

## A study on the diversity of freshwater bivalves in the rivers of Karnataka and Kerala, South India.

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### Abstract

A total of 16 rivers of which 7 rivers from Karnataka and 9 rivers from Kerala were studied for a period ranging from November 2009 to December 2010. A total of 20 species belonging to 3 families Unionidae, Etheridae and Corbiculidae of the Class Bivalvia have been recorded. Maximum numbers of species were from family Unionidae, of which the genera *Lamellidens* Simpson, 1900 and *Parreysia* Conrad, 1853 were dominant. In the present study we have also found one of the most unique and rare bivalve *Pseudomulleria dalyi* E.A. Smith, 1898 from the Western Ghats of Karnataka.

**Keywords:** freshwater bivalves, *Lamellidens*, *Parreysia*, *Pseudomulleria*, Western ghats

### INTRODUCTION

The Sahyadri Hills of the Western Ghats, are well known for their rich and unique assemblage of flora and fauna. Norman Myers included the Western Ghats amongst the 25 biodiversity hot-spots identified in the world. Arising abruptly from the narrow Konkan and Malabar coasts, these hills run 1600 km north-south between the river Tapti in Gujarat and Kanyakumari in Tamilnadu covering an area approximately equal to 160,000 sqkm.

Mussel is the common name used to describe several families of clams. A review of literature revealed that inland Bivalvia of South India remains unattended by and large. Benson (1862) was perhaps the first person to work on *Unio*. Blanford (1866, 1867, 1870) published a series of papers on the malacology covering Bivalve genera *Unio* and *Anadonta* from India, Sri Lanka and Burma. Prashad (1921) published a report on the Lamellibranchs from the Indian museum. The publications of Tonapi (1980) and Rao (1989) also contain useful information on Indian Bivalvia.

The freshwater mussels are soft bodied animals that usually produce an external shell composed of calcium carbonate. The shell serves both protective and supportive purpose. Mussels have a complex life cycle and in their first year they live on the gills of fishes. Adult mussels live buried or partly buried in coarse sand and fine gravel or mud and often between the cobbles and stones. They leave characteristic furrows on the substratum due to the sloughing movements of the wedge like powerful foot during restricted locomotion. Their distribution within a river is might

be patchy, as they are found only where the substrate is suitable and where the flow conditions are appropriate. They play a significant role in aquatic ecosystem. They are edible and some of them are (*Lamellidens marginalis* and *Lamellidens corrianus*) used to produce pearls in some parts of India (Subba Rao and Dey, 1989). These mussels also have medicinal value and shells have economical value. Mussels purify water bodies because they are saprophytic animals. Through their high respiration rate they mineralize a great amount of organic matter and through filtration decrease concentration of suspended particles. These bivalves help stabilize stream sediments and filter bacteria and particulates from water. Bivalves have been used for decades as sensitive organisms to monitor pollution in aquatic environment as they are important indicators of water quality. Mollusks can endure persistent toxins to a greater extent than other organisms and serve as effective biomonitors or indicators (Fang *et al.*, 2001; Salanki *et al.*, 2003 and Somolds *et al.*, 2003). The distribution and diversity of freshwater bivalves depend on their abilities of colonization in a habitat and survival.

### MATERIALS AND METHODS

#### *Sampling Area: Karnataka State*

Samples were collected from 7 Stations of Karnataka

1. Tunga river, Shimoga District
2. Gangavalli river Uttara Kannada district
3. Aghanashini river, Uttara Kannada district
4. Payaswini river Dakshina Kannada district
5. Cauvery river, Harangi, Kodagu district
6. Cauvery river, Siddhapura, Kodagu district
7. Cauvery river, Kushalnagar, Kodagu district

#### *Sampling Area: Kerala State*

Samples were collected from 9 rivers of Kerala.

