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RESEARCH ARTICLE

OYSTER BED ASSOCIATED FAUNA OF A TROPICAL ESTUARY, SOUTH WEST COAST OF INDIA

Ganapathi Naik, M[1]* and Gangadhara Gowda[2]

[1]*Department of Aquaculture, College of Fisheries, Mangalore-575002, Karnataka, India
[2]Department of Aquatic Environment Management, College of Fisheries, Mangalore-575002, Karnataka, India

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ABSTRACT

The oyster bed associated fauna were recorded in Mulky estuary from October 2008 to April 2010. The density of oyster bed associated fauna was ranged from 18 to 386 No/m². Among molluscs, *Cirithidea citrinum, Cirithidea obstusa, Telescopium telescopium*, *Natica tigrina*, *Polinices melanostomus, Cymatium cingulatum, Thias* sp., *Meritrix meritrix, Meritrix casta, Paphia malabarica, Katelysia opima, Perna viridis* were recorded. Among crustaceans, crabs, shrimps (*Alpeus* sp.), barnacles and amphipods were recorded. Among polychaetes, the genus *Nephtydae, Onuphidae, Nereidae* were recorded. A few sea stars, sea urchins, sand tubes and fish were also recorded. Also a few boring sponge of the genus *Cliona* were found associated with *C. madrasensis* and a few number of *Polydora ciliate*, a polychaete was found associated with *S. cucullata*. The present study recorded some predators of oysters such as *Polydora ciliate, Cliona* sp, *Cirithidea citrinum, Cirithidea obstusa, Natica tigrina*, *Polinices melanostomus, Cymatium cingulatum, Thias* sp, starfish and crabs.

INTRODUCTION

Intertidal oyster beds provide habitat for hundreds of infaunal and epifaunal species (Prezant *et al*., 2002; Hosack *et al*., 2006). The oyster bed associated organisms play a decisive role in the well being of oysters (O' Beirn *et al*., 1997). Oyster bed provides shelter, food and spawning substrate for many species of fish and invertebrates (Harding and Mann, 2001). Documentation of oyster bed associated organisms is important to understand the additional factors affecting the oyster population such as disease, competition and predation (Tolley and Volety, 2005). To date, over 300 species have been identified as depending, either directly or indirectly on intertidal oyster beds (Al-Khayat and Al-Ansi, 2008). Based on the relative degree of dependence, oyster bed fauna can be classified as reef residents, facultative residents and transients (Breitburg, 1999; Lehnert and Allen, 2002). Many of these organisms serve as forage for important fish species (Harding and Mann, 2001). Lower species diversity and lower number of individuals of macrofauna in oyster bed are the indications of the stressful environmental conditions (Feldman *et al*., 2000). Description of fish and invertebrate assemblages in the oyster beds indicates the potential importance of the oyster beds as fish habitat. Research along the east coast of the U.S and northern Gulf of Mexico provided evidence that natural and created oyster beds are important habitats for many estuarine fishes and macroinvertebrates (Lenihan *et al*., 2001; Glancy *et al*., 2003). Fishes like sprat, croaker, oyster toadfish, spotted sea trout and catfish often feed on invertebrates of the oyster beds (Wilson *et al*., 2005; Duarte *et al*., 2008). The greater abundance of bottom-feeding fish over oyster bed is related to the greater abundance of benthic fishes and invertebrates (John and Megan, 2005).

MATERIALS AND METHODS

Study area

The Mulky estuary (Lat. 13º 05¹ N and Long. 74º 46¹ E) is located about 29 km north of Mangalore (13° 4N' 74° 17' E), Karnataka, India was selected as the study area for the present investigation. The estuary has an average depth of 3 m and the tidal range is about 1 m. The bottom of the estuary is mostly a mixture of silt and sand. This is a typical tropical estuary which experiences wide variations in salinity. During the south-west monsoon period (June to Sep), the estuary is flooded with fresh water influx from the land and the estuarine waters become almost fresh. During this period, the water is turbid throughout the estuary. During the non-monsoon period, estuarine water comprises mainly of sea water as the freshwater influx is very much reduced.

