

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

Monthly Data Report (June - 2026)

Submitted by

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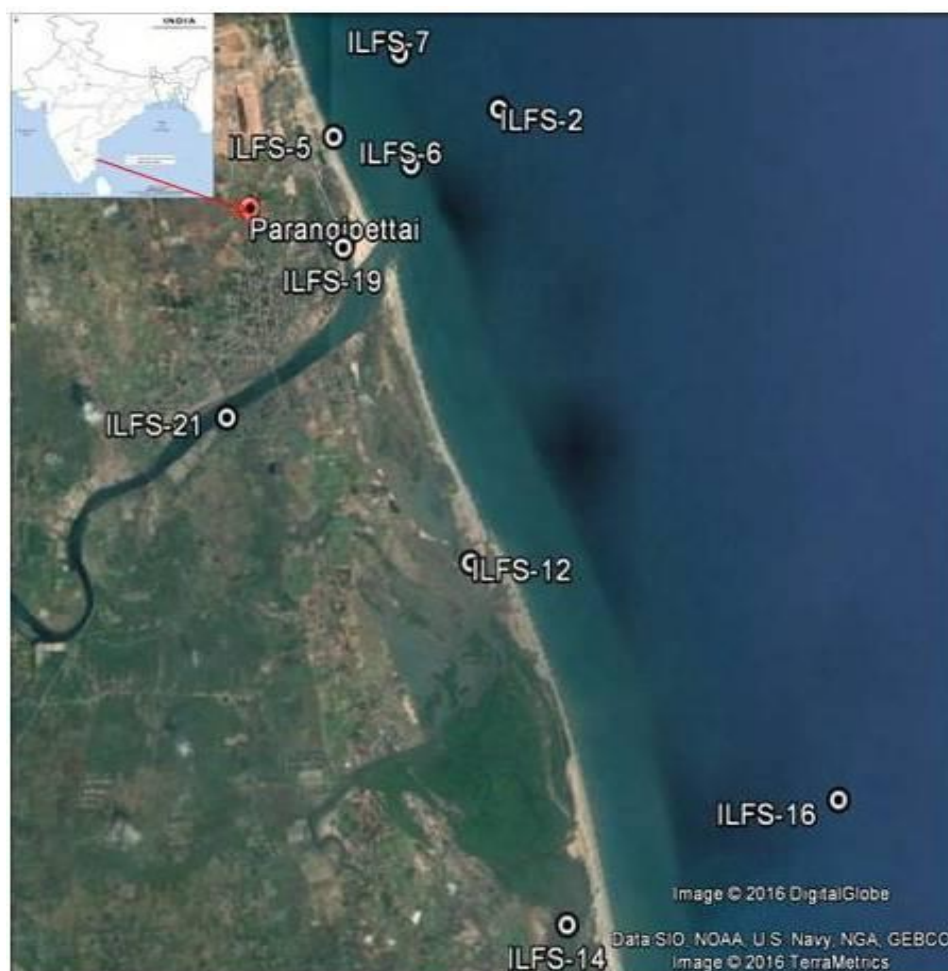
June - 2026



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 18.06.2026 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



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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)	7.15 AM	11°31'27.94"N 79°47'50.77"E
2	ILFS-2-LT	2.20 PM	
3	ILFS-5-HT (Intake)	7.50 AM	11°31'13.31"N 79°46'14.37"E
4	ILFS-5-LT	2.45 PM	
5	ILFS-6-HT (Outfall)	8.45AM	11°30'58.78"N 79°46'59.61"E
6	ILFS-6-LT	3.45 PM	
7	ILFS-7-HT (North Break Water)	9.20 AM	11°31'56.49"N 79°46'52.76"E
8	ILFS-7-LT	4.25 PM	
9	ILFS-16-HT (Off shore parallel to Mangroves-2)	9.50 AM	11°25'29.13"N 79°51'10.08"E
10	ILFS-16-LT	4.45PM	
11	ILFS-12-HT (Pichavaram Mangroves extension from Vellar-2)	7.25 AM	11°27'32.11"N 79°47'34.79"E
12	ILFS-12-LT	2.25 PM	
13	ILFS-14-HT (Pichavaram Mangroves extension from Coleroon-2)	8.45 AM	11°24'23.92"N 79°48'31.59"E
14	ILFS-14-LT	2.40 PM	
15	ILFS-19-HT (Annan kovil landing center)	9.25AM	11° 30' 15.75"N 79° 46'20.07"E
16	ILFS-19-LT	3.25 PM	
17	ILFS-21-HT (Pappa canal)	10.15 AM	11°28'47.22"N 79°45'12.15"E
18	ILFS-21-LT	4.40 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



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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 filtered 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 60⁰ C) in clean glass petri-dishes.

Collection of Sediment Samples (Grab sampler)

Van veen Grab with a biting area of 0.1 m² was employed as a standard sediment sampler, since it is (i) an efficient sampler for the range of soft surface sediments encountered in



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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°C . A quick note for sample collection and preservation procedures for each parameter 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 ($\pm 0.02^{\circ}\text{C}$ 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-Naphthyl) 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 molybdenum 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 silicomolybdate 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 phenanthroline 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 HNO₃ 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 volatilizes 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 pipetted 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 $28 \pm 2^\circ\text{C}$ for 24 to 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 petridishes 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 50 micron to 300 microns) 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 - 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), 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.



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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 recorded in water samples collected in various stations of ITPCL site during June 2026

Station Code	Depth (m)	Transparency (m)	Turbidity (NTU)	TSS (mg/L)	AT (°C)	WT (°C)	pH	Salinity (PSU)	DO (mg/l)	BOD (mg/l)
ILFS-2-HT	8.30	2.50	1.60	21.80	29.95	28.30	8.38	35.90	6.50	1.30
ILFS-2-LT	6.50	2.70	1.80	19.60	29.65	27.60	8.35	34.90	6.60	1.50
ILFS-5-HT	7.50	2.00	1.90	20.90	28.85	27.50	8.34	34.60	6.80	1.25
ILFS-5-LT	6.50	2.50	2.00	20.60	29.90	28.00	8.33	34.60	6.35	1.70
ILFS-6-HT	6.70	1.90	2.45	20.70	29.90	28.30	8.36	34.60	5.70	1.20
ILFS-6-LT	6.50	1.80	2.90	24.10	30.35	29.10	8.28	34.40	5.60	1.20
ILFS-7-HT	7.70	2.50	2.85	23.90	30.50	30.00	8.36	33.30	6.20	1.95
ILFS-7-LT	6.90	1.90	3.35	23.70	30.55	30.05	8.30	33.60	5.70	1.50
ILFS-16-HT	6.70	2.30	2.95	19.50	30.65	30.10	8.32	32.50	6.75	2.20
ILFS-16-LT	6.50	2.20	3.35	21.70	31.40	30.15	8.20	32.30	6.35	2.20
ILFS-12-HT	5.80	1.50	4.50	23.10	31.50	30.05	8.00	33.70	5.75	1.30
ILFS-12-LT	5.30	1.60	5.30	24.70	31.60	30.00	7.90	31.70	5.55	1.25
ILFS-14-HT	5.00	1.50	6.55	22.00	27.90	26.80	8.30	30.00	5.30	1.20
ILFS-14-LT	4.40	1.30	8.80	24.70	30.60	28.70	8.25	29.50	5.65	1.30
ILFS-19-HT	2.80	1.80	9.60	23.50	28.70	27.10	8.30	30.70	6.85	1.60
ILFS-19-LT	2.60	1.30	11.20	24.70	30.75	29.05	8.30	29.60	6.85	1.40
ILFS-21-HT	2.10	0.90	9.60	23.00	29.80	27.90	8.20	29.70	6.50	1.25
ILFS-21-LT	1.10	0.70	11.80	24.10	29.85	29.10	8.25	28.80	6.30	1.20