1. Periyar river. Aluva, Ernakulan district

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2. Bharathapuzha river, Malappuram district
3. Chalakudy river, Thrissur district
4. Meenachil river, Kottayam district
5. Achankovil river, Alapuzha district
6. Chaliyar river, Kozhikode district
7. Kadalundi river, Malappuram district
8. Chandragiri river, Kasargod district
9. Payaswini river, Kasargod district

Sampling was undertaken from November 2009 to December 2010. The organisms were handpicked where the water was at a depth of about 4 feet. As the water level was high in some rivers, the collection was done by fishermen. The mussels were brought to the laboratory alive in water filled cans. Mussels were identified mainly based on external as well as internal shell characters using standard methods given by Preston (1915), Subha Rao (1989) and Ramakrishna *et al.*, (2007) and other available literature.

## RESULTS AND DISCUSSION

From the 7 sampling stations of Karnataka 17 species of bivalves have been recorded (Table 1). From the river Tunga a total of 11 species have been recorded including a most unique and rare bivalves *Pseudomulleria dalyi* E.A. Smith, 1898 of Family Etheriidae. Among these bivalves the length of *Lamellidens* Simpson, 1900 was ranging between 40.2mm and 116.0mm and *Parreysia* Conrad, 1853 between 65.0mm to 25.3mm. From Harangi a tributary of the river Cauvery we have identified 7 species of bivalves of which *Lamellidens* spp. are dominant, with a length ranging from 23.6mm to 99.3mm. *Parreysia cylindrica* Annandale and Prashad, 1919 has also been found in large numbers at Harangi with their length ranging between 21.0mm and 57.3mm. However, from the river Gangavalli we have recorded 6 species of bivalves, most of which belonged to the genus *Parreysia* while very few species of *Lamellidens* were observed. From the rivers Payaswini and Aghanashini, we found 4 species and 3 species of bivalves, respectively, with *Parreysia* spp. dominating in both. From the river Cauvery we have been able to collect 2 species of bivalves at Siddhapura and 3 species at Kushalnagar. However, at Kushalnagar large number of *Corbicula* spp. were observed.

From Kerala we recorded a total of 14 species of bivalves (Table 2). The river Periyar is the longest in Kerala and we have identified 6 species of bivalves including the Genus *Polymesoda*. In this river, even though we found more species of *Lamellidens* than *Parreysia*, the density of *Parreysia* was more. The overall length of *Parreysia* spp. was found to be ranging from 23.0mm to 66.6mm. The next river with high species richness at Kerala was Payaswini with 4 species of bivalves, two species each of *Lamellidens* and *Parreysia*. From the rivers Chalakudi, Bharathapuzha, Chandragiri and Achenkovil we recorded 3 species of bivalves each. River Chalakudi is

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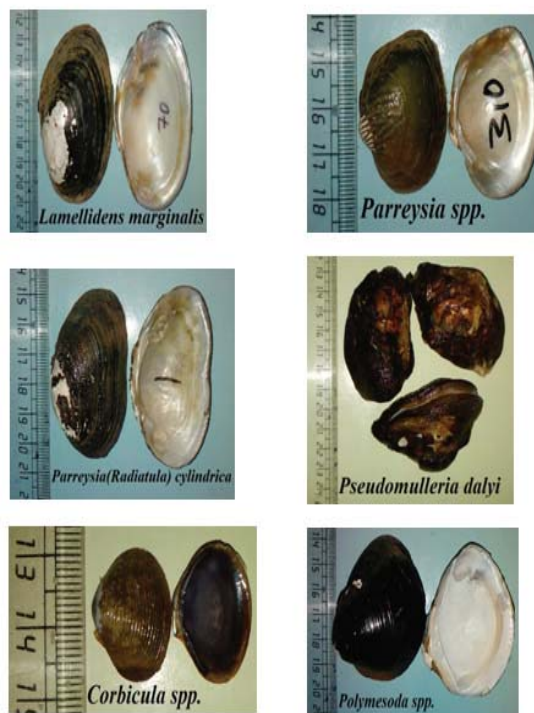


Plate 1. Bivalve species of the present study area

densely populated with *Parreysia corrugata*, while in the river Bharathapuzha *Lamellidens* spp. were more abundant. Other rivers like Meenachil, Kadalundi and Chaliyar harbour two species of bivalves.

