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WATER QUALITY STUDIES OF NETRAVATHI AND GURUPURA RIVER ESTUARY, DAKSHINA KANNADA DISTRICT, KARNATAKA STATE, INDIA.

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ABSTRACT

River estuary is a part of the estuary ecosystem which includes semi-closed waters affected by the tidal processes and receives fresh water flow from the mainland. In the present study, the water samples were collected from 33 different Locations of Netravathi and Gurupura river estuary, in Dakshina Kannada District of Karnataka state, India, in the Month of February 2021 for Physico-chemical and biological analysis. And analysis of various important water quality parameters such as Temperature, p^H, Dissolved oxygen (DO), Total dissolved solids (TDS), Calcium (Ca), Magnesium (Mg), Carbonate ($CO_{3)}$ and Chloride (Cl), and results were revealed that water temperature (30 to 37 ^{0}C), p^H (7.1to 8.1), DO (4.6 to 5.2 ppm) TDS (228 to 633 Mg/l) Mg (0 to 291.1Mg/l) Ca (6005 to 7954 Mg/l) CO_3 (89.96 to 120.3Mg/l) and Cl (14.2 to 18.6 ppt) The results of the study indicate that estuarine environment of Netravathi and Gurupura River is polluted by point sources including industrial effluents and domestic sewage.

KEYWORDS: Estuarine environment, Netravathi River, physico-chemical, Water quality, and Gurupur River.

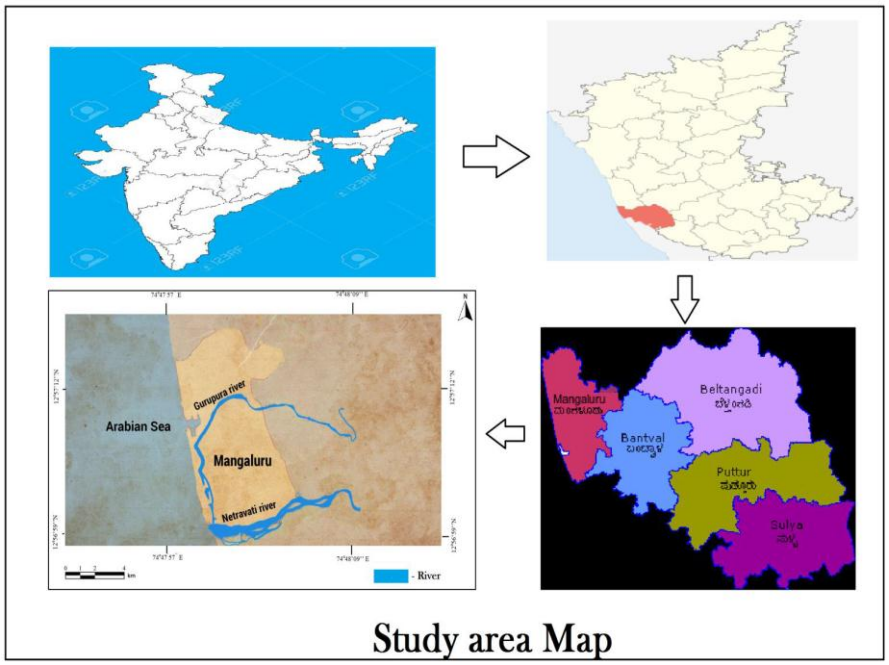
INTRODUCTION

Rivers play a vital role in the water cycle and functioning as "drainage channels" for surface water through estuaries. With the increase in developmental and urbanization activities, demands on our natural resources also shoot up and hence protection of rivers and estuaries for all their natural, economic and aesthetic values is very important (Song et al. 2011; USEPA 2012). When a river or estuary is altered in its natural functions, it becomes polluted and can harm living beings. The rivers play a pivotal role in carrying industrial and urban wastes and this makes rivers more susceptible to environmental problems like pollution. Hence, it is essential to evaluate the stresses on the status of the water quality on a periodic basis for the development of environmental strategies.

