CONTINUOUS MONITORING OF SEA WATER IN AND AROUND THE ITPCL POWER PROJECT AT PARANGIPETTAI, CUDDALORE DISTRICT

Monthly Data Report (July - 2024)

Submitted by

Dr. P. MURUGESAN
Associate Professor & Principal Investigator
Annamalai University

Research Scholars

Dr. K. Manimaran (Research Associate)
Dr. R. Punniyamoorthy
Mr. P. Chandrasekaran
Ms. Sasmita Swain

CAS IN MARINE BIOLOGY
FACULTY OF MARINE SCIENCES
ANNAMALAI UNIVERSITY
Parangipettai, 608502 Tamilnadu

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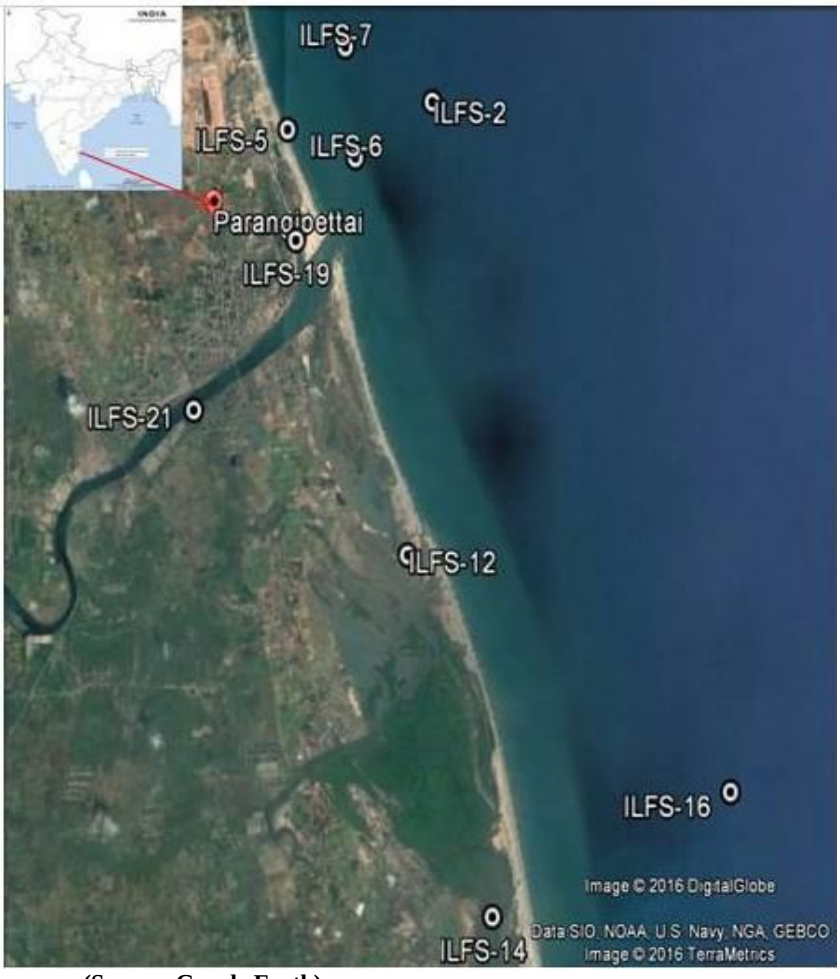
PHYSICO – CHEMICAL AND BIOLOGICAL CHARACTERISTICS

1.1 Sampling Details

As that of previous months, the seawater quality characteristics were studied by conducting sampling in and around the ITPCL Power Project at Parangipettai, Cuddalore District both during low and high tide period during 16-07-2024 in and around the proposed sites including the open sea as shown in Fig.1. The sampling stations details like station code, time, depth and its coordinates are also given in Table 1. Further, water and sediment samples were collected in the pre-determined locations of the open sea, Vellar and Coleroon estuaries.



(Source: Google Earth)

Figure 1 Map showing the sampling Stations in ITPCL site

Table 1 Details of sampling stations with GPS coordinates in ITPCL site

Sl. No.	Station Code	Time	GPS Coordinates
1	ILFS-2-HT (Dredged soil dumping)	7.10 AM	11°31'27.94"N 79°47'50.77"E
2	ILFS-2-LT	2.00 PM	
3	ILFS-5-HT (Intake)	7.50 AM	11°31'13.31"N 79°46'14.37"E
4	ILFS-5-LT	2.40 PM	
5	ILFS-6-HT (Outfall)	8.25 AM	11°30'58.78"N 79°46'59.61"E
6	ILFS-6-LT	3.30 PM	
7	ILFS-7-HT (North Break Water)	8.55 AM	11°31'56.49"N 79°46'52.76"E
8	ILFS-7-LT	4.00 PM	
9	ILFS-16-HT (Off shore parallel to Mangroves-2)	9.20 AM	11º25’29.13"N 79º51’10.08"E
10	ILFS-16-LT	4.35 PM	
11	ILFS-12-HT (Pichavaram Mangroves extension from Vellar-2)	10.10 AM	11°27'32.11"N 79°47'34.79"E
12	ILFS-12-LT	5.05 PM	
13	ILFS-14-HT (Pichavaram Mangroves extension from Coleroon-2)	7.00 AM	11°24'23.92"N 79°48'31.59"E
14	ILFS-14-LT	2.10 PM	
15	ILFS-19-HT (Annan kovil landing center)	8.20 AM	11° 30' 15.75"N 79° 46'20.07"E
16	ILFS-19-LT	2.55 PM	
17	ILFS-21-HT (Pappa canal)	9.10 AM	11°28'47.22"N 79°45'12.15"E
18	ILFS-21-LT	3.45 PM	

MATERIALS AND METHODS

Water samples

Water samples were collected from the predetermined stations considering the tidal influences, discharge and non-discharge points. Subsurface water samples were collected at a depth of 0.5 – 0.7 m using Niskin water sampler. For accurate measurements of the *in situ*

properties and composition of seawater, proper sampling is of utmost importance. It is essential to ensure that the sampling is contamination free and all the samples were appropriately sub-sampled and preserved to avoid/minimize changes in the water composition during storage. After sampling, adequate care was taken for measurements of hydrographic, chemical and biological properties of sea water in coastal and near-shore waters. Prior to sampling, the sampler and sampling containers were acid washed with 1N HCl in the laboratory. Sample bottles were rinsed thoroughly with the water and after that the samples were collected.

For dissolved oxygen, the samples were fixed by employing Winkler's reagent on board and after fixing the samples were kept in shade until analysis. Temperature and pH in water were measured immediately after collection. The water samples were filtred before analysis. Trace metal samples were collected in acid-washed and pre-cleaned high density polyethylene (HDPE) bottles. Disposable, clean gloves were used while sampling and handling samples for trace metals. All samples were kept in a cool condition away from light to avoid evaporation. All samples (for trace metals) were filtered immediately using 0.22 µM pore size filter paper and acidify the pH till 2 by adding SUPRAPURE NITRIC ACID and stored in metal free plastic bags till analysis, so as to avoid contamination.

Sediment samples

Sediment samples were stored in metal free plastic bags for trace metals and in aluminum foils for organic constituents. These samples were stored in ice boxes for transportation and put to dry in an electric oven at low temperatures (about 60 degrees C) in clean glass petri-dishes.

Collection of Sediment Samples (Grab sampler)

Van veen Grab with a sampling area of 0.1 m^2 was employed as a standard sediment sampler, since it is (i) an efficient sampler for the range of soft surface sediments encountered in

the near shore area, (ii) reliable and simple to operate and (iii) widely applied, which allows data comparison with other marine areas.

Preservation and processing of samples

Storage and Preservation of Samples: It is known that the concentration of dissolved constituents is bound to change with time, due to the biological activity of the microorganisms present in the seawater. Trace quantity are vulnerable to adsorption /desorption process, therefore, they were analyzed immediately. When immediate analysis is not possible, the recommended method include freezing the samples in -80 degree C. A quick note for sample collection and preservation procedures is given below.

Temperature, Salinity and pH analysis

The physical parameters such as temperature, salinity and pH were measured *in-situ* in the field. The subsurface temperature was measured with a mercury thermometer (±0.02°C accuracy) and the pH was measured by a calibrated pH pen (pH ep-3 model). Salinity was estimated using a Hand Refractometer (Atago, Japan). Water samples collected for dissolved oxygen estimation were transferred carefully to BOD bottles. The DO was immediately fixed and brought to the laboratory for further analysis.

