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RESEARCH ARTICLE

SPECIES DIVERSITY AND DISTRIBUTION OF MOLLUSCAN FAUNA FROM ESTUARY AND MANGROVES (CORINGA WILDLIFE SANCTUARY) OF EAST GODAVARI ESTUARINE ECOSYSTEM, ANDHRA PRADESH, INDIA.

Jarugulla Eswar Satyanarayana[1*] and P.V. Krishna[2].

1. Department of Environmental Sciences, Acharya Nagarjuna University, Nagarjuna Nagar –522510, Guntur, Andhra Pradesh, India.
2. Department of Zoology & Aquaculture, Acharya Nagarjuna University, Nagarjuna Nagar – 522510, Guntur, Andhra Pradesh, India.

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Abstract

Study on the diversity of molluscan fauna was carried out in different locations in the mangrove areas and estuary region of the East Godavari estuary ecosystem. This study determined the abundance and diversity of molluscs in the East Godavari estuarine ecosystem. A total of 14 Gastropods and 8 bivalves were reported from the mangrove areas and estuary region were documented. Onchidium Sp. which is considered to be the shell-less terrestrial gastropod mollusc was also recorded from this mangrove area.

Introduction:-

Phylum Mollusca with more than 100000 recognized species (Feldkamp, 2002) play an important role in ecosystem function for forage of predators in their habitats. The term molluscs refer to an ecological group of invertebrates that belong to many lesser known creatures (Mardiastuti, 2001).

The term molluscs are relatively know compared to other components of the mangrove habitats (Kober, 2004; Mardiastuti,2001; Smith & Nol, 2000). The Gastropoda with an estimated 75000 to 150000 species are the most diverse class of molluscs in the marine habitats (Strong et al. 2008) such as mangroves (Vermeij, 1973) and terrestrial habitats (Barker, 2001). It has been shown that gastropod assemblages massively contribute to feeding resources of waders within the mangrove ecosystem (Al-Sayed et al., 2008). Although classically the role of mangrove gastropods in nutrient dynamics has been largely overlooked, studies have demonstrated their central ecological role (Fratini et al. 2008).

Mangroves are intertidal vegetation along tropical and subtropical shorelines (Zhang et al. 2007), which have special physiological adaptations to frequently inundate by the tides (Lewis Iii, 2005). These unique ecosystems provide a large number of biological, ecological, economic, scientific, environmental, aesthetic and ethical values (Mitsch, 2005) including controlling tide level (Varnell et al. 2003) reducing effects of wave and wind energy against shorelines (Miththapala, 2008), stabilizing shorelines (Lee & Shih, 2004). Thus mangroves protect inland structures (Lewis Iii, 2005), support coastal fisheries (Walters et al., 2008), provide diverse habitat to support wildlife communities including a large number of waterbirds, especially waders (Lewis Iii, 2005), and so many other direct and indirect benefits (Gustavson et al. 2009; Zhou et al. 2010).

Corresponding Author:- Jarugulla Eswar Satyanarayana.
Address:- Department of Environmental Sciences, Acharya Nagarjuna University, Nagarjuna Nagar – 522510, Guntur, Andhra Pradesh, India.

Molluscs support economically in the fishery sector and the ambiance of our coastal communities are frequently overlooked with diversity of these marine organisms. Molluscan populations as a source of food, ornamental purposes and commercial uses have brought under the shade of endangered species Shanmugam and Vairamani (2005).

Marine invertebrates are considered an important link between the initial detritus at the bases of the food web and the terminal consumers (Coull et al . 1995).The information regarding the role of invertebrates in the mangrove ecosystem are quite scanty, however, molluscs and crustaceans are important components of the ecosystem (Jiang and Li, 1995; Wells,1983, 1990; Milward, 1982; Redfield, 1982).

In the Phylum, Mollusc, about 3270 species have been reported from India belonging to 220 families and 591 genera. Among them the Bivalves are the most diverse (1100 species) followed by Gastropods (190 species). In India, about 215 species of mollusc were reported from mangrove areas of east and west coasts (Boominathan et al. 2012). In Andhra Pradesh a total of 120 molluscs have been reported. In the present study 22 molluscs species were recorded. East Godavari estuary ecosystem of east coast of India is an estuarine mangrove complex and supports a wide variety of biological species.

