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

Monthly Data Report (January - 2025)

Submitted by

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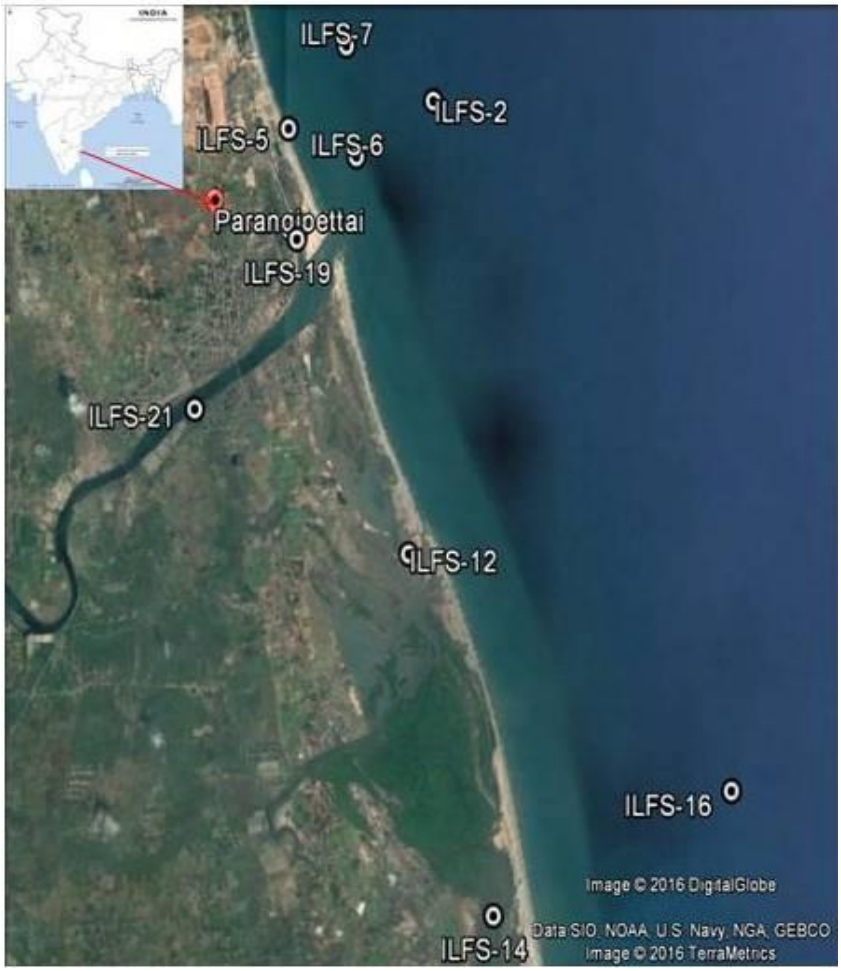
PHYSICO – CHEMICAL AND BIOLOGICAL CHARACTERISTICS

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 20.01.2025 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)	6.50 AM	11°31'27.94"N 79°47'50.77"E
2	ILFS-2-LT	2.10 PM	
3	ILFS-5-HT (Intake)	7.30 AM	11°31'13.31"N 79°46'14.37"E
4	ILFS-5-LT	2.45 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	4.10 PM	
9	ILFS-16-HT (Off shore parallel to Mangroves-2)	9.35 AM	11º25’29.13"N 79º51’10.08"E
10	ILFS-16-LT	4.30 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	5.15 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	2.05 PM	
15	ILFS-19-HT (Annan kovil landing center)	8.15 AM	11° 30' 15.75"N 79° 46'20.07"E
16	ILFS-19-LT	3.25 PM	
17	ILFS-21-HT (Pappa canal)	9.30 AM	11°28'47.22"N 79°45'12.15"E
18	ILFS-21-LT	4.35 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 vessel itself 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 was adopted. 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 (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 Physico-chemical characteristics in water samples collected in various stations of ITPCL site during January 2025

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	6.1	2.1	1.75	22.73	30.18	28.3	8.25	34.55	6.16	1.42
ILFS-2-LT	7.3	2.7	2.38	20.61	30.25	28.12	8.36	34.93	5.84	2.13
ILFS-5-HT	6.8	1.9	2.81	23.95	30.41	28.75	8.28	34.75	5.79	1.86
ILFS-5-LT	7.4	1.8	2.47	21.83	30.54	28.63	8.34	33.81	6.25	1.67
ILFS-6-HT	6.9	1.6	3.29	23.64	30.67	28.96	8.27	33.57	5.79	1.45
ILFS-6-LT	6.7	2.5	2.53	22.07	30.75	28.91	8.21	33.29	6.75	2.58
ILFS-7-HT	6.3	2	3.22	24.8	27.74	26.56	8.22	34.84	6.63	2.41
ILFS-7-LT	2.8	1.7	5.39	21.66	28.59	26.75	8.21	33.24	5.96	1.89
ILFS-16-HT	2.2	1.1	6.51	24.93	27.91	26.83	8.13	31.65	6.26	2.26
ILFS-16-LT	2.9	1.4	5.74	21.58	28.68	26.94	8.27	29.44	6.41	2.04
ILFS-12-HT	2.3	1	8.92	24.72	28.35	27.35	8.22	28.36	6.59	2.47
ILFS-12-LT	2.7	1.3	10.6	22.84	28.91	27.26	8.16	27.85	6.31	1.84
ILFS-14-HT	4.7	1.3	6.37	21.52	27.85	26.48	8.16	26.75	5.9	1.46
ILFS-14-LT	4.2	1.1	8.54	24.31	30.16	28.3	8.25	26.19	5.83	1.18
ILFS-19-HT	3	1.4	9.21	22.64	29.36	26.85	8.29	23.18	6.8	1.65
ILFS-19-LT	2.4	1.1	10.96	24.83	30.55	28.64	8.21	22.41	6.77	1.31
ILFS-21-HT	2.7	1.3	10.6	22.84	28.91	27.26	8.16	27.85	6.31	1.84
ILFS-21-LT	2.1	1.9	11.74	25.11	28.59	27.64	7.93	27.21	6.68	2.47