STUDY AREA

Dakshina Kannada is a maritime district located in the south-western part of Karnataka state adjoining the Arabian Sea. The geographical area is 4770 sq. km the study area lies in between 12˚ 56'12''& 12˚ 57' 59'' North latitude and 74˚ 47' 57''& 74˚, 48', 09'' East longitude. Mangalore town is the district headquarters. Administratively, the district is divided into five taluks viz. Bantwal, Belthangady, Mangalore, Puttur, and Sulya.

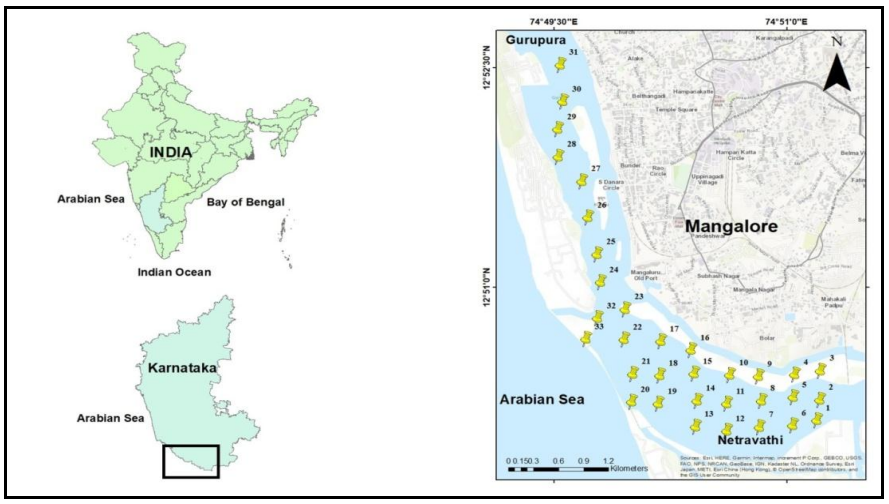
The Netravathi and Gurupura rivers originate on the steep slopes of the Sahyadri hill ranges (Western Ghats) at 900-1800 m above the mean sea-level (msl). The Netravathi River debouches into the Arabian Sea in the south of the New Mangalore Port (NMP) approximately at right angle, whereas the Gurupura River runs parallel to the coast for a distance of about 8 km and meets with the Netravathi River. During their westward flow, they pass through an undulating lateritic terrain and over the low lying coastal plains. The drainage areas of the N-G Rivers are 3,433 and 824 km^2.



Map.1: Location Map of the Study area.

MATERIALS AND METHOD

The study was carried out in the estuary region of Netravathi and Gurupura River in Dakshina Kannada District of Karnataka state (west coast). The water samples were collected in the **Month of February 2021** for the analysis of physico-chemical and biological parameters sample were collected from sampling station and preserved in pre-rinsed plastic containers. Details of the location of surface water sampling as well as their longitude and latitude are presented in **(Table.1)** the water quality parameters like water temperature, p^H and dissolved oxygen and TDS values were taken onsite immediately remaining parameters are analysed in laboratory.



Map.2: Water Sample Location Map.

Table. 1: Different physic-chemical and biological parameters of Netravathi and Gurupura river estuary.