Materials and Methods:-

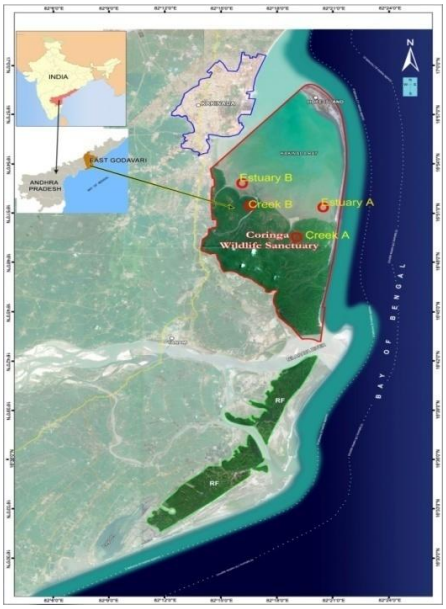
Study area:-

Coringa Wildlife Sanctuary is located between 16°44’ to 16° 53’ N and 082° 14’ to 082° 22’ E and at the confluence of the river Godavari with the Bay of Bengal in the East Godavari District of Andhra Pradesh. The sanctuary is a part of the Godavari Estuary and has extensive mangrove cover. The total area is 235.7 sq.km. The average temperature of the region is 17°C to 40°C. Average Rainfall is greater than 1,000 mm. The Northern part of sanctuary is covered by the back waters of the Kakinada Bay and covers an area of about 100 sq. km.

Due to seasonal distribution of rainfall, East Godavari estuary ecosystem experiences seasonal flooding which introduces a lot of detritus and pollutants from the land.

The estuary region presently serves as a major drainage channel receiving domestic wastes as well as industrial effluents from the industrial area of Kakinada.

Visits to the sampling sites were made during 2015 to 2016. Four sites were thoroughly visited for molluscan diversity and their distribution pattern. Two sampling points were taken from the estuary region and two sites were taken from the mangrove area. Each sampling site was recorded using a Garmin etrex 10 GPS receiver. Photographs were taken at the sampling area and some of the samples were collected and were preserved in 70% alcohol for identification in the field station.



Results and Discussions:-

The aim of the study was to assess the molluscan faunal biodiversity in the mangroves and estuary regions of East Godavari estuary ecosystem. During the study period 14 Gastropods and 8 bivalves from the mangrove areas and estuary region were documented (**Table- 1**). Onchidium Sp. which is considered to be the shell-less terrestrial gastropod mollusc was also recorded from this mangrove area.

In the present study, the recorded specimens were found to occur on mud banks, mud flats, mangrove forest, sandy muddy area swamps and hard substratum. Gastropods and bivalves are generally benthos organisms, they consider to be used as bio indicators of aquatic healthy. Gastropods and bivalves can produce a billion of larvae in the form of planktons that sustains the biotic population and they have a role in food chain. The observation of Gastropods and bivalves populations in mangrove ecosystem is important to evaluate their condition Dewiyanti and Karina(2012).

Clithon oualaniense, Murex trapa, Pirenella cingulata, Placuna placenta, Nassarius dorsatus and *Fusinus colus* are found in the estuary region, *Crassostrea bilineata* were densely found on the trunks, pneumatophores and stilt rots of mangrove plants are found at the adjacent mangrove areas.

Table 1:- List of Molluscan species observed during the study period.

S.No	Species	Authority
	Gastropods	
1	***Assiminea brevicula***	(Pfeiffer, 1855)
2	***Cassidula nucleus***	(Gmelin, 1791)
3	***Cerithidea obtusa***	(Lamarck, 1822)
4	***Littoraria melanostoma***	(Gray, 1839)
5	***Neripteron violaceum***	(Gmelin, 1791)
6	***Pythia plicata***	(Ferussac, 1821)
7	***Telescopium telescopium***	(Linnaeus, 1758)
8	***Terebralia palustris***	(Linnaeus, 1767)
	Bivalves	
9	***Crassostrea bilineata***	(Roding, 1798)
10	***Brachidontes exustus***	(Linnaeus, 1758)
11	***Perna viridis***	(Linnaeus, 1758)
12	***Teredo navalis***	Linnaeus, 1758
13	***Tegillarca granosa***	(Linnaeus, 1758)
14	***Tegillarca rhombea***	(Born, 1778)
15	***Meretrix meretrix***	(Linnaeus, 1758)
	Estuarine	
16	***Clithon oualaniense***	(Lesson, 1831)
17	***Murex trapa***	Roding, 1798
18	***Pirenella cingulata***	(Gmelin, 1791)
19	***Placuna placenta***	(Linnaeus, 1758)
20	***Nassarius dorsatus***	(Röding, 1798)
21	***Fusinus colus***	(Linnaeus ,1758)
22	**Onchidium Sp. (Slug)**	

Narasimham (1973) Radhakrishna and Ganapati (1967) observed that *Anadara granosa* and *Placuna placenta* were restricted in distribution along the western and southern side of the bay. Similar observations were made in the estuarine region of the Coringa Wildlife Sanctuary where the *Placuna placenta* and *Anadara granosa* were harvested by the shell collectors from the estuary region. Rajendar kumar (2016) has reported 10 gastropods and 5 species of bivalves recorded in the Coringa mangroves. Present study reported the molluscan fauna from both mangrove areas and estuarine regions.