Preservation and Laboratory Analysis

After collection, the samples were immediately cooled to 4°C and then brought to the laboratory in an insulated Thermocool box. In the laboratory, water samples were filtered through Whatman GF/C filter paper and analysed for organic matter and other nutrients. Unfiltered samples were used for the estimation of total nitrogen and total phosphorus. All the analyses were carried out by adopting Standard procedures for samples of aquatic origin. Briefly, the methodology for each analysis is given below:

Nitrate and Nitrite

The nitrate and nitrite content of samples were analysed by following the methods described by Strickland and Parsons (1972). The nitrite was estimated from the highly coloured azo dye formed by the addition of N (1-Napthyl) ethylene diamine di hydro-chloride and sulfanilamide into the solution was then measured at 543 nm in a spectrophotometer. The same procedure was followed for the estimation of nitrate. For this, nitrate was reduced to nitrite by passing the sample through copper coated cadmium column. The values are expressed in μmol of Nitrogen/l

Inorganic Phosphate

The single solution mixed reagent procedure developed by Murphy and Riley (1962) was followed for the estimation of dissolved inorganic phosphate levels in water samples. This involves the conversion of phosphate into phosphomolybdic acid, which was then reduced to molybdinum blue color complexes and then the intensity of colour was measured at 882 nm in a Spectrophotometer. The calculated values are expressed in µmol of Phosphorus/l.

Total Phosphorus

The Total Phosphate in samples was estimated by adopting the method described by Menzel and Corwin (1964). This procedure involves the conversion of organically bound phosphate into inorganic phosphate by wet oxidation of samples with potassium persulphate in an Autoclave for 30 min at 15 lbs pressure. The converted inorganic phosphate was then estimated by using the method described by Murphy and Riley (1962). The subtraction of original dissolved inorganic phosphate from total phosphate yielded the organic phosphate in the water sample. The calculated value is expressed in µmol of Phosphorus/l.

Sulfate

The reactive sulfate content of water was estimated by following the method described by AWWA, WEF, APHA, 1998; Sawyer et al. (2000) and Kanagaraj et al. (2017). The turbidimetric method depends on the fact that barium sulfate formed following barium chloride addition to a sample (Equation 2) tends to precipitate in a colloidal form and this tendency is enhanced in the presence of an acidic buffer (consists of magnesium chloride, potassium nitrate, sodium acetate, and acetic acid). These precipitates need to be separated through filtration (using a filter) before the sample is analyzed for sulfate concentration. This is a very rapid method and can be used for samples with sulfate concentration greater than 10 mg/L (samples can be diluted and then it can be analyzed).

Reactive Silicate

The reactive silicate content of water was estimated by following the method of Strickland and Parsons (1972). In this method, the intensity of blue color formed by silico-molybdate complex was measured in a Spectrophotometer at 810 nm and the calculated values are expressed in µmol of Silica/l

Sediment Analysis

For the analysis of textural composition and pH, the air-dried sediment samples were used as such. For all other analyses of organic matter, sediment samples were ground to fine powder and dried in an oven at 110°C to constant weight for an hour.

Total Organic Carbon

The estimation of total organic carbon in sediment was performed by adopting the method of El Wakeel and Riley (1956). The procedure involves chromic acid digestion and

subsequent titration against ferrous ammonium sulphate solution in the presence of 1-10 Ferrous phenonthroline indicator. The values calculated are expressed in mgC/g of sediment.

Heavy Metal Analysis in Water and Sediment Samples

Seawater samples were collected in pre-cleaned polypropylene bottles with 10% nitric acid and Milli-Q water and acidified till pH ~1.6 using HNO_3 for further metal detection by using ICP-MS (Søndergaard et al., 2015). Sediment samples were collected with the aid of cleaned and dried Teflon/stainless steel coated Peterson grab. Sediment samples were transferred from the Grab to cleaned polyethylene containers using cleaned plastics scoops. The samples were stored in frozen condition for further analysis. The preserved sediment sub-samples were dried at 110°C to constant weight for estimation of metals. Dry powdered sediment was gently heated and digested with Hydrofluoric acid whereby Silica volatizes as Silicon tetra-fluoride. This is followed by treatment with Nitric acid and Per-chloric acid to destroy the organic matter. The residue after evaporation of acids was dissolved in 0.1 N HCl and desired metals were determined by Atomic Absorption Spectrophotometry (AAS).

Bacteriological Methods

Collection of samples

Surface water samples were collected in 30ml sterile screw capped bottles for bacteriological assessment. Enough air space was left in the bottles to allow thorough mixing. Precautionary measures were taken to avoid contamination through handling. For microbial assessment in sediment samples, a known quantity of samples was collected from the grab samples using sterilised spatula. The central portion of the collected sediment was aseptically transferred into sterile polyethylene bags. All the samples were brought to the laboratory in portable icebox soon after collection and bacteriological analyses were carried out in the laboratory at CAS immediately, with necessary dilution.

Enumeration of Total Viable Counts

TVC was enumerated by adopting the spread plate method using Zobell's Marine Agar medium (EA123, Hi-Media, Mumbai). The samples (water and sediment) were diluted using the sterile sea water and 0.1 ml of the diluted sample was pippeted into the petriplates containing Zobell's Marine Agar and it was spread using a 'L' shaped glass spreader. The plates after inoculation were incubated in an inverted position at a temperature of 28+2°C for 24to 48 h. The colonies were counted and the population density expressed as Colony Forming Unit (CFU) per ml or g of the sample. The bacterial colonies were picked up from the pertidishes and re-streaked in appropriate nutrient agar plates thrice before a pure culture was established in agar slants.

Enumeration of Total Coliforms:

Macconkey agar with 0.15% bile salt, crystal violet and NaCl has been recommended in accordance with USP/Nfxi (1) for the detection, isolation and enumeration of coliforms and intestinal pathogens in water, dairy products, pharmaceutical preparations, etc. The agar weighing 51.5 g in 1000 ml distilled water was heated up to the boiling point to dissolve the medium completely and sterilized by autoclaving at 15 lbs pressure (121°C) for 15 min. suitably diluted samples were inoculated in the petriplates containing medium and were incubated for 48 h. After incubation, the colonies of *E. coli* appeared with pink color.

M-FC agar is employed for detection and enumeration Faecal Coliforms by the membrane filter technique at higher temperature (44.5°C). The agar weighing 52 g was suspended in 1000 ml of distilled water and heated up to the boiling point to dissolve the medium completely, 10ml of Rosolic acid (dissolved in 0.2 N NaOH) was added, heated with frequent agitation and boiled for 1 min. Then the medium was cooled to 50°C. Finally, the medium was poured into small 60mm plates. Samples filtered by Millipore apparatus using

0.45µm Whatman filter papers were impregnated in the petriplates. After 48 h of incubation, the colonies of *E. coli* appeared with blue colour.

Chlorophyll `a':

The samples were filtered through Whatman GF/C filter papers and the chlorophyll was extracted into 90% acetone. The resulting colored acetone extract was measured in a spectrophotometer at different wave lengths and the same acetone extracts were acidified and measured for the phaeo-pigments. The detailed methodology as described in APHA manual (1989) was followed.

Phytoplankton

Phytoplankton samples were collected from the surface waters of the study areas by towing a plankton net (mouth diameter 0.5 m) made of bolting silk (mesh size 20 micron) for half an hour. These samples were preserved in 5% neutralized formalin and used for qualitative analysis. For quantitative analysis of phytoplankton, the settling method as described by Sukhanovo (1978) was adopted. Numerical plankton analysis was carried out using Utermohl's inverted plankton microscope.

Phytoplankton species was identified using the standard works of Hoppenrath (2009), Joosten (2006), Hällfors (2004), Venkataraman (1939), Cupp (1943), Santhanam (1987), Subramanian (1946), King County (2008), Sournia (1978), Simon (2009), Prescott (1954), Desikachary (1959 and 1987), Hendey (1964), Steidinger and Williams (1970) and Taylor (1976) and Anand *et al.* (1986).