(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 January 2025

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	0.231	0.591	0.179	11.473	0.348	1.863	23.581	13.504	0.683
ILFS-2-LT	0.205	0.516	0.162	8.564	0.417	2.475	21.525	10.836	0.617
ILFS-5-HT	0.186	0.645	0.185	9.731	0.365	2.041	23.746	10.752	0.684
ILFS-5-LT	0.152	0.563	0.147	8.294	0.472	2.638	22.584	9.649	0.541
ILFS-6-HT	0.246	0.758	0.192	10.135	0.439	1.947	24.639	13.851	0.597
ILFS-6-LT	0.211	0.694	0.186	9.681	0.525	2.653	21.503	12.093	0.543
ILFS-7-HT	0.318	1.365	0.373	7.385	0.59	1.434	26.593	12.839	0.489
ILFS-7-LT	0.351	2.183	0.395	8.739	0.625	1.279	24.844	10.945	0.654
ILFS-16-HT	0.274	1.619	0.326	8.417	0.503	1.854	25.791	14.758	0.436
ILFS-16-LT	0.349	1.452	0.384	9.626	0.575	1.422	22.084	13.694	0.674
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	1.35	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	0.195	0.804	0.192	12.708	0.514	1.994	25.614	12.584	0.537
ILFS-19-LT	0.164	0.716	0.168	11.094	0.577	2.368	24.937	10.493	0.514
ILFS-21-HT	0.239	0.795	0.187	12.456	0.463	2.106	26.462	13.651	0.592
ILFS-21-LT	0.213	0.737	0.163	10.738	0.591	2.714	23.493	11.947	0.516

(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; SO_4 – 1.00 to 49.00 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 January 2025

Station Code	Total Organic Carbon(mgC/g)	Soil Texture (%)		
		Sand	Silt	Clay
ILFS-2-HT	6.57	83.56	8.73	7.71
ILFS-2-LT	4.86	88.31	7.47	4.22
ILFS-5-HT	5.72	85.62	7.28	7.1
ILFS-5-LT	5.96	74.83	6.94	18.23
ILFS-6-HT	6.41	76.29	7.53	16.18
ILFS-6-LT	5.83	81.57	10.46	7.97
ILFS-7-HT	5.87	83.26	9.26	7.47
ILFS-7-LT	5.36	82.31	11.23	6.46
ILFS-16-HT	5.75	81.38	12.26	6.36
ILFS-16-LT	4.34	80.35	10.42	9.23
ILFS-12-HT	2.77	84.35	9.32	6.33
ILFS-12-LT	3.61	86.28	10.43	3.28
ILFS-14-HT	4.95	54.51	17.2	28.29
ILFS-14-LT	3.74	49.28	15.64	35.08
ILFS-19-HT	4.69	61.52	14.73	23.75
ILFS-19-LT	3.52	54.92	18.41	26.67
ILFS-21-HT	6.16	61.05	21.34	17.61
ILFS-21-LT	6.38	64.38	26.38	9.23

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 January 2025

Station Code	Chlorophyll 'a'(mg/m^3)	Phaeophytin (mg/m^3)
ILFS-2-HT	1.923	0.765
ILFS-2-LT	1.615	0.541
ILFS-5-HT	1.708	0.864
ILFS-5-LT	1.532	0.653
ILFS-6-HT	1.615	0.831
ILFS-6-LT	1.436	0.617
ILFS-7-HT	1.787	0.908
ILFS-7-LT	1.565	0.753
ILFS-16-HT	1.423	1.226
ILFS-16-LT	1.615	0.888
ILFS-12-HT	2.038	0.786
ILFS-12-LT	1.972	0.735
ILFS-14-HT	1.948	0.849
ILFS-14-LT	1.787	0.729
ILFS-19-HT	1.808	0.723
ILFS-19-LT	1.565	0.643
ILFS-21-HT	1.984	0.841

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 January 2025

Station Code	Fe	Zn	Mn	Cd	Ni	Cr	Pb	Cu	Hg
ILFS-2	17.62	19.41	41.57	2.59	3.95	2.38	3.72	18.44	0.68
ILFS-5	18.75	20.89	44.73	3.02	4.31	2.92	4.08	16.63	0.75
ILFS-6	19.22	21.73	42.48	2.83	3.82	2.71	4.27	18.47	0.64
ILFS-7	16.84	20.49	41.66	3.24	3.27	1.93	4.33	19.61	0.69
ILFS-16	16.82	19.84	37.41	3.75	3.53	2.39	5.81	14.51	0.71
ILFS-12	15.37	17.51	42.37	2.1	2.44	2.72	4.39	16.28	0.62
ILFS-19	16.29	18.36	45.62	3.93	2.75	1.98	6.47	17.44	0.58
ILFS-21	14.06	22.58	43.74	3.95	3.06	2.74	4.95	18.36	0.62

