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Research Article

Impact of Eutrophication on Shallow Marine Water near Karachi Coast, Pakistan

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Abstract: The coastal belt of Karachi, Pakistan was studied to estimate the nutritional levels of shallow seawater. It is investigated to study the localized eutrophication phenomena in the coastal region of Ibrahim Haideri and Karachi Port Trust at Kemari. It was found that the coastal regions of Port Qasim, Clifton and Hawke's Bay Beach when compared with the coastal regions of Ibrahim Haideri and Karachi Port Trust Kemari are more impacted with anthropogenic contamination. Over presence of reactive nitrogen and other nutrients were the indication of disposal of solid waste, sewage effluent and industrial effluents. Oxygen depletion due to localized eutrophication causes too much death of biotic components of marine ecosystems that in turn sink to the bottom of shallow water of Ibrahim Haideri and coastal areas of Karachi Port Trust. This phenomenon increases the microbial decomposition, which in turn decreases the average oxygen level to 6.71 mg/L to 6.99 mg/L at Coastal region of Ibrahim Haideri and Karachi Port Trust respectively. The ammonia, nitrogen was calculated as average 22.48 ppm in the seawater samples collected from Ibrahim Haideri and Karachi Port Trust. The average of total phosphorus in the collected from both these coastal regions were estimated as 1.164 mg/L, with high TDS and TSS values, i.e. average 51598.5 mg/L and 862.75 mg/L in the seawater.

Keywords: Echo System, shallow marine water, coastal belt, oxygen level, phosphorus level, TDS

1. INTRODUCTION

Recent human developments have influenced all main aquatic environments and their activities have replaced the natural composition of marine water and coastal ecosystem. One main reason behind this fact is accelerated aggrandizement of agricultural activities [1]. However, the global formation of soil fertilizing chemicals are more impacted on aquatic systems and it is estimated that it releases more than 510 million metric tons of reactive nitrogen in 1950, this can increase 135 million metric tons of reactive nitrogen by the year 2030 [2]. The more amount of reactive nitrogen is added to agricultural fields by introducing domestic animal manure. Same is the case as little, but ecologically more important part of agricultural phosphorus is introduced from land surface of the earth's crust to receiving water bodies of lakes, rivers and then finally mixed into the marine water. Atmospheric phosphorus is also loaded to surface water bodies and eventually get way to marine water [3-6]. Eutrophic water is water of lake, river or sea where abundant nutrients in the form of nitrogen and phosphorus found. However, aquatic eutrophication alters the normal chemical composition of water bodies, so in other words

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eutrophication is an enrichment of water bodies with different nutrients, especially compounds of nitrogen (reactive nitrogen) and phosphorus. This may cause unwanted change in ecology or natural inhabitants of the aquatic environment and can alter the quality of water and its color, eutrophication causes accelerated growth of algal blooms over water.

The main anthropogenic sources via enrichment of nutrient occurs (i.e., runoff, erosion and leaching from fertilized agricultural areas, and sewage from cities and industrial wastewater). These nutrient inputs have profound effects on the natural manifestation of acquiring water bodies [7, 8]. The visible reaction of marine ecosystem by eutrophication is the greening of top of the water column in the shape of development of algal growth (i.e., algal mat) and vegetation over coastal regions which develop a straight response to nutrient enrichment. Although the most serious impact of eutrophication is unnoticed decrease in dissolved oxygen (DO) concentration (of marine water, which creates deaths of algae and plants.

This phenomenon adds too much pure organic biomolecules to seafloor and provides good favorable conditions for microbial decomposition. A large amount of nutrients collected from land surface via different routes to streams and rivers finally finds their direction toward marine water; eventually estuaries acquire a high level of nutrient inputs per unit surface area [9]. World's greater than half the human population resides under 60 km of coastal environment, in this way 90% or greater world's fisheries depend in one way or another on estuarine and near shore habitats [10].

