Describing the Radular morphology by using SEM in *Muricanthuskuesterianus*(Tapparone-canefri1875) Family: Muricidae, from Palk Bay-South East Coast of India

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Abstract

Scanning electron microscopic studies (SEM) revealed that the radula of *Muricanthus kuesterianus*resembled that of *M. virgineus*in most details. But there were some apparent differences. In *M.kuesterianus* rachidian tooth have a broad base than that of *Muricanthus virgineus*. The base of the median cusp was broad, short, stout and pointed straight towards the anterior end.The left lateral cusp elongated, sharp, slightly bent and pointed outwards and the right lateral cusp dorso ventrally flattened and the anterior end small, slightly pointed. In between the median and left lateral cusps, a sharp and pointed denticle is present where as the right laterals and median cups there is no denticle. The lateral teeth which are two in numbers flanked median rachidian.

Keywords: Scanning Electron Microscope, Radula, Gastropoda, Muricidae, *Muricanthus kuesteianus.*

Resumen

Los estudios de miscroscopía electrónica de transmisión (SEM) revelaron que la rádula de *Muricanthus kuesterianus* se asemejan a *M. virgineus* en varios detalles. Pero hubo algunas diferencias aparentes. En el diente raquídeo de *M. kuesterianus* se encontró una base más ancha que *M. virgineus*. La base de la cúspide media fue ancha, corta, robusta y punteada y apuntado directamente hacia el extremo anterior. La cúspide lateral izquierda, alargada, ligeramente doblada y punteada hacia el exterior, la cúspide lateral derecha es aplastada

dorsoventralmente y el extremo anterior pequeña levemente punteada. Entre las cúspides media y lateral izquierda está presente una dentición aguda y acentuada, en tanto no hay dentición entre los vasos rectos y laterales. Los dientes laterales los cuales están en número e dos flanqueando la raquídea media.

Palabras clave: microscopía electrónica de transmisión, rádula, Gastropoda, Muricidae, *Muricanthus kuesteianus*

Introduction

Scanning Electron Microscopy is the most powerful tool in radular study. Research on functional morphology of the mollusks radula has focused attention on the obvious food-preparing and food gatheringoperation of the teeth and their relationship. This requires some knowledge on the radular and its functioning. The Radula has also been recognized as an important morphological criterion for the taxonomic allocation of species. It shows general similarities on familial and generic levels with consistent differences on the species level. Their respective similarities and differences have been utilized to an increasing extent in the classification of muricid gastropods. Runham Norman (1969) studied various gastropod radulae. Solem Alen (1972) described the radular structure and functioning with SEM. Freeman &Sliva (1973) applied the SEM technique in describing the radulae of two marine gastropods. SolemAlen & Rober (1974) described the pattern of tooth structure in carnivorous snails with SEM. Houart (1992) described the comparative morphology of 17 species of *Chicoreus*with SEM. The importance SEM in the study of gastropod radulae is its effectiveness in investigating the patterns of tooth wear (Carriker, 1969) normal tooth functioning position, chemical composition of the tooth (Runhamet al., 1969), growth (Isarankura&Runham, 1968) and morphology of cusps and other structure of the radula.

Arakawa (1958) has made some observation on the radulae of *Purpura echinulata.* Arakawa (1962a) has studied the radula of Japanese muricidae. Wu (1965a) has studied the radula of Taiwan muricid gastropods. Carriker (1969) has studied the SEM observation of gastropod radulae and its effectiveness in investigating the patterns of tooth and normal tooth functioning position. Runham et.al (1969) has studied the chemical composition of the tooth. Isarankura&Runham, (1968) have studied the growth and morphology of cusps and other structure of the radula. Runham Norman (1969) has studied various gastropod radulae. SolemAlen (1972) has described the radular structure and functioning with SEM. Freeman and

