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AQUATIC BIORESOURCES OF ASHTAMUDI LAKE, RAMSAR SITE, KERALA

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Abstract: Ninety one species of fishes and shellfishes belonging to 39 families were collected from the Ashtamudi Lake, Ramsar site No. 1204, that comprised 68 species of finfishes, 5 species of crabs, 9 species of prawns and 9 species molluscs. The majority of them were marine forms. The once very rich fishery resources of the Lake has considerably declined over the years. Pollution, sand mining reclamation, loss of mangrove habitat and destructive fishing methods are the main reasons for loss of fishery diversity in the Lake.

Key words: Ashtamudi Lake, Backwater, Thoopumpadalam

INTRODUCTION

The brackishwater environment is a unique ecosystem of high fertility, supporting natural fishery and having significant role in the rural economy of India (Thampi, 1973). Estuaries are highly complex, but very productive ecosystems having economic, social and environmental significance. They are one of the finest nurseries and breeding grounds for a number of commercially as well as ecologically important species of fishes, prawns, crabs and molluscs of high nutritive (Bond, 1979) and pharmaceutical values (Pandey and Shukla, 2005).

A large variety of fishes inhabit the estuarine environment. Most of them are migratory marine species, which use this habitat in their early life cycle as a necessity. Some others are permanent residents, which spend their entire life cycle in this ecosystem. Still others like anadromous and catadromous fishes use estuaries as a transitory abode during their migration from their spawning and main feeding areas (Haedrich, 1983; Dando, 1984).

Backwaters are a preferred habitat for about 200 resident or migratory fish and shellfish species and form the crux of the 62,500 ha backwater fishery resources in the state of Kerala (Anon, 2005). A substantial part of fish production in India is contributed by the estuaries, backwaters, coastal creeks and large brackishwater tracts bordering the coast of India (Nair *et al*.,1983). Information on the fishery resources of a water body and their distribution and habitat is of great importance in assessing the ecosystem dynamics and in planning and implementing sustainable developmental programs. Fishery diversity of Ashtamudilake was studied by Nair *et al*. (1983), Kurup and Thomas (2001), Binushma Raju (2011), Saumya (2012) and Bijukumar *et al*., (2012). The study was in a view to find out the present fish and shellfish diversity of the entire lake.

MATERIALS AND METHODS

Ashtamudi Lake (Ramsar site No. 1204) (Fig.1) on the west coast of India (8° 53'- 9° 02' N; 76° 31'- 76° 41' E), is the second largest estuary in Kerala. This palm-shaped water body has eight prominent arms with their confluence at Sakthikulangara, Kollam district, and permanent opening into the Arabian Sea at Neendakara/ Sakthikulangara, which is one of the most important fishing harbours of India. The major

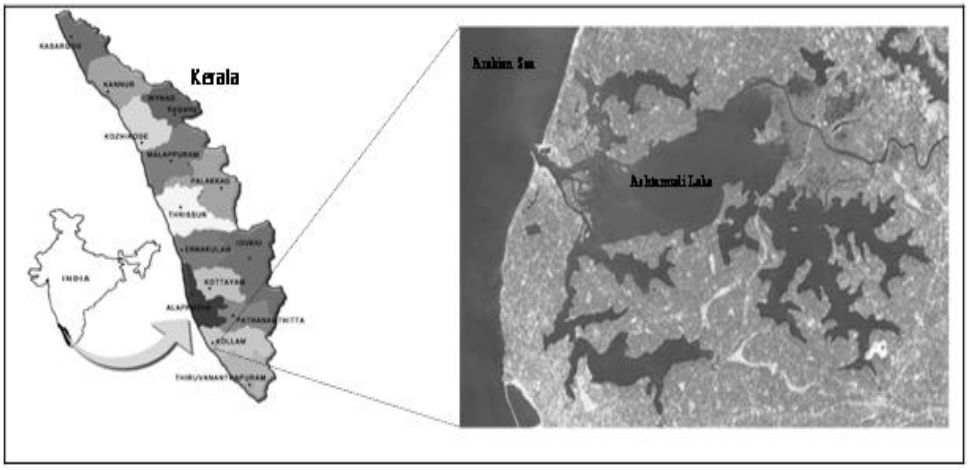

Fig. 1. Map of Ashtamudi estuary, South West coast of India.

freshwater drainage into the estuary is the Kallada River. Samples of fishes/shellfishes were collected from the entire estuary for two years during 2009-2011. Fish collection was done from fish landing centers, local fish markets, from the Chinese dip nets and local fisherman engaged in fishing at the time of sampling Samples were preserved in 10% formalin and identified using standard identification keys (Munro, 1982; Talwar and Jhingran, 1991; Fischer and Bianchi, 1994) FAO (1995) and www. marinespecies.org