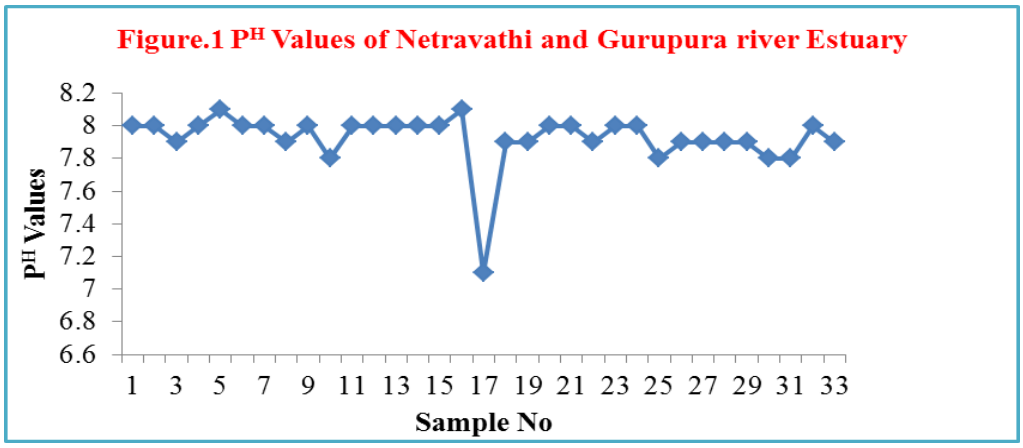
Sl. No	Sample No	Longitude	Latitude	p^H	DO	TDS	Tem in ^0C	Mg	Ca	CO_3	Cl (ppt)
1	1	$74^0$51'16''	$12^0$50'16'	8	5	373	34	0	7954	120.3	18.6
2	2	$74^0$51'16''	$12^0$50'16'	8	5	452	31	0	6014	89.96	16.1
3	3	$74^0$51'16''	$12^0$50'16''	7.9	4.8	452	31	0	6005	95.45	14.5
4	4	$74^0$51'20''	$12^0$50'18''	8	5.1	452	30	252.2	6111	110.16	14.7
5	5	$74^0$51'03''	$12^0$50'33'	8.1	4.8	443	31	0	6200	100.5	14.4
6	6	$74^0$51'16''	$12^0$50'03'	8	4.8	633	31	0	6305	98.32	14.5
7	7	$74^0$51'03''	$12^0$50'05'	8	5.1	381	30	0	6522	98.45	15.1
8	8	$74^0$50'50''	$12^0$50'05''	7.9	4.6	373	32	0	6693	97.9	14.8
9	9	$74^0$50'50''	$12^0$50'19''	8	4.9	373	31	0	6681	96.25	15.2
10	10	$74^0$50'50''	$12^0$50'31''	7.8	4.8	373	32	0	6790	99.96	14.3
11	11	$74^0$50'37''	$12^0$50'30''	8	5	366	32	0	6821	100.05	14.5
12	12	$74^0$50'36''	$12^0$50'19''	8	4.8	373	32	0	6907	108.39	14.6
13	13	$74^0$51'37''	$12^0$50'05''	8	4.9	284	36	0	7372	110.16	18.6
14	14	$74^0$50'24''	$12^0$50'09''	8	5.1	228	35	291.1	6014	116.28	14.3
15	15	$74^0$50'23''	$12^0$50'16''	8	4.8	328	35	0	6020	108.25	14.7
16	16	$74^0$50'24''	$12^0$50'31''	8.1	5	328	35	0	6305	99.96	14.2
17	17	$74^0$50'24''	$12^0$50'40''	7.1	4.8	321	36	0	6201	100.05	14.2
18	18	$74^0$50'11''	$12^0$50'41''	7.9	4.8	284	37	0	6320	101.06	14.7
19	19	$74^0$50'11''	$12^0$50'31''	7.9	4.7	321	35	0	6208	102.02	14.9
20	20	$74^0$50'16''	$12^0$50'11''	8	4.3	321	35	0	6499	114.2	14.7
21	21	$74^0$49'58''	$12^0$50'16''	8	4.6	328	35	0	6014	97.9	15
22	22	$74^0$49'58''	$12^0$50'31''	7.9	4.9	321	36	0	6541	97.06	15.3
23	23	$74^0$49'58''	$12^0$50'43''	8	5.2	335	33	0	6790	99.96	15
24	24	$74^0$49'16''	$12^0$50'56'	8	4.7	321	36	0	6845	96.8	15
25	25	$74^0$49'17''	$12^0$51'17''	7.8	4.8	321	36	0	6887	97.9	15.5
26	26	$74^0$49'44''	$12^0$51'34'	7.9	4.9	366	32	0	6890	98.06	15.3
27	27	$74^0$49'45''	$12^0$51'54''	7.9	4.5	373	32	0	7012	98.8	15.4
28	28	$74^0$49'32''	$12^0$52'00''	7.9	4.9	373	32	0	7145	101.2	16.5
29	29	$74^0$49'32''	$12^0$52'11''	7.9	4.8	381	31	0	7250	102.3	16.6
30	30	$74^0$49'32''	$12^0$52'21''	7.8	4.8	381	31	184.3	7081	106.08	16.4
31	31	$74^0$49'32''	$12^0$52'36''	7.8	5.2	373	32	0	7410	110.08	15.8
32	32	$74^0$49'47''	$12^0$51'07''	8	4.8	328	35	0	7602	113.25	15.9
33	33	$74^0$49'45''	$12^0$50'43''	7.9	4.8	366	33	0	7806	112.4	15.6