(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 January 2025

Station Code	Fe	Zn	Mn	Cd	Ni	Cr	Pb	Cu	Hg
ILFS - 2	1574.72	15.74	70.19	12.08	14.73	10.91	12.63	30.14	0.84
ILFS - 5	1425.53	17.91	73.58	11.59	16.38	12.59	10.35	28.23	0.69
ILFS - 6	1549.31	16.85	72.31	13.63	15.94	13.82	9.74	27.55	0.73
ILFS - 7	1604.58	15.93	69.84	14.28	16.05	11.28	11.55	29.27	0.79
ILFS - 16	1539.64	16.48	69.73	13.89	16.52	11.48	8.36	23.51	0.79
ILFS - 12	1472.15	15.67	68.95	12.41	15.37	13.69	7.52	25.73	0.86
ILFS - 19	1573.08	18.44	73.61	11.73	17.69	10.54	6.49	26.52	0.92
ILFS - 21	1549.28	19.48	75.72	15.09	17.51	9.68	10.71	26.59	0.74

(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 for 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 January 2025

Station Code	Total Viable Count (TVC)	Total Coliforms (TC)	*Streptococcus faecalis* (SF)
ILFS-2-HT	11×10^2	5×10^2	6×10^2
ILFS-2-LT	13×10^2	7×10^2	8×10^2
ILFS-5-HT	9×10^2	6×10^2	9×10^2
ILFS-5-LT	10×10^2	8×10^2	11×10^2
ILFS-6-HT	10×10^3	5×10^2	12×10^2
ILFS-6-LT	11×10^2	4×10^2	13×10^2
ILFS-7-HT	20×10^2	7×10^2	13×10^2
ILFS-7-LT	23×10^2	10×10^2	17×10^2
ILFS-16-HT	21×10^2	6×10^2	14×10^2
ILFS-16-LT	24×10^2	8×10^3	19×10^2
ILFS-12-HT	27×10^3	14×10^3	23×10^2
ILFS-12-LT	28×10^3	18×10^3	20×10^3
ILFS-14-HT	27×10^3	16×10^3	19×10^3
ILFS-14-LT	25×10^3	17×10^3	16×10^2
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

TABLE 9 Bacterial populations recorded in sediment samples collected from various stations of ITPCL site during January 2025

Station Code	Total Viable Count (TVC)	Total Coliforms (TC)	*Streptococcus faecalis* (SF)
ILFS-2-HT	21×10^2	7×10^2	14×10^2
ILFS-2-LT	23×10^2	5×10^2	15×10^2
ILFS-5-HT	22×10^2	6×10^2	18×10^2
ILFS-5-LT	24×10^2	5×10^2	17×10^2
ILFS-6-HT	21×10^2	7×10^2	18×10^2
ILFS-6-LT	23×10^2	6×10^2	14×10^2
ILFS-7-HT	21×10^2	4×10^2	13×10^2
ILFS-7-LT	20×10^2	5×10^2	16×10^2
ILFS-16-HT	25×10^2	8×10^2	18×10^2
ILFS-16-LT	29×10^2	7×10^2	13×10^2
ILFS-12-HT	30×10^2	11×10^2	20×10^2
ILFS-12-LT	31×10^2	7×10^2	16×10^2
ILFS-14-HT	28×10^2	9×10^2	14×10^2
ILFS-14-LT	32×10^2	11×10^2	20×10^2
ILFS-19-HT	31×10^2	8×10^2	15×10^2
ILFS-19-LT	33×10^2	10×10^2	20×10^2
ILFS-21-HT	32×10^2	12×10^2	21×10^2
ILFS-21-LT	34×10^2	14×10^2	19×10^2

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 6626 to 9350 Nos. /L with minimum density was recorded at station ILFS-21-LT during low tide (Pappa canal) and the maximum was in the outfall location of open sea (Station ILFS-6-HT).

TABLE 10 (a) Density of Phytoplankton recorded in various stations of ITPCL Power project site during January 2025

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
	Bacillariaceae										
1	*Nitzschia longissima*	142	236	164	154	280	214	150	160	198	216
2	*Navicula henneydii*	246	234	282	240	258	264	140	256	246	214
3	*Stephanopyxis palmeriana*	242	264	232	250	322	230	222	254	210	148
	Ceratiaceae										
4	*Ceratium furca*	164	164	152	172	142	152	142	290	360	158
5	*C. lineatum*	234	166	164	180	278	140	162	110	138	150
	Chaetocereae										
6	*Bacteriastrum delicatulum*	250	210	240	140	264	150	246	254	240	160
7	*B. hyalinium*	242	176	114	140	120	124	160	128	260	150
8	*B. varians*	150	288	150	170	136	164	128	126	126	*
9	*Chaetoceros affinis*	194	172	122	230	338	214	242	232	240	160
10	*C. clacitrans*	178	216	130	346	128	342	264	110	126	150