Zooplankton

Zooplankton samples were collected from the surface waters of the study area by horizontal towing of plankton net with mouth diameter of 0.35 m, made of bolting silk (No. 70 mesh size 200 µm) for half an hour. After collection, the samples were preserved in 5 - 7%

neutralized formalin and used for quantitative analysis. The zooplankton collected were identified to the species level using the classical works of Larink (2006), Helcom (2005), Goswami (2004), Alekseev (2002), Dakin and Colefax (1940), Santhanam and Srinivasan (1994), Newell and Newell (1963), Kasthurirangan (1963) and Wickstead (1965). For quantitative analysis of zooplankton, a known quantity of water sample (100 L) was filtered through a bag net (0.33 mm mesh size) and filtrate was made up to 1 litre in a wide mouthed bottle and then enumerated using Utermohl's inverted plankton microscope. The plankton density is expressed as number of organisms/m^3.

Benthic Community

For benthic organisms, sediment samples were collected using a Van veen Grab which covered an area of 0.1m^2. The wet sediment was sieved with varying mesh sizes for segregating the organisms. The organisms retained in the sieve were fixed in 5-7% formalin and stained further with Rose Bengal solution for easy spotting at the time of sorting. After a day or two, the organisms were sorted into various groups. The number of organisms in each Grab sample was expressed as number per square meter. According to size, benthic animals are divided into three groups: (i) macrobenthos (ii) meiobenthos and (iii) microbenthos (Mare, 1942). All the species were sorted, enumerated and identified to the advanced level possible with the consultation of available literature. The works of Fauvel (1953), Day (1967) were referred for polychaetes; Barnes (1980) and Lyla *et al*. (1999) for crustaceans; Subba Rao *et al.* (1991) and Ramakrishna (2003) for molluscs.

1.2. Physico-chemical Parameters

The physico-chemical parameters such as depth, transparency, atmospheric temperature (AT), water temperature (WT), Turbidity, Total suspended solids (TSS), pH, salinity, dissolved oxygen (DO) and biochemical oxygen demand (BOD) were analyzed and the results are given in Table 2.

Table 2 Physio-chemical characteristics in water samples collected in various stations of ITPCL site during July 2024

Station Code	Depth (m)	Transparency (m)	Turbidity (NTU)	TSS (mg/L)	AT (ºC)	WT (ºC)	pH	Salinity (PSU)	DO (mg/l)	BOD (mg/l)
ILFS-2-HT	7.10	2.80	2.85	20.37	29.37	28.14	8.64	35.84	6.74	1.36
ILFS-2-LT	6.50	2.30	3.24	22.49	29.72	28.55	8.39	35.72	6.85	1.42
ILFS-5-HT	7.50	3.00	2.93	21.51	30.56	28.62	8.53	35.53	6.63	1.64
ILFS-5-LT	7.00	2.70	3.16	23.84	30.12	29.37	8.41	35.47	6.72	1.83
ILFS-6-HT	7.40	3.30	1.84	20.06	30.83	28.84	8.37	35.39	6.58	1.75
ILFS-6-LT	6.90	2.80	2.09	22.84	30.95	29.55	8.30	35.26	6.68	2.08
ILFS-7-HT	7.60	2.90	1.93	21.59	31.28	29.36	8.31	35.15	5.91	1.93
ILFS-7-LT	7.20	2.30	2.11	23.73	31.41	29.81	8.26	35.07	6.35	2.37
ILFS-16-HT	6.70	2.60	2.74	22.52	28.48	26.41	8.28	34.95	5.95	1.85
ILFS-16-LT	6.30	2.00	3.22	24.80	27.74	26.56	8.22	34.84	6.63	2.41
ILFS-12-HT	2.80	1.70	5.39	21.66	28.59	26.75	8.21	33.24	5.96	1.89
ILFS-12-LT	2.20	1.10	6.51	24.93	27.91	26.83	8.13	31.65	6.26	2.26
ILFS-14-HT	2.90	1.40	5.74	21.58	28.68	26.94	8.27	29.44	6.41	2.04
ILFS-14-LT	2.30	1.00	8.92	24.72	28.35	27.35	8.22	28.36	6.59	2.47
ILFS-19-HT	2.70	1.30	10.60	22.84	28.91	27.26	8.16	27.85	6.31	1.84
ILFS-19-LT	2.10	1.90	11.74	25.11	28.59	27.64	7.93	27.21	6.68	2.47
ILFS-21-HT	1.90	1.20	10.83	22.95	29.27	27.74	7.97	23.69	5.94	1.96
ILFS-21-LT	1.50	0.80	12.11	24.68	29.16	28.16	7.84	22.15	6.17	2.35

(Reference values: TSS 9.70–58.70mg/L; pH 6.5-9.0; DO 3.51–8.92)

1.3. Nutrients and Petroleum Hydrocarbons

The chemical parameters like nitrite (NO_2-N), nitrate (NO_3-N), ammonia (NH_3-N), total nitrogen (TN), inorganic phosphate (IP), Total phosphorus, silicate and petroleum hydrocarbon (PHC) were analyzed and the results are given in Table 3.

Table 3 Nutrients and PHC values recorded in various stations of ITPCL site during July 2024

Station Code	SEAWATER NUTRIENTS (µmol/l)								PHC (µg/l)
	NO_2	NO_3	NH_3	TN	IP	TP	SiO_4	SiO_3	
ILFS-2-HT	0.318	1.365	0.373	7.385	0.590	1.434	26.593	12.839	0.489
ILFS-2-LT	0.351	2.183	0.395	8.739	0.625	1.279	24.844	10.945	0.654
ILFS-5-HT	0.274	1.619	0.326	8.417	0.503	1.854	25.791	14.758	0.436
ILFS-5-LT	0.349	1.452	0.384	9.626	0.575	1.422	22.084	13.694	0.674
ILFS-6-HT	0.272	1.317	0.293	8.285	0.484	1.904	26.402	12.521	0.599
ILFS-6-LT	0.358	1.635	0.325	11.374	0.539	1.743	25.289	11.437	0.732
ILFS-7-HT	0.297	1.408	0.239	10.582	0.447	1.819	24.531	12.864	0.619
ILFS-7-LT	0.339	1.926	0.271	11.318	0.563	1.293	23.794	10.503	0.725
ILFS-16-HT	0.481	1.754	0.254	8.655	0.385	1.385	24.728	12.006	0.674
ILFS-16-LT	0.593	2.369	0.363	10.740	0.472	1.094	22.954	11.249	0.853
ILFS-12-HT	0.475	1.428	0.248	9.843	0.381	1.735	26.062	13.793	0.645
ILFS-12-LT	0.629	2.036	0.272	11.186	0.463	1.350	24.147	11.457	0.782
ILFS-14-HT	0.503	1.815	0.255	10.494	0.459	1.647	23.953	10.306	0.793
ILFS-14-LT	0.584	2.348	0.318	12.663	0.361	1.219	24.625	9.531	0.864
ILFS-19-HT	0.493	1.673	0.231	10.815	0.442	1.547	25.497	12.278	0.572
ILFS-19-LT	0.601	2.057	0.279	12.300	0.569	1.495	24.663	10.395	0.684
ILFS-21-HT	0.525	1.862	0.314	11.953	0.538	1.547	26.931	13.614	0.478
ILFS-21-LT	0.627	2.453	0.406	12.820	0.647	1.269	25.594	12.096	0.375

(Reference values: NO_2: 0.05–1.03µmol/l; TN 0.87–26.16µmol/l; TP: 0.43–7.16µmol/l; NH_3 0.01–3.70 µmol/l)

1.4. Sediment Texture

The results of soil texture and total organic carbon (TOC) analyzed from the sediment samples are given in Table 4.

