



## DENSITY AND DISTRIBUTION OF MEIOFAUNA OF TAMILNADU COAST

**SIVALEELA, G. AND VENKATARAMAN, K.\***

*Marie Biology Regional Centre*

*Zoological Survey of India, 130, Santhome High Road, Chennai-28*

gsivaleela@yahoo.com

*\*Zoological Survey of India, New Alipore, Kolkata-700053*

Venkyzsi56@gmail.com

### INTRODUCTION

The meiofauna inhabiting the different sediment habitat of Tamilnadu was studied. A brief description of the density, sediment characters, total organic carbon, and vertical distribution in different sediment habitats, diversity and cluster analysis is given. All the typical meiofauna groups are present. A quantitative estimate of the diverse taxonomic groups encountered is given. The density of total meiofauna individuals in these intertidal sediments ranged from 26 animals/100 cm<sup>3</sup> to 1440 animals/100 cm<sup>3</sup>. A list of 101 spp. collected from Tamilnadu is given. Several genera and species regarded as widespread and cosmopolitan were recorded. The evidence that several meiofauna species are widely distributed and any future

investigations of the unexplored areas are likely to indicate a closer meiofaunal relationship is supported. The distribution of meiofauna is discussed in relation to the nature of the substratum.

### ENVIRONMENTAL VARIABLES

#### SEDIMENT CHARACTERISTICS

The median particle size at all stations ranged between 2 $\phi$  (0.250 mm) and 3 $\phi$  (0.125 mm) thereby indicating that it contained median sand (Table 1a, b). The median particle size of sandy sediment fluctuated between 2.25 and 2.5 Md $\phi$ , muddy sediment between 2.3 and 2.75 Md $\phi$ , muddy sediment with seagrass bed between 2.7 and 2.75 Md $\phi$  and sandy sediment with rocky environment between 2.0 and 2.25 Md $\phi$  (Table 1a, b).

**Table 1a.** Percentage composition of sediment texture (%) and mean densities of meiofauna (n/10 cm<sup>2</sup>) of Tamil Nadu coast during 2006.

Sediment types and Fauna	Stations											
	1	2	3	4	5	6	7	8	9	10	11	12
<b>Sediment types</b>												
Sand (%)	96.4	92.2	91.1	86.9	81.7	84.6	83.0	88.0	87.2	89.8	90.1	97.2
Silt & clay (%)	3.6	7.8	8.9	13.1	18.4	15.4	17.0	12.0	12.8	10.2	9.9	2.8
Md $\phi$	2.3	2.3	2.5	2.65	2.75	2.7	2.7	2.5	2.55	2.6	2.4	2.0
<b>Fauna</b>												
Nematodes	244	326	304	580	269	708	824	217	502	536	210	238
Harpacticoids	109	238	223	166	110	298	212	78	201	193	116	120
Foraminiferans	116	152	144	107	92	124	160	67	135	146	119	85
Polychaetes	49	45	77	47	29	24	32	48	45	56	51	36

Oligochaetes	190	80	45	-	70	314	340	50	-	-	-	12
Ostracods	26	40	30	12	20	20	22	24	24	16	30	42
Gastrotrichs	-	4	15	-	-	-	-	-	-	-	4	8
Turbellarians	-	15	45	-	-	-	-	-	-	-	-	25
Isopods	-	116	122	-	-	-	15	-	-	-	-	22
<b>Total</b>	<b>734</b>	<b>1016</b>	<b>1005</b>	<b>912</b>	<b>590</b>	<b>1488</b>	<b>1605</b>	<b>484</b>	<b>907</b>	<b>947</b>	<b>530</b>	<b>588</b>

The Md $\phi$  values showed a greater fluctuation in sandy sediments than in muddy sediments. It was also observed that the sediment in stations 4-8, 10-11 had finer sediments than in stations 1-3, 9 and 12 (Table 1a, b).

All stations of sandy environment had little silt and clay content (3.6-8.9%), except station 9

(Mandapam), where high silt and clay content (12.8-13.1%) was observed (Table 1a, b).

Areas with muddy (9.1-18.4%) and muddy with seagrass bed (15.4-18.0%) cover had a higher silt and clay content compared to sandy environment (Table 1a, b). Station 12 which was sandy with rocky environment had very less silt and clay content.

**Table 1b.** Percentage composition of sediment texture (%) and mean densities of meiofauna (n/10 cm<sup>2</sup>) of Tamil Nadu coast during 2007.

Sediment types and Fauna	Stations											
	1	2	3	4	5	6	7	8	9	10	11	12
<b>Sediment types</b>												
Sand (%)	95.7	92.8	91.5	87.3	89.2	83.4	82.0	88.1	86.9	90.4	90.9	97.9
Silt & clay (%)	4.3	7.2	8.5	12.7	10.8	16.6	18.0	11.9	13.1	9.6	9.1	2.1
Md $\phi$	2.25	2.3	2.45	2.6	2.6	2.7	2.75	2.45	2.6	2.3	2.4	2.25
<b>Fauna</b>												
Nematodes	260	422	434	410	150	1008	800	245	675	575	280	298
Harpacticoids	109	138	250	155	45	540	355	55	240	230	125	134
Foraminiferans	87	132	120	120	32	234	275	45	120	150	108	98
Polychaetes	55	40	55	67	58	78	55	70	25	68	75	45
Oligochaetes	240	246	34	15	90	145	120	90	15	25	45	34
Ostracods	15	25	45	42	20	42	95	8	32	20	24	32
Gastrotrichs	-	12	15	-	-	-	-	-	-	-	-	-
Turbellarians	-	-	6	-	-	-	-	-	-	-	-	4
Isopods	-	95	155	20	-	5	125	-	12	15	4	12
<b>Total</b>	<b>766</b>	<b>1110</b>	<b>1114</b>	<b>829</b>	<b>395</b>	<b>2052</b>	<b>1825</b>	<b>513</b>	<b>1119</b>	<b>1083</b>	<b>661</b>	<b>657</b>

The composition of meiofauna in Tamil Nadu coast is mostly related to grain size. The sediment characteristic of muddy sediments with seagrass bed cover had a high silt and clay content with a corresponding higher density of meiofauna. Sediment with higher silt and clay content is mainly inhabited by burrowers such as nematodes and oligochaetes (Table 1a, b).

#### TOTAL ORGANIC CARBON CONTENT

The variation in the sediment organic carbon values in the present study, showed considerable similarity at stations 4 to 8, 10 and 11, which had a muddy sediment (Fig. 1), while stations 1 to 3, 9 and 12 (sandy environment) differed from muddy (stations 4 to 8 and 10 to 11) environment (Fig. 1).

The minimum sediment organic carbon content (5.02-7.42 mg C/g) was observed at sandy sediments and maximum (5.21-9.73 mg C/g) in muddy sediments (Fig. 1).

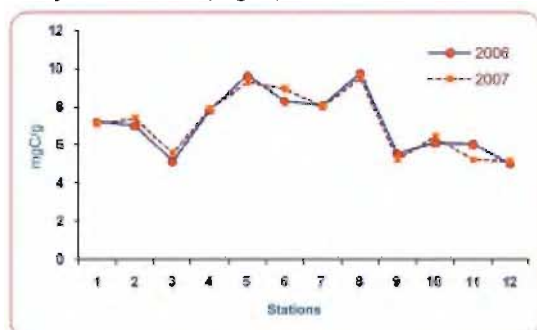


Fig. 1. Variations in total organic carbon content of Tamil Nadu coast during 2006 and 2007.

The highest value of organic content (9.73 mg C/g and 9.51 mg C/g during 2006 and 2007 respectively)

was recorded at station 8 in Tuticorin Port (Fig. 1). In general, the total organic carbon content increased with increasing silt and clay content.

