STUDIES ON THE PHYSICO-CHEMICAL PARAMETERS OF KADALUNDI RIVER ESTUARY, KERALA, SOUTH INDIA

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ABSTRACT

The studies on the physico-chemical parameters of Kadalundi river estuary, Kerala, South India, were carried out during July 2016 to June 2017. In three stations maximum water and air temperature was reported in April and May. The water transparency maximum reported in the month of May. The water is nearly neutral in June and more alkaline in the month of April in three stations. The maximum dissolved oxygen of three stations was observed in the month of March, January and July respectively. The maximum free carbon dioxide of three stations was observed in July, October and June respectively. The water is more saline in April. Total solids maximum in station-A and station-C was reported in April and station-B maximum reported in May. The maximum level of nitrate was reported in three stations in the month of July. The maximum level of phosphate was reported in station-A and station-B in March but station-C reported maximum level of phosphate in the months of February, March and April. The maximum level of silicate was reported in station-A and station-C in August and in station-B in the month of July.

Keywords: Physico-chemical parameters, Kadalundi river, Kerala.

INTRODUCTION

Water has very important physical and chemical property that makes it so very special for human beings, all known living things and even to shaping the surface of the earth. Water can store a lot of heat energy because it has high specific heat index. This allows large bodies of water to help cool or heat the earth's atmosphere therefore keeping our climate's temperature more constant. The scarcity of accessible fresh water is of interest as well as concern since water is an indispensable liquid required for several purposes including drinking, sanitation, irrigation, navigation and recreation, also it is valuable sources of productivity. The regular monitoring of water also helps the aquatic ecosystem from further deterioration by Kutty (1987). The studies on physico-chemical characteristics of river water of Ganga in middle Ganga plains have been reported by (Leena Singh and Choudhary, 2013).

MATERIALS AND METHODS

The physicochemical parameters of Kadalundi River, Kerala, the experiment is started from First July 2016 to 30th June 2017. The areas selected for the study were three different stations of Kalalundi river estuary, borderline of Malappuram and Kozhikkode district of Kerala. The stations are Heros Nagar (Station-A), Palakkal (Station-B) and Keezhayil (Station-C). Kadalundi-Vallikkunnu Community Reserve has been constituted as per G.O. (MS) No. 66/2007 F & WLD dated 17.10.2007 under Section 36(c) of Wildlife Protection Act 1972. It is located on the Western side of the Northern Kerala, in Kozhikode and Malappuram districts on the river mouth of Kadalundipuzha spreading in the estuary. River Kadalundi is originated from Cherakambam mala which is 1160 M. MSL and situated in Eastern side of Malappuram district and flowing westward nearly 130 Kms. Kadalundi River is one of the four most important rivers flowing through Malppuram and Kozhikkode district of Kerala. It extends in Kadalundi of Kozhikode Taluk of Kozhikode District and Vallikunnu of Thirurangadi Taluk of Malappuram District. The total extent of the Community Reserve is 153.8415 ha. The water samples were taken every month for the study and it continued up to 12 months. During the time of sampling, the air temperature and water temperature