1.1 Description of Arabian Sea and Pakistan coastline

Arabian Gulf, Gulf of Oman and Arabian Sea, all combined together to form Arabian Seas, since old time it constitutes most important trade zone [11, 12, 13]. Arabian Sea is the northern region of the Indian Ocean linked to the north by Pakistan and Iran, as on the west by northeastern Somalia and Arabian Peninsula, and on east by India. Recently pollutants that most severely impacted on this costal environment and its physical and biological features are harmful algal blooms (HABs). However, since the last period of time these red tides or HABs found more frequent over the surface of Arabian Sea and transported from one coastal zone to another. This algal blooming is a more serious problem for the region [14]. The coastal regions of the Arabian Sea are undergoing high industrial growth along with urban developing projects that further increase the conditions of extreme destruction of naturally under stressed marine ecosystems. Coastal communities of marine environment are under the impact of untreated industrial effluent, brine effluent, ports and refinery waste, oil discharge and domestic discharge. The geographic location of Pakistan is such that it is facing directly the Arabian Gulf, bordering Iran, India, close to Oman along with landlocked central Asian countries.

Pakistan provides better facilities to benefit from its geo strategic position. Increasing levels of destruction of the coastal resources of the country are a very critical issue, and immediate response is needed. Pakistan coastline is about 990 km long having an adjacent coastal zone of 240,000 square km in the Northern Arabian Sea. This area was explored and, thus, new ports, tourist resorts and industrial sites were established as a part of enhancing national economic activity. Coastal location of Pakistan consists of two distinct units, the passive margin of Sindh coastline covers 370 km and other active margin of the Balochistan coastline include and covers 760 km. Pakistan as its geographic position is very important so it provides a vital trade route. Pakistan provides main oil supply routes from the Persian Gulf; however, this increases the chances of oil spillage in the sea. This whole coastal area of Pakistan supports living and nonliving resources. The living resources comprise mangrove ecosystems in Sindh and Balochistan coastline that link Indus delta; it is worth noting that the mangrove ecosystem in this region is the sixth longest in the world.

The commercial significance of the sea that comes in Pakistan's jurisdiction is because of the fact that it holds 350 different species of fish that are consumed locally and exported massively throughout the world. Coastal ecological system of Pakistan is a zone of naturally equipped resource region, which provides economic material and services as well, material and services both marketed as fish, shellfish and non-marketed like mangroves commonly used in medicine and provide nursery areas for juvenile fish it provides buffers against storm surges [15].

1.2 Components of marine ecosystem of Arabian Sea

Human communities of the coastal regions of Arabian Sea depend upon sea on the bases of economic, culture and social aspects. The ecosystems of sea grass beds, coral reefs, mangrove swamps, and mudflats play a role in productivity and constitute rich marine coastal resources of Arabian Sea [16]. The producers of the Arabian Sea ecosystem are seagrass beds that function ecologically and economically [17]. Ecologically, these components of ecosystem bring food material, they provide feed ground for various species that are under threat of environmental conditions of Arabian Sea, and these species include turtle and dugongs [18, 19]. On economical bases, they provide important nursery to the sea floor for shrimps, pearl oysters and various different animals of Arabian Sea [20]. These seagrass species have ability to tolerate the extreme saline conditions along with increased temperature in the Arabian Sea. They have the ability to tolerate the salinity 70 psu in summer, and the temperature exceeds 31ºC.

An ecological system of corals brings different functions, they maintain renewable resources of seafood genetic, biological and habitat diversity, recreational values, and economic benefits such as utilizing reefs for creating the land. Coral reefs are characterized by biological diversity and high levels of productivity. They provide high range of habitats for different reef species and fish. Coral reefs are supporting habitats for fishes. Coral growth is visible along many regions of the Arabian Sea; nice proliferation is observed on offshore shoals. Fringe corals mostly found in coastal regions of UAE, Qatar, Saudi Arabia and Bahrain [21].

Arabian Sea provides unfavorable conditions for growth of coral reefs and this is significantly because of the high temperature, high saline water and other physical conditions [22]. Even under those adverse environmental conditions, corals of Arabian Sea have shown resilience and vitality. Recently corals of Arabian Sea exposed to severe temperature as compared to corals of other regions of the world were found to have been tolerant of the thermal environment and that is the reason of its survival [23]. This is a noteworthy fact which draws the regional and international attention to use the Arabian Sea as a model ecosystem to find out environmental impacts and climate change in the future [24].