## MEIOFAUNAL TAXA

### TOTAL DENSITY OF MEIOFAUNA

Nine major meiofaunal taxa were identified, namely nematodes, harpacticoid copepods, foraminiferans, polychaetes, oligochaetes, ostracods, gastrotrichs, turbellarians and isopods from intertidal areas of Tamil Nadu coasts. Among the twelve stations studied, minimum (155 individuals/10 cm<sup>2</sup>) meiofaunal density was observed at station 4 (Appendix II, Table 5) and maximum (3128 individuals/10 cm<sup>2</sup>) at station 6. The values are an average of five replicates in each station (Appendix II, Tables 2 to 13).

## Appendix II

Table 2. Density of meiofauna communities (individuals/10 cm<sup>-2</sup>) at Station 1 during 2006 and 2007.

### 2006

S. No.	Fauna	Samples					Total	Mean	SD (±)
		1	2	3	4	5			
1	Nematodes	220	145	225	450	180	1220	244	119.66
2	Harpacticoid copepods	120	145	90	85	105	545	109	24.34
3	Foraminiferans	24	105	56	285	110	580	116	100.97
4	Polychaetes	139	25	45	4	32	245	49	52.45
5	Oligochaetes	259	90	178	345	78	950	190	113.44
6	Ostracods	12	50	64	-	4	130	26	29.05
	<b>Total</b>	<b>774</b>	<b>560</b>	<b>658</b>	<b>1169</b>	<b>509</b>	<b>3670</b>	<b>734</b>	<b>263.39</b>

### 2007

S. No.	Fauna	Samples					Total	Mean	SD (±)
		1	2	3	4	5			
1	Nematodes	360	130	470	250	90	1300	260	158.11
2	Harpacticoid copepods	60	80	215	85	105	545	109	61.38
3	Foraminiferans	24	105	45	151	110	435	87	51.68
4	Polychaetes	139	25	75	4	32	275	55	53.59
5	Oligochaetes	310	110	462	240	78	1200	240	155.99
6	Ostracods	12	-	59	-	4	75	15	25.08
	<b>Total</b>	<b>905</b>	<b>450</b>	<b>1326</b>	<b>730</b>	<b>419</b>	<b>3830</b>	<b>766</b>	<b>372.32</b>

**Table 3.** Density of meiofauna communities (individuals/10 cm<sup>-2</sup>) at Station 2 during 2006 and 2007.

**2006**

S. No.	Fauna	Samples					Total	Mean	SD (±)
		1	2	3	4	5			
1	Nematodes	425	199	135	326	545	1630	326	166.11
2	Harpacticoid copepods	310	157	98	228	397	1190	238	119.09
3	Foraminiferans	150	72	98	220	220	760	152	68.13
4	Polychaetes	19	45	59	12	90	225	45	31.57
5	Oligochaetes	170	23	16	140	51	400	80	70.51
6	Ostracods	64	20	10	32	74	200	40	27.82
7	Gastrotriches	12	8	-	-	-	20	4	5.66
8	Turbellarians	45	24	-	2	4	75	15	19.34
9	Isopods	130	20	48	180	202	580	116	79.89
	<b>Total</b>	<b>1325</b>	<b>568</b>	<b>464</b>	<b>1140</b>	<b>1583</b>	<b>5080</b>	<b>1016</b>	<b>484.19</b>

**2007**

S. No.	Fauna	Samples					Total	Mean	SD (±)
		1	2	3	4	5			
1	Nematodes	650	750	210	175	325	2110	422	262.17
2	Harpacticoid copepods	120	190	96	45	239	690	138	76.88
3	Foraminiferans	175	160	95	120	110	660	132	34.02
4	Polychaetes	68	12	45	-	75	200	40	33.23
5	Oligochaetes	475	385	150	45	175	1230	246	177.78
6	Ostracods	40	-	32	12	41	125	25	18.19
7	Gastrotriches	12	43	-	5	-	60	12	18.01
8	Isopods	45	175	120	-	135	475	95	70.98
	<b>Total</b>	<b>1585</b>	<b>1715</b>	<b>748</b>	<b>402</b>	<b>1100</b>	<b>5550</b>	<b>1110</b>	<b>553.19</b>

**Table 4.** Density of meiofauna communities (individuals/10 cm<sup>2</sup>) at Station 3 during 2006 and 2007.**2006**

S. No.	Fauna	Samples					Total	Mean	SD (±)
		1	2	3	4	5			
1	Nematodes	605	245	95	125	450	1520	304	218.59
2	Harpacticoid copepods	475	180	80	120	260	1115	223	156.35
3	Foraminiferans	340	110	65	90	115	720	144	111.32
4	Polychaetes	165	20	40	55	105	385	77	58.37
5	Oligochaetes	75	45	-	45	60	225	45	28.06
6	Ostracods	63	45	-	8	34	150	30	26.05
7	Gastrotriches	4	12	-	34	25	75	15	14.28
8	Turbellarians	72	33	-	-	120	225	45	51.35
9	Isopods	220	145	45	55	145	610	122	72.59
	<b>Total</b>	<b>2019</b>	<b>835</b>	<b>325</b>	<b>532</b>	<b>1314</b>	<b>5025</b>	<b>1005</b>	<b>677.99</b>

**2007**

S. No.	Fauna	Samples					Total	Mean	SD (±)
		1	2	3	4	5			
1	Nematodes	120	440	850	175	585	2170	434	300.65
2	Harpacticoid copepods	105	220	520	120	285	1250	250	168.04
3	Foraminiferans	87	180	168	45	120	600	120	56.16
4	Polychaetes	25	40	130	-	80	275	55	50.99
5	Oligochaetes	28	35	75	-	32	170	34	26.82
6	Ostracods	50	55	90	10	20	225	45	31.62
7	Gastrotriches	4	8	63	-	-	75	15	27.04
8	Turbellarians	-	20	6	-	4	30	6	8.25
9	Isopods	40	75	420	45	195	775	155	160.90
	<b>Total</b>	<b>459</b>	<b>1073</b>	<b>2322</b>	<b>395</b>	<b>1321</b>	<b>5570</b>	<b>1114</b>	<b>782.59</b>

**Table 5.** Density of meiofauna communities (individuals/10 cm<sup>2</sup>) at Station 4 during 2006 and 2007.

**2006**

S. No.	Fauna	Samples					Total	Mean	SD (±)
		1	2	3	4	5			
1	Nematodes	1200	175	585	90	850	2900	580	464.07
2	Harpacticoid copepods	285	90	190	45	220	830	166	97.56
3	Foraminiferans	210	55	115	20	135	535	107	73.71
4	Polychaetes	90	12	23	-	110	235	47	49.57
5	Ostracods	28	-	12	-	20	60	12	12.33
	<b>Total</b>	<b>1813</b>	<b>332</b>	<b>925</b>	<b>155</b>	<b>1335</b>	<b>4560</b>	<b>912</b>	<b>689.27</b>

**2007**

S. No.	Fauna	Samples					Total	Mean	SD (±)
		1	2	3	4	5			
1	Nematodes	210	330	210	450	850	2050	410	265.33
2	Harpacticoid copepods	105	120	70	170	310	775	155	93.81
3	Foraminiferans	80	65	50	75	330	600	120	117.95
4	Polychaetes	70	90	-	55	120	335	67	44.67
5	Oligochaetes	40	25	-	-	10	75	15	17.32
6	Ostracods	40	35	20	30	85	210	42	25.15
7	Isopods	-	20	-	20	60	100	20	24.49
	<b>Total</b>	<b>545</b>	<b>685</b>	<b>350</b>	<b>800</b>	<b>1765</b>	<b>4145</b>	<b>829</b>	<b>549.49</b>

