



MOLLUSCA FISHERY OF PENNERA RIVER ESTUARY, NELLORE ANDHRA PRADESH

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ABSTRACT

During the year 2011-2013 surveys of the Pennar River estuary were conducted three times at six sampling stations along the estuarine part of the river at Nellore, Andhra Pradesh. Altogether there are 79 mollusca species recorded from the study sites which are economically important, of this 46 belongs to Gastropoda coming under 20 families and 33 bivalves under 13 families. Out of 79 mollusca reported, 60 are found to be used in recreation purpose while 20 are used as food and 15 are used in lime factories.

KEYWORDS: Mollusca fishery, Pennera River, Ecology, Andhra Pradesh.

INTRODUCTION

Estuarine environments are among the most productive natural habitat on earth and support unique communities of plants and animals especially adapted for life at the margin of the sea. The estuarine ecosystem is very important ecosystems as Estuaries and coastal areas trap significant quantities of material and thus act as filters between land and oceans. More important is the trapping of suspended mud and sand carried by rivers which leads to delta formation around estuaries. The ability of estuaries to remove and to retain materials in suspension and in solution has important practical as well as scientific implications. It leads, or at least contributes in a significant way, to many of the most serious estuarine pollution and management problems (Schubel, 1984). Recently, estuary gets lots of attention because these areas are included amongst the most heavily populated areas throughout the world. Molluscs are important group of animal that live in estuarine ecosystems including shallow sub tidal regions and along the continental shelf and is vital for a healthy ecosystem. They are also very susceptible to changes in their environment. Therefore, Molluscs are considered as excellent ecological indicator; their ecological status provides a window into the health of entire ecosystems. In India, there are 5070 species of molluscs, of these 3371 species are marine molluscs (source Wikipedia, accessed 29th December 2012). Because of its importance, estuarine ecology has been studied by many workers both in India and abroad. Numerous studies documented the significant of marine molluscs in ecology and socio economy. Significant works on the marine molluscs of India have been carried out by Subba Rao NV (2003). Other studies on the marine molluscs have also been made by various workers like, Mookherjee, (1985), Ramakrishna *et al.*, (2007). Very few studies have been done on the Pennar estuary that also in pollution status of the river (Sundara Raja Reddy *et al.*, 2009, Jayaraju *et al.*, 2008). However there is lack of information regarding its mollusca fauna and its fishery and ecology.

MATERIALS & METHODS

The Pennar or Pennera river is the third major river in Andhra Pradesh, after Godavari and Krishna. The Pennera rises on the hill of Nandi Hills in Karnataka state, and runs north and east through the state of Andhra Pradesh and empties into the Bay of Bengal. It is 597 kms long, with a drainage basin of 55,213 square km. The river is perennial and a major water source of Nellore District of AP. Surveys of the Pennar River estuary were conducted three times during the year 2011-2013. Ecological parameters like, temperature, pH, transparency, salinity, free carbon dioxide and dissolved oxygen were also measured at the spot by using a standard protocols. Mollusca shells were hand picked randomly from the exposed areas and some are collected from fisherman. All the samples collected were identified by using relevant literature. Study sites are given below:-

Locality (P1): Pennera estuary at Kudithipalem, Nellore, Andhra Pradesh.

Locality (P2): Pennera estuary at Mudhivarthipalem, Nellore, Andhra Pradesh.

Locality (P3): Pennera estuary at Palipalam channel, Utukuru Nellore, Andhra Pradesh.

Locality (P4): Pennera estuary at Sea beach (River mouth), Nellore, Andhra Pradesh.

Locality (P5): Pennera Estuary Island 1, Nellore, AP.

Locality (P6): Pennera estuary at Island 2, Nellore, Andhra Pradesh.

Physico-Chemical characteristics

Estuaries are dynamic systems with continuously changing physico-chemical parameters of the water. The most important variable characteristics of estuary water are the concentration of dissolved oxygen, salinity and sediment load. At any one point the salinity will vary considerably over time and seasons, making it a harsh environment for organisms to live. Therefore, the fauna of estuaries is characterized by having relatively few species, the number

decreasing within the estuary from both the seaward and river end to reach a minimum of species at salinity of 5%, whilst at the same time these few species may be extremely abundant. The abundance of estuarine animals leads to the recognition of estuaries as one of the most productive natural habitats. In the present study, six physico-chemical parameters of estuarine water, viz.

