Using Sem Technique in Describing the Morphology of Radula of Chicoreus virgineus ponderosus and Siratus virgineus ponderosus (Gastropoda: Muricidae) from Thondi Coast, Palk Bay-Tamil Nadu-South East Coast of India

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Abstract: Scanning Electron Microscopy is the most powerful tool in radular study. The radula has also been recognized as an important morphological criterion for the taxonomic allocation of species. In the family muricidae, generally the radula is of typical rachiglossate type and the radular formula is 1+R+1. This type of radula is highly evolved next to toxoglossate type. The present study describes the morphology of two species of radula using SEM technique. The radula of Siratus virgineus ponderosus resembles that of Chicoreus virgineus ponderosus in most details. But there are some apparent differences. In Siratus virgineus ponderosus, rachidian teeth have a broad base than that of Chicoreus virgineus ponderosus. The lateral teeth of these two species are almost resembled with each other. In the present study since two species are exhibit the same generalized rachiglossate pattern it does not offer much scope for systematic diagnosis below generic level.

Key words: Chicoreus virgineus ponderosus • Siratus virgineus ponderosus • Muricidae • Radula • Morphology • SEM

INTRODUCTION

The morphology of the radula, the chitinous strip of teeth found in molluscs has traditionally been one of the most commonly used sources of data for studies on molluscan systematic. The shape and form of molluscan radular teeth are typically unique to a species or genus and some features of the radula, such as teeth numbers, have been used to investigate higher level molluscan taxonomic relationships. Thus intraspecific variation in radular characteristics are important and must be documented for molluscan relationships. Scanning Electron Microscopy is the most powerful tool in radular study. Research on functional morphology of the molluscs radula has focused attention on the obvious food-preparing and food gathering operation of the teeth and their relationship. This requires some knowledge on the radula 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.


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two marine gastropods. Solem and Rober [10] described the pattern of tooth structure in carnivorous snails with SEM. Fujioka [11] studied the sexual dimorphism in radular tooth of Drupella species. Roller et al. [12] studied the regeneration of the proboscis, radula and odontophoral cartilage of the southern oyster drilled Thais. Houart [13] described the comparative morphology of 17 species of Chicoreus with SEM. Guralnick and Maintenon [14] studied the development and homology of radular teeth, a case study using columbellid gastropods. Marta [15] studied the sexually dimorphic radular morphology in Euplica varians and Euplica versicolor. Annadurai [16] studied the radula structure of the venomous gastropod Conus textile in relation to feeding habits elucidated by scanning microscopy. Juliana et al. [17] studied the radula morphology in veined rapa whelks, Rapana venosa from Chesapeake Bay. However no detailed work has been carried out so far to study the muricid gastropods Chicoreus virgineus ponderosus and Siratus virgineus ponderosus, therefore the present study was undertaken.

**MATERIALS AND METHODS**

In the present study, a regular survey was conducted at Thondi coast in Palk Bay area (Lat 9° and 10° and Long 79° and 80°) (Map 1). The species of Chicoreus virgineus ponderosus and Siratus virgineus ponderosus are exclusively marine in distribution. The specimens were collected from the 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 from the proboscis was kept in a boiling tube containing alkaline solution. Dehydration was done by immersing the radula in increasing concentration of alcohol (50, 70, 90, 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.

**RESULTS**

The entire radula in matured animals measured about 1.8 cm in length of Chicoreus virgineus ponderosus and Siratus virgineus ponderosus it was 1.6cm. The radula is of typical rachiglossate type and the radular formula is 1+R+1. This type of radula is highly evolved next to toxoglossate type. In general the central or rachidian tooth is tricuspid having three large pointed sharp cusps. The median cusp of the median rachidian tooth is somewhat 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.

Radula of Chicoreus virgineus ponderosus is of typical rachiglossate type with several rows of teeth and proves the radular formula is 1+R+1. Each row consists of a central and two laterals cusps. The length of radula in Chicoreus virgineus ponderosus measured about 1.8cm (Photos 1-4) Photomicrograph shows that the central
Chicoreus virgineus ponderosus

Photo 3: Rachidian tooth  Photo 4: Lateral tooth
D - Dentine; Lt- Lateral tooth; Lc - Lateral cusp; M- Median cusp; R-Rachidian tooth

Siratus virgineus ponderosus

Photo 5: Anterior region of Radula  Photo 6: Posterior region of Radula

Siratus virgineus ponderosus

Photo 7: Rachidian tooth  Photo 8: Lateral tooth
D - Dentine; Lt- Lateral tooth; Lc - Lateral cusp; M- Median cusp; R-Rachidian tooth
The radula of *Siratus virgineus ponderosus* resembles that of *Chicoreus virgineus ponderosus* in most details (Photos 5-8). But there are some apparent differences. In *Siratus virgineus ponderosus*, rachidian tooth has a broad base than that of *Chicoreus virgineus ponderosus*. The base of the median cusp is broad, short, sharp and pointed straight towards the anterior end. The lateral cusps are sharp and slightly bent outwards. The central cusps are sharp and slightly bent outwards. The central cusps are longer than lateral cusps. Both central and laterals of the rachidian tooth are bent along the axis of radula. In between the median and lateral cusps, a denticle is present. The lateral tooth are present on either side of the rachidian tooth. The lateral tooth are flanks, elongated with pointed tip. The lateral cusps are broad, longer, sharp, pointed and bent towards the rachidian tooth. They are typically sickle shaped with broad strong base. The rachidian teeth also cover one another.

### DISCUSSION

The radula is a chitinous ribbon-like series of nearly colourless transverse tooth rows resting a top the radula membrane [18]. Muricid radulae consists of 100 to 500 transverse rows of teeth, each rows of teeth consists of a central rachidian tooth (R) and two slender marginal teeth (M) in the formation of M+R+M [4]. In two species the SEM observation on the radula elucidated several morphological details. The radula in two species proves itself as a rachiglossate type showing the radular formula of 1+R+1. The central rachidian tooth in each transverse row is responsible for most of the rasping and physical shell removal during drilling while the marginal teeth synchronously tear flesh from the prey [19]. In these two species there is a close relationship between the radular ribbon and dental conformation. Similar observation was made by Krutak [20]. Muricid gastropods use the anterior teeth when drilling holes of bivalve prey [21-23]. As the anterior teeth are worn down, they are replaced by younger teeth that are formed in the radular sac and gradually moved forward along the radula. In general the radular ribbon is longer in *Chicoreus virgineus ponderosus* when it compared to *Siratus virgineus ponderosus*. The reduction on the size of radular teeth seems to correlate with its environmental condition and food and feeding habits. In *Siratus virgineus ponderosus* the median rachidian has a broad basal region when compared to *Chicoreus virgineus ponderosus*. The similar observation was made in *Drupa rincica* by Wu [24]. The lateral tooth of these two species almost resemble with each other. In the present study since two species exhibit the same generalized rachiglossate pattern it does not offer much scope for systematic diagnosis below generic level.

### REFERENCES