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



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1.3. Nutrients and Petroleum Hydrocarbons

The chemical parameters like nitrite (NO₂-N), nitrate (NO₃-N), ammonia (NH₃-N), total nitrogen (TN), inorganic phosphate (IP), Total phosphorus, silicate, sulfate 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 June 2026

Station Code	SEAWATER NUTRIENTS (μmol/l)								PHC (μg/l)
	NO ₂	NO ₃	NH ₃	TN	IP	TP	SO ₄	SiO ₃	
ILFS-2-HT	0.395	1.295	0.185	8.650	0.780	1.920	26.900	12.550	0.650
ILFS-2-LT	0.220	1.480	0.190	8.750	0.610	2.000	26.000	11.900	0.600
ILFS-5-HT	0.290	1.270	0.155	10.400	0.700	1.850	24.200	10.500	0.650
ILFS-5-LT	0.245	1.280	0.165	10.200	0.610	2.000	24.450	12.750	0.560
ILFS-6-HT	0.260	1.350	0.170	10.300	0.820	2.050	22.700	12.700	0.820
ILFS-6-LT	0.310	1.600	0.190	11.600	0.390	1.950	23.900	13.800	0.650
ILFS-7-HT	0.190	1.870	0.175	10.100	0.470	2.950	22.850	13.650	0.850
ILFS-7-LT	0.160	1.970	0.210	11.050	0.520	2.750	22.950	9.900	0.570
ILFS-16-HT	0.270	1.720	0.280	10.850	0.680	1.950	23.100	13.000	0.750
ILFS-16-LT	0.250	1.700	0.320	10.800	0.600	2.750	21.950	12.350	0.570
ILFS-12-HT	0.300	1.720	0.380	12.100	0.650	2.000	24.000	11.850	0.850
ILFS-12-LT	0.280	1.900	0.410	12.000	0.470	2.600	23.000	10.000	0.720
ILFS-14-HT	0.260	1.870	0.310	13.450	0.650	1.950	24.000	13.600	0.810
ILFS-14-LT	0.245	1.900	0.350	12.250	0.520	1.850	25.350	12.900	0.550
ILFS-19-HT	0.250	1.780	0.620	13.650	0.560	2.850	26.200	11.850	0.650
ILFS-19-LT	0.140	2.000	0.780	12.950	0.580	2.000	26.000	12.750	0.600
ILFS-21-HT	0.235	2.010	0.680	11.100	0.610	2.500	27.800	13.100	0.680
ILFS-21-LT	0.225	1.970	0.800	12.700	0.540	2.200	26.900	13.950	0.550

(Reference values: NO₂: 0.05–1.03μmol/l; TN 0.87–26.16μmol/l; TP: 0.43–7.16μmol/l; NH₃ 0.01–3.70 μmol/l; SO₄ – 1.00 to 49.00 μmol/l)



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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 June 2026

Station Code	Total Organic Carbon (mgC/g)	Soil Texture (%)		
		Sand	Silt	Clay
ILFS-2-HT	5.45	86.25	7.75	6.0
ILFS-2-LT	5.25	88.31	6.53	5.16
ILFS-5-HT	4.6	79.92	9.45	10.63
ILFS-5-LT	4.5	80.19	8.21	11.6
ILFS-6-HT	3.55	86.65	9.35	4.0
ILFS-6-LT	4.85	83.56	11.3	5.14
ILFS-7-HT	3.45	77.78	11.1	11.12
ILFS-7-LT	5.8	74.00	10.9	15.1
ILFS-16-HT	5.1	84.76	8.2	7.04
ILFS-16-LT	5.7	84.57	9.46	5.97
ILFS-12-HT	5.65	63.13	20.09	16.78
ILFS-12-LT	3.3	53.28	14.7	32.02
ILFS-14-HT	3.9	55.06	19.5	25.44
ILFS-14-LT	3.75	56.28	20.2	23.52
ILFS-19-HT	5.5	45.85	26.55	27.6
ILFS-19-LT	6.45	25.5	26.77	47.73
ILFS-21-HT	5.25	43.88	29.58	26.54
ILFS-21-LT	5.5	56.13	25.32	18.55



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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 June 2026

Station Code	Chlorophyll 'a'(mg/m ³)	Phaeophytin (mg/m ³)
ILFS-2-HT	1.820	0.680
ILFS-2-LT	1.870	0.870
ILFS-5-HT	2.080	0.990
ILFS-5-LT	1.960	0.860
ILFS-6-HT	1.680	0.690
ILFS-6-LT	1.820	0.780
ILFS-7-HT	1.780	0.990
ILFS-7-LT	1.690	0.760
ILFS-16-HT	1.460	0.670
ILFS-16-LT	1.630	0.850
ILFS-12-HT	2.580	0.910
ILFS-12-LT	1.990	0.640
ILFS-14-HT	1.370	0.690
ILFS-14-LT	1.470	0.780
ILFS-19-HT	1.750	0.820
ILFS-19-LT	1.340	0.570
ILFS-21-HT	1.460	0.910



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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 ($\mu\text{g/l}$) in Seawater samples collected from various stations of ITPCL sites during June 2026

Station Code	Fe	Zn	Mn	Cd	Ni	Cr	Pb	Cu	Hg
ILFS-2	14.35	20.35	36.1	2.65	1.75	2.2	4.35	11.45	0.58
ILFS-5	15.1	18.55	38.8	3.55	2.85	2.75	5.4	15.7	0.82
ILFS-6	13.8	15.2	32.9	2.35	2.9	2.75	4.85	15.55	0.71
ILFS-7	15.7	15.8	39.3	2.7	2.5	2.85	5.4	12.7	0.66
ILFS-16	13.3	20.8	42.1	3.35	3.6	2.65	4.55	14.75	0.64
ILFS-12	14.7	23.05	45.3	2.25	2.75	2.85	5.15	15.65	0.6
ILFS-19	12.45	21.5	34.8	2.4	2.55	2.35	5.55	13.8	0.45
ILFS-21	16.75	19	35.2	2.4	3	2.8	4.6	14.5	0.6

(Reference values: Zn 1.02–34.11 $\mu\text{g/L}$; Mn 1.02–51.77 $\mu\text{g/L}$; Cd 4.56–9.43 $\mu\text{g/L}$; Ni 0.52–36.18 $\mu\text{g/L}$; Cr 6.55–13.9 $\mu\text{g/L}$ and Hg 0.52–13.45 $\mu\text{g/L}$)