**Table 6.** Density of meiofauna communities (individuals/10 cm<sup>2</sup>) at Station 5 during 2006 and 2007.

**2006**

S. No.	Fauna	Samples					Total	Mean	SD (±)
		1	2	3	4	5			
1	Nematodes	120	145	445	545	90	1345	269	210.22
2	Harpacticoid copepods	80	90	155	180	45	550	110	55.79
3	Foraminiferans	40	60	210	110	40	460	92	71.90
4	Polychaetes	25	30	-	90	-	145	29	36.81
5	Oligochaetes	55	20	10	250	15	350	70	102.16
6	Ostracods	10	10	20	60	-	100	20	23.45
	<b>Total</b>	<b>330</b>	<b>355</b>	<b>840</b>	<b>1235</b>	<b>190</b>	<b>2950</b>	<b>590</b>	<b>436.28</b>

2007

S. No.	Fauna	Samples					Total	Mean	SD (±)
		1	2	3	4	5			
1	Nematodes	110	120	90	310	120	750	150	90.28
2	Harpacticoid copepods	20	80	10	90	25	225	45	37.08
3	Foraminiferans	35	20	5	90	10	160	32	34.39
4	Polychaetes	60	55	40	90	45	290	58	19.56
5	Oligochaetes	45	50	60	220	75	450	90	73.57
6	Ostracods	5	30	-	50	15	100	20	20.31
	<b>Total</b>	<b>275</b>	<b>355</b>	<b>205</b>	<b>850</b>	<b>290</b>	<b>1975</b>	<b>395</b>	<b>259.88</b>

Table 7. Density of meiofauna communities (individuals/10 cm<sup>-2</sup>) at Station 6 during 2006 and 2007.

2006

S. No.	Fauna	Samples					Total	Mean	SD (±)
		1	2	3	4	5			
1	Nematodes	450	650	445	870	1125	3540	708	291.22
2	Harpacticoid copepods	320	175	210	255	530	1490	298	140.56
3	Foraminiferans	90	110	120	110	190	620	124	38.47
4	Polychaetes	-	50	10	20	40	120	24	20.74
5	Oligochaetes	390	280	410	370	120	1570	314	119.29
6	Ostracods	23	17	10	10	40	100	20	12.43
	<b>Total</b>	<b>1273</b>	<b>1282</b>	<b>1205</b>	<b>1635</b>	<b>2045</b>	<b>7440</b>	<b>1488</b>	<b>353.77</b>

2007

S. No.	Fauna	Samples					Total	Mean	SD (±)
		1	2	3	4	5			
1	Nematodes	1200	850	1450	1005	535	5040	1008	346.75
2	Harpacticoid copepods	735	345	950	440	230	2700	540	295.91
3	Foraminiferans	275	120	395	300	80	1170	234	131.02
4	Polychaetes	40	120	125	90	15	390	78	48.81
5	Oligochaetes	40	120	90	155	320	725	145	106.54
6	Ostracods	35	40	93	32	10	210	42	30.73
7	Isopods	-	-	25	-	-	25	5	11.18
	<b>Total</b>	<b>2325</b>	<b>1595</b>	<b>3128</b>	<b>2022</b>	<b>1190</b>	<b>10260</b>	<b>2052</b>	<b>739.10</b>

**Table 8.** Density of meiofauna communities (individuals/10 cm<sup>2</sup>) at Station 7 during 2006 and 2007.

**2006**

S. No.	Fauna	Samples					Total	Mean	SD (±)
		1	2	3	4	5			
1	Nematodes	1125	1200	794	445	556	4120	824	334.79
2	Harpacticoid copepods	320	145	230	120	245	1060	212	80.67
3	Foraminiferans	210	120	235	145	90	800	160	60.93
4	Polychaetes	-	10	40	75	35	160	32	29.28
5	Oligochaetes	50	40	540	420	650	1700	340	281.34
6	Ostracods	40	55	15	-	-	110	22	24.65
7	Isopods	50	25	-	-	-	75	15	22.36
	<b>Total</b>	<b>1795</b>	<b>1595</b>	<b>1854</b>	<b>1205</b>	<b>1576</b>	<b>8025</b>	<b>1605</b>	<b>254.48</b>

**2007**

S. No.	Fauna	Samples					Total	Mean	SD (±)
		1	2	3	4	5			
1	Nematodes	770	850	1100	410	870	4000	800	250.20
2	Harpacticoid copepods	290	440	680	150	215	1775	355	211.36
3	Foraminiferans	250	320	495	120	190	1375	275	143.44
4	Polychaetes	50	20	75	110	20	275	55	38.41
5	Oligochaetes	90	140	50	280	40	600	120	97.72
6	Ostracods	180	40	100	35	120	475	95	60.21
7	Isopods	50	150	225	-	200	625	125	96.82
	<b>Total</b>	<b>1680</b>	<b>1960</b>	<b>2725</b>	<b>1105</b>	<b>1655</b>	<b>9125</b>	<b>1825</b>	<b>590.88</b>

**Table 9.** Density of meiofauna communities (individuals/10 cm<sup>2</sup>) at Station 8 during 2006 and 2007.

**2006**

S. No.	Fauna	Samples					Total	Mean	SD (±)
		1	2	3	4	5			
1	Nematodes	340	75	245	175	250	1085	217	98.65
2	Harpacticoid copepods	120	25	90	70	85	390	78	34.75
3	Foraminiferans	140	15	105	40	35	335	67	52.99
4	Polychaetes	40	60	40	40	60	240	48	10.95
5	Oligochaetes	50	90	30	35	45	250	50	23.72
6	Ostracods	30	-	40	-	50	120	24	23.02
	<b>Total</b>	<b>720</b>	<b>265</b>	<b>550</b>	<b>360</b>	<b>525</b>	<b>2420</b>	<b>484</b>	<b>176.83</b>



**2007**

S. No.	Fauna	Samples					Total	Mean	SD (±)
		1	2	3	4	5			
1	Nematodes	195	440	170	330	90	1225	245	139.10
2	Harpacticoid copepods	45	90	50	70	20	275	55	26.46
3	Foraminiferans	40	20	50	45	70	225	45	18.03
4	Polychaetes	90	30	70	50	110	350	70	31.62
5	Oligochaetes	140	80	125	30	75	450	90	43.73
6	Ostracods	-	20	-	20	-	40	8	10.95
	<b>Total</b>	<b>510</b>	<b>680</b>	<b>465</b>	<b>545</b>	<b>365</b>	<b>2565</b>	<b>513</b>	<b>115.25</b>

**Table 10.** Density of meiofauna communities (individuals/10 cm<sup>-2</sup>) at Station 9 during 2006 and 2007.

**2006**

S. No.	Fauna	Samples					Total	Mean	SD (±)
		1	2	3	4	5			
1	Nematodes	515	425	600	450	520	2510	502	68.43
2	Harpacticoid copepods	205	235	195	215	155	1005	201	29.66
3	Foraminiferans	125	110	130	160	150	675	135	20.00
4	Polychaetes	45	40	40	80	20	225	45	21.79
5	Ostracods	60	20	10	10	20	120	24	20.74
	<b>Total</b>	<b>950</b>	<b>830</b>	<b>975</b>	<b>915</b>	<b>865</b>	<b>4535</b>	<b>907</b>	<b>59.64</b>