11	*C. coarctatus*	164	272	324	164	320	152	250	460	246	162
	Biddulphoidae										
12	*Biddulphia heteroceros*	336	228	118	120	228	114	118	116	138	168
13	*B. reticulate*	186	214	248	142	*	206	110	128	182	178
	Coscinodisceae										
14	*Coscinodiscus centralis*	282	264	246	246	254	230	280	240	650	240
15	*C. gigas*	236	216	140	118	274	188	148	*	122	114
16	*C. granii*										
17	*Skeletonema costatum*	246	140	150	124	230	252	140	152	168	160
18	*Melosira borreri*	136	152	158	132	398	128	134	130	254	230
19	*Lauderia borealis*	220	126	114	100	316	132	218	120	214	236
	Eucampiinae										
20	*Eucampia groenlandica*	132	128	246	324	130	250	326	142	140	348
21	*E. zoodiacus*	362	382	120	180	242	162	244	180	312	216
	Fragilariaceae										
22	*Diatoma anceps*	276	256	280	264	*	346	328	314	322	*
23	*Thalassiosira subtilis*	172	132	426	128	142	132	254	*	166	148
24	*Thalassionema nitzschioides*	286	246	242	124	332	420	154	280	350	*
25	*T. punctigera*	160	140	150	184	170	160	274	182	286	274
	Naviculoideae										
26	*Gyrosigma acuminatum*	230	132	140	322	456	352	142	160	134	214

27	*G. balticum*	128	188	214	254	216	230	284	264	126	240
28	*Pleurosigma normanii*	*	256	270	240	338	260	280	240	230	240
29	*Asterionella glacialis*	184	146	240	182	368	236	328	108	170	234
	Peridiniaceae										
30	*Peridinium claudicans*	240	118	172	234	356	283	128	152	246	264
31	*Protoperidinium oceanicum*	186	142	*	168	198	239	128	122	254	378
	Soleniae										
32	*Leptocylindrus danicus*	126	238	320	170	244	264	138	120	*	282
33	*Rhizosolenia alata*	246	326	282	140	250	230	128	214	172	256
34	*R. imbricate*	128	124	126	*	110	132	128	148	*	140
	Pyrophacaceae										
35	*Pyrophacus steinii*	262	254	300	246	230	282	264	240	214	240
36	*Dinophysis acuta*	126	128	256	240	246	216	230	326	150	128
37	*D. caudata*	142	*	260	146	166	128	142	128	228	134
	Triceratiinae										
38	*Lithodesmium undulatum*	180	170	260	182	280	240	260	270	*	346
39	*Odontella mobiliensis*	420	246	280	320	346	260	364	270	240	264
	Cyanophyceae										
40	*Anabaena circinails*	162	128	264	254	244	216	130	214	378	268
	Total	**7996**	**7618**	**8096**	**7470**	**9350**	**8434**	**7908**	**7340**	**8236**	**7608**

*** Organisms not present**

TABLE 10 (b) Density of Phytoplankton recorded in various stations of ITPCL Power project site during January 2025

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
	Bacillariaceae								
1	*Nitzschia longissima*	126	320	264	120	180	138	144	138
2	*Navicula henneydii*	142	260	228	328	130	*	166	142
3	*Stephanopyxis palmeriana*	140	130	278	264	210	136	132	138
	Ceratiaceae								
4	*Ceratium furca*	156	240	164	146	150	134	154	138
5	*C. lineatum*	154	*	246	*	184	160	142	*
	Chaetocereae								
6	*Bacteriastrum delicatulum*	120	164	190	132	130	164	154	168
7	*B. hyalinium*	76	182	160	240	286	134	*	286
8	*B. varians*	148	174	250	234	284	182	164	152
9	*Chaetoceros affinis*	198	216	152	338	140	150	210	250
10	*C. clacitrans*	264	276	280	234	264	251	246	252
11	*C. coarctatus*	178	118	230	182	164	162	109	242
	Biddulphoidae								
12	*Biddulphia heteroceros*	242	196	210	240	230	256	468	100
13	*B. reticulate*	346	208	680	380	276	284	280	170
	Coscinodisceae								

14	*Coscinodiscus centralis*	180	258	180	276	164	162	194	170
15	*C. gigas*	148	230	248	158	128	138	120	130
16	*C. granii*	352	122	320	330	134	140	110	132
17	*Skeletonema costatum*	127	264	216	130	246	128	144	130
18	*Melosira borreri*	230	*	232	219	146	206	*	352
19	*Lauderia borealis*	338	160	140	150	130	164	312	*
	Eucampiinae								
20	*Eucampia groenlandica*	240	204	224	*	228	*	248	226
21	*E. zoodiacus*	*	134	254	262	148	164	246	242
	Fragilariaceae	142	160	140	230	152	162	264	*
22	*Diatoma anceps*								
23	*Thalassiosira subtilis*	178	230	246	250	*	270	156	264
24	*Thalassionema nitzschioides*	218	*	124	245	264	220	182	234
25	*T. punctigera*	224	224	374	334	228	*	242	148
	Naviculoideae								
26	*Gyrosigma acuminatum*	152	*	142	*	172	152	*	124
27	*G. balticum*	252	*	234	*	170	164	192	*
28	*Pleurosigma normanii*	280	260	*	230	280	*	240	270
29	*Asterionella glacialis*	296	252	242	386	212	122	142	148
	Peridiniaceae								
30	*Peridinium claudicans*	216	242	*	232	170	216	138	142
31	*Protoperidinium oceanicum*	130	150	340	208	156	128	128	168

