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First record of black spined sea urchin, *Stomopneustes variolaris* (Lamarck, 1816) from Ratnagiri, (Echinoidea, Stomopneustoida, Stomopneustidae) Maharashtra

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Abstract
The first report of sea urchin (Echinodermata, Echinoidea) *Stomopneustes variolaris* (Lamarck, 1816) from Ratnagiri coast (Maharashtra West coast of India). A complete description of the species has been made based on test morphology. The study revealed that characters of ambulacral and inter-ambulacral plates, peristome, tubercles, apical system, Periproct and spine colouration.

Keywords: sea urchin, first record, *stomopneustes*, Ratnagiri

Introduction
Sea urchin (Echinodermata, Echinoidea) inhabit seagrass beds, coral reefs intertidal regions and feed on benthic invertebrates and algae [5]. Sea urchin is one of the most common components of the near shore marine ecosystem of worldwide, often playing an important role in ecological role in shallow subtidal environment [7, 2]. Published literature on sea urchins [5] suggests that the structure of apical system and peristome, arrangement of porepairs and sutural pits are the most important criteria for species identification. Information available for Indian waters reveals the occurrence of only one Stomopneustidae species, namely *Stomopneustes variolaris* (Lamarck, 1816) [14, 15, 1].The present paper describes a first record of *Stomopneustes variolaris* (Lamarck, 1816) for the Ratnagiri region (Maharashtra, west coast of India).

Materials and Methods
The present study area is has been carried out along the intertidal rocky shore of Varwade, (Latitude- 17°11'24.78"N and Longitude- 73°14'43.59"E) Ratnagiri. The specimens were collected from the intertidal rocky shore during low tide. The sea urchin specimens were collected during low tide. The good quality intact specimens were taken to the laboratory for morphological examination. Parts of these specimens were examined under a microscope and morphological characters were recorded. The sea urchins were identified down to species level using morphological features such as test texture, arrangement of ambulacral pore-pairs and structure of the Aristotle's lantern [7, 2, 3, 5]. Subsequently, species identification was carried out using external characters such as test colour, shape, arrangement of ambulacral pore-pairs, sutural pits near the peristome, form of apical system and periproct, position of anal opening and presence of a suranal plate. Morphological parameters (see Abbreviations) were measured using Varniercaliper with an accuracy of 0.01 mm. The apical systems as well as ambulacral and interambulacral plates were examined for identification and differentiation of the species.

Further, ten morphological ratios were derived from these morphometric parameters following Hegde and Rivonker, (2013). All the photographs were taken using Digital camera (Nikon).

Abbreviations
AD: Apical Disc Diameter
GD: Gonopore Diameter
GPH: Genital Plate Height
GPW: Genital Plate Width
HTD: Horizontal Test Diameter
PPD: Periproct Diameter
PSD: Peristome Diameter
SL: Spine Length
VTD: Vertical Test Diameter

Results and Discussions
Class: Echinoidea (Leske, 1778)
Subclass: Euechinoidea (Bronn, 1860)
Infraclass: Carinacea
Superorder: Echinacea
Order: Stomopneustoida
Family: Stomopneustidae
Genus: *Stomopneustes*
Species: *Stomopneustesvariolaris*

Synonyms
Echinus variolaris (Lamarck, 1816)

Habitat and distribution: Habitat: rock pools, crevices, bores, overhangs and the like. The sea urchin, *Stomopneustesvariolaris*were observed from seaweed zone with constant water circulation, avoiding direct wave action. Also distributed in SE Arabia, West India, Pakistan, Maldive area, Ceylon, Bay of Bengal, East Indies, north Australia, China, south Japan and South Pacific.

Morphological Diagnosis

Test is small, dome-shaped (hemispherical), oral surface with sunken Peristome: HTD ranges from 51 to 54 mm (μ=52.50±0.3562) and VTD ranges from 25 to 27 mm (μ=26.10±0.2844) test width about twice in height (μ VTD/HTD ratio= 0.51:1). Test comprises of five pairs of alternatively palacedambulacral and inter-ambulacral plates, Inter-ambulacral plates placed at the level of ambulacral plates. Spines are black coloured. Ambulacral plates are compound, trigeminate, pore-pairs bearing numerous tube feet (in living specimens) arranged in a straight line forming a three adradial band.

Double primary tubercles of each ambulacral plate which are doubly compound so that the ambitus one very large ambulacral tubercle corresponds to three to six arcs each of the three pore pairs. Amitalambulacral plates with primary tubercles of small or moderate size corresponding to each arc of pore-pairs. Interambulacral plates are covers a slightly larger area of the test than the corresponding ambulacral plates. Each interambulacral plate is having a central primary tubercle surrounded by smaller secondary and miliary tubercles that cover the remainder of the plate. Primary tubercles are imperforate and distinctly crenulated. Wedge-shaped pits are located at the angle of the suture and arranged in a zig-zag manner along the middle of the interambulacrum; lateral extensions of the

Fig 1: Test of *Stomopneustes variolaris;* A, inter-ambulacrum B, ambulacrum

Pitsseparat the interambulacral plate reaches the pore-pair zone; sutural pits near the peristome are also conspicuous.