**2007**

S. No.	Fauna	Samples					Total	Mean	SD (±)
		1	2	3	4	5			
1	Nematodes	700	645	550	790	690	3375	675	87.46
2	Harpacticoid copepods	220	180	265	330	205	1200	240	59.06
3	Foraminiferans	105	90	110	140	155	600	120	26.69
4	Polychaetes	10	15	45	35	20	125	25	14.58
5	Oligochaetes	30	10	15	-	20	75	15	11.18
6	Ostracods	40	40	20	20	40	160	32	10.95
7	Isopods	40	10	-	10	-	60	12	16.43
	<b>Total</b>	<b>1145</b>	<b>990</b>	<b>1005</b>	<b>1325</b>	<b>1130</b>	<b>5595</b>	<b>1119</b>	<b>134.97</b>

**Table 11.** Density of meiofauna communities (individuals/10 cm<sup>2</sup>) at Station 10 during 2006 and 2007.

**2006**

S. No.	Fauna	Samples					Total	Mean	SD (±)
		1	2	3	4	5			
1	Nematodes	450	345	475	670	740	2680	536	163.68
2	Harpacticoid copepods	125	140	170	225	305	965	193	73.37
3	Foraminiferans	90	130	90	180	240	730	146	64.27
4	Polychaetes	30	90	60	78	22	280	56	29.53
5	Ostracods	20	20	10	-	30	80	16	11.40
	<b>Total</b>	<b>715</b>	<b>725</b>	<b>805</b>	<b>1153</b>	<b>1337</b>	<b>4735</b>	<b>947</b>	<b>281.87</b>

**2007**

S. No.	Fauna	Samples					Total	Mean	SD (±)
		1	2	3	4	5			
1	Nematodes	745	225	550	370	985	2875	575	300.89
2	Harpacticoid copepods	160	120	220	270	380	1150	230	101.49
3	Foraminiferans	110	90	110	150	290	750	150	81.24
4	Polychaetes	20	130	40	110	40	340	68	48.68
5	Oligochaetes	-	80	-	45	-	125	25	36.40
6	Ostracods	10	20	20	10	40	100	20	12.25
7	Isopods	35	-	40	-	-	75	15	20.62
	<b>Total</b>	<b>1080</b>	<b>665</b>	<b>980</b>	<b>955</b>	<b>1735</b>	<b>5415</b>	<b>1083</b>	<b>395.86</b>

**Table 12.** Density of meiofauna communities (individuals/10 cm<sup>2</sup>) at Station 11 during 2006 and 2007.

**2006**

S. No.	Fauna	Samples					Total	Mean	SD (±)
		1	2	3	4	5			
1	Nematodes	225	110	340	270	105	1050	210	102.16
2	Harpacticoid copepods	120	80	230	110	40	580	116	70.92
3	Foraminiferans	110	85	190	90	120	595	119	42.19
4	Polychaetes	40	75	20	40	80	255	51	25.59
5	Ostracods	20	-	80	50	-	150	30	34.64
6	Gastrotriches	-	-	10	10	-	20	4	5.48
	<b>Total</b>	<b>515</b>	<b>350</b>	<b>870</b>	<b>570</b>	<b>345</b>	<b>2650</b>	<b>530</b>	<b>214.51</b>

2007

S. No.	Fauna	Samples					Total	Mean	SD (±)
		1	2	3	4	5			
1	Nematodes	120	230	420	120	510	1400	280	177.62
2	Harpacticoid copepods	60	105	155	60	245	625	125	77.70
3	Foraminiferans	40	90	110	120	180	540	108	50.70
4	Polychaetes	90	80	55	100	50	375	75	21.79
5	Oligochaetes	78	45	10	80	12	225	45	34.01
6	Ostracods	18	12	40	40	10	120	24	14.90
7	Isopods	-	-	12	-	8	20	4	5.66
	<b>Total</b>	<b>406</b>	<b>562</b>	<b>802</b>	<b>520</b>	<b>1015</b>	<b>3305</b>	<b>661</b>	<b>244.90</b>

Table 13. Density of meiofauna communities (individuals/10 cm<sup>-2</sup>) at Station 12 during 2006 and 2007.

2006

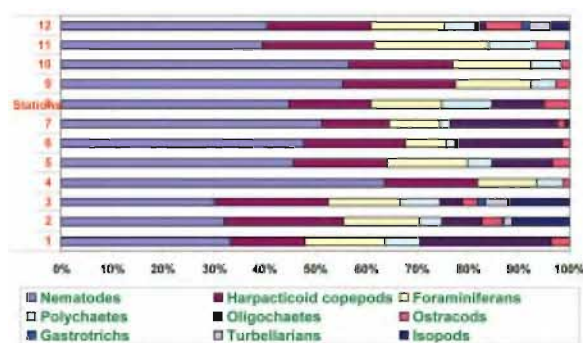
S. No.	Fauna	Samples					Total	Mean	SD (±)
		1	2	3	4	5			
1	Nematodes	125	320	145	205	395	1190	238	116.06
2	Harpacticoid copepods	90	120	95	100	195	600	120	43.45
3	Foraminiferans	50	90	60	75	150	425	85	39.37
4	Polychaetes	75	30	60	-	15	180	36	31.10
5	Oligochaetes	30	-	20	10	-	60	12	13.04
6	Ostracods	30	60	20	60	40	210	42	17.89
7	Gastrotriches	10	5	-	-	25	40	8	10.37
8	Turbellarians	10	60	-	-	55	125	25	30.00
9	Isopods	25	-	25	20	40	110	22	14.40
	<b>Total</b>	<b>445</b>	<b>685</b>	<b>425</b>	<b>470</b>	<b>915</b>	<b>2940</b>	<b>588</b>	<b>210.52</b>

2007

S. No.	Fauna	Samples					Total	Mean	SD ( $\pm$ )
		1	2	3	4	5			
1	Nematodes	423	345	110	256	356	1490	298	120.73
2	Harpacticoid copepods	180	157	133	75	125	670	134	39.40
3	Foraminiferans	150	72	98	60	110	490	98	35.24
4	Polychaetes	19	45	59	12	90	225	45	31.57
5	Oligochaetes	70	23	16	10	51	170	34	25.52
6	Ostracods	64	20	10	32	34	160	32	20.35
7	Turbellarians	4	12	-	-	4	20	4	4.90
8	Isopods	30	-	12	14	4	60	12	11.58
	<b>Total</b>	<b>940</b>	<b>674</b>	<b>438</b>	<b>459</b>	<b>774</b>	<b>3285</b>	<b>657</b>	<b>212.86</b>

Nematodes were the most dominant group of meiofauna at all the sampling stations of Tamil Nadu coast, constituting from 30.25% to 63.60% of total abundance (Figs. 2 a, b). The next important faunal group was the harpacticoid copepods which contributes 10.72 to 26.32% of the total meiofauna. Nematodes and harpacticoid copepods together comprised about 80% of the meiofauna (Figs. 2 a, b).

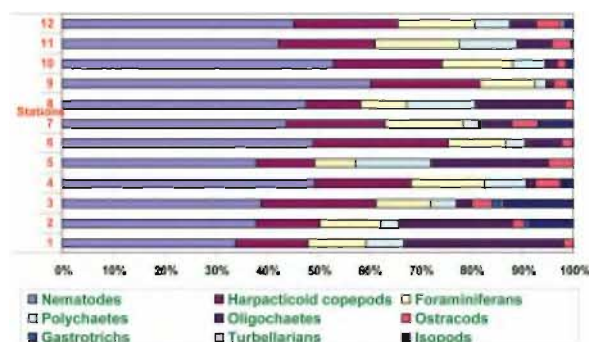
**Fig. 2a** Mean percentage composition of meiofauna communities from intertidal sediments of Tamil Nadu coast during 2006.



The foraminiferans ranked third, with a percentage contribution of 8.1 to 22.45% of the total meiofauna. However, at station 11 (Rameswaram) alone they ranked second. Polychaetes formed the fourth largest group, with a percentage occurrence of 1.61 to 14.69% of the total fauna. Oligochaetes were observed at all the stations during 2007; nonetheless, it was totally absent at stations 3, 9-11 during 2006. Their

percentage was high (31.33% of the total meiofauna) at station 1 (Chennai) during 2007 (Figs. 2 a, b).