Table 4 Sediment Texture and Organic Carbon recorded in various stations of ITPCL site during July 2024

Station Code	Total Organic Carbon(mgC/g)	Soil Texture (%)		
		Sand	Silt	Clay
ILFS-2-HT	5.87	83.26	9.26	7.47
ILFS-2-LT	5.36	82.31	11.23	6.46
ILFS-5-HT	5.75	81.38	12.26	6.36
ILFS-5-LT	4.34	80.35	10.42	9.23
ILFS-6-HT	2.77	84.35	9.32	6.33
ILFS-6-LT	3.61	86.28	10.43	3.28
ILFS-7-HT	3.87	84.24	11.40	4.37
ILFS-7-LT	3.49	85.33	10.34	4.33
ILFS-16-HT	3.64	83.38	11.36	5.27
ILFS-16-LT	4.72	87.26	8.53	4.22
ILFS-12-HT	6.54	66.38	22.53	11.09
ILFS-12-LT	6.32	72.36	20.31	7.33
ILFS-14-HT	5.75	58.65	25.93	15.43
ILFS-14-LT	5.97	63.35	22.34	14.31
ILFS-19-HT	6.16	61.05	21.34	17.61
ILFS-19-LT	6.38	64.38	26.38	9.23
ILFS-21-HT	5.74	59.33	21.51	19.16
ILFS-21-LT	6.11	57.63	25.24	17.13

1.5. Chlorophyll -*a* and phaeophytin

Chlorophyll '*a*' and phaeophytin, which are considered as an index of phytoplankton density, were analyzed in the samples collected at ITPCL power project site, Parangipettai. The results are given in Table 5.

Table 5 Chlorophyll -*a* and phaeophytin levels recorded in water samples collected in various stations of ITPCL site during July 2024

Station Code	Chlorophyll 'a'(mg/m^3)	Phaeophytin (mg/m^3)
ILFS-2-HT	1.948	0.849
ILFS-2-LT	1.787	0.729
ILFS-5-HT	1.808	0.723
ILFS-5-LT	1.565	0.643
ILFS-6-HT	1.923	0.765
ILFS-6-LT	1.615	0.541
ILFS-7-HT	1.708	0.864
ILFS-7-LT	1.532	0.653
ILFS-16-HT	1.615	0.831
ILFS-16-LT	1.436	0.617
ILFS-12-HT	1.688	0.564
ILFS-12-LT	1.475	1.050
ILFS-14-HT	1.948	1.200
ILFS-14-LT	1.787	0.908
ILFS-19-HT	1.565	0.753
ILFS-19-LT	1.423	1.226
ILFS-21-HT	1.615	0.888

1.6. Heavy metals in seawater and sediments

The level of Heavy metals recorded in seawater and sediments samples in and around ITPCL site is given in the Tables 6 and 7.

Table 6 Heavy Metals (µg/l) in Seawater samples collected from various stations of ITPCL sites during July 2024

Station Code	Fe	Zn	Mn	Cd	Ni	Cr	Pb	Cu	Hg
ILFS-2	13.84	21.44	39.48	3.73	4.62	2.15	3.68	16.38	0.61
ILFS-5	16.51	20.53	40.63	3.84	4.78	2.49	3.95	17.92	0.74
ILFS-6	17.62	19.41	41.57	2.59	3.95	2.38	3.72	18.44	0.68
ILFS-7	18.75	20.89	44.73	3.02	4.31	2.92	4.08	16.63	0.75
ILFS-16	19.22	21.73	42.48	2.83	3.82	2.71	4.27	18.47	0.64
ILFS-12	16.84	20.49	41.66	3.24	3.27	1.93	4.33	19.61	0.69
ILFS-19	17.63	21.52	39.08	3.17	2.85	1.75	4.74	17.27	0.66
ILFS-21	15.44	20.36	41.79	2.94	1.94	1.92	4.52	18.38	0.67

(Reference values: Zn 1.02–34.11µg/L; Mn 1.02–51.77µg/L; Cd 4.56-9.43µg/L; Ni 0.52–36.18µg/L; Cr 6.55-13.9µg/L and Hg 0.52-13.45µg/L)

Table 7 Heavy Metals (µg/g) in sediment samples collected from various stations of ITPCL sites during July 2024

Station Code	Fe	Zn	Mn	Cd	Ni	Cr	Pb	Cu	Hg
ILFS - 2	1472.41	16.28	75.48	11.64	17.48	11.44	8.64	21.93	0.78
ILFS - 5	1581.68	17.05	80.66	13.51	16.74	10.63	9.73	23.85	0.81
ILFS - 6	1359.19	14.83	71.84	12.73	15.91	12.85	10.81	25.63	0.69
ILFS - 7	1574.72	15.74	70.19	12.08	14.73	10.91	12.63	30.14	0.84
ILFS - 16	1425.53	17.91	73.58	11.59	16.38	12.59	10.35	28.23	0.69
ILFS - 12	1549.31	16.85	72.31	13.63	15.94	13.82	9.74	27.55	0.73
ILFS - 19	1604.58	15.93	69.84	14.28	16.05	11.28	11.55	29.27	0.79
ILFS - 21	1571.43	16.47	72.63	13.75	15.83	10.36	10.89	28.61	0.71

(Reference values: Hg 0.0-3.7 µg/g; Cu 16-62 µg/g; Mn 34.36-177.3µg/g; Ni 30-55µg/g; Pb 7.4-47.1µg/g and Cr 12.08–112.9 µg/g)

1.7. MICROBIOLOGY

Water samples

The microbial parameters such as Total viable counts (TVC), total coliforms and *Streptococcus faecalis* (SF) were analyzed in seawater samples in and around the ITPCL power project site at Parangipettai. The results are given in Table 8. Similarly, the results of microbial parameters analysed in sediment samples are given in Table 9.

Table 8 Bacterial populations recorded in water samples collected in various stations of ITPCL site during July 2024

Station Code	Total Viable Count (TVC)	Total Coliforms (TC)	*Streptococcus faecalis* (SF)
ILFS-2-HT	11×10^2	7×10^2	8×10^2
ILFS-2-LT	13×10^2	9×10^2	10×10^2
ILFS-5-HT	11×10^2	6×10^2	11×10^2
ILFS-5-LT	12×10^2	8×10^2	13×10^2
ILFS-6-HT	10×10^3	9×10^2	10×10^2
ILFS-6-LT	12×10^2	8×10^2	11×10^2
ILFS-7-HT	13×10^2	9×10^2	12×10^2
ILFS-7-LT	16×10^2	10×10^2	14×10^2
ILFS-16-HT	13×10^2	7×10^2	13×10^2
ILFS-16-LT	16×10^2	9×10^2	15×10^2
ILFS-12-HT	20×10^2	7×10^3	12×10^2
ILFS-12-LT	23×10^2	8×10^3	14×10^2
ILFS-14-HT	19×10^2	6×10^2	11×10^2
ILFS-14-LT	24×10^2	8×10^2	16×10^2
ILFS-19-HT	21×10^3	9×10^3	14×10^3
ILFS-19-LT	25×10^3	10×10^3	17×10^3
ILFS-21-HT	22×10^3	11×10^3	13×10^3
ILFS-21-LT	26×10^3	13×10^3	15×10^3

Table 9 Bacterial populations recorded in sediment samples collected from various stations of ITPCL site during July 2024

Station Code	Total Viable Count (TVC)	Total Coliforms (TC)	*Streptococcus faecalis* (SF)
ILFS-2-HT	19×10^2	7×10^2	11×10^2
ILFS-2-LT	21×10^2	8×10^2	15×10^2
ILFS-5-HT	20×10^2	6×10^2	12×10^2
ILFS-5-LT	24×10^2	9×10^2	16×10^2
ILFS-6-HT	20×10^2	7×10^2	13×10^2
ILFS-6-LT	23×10^2	10×10^2	17×10^2
ILFS-7-HT	21×10^2	6×10^2	14×10^2
ILFS-7-LT	24×10^2	8×10^3	19×10^2
ILFS-16-HT	23×10^2	10×10^2	14×10^3
ILFS-16-LT	26×10^2	13×10^2	18×10^3
ILFS-12-HT	33×10^2	11×10^2	20×10^2
ILFS-12-LT	35×10^2	14×10^2	23×10^2
ILFS-14-HT	28×10^2	11×10^2	19×10^2
ILFS-14-LT	32×10^2	15×10^2	24×10^2
ILFS-19-HT	31×10^3	11×10^3	20×10^3
ILFS-19-LT	35×10^3	13×10^3	25×10^3
ILFS-21-HT	32×10^3	12×10^3	21×10^3
ILFS-21-LT	36×10^3	16×10^3	26×10^3

1.8 Phytoplankton Density and Diversity

The results of qualitative and quantitative estimation of the phytoplankton samples done in various sampling stations are given in Tables 10(a) and 10(b). The population density varied from 6540 to 7948 Nos. /L with minimum density was recorded at station ILFS-21-LT during low tide (Pappa canal) and the maximum was in the Dredged soil dumping (Station ILFS-2-HT).

