

Distribution and Diversity of Oligochaetes of Tamilnadu Coast, India

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ABSTRACT

Aim of this research was to investigate Oligochaetes distribution and diversity in Tamilnadu Coast during 2006 and 2007. Meiofauna was abundant in all samples; the animals are harpacticoida, Nematoda, Oligochaeta, Tardigrada, Ostracoda etc. During the present study, oligochaetes were observed to be the second dominant group only at stations 6 and 7, which were organically enriched. This is found in abundance in sewage polluted waters.

Keywords: Oligochaetes, Diversity, abundance, Distribution & Density

INTRODUCTION

The Tamil Nadu Coast is located on the southern part of India. The twelve stations as in Fig. 1 were chosen for the present study from entire coast of Tamil Nadu. The Oligochaetes inhabiting the different sediment habitat of Tamilnadu was studied from 2006 and 2007. A brief description of the density, sediment characters, total organic carbon, and vertical distribution in different sediment habitats, diversity and cluster analysis is given. The density of total Oligochaetes individuals in these intertidal sediments ranged from 26 animals/100 cm³ to 1440 animals/100 cm³. Several genera and species regarded as widespread and cosmopolitan were recorded. The distribution of Oligochaetes species discussed in relation to the nature of the substratum. Highest densities of Oligochaetes were recorded at Thondi during 2006 and 2007, while lowest density was observed at Tuticorin and Nagaipattinam respectively during 2006 and 2007. The similarity in the Oligochaetes fauna between various stations in the estuary is discussed.

RESULTS

Abundance of oligochaetes:

The oligochaetes were recorded at all the 12 stations during 2007. However, during 2006, they were totally absent at stations 4 and 9-11. Their density range from 90 to 345 individuals/10 cm², 16 to 170 individuals/10 cm², 0 to 75 individuals/10 cm², 10 to 250 individuals/10 cm², 120 to 410 individuals/10 cm², 40 to 650 individuals/10 cm², 30 to 50 individuals/10 cm² and 0 to 30 individuals/10 cm² at stations 1-12 respectively during 2006.

During 2007, it was observed to be 78-310 n/10 cm², 45-475 n/10 cm², 0-75 n/10 cm², 0-40 n/10 cm², 45-220 n/10 cm², 40-320 n/10 cm², 40-280 no/10 cm², 30-140 no/10 cm², 0-30 n/10 cm², 0-80 n/10 cm², 10-80 n/10 cm², 10-70 n/10 cm² at stations 1- 12 respectively. (Fig.2).

The mean density of oligochaetes ranged from 0 to 340 n/10 cm² during 2006 and from 15 to 246 n/10 cm² during 2007. The highest density of oligochaetes was recorded at station 7 during 2006 and station 2 during 2007 (Figs. 3).

Species composition of oligochaetes:

Totally six species belonging to six genera were identified. i.e. *Limnodriloides* sp., *Akteredrilus* sp., *Heterodrilus* sp., *Olavius* sp., *Phalodrilus* sp., *Grania* sp. Species such as *Akteredrilus* sp. and *Olavius* sp. together comprised 17% of the total abundance. Only one species (*Heterodrilus* sp.) occurred sporadically.

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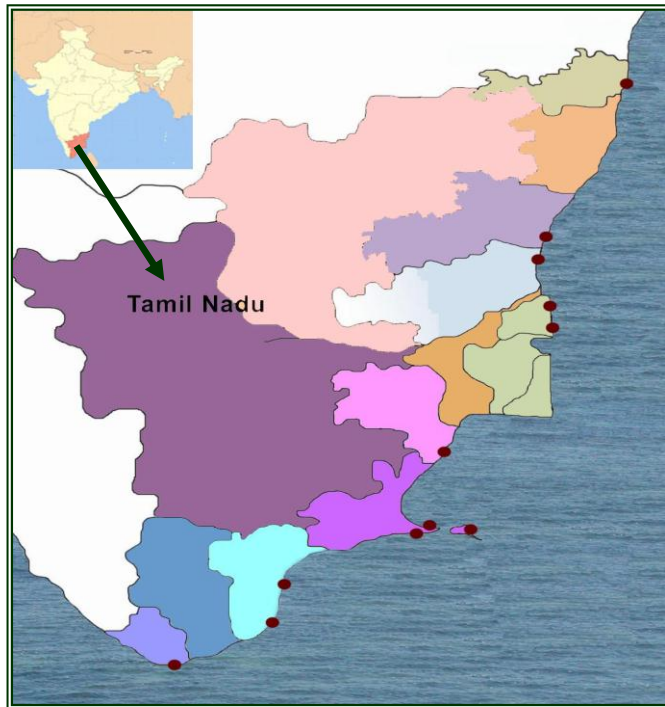
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Nonetheless, stations 6 and 7 have all the six species of oligochaetes.