	Soleniae								
32	*Leptocylindrus danicus*	132	138	216	128	210	218	136	128
33	*Rhizosolenia alata*	320	312	350	346	320	342	286	276
34	*R. imbricate*	*	142	116	214	256	124	134	142
	Pyrophacaceae								
35	*Pyrophacus steinii*	152	234	160	112	250	145	234	128
36	*Dinophysis acuta*	212	228	362	124	252	184	122	118
37	*D. caudata*	246	*	350	216	*	352	248	116
	Triceratiinae								
38	*Lithodesmium undulatum*	348	312	294	118	138	164	246	214
39	*Odontella mobiliensis*	253	226	160	326	128	282	124	168
	Cyanophyceae								
40	*Anabaena circinails*	136	132	346	270	346	264	316	280
	Total	**7792**	**7098**	**9342**	**8332**	**7656**	**6762**	**7273**	**6626**

***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 are given in Tables 11(a) and 11(b). The population density varied from 5341 to 6154 Nos./m^3 with minimum density recorded at station ILFS-21-LT (Pappa canal) during low tide and maximum was he North Break Water (station ILFS-7-HT).

TABLE 11(a) Density of Zooplankton recorded in various stations of ITPCL Power project site during January 2025

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*	118	126	120	114	214	116	118	120	242	132
2	*G. opima*	194	204	226	148	*	242	232	226	148	*
	Annelida										
3	Polychaete larvae	142	136	126	138	130	130	210	116	114	156
	Calanoid copepods										
4	*Acartia danae*	150	158	134	142	128	260	142	140	248	152
5	*A. erythraea*	150	166	154	214	148	140	240	152	*	176
6	*A. spinicauda*	138	160	280	186	138	128	134	138	116	156
7	*Acrocalanus gibber*	168	140	162	150	168	130	140	140	108	152
8	*A. gracilis*	148	140	150	128	128	124	312	128	124	128
9	*Calanopia minor*	130	134	180	128	164	132	140	160	148	152
10	*Centropages furcatus*	342	286	170	186	140	178	134	210	214	158
11	*Labidocera acuta*	148	138	138	120	270	148	156	140	132	148
12	*Paracalanus parvus*	228	432	332	232	228	130	206	118	402	120
13	*Pseudodiaptomus aurivilli*	116	118	120	*	350	120	120	*	326	114
14	*Temora stylifera*	128	291	160	430	160	106	116	156	140	246
	Harpacticoid copepods										
15	*Clytmnestra scutellata*	164	218	216	224	152	242	164	140	160	160
16	*Euterpina acutifrons*	242	118	230	242	168	336	182	114	264	152

17	*Macrosetella gracilis*	158	154	236	128	132	130	110	112		
18	*Metis jousseaumei*	230	264	222	232	200	222	210	212	*	132
	Cyclopoid copepod										
19	*Corycaeus catus*	196	142	164	164	150	162	106	162	164	214
20	*Oithona brevicornis*	156	*	148	146	280	162	168	230	256	*
21	*O. rigida*	128	140	140	138	146	*	156	142	130	130
22	*O. similes*	130	128	346	264	152	110	150	134	140	178
	Coelenterate										
23	*Aurelia aurita*	156	133	264	126	250	138	130	180	142	142
	Spirotrichea										
24	*Favella brevis*	*	140	130	132	246	138	264	278	234	264
25	*F. philipiensis*	124	*	120	*	116	124	156	206	148	138
26	*Tintinnopsis tubulosa*	164	142	148	160	122	118	188	136	140	164
	Decapoda										
27	*Lucifer hanseni*	118	154	140	120	130	216	164	216	142	166
	Other Crustacean forms										
28	Barnacle nauplii	130	120	172	108	104	102	254	124	208	224
29	Copepod nauplii	164	150	156	134	148	128	158	216	*	126
30	Mysis larvae	126	112	152	234	124	*	260	142	136	246
	Mollusca										
31	Gastropod veliger	122	128	174	122	258	216	232	148	464	168
	Larvacea										
32	*Oikopleura parva*	120	154	146	168	138	132	220	228	231	228
33	*O. dioica*	232	124	154	264	152	138	342	220	210	284

	Rotatoria										
34	*Brachionus rubens*	168	140	*	150	168	130	140	140	108	352
	Total	**5328**	**5290**	**5910**	**5572**	**5702**	**5028**	**6154**	**5424**	**5739**	**5458**

***Organisms not present**

TABLE 11(b) Density of Zooplankton recorded in various stations of ITPCL Power project site during January 2025

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*	120	110	*	118	166	160	138	240
2	*G. opima*	236	*	210	222	140	142	170	146
	Annelida								
3	Polychaete larvae	130	128	226	124	130	140	132	240
	Calanoid Copepod								
4	*Acartia danae*	120	104	142	216	126	156	158	144
5	*A. erythraea*	144	132	138	126	122	126	142	144
6	*A. spinicauda*	164	382	242	124	204	240	*	110
7	*Acrocalanus gibber*	230	430	126	178	118	*	242	175
8	*A. gracilis*	210	214	140	242	196	468	134	172
9	*Calanopia minor*	110	146	*	326	*	142	150	116
10	*Centropages furcatus*	210	128	152	118	212	171	216	*