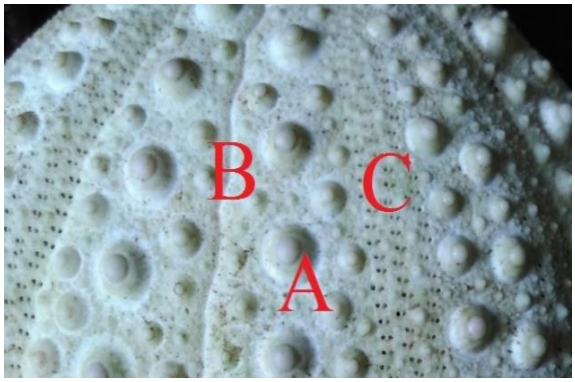

Fig 2: A, primary tubercle; B, secondary tubercle and C, pore pairs

Fig 3: Peristome with five pyramid forming the frame of the Aristotle's lantern.

Peristome ranges from 12 to 16 mm (PSD 14.85±0.3468% of HTD), roughly circular in outline with very feeble buccal notches; covered with soft skin, comprising of five pairs of buccal plates with buccal tube feet emanating from them. Pyramids form of Aristotle's lantern *S. variolaris*, without complete bridge no complete bridge across, V-shaped space at the upper end of each of five pyramid forming the frame of the Aristotle's lantern a paired rod-like epiphysis bridging across the upper end of pyramid

Apical system is bicyclic, relatively large, but smaller than the peristome. The anus diameter ranges from 2.3 to 6.1 mm (AD 4.55±0.3391% of HTD). Apical system is with four equal-sized genital plates and one larger genital plate with madreporite. Inner part of each genital platesare with small tubercles, outer part naked. The number of tubercles varying with the size of the specimens: 1-2 tubercles in specimens <5 mm, whereas 3-5 tubercles in larger specimens. Genital plate is wider than long (mean GPH: GPW = 0.8708:1). Gonopore roughly circular, approximately ⅓ rdof genital plate size it range from 3 to 6 mm (GD 4.45 ±0.3181% of GPH) and located at the center of each genital plate. Ocular plates are oval-shaped, placed at the junction of two adjacent genital plates, not reaching the periproct margin; covered with 3-5 small tubercles. Conspicuous triangular pit present at the junction of the ocular plate with its two adjacent genital plates.

Fig 4: A=Apical system

Fig 5: Live specimen of *Stomopneustesvariolaris* (Lamarck, 1816)

Periproct is roughly circular in outline, it ranges from 7 to 11 mm (PPD 8.20±0.3739 % of HTD), composed of brown plates; Anal opening is eccentric, located on opposite to genital plate. Spines are thin, total length ranges from 44 to 55 mm (SL 51.30± 0.8082 % of HTD), Spine colouration is black. Similar observation was[14]reported the distributions of sea urchin, *S. variolaris* in the seaweed zone along the Visakhapatham coast, India.Gavas and Shirke (2015) made a first record of *Temnopleurustoreumaticus* (Leske, 1778) from Mumbai.The sea urchin, *T. decipiens*newly reported from Goa, west coast of India [5]. The sea urchin species *viz*.,, *Salamicsvirgulata*, *S.bicolor*, *S. dussumieri*, *T. toreumaticus*, *Echinothrixdiadema*, *S. variolaris*, *Salmacisbicolar*, *T. toreumaticus*, *E.diadema*, *S. variolaris*, *Salmacielladussumieri*, *S.bicolor*, *S. virgulata*, *T. alexandri*and *T. toreumaticus*were reported from the coast of Mudasalodai and Pazhayar, Muttom and Colachel, Gulf of Mannar, Tamil Nadu [8, 10, 18]. The sea urchins as, *S. virgulata*and *S. variolaris* (Echinoidea) were recorded from the coast of Pondicherry and Visakhapatnam respectively [17, 1]. The sea urchin, species *viz*., *Diademasavignyi*, *Diademasetosum*, *Echinometramathaei*, *Echinothrixcalamaris*, *Trepneustesdepressus Echniostrepus Molaris S. virgulata*, *S. bicolor*, *S. dussumieri*, *T. toremati*cs,*E. mathaei* and *S. variolaris* were recorded from the coastal waters of South Andaman and the Lakshadweep Islands [12, 6] (Rao and Kumar, 2014; James, 1982)

Conclusion

The present study reports the first record of*S.variolaris* (Lamarck, 1816) from Ratnagiri region.

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