RESULTS AND DISCUSSION

Only very little information is available on the fishery resources of lakes and the catch data from the estuaries rather than major lakes of Kerala mainly because of the traditional fishing methods used and the small daily catches compared to commercial fisheries and lack of proper documentation from the concerned departments The species richness of finfishes and shellfishes differs between the estuarine and freshwater systems. Nair *et al*. (1983) reported 67 species of fishes belonging to 34 families from Kadinamkulam backwater and 97 species from Ashtamudi estuary. Kurup and Samuel (1987) recorded 150 species of fishes from Vembanad Lake. Paravur Lake is reported to support 24 species fishes (Shibu, 1991). George Thomas (1995) reported 23 species of fishes belonging to 18 families and 5 species of prawns under 2 families from the mangroves of Quilon, Kumarakom and Veli areas. Bijukumar and Sushama (2000) gave the first report on the ichthyofauna of Ponnani estuary; it represented 112 species belonging to 14 orders, 53 families and 80 genera. Rajukumar (2005) recorded 38 species from Anchuthengu backwaters and Santhamma Jaishinimol Bhargavan (2007), 37 species from Thotappally backwater.

During the present study, 91 species belonging to 39 families were collected from the Ashtamudi estuary, which comprised 68 species finfishes, 5 species of crabs and 9 species each of prawns and molluscs (Table 1). Of the 68 species of fishes, 24 were typically marine, 9 typically freshwater and four, typical estuarine. The rest were transient forms inhabiting estuarine-riverine (8 species), marine-estuarine (19 species) and marine-estuarine-riverine (4 species). *Etroplussuratensis* and mugilidae support a good fishery in this estuary. Astamudi estuary, particularly the Kureepuzhakayal, supports a gobioid fishery based on the species *Oxyurichthys tentacularis*, (local name Koozhali). A modified gill net, "koozhalivala", is used for its fishing. Though its abundance and distribution is noted in other estuaries and backwaters of India, perhaps this is the only estuary in India where there is a commercial fishery for a goboid species (Kurup and Thomas, 2001). Nair *et al*. (1983) reported 97 species of fin fishes from the Ashtamudi estuary. BinushmaRaju (2011)

recorded 46 species of finfishes, 3 species prawns, 2 species crabs, 2 mussels, a single oyster and 5 species of clams from this Lake. Forty seven species of finfishes, 4 species of prawns, 2 species of crabs, 2 species of mussels, 5 species of clams and a single oyster were recorded by Saumya (2012) from the Ashtamudi itself. Bijukumar *et al*. (2012) recorded the presence of 21 species of fish belonging to 14 families, 2 species of crabs and one species of cephalopod in the cast net fishery from the Ashtamudi estuary.

Clams and oysters constitute the major molluscan resource of the estuaries of India. They are widely exploited for both meat as food and shell as raw material for industrial purposes (Appukuttan *et al*., 1999) and hence are an important income resource for local people. *Paphia malabarica*is widely distributed and is an important component of the molluscan fauna of Ashtamudi estuary as it is in many estuaries and coastal waters of India. The Ashtamudi estuary has a rich crustacean resource consisting of 9 species, which include 8 species of shrimps and one species of prawn. The fishery in premonsoon months is mainly for shrimps.

Diversified techniques and methods are employed in the estuary for harvest of the fishery resources. Fishing crafts in this estuary are the traditional dug-

Table 1. List of finfish and shellfish species from Ashtamudi Estuary

	Family	Species	Habitat
1	Anabantidae	1. *Anabas testudineus* (Bloch)	R
2	Aplocheilidae	2. *Aplocheilus lineatus* (Valenciennes)	E,R
3	Ariidae	3. *Arius maculatus* (Thunberg)	E,R
		4. *A. subrostratus* Valenciennes	M,E,R
4	Belonidae	5. *Strongylura strongylura* (van Hasselt)	M,E
		6. *Xenentodon cancila* (Hamilton)	R
5	Carangidae	7. *Carangoides praeustus* (Anonymous [Bennett])	M
		8. *Caranx ignobilis* (Forsskal)	M
6	Centropomidae	9. *Ambassis ambassis* (Lacepede)	E,R
		10. *A. gymnocephalus* (Lacepede)	E,R
7	Chanidae	11. *Chanos chanos* (Forsskal)	E
8	Channidae	12. *Channa punctata* (Bloch)	R
		13. *C. striata* (Bloch)	R
9	Cichlidae	14. *Etroplus maculatus* (Bloch)	E,R
		15. *E. suratensis* (Bloch)	E,R
10	Clupeidae	16. *Anodontostoma chacunda* (Hamilton)	M,E
		17. *Ehirava fluviatilis* Deraniyagala	M
		18. *Sardinella fimbriata* (Valenciennes)	M
		19. *S. longiceps* Valenciennes	M
11	Cynoglossidae	20. *Cynoglossus lida* (Bleeker)	M
		21. *C. lingua* Hamilton	M,E