**Fig. 2b** Mean percentage of meiofauna communities from intertidal sediments of Tamil Nadu coast during 2007.



Ostracods were recorded at all the twelve stations, but their population density was considerably low (1.34% to 7.14% of the total abundance).

The other taxa found were gastrotrichs, turbellarians and isopods which made up only less than 5% of the total meiofauna. However, at station 3 (Cuddalore) isopods constituted the maximum percentage (13.91%) during 2007 (Figs. 2 a, b).

## DISTRIBUTION OF MEIOFAUNA

### Sandy sediment

The meiofauna density ranged between 509 and 1169 individuals/10 cm<sup>-2</sup> (Appendix II, Table 2),

464 and 1583 individuals/10 cm<sup>-2</sup> (Appendix II, Table 3), 325 and 2019 individuals/10 cm<sup>-2</sup> (Appendix II, Table 4) and 830 and 975 individuals/10 cm<sup>-2</sup> (Appendix II, Table 10) at stations 1, 2, 3 and 9 respectively during 2006.

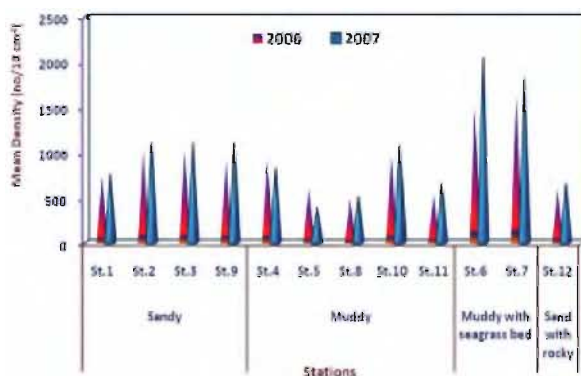
During 2007, ranges of 419 to 1326 individuals/10 cm<sup>-2</sup> (Appendix II, Table 1), 402-1715 individuals/10 cm<sup>-2</sup> (Appendix II, Table 3), 395-2322 individuals/10 cm<sup>-2</sup> (Appendix II, Table 4) and 990-1325 individuals/10 cm<sup>-2</sup> (Appendix II, Table 10) were encountered at stations 1, 2, 3 and 9 respectively.

### Muddy sediment

The meiofaunal density ranged from 155 to 1813 individuals/10 cm<sup>-2</sup> (Appendix II, Table 5), 190 to 1235 individuals/10 cm<sup>-2</sup> (Appendix II, Table 6), 265 to 720 individuals/10 cm<sup>-2</sup> (Appendix II, Table 9), 715 to 1337 individuals/10 cm<sup>-2</sup> (Appendix II, Table 11) and 345 to 870 individuals/10 cm<sup>-2</sup> (Appendix II, Table 12) at stations 4, 5, 8, 10 and 11 respectively during 2006.

During 2007, a ranges of 350-1765 individuals/10 cm<sup>-2</sup> (Appendix II, Table 5), 205-850 individuals/10 cm<sup>-2</sup> (Appendix II, Table 6), 365 to 680 individuals/10 cm<sup>-2</sup> (Appendix II, Table 9), 665-1735 individuals/10 cm<sup>-2</sup> (Appendix II, Table 11) and 406-1015 individuals/10 cm<sup>-2</sup> (Appendix II, Table 12) were recorded at stations 4, 5, 8, 10 and 11 respectively.

**Fig. 3.** Mean total density of meiofauna in relation to substratum from intertidal sediments



### Muddy sediment with seagrass bed

The meiofaunal density ranged between 1205 and 2045 individuals/10 cm<sup>-2</sup> (Appendix II, Table 7) and between 1205 and 1854 individuals/10 cm<sup>-2</sup> (Appendix II, Table 8) at stations 6 and 7 respectively during 2006. During 2007, a range of 1190-3128 individuals/10 cm<sup>-2</sup> (Appendix II, Table 7) and 1105-2725 individuals/10 cm<sup>-2</sup> (Appendix II, Table 8) were recorded at stations 6 and 7 respectively.

### Sandy sediment with rocky environment

The meiofaunal density varied from 425 to 915 individuals/10 cm<sup>-2</sup> (Appendix II, Table 13) and from 438 to 940 individuals/10 cm<sup>-2</sup> at station 12 during 2006 and 2007 respectively (Appendix II, Table 13). In general, muddy sediments with seagrass bed had relatively higher densities of meiofauna than those with other sediment types (Fig. 3). The gastrotrichs and turbellarians were totally absent in muddy environment.

### DIVERSITY INDEX

The diversity indices were lowest at stations 5 (Nagapattinam) and 8 (Tuticorin), which can be considered as indications of the stress at these sites. These sites were very close to the harbor. Station 7, showed higher diversity in addition to a high density of meiofauna. It must be stated that the sediment here was muddy with seagrass (Table 14).

**Table 14.** Diversity of meiofauna at various stations in Tamil Nadu coast during 2006 and 2007 (*S* = Number of species; *N* = Number of animals; *d* = Margalef Richness; *J'* Evenness; *H* = Shannon - Wiener diversity, *l*- Lambda - Simson richness).

Stations	S	N	d	J'	H'(log2)
1	61	734	9.09296	0.89801	5.32584
2	67	1016	9.53257	0.87700	5.31996
3	64	1005	9.11360	0.88939	5.33635
4	49	912	7.04263	0.91500	5.13748
5	40	590	6.11274	0.91232	4.85530**
6	58	488	7.80267	0.89486	5.24206
7	70	1605	9.34848	0.89436	5.48180*
8	43	484	6.79382	0.84802	4.60156**
9	42	907	6.02043	0.93143	5.02259
10	44	947	6.27435	0.91300	4.98444
11	40	530	6.21724	0.95418	5.07810
12	45	588	6.90009	0.93887	5.15612

(\*- higher diversity indices; \*\*- lowest diversity indices)

It could also be seen from the similarity matrix (Fig.4) and the MDS plot (Fig.5) that the muddy and seagrass bed environment, muddy environment and sandy environment harboured distinct populations. Few sites of muddy stations are closer to those in other zones of sandy sediment stations. Nonetheless in some stations of muddy environment no such distinctness could be recognized, probably because of the impact of pollution (stations 5 (NAG), 8 (TUT) and 11 (RAM)).

Fig. 4. Cluster analysis for meiofauna from intertidal sediments of Tamil Nadu coast during 2006 and 2007.

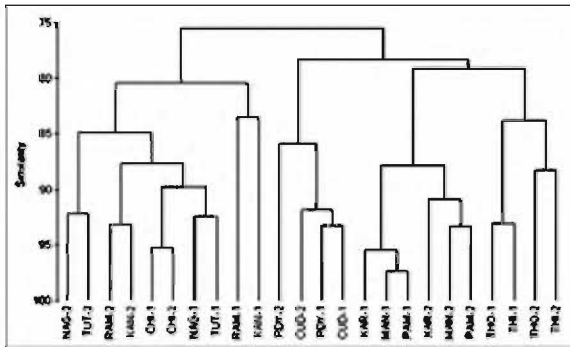
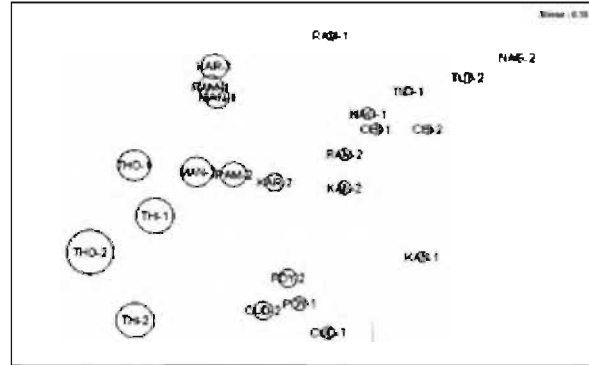


Fig. 5. MDS of meiofauna from intertidal sediments of Tamil Nadu coast during 2006 and 2007.