Figure-1. Study areas



Family level composition of oligochaetes:

Two families of oligochaetes were identified. Of these Tubificidae had 5 species which comprised 0-15.67% of the total abundance number.

Diversity of oligochaetes:

The oligochaete species composition in relation to sediment characteristics showed some distinct variations. Greater diversity was observed at station 5 (Nagapattinam), which was an organically enriched environment (Table 1).

The significance difference ($F=3.564, p<0.001$) was observed with respect to abundance between the stations (Table 2).

The *k*-dominance curves showed clear variation in the dominance of species more at station 5 as this station was located very close to harbor area. These findings also support the results of Shannon-Wiener diversity index (H') and evenness index (J) and MDS analysis. The differences between the other stations were less clear as the curves crossed (Figure-4).

The maximum density of oligochaetes was found at 2-4 cm in sandy sediments (0-145 individuals 10 cm^{-2} ; 14 % of the total fauna) (Figs. 5 a, b, c & l), whereas in muddy sediments, the maximum density was reached at 0-2 cm interval (0-214 individuals 10 cm^{-2} ; 15 % of the total abundance) (Figs. 5 d, e, f, g, h, j & k).

The other depth intervals of sandy sediments showed 0-80 individuals/ 10 cm^{-2} , 0-30 individuals 10 cm^{-2} , 0-45 individuals/ 10 cm^{-2} and 0-25 individuals/ 10 cm^{-2} at 0-2 cm, 4-6 cm, 6-10 cm and 10-15 cm interval respectively. In muddy sediments, the range was from 0 to 170 individuals/ 10 cm^{-2} , 0 to 10 individuals/ 10 cm^{-2} , 0 to 95 individuals/ 10 cm^{-2} and 0 to 5 individuals/ 10 cm^{-2} at 0-4 cm, 4-6 cm, 4-6 cm, 6-10 cm and 10-15 cm depth intervals respectively.

Figure-2. Mean density of Oligochaetes of Tamil Nadu coast during 2006 and 2007 (average of five replicates)