RESULT AND DISCUSSION

1. p^H

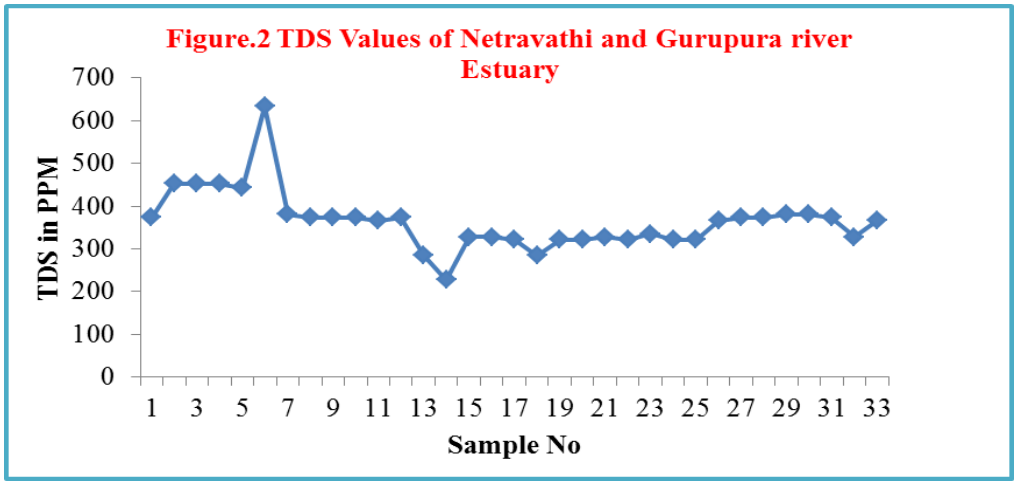
P^H is a measure of acidity or alkalinity of water on a log scale from 0 (extremely acidic) through 7 (neutral) to 14 (extremely alkaline). Water's pH is affected by the minerals dissolved in the water, aerosols and dust from the air, and human-made wastes as well as by plants and animals through photosynthesis and respiration The pH values of the samples ranged from 7.1to 8.1 the average 7.9 **(Table-1, Figure-1)**. All the samples are slightly

alkaline. The slightly alkaline p^H of seawater is due to the natural buffering from carbonate and bicarbonate dissolved in the water.



2. Total Dissolved Solids (TDS)

Total dissolved solids (TDS) are defined as all inorganic and organic substances contained in water that can pass through a 2 micron filter. In general, the TDS concentration is the sum of the cations (positively charged) and anions (negatively charged) in the water. TDS usually include carbonate, bicarbonate, chloride, fluoride, sulphate, phosphate, nitrate, calcium, magnesium, sodium, and potassium, TDS originate from natural sources, sewage, urban run-off, industrial wastewater, and chemicals used in the water treatment process, and the nature of the piping or hardware used to convey the water, in the present study the TDS value varies in between 228 to 633 the average is 364 mg/l **(Table-1, Figure-2)**