Collection of oyster bed associated organisms

Oyster bed associated organisms were collected from oyster bed 1 (OB1) and oyster bed 2 (OB2) (Plate 1). The macrobenthos were also collected from non-oyster bed 1(NOB1) and non-oyster bed 2 (NOB2) (Plate 1). The sediment samples were sieved through 0.5mm mesh size. The fauna retained in the sieve were transferred into a polythene bottle and preserved in 10% rosebengal-seawater formalin. The encrusting/attached forms of macrobenthos on the oyster shells were also collected. Many fauna (especially molluscans) were also handpicked. In the laboratory, macrobenthos were sorted out and identified to generic level. The numerical abundance of macrobenthos was expressed in terms of No/m².

* Corresponding author: Tel: 9448369734
E-mail address: ganapathi70@rediffmail.com

RESULTS

The monthly distribution of oyster bed associated organisms at OB1 in the Mulky estuary from October 2008 to April 2010 is given in the table 1 and fig.1. At OB1, oyster bed associated organisms were ranged from 128 to 386No/m². The maximum associated organisms were found during February 2009 and minimum during November 2009. The molluscans were dominant throughout the study period followed by crustaceans and polychaetes. A few numbers of sea star, sea urchin, sand tube and fish were also recorded. A few numbers of boring sponges of the genus *Cliona* was also found associated with *C. madrasensis*. The monthly distribution of oyster bed associated organisms at OB2 in the Mulky estuary from October 2008 to April 2010 is given in the table 2 and fig.1. At OB2, oyster bed associated organisms were ranged from 18 to 258No/m². The maximum associated organisms were found during March 2010 and minimum during February 2009. The molluscans were dominant throughout the study period followed by crustaceans and polychaetes. A few numbers of sea star, sea urchin, sand tube and fish were also recorded. A few numbers of *Polydora ciliate*, a polychaete was found associated with *S. cucullata*.

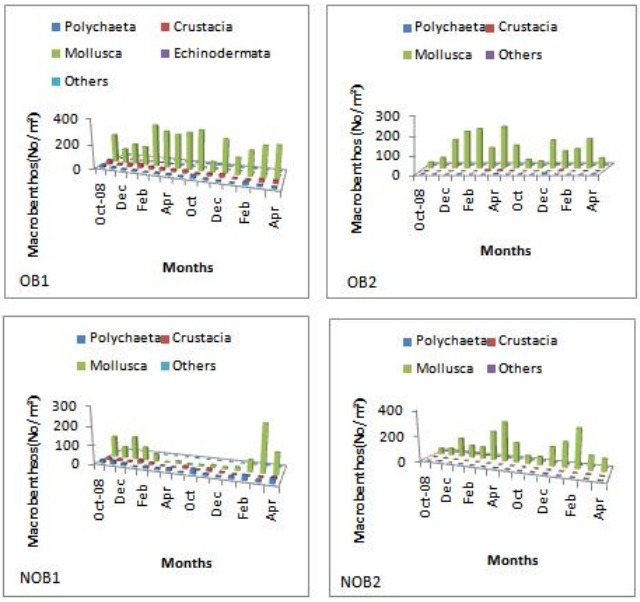

Fig.1 Monthly distribution of macrobenthos (No/m²) at OB1, OB2, NOB1 and NOB2 in the Mulky estuary from October 2008 to April 2010.

The monthly distribution of oyster bed associated organisms at NOB1 in Mulky estuary from October 2008 to April 2010 is given in the table 3 and fig.1. At NOB1, the density of macrobenthos was ranged from 32 to 222 No/m². The maximum macrobenthos were recorded during April 2009 and minimum during October 2008. The molluscans were dominant throughout the study period followed by crustaceans and polychaetes. The monthly distribution of oyster bed associated organisms at NOB2 in Mulky estuary from October 2008 to April 2010 is given in the table 4 and fig.1. At NOB2, the density of macrobenthos was ranged from 50 to 314 No/m². The maximum macrobenthos were recorded during April 2009 and minimum during October 2008. The molluscs were dominant throughout the study period followed by crustaceans and polychaetes.