Temperature, transparency, pH, salinity, Free CO₂ and DO were analysed at the spot itself during June 2011 to January 2013 (Table 1). It was found that surface water temperature fluctuated from 26-30°C with an average value of 28°C. Transparency of the water fluctuated from 35- 65 cm with a mean value of 50 cm.

TABLE 1. Average value of physico-chemical parameters of water of Pennera estuary at four survey sites

Location /Parameters	Temperature Air/Water, °C	Transparency cm	Salinity ppt	pH	Free CO ₂ mg l ⁻¹	DO mg l ⁻¹
MDP	31/30	Bottom visible	3.6	9	2.9	3.7
KDP	30/29	40	9	9.7	0	8
PLP canal	28/27	65	30	8.9	4.2	7.2
River mouth	29/28	35	30	7.8	5.2	7.7
Average	29/28	50	18	7.8	2.7	6.6

The water of Pennera estuary is alkaline in nature with pH ranging from 7- 9.7 and the average pH value for the study was 7.8. During the study, salinity of the water ranged from 3ppt to 42 ppt, lowest being observed at Mudhivarthipalem, which is about 11 km upstream from river mouth. Salinity fluctuated 26-35 ppt at the river mouth. Free carbon dioxide which is a determining factor of the ecological health of water body was found to vary from 0 to 5.2 mg l⁻¹ with an average value of 2.7 mg l⁻¹. Dissolved oxygen during the present study was found to fluctuate between 3.7-8.7 mg l⁻¹ which is a good sign of healthy ecosystem. Generally, sea water presents high

dissolved oxygen. Minimum DO was observed at Mudhivarthipalem where as maximum was found at the sand dune near mouth and average DO value was 6.6mg l⁻¹.

DISCUSSION

A total of 79 species of molluscs having different economic value were identified from the Pennera estuarine system of Andhra Pradesh, of which 46 belongs to Gastropoda coming under 20 families and Thirty-three (33) bivalve species have been identified under 13 families (Table 2).

TABLE 2. Economically important Mollusca species of Pennera river estuary.

Sl No.	Family	Genus/ species	F	R	O	H	L
1	Trochidae	<i>Ubonium vestiarium</i> (Lin)		✓		✓	
2	Viviparidae	<i>Bellamyia dissimilis</i> (Mueller)	✓				✓
3	-do-	<i>Bellamyia bengalensis</i> (Lam)	✓				✓
4	Ampullariidae	<i>Pila virens</i> (Lam)	✓				✓
5	-do-	<i>Pila globosa</i> (Swainson)	✓				✓
6	Turritellidae	<i>Turritella attenuata</i> Reeve		✓			✓
7	-do-	<i>Turritella duplicata</i> (Lin)		✓			✓
8	Xenophoridae	<i>Xenophora</i> (Stellaria) <i>solaris</i> (Lin)		✓		✓	
9	Naticidae	<i>Polinices</i> (<i>Polinices</i>) <i>mamailla</i> (Lin)		✓			✓
10	-do-	<i>Polinices</i> (<i>Glossaulax</i>) <i>didyma</i> (Roeding)		✓			✓
11	-do-	<i>Natica gualteriana</i> Recluz		✓			✓
12	-do-	<i>Natica tigrina</i> (Roeding)		✓			✓
13	-do-	<i>Natica vitellus</i> Linnaeus		✓			✓
14	Tonnidae	<i>Tonna dolium</i> (Lin)		✓			✓
15	-do-	<i>Tonna sulcosa</i> (Born)		✓			✓
16	Ficidae	<i>Ficus gracilis</i> (Sowerby)		✓			✓
17	-do-	<i>Ficus variegata</i> (Roeding)		✓			✓
18	Cassidae	<i>Phalium</i> (<i>Phalium</i>) <i>areola</i> Lin		✓			✓
19	-do-	<i>Semicassis bisulcatum</i> (Schubert & Wagner)		✓			✓
20	-do-	<i>Semicassis canaliculatum</i> (Bruguere)		✓			✓
21	Bursidae	<i>Bufo naria crumena</i> (Lam)		✓			✓
22	-do-	<i>Bufo naria echinata</i> (Link)		✓			✓
23	-do-	<i>Bufo naria rana</i> (Lin)		✓			✓
24	Muricidae	<i>Murex carbonnieri</i> (Jousseume)		✓			✓
25	-do-	<i>Murex tribulus</i> Lin		✓			✓
26	-do-	<i>Hexaplex</i> (<i>Muricanthus</i>) <i>virgineus</i> (Roeding)		✓		✓	
27	-do-	<i>Pterynotus pinnatus</i> (Swainson)		✓		✓	
28	-do-	<i>Thais lacera</i> (Born)		✓			✓