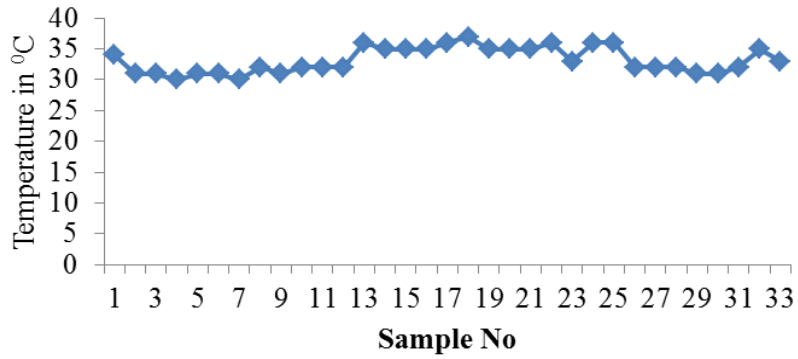


3. Temperature (^{0}C)

Water temperature is a measure of the kinetic energy of water and is expressed in degrees Fahrenheit (F) or Celsius (^{0}C). Water temperature varies according to season, depth, and, in

some cases, time of day. Temperature also affects the water's ability to dissolve gases, including oxygen. The lower the temperature, the higher the solubility. The temperature values of the present study area vary from 30 to 37 ^{o}C average 33^{o}C **(Table.1 and Figure.3).**

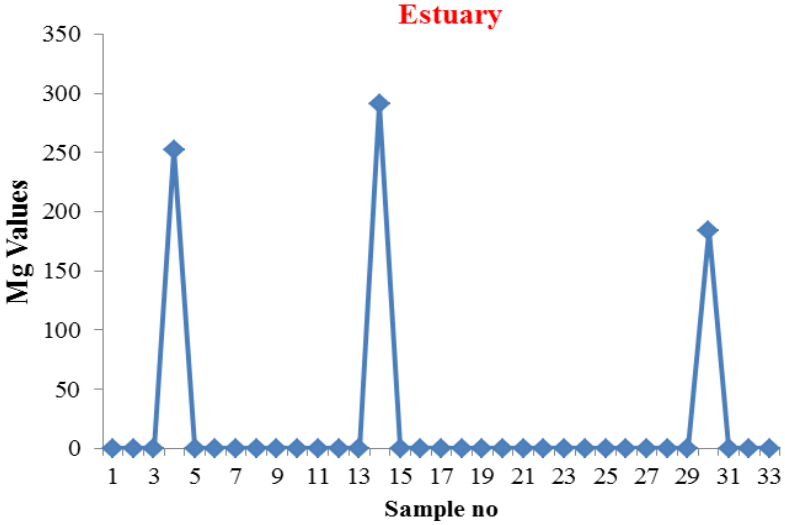
Figure.3 Temperature Values of Netravathi and Gurupura river Estuary



4. Magnesium (Mg)

Magnesium is a chemical element with the symbol Mg and atomic number 12. The Mg values of the Netravathi and Gurupura all the samples are shows zero except 3 locations (**Table.1 Figure.4)**

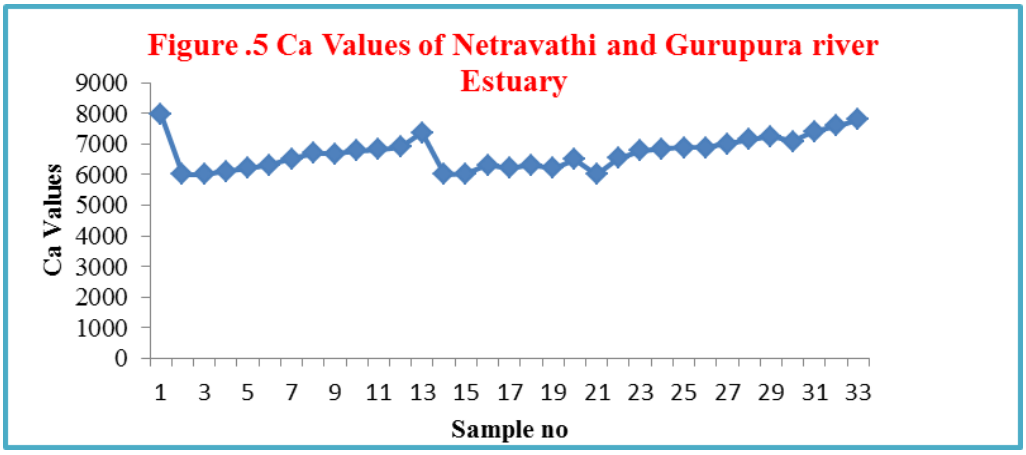
Figure.4 Mg Values of Netravathi and Gurupura river Estuary