11	*Labidocera acuta*	170	142	248	156	124	*	142	134
12	*Paracalanus parvus*	130	132	130	270	216	216	142	138
13	*Pseudodiaptomus aurivilli*	126	128	152	144	142	140	150	154
14	*Temora stylifera*	136	360	220	146	122	102	128	122
	Harpacticoid copepod								
15	*Clytmnestra scutellata*	160	124	152	156	128	130	150	128
16	*Euterpina acutifrons*	204	178	198	242	178	232	198	324
17	*Macrosetella gracilis*	160	148	150	128	*	258	154	158
18	*Metis jousseaumei*	180	240	140	*	132	138	160	142
	Cyclopoid copepod								
19	*Corycaeus catus*	144	*	150	164	114	108	140	142
20	*Oithona brevicornis*	160	124	152	156	128	130	150	128
21	*O. rigida*	158	154	170	138	140	240	132	148
22	*O. similes*	*	152	238	226	*	110	132	*
	Coelenterate								
23	*Aurelia aurita*	174	206	352	*	264	288	324	170
	Spirotrichea								
24	*Favella brevis*	284	240	140	217	372	360	346	360
25	*F. philipiensis*	151	168	150	186	178	124	148	152
26	*Tintinnopsis tubulosa*	264	170	234	184	186	154	256	160
	Decapoda								
27	*Lucifer hanseni*	116	150	230	146	164	138	148	144

	Other Crustacean forms								
28	Barnacle nauplii	192	188	194	*	186	226	148	164
29	Copepod nauplii	134	148	250	254	210	*	254	116
30	Mysis larvae	250	230	112	160	124	110	134	234
	Mollusca								
31	Gastropod veliger	164	158	282	182	174	176	134	182
	Larvacea								
32	*Oikopleura parva*	232	142	120	216	162	248	150	162
33	*O. dioica*	340	126	140	348	240	142	158	168
	Rotatoria								
34	*Brachionus rubens*	140	152	120	212	342	110	160	124
	Total	**5843**	**5734**	**5800**	**5825**	**5440**	**5625**	**5620**	**5341**

***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 1750 to 2375 Nos./m^3 with minimum density was recorded at station ILFS-21-LT (Pappa canal) during low tide and maximum in the Dredged soil dumping open sea (station ILFS-2-HT).

TABLE 12(a) Density and Diversity of Macrobenthos recorded in various stations of ITPCL Power project site during January 2025

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*	50	25	25	25	25	25	25	50	50	50
2	*Dorvillea rudolphi*	25	125	25	50	75	25	25	75	100	75
3	*Chone collaris*	50	75	25	*	175	25	75	25	50	25
4	*C. filicaudata*	25	25	50	175	25	25	25	50	75	50
5	*Cirratulus chrysoderma*	*	50	25	25	25	*	50	75	50	25
6	*C. cirratus*	25	50	50	50	50	50	50	*	150	50
7	*Cossura coasta*	50	75	50	75	50	50	75	50	75	75
8	*Euchone rosea*	25	125	25	25	25	25	25	50	*	50
9	*Euclymene lumbricoides*	125	75	75	75	50	25	25	75	50	50
10	*Exogone clavator*	50	50	50	*	50	*	25	50	175	50
11	*Glycera benguellana*	25	25	25	25	125	25	50	75	50	75
12	*Goniada emerita*	75	50	50	75	75	150	75	25	175	25
13	*Nephtys dibranchis*	25	*	100	25	50	*	50	25	50	75
14	*Nereis* sp.	50	75	75	50	25	50	50	75	125	75
15	*Notomastus aberans*	75	75	25	250	25	*	50	25	25	50
16	*N. faveli*	175	150	50	125	50	25	75	75	25	*
17	*Onuphis eremita*	50	25	75	50	25	150	50	25	25	25
18	*O. gracilis*	75	75	25	125	25	50	75	25	50	50

19	*Owenia fusiformis*	25	25	25	25	25	25	25	225	50	50
20	*Pista cristata*	75	75	75	*	25	175	75	50	50	50
21	*Prionospio cirrifera*	125	50	50	25	50	75	50	25	25	25
22	*Pygospio elegans*	125	50	50	50	75	125	125	50	25	50
23	*Scolelepis squamata*	25	75	75	100	25	50	25	50	50	50
24	*Syllis gracilis*	50	50	125	50	25	150	25	50	25	*
25	*Terebellides stroemi*	100	75	75	50	75	75	75	50	50	50
	Gastropods										
26	*Cerithedia cingulata*	50	50	25	25	50	25	50	50	50	*
27	*Nassarius stollatus*	75	100	125	25	100	75	75	50	150	50
28	*Natica didyma*	150	*	75	175	150	150	*	50	100	50
29	*Turritella attenuata*	75	75	100	25	25	25	50	*	50	125
30	*Umbonium vestiarium*	25	50	50	*	25	50	75	*	75	75
	Crustaceans										
31	*Ampithoe rubricata*	100	*	150	50	100	50	50	25	*	75
32	Copepod nauplii	100	25	50	*	50	50	125	100	*	25
33	Penaeid shrimp larvae	175	50	*	50	75	100	75	50	50	25
	Bivalves										
34	Cardium veligers	50	*	75	75	175	*	75	*	25	75
35	*Crassostrea madrasensis*	25	25	25	50	50	50	25	75	*	125
36	*Donax scortum*	50	*	175	50	*	75	25	25	25	25
37	*Perna viridis*	*	75	*	50	75	50	50	50	*	50
	Total	**2375**	**2000**	**2150**	**2100**	**2125**	**2075**	**1950**	**1825**	**2100**	**1850**