Table 7. Heavy Metals ($\mu\text{g/g}$) in sediment samples collected from various stations of ITPCL sites during June 2026

Station Code	Fe	Zn	Mn	Cd	Ni	Cr	Pb	Cu	Hg
ILFS - 2	1465.20	12.80	61.50	12.80	12.75	10.80	9.25	22.80	0.81
ILFS - 5	1488.60	15.70	71.90	11.75	15.80	9.70	5.45	20.80	0.85
ILFS - 6	1542.30	13.85	70.60	15.30	12.55	11.10	9.85	26.10	0.62
ILFS - 7	1589.80	15.15	69.50	12.85	15.15	10.75	7.70	22.10	0.68
ILFS - 16	1475.50	16.55	68.50	12.25	10.75	10.80	11.90	25.10	0.71
ILFS - 12	1453.00	14.65	66.60	10.75	12.25	12.75	6.70	28.40	0.78
ILFS - 19	1368.20	17.85	71.30	12.40	14.00	10.75	11.10	25.10	0.60
ILFS - 21	1428.50	16.85	75.40	14.20	12.15	9.55	11.65	22.30	0.75

(Reference values: Hg 0.0–3.7 $\mu\text{g/g}$; Cu 16–62 $\mu\text{g/g}$; Mn 34.36–177.3 $\mu\text{g/g}$; Ni 30–55 $\mu\text{g/g}$; Pb 7.4–47.1 $\mu\text{g/g}$ and Cr 12.08–112.9 $\mu\text{g/g}$)



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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 and 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 June 2026

Station Code	Total Viable Count (TVC)	Total Coliforms (TC)	<i>Streptococcus faecalis</i> (SF)
ILFS-2-HT	13×10 ³	8×10 ³	7×10 ³
ILFS-2-LT	12×10 ³	9×10 ³	8×10 ³
ILFS-5-HT	17×10 ³	7×10 ³	8×10 ³
ILFS-5-LT	20×10 ³	10×10 ³	11×10 ³
ILFS-6-HT	16×10 ³	11×10 ³	10×10 ³
ILFS-6-LT	16×10 ³	12×10 ³	12×10 ³
ILFS-7-HT	17×10 ³	10×10 ³	9×10 ³
ILFS-7-LT	18×10 ³	11×10 ³	11×10 ³
ILFS-16-HT	20×10 ³	13×10 ³	12×10 ³
ILFS-16-LT	23×10 ³	14×10 ³	12×10 ³
ILFS-12-HT	21×10 ³	12×10 ³	13×10 ³
ILFS-12-LT	24×10 ³	12×10 ³	15×10 ³
ILFS-14-HT	22×10 ³	10×10 ³	13×10 ³
ILFS-14-LT	23×10 ³	13×10 ³	15×10 ³
ILFS-19-HT	21×10 ³	10×10 ³	12×10 ³
ILFS-19-LT	24×10 ³	11×10 ³	12×10 ³
ILFS-21-HT	23×10 ³	12×10 ³	14×10 ³
ILFS-21-LT	23×10 ³	14×10 ³	16×10 ³



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Table 9. Bacterial populations recorded in sediment samples collected from various stations of ITPCL site during June 2026

Station Code	Total Viable Count (TVC)	Total Coliforms (TC)	<i>Streptococcus faecalis</i> (SF)
ILFS-2-HT	16×10 ³	11×10 ³	12×10 ³
ILFS-2-LT	15×10 ³	12×10 ³	13×10 ³
ILFS-5-HT	20×10 ³	13×10 ³	15×10 ³
ILFS-5-LT	23×10 ³	12×10 ³	13×10 ³
ILFS-6-HT	25×10 ³	11×10 ³	15×10 ³
ILFS-6-LT	25×10 ³	13×10 ³	17×10 ³
ILFS-7-HT	24×10 ⁴	13×10 ⁴	17×10 ⁴
ILFS-7-LT	23×10 ⁴	14×10 ⁴	18×10 ⁴
ILFS-16-HT	25×10 ³	15×10 ³	22×10 ³
ILFS-16-LT	27×10 ³	14×10 ³	23×10 ³
ILFS-12-HT	26×10 ³	14×10 ³	23×10 ³
ILFS-12-LT	28×10 ³	17×10 ³	21×10 ³
ILFS-14-HT	28×10 ³	15×10 ³	20×10 ³
ILFS-14-LT	29×10 ³	18×10 ³	18×10 ³
ILFS-19-HT	28×10 ³	17×10 ³	20×10 ³
ILFS-19-LT	30×10 ³	20×10 ³	24×10 ³
ILFS-21-HT	27×10 ³	22×10 ³	23×10 ³
ILFS-21-LT	29×10 ³	21×10 ³	23×10 ³



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1.8 Phytoplankton Density and Diversity

The results of qualitative and quantitative estimation of the phytoplankton samples collected in various sampling stations are given in Tables 10(a) and 10(b). The population density varied from 7009 to 11538 Nos. /L with minimum density was recorded at station ILFS-21-LT during low tide (Pichavaram Mangroves, Pappa canal) and the maximum was in the Intake point in open Sea (Station ILFS-2-HT).

Table 10 (a) Density of Phytoplankton recorded in various stations of ITPCL Power project site during June 2026

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	<i>Navicula directa</i>	255	270	238	170	395	200	*	130	250	388
2	<i>N. hennedyi</i>	268	*	205	145	165	*	263	270	*	275
3	<i>Stephanopyxis palmeriana</i>	220	248	278	245	120	245	285	*	295	285
4	<i>Nitzschia seriata</i>	*	190	*	140	*	290	230	290	190	*
5	<i>Planktoniella sol</i>	195	250	280	270	290	300	280	270	290	300
	Naviculoideae										
6	<i>Gyrosigma acuminatum</i>	255	190	175	170	195	295	405	280	170	190
7	<i>G. balticum</i>	380	160	150	*	295	252	190	200	230	250
8	<i>Pleurosigma normanii</i>	180	150	270	145	155	140	225	495	245	295
9	<i>P. elongatum</i>	250	158	190	190	395	*	260	280	195	*
10	<i>Asterionella glacialis</i>	395	360	348	360	280	160	270	258	*	250



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	Belleracheaceae										
11	<i>Bellerachea</i> sp.	245	148	120	145	158	164	202	250	155	205
12	<i>B. malleus</i>	305	108	105	105	118	130	242	145	125	145
	Biddulphoidae										
13	<i>Biddulphia heteroceros</i>	168	*	262	145	136	152	156	166	248	242
14	<i>B. reticulate</i>	165	125	320	438	*	235	*	225	142	132
15	<i>B. obtuse</i>	145	235	*	115	116	145	340	140	148	*
	Chaetocereae										
16	<i>Bacteriastrum delicatulum</i>	145	160	255	135	355	180	380	155	310	*
17	<i>B. hyalinum</i>	*	330	345	265	250	*	360	*	275	280
18	<i>Bacteriastrum comosum</i>	168	145	152	140	195	170	175	145	145	185
19	<i>Chaetoceros affinis</i>	260	365	*	*	355	150	*	170	390	160
20	<i>C. clacitrans</i>	*	160	170	175	158	165	245	155	185	185
21	<i>C. decipiens</i>	140	340	145	170	160	150	150	160	*	285
	Coscinodisceae										
22	<i>Coscinodiscus centralis</i>	190	158	265	275	280	285	235	235	205	150
23	<i>C. granii</i>	335	305	270	252	260	130	250	*	265	*
24	<i>Lauderia borealis</i>	425	*	395	*	220	190	*	160	135	175
25	<i>Skeletonema costatum</i>	260	285	255	265	*	130	145	185	145	205
	Eucampiinae										
26	<i>Eucampia zodiacus</i>	240	250	260	275	240	165	250	150	150	120
	Asterionellaceae										
27	<i>Astrionella</i> sp.	170	250	150	170	160	290	150	*	*	*
28	<i>A. glacialis</i>	290	205	160	160	135	120	145	175	180	245