5. Calcium (Ca)

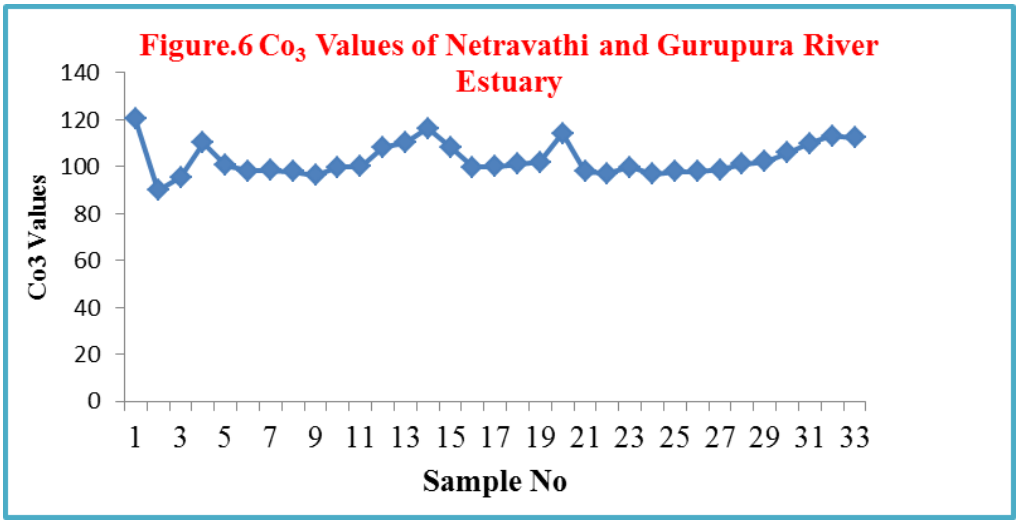
Calcium ions are among the most commonly occurring in nature. They may result from the leaching of soil and other natural sources or may come from man-made sources such as

sewage and some industrial wastes. Calcium is usually one of the most important contributors to hardness. Calcium and magnesium enter the water mainly by leaching of rocks. Most calcium in surface waters comes from streams flowing over limestone, dolomite, gypsum, and other calcium-containing rocks and minerals. The Ca values of Netravathi and Gurupura river estuary varies from 6005 ppm to 7954 ppm the highest values of Ca mainly observed in meeting point of river and sea. **(Table.1 and Figure.5)**



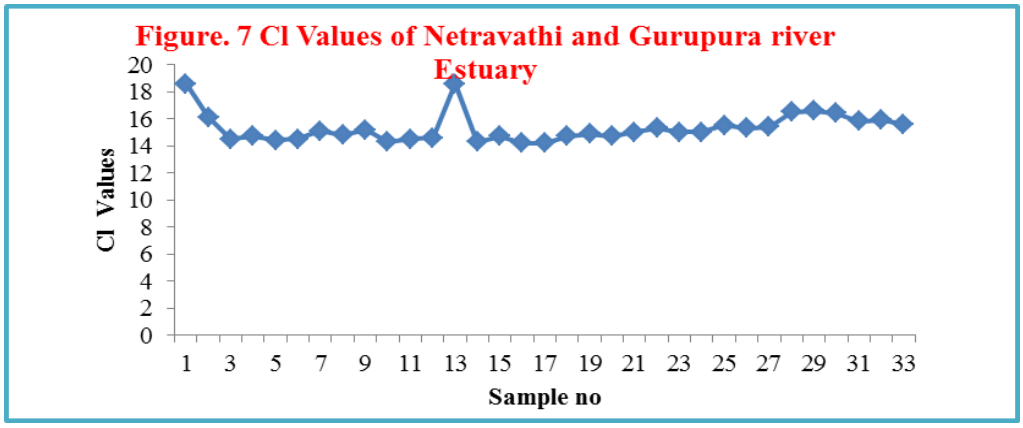
6. Carbonate(Co_3)