Ecologically, mangroves are a very necessary ecosystem of Arabian Sea; it brings food, cover and nursery areas for different terrestrial and marine fauna. Mangrove ecosystems of Arabian Sea coastal regions supports and provides shelter to a variety of important species of fish, shrimps, turtles, and birds, and contribute a big role in coastal productivity [25]. There is only one species Avicennia marina found dominated along coastal regions of the Arabian Sea. However, osmoregulation and salt secretion allow Avicennia marina to cope with hyper salinity in Arabian Sea [26]. The sedimentary nature of the Arabian Sea is high, so sand and mud substrata are the most widespread habitats occur along the coastline of the Arabian Sea. These habitats are more favorable areas of mangroves to colonize costal margins and to maintain ecology, these also facilitate algal growth and cyanobacteria, these act as primary producers of food chain. Subtidal and tidal muddy habitats are richer in microbenthic assemblages all these produce huge and constitute very differing marine ecosystem in the Arabian Sea.

1.3 Anthropogenic activities

Since the last few decades, anthropogenic activities have profoundly impacted on world's coastal ecosystems by elevation in chemical nutrition levels in coastal regions, and in the same fashion it is contributing an increase in nutrient loading in the Arabian Sea [27]. This may cause serious impact on aquatic ecosystems by increased growth of HABs over Arabian Sea regions [28].

1.4 Red tide events and their impacts

The first event of HABs occurred in the history of Arabian Sea was recorded in 1908 along the Indian coastline where the outbreak extended from the Malabar coast towards Laccadive Islands, as this area of Arabian Sea is impacted through India that is rich in phosphate nutrient enrichment. The impact of this was so high that a significant rise in fish mortality was observed [29].

1.5 Impact of Eutrophication

The most common impact of eutrophication is the development of algal bloom, in some instances, this transformation has been accompanied by the appearance and persistence of harmful algal blooms (HABs) to the extent that it has recently been suggested that nutritionally enriched coastal and offshore waters are experiencing an epidemic of harmful phytoplankton blooms [30]. The toxic material of toxic algal blooms (HABs) has the tendency of bio-concentration throughout the food chain. Hence, human population almost occupies a large position in this food chain become easily susceptible to potential impacts of accumulated toxic material [31, 32].

The risk of food poisoning and other gastric infections increase in this way, which is directly connected to sea food ingestion. Marine biologists have investigated that there are two strains of Noctiluca found common, i.e. red coloring and green coloring strains. Sweeney was first ever person who has used term Green Noctiluca. The red water coloration due to algal strain *Noctiluca scitillans* is one of the common reports of this phenomenon in North Arabian Sea [33]. This phenomenon creates very long red color streaking over the surface of seawater investigated in North Arabian Sea [34, 35]. Algal growth with blooming over seawater either toxic or nontoxic cause reduced oxygen level (Hypoxia) at the site of occurrence, which results in a high rate of deaths in seawater, this situation impacted on recreation, fish trade, tourism and health of coastal human communities due to transformation of infectious material into the human food chain [36].

1.6 Fate of Microorganisms in Eutrophicated marine environment

In many ecological processes of marine ecosystem, microbiological activities are playing very important role. It is the functions of microbial communities to maintain essential role for biogeochemical cycles, which stand for need to conserve life on earth globe [37]. In marine coastal environmental ecosystems microbial communities contribute natural territory for a range of microbial pathogens such as bacteria, viruses and parasites. Some pathogenic microorganisms inhabit the water and some live adhering to abiotic particles of ecosystem or live inside the bodies of large animals in marine water. The huge range of these animals and greater concentrations of microbial communities within coastal water indicate that the water or even seafood may be infected by organisms associated with human waste [38, 39]. Ingesting semi cooked seafood, which is contaminated with parasites of eutrophicated coastal water, increases the risk of parasitic infections, like anisakids and cestodes, which is found in shellfish [40]. In addition, many research findings have provided information that human pathogens originate from marine environment often transfer infections into the marine mammals exposed to polluted water as like parasitic infection giardiasis and other papilloma virus linked infections with brucellosis that is a bacterial infection [41, 42].