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	Fragilariaceae										
29	<i>Diatoma anceps</i>	270	155	150	170	155	*	145	245	240	*
30	<i>Thalassionema nitzschioides</i>	155	280	200	275	150	185	345	285	155	150
	Soleniceae										
31	<i>Bacillaria paradoxa</i>	*	175	140	*	185	160	150	185	*	160
32	<i>Leptocylindrus danicus</i>	260	265	255	275	*	230	*	225	230	225
33	<i>Rhizosolenia alata</i>	*	385	340	*	365	260	355	*	130	135
	Triceratiinae										
34	<i>Ditylum brightwelli</i>	445	260	265	275	255	150	145	260	140	140
35	<i>Odontella mobiliensis</i>	280	190	165	175	190	270	240	235	180	125
36	<i>O. sinensis</i>	170	240	160	345	180	355	*	260	*	265
37	<i>Lithodesmium undulatum</i>	430	*	260	280	230	250	300	130	290	140
	DINOFLAGELLATES (DINOPHYCEAE)										
	Ceratiaceae										
38	<i>Ceratium lineatum</i>	200	205	225	245	258	235	225	315	*	240
39	<i>C. ranipes</i>	255	145	225	140	155	280	180	*	235	155
40	<i>C. furca</i>	320	150	155	335	160	215	240	185	305	*
	Peridiniaceae										
41	<i>Peridinium claudicans</i>	250	168	160	178	135	180	225	*	230	*
42	<i>Protoperidinium oceanicum</i>	230	130	160	230	155	270	450	*	280	120
	Prorocentraceae										
43	<i>Prorocentrum</i> sp.	124	240	*	220	*	135	175	256	*	144
44	<i>P. micans</i>	360	140	135	*	*	150	115	310	125	130
	Dinophysiaceae										



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45	<i>Pyrophacus steinii</i>	325	140	550	225	355	155	*	230	140	135
46	<i>Dinophysis acuta</i>	265	160	280	*	140	175	140	150	*	160
47	<i>D. caudata</i>	180	170	115	145	245	235	175	115	180	195
BLUE GREEN ALGAE (CYANOBACTERIA)											
	Cyanophyceae										
48	<i>Anabaena circinails</i>	455	275	155	165	375	*	190	125	185	375
49	<i>Trichodesmium erytheaum</i>	255	275	265	225	260	260	250	300	265	*
50	<i>Oscillatoria</i> sp.	260	145	148	155	405	280	280	195	145	140
	Total	11538	9838	10271	9123	9939	9263	10158	9095	8523	8081

* Organisms not present

Table 10 (b) Density of Phytoplankton recorded in various stations of ITPCL Power project site during June 2026

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	<i>Navicula directa</i>	138	240	275	155	140	240	132	135
2	<i>N. hennedyi</i>	*	145	278	285	255	145	120	138
3	<i>Stephanopyxis palmeriana</i>	255	255	145	145	150	235	175	165
4	<i>Nitzschia seriata</i>	380	*	290	270	260	*	*	168
5	<i>Planktoniella sol</i>	230	135	355	140	145	140	165	175
	Naviculoideae								
6	<i>Gyrosigma acuminatum</i>	135	*	335	225	*	155	135	128



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7	<i>G. balticum</i>	*	140	280	*	130	135	*	*
8	<i>Pleurosigma normanii</i>	445	275	155	305	165	*	145	170
9	<i>P. elongatum</i>	140	225	285	150	150	*	145	135
10	<i>Asterionella glacialis</i>	360	335	*	335	195	175	135	170
	Bellerocheaceae								
11	<i>Bellerochea</i> sp.	105	*	215	218	148	165	185	225
12	<i>B. malleus</i>	175	150	218	228	260	*	130	180
	Biddulphoidae								
13	<i>Biddulphia heteroceros</i>	*	215	118	130	110	158	135	125
14	<i>B. reticulate</i>	250	210	*	215	135	105	128	105
15	<i>B. obtuse</i>	230	*	235	125	130	210	265	*
	Chaetocereae								
16	<i>Bacteriastrium delicatulum</i>	168	285	260	150	170	250	245	160
17	<i>B. hyalinium</i>	290	175	170	375	245	265	270	175
18	<i>Bacteriastrium comosum</i>	145	250	345	*	140	120	150	145
19	<i>Chaetoceros affinis</i>	245	150	120	140	130	145	*	250
20	<i>C. clacitrans</i>	260	245	265	285	260	250	255	*
21	<i>C. decipiens</i>	*	255	135	170	155	145	160	175
	Coscinodisceae								
22	<i>Coscinodiscus centralis</i>	230	240	220	295	195	150	150	120
23	<i>C. granii</i>	180	275	205	160	205	220	205	205
24	<i>Lauderia borealis</i>	*	305	290	255	315	*	*	275
25	<i>Skeletonema costatum</i>	230	180	180	285	245	240	210	210
	Eucampiinae								



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26	<i>Eucampia zoodiacus</i>	285	275	265	245	255	245	285	290
	Asterionellaceae								
27	<i>Astrionella</i> sp.	108	185	310	135	110	140	145	120
28	<i>A. glacialis</i>	380	*	110	100	*	198	160	125
	Fragilariaceae								
29	<i>Diatoma anceps</i>	170	335	132	265	108	170	158	180
30	<i>Thalassionema nitzschioides</i>	230	250	105	135	255	255	268	248
	Soleniceae								
31	<i>Bacillaria paradoxa</i>	235	215	142	*	218	218	130	130
32	<i>Leptocyldrus danicus</i>	*	305	208	228	225	230	180	150
33	<i>Rhizosolenia alata</i>	265	225	*	285	168	188	210	198
	Triceratiinae								
34	<i>Ditylum brightwelli</i>	*	*	425	280	160	155	125	155
35	<i>Odontella mobiliensis</i>	280	170	305	185	175	175	170	*
36	<i>O. sinensis</i>	160	255	185	380	245	155	240	150
37	<i>Lithodesmium undulatum</i>	145	245	155	165	155	*	160	145
	DINOFLAGELLATES (DINOPHYCEAE)								
	Ceratiaceae								
38	<i>Ceratium lineatum</i>	120	158	225	*	140	232	125	136
39	<i>C. ranipes</i>	345	140	300	255	350	245	225	*
40	<i>C. furca</i>	200	*	*	165	248	295	365	*
	Peridiniaceae								
41	<i>Peridinium claudicans</i>	170	165	280	170	160	155	140	125
42	<i>Protoperidinium oceanicum</i>	395	300	250	240	140	140	165	135