Silva (1973) have applied the SEM technique in describing the radulae of two marine gastropods. SolemAlen&Rober (1974) have described the pattern of tooth structure in carnivorous snails with SEM. Fujioka (1982) has studied the sexual dimorphium in radular tooth of *Drupella* species. Roller et al., (1984) have studied the regeneration of the proboscis, radula and odontophoral cartilage of the southern oyster drilled *Thais.* Houart (1992) has described the comparative morphology of 17 species of *Chicoreus* with SEM. Stella (1995) describing the radular morphology of *Chicoreus* species in Parangipettai waters. Guralnick& Maintenon (1997) have studied the development and homology of radular teeth a case study using columbellid gastropods. Marta de Maintenon (2004) has studied the sexually dimorphic radular morphology in *Euplica varians* and *Euplica versicolor* .Annadurai (2006) has studied the radula structure of the venomous gastropod *Conus textile* in relation to feeding habits elucidated by scanning microscopy. Harding et.al (2008) have studied the radula morphology in veined rapa whelks, *Rapana venosa* from Chesapeake Bay. Stella &Balalakshmi (2011) studied the radular morphology of *Chicoreus species* (Gastropods:Muricidae) by using SEM technique collected from Palk Bay. Ravichandran et al., (2013) describing the morphology of radula using SEM technique in *Chicoreus virgineus ponderosus* and *Siratus virgineu sponderosus*.Stella et al., (2014) describing the morphology of radula of two forms of *Chicoreusramosus* (Gastropoda: Muricidae) using SEM technique in Palk bay -south east coast of India. However no detailed work has been carried out so far to study the radulae of *Muricanthuskuesterianus*. Therefore the present study was undertaken.

Systematics

Muricanthus kuesterianus

Family: Muricidae

Genus: *Muricanthus*

Species: *kuesterianus* (Tapparone-Canefri, 1875)

Synonym: *Chicoreusvirgineus*; Subrahmanyam et al (1952); Menon et al (1961), *Muricanthus virgineus*; Distribution: Palk Strait -10 to 15 Fathoms .

Materials and Methods

In the present study, a regular survey was conducted in Palk Bay area (Lat 9° and10° and Long 79° and 80°) (Fig. 1).The specimens were collected from trawlers. The animals were brought to the laboratory and the outer hard shells were broken with a hammer. Care was taken not to damage the soft parts. The anterior portion of the proboscis was cut and used for the radular analysis with SEM. The Radula removed with from the proboscis was put in a boiling tube containing alkaline solution. Dehydration was done by immersing the Radula in increasing concentration of alcohol (50, 70, 90, and 100%). Then the dehydrated radulae were brought to the next step of coating making them suitable for SEM observation.The SEM studies were made with the help of TESCAN make Scanning Electron microscope installed at CECRI ,Karaikudi.

Fig.1. Showing the study area

Results and Discussion

The Radula is of typical rachigloosate type and the radular formula is 1+ R + 1. This type of Radula is highly evolved next to toxoglossate type (Fig 2). In general the central or rachidian tooth is tricuspid having three large pointed sharp cusps. The median cusp of the median rachidian tooth is some what shorter than the lateral cusps. The median cusp is sharp

and pointed straight towards the anterior end. The lateral cusps are also sharp but slightly bent and pointed outwards.

The entire length of Radula in *Muricanthus kuesterianus* measured about 1.9 cm. The central Rachidian tooth of *Muricanthus kuesterianus* different from other species of *Chicoreus* in having shape and size of median and lateral cusps .The median cusp of the median rachidian tooth is some what longer and stout than the lateral cusps. The base of median cusp is broad, stout and elongated and anterior end pointed and straight.The left lateral cusp elongated, sharp, slightly bent and pointed outwards and the right lateral cusp dorsoventrally flattened and the anterior end small, slightly pointed. In between the median and left lateral cusps, a sharp and pointed denticle is present where as the right laterals and median cups there is no denticle (Fig. 2). The laterals are two in number occurring one on either side of the rachidian tooth. The lateral teeth are longer, sharp pointed and bent towards the rachidian tooth. The anterior region of the radular morphology is differing from middle and posterior regions. The central cusp is smaller than the lateral cusps. Both central and laterals of the rachidian tooth are sharp and bent along the axis of radula. In such condition all the teeth overlap the others that lie just in front of them. The rachidian teeth also cover one another.

SEM studies on the radular morphology of *Muricanthus kuesterianus* are similar in rachiglossate type and radular formula when it compare to other species of *Chicoreus.* But in the morphological structure were some apparent difference. In general the rachidian tooth in tricuspid having one median cusp, two lateral cusps and two denticle. In the present study this similar observation has been made in *Chicoreus species(*Stella & Balalakshmi 2011); *Chicoreus virgineus ponderosus* and *Siratus virgineus ponderosus* (Ravichandran et al., 2013); two forms of *Chicoreus ramosus* (Stella et al., 2014) except the dorsoventally flattened right lateral cusp and the absence of denticle between right lateral and median cusp. In *Muricanthus kuesterianus* the base of the median cusp in broad and stout where as in *Muricanthus virgineus*it is narrow and straight towards the anterior end of the rachidian tooth. In *Muricanthus kuesterianus*the median rachidian has a broad basal region when compared *Muricanthus virgineus*.The same has also been observed in *Drupa rincica* (Wu,1962) in two species there is close relationship between the radular ribbon and dental conformation. Similar observation was made by Radwin & Wells (1968) and Krutak (1977).In general the radular ribbon is longer in *Muricanthus kuesterianus* when compared to *Muricanthus virgineus*. The length of the radular ribbon is longer where there are more replacements. (Isarunkura & Runham 1968). The reduction on the size of radular teeth seems to correlate with its

environmental condition and food and feeding habits. The lateral tooth of three species are resemble and each other. In the present study since three species are exhibit the same generalized rachiglossate pattern it does not offer much scope for systematic diagnosis below generic level.