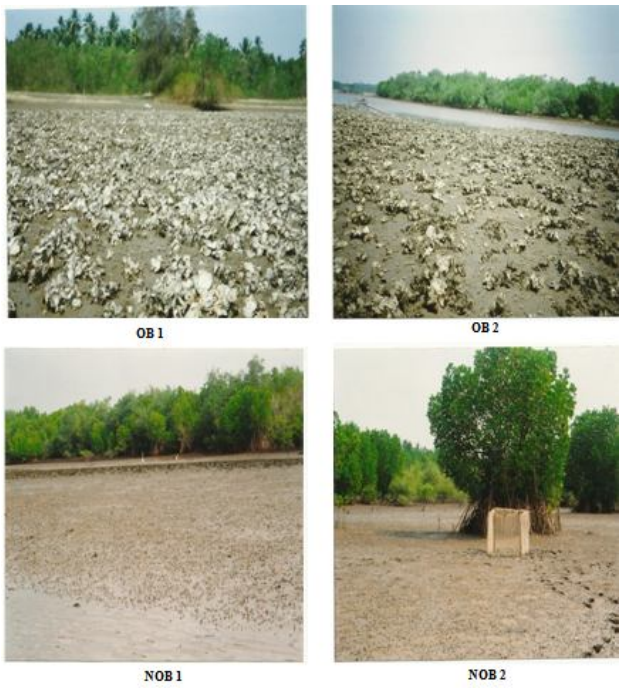

Plate 1. The sampling stations OB1, OB 2, NOB 1 and NOB 2 in Mulky estuary

DISCUSSION

In the present study, the density of oyster bed associated organisms was ranged from 128 to 386 No/m² and 18 to 258 No/m² at OB1 and OB2 respectively. From these results, it is clear that associated organisms were more abundant at OB1 compared to OB2. Dame (1996) reported an average 2,949 associated fauna/m² in intertidal oyster beds of South Carolina. Bahr (1974) reported an average 24,747/ m² of associated fauna in the oyster beds of Georgia, USA. The reported density of associated fauna in oyster beds of South Carolina and Georgia, USA was quite higher than the density reported in the present study. This may be due to temperate oyster beds provide shelter for large number of fauna. Moreover, density of the associated fauna is influenced by the water exchange in the estuary.

In the present study, both at OB1 and OB2, the molluscs were dominant throughout the study period followed by crustaceans and polychaetes. Among molluscs, *Cirithidea citrinum, Cirithidea obstusa, Telescopium telescopium*, *Natica tigrina*, *Polinices melanostomus, Cymatium cingulatum, Thias* sp., *Meritrix meritrix, Meritrix casta, Paphia malabarica, Katelysia opima, Perna viridis* were recorded. Among crustaceans, crabs, shrimps (*Alpeus* sp.), barnacles and amphipods were recorded. Among polychaetes, the genus *Nephtydae, Onuphidae, Nereidae* were recorded. A few numbers of sea star, sea urchin, sand tube and fish were also recorded. Interestingly, a few number of boring sponge of the genus *Cliona* was also found associated with *C. madrasensis* at OB1 and a few number of *Polydora ciliate*, a polychaete was found associated with *S. cucullata* at OB2.

It was reported that in Qatari waters, Arabian Gulf, molluscs comprised the most abundant group with 104 species followed by echinodermata with 25 species, crustacean with 20 species, coral with 12 species and polychaetes with 7 species. The sea