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	Prorocentraceae								
43	<i>Prorocentrum</i> sp.	380	*	135	260	170	230	185	185
44	<i>P. micans</i>	250	135	235	270	245	245	*	270
	Dinophysiaceae								
45	<i>Pyrophacus steinii</i>	400	165	140	*	140	150	170	*
46	<i>Dinophysis acuta</i>	180	*	*	180	155	120	130	125
47	<i>D. caudata</i>	170	270	190	190	140	150	175	165
	BLUE GREEN ALGAE (CYANOBACTERIA)								
	Cyanophyceae								
48	<i>Anabaena circinalis</i>	295	*	260	160	245	265	265	*
49	<i>Trichodesmium erytheum</i>	150	245	*	*	150	140	120	118
50	<i>Oscillatoria</i> sp.	*	260	165	155	215	230	115	125
	Total	9904	8983	9896	9489	9005	8374	8051	7009

***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 5776 to 8795 Nos./m³ with minimum density was recorded at station ILFS-21-LT (Pichavaram Mangroves, Pappa canal) during low tide and maximum was recorded Intake open sea (station ILFS-2-HT).



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Table 11(a) Density of Zooplankton recorded in various stations of ITPCL Power project site during June 2026

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	<i>Globigernia bulloides</i>	245	170	275	255	320	140	235	150	245	150
2	<i>G. opima</i>	145	355	355	245	175	245	140	130	225	260
	Annelida										
3	Polychaete larvae	175	140	280	215	245	265	235	275	230	220
	Calanoid copepods										
4	<i>Acartia danae</i>	230	138	138	260	145	178	*	118	230	118
5	<i>A. erythraea</i>	225	315	350	228	210	250	345	140	240	365
6	<i>Acrocalanus gibber</i>	325	260	*	160	130	165	*	250	118	145
7	<i>A. gracilis</i>	140	240	245	310	220	120	230	135	320	108
8	<i>Centropages furcatus</i>	395	250	275	375	140	*	240	240	215	*
9	<i>Eucalanus elongates</i>	165	180	360	245	350	260	245	140	290	*
10	<i>Labidocera pavo</i>	325	220	330	125	165	145	190	250	210	160
11	<i>L. acuta</i>	210	360	220	250	285	385	275	145	140	130
12	<i>Nannocalanus minor</i>	270	120	145	360	175	245	150	250	*	145
13	<i>Paracalanus parvus</i>	*	140	*	240	*	290	230	*	*	115
14	<i>Temora stylifera</i>	345	375	340	230	325	240	140	335	145	225
	Harpacticoid copepods										
15	<i>Clytmnestra scutellata</i>	265	*	260	220	150	120	255	160	185	245
16	<i>Euterpina acutifrons</i>	235	140	255	*	255	*	140	240	165	125
17	<i>Macrosetella oculata</i>	155	175	*	165	*	145	260	150	*	190



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18	<i>M. gracilis</i>	235	260	355	235	255	*	245	145	245	140
19	<i>Microsetella rosea</i>	*	*	165	185	245	215	255	160	190	145
20	<i>Metis jousseaumei</i>	170	245	155	*	145	260	220	*	*	290
	Cyclopoid copepods										
21	<i>Copilia vitrea</i>	*	350	285	140	*	235	*	150	*	145
22	<i>Corycaeus danae</i>	135	185	345	360	*	160	*	145	275	165
23	<i>C. catus</i>	*	195	145	245	270	280	235	150	245	155
24	<i>Oithona brevicornis</i>	275	250	360	*	*	235	235	250	270	295
25	<i>O. linearis</i>	285	180	140	*	235	255	*	140	185	*
26	<i>O. rigida</i>	260	255	*	145	290	160	240	260	*	235
	Coelenterates										
27	<i>Aurelia aurita</i>	345	295	140	225	270	250	195	355	*	145
28	<i>Diphyysis</i> sp.	295	255	*	250	*	170	*	120	260	*
	Spirotrichea										
29	<i>Favella brevis</i>	165	*	325	*	220	215	*	150	155	255
30	<i>F. philipiensis</i>	*	140	*	285	275	250	145	160	270	275
31	<i>Rhabdonella lohmani</i>	165	145	175	*	275	120	260	170	170	180
32	<i>T. tubulosa</i>	325	*	235	255	275	*	285	170	255	*
33	<i>T. beroidea</i>	350	290	*	275	230	255	265	270	280	185
	Decapods										
34	<i>Lucifer hansenii</i>	270	*	325	*	*	232	*	254	156	*
	Other Crustacean forms										
35	Barnacle nauplii	230	138	255	150	145	145	160	*	375	140
36	Copepod nauplii	145	*	*	235	240	*	*	150	250	*



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37	Mysis larvae	*	255	290	270	275	135	180	150	150	120
38	Crab zoea	215	145	145	250	160	360	235	120	*	215
	Molluscan forms										
39	Gastropod veliger	342	259	135	139	218	151	351	124	212	114
	Larvaceans										
40	<i>Oikopleura parva</i>	215	210	245	*	*	225	200	260	95	140
41	<i>O. dioica</i>	125	130	120	128	110	165	95	100	105	140
	Rotifers										
42	<i>Brachionus plicatilis</i>	95	235	215	165	225	*	195	110	145	165
43	<i>B. calciflorus</i>	98	125	*	*	235	*	120	*	135	50
44	<i>B. rubens</i>	205	*	175	125	*	130	175	215	130	*
	Total	8795	8120	8558	7945	7883	7796	7601	7386	7511	6395

*Organisms not present

Table 11(b) Density of Zooplankton recorded in various stations of ITPCL Power project site during June 2026

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	<i>Globigernia bulloides</i>	325	215	325	118	145	120	*	250
2	<i>G. opima</i>	112	138	240	155	125	148	105	108
	Annelida								
3	Polychaete larvae	215	245	128	124	318	126	314	*
	Calanoid Copepods								



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4	<i>Acartia danae</i>	230	235	185	195	235	285	160	325
5	<i>A. erythraea</i>	325	155	*	155	175	155	160	195
6	<i>Acrocalanus gibber</i>	145	160	155	350	150	235	155	270
7	<i>A. gracilis</i>	325	245	245	125	155	145	140	250
8	<i>Centropages furcatus</i>	165	160	130	245	*	250	285	145
9	<i>Eucalanus elongates</i>	150	135	315	135	140	135	145	155
10	<i>Labidocera pavo</i>	215	185	165	160	170	*	135	*
11	<i>L. acuta</i>	255	*	245	245	170	240	175	140
12	<i>Nannocalanus minor</i>	190	190	170	135	150	130	120	*
13	<i>Paracalanus parvus</i>	160	155	170	155	335	205	185	235
14	<i>Temora stylifera</i>	375	155	240	125	260	150	135	125
	Harpacticoid copepods								
15	<i>Clytmnestra scutellata</i>	*	180	240	275	165	235	260	160
16	<i>Euterpina acutifrons</i>	150	175	230	325	215	145	135	*
17	<i>Macrosetella oculata</i>	130	130	165	235	115	140	245	155
18	<i>M. gracilis</i>	225	255	185	155	160	150	145	*
19	<i>Microsetella rosea</i>	*	170	230	170	*	*	230	135
20	<i>Metis jousseaumei</i>	325	*	245	*	145	160	155	155
	Cyclopoid copepods								
21	<i>Copilia vitrea</i>	*	130	*	165	*	245	*	170
22	<i>Corycaeus danae</i>	345	250	135	*	160	170	145	145
23	<i>C. catus</i>	260	140	*	180	*	150	285	210