Carbonates are present in many different types of rock, including most sedimentary rocks, and even some igneous and metamorphic rocks, Seawater can assimilate much more CO_2 than fresh water. The reason for this is that bicarbonate and carbonate ions have been perpetually discharged into the sea over aeons. The carbonate values of present study vary between 89.96 to 120.3 ppm the high values of Co_3 is observed in shore line of both the rivers. **(Table.1 and Figure.6)**



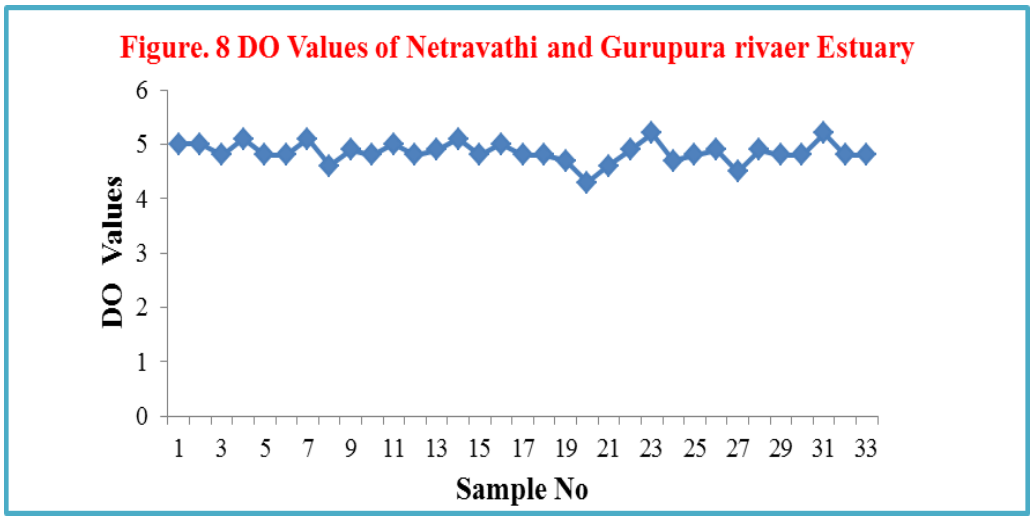
7. Chlorides (Cl)

It occurs naturally in all types of waters. High concentration of chlorides is considered to be the indicators of pollution due to organic wastes of animal or industrial origin. Chlorides are troublesome in irrigation water and also harmful to aquatic life (Rajkumar, 2004). The values of Cl varies between 14.2 ppt to 18.6 ppt the highest values of Cl is noticed in shore line region of both river **(Table.1 and Figure.7)**



8. Dissolved Oxygen (DO)

Dissolved oxygen is a measure of the amount of oxygen dissolved in the water column, DO is one of the most important factors controlling the presence or absence of estuarine species, in both estuarine and near shore coastal waters. The oxygen content in water samples depends on a number of physical, chemical, biological and microbiological processes. DO values also show lateral, spatial and seasonal changes depending on industrial, human and thermal activity. In the present study, the value of DO ranged from 4.6 mg/l to 5.2 mg/l and average value is 4.8 mg/l **(Table.1 and Figure. 8)**



Water Sample collection field photo

CONCLUSION

Assessment of water quality is essential to check the suitability of a water source for the designated use. Several water quality parameters are assessed and compared with their standard values to determine the acceptability of the water to be used. The Netravathi and Gurupura river estuary receives contaminated sewage effluents, industrial discharge, urban and agricultural run-off. The quality of river ecosystem is of great significance as thousands of people depend on this particular river

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