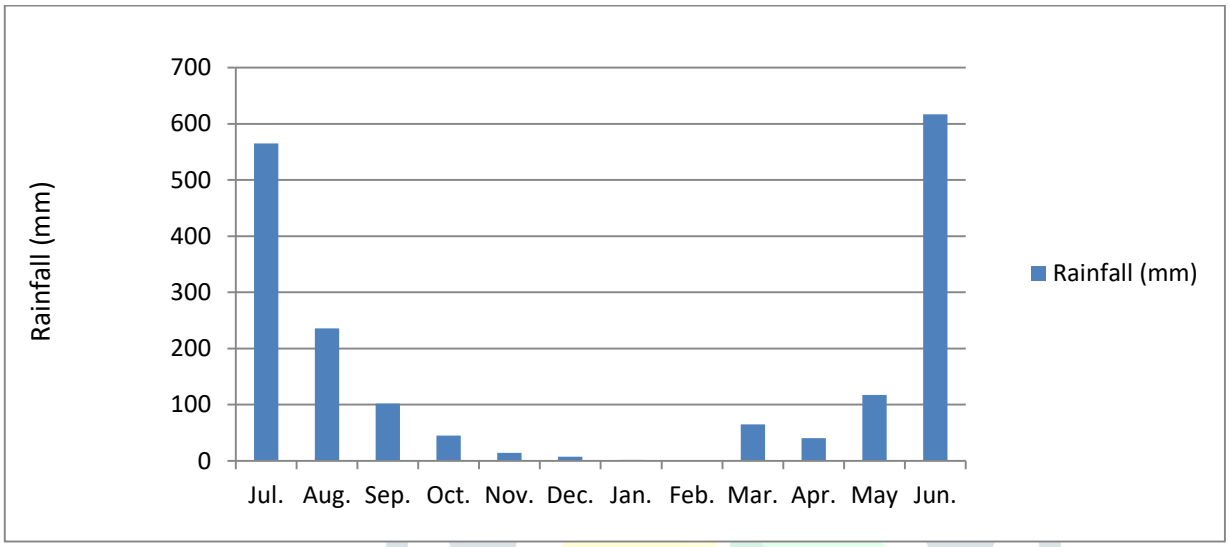
was noted with the help of mercury filled Celsius thermometer as the minimum the thermometer should have a scale marked for 1 degree with marking edged on the capillary glass. The transparency was recorded with the help of Seechi's disc, Meter scale with the pen. The pH of the pond water was measured with the help of Ph digital pen (Phep-HI 96107, made by Italy). The dissolved oxygen content of the pond water was estimated by Winkler's method. The carbon dioxide content of the pond water sample was estimated by Titrimetric method. The alkalinity was determined by titrating known volume of the water sample with 0.02 MHCl. The total dissolved solid (TDS) was determined by gravimetrically by evaporating a known volume of water to dryness in a pre-weighed crucible on a steam bath. The primary production was estimated by observing the post-incubation changes in dissolved oxygen concentrations in the water collected from the sampling site in light and dark bottles following the method of Gaarder and Gran (1927). To determine T.S.S, T.D.S and T.S a 500ml beaker was taken then weighed and labeled as A. 500ml of water sample was taken in the same beaker and evaporated till dryness over a heater. Now the beaker weighed and cooled then labeled as B. (B-A) x 2 gives the total solids present in the water sample in mg/l. Take 500ml of another beaker and filtered through a pre weighed filter paper. The two filter paper difference gives the total suspended solids (T.S.S). The filtrate was taken in a pre weighed beaker and evaporated till dryness. The beaker cooled and weighed. The two weights of beaker difference give the total dissolved (T.D.S) solids present in the water. Calibrate the conductivity cell with the help of standard KCL solution and determine the cell constant was measured following the method of APHA (1995). For to determine electrical conductivity dip the conductivity cell assembly of water taken in a 50 or 100 ml beaker and record the conductivity. If the value is too low, change the adjustment accordingly. Record the temperature of the water during a test. Observed values of electrical conductivity are multiplied by cell constant (usually given on conductivity cell) and temperature factor express result at 25°C. To determine silicate ammonium molybdate solution and 1:1 sulphuric acid solution was used. Standard phosphate solution, ammonium molybdate solution and stannous chloride solution and spectrophotometer were used for determination of phosphate. The estimation of nitrate is by using naphthalamine, hydrochloric acid and spectrophotometer.

RESULTS

In three stations maximum water temperature was reported in April and May. Station-A and station-B water temperature is least in December but in station-C shows least water temperature in December, January and June. The maximum air temperature was reported in April and May in three stations .The air temperature is least in the month of December in three stations. Station-C shows least air temperature in December and January. The water transparency maximum reported in the month of May. The water is less transparent in the month of July (4.6 inches) in first and second station. In third station the water transparency is less in the month of June (6.2 inches). The water is nearly neutral in June and more alkaline in the month of April in three stations. The maximum dissolved oxygen of three stations was observed in the month of March, January and July respectively. The minimum dissolved oxygen in November in three stations. The maximum free carbon dioxide of three stations was observed in July, October and June respectively. The free carbon dioxide minimum level was observed in April. The water is more saline in April. Total solids maximum in station-A and station-C was reported in April and station-B maximum reported in May. The total dissolved solids and total suspended solids of three stations was reported maximum in the month of April. The minimum salinity, total solids, total dissolved solids, total suspended solids and electrical conductivity was reported in June. Physicochemical parameters are noted in (Table 1, 2 and 3). The maximum level of nitrate was reported in three stations in the month of July. The minimum level of nitrate was reported in station-A and station-C in March (0.36mg/l and 0.46mg/l). In station-B

minimum level nitrate was observed in December (0.38mg/l). The maximum level of phosphate was reported in station-A and station-B in March but station-C reported maximum level of phosphate in the months of February, March and April. The phosphate level is BDL (Below detection limit) in the month of June. The maximum level of silicate was reported in station-A and station-C in August and in station-B in the month of July. The station-A and station-B minimum level of silicate was reported in April but in station-C minimum level silicate was reported in March. The dissolved nutrients noted in (Table 4, 5 and 6).