*** Organisms not present**

TABLE 12(b) Density and Diversity of Macrobenthos recorded in various stations of ITPCL Power project site during January 2025

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*	25	100	50	25	50	50	25	75
2	*Dorvillea rudolphi*	50	25	50	25	50	25	50	25
3	*Chone collaris*	50	25	175	25	50	50	75	75
4	*C. filicaudata*	25	50	50	*	50	50	50	50
5	*Cirratulus chrysoderma*	50	75	25	50	75	50	25	75
6	*C. cirratus*	25	25	25	25	25	75	50	50
7	*Cossura coasta*	50	25	75	25	50	25	75	25
8	*Euchone rosea*	25	50	25	*	25	175	50	25
9	*Euclymene lumbricoides*	50	75	50	25	50	25	125	25
10	*Exogone clavator*	50	25	75	25	25	50	50	75
11	*Glycera benguellana*	50	75	50	25	50	100	50	75
12	*Goniada emerita*	50	50	50	25	25	*	25	50
13	*Nephtys dibranchis*	125	75	25	*	150	50	25	125
14	*Nereis* sp.	50	25	`25	25	50	25	50	25
15	*Notomastus aberans*	75	75	*	75	75	75	25	25
16	*N. faveli*	25	*	50	125	25	50	50	150
17	*Onuphis eremita*	75	25	50	25	75	25	25	25
18	*O. gracilis*	25	50	*	25	75	25	25	25
19	*Owenia fusiformis*	75	50	50	75	25	75	75	75

20	*Pista cristata*	50	25	50	75	75	25	25	*
21	*Prionospio cirrifera*	25	50	75	100	225	25	50	50
22	*Pygospio elegans*	25	25	125	75	125	50	*	50
23	*Scolelepis squamata*	50	50	50	75	75	25	125	25
24	*Syllis gracilis*	75	75	25	50	50	50	150	50
25	*Terebellides stroemi*	50	25	50	150	25	*	25	75
	Gastropods								
26	*Cerithedia cingulata*	75	125	50	25	125	25	25	25
27	*Nassarius stollatus*	25	50	25	50	50	125	150	*
28	*Natica didyma*	50	150	75	25	25	150	150	50
29	*Turritella attenuata*	50	50	50	100	25	50	50	25
30	*Umbonium vestiarium*	25	25	50	50	50	25	50	75
	Crustaceans								
31	*Ampithoe rubricata*	25	75	75	25	25	125	50	25
32	Copepod nauplii	75	25	50	50	*	75	*	75
33	Penaeid shrimp larvae	50	75	50	50	50	50	25	*
	Bivalves								
34	Cardium veligers	125	25	25	100	75	25	25	25
35	*Crassostrea madrasensis*	50	25	75	75	25	25	25	75
36	*Donax scortum*	75	*	175	75	75	25	50	25
37	*Perna viridis*	50	75	75	50	75	75	75	25
	Total	**1900**	**1850**	**2025**	**1825**	**2175**	**1950**	**1975**	**1750**

***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 175 to 242 Nos/10cm^2 with minimum density was recorded at station ILFS-21-LT (Papaa canal) during low tide and maximum was at the Outfall location (station ILFS-2-HT).

TABLE 13(a) Density and Diversity of Meiobenthos recorded in various stations of ITPCL Power project site during January 2025

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*	4	8	4	10	4	4	10	6	6	6
2	*Halalaimus filum*	6	2	4	8	10	8	14	6	10	6
3	*Astomonema jenneri*	4	4	4	4	8	4	6	*	8	4
4	*Pselionema* sp.	10	4	12	6	4	6	6	*	6	*
5	*Stephanolaimus* sp.	12	6	10	8	10	6	8	6	*	6
6	*Quadricoma* sp.	10	10	10	4	6	10	*	8	6	8
7	*Araeolaimus longicauda*	6	5	4	10	12	6	10	6	4	10
	Foraminiferans										
8	*Ammonia beccarii*	10	8	4	8	*	4	8	8	6	10
9	*A. tepida*	5	5	12	6	14	6	6	4	12	6
10	*Bolivina limbata*	12	10	8	8	6	10	10	6	6	6
11	*Elphidium texanum*	4	5	4	*	14	12	10	4	4	4
12	*Lagena lacunata*	6	*	*	4	6	5	4	14	6	8
13	*Lagena semistriata*	4	5	6	10	12	6	10	6	4	10