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24	<i>Oithona brevicornis</i>	170	150	*	145	*	195	170	170
25	<i>O. linearis</i>	*	120	145	195	285	160	*	145
26	<i>O. rigida</i>	265	145	285	275	145	155	150	160
	Coelenterates								
27	<i>Aurelia aurita</i>	225	*	185	370	270	140	*	*
28	<i>Diphyysis</i> sp.	*	365	195	*	235	265	485	270
	Spirotrichea								
29	<i>Favella brevis</i>	165	*	185	185	385	*	140	*
30	<i>F. philipiensis</i>	185	*	295	*	*	*	*	*
31	<i>Rhabdonella lohmani</i>	155	155	*	*	255	155	145	165
32	<i>T. tubulosa</i>	265	135	175	145	*	135	*	195
33	<i>T. beroidea</i>	*	185	*	*	275	380	245	260
	Decapods								
34	<i>Lucifer hansenii</i>	145	310	225	285	335	180	240	155
	Other Crustacean forms								
35	Barnacle nauplii	120	*	235	230	290	122	150	150
36	Copepod nauplii	250	235	225	*	145	*	225	*
37	Mysis larvae	200	155	120	*	325	*	130	*
38	Crab zoea	115	240	*	230	*	130	120	260
	Mollusca								
39	Gastropod veliger	125	*	115	138	160	125	*	*
	Larvaceans								



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40	<i>Oikopleura parva</i>	*	240	310	155	*	130	125	128
41	<i>O. dioica</i>	140	110	185	128	135	55	70	120
	Rotifers								
42	<i>Brachionus plicatilis</i>	165	165	145	155	145	155	220	125
43	<i>B. calciflorus</i>	125	165	*	170	150	*	90	*
44	<i>B. rubens</i>	150	180	160	175	130	140	145	145
	Total	7587	6858	7328	6908	7153	6341	6664	5776

***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 3052 to 4425 Nos./m³ with minimum density was recorded at ILFS-21-LT (Pichavaram Mangroves, Pappa canal) during low tide and maximum was recorded at the dumping point of dredged soil at open sea (station ILFS-2-HT).

Table 12(a) Density and Diversity of Macrobenthos recorded in various stations of ITPCL Power project site during June 2026

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										



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1	<i>Ampharete acutifrons</i>	50	75	50	100	75	50	75	100	100	100
2	<i>Armandia longicaudata</i>	150	50	25	75	75	50	50	50	75	75
3	<i>Boccardia polybranchia</i>	100	75	100	75	100	75	100	75	125	125
4	<i>Capitella capitata</i>	150	50	*	75	75	75	75	50	125	125
5	<i>C. filicaudata</i>	75	*	75	50	50	50	*	50	75	100
6	<i>Cirratulus chrysoderma</i>	75	125	125	100	100	*	100	125	125	125
7	<i>C. cirratus</i>	150	150	75	75	75	100	75	75	150	75
8	<i>Cirriformia</i> sp.	125	100	75	100	100	100	100	125	75	75
9	<i>Cossura coasta</i>	150	75	75	75	75	100	75	75	100	100
10	<i>Dorvillea rudolphi</i>	100	100	100	50	50	50	100	50	100	75
11	<i>D. gardineri</i>	100	75	75	75	75	75	75	75	75	75
12	<i>Euchone rosea</i>	100	75	150	125	100	100	75	100	50	50
13	<i>Euclymene lumbricoides</i>	75	75	125	75	75	50	150	*	*	50
14	<i>Exogone clavator</i>	75	100	75	75	50	75	50	75	75	75
15	<i>Glycera benguellana</i>	150	75	50	100	75	75	75	50	75	75
16	<i>G. longipennis</i>	150	75	75	75	75	50	100	125	75	75
17	<i>Goniada emeriti</i>	125	75	75	100	75	100	75	75	50	100
18	<i>Notomastus aberans</i>	150	125	50	50	150	75	50	75	75	125
19	<i>Nephtys dibranchis</i>	100	75	75	75	75	50	100	50	125	50
20	<i>Nereis</i> sp.	150	75	75	75	125	125	75	75	150	75
21	<i>Owenia fusiformis</i>	50	50	50	50	75	50	100	*	100	75
22	<i>Onuphis gracilis</i>	150	75	125	75	75	75	175	100	100	*



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23	<i>Pisone sp.</i>	125	75	*	75	125	75	75	75	100	100
24	<i>Plotohormis sp.</i>	*	50	100	75	125	75	75	100	75	75
25	<i>Pista cristata</i>	50	50	100	75	75	*	75	100	50	125
26	<i>Polydora capensis</i>	*	125	150	50	50	75	75	75	50	75
27	<i>Prionospio cirrifera</i>	50	75	150	50	75	75	100	125	150	100
28	<i>P. sexoculata</i>	75	75	100	75	100	100	*	50	75	75
29	<i>Pygospio elegans</i>	50	*	125	50	125	100	75	50	150	75
30	<i>Scolecopsis squamata</i>	125	50	100	75	100	100	75	50	100	*
31	<i>Syllis gracilis</i>	125	75	75	75	50	125	175	125	*	75
32	<i>Terebellides stroemi</i>	100	75	*	75	75	100	100	50	75	100
	Crustaceans										
33	<i>Ampithoe rubricata</i>	75	50	100	100	75	50	75	25	25	*
34	<i>Angeliella phreaticola</i>	50	100	75	25	50	50	50	50	50	50
35	<i>Campylaspis sp.</i>	50	75	75	50	25	25	50	25	25	50
36	Penaeid shrimp larvae	50	75	75	50	25	25	50	50	75	50
37	Copepod nauplii	50	50	50	25	50	*	50	*	*	*
	Bivalves										
38	<i>Meretrix casta</i>	75	125	75	100	100	100	75	75	*	*
39	<i>M. meretrix</i>	75	150	100	75	75	75	75	*	75	100
40	<i>Perna viridis</i>	100	*	75	75	150	175	125	150	75	75
41	<i>Placenta placenta</i>	75	75	75	75	100	75	50	75	50	50
42	<i>Saccostrea cucullata</i>	75	75	150	75	100	*	50	75	50	75