Average rainfall recorded during 2016-17 in the study area



Physico-chemical parameters in different stations of Kadalundi River estuary from July, 2016, to June, 2017

Table: 1. Station-A

Parameters / Months	Atm. Temp. (°C)	Water Temp. (°C)	Transparency (inches)	pH	Alkalinity (mg/l)	Dissolved oxygen (mg/l)	Dissolved CO_2 (mg/l)	Salinity (ppt)	Total solids (mg/l)	Total dissolved solids (mg/l)	Total suspended solids (mg/l)	Electrical conductivity (mS/cm)
Jul.	27	26	4.6	7.52	23.56	3.98	4.54	30.84	29747	29615	132	47.40
Aug.	28	26	5.6	7.62	23.34	3.65	4.38	31.62	30481	30337	144	48.47
Sep.	28	27	5.8	7.64	23.54	3.80	4.12	31.75	30607	30459	148	48.65
Oct.	28	26	6.4	7.68	23.85	3.92	4.24	31.58	30439	30297	142	48.41
Nov.	27	25	6.8	7.72	24.22	3.44	4.10	31.45	30321	30182	139	48.24
Dec.	25	23	6.1	7.74	52.42	3.54	3.78	31.96	30800	30648	152	48.93
Jan.	27	25	6.5	8.02	102.53	4.62	3.74	32.64	31437	31277	160	49.86
Feb.	27	25	7.4	8.06	102.62	4.78	3.98	33.22	31978	31812	166	50.65
Mar.	28	26	8.5	8.12	105.20	4.88	4.08	33.72	32452	32274	178	51.33
Apr.	29	27	9.6	8.24	106.44	4.22	3.66	33.95	32668	32484	184	51.64
May	29	28	9.8	8.08	104.22	4.62	3.96	33.82	32549	32369	180	51.47
Jun.	27	25	4.8	7.42	23.82	3.54	4.31	30.59	29514	29386	128	47.06

Table: 2. Station-B

Parameters / Months	Atm. Temp. (°C)	Water Temp. (°C)	Transparency (inches)	pH	Alkalinity (mg/l)	Dissolved oxygen (mg/l)	Dissolved CO_2 (mg/l)	Salinity (ppt)	Total solids (mg/l)	Total dissolved solids (mg/l)	Total suspended solids (mg/l)	Electrical conductivity (mS/cm)

Jul.	27	26	5.8	7.32	23.76	4.32	4.20	28.40	27474	27354	120	44.03
Aug.	28	26	6.2	7.38	23.28	3.84	4.12	29.22	28245	28117	128	45.17
Sep.	28	26	6.4	7.52	24.98	3.43	4.02	29.58	28582	28446	136	45.66
Oct.	28	27	6.9	7.48	24.94	3.86	4.36	29.40	28408	28278	130	45.41
Nov.	28	26	7.2	7.52	27.62	3.42	3.90	29.24	28254	28130	124	45.19
Dec.	26	24	6.4	7.63	53.22	3.92	3.82	29.82	28813	28667	146	45.99
Jan.	26	25	6.5	7.96	98.80	4.70	3.86	30.56	29505	29353	152	47.01
Feb.	27	26	7.4	7.66	103.24	4.68	3.88	31.05	29969	29811	158	47.69
Mar.	28	27	8.8	8.12	104.20	4.60	3.62	31.64	30517	30357	160	48.50
Apr.	29	27	9.7	8.14	105.44	4.62	3.54	31.94	30532	30634	168	48.91
May	29	28	9.8	7.90	102.56	4.68	3.82	31.70	30574	30411	163	48.58
Jun.	27	25	6.1	7.30	23.44	3.94	4.04	27.50	26628	26513	115	42.77

