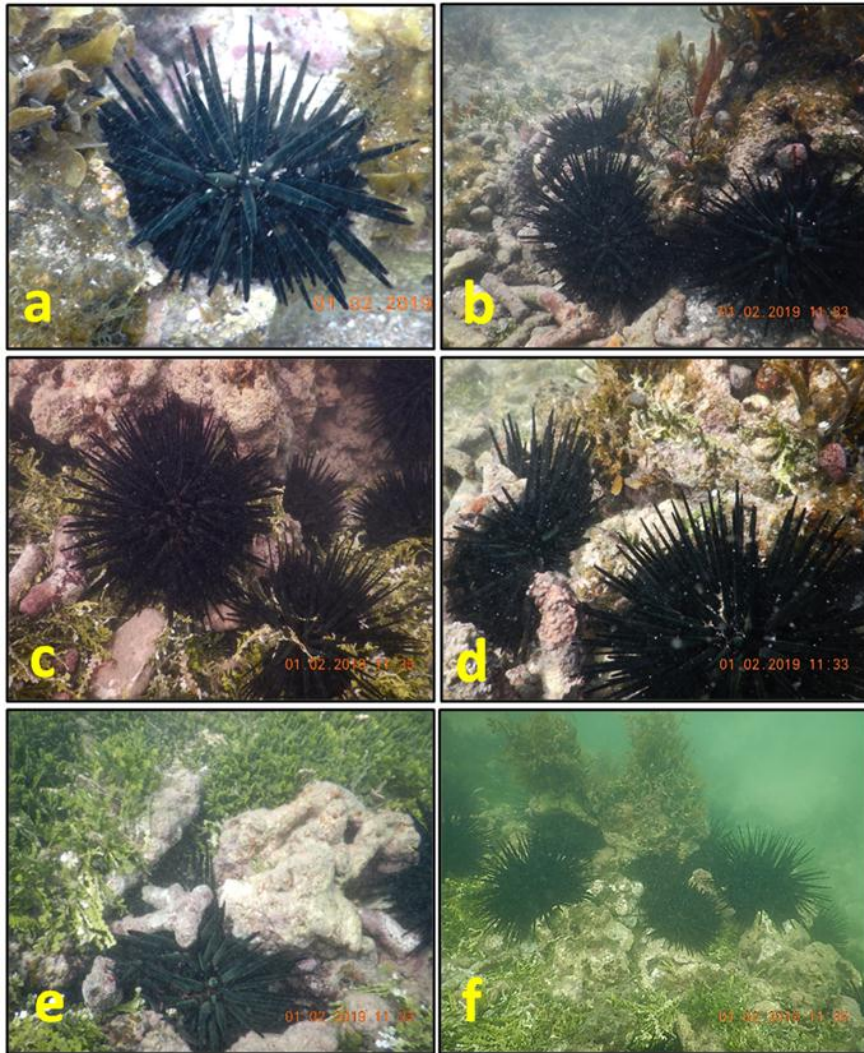


Figure-2 a. *Stomopneustes variolaris* – single specimen. b. Aggregation of 5-6 individuals together on rubbles. c. & d. Individuals hide inside the crevices or dead rocks; e. *S. variolaris* with invasive algae *Halimeda* sp.; f. aggregated *S. variolaris* lying on the dead rubbles covered with algae.

Source: Present work, NCCR, MoES.