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Analysis of Sea Water in Thoothukudi Coastal Area

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Abstract

Sea Water samples were collected from three (03) locations in Thoothukudi coastal. The physico-chemical parameters such as Sodium, Calcium, Magnesium, Potasium, Chloride, Calcium Carbonate, Calcium BiCarbonate, Magnesium Chloride, Sodium Chloride, Electric Conductivity, pH, Temperature, Oil & Grease were examined to know the present status of the sea water quality.

Key words: Thoothukudi, Coastal region, Sea water

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INTRODUCTION

Water is one of the most probable and crucial wealth on earth. Without water there would be no life on earth. Water is the source of all biological lives and their nourishment also. Water condition has become a hefty universal entanglement due to snowballing creatural enlightening movement (See [12]).

A correlation matrix is a table showing correlation coefficients between variables. Each cell in the table shows the correlation between two variables (See [13, 14]).

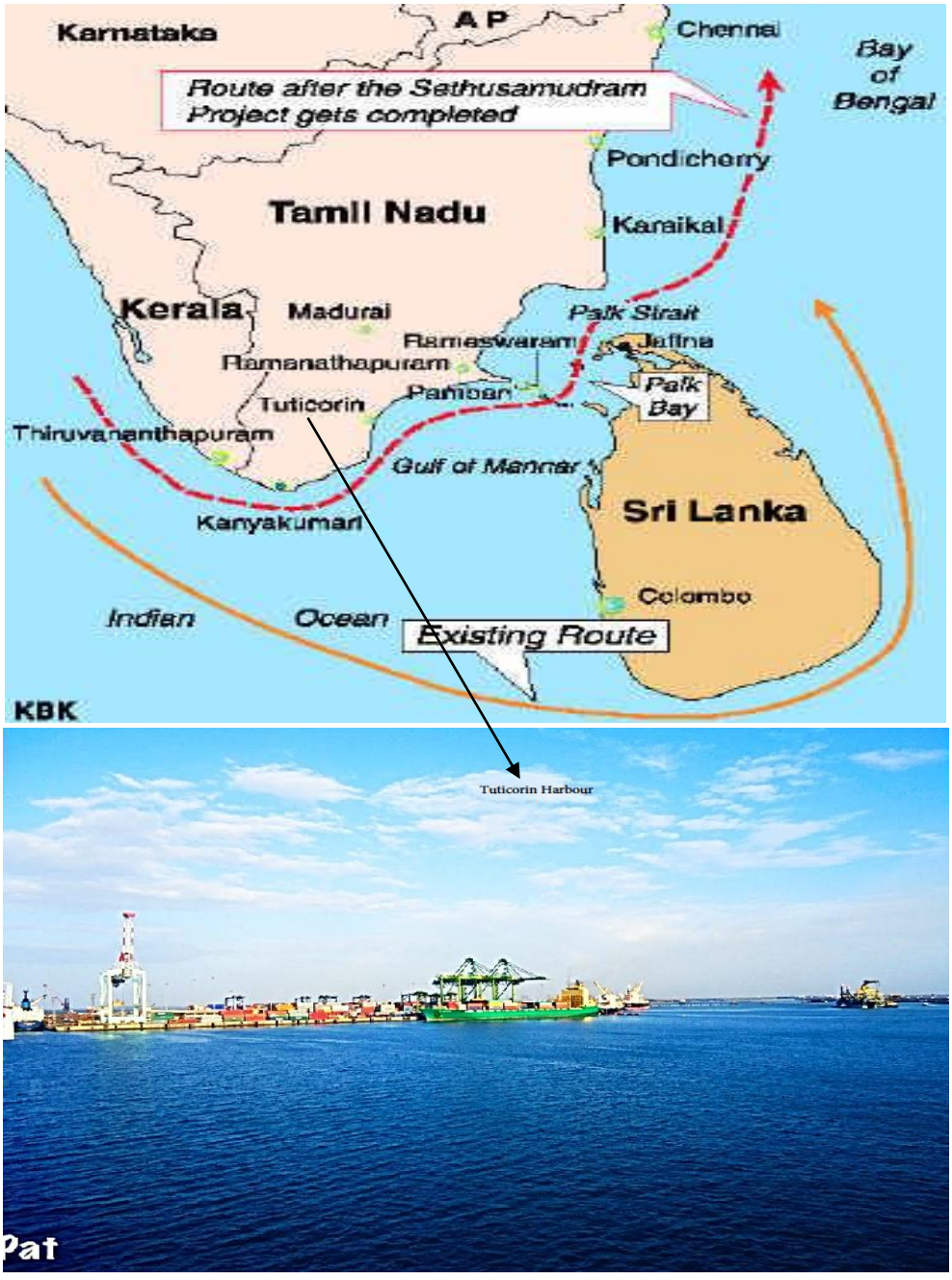
Cluster Analysis: Hierarchical agglomerative clustering is the most usual way, which implements inevitable relationships between any one sample and the entire data set and is naturally illuminated by a dendrogram. The dendrogram shows an image summary of the clustering processes (Shrestha & Kazama, 2007).