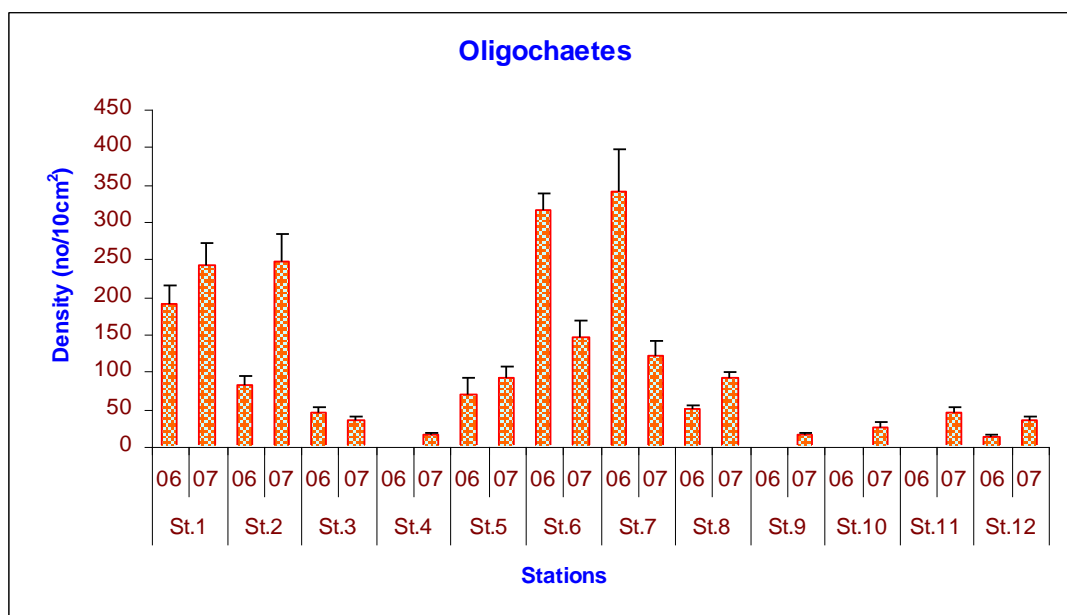
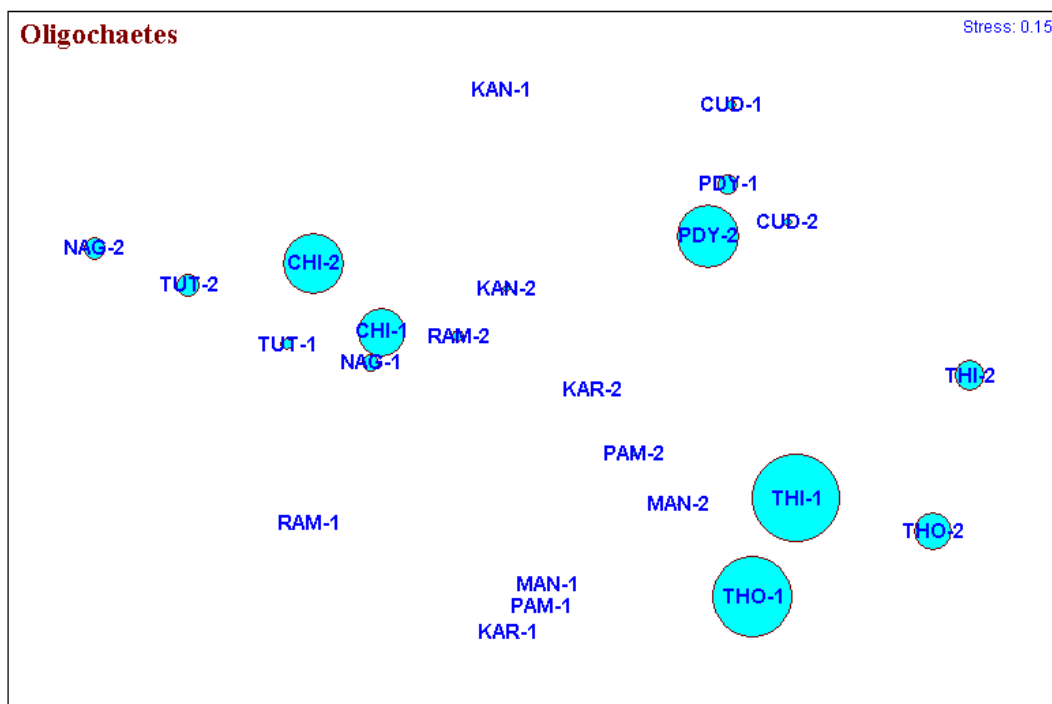


Figure-3. MDS for Oligochaetes in Tamil Nadu coast during 2006 and 2007



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

Table-1. Diversity of oligochaete at various stations of Tamil Nadu coast during 2006 and 2007 (S= Number of species; N= Number of animals; d=Margalef Richness; J' Evenness; H=Shannon-Wiener diversity, I-Lambda –Simpson richness).

Stations	S	N	D	J'	H'(log2)	1-Lambda'
1	5	190	0.7623	0.7965	1.849	0.6865
2	4	80	0.6846	0.6528	1.306	0.4687
3	3	45	0.5254	0.9057	1.436	0.6061
4	0	0	****	****	0	****
5	5	70	0.9415	0.9367	2.175	0.7739
6	6	314	0.8697	0.7413	1.916	0.6849
7	6	340	0.8578	0.7633	1.973	0.6861
8	2	50	0.2556	0.7219	0.7219	0.3265
9	0	0	****	****	0	****
10	0	0	****	****	0	****
11	0	0	****	****	0	****
12	1	12	0	****	0	0

Table-2. One-way ANOVA of all species of oligochaetes at different stations.