12	Cyprinidae	22. *Devario aequipinnatus* (McClelland)	R
		23. *Puntius. filamentosus* (Valenciennes)	R
		24. *Puntius mahecola* (Valenciennes)	R
		25. *P. sarana* (Hamilton)	R
		26. *Rasbora daniconius* (Hamilton)	R
13	Dussumieriidae	27. *Dussumieria acuta* Valenciennes	M
14	Eleotridae	28. *Eleotris fusca* (Forster)	E,R
15	Engraulidae	29. *Stolephorus commersonii* Lacepede	M
		30. *S. indicus* (van Hasselt)	M
		31. *Thryssa hamiltonii* Gray	M
		32. *T. malabarica* (Bloch)	M
		33. *T. mystax* (Bloch & Schneider)	M
16	Gerreidae	34. *Gerres erythrourus* (Bloch)	M
		35. *G. filamentosus* Cuvier	M
		36. *G. setifer* (Hamilton)	E
17	Gobiidae	37. *Glossogobius giuris* (Hamilton)	M,E,R
		38. *Oligolepis acutipennis* (Valenciennes)	M,E
		39. *Oxyurichthys formosanus* Nichols	M,E
		40. *O. microlepis* (Bleeker)	M
		41. *O. tentacularis* (Valenciennes)	M
18	Hemirhamphidae	42. *Hyporhamphus limbatus* (Valenciennes)	M,E
		43. *H. xanthopterus* (Valenciennes.)	M,E
19	Leiognathidae	44. *Eubleekeria splendens* (Cuvier)	M
		45. *Leiognathus equulus* (Forsskal)	M,E,R
		46. *Photopectoralis bindus* (Valenciennes)	M
		47. *Secutor insidiator* (Bloch)	M
		48. *S. ruconius* (Hamilton)	M
20	Lutjanidae	49. *Lutjanus argentimaculatus* (Forsskal)	M,E
		50. *L. fulviflamma* (Forsskal)	M,E
		51. *L. russelli* (Bleeker)	M
21	Megalopidae	52. *Megalops cyprinoides* (Broussonet)	E
22	Monodactylidae	53. *Monodactylus argenteus* (Linnaeus)	M,E
23	Mugilidae	54. *Mugil cephalus* Linnaeus	M,E,R
		55. *Liza macrolepis* (Smith)	M,E
		56. *L. parsia* (Hamilton)	M,E
		57. *Valamugil buchanani* (Bleeker)	M,E
		58. *V. cunnesius* (Valenciennes)	M,E
24	Serranidae	59. *Epinephelus tauvina* (Forsskal)	M
25	Sillaginidae	60. *Sillago sihama* (Forsskal)	M,E
26	Soleidae	61. *Brachirus orientalis* (Bloch & Schneider)	M
27	Sparidae	62. *Acanthopagrus berda* (Forsskal)	M,E

27	Sparidae	62. *Acanthopagrus berda* (Forsskal)	M,E
28	Sphyraenidae	63. *Sphyraena jello* Cuvier	M
29	Syngnathidae	64. *Microphis cuncalus* (Hamilton)	E,R
30	Terapontidae	65. *Pelates quadrilineatus* (Bloch)	E
		66. *Terapon jarbua* (Forsskal)	M,E
		67. *T. puta* Cuvier	M,E
31	Triacanthidae	68. *Triacanthus biaculeatus* (Bloch)	M,E
		Crabs	
1	Portunidae	1. *Charybdis (Charybdis) feriata* (Linnaeus)	
		2. *Portunus (Portunus) pelagicus* (Linnaeus)	
		3. *Portunus (Portunus) sanguinolentus* (Herbst)	
		4. *Scylla serrata* (Forskal)	
		5. *S. tranquebarica* (Fabricius)	
		Molluscs	
1	Arcidae	1. *Tegillarca granosa* (Linnaeus)	
2	Cyrenidae	2. *Villorita cyprinoides* (Gray)	
3	Mytilidae	3. *Perna viridis* (Linnaeus)	
4	Ostreidae	4. *Crassostrea bilineata* (Röding)	
		5. *Saccostrea cucullata* (Born)	
5	Veneridae	6. *Marcia opima* (Gmelin)	
		7. *Meretrix casta* (Gmelin)	
		8. *M. meretrix* (Linnaeus)	
		9. *Protapes gallus* (Gmelin)	
	Family	**Shrimps and Prawns**	
1	Penaeidae	1. *Fenneropenaeus indicus* (H. Milne Edwards)	
		2. *Marsupenaeus japonicas* (Spence Bate)	
		3. *Metapenaeus affinis* (H. Milne Edwards)	
		4. *M. dobsoni* (Miers)	
		5. *M. monoceros* (Fabricius)	
		6. *Parapenaeopsis stylifera* (H. Milne Edwards)	
		7. *Penaeus monodon* Fabricius	
		8. *P. semisulcatus* De Haan	
2	Palaemonidae	9. *Macrobrachium rosenbergii* (De Man)	