STUDY AREA

Thoothukudi is placed at 8.53°N 78.36°E. Thoothukudi is positioned in South India, on the Gulf of Mannar, about 540 kilometres (340 miles) south of Chennai and 125 kilometres (78 miles) north of Kanyakumari. The outback of the port of the city is linked to the districts of Madurai, Tirunelveli, Ramanathapuram and Tiruchirapalli (See[21]). The city mostly has a flat land and more or less prorated into two by the

Buckle channel. Being in coastal region, the soil is mostly clay sandy and the water table varies between 1m and 4 m below ground level. The city has disengage soil with belligerent brushwood in the north and salt pans in the south. The city acquaintances vaporous ethereal circumstances characterised with exorbitant warm summer, bearable winter and assiduous rainstorm. Summer elongates between March and June when the climate is very soggy (See [21]).

LOCATION MAP OF THE STUDY AREA



Sample collection

The sampling locations consist of Thoothukudi Coastal area(See[21]). Sea water samples were collected from three (03) locations. Samples were collected in plastic container to avoid unforeseeable changes in characteristic as per standard procedure (APHA, 1998).

Physico-Chemical analysis of Sea water

The collected samples were analyzed for different physico-chemical parameters such Sodium, Calcium, Magnesium, Potasium, Chloride, Calcium Carbonate, Calcium BiCarbonate, Magnesium Chloride, Sodium Chloride, Electric Conductivity, pH, Temperature and Oil & Grease as per the standard methods (APHA, 1998).

RESULTS AND DISCUSSION

The water quality analysis of different areas of Sea water samples have been carried out for Sodium, Calcium, Magnesium, Potasium, Chloride, Calcium Carbonate, Calcium BiCarbonate, Magnesium Chloride, Sodium Chloride, Electric Conductivity, pH, Temperature and Oil & Grease. The status of water quality of these lake water sources is presented in Table 1.

Statistical treatment of data

Correlation matrix was prepared within the studied parameters and tabulated in Table 2 for determining the kinship between the physico-chemical variables. Positive co-relationship occurred between some attributes and negative co-relationship occurred between some attributes. A dendogram of sampling sites, obtained by Ward's method is shown in Figure 2. There are two statistically significant clusters are formed. Present study reveals that there is a difference in the physico-chemical properties of cluster 2 and cluster 1.

Table 1. Water Quality at different locations of Thoothukudi Harbour

(Laboratory Analysis)

Name of Area	Sodium (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Potasium (mg/L)	Chloride (mg/L)	Calcium Carbonate (meq/L)
Thoothukudi Fishing Harbour	7026	348	984	247	17602	0.70
Outer Harbour	7346	357	956	233	16242	0.70
New harbour	7598	380	1038	258	18962	0.70

Calcium Bi-Caronate (meq/L)	Magnesium Chloride (meq/L)	Sodium Chloride (meq/L)	Electric Conductivity (dS/m)	pH	Temperature (^{0}C)	Oil & Grease (mg/L)
1.16	81.5	327.92	40.6	8.26	33.4	9.14
0.86	82.5	339.36	36.8	7.94	34.2	9.44
1.38	88.4	352.16	39.6	8.34	34.4	10.12