Factor	SS	Df	Ms	F(cal)	P(F<=F(cal))	F(0.05)
A (Between Groups)	27541.375	11	2503.761	3.564791994	*** (P<=0.001)	0.000681125
R(A) (Within Groups)	42141.5	60	702.3583			1.9522119
AR (Total)	69682.875	71				

*** (P<=0.001)

Figure-4. Average *k*-dominance curves derived from oligochaetes species at all the 12 stations of Tamil Nadu coast. The *k*-dominance curves illustrated the dominance of oligochaetes in few stations.

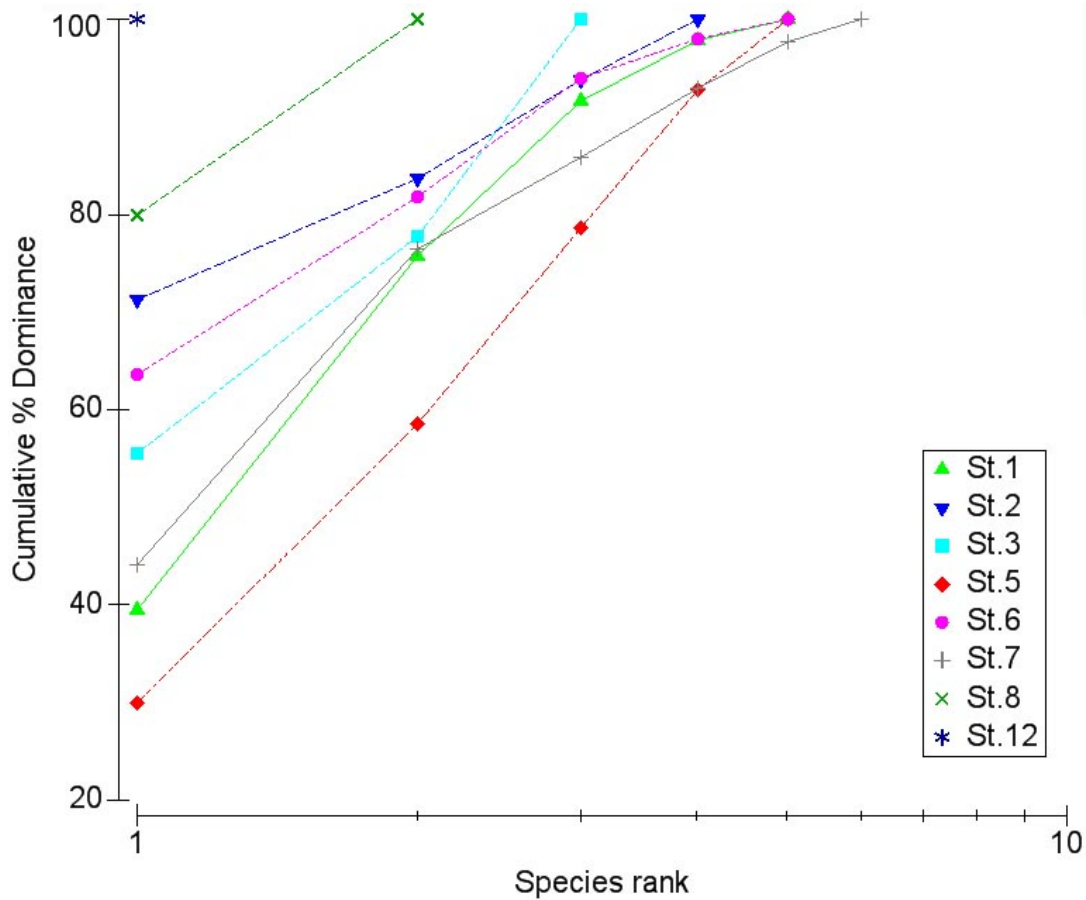


Figure-5. Vertical distribution of oligochaetes of intertidal sediments of Tamil Nadu coast at stations 1-12.