Table 10 (a) Density of Phytoplankton recorded in various stations of ITPCL Power project site during July 2024

Sl. No.	Name of the Species	Nos./L									
		ILFS-2-HT	ILFS-2-LT	ILFS-5-HT	ILFS-5-LT	ILFS-6-HT	ILFS-6-LT	ILFS-7-HT	ILFS-7-LT	ILFS-16-HT	ILFS-16-LT
	DIATOMS (BACILLARIOPHYCEAE)										
	Bacillariaceae										
1	*Navicula directa*	164	164	154	186	152	130	102	164	256	360
3	*Stephanopyxis palmeriana*	150	164	170	144	160	458	154	240	166	237
4	*Nitzschia longissima*	152	170	114	164	126	144	124	*	164	124
5	*N. seriata*	160	256	*	116	250	264	128	148	139	204
	Naviculoideae										
6	*Gyrosigma acuminatum*	326	196	259	146	130	132	328	122	346	156
7	*G. balticum*	142	148	460	280	130	214	220	150	142	126
8	*Pleurosigma normanii*	172	146	158	270	176	214	256	176	342	*
9	*Asterionella glacialis*	142	128	*	130	142	134	320	126	*	176
	Bellerocheaceae										
10	*Bellerochea malleus*	142	146	346	270	326	196	*	146	130	132

	Biddulphoidae										
11	*Biddulphia heteroceros*	216	142	142	158	240	132	356	240	280	124
12	*B. reticulate*	182	154	168	120	130	160	184	134	140	130
13	*B. obtuse*	356	568	280	246	270	126	128	164	198	180
	Chaetocereae										
14	*Bacteriastrum delicatulum*	124	112	270	260	136	138	247	144	231	138
15	*B. varians*	162	130	120	116	140	204	230	136	134	144
16	*Bacteriastrum comosum*	216	218	140	126	158	*	264	148	130	170
17	*Chaetoceros affinis*	152	142	144	134	138	162	150	150	164	154
18	*C. clacitrans*	164	*	180	188	168	138	140	150	198	148
19	*C. decipiens*	462	456	472	452	472	172	124	424	246	278
	Coscinodisceae										
20	*Coscinodiscus centralis*	260	140	120	164	112	140	152	132	142	138
21	*C. granii*	110	132	128	136	118	180	174	146	172	130
22	*Lauderia borealis*	180	164	123	152	176	140	*	140	324	158
23	*Skeletonema costatum*	180	120	114	162	142	218	178	142	128	128
	Eucampiinae										
24	*Eucampia zoodiacus*	214	146	*	246	216	216	234	138	142	214
	Asterionellaceae										
25	*Astrionella glacialis*	174	114	140	*	253	276	*	350	340	128
	Fragilariaceae										
26	*Diatoma anceps*	170	150	170	162	242	118	302	240	172	130
27	*Thalassionema nitzschioides*	128	150	186	102	156	160	150	162	142	160

	Soleniceae										
28	*Bacillaria paradoxa*	*	160	140	130	170	234	172	130	144	148
29	*Leptocylindrus danicus*	*	130	*	140	*	218	*	350	222	458
30	*Rhizosolenia styliformis*	172	122	230	256	100	196	256	112	186	144
	Triceratiinae										
31	*Ditylum brightwelli*	172	168	262	134	263	*	170	136	242	126
32	*Odontella mobiliensis*	164	158	146	142	158	240	182	140	148	168
33	*Lithodesmium undulatum*	*	132	280	164	*	247	116	200	244	234
	DINOFLAGELLATES (DINOPHYCEAE)										
	Ceratiaceae										
34	*Ceratium lineatum*	264	162	*	182	162	140	114	*	130	102
35	*C. macroceros*	462	450	348	326	342	158	240	286	276	256
	Peridiniaceae										
36	*Peridinium claudicans*	264	250	264	214	216	170	160	252	250	188
37	*Protoperidinium oceanicum*	218	*	240	182	190	*	152	132	142	124
	Prorocentraceae										
38	*Prorocentrum micans*	156	462	264	162	170	287	354	196	146	264
	Dinophysiaceae										
39	*Pyrophacus steinii*	188	240	150	168	240	*	180	142	222	152
40	*Dinophysis acuta*	264	*	246	150	148	144	170	134	140	166
41	*D. caudata*	280	170	144	264	126	118	240	130	142	164
	BLUE GREEN ALGAE (CYANOBACTERIA)										
	Cyanophyceae										

42	*Anabaena circinails*	130	270	126	154	250	142	*	242	*	148
43	*Trichodesmium erytheaum*	214	128	268	138	172	302	146	140	140	176
	Total	**7948**	**7558**	**7666**	**7536**	**7566**	**7162**	**7297**	**7134**	**7742**	**7185**

*** Organisms not present**

Table 10 (b) Density of Phytoplankton recorded in various stations of ITPCL Power project site during July 2024

Sl. No.	Name of the Species	Nos./L							
		ILFS-12-HT	ILFS-12-LT	ILFS-14-HT	ILFS-14-LT	ILFS-19-HT	ILFS-19-LT	ILFS-21-HT	ILFS-21-LT
	DIATOMS (BACILLARIOPHYCEAE)								
	Bacillariaceae								
1	*Navicula directa*	196	235	134	152	179	*	182	134
3	*Stephanopyxis palmeriana*	152	*	197	168	256	263	134	110
4	*Nitzschia longissima*	140	302	154	128	213	172	138	124
5	*N. seriata*	285	*	129	320	218	222	164	152
	Naviculoideae								
6	*Gyrosigma acuminatum*	88	214	142	152	142	146	160	140
7	*G. balticum*	150	100	*	166	128	142	138	142
8	*Pleurosigma normanii*	166	164	156	174	174	180	234	128
9	*Asterionella glacialis*	140	184	130	174	160	264	*	364
	Bellerocheaceae								
10	*Bellerochea malleus*	140	122	156	*	142	174	154	154

	Biddulphoidae								
11	*Biddulphia heteroceros*	246	*	102	153	156	138	184	*
12	*B. reticulate*	140	146	140	130	148	264	180	110
13	*B. obtuse*	150	346	276	116	100	126	*	342
	Chaetocereae								
14	*Bacteriastrum delicatulum*	234	140	146	130	158	144	134	138
15	*B. varians*	156	132	164	146	138	*	218	238
16	*Bacteriastrum comosum*	164	144	250	*	242	154	152	144
17	*Chaetoceros affinis*	156	138	120	128	130	250	140	128
18	*C. clacitrans*	138	150	152	146	164	242	240	232
19	*C. decipiens*	164	170	240	246	*	154	124	142
	Coscinodisceae								
20	*Coscinodiscus centralis*	140	*	164	150	146	132	250	152
21	*C. granii*	136	160	142	154	136	*	246	163
22	*Lauderia borealis*	164	260	172	154	162	346	284	127
23	*Skeletonema costatum*	164	234	240	128	136	*	240	*
	Eucampiinae								
24	*Eucampia zoodiacus*	264	144	128	142	108	218	142	128
	Asterionellaceae								
25	*Astrionella glacialis*	132	270	*	256	467	253	173	242
	Fragilariaceae								
26	*Diatoma anceps*	128	134	214	213	*	150	218	184
27	*Thalassionema nitzschioides*	120	110	150	140	126	162	218	*