M = marine; E = estuarine; R = riverine

out canoes and plank-built boats. Based on availability of resources fisherman change the gear, the different gear used for fishing in the estuary are gill nets, cast nets, pole and line, hook and line, seine, scoop nets and traps. Diving, dredging and hand picking are also common practice particularly for molluscan harvest. Gill net is the major gear; a variety of gill nets are used for different type of fishes: *njanduvala, chemmeenvala, koozhalivala, choodavala, neetuvala, chalavala, vaisalivala* and*nandanvala*. Chinese and stake nets are the two main destructive methods of fishing employed in the lake. Stake nets are used in the estuarine area. The unauthorized Chinese nets are laid all over the lake with the commencement of monsoon. During monsoon, more than 30 species of marine fishes, which have commercial value, enter Ashtamudilake through the estuary at Shakthikulangara, either for spawning or to find safe nurseries. The latter category comprises schools of fry of different species. The stake nets set at the entry point into the lake trap the fish arriving for spawning and the fry that come in search of nurseries. The fry trapped in the net have no commercial value and are just dumped back into the lake, which causes huge loss in the fishery potential. The "thoopumpadalam," is rampant in the estuary. Among the various fishing methods prevailing in the Ashtamudi estuary, this is probably the most destructive because of the extent of destruction caused to juvenile populations of commercially important fish, such as pearlspot, mullet, shrimp and perch (Suresh, 2000). A large number of juveniles and sub-adults of commercially important fishes are removed each month almost year round, especially during the pre-monsoon period. If the juveniles are allowed to grow to a marketable size with judicious exploitation by statutory gears, it would replenish the stock of the estuary by at least 600 t (Kurup and Thomas, 2001). Even though padalfishing is also practised in the Vemband estuary in Kerala (Harikrishnan, 1997) and the floating islands are found in the Loktak estuary of Manipur state (Suresh, 2000), the padalsystem of the Ashtamudi estuary differs from other estuaries by virtue of its structural differences and operational peculiarities. The fishing technique is similar to the 'Kolachil' fishing method, in the Malabar area of the state using the stem of coconut tree to form structures with a view to attracting fishes, mainly cuttlefish. Padalsare built during the early months of the year, by dumping bunches of plant twigs and leaves tied together by a rope anchored in the shallow regions of the estuary. Twigs collected from locally available trees such as *Calophyllum inophyllum* (Punna), *Anacardiumoccidentale* (Cashew) and *Mangiferaindica*(Mango) are commonly used for making the padal. The decaying plant materials augment the rich organic material at the vicinity, which in turn attracts a large quantity of fishes towards these stationary structures. Fishes are harvested during the lunar period of every month by encircling them with small mesh nylon net to prevent the fish sheltered beneath from escaping. The plant materials (twigs) are removed from the enclosed structure and fishing is carried out in the enclosed area using a scoop net or cast net. Plant materials are redeposited, either in the same area or in an adjacent area for the next cycle of operation (Thomas and Kurup, 2004).

Fishery is the major direct use value of Ashtamudi estuary and hence it should be the focal point for the economic development of the estuary since the majority of people living around the estuary earn their livelihood out of fishing. There has been decline in fish availability in Ashtamudi estuary, which has been accepted by fishermen, scientists as well as environmentalists (Binushma Raju, 2011). Reduced summer flow due to drying up of rivers and dumping of sewage lead to mass mortality of fishes. A considerable area of the backwater has already been lost due to reclamation for agricultural, mining, urban area development and similar activities (Soumya, 2012) . This may also be another reason for the depletion of fish fauna. Further encroachment/reclamation should be strictly regulated Hence there is imminent need to initiate concrete measures with community participation, to conserve the fish stock of the estuary in a sustainable manner.

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