Table 1 Monthly distribution of macrobenthos (No/m²) at OB1 in the Mulky estuary

SL.NO.	Class/Family	Oct 08	Nov 08	Dec 08	Jan 09	Feb 09	Mar 09	Apr 09	May 09	Oct 09	Nov 09	Dec 09	Jan 10	Feb 10	Mar 10	April 10
		No/m²	No/m²	No/m²	No/m²	No/m²	No/m²	No/m²	No/m²	No/m²	No/m²	No/m²	No/m²	No/m²	No/m²	No/m²
I	**Polychaeta**															
	i. Nephtydae	12	8	4	2	-	8	2	-	6	4	2	-	14	6	4
	ii.Onuphidae	-	2	2	-	4	6	2	4	8	-	2	4	4	-	2
	iii.Nereidae	16	8	6	12	4	-	10	4	14	8	4	-	6	8	6
	Total	**28**	**18**	**12**	**14**	**8**	**14**	**14**	**8**	**28**	**12**	**8**	**4**	**24**	**14**	**12**
II	**Crustacia**															
	i.Crabs	24	14	22	20	16	8	8	2	10	10	14	6	6	14	6
	ii. Shrimps	6	-	2	2	-	-	2	4	2	6	4	2	-	-	-
	iii.Barnacles	8	4	6	12	8	16	12	18	-	6	4	-	4	8	16
	iv.Amphipoda	2	-	-	2	-	-	-	-	-	-	4	-	-	-	2
	Total	**40**	**18**	**30**	**36**	**24**	**24**	**22**	**24**	**12**	**22**	**26**	**8**	**10**	**22**	**24**
III	**Mollusca**															
	A) Gastropoda															
	i.*Cirithidea citrinum*	98	48	72	46	226	88	124	132	126	12	104	46	64	38	64
	ii.*Cirithidea obstusa*	86	52	68	74	96	154	124	128	102	36	150	66	104	164	136
	iii.Turritellidae	2	-	2	6	6	-	-	-	-	6	-	2	2	-	-
	iv. *Telescopium telescopium*	2	-	2	4	-	-	2	-	-	2	4	-	-	-	-
	v. *Natica tigrina*	19	11	8	12	-	22	4	26	-	10	-	10	4	16	14
	Vii. *Polinices melanostomus*	4	2	6	10	2	23	14	8	4	6	-	2	10	8	22
	viii.*Cymatium cingulatum*	-	-	2	2	-	2	4	4	-	-	-	2	2	2	6
	ix.*Thias* sp.	-	-	-	-	-	2	4	2	-	-	-	-	2	4	4
	Total	**215**	**113**	**160**	**152**	**330**	**291**	**276**	**300**	**232**	**72**	**258**	**128**	**188**	**232**	**248**
	B) Bivalvia															
	i.*Meritrix meritrix*	-	4	-	-		4	-	-	-	2	-	2	-	4	-
	ii.*Meritrix casta*	4	-	6	2	8	4	-	2	8	4	6	8	-	4	6
	iii.*Paphia malabarica*	4	2	-	-	4	-	-	-	-	6	2	2	-	6	2
	iv. *Katelysia opima*	-	-	2	-	-	-	2	-	-	4	-	-	-	-	2
	v. *Perna viridis*	2	-	2	-	-	-	-	-	4	-	-	2			
	Total	**10**	**6**	**10**	**2**	**12**	**8**	**2**	**2**	**12**	**14**	**8**	**14**	**-**	**14**	**10**
III	**Echinodermata**															
	i. Sea star	-	-	-	-	-	-	2	-	-	-	-	-	-	-	2
	ii. Sea urchin	-	-	-	-	2	-	-	-	-	-	-	-	-	2	-
	Total	**0**	**0**	**0**	**0**	**2**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**2**
IV	**Others**															
	i. Sand tubes	4	2	-	2	4	6	-	-	-	4	-	2	4	-	2
	ii.Fish	-	-	-	-	2		2			4	-	-	-	-	-
	ii.Annelida tube	2	-	-	-	4	-	-	-	-	-	2	-	-	-	-
	Total	**6**	**2**	**-**	**2**	**10**	**6**	**2**	**0**	**0**	**8**	**2**	**2**	**4**	**0**	**2**
	Grand total	**299**	**157**	**212**	**206**	**386**	**343**	**318**	**334**	**284**	**128**	**302**	**156**	**226**	**270**	**288**

Table 2 Monthly distributions of macrobenthos (No/m²) at NOB1 in the Mulky estuary

SL.NO.	Class/Family	Oct 08	Nov 08	Dec 08	Jan 09	Feb 09	Mar 09	Apr 09	May 09	Oct 09	Nov 09	Dec 09	Jan 10	Feb 10	Mar 10	April 10
		No/m²	No/m²	No/m²	No/m²	No/m²	No/m²	No/m²	No/m²	No/m²	No/m²	No/m²	No/m²	No/m²	No/m²	No/m²
I	**Polychaeta**															
	i. Nephtydae		-	-	2	-	-	2	-	-	-	4	-	-		2
	ii.Onuphidae	2	-	-	-	-	-	-	-	2	-	-	-	-	-	-
	iii.Nereidae	-	2	-	-	-		2	-	-	-	4	-	-	-	-
	Total	**2**	**2**	**0**	**2**	**0**	**0**	**4**	**0**	**2**	**0**	**8**	**0**	**0**	**0**	**2**
II	**Crustacia**															
	i.Crabs	2	0	0	0	0	8	8	4	0	0	0	6	0	2	-
	ii. Shrimps	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	iii.Barnacles	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	iv.Amphipoda	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-
	Total	**2**	**0**	**0**	**0**	**0**	**8**	**8**	**4**	**0**	**0**	**0**	**8**	**0**	**2**	**2**
III	**Mollusca**															
	A) Gastropoda															
	i.*Cirithidea citrinum*	-	12	42	80	154	46	138	44	-	8	66	48	28	62	22
	ii.*Cirithidea obstusa*	2	32	88	100	44	48	54	40	-	24	72	30	60	84	26
	iii.Turritellidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	iv. *Telescopium telescopium*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	v. *Natica tigrina*	24	6	14	4	-	6	14	24	42	-	2	10	8	-	4
	Vi .*Polinices melanostomus*	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
	viii.*Cymatium cingulatum*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ix. *Thias* sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total	**26**	**50**	**144**	**184**	**198**	**100**	**206**	**108**	**42**	**32**	**140**	**88**	**98**	**146**	**52**
	B) Bivalvia															
	i.*Meritrix meritrix*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ii.*Meritrix casta*	2	1	-	-	-	4	4	4	-	-	-	-	-	-	-
	iii.*Paphia malabarica*	-	2	-	-	2	-	-	4	-	-	2	-	-	2	-
	iv.*Katelysia opima*	2	-	-	2	-	-	-	-	-	4	-	-	-	-	-
	v. *Perna viridis*		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total	**4**	**3**	**0**	**2**	**2**	**4**	**4**	**8**	**0**	**4**	**2**	**0**	**0**	**2**	**0**
III	**Echinodermata**															
	i. Sea star	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ii. Sea urchin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
IV	**Others**															
	i. Sand tubes	-	-	2	-	-	-	-	-	2		-	-	-	-	--
	ii.Fish	-	-	-	-	-		-	-	-	-	2	-	-	-	-
	ii.Annelida tube	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**2**	**0**	**0**	**0**	**0**
	Grand total	**32**	**55**	**148**	**188**	**200**	**112**	**222**	**120**	**146**	**48**	**34**	**148**	**98**	**148**	**56**