29	-do-	<i>Thais (Mancinella) bufo</i> (Lamarck)	✓		✓
30	-do-	<i>Rapana rapiformes</i> (Born)	✓		✓
31	Buccinidae	<i>Babylonia spirata</i> (Lin)	✓	✓	
32	-do-	<i>Babylonia zeylanica</i> (Bruguère)	✓	✓	
33	Melonginidae	<i>Pugilina (Hemifusus) cochlidium</i> (Lin)	✓	✓	
34	Volutidae	<i>Melo melo</i> (Solander)	✓	✓	
35	Fascioliariidae	<i>Fusinus colus</i> (Lin)	✓	✓	
36	Harpidae	<i>Harpa major</i> Roeding	✓	✓	
37	Olividae	<i>Olivancillaria gibbosa</i> (Born)	✓		✓
38	-do-	<i>Oliva vidua</i> (Roeding)	✓		✓
39	-do-	<i>Oliva sericea</i> (Roeding)	✓		✓
40	Conidae	<i>Conus betulinus</i> Lin	✓		✓
41	-do-	<i>Conus figulinus</i> Lin	✓		✓
42	-do-	<i>Conus generalis</i> Lin	✓		✓
43	Turridae	<i>Lophiotoma indica</i> (Roeding)	✓		✓
44	-do-	<i>Turricula javana</i> (Lin)	✓		✓
45	Architectonicid ae	<i>Architectonica laevigata</i> (Lam)	✓	✓	
46	-do-	<i>Architectonica perspectiva</i> (Lin)	✓	✓	
47	Arcidae	<i>Anadara antiquate</i> (Lin)	✓	✓	✓
48	-do-	<i>Anadara granosa</i> (Lin)	✓	✓	✓
49	-do-	<i>Anadara rhombea</i> (Born)	✓	✓	✓
50	-do-	<i>Anadara (Scapharca) deyrollei</i> Joussaume		✓	✓
51	-do-	<i>Anadara inaequivalvis</i> (Bruguere)		✓	✓
52	Cucullaeidae	<i>Cucullaea labiata</i> (Lightfoot)	✓	✓	✓
53	Mytilidae	<i>Perna viridis</i> (Lin)	✓	✓	✓
54	Pteriidae	<i>Pinctada margaritifera</i> (Lin)		✓	✓
55	Ostreidae	<i>Crassostrea cuttackensis</i> (Newton&Smith)	✓	✓	✓
56	-do-	<i>Saccostrea cucullata</i> (Born)	✓	✓	✓
57	Pectinidae	<i>Chlamys (Argopecten) tranquebaria</i> (Gmelin)	✓		✓
58	Anomiidae	<i>Anomia achaeus</i> Gray	✓	✓	
59	Placunidae	<i>Placuna placenta</i> Lin	✓	✓	
60	Unionidae	<i>Parreysia (Radiatula) caerulea</i> (Lea)	✓		✓
61	-do-	<i>Parreysia favidens</i> (Benson)	✓		✓
62	Carditidae	<i>Cardites bicolor</i> (Lam)	✓	✓	
63	Cardiidae	<i>Trachycardium asiaticum</i> (Bruguere)	✓	✓	
64	Psammobiidae	<i>Donax (Latona) cuneatus</i> Lin	✓	✓	✓
65	-do-	<i>Donax (Hecuba) scortum</i> (Lin)	✓	✓	✓
66	Veneroidae	<i>Gafrarium pectinatum</i> (Lin)	✓		✓
67	-do-	<i>Sunetta meroe</i> (Lin)	✓		✓
68	-do-	<i>Sunetta scripta</i> (Lin)	✓		✓
69	-do-	<i>Sunetta donacina</i> (Gmelin)	✓		✓
70	-do-	<i>Sunetta kurachensis</i> Sowerby	✓		✓
71	-do-	<i>Anomalocardia squamosa</i> (Lin)	✓		✓
72	-do-	<i>Timoclea imbricata</i> (Sowerby)	✓		✓
73	-do-	<i>Timoclea arakana</i> (Nevill)	✓		✓
74	-do-	<i>Meretrix meretrix</i> (Lin)	✓	✓	✓
75	-do-	<i>Meretrix casta</i> (Gmelin)	✓	✓	✓
76	-do-	<i>Marcia pinguis</i> (Schroeter)	✓	✓	✓
77	-do-	<i>Paphia textris</i> (Schroeter)	✓		✓
78	-do-	<i>Paphia undulata</i> (Born) 1 valve	✓		✓
79	-do-	<i>Paphia malabarica</i> (Schroeter)	✓		✓