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43	<i>Cardium veligers</i>	75	50	75	50	75	100	50	75	75	*
44	<i>Donax scortum</i>	*	75	*	75	*	100	75	75	75	75
45	<i>Perna indica</i>	125	125	150	150	100	*	75	150	50	50
	Gastropods										
46	<i>Cerithidea cingulata</i>	50	100	50	*	150	100	75	100	*	100
47	<i>Murex trapa</i>	75	75	75	50	75	75	150	100	50	75
48	<i>Umbonium vestiarium</i>	125	75	75	75	75	*	100	*	50	*
49	<i>Turritella attenuate</i>	50	75	75	75	50	75	75	50	100	100
50	<i>Natica didyma</i>	50	75	75	75	50	*	75	75	75	75
	Total	4425	3825	4025	3600	4025	3400	4000	3525	3725	3525

* Organisms not present

Table 12(b) Density and Diversity of Macrobenthos recorded in various stations of ITPCL Power project site during June 2026

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	<i>Ampharete acutifrons</i>	150	75	125	50	50	175	125	75
2	<i>Armandia longicaudata</i>	175	125	50	50	100	100	100	125
3	<i>Boccardia polybranchia</i>	75	75	50	125	125	100	125	75
4	<i>Capitella capitata</i>	100	75	50	50	75	*	100	75



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5	<i>C. filicaudata</i>	50	50	75	75	50	75	75	50
6	<i>Cirratulus chrysoderma</i>	75	75	50	50	75	50	50	75
7	<i>C. cirratus</i>	125	75	50	50	50	100	75	50
8	<i>Cirriformia</i> sp.	*	75	75	*	75	75	100	75
9	<i>Cossura coasta</i>	50	75	100	75	100	100	75	75
10	<i>Dorvillea rudolphi</i>	75	150	75	75	75	75	50	50
11	<i>D. gardineri</i>	50	75	100	75	75	*	50	75
12	<i>Euchone rosea</i>	100	75	75	100	50	75	75	50
13	<i>Euclymene lumbricoides</i>	125	75	75	75	125	75	100	75
14	<i>Exogone clavator</i>	150	75	50	75	100	75	125	75
15	<i>Glycera benguellana</i>	75	75	75	100	125	125	100	100
16	<i>G. longipennis</i>	50	100	100	125	125	100	75	125
17	<i>Goniada emeriti</i>	100	100	100	75	100	75	100	50
18	<i>Notomastus aberans</i>	75	75	75	100	75	100	75	125
19	<i>Nephtys dibranchis</i>	50	75	175	75	100	*	50	100
20	<i>Nereis</i> sp.	75	75	75	75	75	150	75	75
21	<i>Owenia fusiformis</i>	75	100	50	125	125	*	75	75
22	<i>Onuphis gracilis</i>	150	75	125	50	100	100	100	50
23	<i>Pisione</i> sp.	100	100	75	75	125	75	75	125
24	<i>Plotohelms</i> sp.	75	100	50	75	100	50	75	*
25	<i>Pista cristata</i>	50	150	75	125	100	50	75	100
26	<i>Polydora capensis</i>	150	75	75	125	75	125	75	75



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27	<i>Prionospio cirrifera</i>	75	125	75	100	100	75	100	100
28	<i>P. sexoculata</i>	75	100	75	75	75	100	75	*
29	<i>Pygospio elegans</i>	100	*	100	100	100	100	50	*
30	<i>Scolecopsis squamata</i>	175	75	75	75	125	*	50	75
31	<i>Syllis gracilis</i>	50	75	100	100	75	100	125	100
32	<i>Terebellides stroemi</i>	75	75	125	100	75	75	75	75
	Crustaceans								
33	<i>Ampithoe rubricata</i>	25	50	25	75	*	75	50	50
34	<i>Angeliella phreaticola</i>	50	25	50	50	25	25	25	50
35	<i>Campylaspis</i> sp.	25	50	50	25	25	*	100	25
36	Penaeid shrimp larvae	50	50	100	50	50	25	50	50
37	Copepod nauplii	25	25	50	25	50	25	50	50
	Bivalves								
38	<i>Meretrix casta</i>	50	50	50	25	50	*	50	50
39	<i>M. meretrix</i>	75	50	50	25	*	50	50	*
40	<i>Perna viridis</i>	50	50	25	50	25	50	50	*
41	<i>Placenta placenta</i>	25	50	50	25	*	25	25	25
42	<i>Saccostrea cucullata</i>	25	*	50	25	50	50	50	50
43	<i>Cardium veligers</i>	50	50	50	*	75	50	50	50
44	<i>Donax scortum</i>	50	50	25	25	*	*	*	*
45	<i>Perna indica</i>	50	75	25	50	50	75	25	50
	Gastropods								



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46	<i>Cerithidea cingulata</i>	75	*	50	*	50	25	50	52
47	<i>Murex trapa</i>	50	50	*	50	25	50	125	25
48	<i>Umbonium vestiarium</i>	50	25	75	50	50	50	50	*
49	<i>Turritella attenuate</i>	50	50	75	75	75	*	75	75
50	<i>Natica didyma</i>	75	75	25	25	*	50	50	100
	Total	3725	3475	3425	3250	3500	3100	3575	3052

***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 201 to 371 Nos/10cm² with minimum density was recorded at station ILFS-21-LT (Pichavaram Mangroves, Pappa canal) during low tide and maximum was recorded dumping point of dredged soil at Open sea (station ILFS-2-HT).

**Table 13(a) Density and Diversity of Meiobenthos recorded in various stations of ITPCL Power project site during
June 2026**

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										



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1	<i>Daptonema conicum</i>	7	7	*	5	13	3	11	*	10	3
2	<i>Astomonema jenneri</i>	12	8	13	10	10	*	11	5	1	5
3	<i>Draconema cephalatum</i>	5	14	*	7	5	5	13	14	*	6
4	<i>Neochromadora craspedota</i>	5	5	6	12	7	10	7	3	5	4
5	<i>Halalaimus filum</i>	5	13	7	*	10	7	3	5	6	3
6	<i>Oxystomina clavicauda</i>	6	6	5	6	6	5	12	10	*	6
7	<i>Enoplolaimus abnormis</i>	11	11	14	11	6	7	4	6	7	8
8	<i>Neochromadora</i> sp.	11	10	10	5	1	4	*	4	5	5
	Foraminifera										
9	<i>Ammodiscus intermedius</i>	5	6	*	15	8	6	15	15	7	9
10	<i>Ammonia beccarii</i>	9	6	12	7	9	*	7	6	5	15
11	<i>A. tepida</i>	16	*	6	7	9	8	15	6	9	7
12	<i>Bolivina limbata</i>	13	15	6	8	7	15	5	5	8	9
13	<i>Elphidium clavatum</i>	7	12	6	13	9	8	6	2	12	7
14	<i>E. texanum</i>	*	8	10	6	7	6	7	5	8	*
15	<i>E. macellum</i>	8	6	8	*	8	5	*	15	6	9
16	<i>Fissurina quadrata</i>	7	12	15	10	13	9	10	7	5	7
17	<i>Globorotalia hirsuta</i>	12	14	13	8	13	6	18	2	2	9
18	<i>Lagena semistriata</i>	6	13	5	*	16	16	6	13	6	5
19	<i>Neouvigerina hispida</i>	15	5	6	13	5	5	11	4	*	10
20	<i>Nonion grateloupi</i>	10	6	13	6	9	9	6	7	7	12