CHI-Chennai; PDY-Puducherry; CUD-Cuddalore; KAR-Karaikal; NAG-Nagapattinam; THO-Thondi; THI-Thiruchendur; TUT-Tuticorin; MAN-Mandabam; PAM-Pamban; RAM-Rameswaram; KAN-Kanyakumari; 1-2006; 2-2007

The densities of meiofauna varied significantly ( $F = 4.895; P < 0.001$ ) between the stations (Table 15), probably due to the variation in environmental parameters like nature of sediment.

Table 15. ANOVA for meiofauna density within stations.

Factor	SS	Df	Ms	F(cal)	P(F<=F(cal))	F(0.05)
A (Between Groups)	13867.38	11	1260.67	4.895 *** (P<=0.001)	1.90E-07	1.797
R(A) (Within Groups)	309048.04	1200	257.54			
AR (Total)	322915.42	1211				

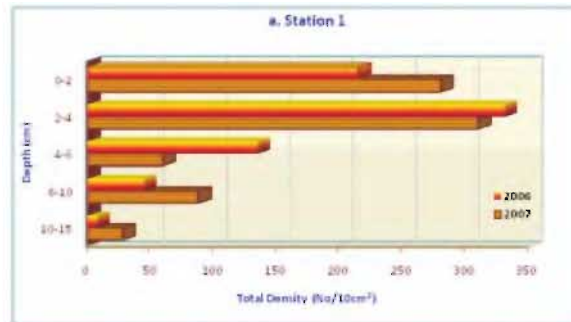
\*\*\* (P<=0.001)

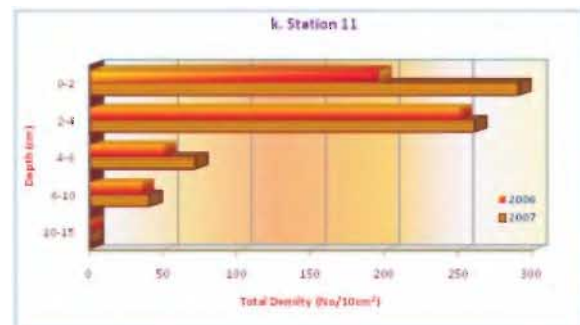
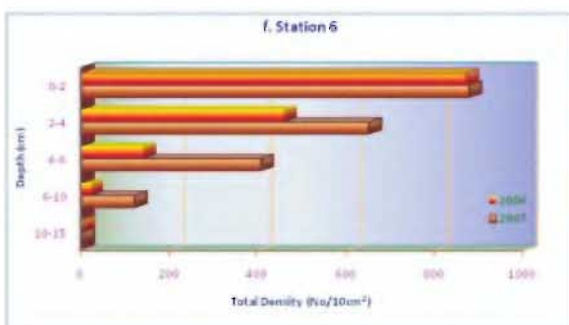
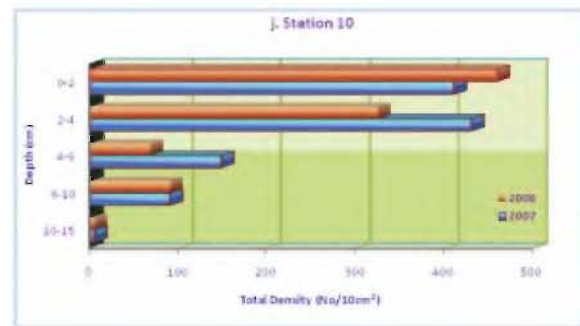
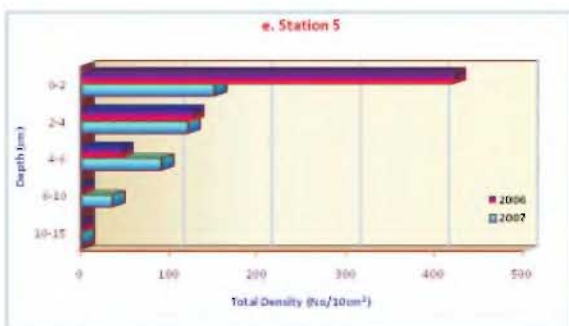
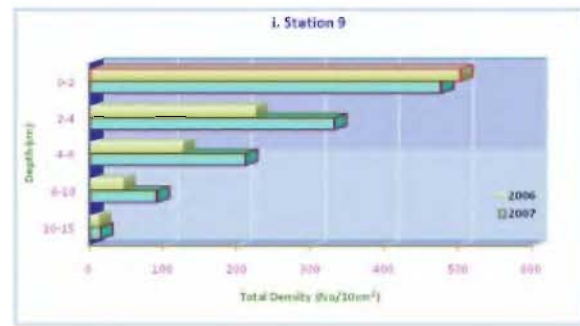
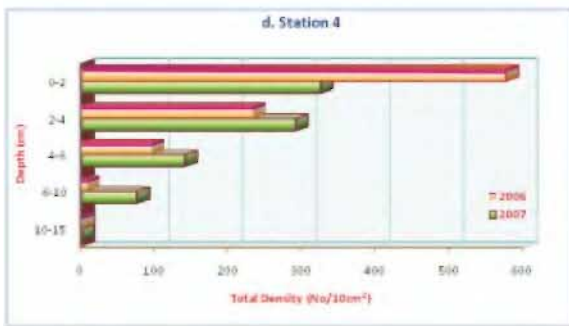
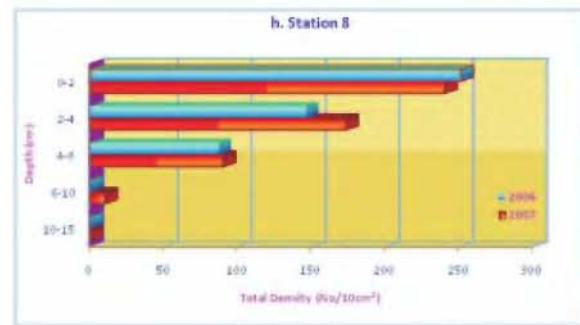
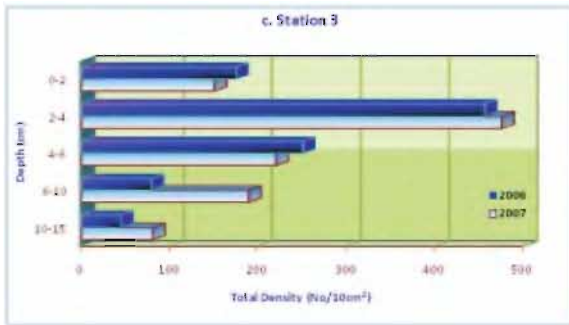
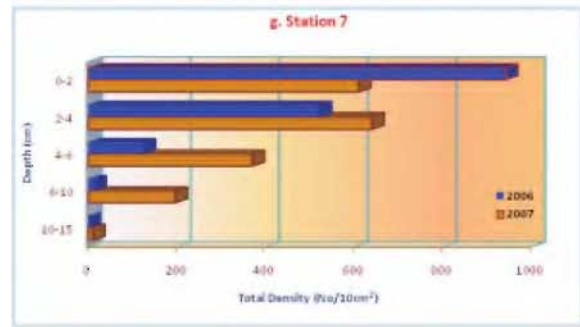
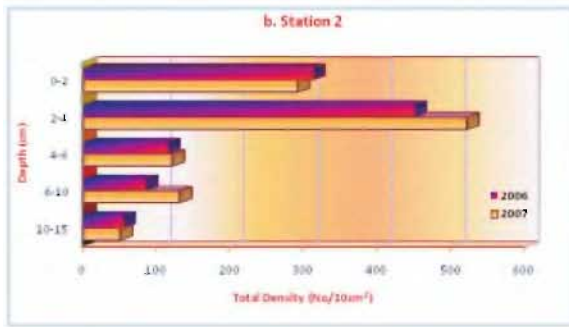
**VERTICAL DISTRIBUTION OF MEIOFAUNA**

The vertical distribution of meiofauna was quite similar in all the twelve stations. Densities were highest near the sediment surface and especially in muddy sediments, where the upper sediment had up 50% of the total fauna (Fig. 6 d, e, h, i, k).