F= Food; R= recreation; O= others; H= high value; L=Low value

However, from the whole state of Andhra Pradesh, 200 species of marine gastropoda reported by Ramakrishna *et al.* (2007) and 142 marine bivalve species were reported Dey and Ramakrishna (2007). Extensive bivalve beds consisting of *Crassostrea sp.* and *Saccostrea sp.* were

observed at the back side of the river island near the mouth. Wide spread gastropoda beds consisting *Cerithidea cingulata* and *Theodoxus (Clithon) ovalaniensis* were observed both at canal area and at Kudithipalem, reflecting a true characteristic of estuarine environment. The fresh

water species like *Bellamy sps.*, *Pila sps.*, *Lymnaeasps etc.* were observed in the upper stretches at Murdiverthypalem where salinity was almost nil. As the Pennera is not a large river, the tidal influence from ocean might not reach up to this site which is hardly 8 km up from the river mouth. Due to presence of anicut at Nellore, fresh water from the upstream could not reach the area either.

Mollusca fishery

Since prehistoric times humans have valued marine mollusca shells. Their meat has been an important source of protein and continues to be an important part of local diets. Mollusca fishery which comprise mainly of bivalves rearing such as clams, mussels and oysters for food and pearl productions are also started getting importance in India. In addition, marine shells have been used for currency, jewellery, ornaments, tools, horns, games, medicine and as magical or religious symbols. Shell-craft industries have intensified in the recent years and thousands of molluscs species are involved in the ornamental shell trade both in India and abroad. The marine shells are also used to make lime and also use in medicinal purposes. Though the utilization of molluscs as food is limited, however uses of sea shells for ornamental purposes have high commercial implementation. Almost all the marine shells are useful in recreation purpose only the things is their difference in their economic value, some shells high market value like *Ubonium*, *Anomia*, *Placuna etc.* and others like *Murex sps.* have less economic value in the recreation business. Same is in the case of supplying in lime factory; species like *Anadara* fetch more price than *Perna* or *Meretrix sps.* The demand for mollusca as food has increases many folds and shellfish dishes are a feature of almost all the cuisines, providing an important source of protein in many cuisines around the world, especially in the countries with coastal areas. Mussels and clams

represent an important food source in many parts of the world, including Europe, South America, and the Far East, and they have considerable potential as a valuable protein source for many developing countries. Some species of sea shells which were used for food however, in olden days their demand is not so much and consumed by the poor fishermen alone. Species like *Bellamy*, *Pila* and *Parreysia* which have been used as food in many parts of India was also encountered in the upper part of the river. Species having high demand in international food market like *Perna viridis*, *Cardites* and *Trachycardium* species were also abundantly available in this estuary. Altogether three are 20 mollusca recorded from the study sites which are used as food. The species observed in the present study are dominated by true marine forms and most of them are represented by death and empty shells. These shells are mostly collected either from the mouth part of the estuary or from the Palipalam canal area which is a harbor area of fishing boats. There were heaps of bivalves in some parts of this area for supplying in the lime factories. The main species for the purpose consists of *Anadara sps.*, *Crassostrea sps.*, *Saccostrea sps.*, *Cardites sps.*, *Trachycardium sps.*, *Donax sps.*, *Meretrix sps.*, *Marcia sps* (Fig. 1-4). The most highly priced one is the *Anadara sps.* followed by *Meretrix* and *Marcia sps.* However, at present there is no regular fishery of this species at this area; semiskilled fishermen collected the calms by using cast net and dugout canoe from the open sea (Fig 5). As there is no lime industry nearby the site, the fishermen send their catch to nearby cities like Vishakhapatnam. If a well organized fishery is set up with implementation of scientific know how, the fishery can yield good results as there are lots of highly demanded molluca reported from this estuary (Table 2).





FIGURE 1-4



FIGURE 5



FIGURE 6: Bivalve Fishing at Pennera Estuary

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