2. MATERIALS & METHODS

The research study was designed to understand eutrophication phenomenon of coastal aquatic environment and its impacts on coastal water and coastal ecosystem of Arabian Sea in Karachi, Pakistan. The research material required to undertake research on coastal aquatic environment to check impacts of eutrophication on marine ecosystems of the coastal environment of Arabian Sea in Karachi Pakistan was shallow seawater samples taken from various zones as shown in Fig. 1.

Five principal locations of the Karachi coastal belt were chosen for sampling and field observation survey depending upon the individual coastal location. All water samples were collected according to Grab water sampling technique, and were analyzed qualitatively and quantitatively. Sampling regions are depicted in Fig. 1. Samples were collected during different time intervals throughout this study in two phases.

Different samples from five different locations were collected during retreating climate of the year 2015, in order to check eutrophication level through variation and elevation in temperature, pH, conductivity, color, turbidity, dissolved oxygen, total nitrogen, total phosphorous, the total dissolved solids and total suspended solids of the seawater.

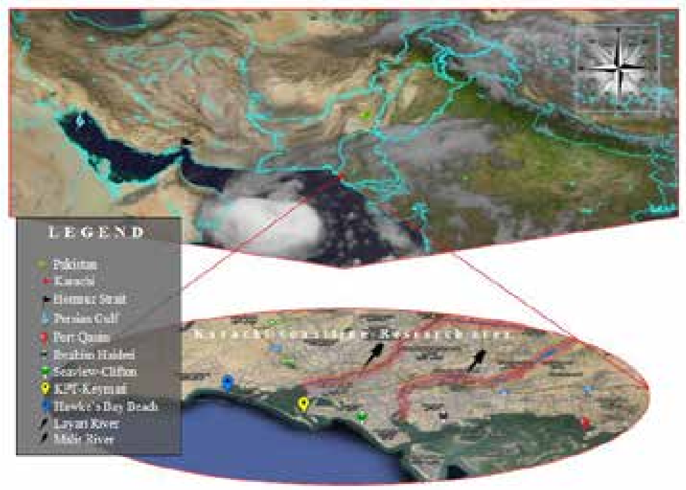
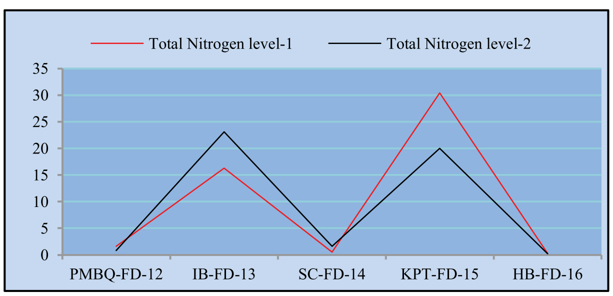
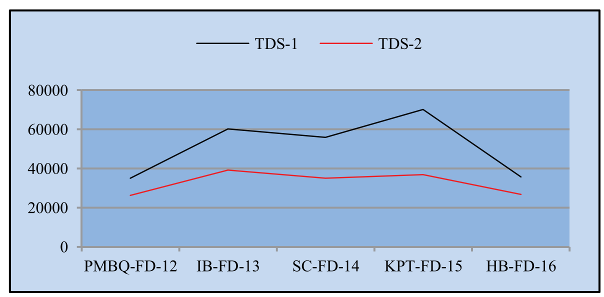


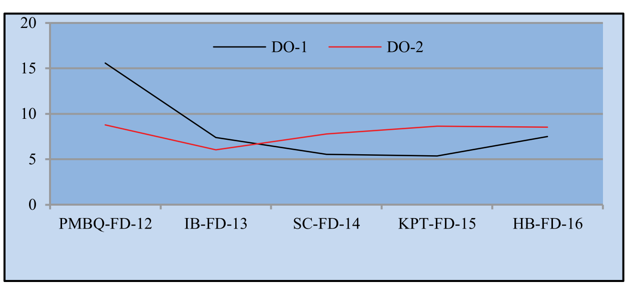
Fig. 1. Geographic map showing Arabian Sea and study regions of the Arabian Sea in Karachi coastline Pakistan