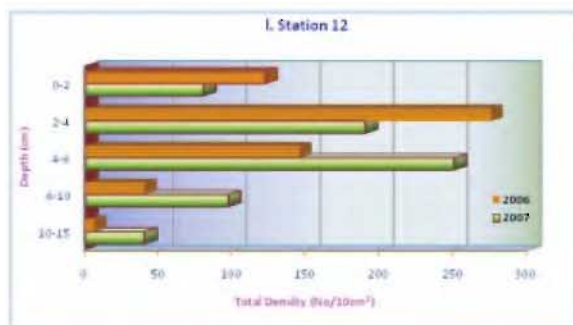
In sandy sediments, total meiofauna fluctuated with depth, and the maximum was found at 2-6 cm. (Fig. 6 a, b, c, l). In muddy sediment with seagrass bed, again, higher densities occurred in the top portion (Fig. 6f, g).

Fig. 6. Vertical distribution of meiofauna (n/10cm<sup>2</sup>) at stations1-12 during 2006 and 2007.









## COMPOSITION OF MEIOFAUNA

A total of 101 species of meiofauna belonging to 63 families were identified, of which 34 species were nematodes, nine were harpacticoid copepods, 38 were foraminiferans, six each were polychaetes, ostracods and oligochates, one was an isopod and one each of unidentified species of gastrotrichs and turbellarians (Table 16).

**Table 16.** Occurrence and distribution of meiofaunal community in the intertidal region of Tamil Nadu coast during 2006 and 2007.

S. No	Name of the Family & Species	Stations											
		1	2	3	4	5	6	7	8	9	10	11	12
<b>NEMATODES</b>													
<b>Family: Thoracostomopsidae</b>													
1	<i>Enoploides</i> sp.	+	+	+	-	-	+	+	-	+	+	+	+
<b>Family: Anoplostomatidae</b>													
2	<i>Anoplostoma</i> sp.	-	-	-	-	-	+	+	-	-	-	-	-
<b>Family: Ironidae</b>													
3	<i>Trissonchulus oceanus</i>	+	+	+	-	+	-	+	-	+	+	+	+
<b>Family: Oxystominidae</b>													
4	<i>Halalaimus filum</i>	+	-	-	+	-	-	+	-	-	-	-	-
5	<i>Halalaimus gracilis</i>	+	+	+	+	-	+	+	+	+	+	+	-
<b>Family: Oncholaimidae</b>													
6	<i>Viscosia viscosa</i>	+	+	+	+	+	+	+	+	+	+	+	+
7	<i>Adoncholaimus fuscus</i>	+	+	+	-	-	+	+	-	+	+	-	+
8	<i>Oncholaimus</i> sp.	+	+	+	-	+	+	+	+	+	-	+	+
<b>Family: Enchelidiidae</b>													
9	<i>Polygastrophora septembulba</i>	-	-	-	+	-	+	+	-	-	-	-	-
<b>Family: Tripyloidiidae</b>													
10	<i>Tripyloides gracilis</i>	-	+	+	+	-	+	+	-	-	-	-	-
<b>Family: Chromadoridae</b>													
11	<i>Ptycholaimellus ponticus</i>	-	-	+	-	-	-	+	-	-	-	-	-
<b>Family: Comesomatidae</b>													
12	<i>Hopperia</i> sp.	-	-	-	+	-	+	+	-	+	-	-	-
13	<i>Dorilaimopsis timmi</i>	-	-	-	+	-	+	+	-	-	-	-	-
14	<i>Paracommesoma dubium</i>	-	-	-	+	-	-	+	-	-	-	-	-



15	<i>Sabatieria falcifera</i>	+	-	+	+	+	+	+	-	-	-	-	-
<b>Family: Cyatholaimidae</b>													
16	<i>Paracanthonchus elongatus</i>	+	-	-	+	-	+	+	+	-	-	-	-
<b>Family: Selachnematidae</b>													
17	<i>Halichoanolaimus dolichurus</i>	+	+	+	+	-	+	+	-	+	+	+	+
<b>Family: Desmodoridae</b>													
18	<i>Metachromadora remanei</i>	+	+	+	+	+	+	+	+	+	+	+	+
19	<i>Desmodora (D.) sanguinea</i>	+	-	+	+	-	-	-	-	-	+	-	-
20	<i>Desmodora (D.) tenuispiculum</i>	+	+	+	-	-	+	+	+	-	+	-	+
21	<i>Spirinia (S.) parasitifera</i>	+	+	-	+	+	+	+	-	-	-	-	-
<b>Family: Microlaimidae</b>													
22	<i>Microlaimus sp.</i>	+	+	-	-	-	-	+	-	-	-	-	-
<b>Family: Ceramonematidae</b>													
23	<i>Pselionema sp.</i>	+	+	+	-	+	+	+	+	+	+	+	+
<b>Family: Leptolaimidae</b>													
24	<i>Camacolaimus barbatus</i>	-	-	-	+	-	+	+	-	-	-	-	-
<b>Family: Desmoscolecidae</b>													
25	<i>Desmoscolex falcatus</i>	+	+	+	+	-	+	+	-	-	-	-	-
<b>Family: Xyalidae</b>													
26	<i>Daptonema conicum</i>	+	+	+	+	+	+	+	+	+	+	+	+
27	<i>Daptonema oxycerca</i>	+	+	-	+	+	+	+	+	+	+	+	+
28	<i>Theristus pertenuis</i>	+	+	+	-	+	+	+	+	+	+	+	+
29	<i>Theristus clax</i>	+	+	+	+	+	+	+	-	+	+	+	+
<b>Family: Linhomoeidae</b>													
30	<i>Paralinhomoeus brevibucca</i>	-	-	-	+	-	+	+	-	-	-	-	-
31	<i>Metalinhomoeus typicus</i>	+	-	+	+	-	-	+	-	-	-	-	-
32	<i>Terschellingia longicaudata</i>	-	-	-	+	-	+	+	-	-	-	-	-
<b>Family: Axonolaimidae</b>													
33	<i>Paradontophora breviseta</i>	-	-	-	+	-	+	+	-	-	-	-	-
<b>Family: Diplopeltidae</b>													
34	<i>Araeolaimus longicauda</i>	-	-	-	+	-	+	-	-	-	-	-	-
<b>HARPACTICOID COPEPODS</b>													
<b>Family: Canullidae</b>													
35	<i>Canuella sp.</i>	-	+	+	-	-	-	-	-	+	-	+	-