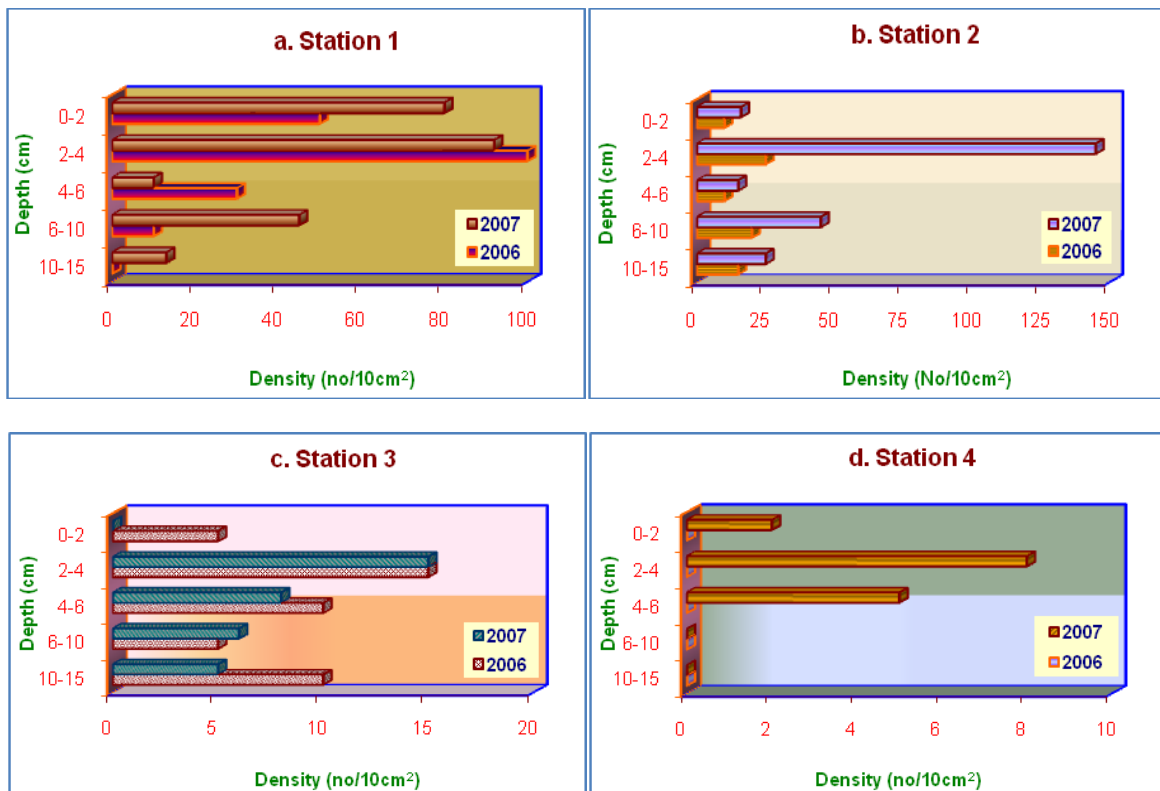
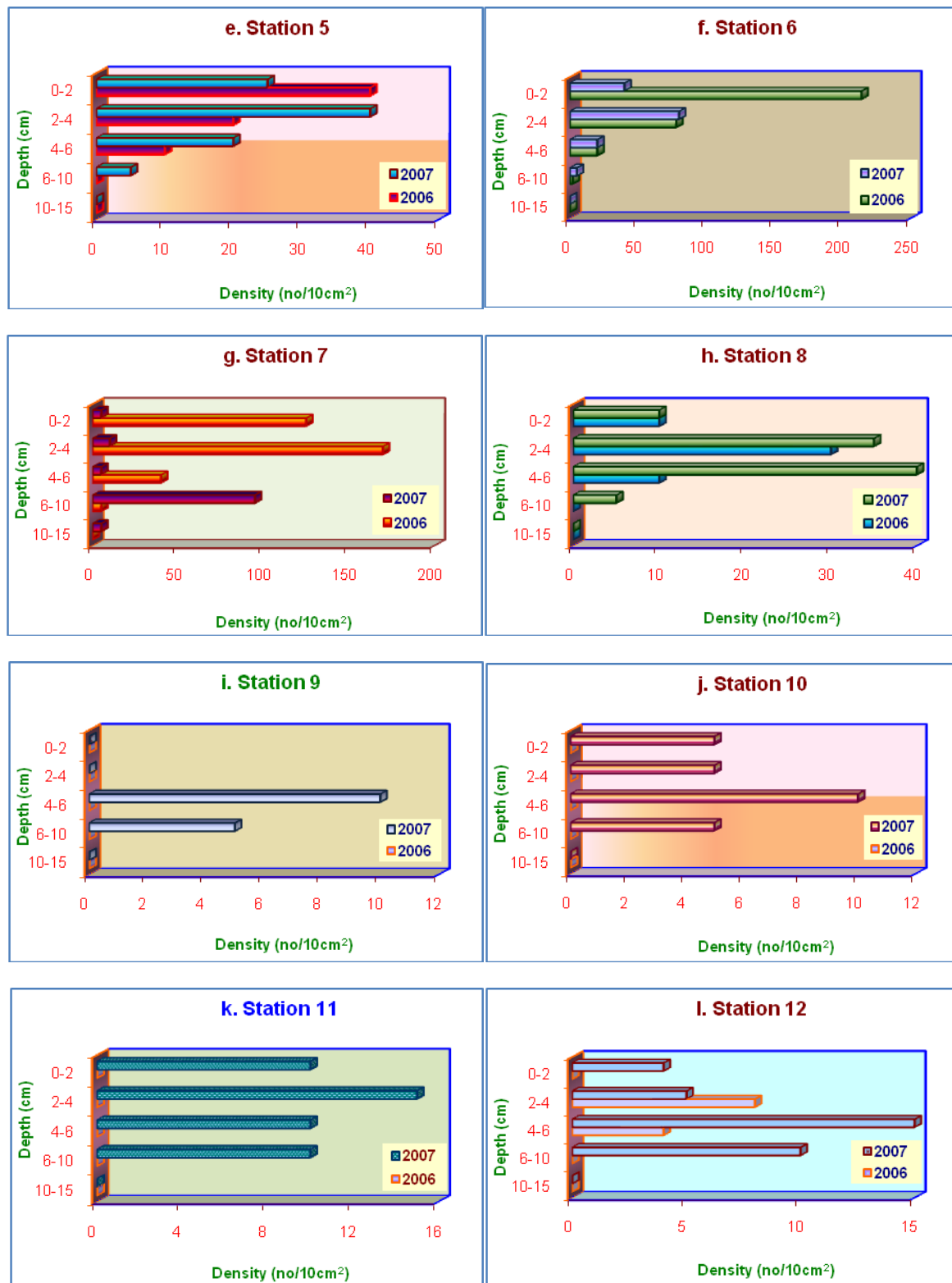