(a) Total Nitrogen level of Karachi coastal zones



(b) Total dissolved solids of Karachi coastal Zones



(c) Dissolved Oxygen level of Karachi coastal zones

(d) Total Phosphorus level of Karachi coastal zones

Fig. 2. The levels of total nitrogen, TDS, dissolved oxygen and total phosphorous at various locations

Temperature, pH, conductivity and dissolved oxygen measurement of different coastal zones was recorded immediately after sampling through HACH Sens-ion 156 pH/Conductivity meter, by using pH electrode (i.e. 59005-52), conductivity probe (i.e. 19604-50) and dissolved oxygen probe (i.e. 53013-50). Color of seawater samples was estimated by Platinum Cobalt Standard Method 8025. Turbidity of seawater samples was measured according to International Standardization Organization Method 7027 (ISO Method 7027). Total dissolved solids of seawater samples were estimated through APHA method 2540 C. Total suspended solids of seawater sample was estimated according to APHA method 2540 D. Total phosphorous of seawater samples was examined according to USEPA with acid per sulfate digestion method 8190. Total nitrogen of seawater samples was analyzed according to Nitrogen, Ammonia salicylate method 8155.

The routes of nutrient enrichment of coastal belt of Karachi were identified during the research field survey. It was clear from the survey that disposal of Karachi city's domestic waste (i.e., high in organic constituents), untreated sewage (i.e., high in ammonia, nitrates and phosphates), and disposal of untreated industrial effluent (i.e., rich in various nutrients) via Lyari river and Malir river runs to the seawater of the Karachi coastal belt causes the elevation of nutrient level of seawater.

3. RESULTS AND DISCUSSION

Sewage discharges were found to be contaminated with various chemicals and pathogenic microorganism, bioaccumulation and bio-magnification with virulent microorganisms and their toxins potentially impacted on quality of seafood, which in turn pose a severe risk to human health as well. Due to localized eutrophication, suspended and dissolved constituents of coastal water become increased as these contaminating factors were impacted on the natural chemical composition of seawater that leads elevation of seawater Temperature and high TDS and TSS level of the coastal region's seawater, this phenomenon impacted on the physiological characteristics of components of the ecosystem (i.e., growth of mangroves swamps & Seagrass), their diversity and spatial distribution and pathological impacts on marine biotic ecosystems (i.e., fish & shellfish). Although increased nutrient level of seawater estimated due to increased trade activities, frequent shipping introduces additional nutrient factors into the seawater that further increase the nutrient enrichment level of coastal water. Coastal developments also increase the artificial nutrient level of seawater. All of these, thus, lead to the deterioration of normal ecological components of the marine environment. In Karachi city, there are more than 700 small and large industrial units, these are classified into different industrial zones like Sindh industrial trading estate in North Karachi, Landhi industrial trading estate in east Karachi and Korangi industrial area in south Karachi. A significant amount of nutrient dense liquid from all these industrial regions enriches the coastal belt of Karachi which causes localized eutrophication of different coastal regions. Although different contaminating sources play a major contributory role in nutrient enhancement of coastal regions, hence provide nutrient factors for biological stressors of the marine ecosystem such as invasive species and algal blooms, these play further roles in the degradation of marine ecosystems, fish mortalities and dislocation of coastal communities of fish species and other marine animals in different areas of Karachi coast. Localized Eutrophication of Coastal zone of Ibrahim Haideri was eutrophicated with reactive nitrogen by dumping of solid waste collected from different areas of Karachi city and Malir river contaminations.

This localized eutrophication was found elevating the biogeochemical processes of coastal marine water. As the normal nitrogen seawater concentration is almost 0.5 ppm worldwide, However, consecutive ammonia, nitrogen level of the Ibrahim Haideri coastal area was recorded; average ammonia, nitrogen in number of two samples of Ibrahim Haideri coastal seawater was (i.e., 19.7 ppm). Although the average TDS and TSS in number of two seawater samples of this coastal zone was calculated (i.e., TDS=49678 mg/L., & TSS=856 mg/L respectively. The results are presented in Table 1 and Table 2.