Table 3 Monthly distributions of macrobenthos (No/m²) at NOB2 in the Mulky estuary

SL.NO.	Class/Family	Oct 08	Nov 08	Dec 08	Jan 09	Feb 09	Mar 09	Apr 09	May 09	Oct 09	Nov 09	Dec 09	Jan 10	Feb 10	Mar 10	April 10
		No/m²	No/m²	No/m²	No/m²	No/m²	No/m²	No/m²	No/m²	No/m²	No/m²	No/m²	No/m²	No/m²	No/m²	No/m²
I	**Polychaeta**															
	i. Nephtydae	-	2	-	-	-	-	-	-	-	2	-	-	-		-
	ii.Onuphidae	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-
	iii.Nereidae	-	2	-	-	-		2	-	-	-	4	-	-	-	-
	Total	**0**	**4**	**0**	**0**	**0**	**0**	**2**	**4**	**0**	**2**	**4**	**0**	**0**	**0**	**0**
II	**Crustacia**															
	i.Crabs	-	2	-	-	-	-	-	-	-	-	-	-	-	2	-
	ii. Shrimps	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	iii.Barnacles	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	iv.Amphipoda	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**
III	**Mollusca**															
	A) Gastropoda															
	i.*Cirithidea citrinum*	28	20	92	26	74	204	156	102	22	26	84	116	166	56	50
	ii.*Cirithidea obstusa*	22	34	54	72	22	18	150	50	32	38	66	70	140	56	48
	iii.Turritellidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	iv. *Telescopium telescopium*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	v. *Natica tigrina*	-	4	-	-	-	-	-	-	8	-	-	12	-	-	-
	Vi .*Polinices melanostomus*	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
	viii.*Cymatium cingulatum*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ix. *Thias* sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total	**50**	**58**	**148**	**98**	**96**	**222**	**306**	**152**	**62**	**64**	**150**	**198**	**306**	**112**	**98**
	B) Bivalvia															
	i.*Meritrix meritrix*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ii.*Meritrix casta*	-	-	2	-	-	4	-	-	-	-	-	-	-	-	-
	iii.*Paphia malabarica*	-	-	-	-	-	2	-	-	-	-	-	2	-	-	-
	iv. *Katelysia opima*	-	-	-	2	-	-	-	4	-	-	-	-	2	-	-
	v. *Perna viridis*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total	**0**	**0**	**2**	**2**	**0**	**6**	**6**	**4**	**0**	**0**	**0**	**2**	**2**	**0**	**0**
III	**Echinodermata**															
	i. Sea star	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ii. Sea urchin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
IV	**Others**															
	i. Sand tubes	-	-	-	-	-	-	2	-	-		-	-	4	-	--
	ii.Fish	-	2	-	-	-		-	-	-	-	-	-	2	-	-
	ii.Annelida tube	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total	**0**	**2**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**6**	**0**	**0**
	Grand total	**50**	**66**	**150**	**100**	**96**	**228**	**314**	**160**	**62**	**66**	**154**	**200**	**106**	**112**	**98**