	Soleniceae								
28	*Bacillaria paradoxa*	140	156	100	110	122	228	140	184
29	*Leptocylindrus danicus*	126	142	548	218	230	186	231	270
30	*Rhizosolenia styliformis*	138	*	231	232	247	146	*	116
	Triceratiinae								
31	*Ditylum brightwelli*	360	128	175	164	151	140	156	188
32	*Odontella mobiliensis*	228	212	128	141	110	*	250	256
33	*Lithodesmium undulatum*	148	254	210	*	210	130	128	124
	DINOFLAGELLATES (DINOPHYCEAE)								
	Ceratiaceae								
34	*Ceratium lineatum*	*	138	128	128	124	142	130	144
35	*C. macroceros*	174	*	152	146	138	*	283	*
	Peridiniaceae								
36	*Peridinium claudicans*	240	146	150	*	120	*	236	267
37	*Protoperidinium oceanicum*	216	130	130	130	144	140	144	138
	Prorocentraceae								
38	*Prorocentrum micans*	280	264	432	346	328	172	214	285
	Dinophysiaceae								
39	*Pyrophacus steinii*	130	126	232	230	214	120	116	140
40	*Dinophysis acuta*	126	128	144	132	138	260	242	*
41	*D. caudata*	160	156	142	154	132	264	264	242
	BLUE GREEN ALGAE (CYANOBACTERIA)								
	Cyanophyceae								
42	*Anabaena circinails*	154	132	154	140	146	140	126	158

43	*Trichodesmium erytheaum*	132	146	346	*	126	222	124	110
	Total	**7005**	**6257**	**7400**	**6237**	**6809**	**6586**	**7231**	**6540**

***Organisms not present**

9. Zooplankton Density and Diversity

As done for phytoplankton, zooplankton density was studied in the coastal waters of ITPCL power project site at Parangipettai, and the results observed are given in Tables 11(a) and 11(b). The population density varied from 4982 to 6746 Nos./m^3 with minimum density was recorded at station ILFS-19-LT (Annan kovil landing center) during low tide and maximum was at Dredged soil dumping (station ILFS-2-HT).

Table 11(a) Density of Zooplankton recorded in various stations of ITPCL Power project site during July 2024

Sl. No.	Name of the Species	Nos/m^3									
		ILFS-2-HT	ILFS-2-LT	ILFS-5-HT	ILFS-5-LT	ILFS-6-HT	ILFS-6-LT	ILFS-7-HT	ILFS-7-LT	ILFS-16-HT	ILFS-16-LT
	Protozoans										
1	*Globigernia bulloides*	186	132	231	282	150	154	142	150	158	134
2	*G. opima*	128	68	126	110	80	82	138	120	128	130
	Annelida										
3	Polychaete larvae	136	144	156	110	124	128	254	144	170	188
	Calanoid copepod										
4	*Acartia danae*	172	132	136	154	166	*	168	142	92	134
5	*A. spinicauda*	*	134	156	148	126	146	126	158	*	136
6	*Acrocalanus gibber*	128	142	144	138	136	108	*	128	142	*

7	*A. gracilis*	380	270	450	420	450	360	350	280	370	410
8	*Calanopia minor*	126	146	124	130	210	110	242	*	140	*
9	*Labidocera acuta*	124	*	*	114	132	128	*	128	142	148
10	*Nannocalanus minor*	124	126	128	128	150	*	312	118	148	140
11	*Paracalanus parvus*	350	326	410	420	316	286	320	340	260	260
12	*Temora stylifera*	164	164	150	120	206	106	148	164	212	142
	Harpacticoid copepod										
13	*Clytmnestra scutellata*	122	154	188	*	364	*	*	174	126	178
14	*Euterpina acutifrons*	130	152	*	148	152	168	140	150	148	*
15	*Macrosetella oculata*	148	140	180	130	170	156	130	*	128	126
16	*M. gracilis*	128	*	134	110	126	130	134	140	128	254
17	*Microsetella rosea*	260	240	250	240	340	280	270	260	258	264
	Cyclopoid copepod										
21	*Copilia vitrea*	*	160	180	170	138	150	146	170	188	*
18	*Corycaeus danae*	126	120	134	130	132	156	164	106	124	120
19	*Oithona brevicornis*	150	120	164	164	162	206	148	164	212	142
20	*O. rigida*	260	*	128	140	162	136	178	146	150	122
	Coelenterates										
21	*Aurelia aurita*	260	150	*	148	284	130	132	142	*	144
	Spirotrichea										
22	*Favella brevis*	280	*	142	148	162	*	140	146	126	*
23	*F. philipiensis*	154	156	155	150	230	138	134	138	132	140
24	*Rhabdonella lohmani*	340	342	152	144	122	110	140	133	162	110

	Decapods										
25	*Lucifer hanseni*	138	140	162	132	152	*	140	150	88	134
	Other Crustacean forms										
26	Barnacle nauplii	138	118	*	168	*	116	132	124	181	170
27	Copepod nauplii	462	148	138	148	148	144	130	120	146	138
28	Mysis larvae	342	258	356	346	340	412	368	284	264	282
29	Crab zoea	140	120	154	118	146	130	164	143	140	128
	Mollusca										
30	Gastropod veliger	126	226	182	154	280	160	170	130	128	*
	Larvaceans										
31	*Oikopleura parva*	180	164	354	162	174	164	184	158	192	188
32	*O. dioica*	360	340	370	380	260	350	260	240	240	280
	Brachionus										
33	*Brachionus plicatilis*	270	140	208	122	178	246	264	140	166	136
34	*B. rubens*	214	242	164	162	*	134	156	120	216	140
	Total	**6746**	**5414**	**6106**	**5988**	**6468**	**5224**	**6024**	**5350**	**5605**	**5018**

***Organisms not present**

Table 11(b) Density of Zooplankton recorded in various stations of ITPCL Power project site during July 2024

Sl. No.	Name of the Species	Nos/m^3							
		ILFS-12-HT	ILFS-12-LT	ILFS-14-HT	ILFS-14-LT	ILFS-19-HT	ILFS-19-LT	ILFS-21-HT	ILFS-21-LT
	Protozoans								
1	*Globigernia bulloides*	136	142	*	152	140	*	264	144
2	*G. opima*	100	122	126	126	126	124	110	106
	Annelida								
3	Polychaete larvae	172	128	228	128	136	110	148	164
	Calanoid copepod								
4	*Acartia danae*	148	136	128	128	134	142	142	132
5	*A. spinicauda*	216	218	250	138	*	128	*	242
6	*Acrocalanus gibber*	164	132	210	154	162	130	122	*
7	*A. gracilis*	380	360	280	270	340	260	270	260
8	*Calanopia minor*	261	218	*	126	186	114	130	*
9	*Labidocera acuta*	154	130	126	130	214	142	130	128
10	*Nannocalanus minor*	128	124	110	*	152	128	132	130
11	*Paracalanus parvus*	280	290	280	360	310	350	270	240
12	*Temora stylifera*	162	196	214	214	146	162	116	208
	Harpacticoid copepod								
13	*Clytmnestra scutellata*	128	*	124	158	142	144	134	*
14	*Euterpina acutifrons*	168	164	166	150	*	162	*	182
15	*Macrosetella oculata*	*	88	100	164	96	178	110	122

16	*M. gracilis*	136	140	132	122	130	156	140	132
17	*Microsetella rosea*	320	*	270	132	280	240	260	250
	Cyclopoid copepod								
21	*Copilia vitrea*	*	166	172	176	150	152	232	116
18	*Corycaeus danae*	138	114	152	118	118	108	110	110
19	*Oithona brevicornis*	196	214	106	162	214	146	116	208
20	*O. rigida*	136	130	140	162	136	156	146	156
	Coelenterates								
21	*Aurelia aurita*	130	120	138	*	128	150	136	162
	Spirotrichea								
22	*Favella brevis*	153	126	168	130	164	140	128	128
23	*F. philipiensis*	152	142	120	*	144	*	128	*
24	*Rhabdonella lohmani*	*	138	132	136	132	168	128	138
	Decapods								
25	*Lucifer hanseni*	164	180	90	164	136	162	152	92
	Other Crustacean forms								
26	Barnacle nauplii	124	114	102	*	104	130	144	162
27	Copepod nauplii	148	150	156	140	*	116	132	164
28	Mysis larvae	326	274	316	264	250	284	270	282
29	Crab zoea	130	142	216	128	166	138	156	128
	Mollusca								
30	Gastropod veliger	116	164	180	166	250	134	128	128
	Larvaceans								

31	*Oikopleura parva*	182	158	150	186	146	164	154	150
32	*O. dioica*	*	120	154	150	140	164	110	100
	Brachionus								
33	*Brachionus plicatilis*	222	187	*	178	142	*	148	148
34	*B. rubens*	110	148	*	180	220	*	170	192
	Total	**5480**	**5375**	**5236**	**5092**	**5434**	**4982**	**5166**	**5004**

***Organisms not present**

2.0. Macro benthos Density and Diversity

The density and species diversity of Macrobenthos recorded in various stations of ITPCL power project site at Parangipettai are given in Tables 12(a) and 12(b). The population density varied from 1350 to 1900 Nos./m^2 with minimum density was recorded at station ILFS-21-LT (Pappa canal) during low tide and maximum in the dredged soil dumping (station ILFS-2-HT).