In this study we observed that the rivers of Karnataka and Kerala are richer in species of the genus *Lamellidens* than *Parreysia*. However the density of *Parreysia* was more than *Lamellidens*. In our study we have not come across the genus *Polymesoda* in Karnataka. It has also been observed that even though the inorganic constituents of water has effect on the diversity of the bivalves, the texture of the sediment and the quantity of organic matter seemed to have played a role in their distribution. Finely textured soil and more organic matter were found to be favourable for the growth of *Lamellidens* while, *Parreysia* were able to survive even in the presence of sandy soil and lesser organic matter.

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**Table 1.** List of Bivalve species recorded in Karnataka, India.

Family Name and Scientific Name	Rivers						
	T	G	A	P	CH	CS	CK
<b>Family UNIONIDAE</b> Fleming, 1828							
Genus <i>Arcidopsis</i> Simpson, 1900	Y	N	N	N	N	N	N
<i>Arcidopsis footei</i> (Theobald, 1876)							
Genus <i>Lamellidens</i> Simpson, 1900	Y	N	N	N	N	N	N
<i>Lamellidens consobrinus</i> (Lea, 1859)							
<i>Lamellidens corrianus</i> (Lea, 1834)	N	N	N	N	Y	N	N
<i>Lamellidens generosus</i> (Gould, 1847)	Y	Y	N	Y	Y	N	Y
<i>Lamellidens jenkinsianus</i> (Benson, 1862)	Y	N	Y	N	Y	Y	N
<i>Lamellidens jenkinsianus</i> sub sp. <i>daccaensis</i> (Preston, 1912)	Y	N	N	N	N	N	N
<i>Lamellidens jenkinsianus</i> sub sp. <i>obesa</i> (Hanley and Theobald, 1877)	Y	N	N	N	N	N	N
<i>Lamellidens marginalis</i> (Lamarck, 1819)	Y	Y	Y	N	Y	N	N
<i>Lamellidens phenchooganjensis</i> Preston, 1912	Y	N	N	N	N	N	N
Genus <i>Parreysia</i> Conrad, 1853	N	Y	N	N	N	N	N
<i>Parreysia</i> ( <i>Parreysia</i> ) <i>corrugata</i> (Mueller, 1774)							
<i>Parreysia</i> ( <i>Parreysia</i> ) <i>corrugata</i> (Mueller) sub sp. <i>nagpoorensis</i> (Lea, 1859)	N	N	N	N	N	N	N
<i>Parreysia</i> ( <i>Parreysia</i> ) <i>favidens</i> (Benson, 1862)	Y	Y	Y	N	Y	Y	Y
<i>Parreysia</i> ( <i>Parreysia</i> ) <i>gowhattensis</i> (Theobald, 1873)	N	N	N	N	N	N	N
<i>Parreysia</i> ( <i>Parreysia</i> ) <i>sikkimensis</i> (Lea, 1859)	N	N	N	Y	N	N	N
<i>Parreysia</i> ( <i>Radiatula</i> ) <i>cylindrica</i> Annandale and Prashad, 1919	N	Y	N	N	Y	N	N
<i>Parreysia</i> ( <i>Radiatula</i> ) <i>khadakvaslaensis</i> (Ray, 1966)	Y	N	N	N	N	N	N
<i>Parreysia</i> ( <i>Radiatula</i> ) <i>theobaldi</i> (Preston, 1912)	N	N	N	Y	N	N	N
<b>Family ETHERIIDAE</b>	Y	N	N	N	N	N	N
Genus <i>Pseudomulleria</i> Anthony, 1907							
<i>Pseudomulleria dalyi</i> E. A. Smith, 1898							
<b>Family CORBICULIDAE</b>	N	Y	N	Y	Y	N	Y
Genus <i>Corbicula</i> Megerle von Muehlfeld, 1811							
<i>Corbicula assamensis</i> Prashad, 1928							
Genus <i>Polymesoda</i> Rafinesque, 1820	N	N	N	N	N	N	N
<i>Polymesoda</i> ( <i>Geloina</i> ) <i>bengalensis</i> (Lamarck, 1818)							

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**Table 2.** List of Bivalve species recorded in Kerala, India.