anemones, sea urchins, sponges (*Callyspongia* sp) and boring sponges (*Cliona* sp) were also recoded (Khayat and Ansi, 2008). Thangavelu and Sanjeevaraj (1988) reported that in Pulicate Lake oyster beds, sponges such as *Haliclona* sp and *Hyatella* sp were associated with *C. madrasensis*. Thomas (1979) recorded *Cliona celata*, *C. vastifica*, *C. carpenteri* and *Ake minuta* in the oysters along the southeast and southwest coasts of India.

At NOB1 and NOB2 station, macrobenthos were ranged from 32 to 222 No/m² and 50 to 314 No/m² respectively. At both OB1 and OB2, the molluscs were dominant throughout the study period followed by crustaceans and polychaetes. The overall percentage distribution of the different biota indicated that the molluscs, especially gastropods and bivalves were more abundant than other fauna in all the stations. Overall, macrobethos were found more abundant in OB 1 and OB 2 compared to NOB 1 and NOB 2. This is due to oyster beds (OB1 & OB2) provide good habitat for the macrobenthos. In all the stations macrobenthos were found to be abundant during pre monsoon months compared to post monsoon months.

Furthermore, some associated organisms may cause damage to the oysters in terms of disease, competition and predation. The gastropods and crabs are the common predators of oysters in India (Rajapandian and Rajan, 1987). The present study reported some predators of oysters such as *Polydora ciliate, Cliona* sp, *Cirithidea citrinum, Cirithidea obstusa, Natica tigrina*, *Polinices melanostomus, Cymatium cingulatum, Thias* sp, starfish and crabs. It was reported that flatworms, fishes and birds also prey on oysters (Narasimham, 2005). Rao *et al.* (1987) observed the predation of the gastropod, *Thias rudolphi* on *C. madrasensis* in Athankari estuary. Muthiah *et al*., 1987) observed that 13% mortality of *C. madrasensis* occurred due to the predation by the gastropod *Cymatium cingulatum* in the Tuticorin oyster farm. Rao *et al.* (1987) reported that predation of the mud crab, *Scylla serrata* on the oysters in Athankarai estuary. In the Tuticorin oyster farm, *S. serrata* and *Panurus* sp. caused mortality of the oyster spat settled on tiles and rens (Muthaiah *et al*., 1987). In the oyster beds of Barataria Bay, Louisiana, USA, mud crabs were associated with oyster beds and preying on small bivalves including oyster spats (Perry *et al*., 2001). Korringa (1952) reported that the meat of oysters heavily infested by *polydora ciliate* is in poor condition and the oyster is more susceptible to disease. The sponge borers, mostly *Cliona* spp. make the oyster shell brittle that renders the oysters an easy prey to predators. Recently, while assessing the rate of oyster spat fall, oyster spat predators such as *Natica tigrina*, *Polinices melanostomus*, *Cymatium cingulatum, Thias* sp, starfish and crabs were recorded in Mulky estuary (Ganapathi Naik and Gangadhara Gowda., 2013b).

Fishes like sprat, croaker, oyster toadfish, spotted sea trout and catfish often feed on invertebrates of the oyster beds (Wilson *et al*., 2005; Duarte *et al*., 2008). The greater abundance of bottom-feeding fish over oyster bed is related to the greater abundance of benthic fishes and invertebrates (John and Megan, 2005). Recently, density and growth of oysters were determined in Mulky estuary and found that both density and growth of oysters indicating good ecosystem health, higher species diversity and higher number of associated fauna(Ganapathi Naik and Gangadhara Gowda., 2013a).

CONCLUSION

In Mulky estuary, intertidal oyster beds are associated with hundreds of infaunal and epifaunal species. The oyster bed associated organisms play a decisive role in the well being of oysters. However, documentation of oyster bed associated organisms is important to understand the additional factors affecting the oyster population such as disease, competition and predation. Furthermore, lower species diversity and lower number of individuals of macrofauna in oyster bed are the indications of the stressful environmental conditions. Thus, in Mulky estuary, density and diversity of oyster bed associated organisms are good indicating healthy ecological condition of the estuary. Moreover, recently, transplantation of oysters in Mulky estuary also revealed the higher association of fauna with transplanted oysters (Ganapathi Naik., 2012).

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