Table 12(a) Density and Diversity of Macrobenthos recorded in various stations of ITPCL Power project site during July 2024

Sl. No.	Name of the Species	Nos/m^2									
		ILFS-2-HT	ILFS-2-LT	ILFS-5-HT	ILFS-5-LT	ILFS-6-HT	ILFS-6-LT	ILFS-7-HT	ILFS-7-LT	ILFS-16-HT	ILFS-16-LT
	Polychaetes										
1	*Ampharete acutifrons*	25	50	25	25	25	75	50	25	50	75

2	*Armandia longicaudata*	*	75	50	50	50	50	75	50	25	*
3	*Boccardia polybranchia*	75	25	25	25	75	*	75	*	75	50
4	*Capitella capitata*	25	25	50	50	25	25	25	50	25	50
5	*Cirratulus chrysoderma*	50	25	25	75	50	50	50	25	100	25
6	*C. cirratus*	50	50	100	25	25	75	50	50	50	*
7	*Cossura coasta*	50	50	50	50	50	50	50	25	50	25
8	*Dorvillea rudolphi*	50	50	50	25	*	50	50	75	75	75
9	*D. gardineri*	75	75	50	50	75	75	75	50	*	25
10	*Euchone rosea*	25	25	50	25	25	*	25	50	50	75
11	*Euclymene lumbricoides*	75	75	75	25	25	75	75	75	50	75
12	*Glycera benguellana*	25	25	50	50	50	25	25	50	*	25
13	*Goniada emeriti*	50	50	25	75	75	50	50	25	25	50
14	*Notomastus aberans*	50	50	50	50	25	75	75	25	50	50
15	*Nephtys dibranchis*	50	50	50	25	75	50	*	50	25	75
16	*Nereis* sp.	75	25	75	50	50	50	50	25	75	75
17	*Owenia fusiformis*	50	75	*	50	75	50	75	75	50	50
18	*Pista cristata*	50	100	50	25	25	25	25	25	25	25
19	*Polydora capensis*	75	50	25	*	25	*	50	50	25	50
20	*Prionospio cirrifera*	50	50	25	50	50	50	25	*	25	*

21	*P. sexoculata*	25	75	25	25	25	75	50	50	*	50
22	*Pygospio elegans*	75	50	50	50	50	25	*	25	25	25
23	*Scolelepis squamata*	25	50	*	25	25	50	50	50	50	50
24	*Syllis gracilis*	50	50	25	*	25	*	25	75	25	75
25	*Terebellides stroemi*	25	25	25	25	25	25	50	50	50	50
	Gastropods										
26	*Cerithedia cingulata*	50	50	75	25	25	50	25	50	75	25
27	*Nassarius stollatus*	75	25	25	50	25	*	25	75	50	50
28	*Natica didyma*	50	25	50	75	25	25	25	25	50	*
29	*Umbonium vestiarium*	25	*	25	50	25	50	25	50	25	50
	Crustaceans										
30	*Ampithoe rubricata*	50	25	25	25	100	25	25	50	50	50
31	*Angeliera phreaticola*	*	75	25	50	25	25	75	25	75	75
32	Penaeid shrimp larvae	50	50	25	*	50	25	50	50	25	25
33	Copepod nauplii	50	50	*	25	50	25	50	*	75	*
	Bivalves										
34	*Meretrix casta*	75	*	50	50	75	50	150	25	25	25
35	*M. meretrix*	50	50	75	75	50	75	50	50	25	25
36	*Perna viridis*	50	*	50	25	50	50	50	*	50	*

37	Cardium veligers	75	25	125	*	*	*	50	75	50	50
38	*Donax scortum*	75	50	75	50	100	50	*	50	25	*
39	*Saccostrea cucullata*	50	50	*	50	50	50	25	75	25	25
	Total	**1900**	**1725**	**1650**	**1475**	**1675**	**1575**	**1775**	**1650**	**1625**	**1525**

*** Organisms not present**

Table 12(b) Density and Diversity of Macrobenthos recorded in various stations of ITPCL Power project site during July 2024

Sl. No.	Name of the Species	Nos/m^2							
		ILFS-12-HT	ILFS-12-LT	ILFS-14-HT	ILFS-14-LT	ILFS-19-HT	ILFS-19-LT	ILFS-21-HT	ILFS-21-LT
	Polychaetes								
1	*Ampharete acutifrons*	50	*	*	50	25	75	25	75
2	*Armandia longicaudata*	25	25	50	*	50	50	25	75
3	*Boccardia polybranchia*	25	25	100	50	25	25	25	25
4	*Capitella capitata*	25	50	75	50	25	*	25	50
5	*Cirratulus chrysoderma*	75	50	50	50	25	50	50	*
6	*C. cirratus*	25	25	50	25	*	50	75	25
7	*Cossura coasta*	75	25	50	25	75	75	*	25
8	*Dorvillea rudolphi*	25	75	25	50	50	50	25	50
9	*D. gardineri*	50	50	25	75	50	50	75	25

10	*Euchone rosea*	75	25	50	50	50	25	25	25
11	*Euclymene lumbricoides*	25	50	75	25	75	50	50	75
12	*Glycera benguellana*	50	*	50	50	*	75	25	50
13	*Goniada emeriti*	75	75	25	50	50	50	25	50
14	*Notomastus aberans*	25	25	75	25	25	50	75	25
15	*Nephtys dibranchis*	*	25	25	*	75	25	25	50
16	*Nereis* sp.	25	25	50	50	50	75	75	25
17	*Owenia fusiformis*	25	*	*	75	*	25	25	50
18	*Pista cristata*	25	50	25	50	25	50	50	25
19	*Polydora capensis*	75	75	75	*	25	75	50	*
20	*Prionospio cirrifera*	25	25	25	50	75	50	25	25
21	*P. sexoculata*	50	50	50	25	*	50	*	25
22	*Pygospio elegans*	*	100	25	50	50	25	25	50
23	*Scolelepis squamata*	25	50	50	*	75	50	25	50
24	*Syllis gracilis*	50	75	75	25	*	25	25	25
25	*Terebellides stroemi*	25	*	50	50	50	50	50	*
	Gastropods								
26	*Cerithedia cingulata*	50	25	*	50	50	25	75	25
27	*Nassarius stollatus*	75	50	75	*	75	25	25	25
28	*Natica didyma*	50	25	75	75	75	25	50	75
29	*Umbonium vestiarium*	25	*	50	50	50	*	25	*
	Crustaceans								
30	*Ampithoe rubricata*	25	25	25	75	50	50	25	50

31	*Angeliera phreaticola*	*	75	50	25	25	*	50	*
32	Penaeid shrimp larvae	50	25	*	75	*	25	25	50
33	Copepod nauplii	75	*	25	25	100	25	*	50
	Bivalves								
34	*Meretrix casta*	*	25	50	*	25	50	50	25
35	*M. meretrix*	25	25	25	25	75	*	50	*
36	*Perna viridis*	25	25	25	25	50	50	75	75
37	Cardium veligers	50	50	50	75	75	*	50	25
38	*Donax scortum*	75	50	25	25	25	50	50	*
39	*Saccostrea cucullata*	50	25	75	50	25	25	25	50
	Total	**1525**	**1400**	**1700**	**1525**	**1650**	**1525**	**1475**	**1350**

***Organisms not present**

2.1. Meiobenthos Density and Diversity

The density and species diversity of Meiobenthos recorded in various stations of ITPCL power project site at Parangipettai are given in Tables 13(a) and 13(b). The population density varied from 199 to 278 Nos/10cm^2 with minimum density was recorded at station ILFS-21-LT (Pichavaram Mangroves, Pappa canal) during low tide and maximum was at the Dredged soil dumping (station ILFS-2-HT).