Telescopium telescopium were found in the two sites of the mangrove areas which were abundant along the fish bone canals which were dug for facilitating water to the regeneration of the mangrove plantation by the forest department.

Cassidula nucleus, Pythia plicata and *Cerithidea obtuse* has been observed to be on the same trunk of a tree during the high tide.

Molluscan fauna (Gastropods) recorded during the study in the Mangrove areas and estuarine regions in East Godavari estuarine ecosystem

Gastropods

Clithon oualaniense (Lesson, 1831)

Murex trapa (Roding, 1798)

Pirenella cingulata (Gmelin, 1791)

Nassarius dorsatus (Röding, 1798)

Fusinus colus (Linnaeus ,1758)

Onchidium Sp.

Species richness and number of individuals were determined and calculated the species diversity by Shannon-Wiener Index, Table -2. The results shows that the species diversity at Creek A is 1.718 and Creek B is 1.870, the species richness was same for the two creeks and the estuary region. *Telescopium telescopium* and *Cerithidea obtuse* are found to be in abundant all over the mangrove areas. During the survey at the time of high tide *Cerithidea obtuse* tends to avoid the water by crawling on to the trees to a height of 30cm to 50cm. These findings were done during the subsequent surveys for the small carnivores monitoring in the Coringa Wildlife Sanctuary.

Molluscan fauna (Bivalves) recorded during the study in the Mangrove areas and estuarine regions in East Godavari estuarine ecosystem

Bivalves

Crassostrea bilineata (Roding, 1798)

Brachidontes exustus (Linnaeus, 1758)

Perna viridis (Linnaeus, 1758)

Teredo navalis (Linnaeus, 1758)

Tegillarca granosa (Linnaeus,1758)

Tegillarca rhombea (Born, 1778)

Meretrix meretrix (Linnaeus, 1758)

Placuna placenta (Linnaeus,1758)

	Creek A		Creek B		Estuary A		Estuary B	
Species	**Abundance**	**Relative abundance**	**Abundance**	**Relative abundance**	**Abundance**	**Relative abundance**	**Abundance**	**Relative abundance**
Assiminea brevicula	24	0.088	12	0.056	18	0.085	42	0.197
Fusinus colus	0	0.000	0	0.000	0	0.000	0	0.000
Nassarius dorsatus	0	0.000	0	0.000	0	0.000	0	0.000
Pirenella cingulata	0	0.000	0	0.000	0	0.000	0	0.000
Neripteron violaceum	30	0.109	21	0.099	18	0.085	25	0.117
Pythia plicata	19	0.069	18	0.085	6	0.028	12	0.056
Telescopium telescopium	68	0.248	42	0.197	30	0.141	20	0.094
Terebralia palustris	12	0.044	8	0.038	1	0.005	3	0.014
Clithon oualaniense	0	0.000	0	0.000	0	0.000	0	0.000
Murex trapa	0	0.000	0	0.000	0	0.000	0	0.000
Littoraria melanostoma	2	0.007	25	0.117	0	0.000	0	0.000
Cerithidea obtusa	54	0.197	22	0.103	0	0.000	0	0.000
Cassidula nucleus	47	0.172	38	0.178	39	0.183	8	0.038
Onchidium Sp.	18	0.066	27	0.127	0	0.000	0	0.000
Species Richness (S):	**9**		**9**		**6**		**6**	
Number of Individuals (N):	**274**		**213**		**112**		**110**	
Shannon-Wiener Index of Diversity (H'):	**1.718**		**1.870**		**0.921**		**0.888**	
Species Evenness (H'/ln(S)):	**0.782**		**0.851**		**0.514**		**0.495**	

Recommendations:-

It was evident from the observations that unsustainable harvesting of the shells may cause decline in the populations of some molluscan species in this region. Hence, awareness programmes should be conducted on the sustainable methods of harvest of the shells to the shell collectors in this region.

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