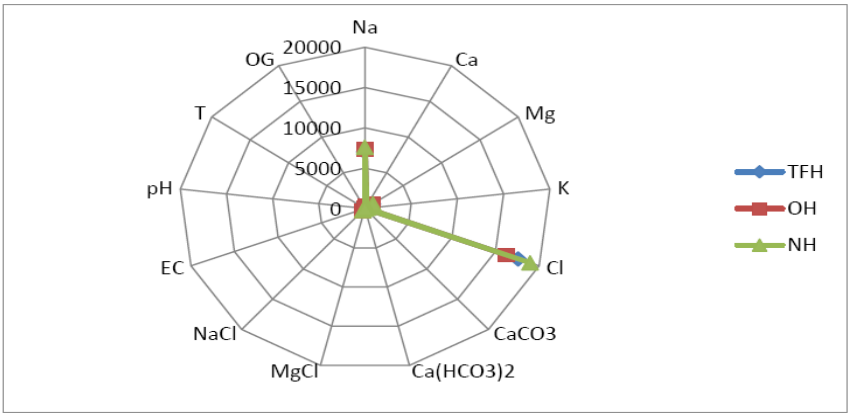


Fig 1: Graphical representation of data

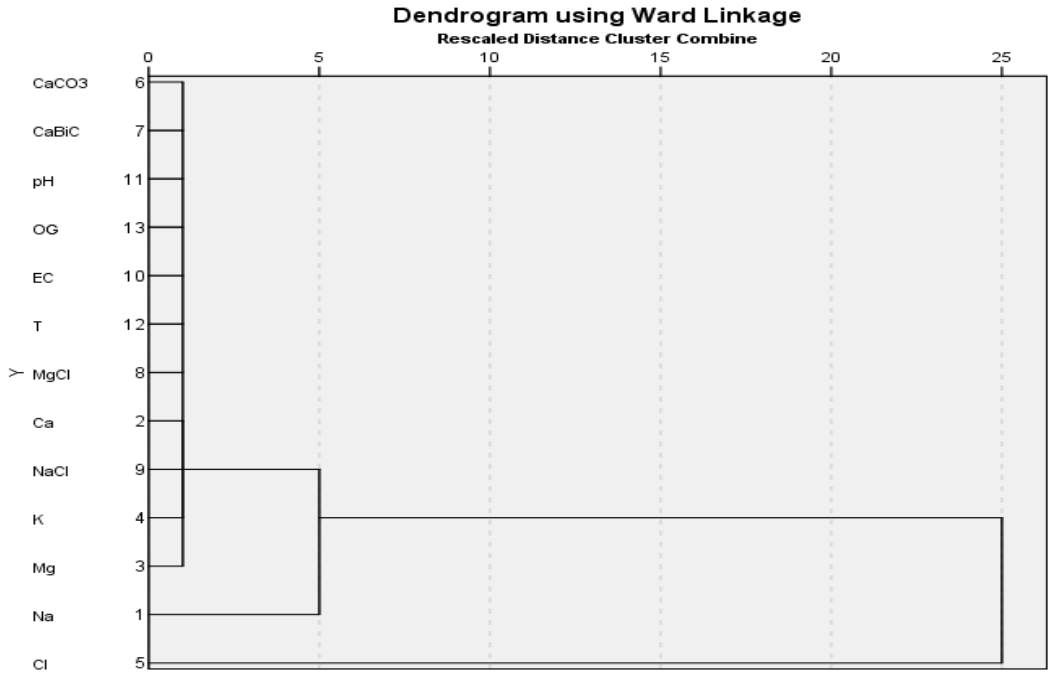


Fig 2: Dendogram based for agglomerative hierarchical clustering (Wards method)

Table 2. Pearson Correlation Matrix for the data

	Na	*Ca*	*Mg*	*K*	*Cl*	*CaCO3*	*Ca(HCO3)2*	*MgCl*	*NaCl*	*EC*	*pH*	*T*	*OG*
Na	1												
Ca	0.950503	1											
Mg	0.594085	0.814619	1										
K	0.376392	0.645626	0.968856	1									
Cl	0.439525	0.696863	0.983654	0.997609	1								
CaCO3	1.3E-15	-1.4E-15	1.11E-15	0	0	1							
Ca(HCO3)2	0.358331	0.630676	0.963865	0.999811	0.996078	-1.7E-16	1						
MgCl	0.897103	0.98998	0.888358	0.746992	0.791157	-1.6E-15	0.733942	1					
NaCl	0.994913	0.976969	0.672097	0.467808	0.527776	1.91E-15	0.450557	0.937048	1				
EC	-0.31947	-0.00923	0.572454	0.757663	0.710742	0	0.770193	0.132068	-0.22239	1			
pH	0.121298	0.423714	0.870524	0.965275	0.944911	1.71E-15	0.970166	0.547375	0.220675	0.901847	1		
T	0.965107	0.835975	0.362718	0.120659	0.188982	0	0.101361	0.750107	0.933818	-0.55646	-0.14286	1	
OG	0.958596	0.999631	0.798558	0.624637	0.677117	4.33E-15	0.609355	0.985777	0.982407	-0.0364	0.398944	0.850578	1

Na: Sodium, Ca: Calcium, Mg: Magnesium, K: Potasium, Cl: Chloride, $CaCo_3$: Calcium Carbonate, $Ca(HCo_3)_2$: Calcium BiCarbonate, MgCl: Magnesium Chloride, NaCl: Sodium Chloride, EC : Electric Conductivity, pH: pH, T: Temperature, OG; Oil & Grease.

CONCLUSIONS

Conclusion of the study determined that sea water is contaminated and not consummately protected for drinking prospect. It desires disburse survey and environment management plans to control the release of diffusion. It displays that the amount of profanation eventualized due to unearthing, industrial exonerate, domestic release. There is positive co-relationship between some attributes and also negative co-relationship between some attributes. By cluster analysis it shows that there is a difference in the physico-chemical properties of cluster 2 and cluster 1.

CONFLICTS OF INTEREST: The author declare that there is are conflicts of interest regarding the publication of this article.

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