<b>Family: Candeinidae</b>													
55	<i>Globigerina</i> sp.	+	+	+	-	-	-	+	-	+	-	+	+
56	<i>Globigerinita</i> sp.	-	+	+	-	-	-	-	-	-	-	-	-
<b>Family: Vaginulinidae</b>													
57	<i>Legena</i> sp.	+	+	+	-	+	-	+	-	-	+	-	-
<b>Family: Neoconorbinidae</b>													
58	<i>Neoconorbina</i> sp.	-	-	-	-	+	-	-	+	-	-	+	+
<b>Family: Nonionidae</b>													
59	<i>Nonion depressulum</i>	-	+	+	-	-	-	+	+	-	-	-	-
<b>Family: Heterolepidae</b>													
60	<i>Oridosalis umbonatus</i>	-	-	-	+	+	-	-	-	-	-	-	-
<b>Family: Planulinidae</b>													
61	<i>Planulina</i> sp.	-	-	-	-	-	-	-	+	-	-	-	-
62	<i>Planorbullina</i> sp.	-	-	-	-	-	-	-	+	-	-	-	-
<b>Family: Hauerinidae</b>													
63	<i>Quinqueloculina bradyana</i>	+	+	+	+	+	+	+	+	+	+	+	+
64	<i>Q. laevigata</i>	+	+	+	-	-	-	+	-	-	-	-	-
65	<i>Q. agglutianans</i>	+	+	+	-	-	+	-	-	-	-	-	-
66	<i>Q. oblanga</i>	+	+	+	-	-	+	-	-	-	-	-	-
67	<i>Q. lamarkiana</i>	-	-	-	-	-	+	-	-	-	-	-	-
<b>Family: Rosalinidae</b>													
68	<i>Rosalina agglutinans</i>	+	+	+	+	+	+	+	+	+	+	+	+
69	<i>R. floridana</i>	-	+	-	-	-	-	+	-	-	+	-	-
70	<i>R. globularis</i>	+	+	+	+	+	+	+	+	+	+	+	+
71	<i>R. vilardeboana</i>	+	-	+	-	-	-	-	+	-	-	-	-
72	<i>R. bradyi</i>	+	+	+	+	+	+	+	+	+	+	+	+
<b>Family: Rotaliidae</b>													
73	<i>Ammonia beccarii</i>	-	+	+	+	-	+	+	+	+	+	+	+
<b>Family: Spirillinidae</b>													
74	<i>Spirillina lateseptata</i>	-	-	-	-	-	-	+	+	-	+	-	+
75	<i>S. limbata</i>	+	+	+	+	+	+	+	+	+	+	+	+
<b>Family: Nubeculariidae</b>													
76	<i>Spiroloculina antillarum</i>	-	+	-	-	-	-	-	-	-	-	-	-
<b>Family: Textulariidae</b>													
77	<i>Textularia cuneiformis</i>	+	-	-	-	-	-	-	-	-	+	-	-

78	<i>T. candiana</i>	-	-	-	-	-	-	-	-	-	-	-	+
79	<i>T. agglutinans</i>	-	+	-	+	-	-	-	+	-	+	-	+
<b>Family: Miliolidae</b>													
80	<i>Triloculina</i> sp.	+	+	+	+	+	+	+	+	+	+	+	+
<b>POLYCHAETES</b>													
<b>Family: Pisionidae</b>													
81	<i>Pisione</i> sp.	+	+	+	+	-	-	+	-	+	-	+	+
<b>Family: Capitellidae</b>													
82	<i>Capitella</i> sp.	+	+	+	+	+	+	+	+	+	+	+	+
<b>Family: Nephtyidae</b>													
83	<i>Nephtys</i> sp.	+	+	+	+	+	-	-	+	+	+	+	+
<b>Family: Nerillidae</b>													
84	<i>Nerillidium</i>	+	+	+	-	-	-	-	-	-	-	+	+
85	<i>Nerilla</i>	+	+	+	+	-	-	+	-	+	-	-	-
<b>Family: Protodrilidae</b>													
86	<i>Protodrilus</i> sp.	-	+	+	+	-	-	+	-	+	+	-	-
<b>OLIGOCHAETES</b>													
<b>Family: Tubificidae</b>													
87	<i>Limnodriloides</i> sp.	+	+	+	-	+	+	+	-	-	-	-	-
88	<i>Akteredrilus</i> sp.	+	+	+	-	+	+	+	+	-	-	-	-
89	<i>Heterodrilus</i> sp.	-	+	-	-	+	+	+	-	-	-	-	-
90	<i>Olavius</i> sp.	+	-	-	-	+	+	+	-	-	-	-	-
91	<i>Phallogdrilus</i> sp.	+	-	-	-	-	+	+	-	-	-	-	-
<b>Family: Enchytracidae</b>													
92	<i>Grania</i> sp.	+	+	+	-	+	+	+	+	-	-	-	+
<b>OSTRACODS</b>													
<b>Family: Cypridae</b>													
93	<i>Cyprideis</i> sp.	+	+	+	+	-	-	-	+	-	-	-	-
<b>Family: Cytherideidae</b>													
94	<i>Cytheridea</i> sp.	-	-	-	-	+	+	+	-	-	-	-	-
<b>Family: Paracytherideidae</b>													
95	<i>Paracytheridea</i> sp.	-	-	-	-	-	-	-	-	-	-	-	+
<b>Family: Cyprididae</b>													
96	<i>Herpetocypris</i> sp.	+	+	+	-	-	+	+	+	+	+	+	+

<b>Family: Cytheruridae</b>														
97	<i>Cytheromorpha</i> sp.	+	+	+	+	+	+	+	+	+	+	+	+	+
<b>Family: Paracythermidae</b>														
98	<i>Paracythroma</i> sp	-	-	-	-	-	-	-	-	+	-	-	-	-
<b>ISOPODS</b>														
<b>Family: Microcerberidae</b>														
99	<i>Microcerberus</i> sp.	-	+	+	-	-	-	+	-	-	-	-	-	+

+ Presence of nematode distribution

- Absence of nematode distribution

Nine major meiofaunal taxa i.e. nematodes, harpacticoid copepods, foraminiferans, polychaetes, ostracods, oligochaetes, gastrotrichs, turbellarians and isopod were recorded at different sediment nature of Tamil Nadu coast. Nematodes were the most abundant group of meiofauna at all the sampling sites. This is generally the case in marine sediments. The abundance of polychaetes was less, which may be due to predominance of sand fraction in sediments at most of the stations. Oligochaetes were second in abundance to nematodes only at stations 1, 6 and 7 (Chennai, Thondi and Thiruchendur), probably because at station 1, situated near the sewage mixing area and sediment here was very fine. In general, oligochaetes are mainly found in the polluted areas. Among the different sampling sites, areas with seagrass bed cover (stations 6 and 7) sediment contained highest density of meiofauna and also mainly inhabited by burrowers such as nematodes and oligochaetes. Nematodes were the most dominant group in the

finer sediments. Meiofauna densities in the seagrass bed were significantly related, with a time log, to change in bacterial standing stock, indicating that microbes may be an important resource. The increase of detritus, which provides the main food for the meiofauna, is suggested to be the reason for the high meiofauna densities observed in the seagrass bed. A lowest density of meiofauna was observed in sandy sediments especially at stations 1 (Chennai), 5 (Nagapattinam), 8 (Tuticorin), 11 (Rameswaram) and 12 (Kanyakumari). Probably because at station 1, situated near the sewage mixing area.

#### ACKNOWLEDGEMENTS

The first author is highly thankful to the Director, ZSI, Kolkata for support and facilities provided to carryout my Ph.D programme for his excellent guidance and encouragement in Ph.D and also thankful to Dr. C.Venkatraman Scientist-C and Officer-in-charge, MBRC/ZSI for his support.

#### REFERENCE

Warwick, R.M., H.M. Platt and Somerfield, P. J., 1998. Free-living marine nematodes. Part III: *British Monhysterids*. Synopses of the British Fauna (New series) No. 53, Shrewsbury: Field Studies Council, 296 pp.