Table 13(a) Density and Diversity of Meiobenthos recorded in various stations of ITPCL Power project site during July 2024

Sl. No.	Name of the Species	Nos./10cm^2									
		ILFS-2-HT	ILFS-2-LT	ILFS-5-HT	ILFS-5-LT	ILFS-6-HT	ILFS-6-LT	ILFS-7-HT	ILFS-7-LT	ILFS-16-HT	ILFS-16-LT
	Nematodes										
1	*Daptonema conicum*	15	7	10	*	9	7	5	9	12	9
2	*Astomonema jenneri*	7	*	2	7	9	6	12	2	4	10
3	*Draconema cephalatum*	13	16	9	6	6	17	5	2	5	10
4	*Halalaimus filum*	12	10	13	7	10	10	12	9	10	7
5	*Oxystomina clavicauda*	8	19	5	19	5	8	7	13	6	*
6	*Enoplolaimus abnormis*	*	13	4	7	13	5	5	4	7	10
7	*Neochromadora* sp.	4	6	15	6	12	4	*	11	5	9
8	*Araeolaimus longicauda*	8	6	9	2	15	2	12	6	9	15
	Foraminiferans										
9	*Ammonia beccarii*	11	*	9	7	13	8	8	2	9	*
10	*A. tepida*	3	10	10	4	3	13	6	7	10	7

11	*Bolivina limbata*	10	8	4	8	*	4	8	8	6	10
12	*Elphidium clavatum*	5	5	12	6	14	6	6	4	12	6
13	*E. texanum*	12	10	8	7	6	10	10	6	7	6
14	*E. macellum*	4	5	4	*	13	13	10	5	7	9
15	*Fissurina quadrata*	6	*	4	4	5	5	3	14	6	9
16	*Lagena semistriata*	7	5	7	10	13	6	10	3	5	10
17	*Neouvigerina hispida*	10	6	8	8	4	4	*	8	6	8
18	*Nonion grateloupi*	*	9	5	5	6	*	8	12	11	10
19	*Orbulina universa*	10	4	12	6	4	6	6	*	6	*
20	*Pararotalia ozawai*	7	*	10	7	*	13	3	6	10	4
21	*Pseudononion japonicum*	4	4	12	6	8	*	4	6	10	6
22	*Rosalina globularis*	3	8	5	10	4	5	9	7	9	6
23	*Spirillina limbata*	10	7	15	7	8	5	9	13	8	2
24	*Spiroloculina excavata*	6	2	7	8	10	8	14	6	10	6
25	*S. depressa*	4	8	6	4	6	8	14	4	8	10
	Ostrocodes										
26	*Basslerites liebaui*	12	6	10	8	10	6	8	6	*	6
27	*Bairdoppilata scaura*	8	8	6	10	*	12	10	4	10	*
28	*Patagonia theretricostata*	10	10	10	6	6	10	*	8	6	8
29	*Eucythere argus*	13	16	9	6	6	*	5	2	5	5
30	*Cytheromorpha fuscata*	7	7	5	3	7	10	13	6	3	10
31	*Stenocypris major*	12	10	5	9	8	13	8	8	8	6
	Harpacticoids										

32	*Euterpina acutifrons*	9	2	2	12	7	6	*	10	*	*
33	*Harpacticus chelifer*	*	10	7	7	8	8	6	9	6	8
34	*Macrosetella gracilis*	9	8	7	8	*	*	13	8	13	9
35	*Canuella perplexa*	4	6	12	*	6	4	10	14	*	4
	Total	**263**	**251**	**278**	**230**	**254**	**242**	**259**	**242**	**249**	**235**

*** Organisms not present**

Table 13(b) Density and Diversity of Meiobenthos recorded in various stations of ITPCL Power project site during July 2024

Sl. No.	Name of the Species	Nos./10cm²							
		ILFS-12-HT	**ILFS-12-LT**	**ILFS-14-HT**	**ILFS-14-LT**	**ILFS-19-HT**	**ILFS-19-LT**	**ILFS-21-HT**	**ILFS-21-LT**
	Nematodes								
1	*Daptonema conicum*	5	9	6	6	7	18	5	6
2	*Astomonema jenneri*	5	12	4	11	9	9	6	2
3	*Draconema cephalatum*	12	8	6	8	6	5	2	7
4	*Halalaimus filum*	*	5	9	4	6	8	10	7
5	*Oxystomina clavicauda*	5	8	*	9	7	7	5	6
6	*Enoplolaimus abnormis*	7	10	5	14	7	8	5	8
7	*Neochromadora* sp.	10	4	14	5	7	*	5	6
8	*Araeolaimus longicauda*	15	8	7	9	5	7	9	12
	Foraminiferans								

9	*Ammonia beccarii*	4	4	6	8	6	10	8	4
10	*A. tepida*	12	7	6	4	6	6	8	6
11	*Bolivina limbata*	8	*	9	7	14	*	8	7
12	*Elphidium clavatum*	10	*	6	4	7	7	5	8
13	*E. texanum*	10	8	14	2	*	8	9	6
14	*E. macellum*	9	7	6	8	3	4	7	7
15	*Fissurina quadrata*	4	*	4	6	8	6	10	4
16	*Lagena semistriata*	7	11	9	*	9	*	9	*
17	*Neouvigerina hispida*	*	6	6	4	6	10	8	4
18	*Nonion grateloupi*	5	9	8	7	5	7	3	6
19	*Orbulina universa*	6	2	2	10	6	8	6	6
20	*Pararotalia ozawai*	8	14	14	5	2	6	*	6
21	*Pseudononion japonicum*	11	5	7	9	12	9	9	8
22	*Rosalina globularis*	8	7	5	9	8	5	9	12
23	*Spirillina limbata*	10	4	10	10	8	*	*	6
24	*Spiroloculina excavata*	10	*	12	2	4	6	*	4
25	*S. depressa*	8	2	0	6	10	*	4	4
	Ostrocodes								
26	*Basslerites liebaui*	6	8	4	6	2	10	8	4
27	*Bairdoppilata scaura*	7	8	6	7	*	10	5	9
28	*Patagonia theretricostata*	12	6	4	12	6	*	11	5
29	*Eucythere argus*	2	5	7	*	7	9	9	*

30	*Cytheromorpha fuscata*	6	7	8	8	5	9	5	*
31	*Stenocypris major*	6	12	5	2	10	*	9	8
	Harpacticoids								
32	*Euterpina acutifrons*	4	4	7	6	9	7	7	10
33	*Harpacticus chelifer*	7	10	8	5	10	12	4	5
34	*Macrosetella gracilis*	*	5	4	2	12	*	10	6
35	*Canuella perplexa*	8	4	9	8	3	10	*	*
	Total	**247**	**219**	**237**	**223**	**232**	**221**	**218**	**199**

***Organisms not present**

CONCLUDING REMARKS

In the present survey, made on 16th July - 2024, as has been done during previous months, the physico-chemical and biological parameters were analyzed both in the water and sediment samples collected from 18 stations by considering high and low tides at ITPCL Power Project site, Parangipettai. On the whole, the physico-chemical parameters did not show much variation except a few parameters which indicated only marginal variations. Further, the results of physico-chemical and biological parameters indicate that the water is well oxygenated and nutrient parameters were adequate enough supporting relatively good planktonic organisms as they form base in the food chain. Regarding the biological parameters, the diatom species recorded during this survey were *Copilia vitrea, Odontella mobiliensis, Nitzschia longissima, Asterionella glacialis, Navicula henneydii, Chaetoceros affinis, Biddulphia heteroceros, Melosira borreri* and *Lauderia borealis* were recorded commonly during the survey. Besides, the conservative macro benthic species like *Polydontes melanonlus, Meretrix casta, M. meretrix, Ammonia beccarii, A. tepida, Elphidium clavatum* and *Spiroloculina angulosa* were predominantly reported in the ITPCL site, Parangipettai coastal waters, which are again indicating the stable nature of the ecosystem. Not only is that, the metal concentration in coastal water and sediment samples indicates that it is well within the ERM (Effective Range Median) values which means that there are no possibilities of Heavy metal contamination in the region. In a nutshell, comparing the values of the seawater, sediment quality and biotic components in and around the ITPCL Power Project at Parangipettai collected during previous months suggests that there is no marked variation in the levels of physico-chemical parameters and are found to be in the safe limits.