Figure-5. Vertical distribution of oligochaetes of intertidal sediments of Tamil Nadu coast at stations 1-12.



Conclusion

The oligochaetes were distributed up to a depth of 15 cm. A linear increase in the oligochaetes density was observed corresponding to the increase in depth.

Hodda and Nicholas (1985) observed oligochaetes to be the abundant group following nematodes and copepods, while Dye (1983) recorded ciliates, followed

by oligochaetes, turbellarians and Kinorhynchs. Copepods, Polychaetes, Gastrotriches, larvae of crustaceans and insects only appeared sporadically. During the present study, oligochaetes were observed to be the second dominant group only at stations 6 and 7, which were organically enriched. Hodda and Nicholas also found the abundance of oligochaetes to be significantly correlated to levels of water pollution. Coull and Wells (1981) have suggested that oligochaete abundance may be a better indicator of heavy metal pollution than other proposed indicator. Goldin *et al.*, (1996) observed oligochaetes sewage polluted waters. Oligochaetes were second in abundance to nematodes only at stations 1, 6 and 7 (Chennai, Thondi and Thiruchendur) which are situated very close to the area where the sewage was found and the sediment here was very fine. Generally oligochaetes are mainly found in the polluted areas. Turbellarians and Gastrotriches occurred sporadically.

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Conflict of Interests

Authors declare that there is no conflict of interests regarding the publication of this paper.

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