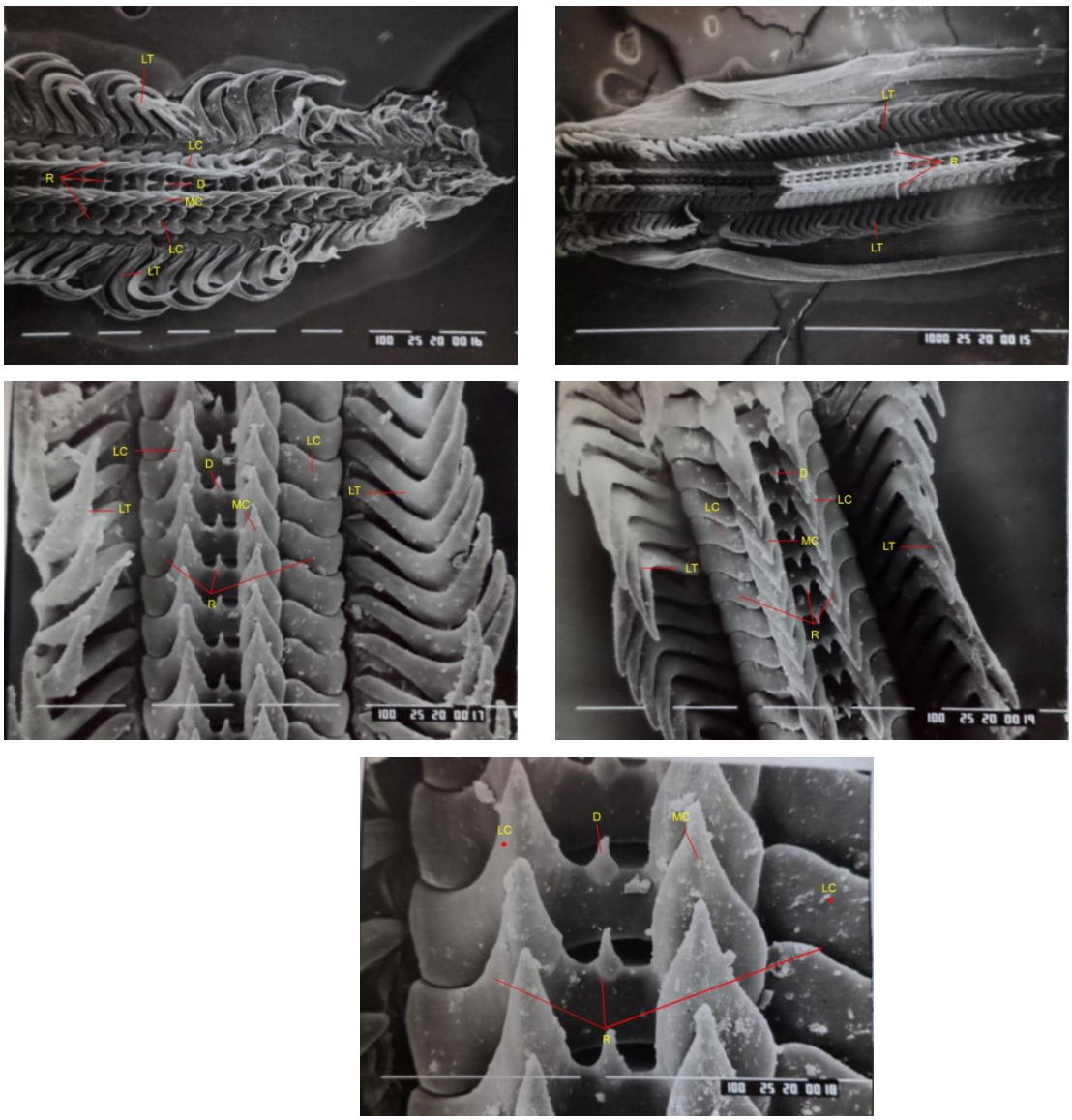

Fig. 2: SEM photographs of radule of *Muricanthus kuesterianus* (D - Denticle; LT- Lateral tooth; LC - Lateral cusp; MC- Median cusp; R-Rachidian tooth)

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