14	*Nonion depressulum*	10	6	8	8	4	4	*	8	6	8
15	*Quinqueloculina* sp.	12	8	9	14	10	8	6	8	5	4
16	*Eponides repandus*	4	*	*	8	10	12	2	4	10	4
17	*Globigerina rubber*	4	4	*	6	8	*	4	6	10	6
18	*Rosalina globularis*	6	8	4	10	4	4	10	6	9	6
19	*Rotalia vilardeboana*	10	4	18	6	*	6	*	12	8	2
20	*Spirillina limbata*	6	2	6	8	10	8	14	6	10	6
21	*Spiroloculina excavata*	10	4	12	6	4	6	6	*	6	*
22	*Textularia agglutinans*	4	8	6	4	6	8	14	4	8	10
	Ostrocodes										
23	*Leguminocythereis oertlii*	6	8	12	8	12	14	8	4	10	8
24	*Patagonia theretricostata*	12	6	8	10	8	8	10	6	*	6
25	*Eucythere argus*	12	6	10	8	*	6	8	6	*	6
26	*Paracytheroma sudaustralis*	8	8	6	10	12	12	10	4	10	12
27	*Cytheromorpha fuscata*	10	10	10	6	6	10	*	8	6	8
28	*Stenocypris major*	6	6	10	*	4	4	*	10	4	6
	Harpacticoids										
29	*Diarthrodes major*	8	10	6	6	6	4	12	4	*	4
30	*Euterpina acutifrons*	9	8	4	4	4	4	*	6	4	8
31	*Harpacticus chelifer*	6	10	9	8	6	5	4	2	12	*
32	*Paramesochra dubia*	*	14	12	4	8	8	12	6	4	2
33	*Macrosetella gracilis*	6	*	6	2	4	2	8	*	6	10
	Total	**242**	**202**	**238**	**222**	**232**	**220**	**230**	**184**	**206**	**200**

*** Organisms not present**

CAS IN MARINE BIOLOGY

TABLE 13(b) Density and Diversity of Meiobenthos recorded in various stations of ITPCL Power project site during January 2025

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*	8	14	14	8	*	6	2	6
2	*Halalaimus filum*	16	6	4	10	9	8	12	9
3	*Astomonema jenneri*	8	8	6	6	9	12	8	5
4	*Pselionema* sp.	12	6	6	4	8	4	6	*
5	*Stephanolaimus* sp.	10	*	12	2	*	4	4	6
6	*Quadricoma* sp.	8	2	0	6	16	12	10	*
7	*Araeolaimus longicauda*	*	6	6	4	8	4	6	10
	Foraminiferans								
8	*Ammonia beccarii*	10	4	10	10	*	6	8	*
9	*Ammonia tepida*	6	8	4	6	6	4	2	10
10	*Bolivina limbata*	9	8	6	8	4	6	4	4
11	*Elphidium texanum*	12	6	*	4	8	4	4	*
12	*Lagena lacunata*	4	4	6	8	6	4	6	10
13	*Lagena semistriata*	12	8	6	4	10	6	6	6
14	*Nonion depressulum*	8	*	9	8	8	4	14	*
15	*Quinqueloculina* sp.	10	*	6	4	5	8	6	6
16	*Eponides repandus*	10	8	14	2	9	6	*	8
17	*Globigerina rubber*	9	6	6	8	7	12	4	4

18	*Rosalina globularis*	4	*	4	6	10	4	8	6
19	*Rotalia vilardeboana*	6	12	6	*	9	*	10	*
20	*Spirillina limbata*	10	12	12	*	8	6	2	9
21	*Spiroloculina excavata*	4	10	8	6	4	12	4	8
22	*Textularia agglutinans*	6	2	2	10	6	4	6	8
	Ostrocodes								
23	*Leguminocythereis oertlii*	*	6	8	10	12	8	12	10
24	*Patagonia theretricostata*	8	8	4	16	10	12	8	4
25	*Eucythere argus*	10	*	12	2	*	4	4	6
26	*Paracytheroma sudaustralis*	8	14	14	4	*	6	2	8
27	*Cytheromorpha fuscata*	8	2	0	6	4	4	10	*
28	*Stenocypris major*	*	6	6	4	8	8	16	10
	Harpacticoids								
29	*Diarthrodes major*	6	8	4	6	8	4	2	10
30	*Euterpina acutifrons*	8	6	4	4	6	10	4	*
31	*Harpacticus chelifer*	*	4	2	2	6	*	2	6
32	*Paramesochra dubia*	*	4	10	10	*	6	8	*
33	*Macrosetella gracilis*	*	6	2	12	12	4	8	6
	Total	**230**	**194**	**213**	**200**	**216**	**202**	**208**	**175**

***Organisms not present**

CONCLUDING REMARKS

In the present survey, made on 20th January - 2025, 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. As a whole, the physico-chemical parameters did not show much variation except a few parameters which indicated only marginally. 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 *Nitzschia longissima, Navicula henneydii, Stephanopyxis palmeriana, Ceratium furca, Bacteriastrum hyalinium, Chaetoceros coarctatus, Biddulphia reticulate, Coscinodiscus granii, Melosira borreri* and *Lauderia borealis* were recorded commonly during the survey. Besides, the conservative macro benthic species like *Peridinium claudicans, Protoperidinium oceanicum, Terebellides stroemi, Nephtys polybranchia,* and *Cirratulus chrysoderma* 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 waters and sediment samples indicates that it is well within the ERM (Effective Range Median) values indicating there are no possibilities of Heavy metal contamination in the region. In short, comparing the values of the seawater quality, 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 recommended limits.