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21	<i>Orbulina universa</i>	7	9	14	*	*	14	*	4	12	6
22	<i>Orbitolites adunca</i>	16	*	12	5	*	6	9	6	2	7
23	<i>Pararotalia ozawai</i>	8	16	14	2	16	5	8	4	*	15
24	<i>Pseudononion japonicum</i>	15	6	7	3	5	3	9	9	7	6
25	<i>Quinqueloculina granulocostata</i>	6	16	6	4	6	9	8	6	15	6
26	<i>Rosalina globularis</i>	5	6	*	16	10	8	16	*	6	9
27	<i>Rosalina orbicularis</i>	6	5	16	9	12	6	6	*	10	9
28	<i>Spirillina lateseptata</i>	15	10	5	10	8	7	6	12	5	7
29	<i>Spiroloculina excavata</i>	13	13	3	7	13	6	16	6	6	6
30	<i>S. depressa</i>	12	5	4	8	5	15	3	*	5	5
31	<i>Triloculina tricarinata</i>	16	15	6	13	11	9	4	9	13	9
	Ostracodes										
32	<i>Basslerites liebaui</i>	10	6	5	6	5	9	6	*	5	6
33	<i>Bairdoppilata scaura</i>	6	*	9	5	8	4	4	6	15	9
34	<i>Neocytherideis senescens</i>	5	5	16	3	16	7	6	*	7	8
35	<i>Leguminocythereis oertlii</i>	15	*	5	8	15	5	16	5	16	6
36	<i>Patagonia theretricostata</i>	*	7	6	6	9	7	8	5	8	6
37	<i>Stenocypris major</i>	6	6	8	6	6	6	6	6	6	8
38	<i>Tanella gracilis</i>	*	*	6	4	5	8	5	*	17	6
	Harpacticoids										
39	<i>Macrosetella gracilis</i>	4	6	10	4	6	4	6	6	6	7



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40	<i>Canuella perplexa</i>	16	9	7	8	8	6	*	*	9	*
41	<i>Leptastacus mocronyx</i>	9	*	6	*	6	*	5	10	*	6
42	<i>Euterpina acutifrons</i>	6	*	3	10	4	10	6	9	5	9
43	<i>Paramesochra dubia</i>	5	9	15	9	*	6	*	6	5	*
	Total	371	326	338	295	345	294	320	243	289	295

* Organisms not present

Table 13(b) Density and Diversity of Meiobenthos recorded in various stations of ITPCL Power project site during June 2026

Sl. No.	Name of the Species	Nos/10cm 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
	Nematodes								
1	<i>Daptonema conicum</i>	*	6	6	*	6	4	4	3
2	<i>Astomonema jenneri</i>	8	7	7	6	*	*	9	*
3	<i>Draconema cephalatum</i>	7	2	8	6	12	6	4	6
4	<i>Neochromadora craspedota</i>	4	4	6	8	*	10	12	*
5	<i>Halalaimus filum</i>	8	13	6	5	5	6	5	*
6	<i>Oxystomina clavicauda</i>	13	2	13	7	8	6	5	12
7	<i>Enoplolaimus abnormis</i>	7	12	12	12	14	5	8	9
8	<i>Neochromadora</i> sp.	13	*	4	9	6	9	7	8
	Foraminifera								
9	<i>Ammodiscus intermedius</i>	12	8	4	6	6	12	6	7



**DATA REPORT ON COASTAL WATER QUALITY MONITORING
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10	<i>Ammonia beccarii</i>	13	*	4	11	12	13	6	*
11	<i>A. tepida</i>	*	13	12	6	5	7	2	5
12	<i>Bolivina limbata</i>	12	9	10	4	7	6	7	7
13	<i>Elphidium clavatum</i>	14	6	13	9	9	13	6	9
14	<i>E. texanum</i>	7	6	14	17	6	6	6	*
15	<i>E. macellum</i>	13	7	*	6	*	16	6	5
16	<i>Fissurina quadrata</i>	14	7	13	*	9	7	5	9
17	<i>Globorotalia hirsuta</i>	9	*	8	10	9	9	6	5
18	<i>Lagena semistriata</i>	13	16	9	8	6	*	7	2
19	<i>Neouvigerina hispida</i>	7	8	6	12	9	6	16	5
20	<i>Nonion grateloupi</i>	7	16	3	6	9	6	9	*
21	<i>Orbulina universa</i>	9	13	16	9	16	5	*	6
22	<i>Orbitolites adunca</i>	12	13	15	3	15	16	6	6
23	<i>Pararotalia ozawai</i>	12	8	6	10	9	*	9	*
24	<i>Pseudononion japonicum</i>	9	4	5	15	13	15	6	15
25	<i>Quinqueloculina granulocostata</i>	5	7	14	5	9	9	7	9
26	<i>Rosalina globularis</i>	9	6	*	7	15	*	10	*
27	<i>Rosalina orbicularis</i>	18	13	6	*	11	9	9	9
28	<i>Spirillina lateseptata</i>	*	5	9	*	13	*	4	8
29	<i>Spiroloculina excavata</i>	7	*	7	*	9	6	6	8
30	<i>S. depressa</i>	2	7	6	2	2	2	*	*
31	<i>Triloculina tricarinata</i>	6	9	15	12	7	*	*	*
	Ostracodes								
32	<i>Basslerites liebaui</i>	12	*	13	6	6	7	*	6



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33	<i>Bairdoppilata scaura</i>	*	*	12	*	4	*	6	5
34	<i>Neocytherideis senescens</i>	4	16	6	*	5	*	16	6
35	<i>Leguminocythereis oertlii</i>	*	7	6	7	9	6	5	9
36	<i>Patagonia theretricostata</i>	8	10	8	5	6	5	*	*
37	<i>Stenocypris major</i>	*	6	6	*	9	6	6	*
38	<i>Tanella gracilis</i>	9	8	7	10	9	7	*	6
	Harpacticoids								
39	<i>Macrosetella gracilis</i>	*	8	16	5	4	5	*	*
40	<i>Canuella perplexa</i>	6	*	*	*	*	5	12	4
41	<i>Leptastacus mocronyx</i>	*	8	7	7	6	*	4	*
42	<i>Euterpina acutifrons</i>	6	*	6	15	*	4	7	4
43	<i>Paramesochra dubia</i>	5	*	6	*	6	*	4	8
	Total	320	290	350	266	321	254	253	201

*Organisms not present



CONCLUDING REMARKS

In the present survey, made on 18th June - 2026, 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 fluctuated 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 namely *Copilia vitrea*, *Oithona brevicornis*, *Globigernia rubescense*, *Dinophysis punctata*, *Nitzschia longissima*, *Pleurosigma elongatum*, *Odontella mobiliensis* and *Peridinium claudicans* *Microsetella rosea*, were recorded commonly during the survey. Besides, the conservative macro and meio benthic species like *Terebellides stroemi*, *Notomastus aberans*, *Nephtys dibranchis*, *Meretrix casta*, *M. meretrix*, *Ammonia beccarii*, *A. tepida*, *Elphidium clavatum*, *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 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 they are found to be within the permissible limits.