Family Name and Scientific Name	Rivers									
	P	B	CK	M	A	CL	K	CD	PY	
<b>Family UNIONIDAE</b> Fleming, 1828										
Genus <i>Arcidopsis</i> Simpson, 1900	N	N	N	N	N	N	N	N	N	N
<i>Arcidopsis footei</i> (Theobald, 1876)										
Genus <i>Lamellidens</i> Simpson, 1900	N	N	N	N	N	N	N	N	N	N
<i>Lamellidens consobrinus</i> (Lea, 1859)										
<i>Lamellidens corrianus</i> (Lea, 1834)	N	N	N	N	N	N	N	N	N	Y
<i>Lamellidens generosus</i> (Gould, 1847)	N	N	N	N	N	N	N	N	N	Y
<i>Lamellidens jenkinsianus</i> (Benson, 1862)	N	Y	Y	N	Y	N	N	N	N	N
<i>Lamellidens jenkinsianus</i> sub sp. <i>daccaensis</i> (Preston, 1912)	Y	N	N	N	N	N	N	N	N	N
<i>Lamellidens jenkinsianus</i> sub sp. <i>obesa</i> (Hanley and Theobald, 1877)	Y	N	N	N	N	N	N	N	N	N
<i>Lamellidens marginalis</i> (Lamarck, 1819)	Y	N	Y	N	N	Y	Y	Y	Y	Y
<i>Lamellidens phenchooganjensis</i> Preston, 1912	N	N	N	N	Y	N	N	N	N	N
Genus <i>Parreysia</i> Conrad, 1853	Y	Y	Y	N	N	Y	Y	Y	Y	Y
<i>Parreysia</i> ( <i>Parreysia</i> ) <i>corrugata</i> (Mueller, 1774)										
<i>Parreysia</i> ( <i>Parreysia</i> ) <i>corrugata</i> (Mueller) sub sp. <i>nagpoorensis</i> (Lea, 1859)	Y	N	N	N	N	N	N	N	N	N
<i>Parreysia</i> ( <i>Parreysia</i> ) <i>favidens</i> (Benson, 1862)	N	N	N	N	N	N	N	N	N	N
<i>Parreysia</i> ( <i>Parreysia</i> ) <i>gowhattensis</i> (Theobald, 1873)	N	N	N	N	N	N	N	N	N	Y
<i>Parreysia</i> ( <i>Parreysia</i> ) <i>sikkimensis</i> (Lea, 1859)	N	N	N	Y	Y	N	N	N	N	N
<i>Parreysia</i> ( <i>Radiatula</i> ) <i>cylindrica</i> Annandale and Prashad, 1919	N	N	N	N	N	N	N	N	N	N
<i>Parreysia</i> ( <i>Radiatula</i> ) <i>khadakvaslaensis</i> (Ray, 1966)	N	N	N	Y	N	N	N	N	N	N
<i>Parreysia</i> ( <i>Radiatula</i> ) <i>theobaldi</i> (Preston, 1912)	N	N	N	N	N	N	N	N	N	N
<b>Family ETHERIIDAE</b>										
Genus <i>Pseudomulleria</i> Anthony, 1907	N	N	N	N	N	N	N	N	N	N
<i>Pseudomulleria dalyi</i> E. A. Smith, 1898										
<b>Family CORBICULIDAE</b>										
Genus <i>Corbicula</i> Megerle von Muehlfeld, 1811	N	Y	Y	N	N	N	N	N	N	N
<i>Corbicula assamensis</i> Prashad, 1928										
Genus <i>Polymesoda</i> Rafinesque, 1820	Y	N	N	N	N	N	N	N	N	N
<i>Polymesoda</i> ( <i>Geloina</i> ) <i>bengalensis</i> (Lamarck, 1818)										

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