Table: 3. Station-C

Parameters / Months	**Atm. Temp. (°C)**	**Water Temp. (°C)**	**Transparency (inches)**	**pH**	**Alkalinity (mg/l)**	**Dissolved oxygen (mg/l)**	**Dissolved CO_2 (mg/l)**	**Salinity (ppt)**	**Total solids (mg/l)**	**Total dissolved solids (mg/l)**	**Total suspended solids (mg/l)**	**Electrical conductivity (mS/cm)**
Jul.	27	26	6.4	7.28	24.66	4.98	3.96	27.58	26700	26586	114	42.88

Aug.	28	26	6.5	7.36	23.22	3.68	4.14	28.35	27427	27307	120	43.96
Sep.	28	26	6.7	7.42	23.64	3.26	4.16	28.40	27480	27354	126	44.03
Oct.	28	26	6.9	7.36	24.69	3.64	4.14	28.28	27362	27240	122	43.86
Nov.	27	26	7.1	7.44	24.94	3.22	3.84	28.12	27209	27093	116	43.64
Dec.	26	25	6.3	7.36	43.34	3.28	3.96	28.60	27667	27534	133	44.30
Jan.	26	25	6.4	7.68	95.88	4.32	3.70	29.52	28530	28392	138	45.58
Feb.	28	26	7.3	7.70	102.23	4.10	3.82	29.86	28849	28707	142	46.05
Mar.	29	27	9.3	7.44	101.36	3.76	3.46	30.52	29465	29319	146	46.96
Apr.	30	28	9.7	7.86	105.12	4.12	3.36	30.90	29833	29669	164	47.48
May	30	28	9.9	7.72	101.46	4.32	3.84	30.66	29603	29447	156	47.15
Jun.	27	25	6.2	7.18	23.42	3.94	4.22	27.20	26343	26233	110	42.35

Monthly variations of dissolved nutrients in different stations of Kadalundi River estuary from July, 2016 to June, 2017

Table: 4. Station-A

Months	Nitrate (mg/l)	Phosphate (mg/l)	Silicate (mg/l)
Jul.	1.62	0.02	6.32
Aug.	1.56	0.02	6.88
Sep.	1.42	0.03	5.86
Oct.	1.30	0.03	4.28
Nov.	0.96	0.05	4.10
Dec.	0.84	0.04	3.12
Jan.	0.38	0.03	2.02
Feb.	0.44	0.04	1.26
Mar.	0.36	0.06	1.20
Apr.	0.64	0.03	1.12
May	0.82	0.03	2.36
Jun.	1.52	BDL	6.20

BDL: Below Detection Limit

Table: 5. Station-B

Months	Nitrate (mg/l)	Phosphate (mg/l)	Silicate (mg/l)
Jul.	1.56	0.02	6.20
Aug.	1.14	0.04	5.56
Sep.	0.89	0.02	5.42
Oct.	0.56	0.05	4.32

Nov.	0.44	0.04	3.66
Dec.	0.38	0.03	1.98
Jan.	0.46	0.04	1.67
Feb.	0.50	0.04	1.24
Mar.	0.52	0.06	1.18
Apr.	0.54	0.04	1.16
May	0.48	0.05	2.18
Jun.	1.38	BDL	5.20

BDL: Below Detection Limit

Table: 6. Station-C

Months	**Nitrate (mg/l)**	**Phosphate (mg/l)**	**Silicate (mg/l)**
Jul.	1.82	0.02	6.64
Aug.	1.70	0.04	6.84
Sep.	1.42	0.04	5.86
Oct.	1.20	0.04	4.20
Nov.	0.84	0.03	3.98
Dec.	0.72	0.02	2.66
Jan.	0.56	0.05	1.48
Feb.	0.60	0.06	1.26
Mar.	0.46	0.06	1.22
Apr.	0.48	0.06	1.32
May	0.86	0.08	1.70
Jun.	1.62	BDL	5.40

BDL: Below Detection Limit

DISCUSSION

The studies on the physico-chemical parameters of Kadalundi river estuary, Kerala, South India, were carried out during July 2016 to June 2017. The river showing the much pollution because of dumping the large number of home wastes, plastics and other effluents reached in water bodies. The water bodies also polluted due to the presence fish nets and coconut wastes. The oils and soap wastes cover water surface and reduce the storing of oxygen of water bodies, Ali Akshad, M.,et al (2017). The three stations more polluted due the presence of human excreta. The station-B and station-C contain the dead shells of perna and crossostrea that make the color changes of water. When the more wastes dumped in that time the river water showing more changes in the physical and chemical water quality and results increase in the production of phyto-zooplankton community.

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