The local human communities of this coastal zone depends upon seaborne trade, however enrichment of this coastal zone with organic, inorganic and pathogenic constituents of solid waste and effluent of Malir river negatively impacted on seaborne trade, as the seafood was found heavily contaminated due to eutrophication. Although bioaccumulation and bio magnification of seafood with toxic substances of algae and bio toxins of pathogenic microorganisms often introduce from untreated infectious solid waste and liquid effluents. In this way intoxication and bioaccumulation occurs. In this state seafood was found under impacted and contaminated due to localized eutrophication of this coastal area and said to be unsafe for human health when consumed.

Although the coastal area of Karachi Port Trust also receives high concentration of nutrients in the form of reactive nitrogen, it was estimated that average ammonia, nitrogen level in a number of two seawater samples collected from this zone was, i.e., 25.2 ppm. The condition of high TDS and TSS (i.e., 53519 mg/L., & 869.5 mg/L., respectively) of this coastal zone also move towards the direction of

Table 1. Phase-1, Sampling regions and Climate-Karachi coastal belt Pakistan

1st Phase, October, 2015						
Karachi coastal regions		**Sample description**		**Field climate conditions**		
S. No	**Sampling Locations**	**TP**	**DT**	**TR**	**HT**	**WS**
1	**PMBQ-A**	SW-Surface	3m	36C Sunny	34%	10 km/h
2	**IH-B**	SW-Surface	10cm	36C Sunny	34%	9 km/h
3	**SC-FD-C**	SW-Surface	20cm	34C Sunny	34%	13 km/h
4	**KPT-FD-D**	SW-Surface	5m	33.3C Sunny	34%	12 km/h
5	**HB-FD-E**	SW-Surface	15cm	31.5C Sunny	34%	10 km/h

Locations of seawater sampling: PMBQ, A; Port Muhammad Bin Qasim., **IH-FD, B;** Ibrahim Haideri., **SC, C;** Sea view-Clifton., **KPT, D;** Karachi Port Trust., **HB, E;** Hawke's Bay
Field sampling detail: TP; Type of Sample, i.e. deep or surface., **SW;** Sea Water., **DT;** Sample Depth= It is the description about depth of each specific sample collected from a specific coastal region it is Measured in Meter (m) and centimeter (cm)., **TR;** Day Temperature during sampling was measured in Celsius scale (˚C).
HT; Humidity measured in percent (%)., **WS;** Wind Speed measured in kilometer per hour (km/h).

Table 2. Phase-2, Sampling regions and Climate-Karachi coastal belt Pakistan.

2nd Phase, November, 2015						
Karachi coastal regions		**Sample description**			**Field climate conditions**	
S. No	**Sampling Locations**	**TP**	**DT**	**TR**	**HU**	**WS**
1	**PMBQ-A**	SW-Surface	2m	21C Sunny	33%	16km/h
2	**IH-B**	SW-Surface	3m	21C Sunny	33%	16km/h
3	**SC-C**	SW-Surface	10cm	21C Sunny	33%	12km/h
4	**KPT-D**	SW-Surface	5m	21C Sunny	33%	12km/h
5	**HB-E**	SW-Surface	15cm	21C Sunny	33%	12km/h

Table 3. Phase-1, Laboratory investigations of seawater of Karachi coastal regions of Pakistan.

1st Phase, October, 2015											
Karachi coastal region		***Lab. Investigation Results***									
S. No	***Sample No.***	**T**	**CL**	**Tur**	**Cond**	**pH**	**TSS**	**TDS**	**DO**	**TN**	**TP**
1	***PMBQ-FD-12***	32	61	3.01	1400	7.30	542	35011	15.59	1.643	0.961
2	***IH-FD-13***	32.4	299	18.7	1016	6.2	981	60201	7.38	16.362	0.993
3	***SC-FD-14***	32.4	48	1.85	1207	8.52	843	55873	5.53	0.576	0.264
4	***KPT-FD-15***	30.6	153	12.8	1464	7.95	978	70127	5.35	30.491	1.154
5	***HB-FD-16***	30.8	123	3.93	1367	8.49	210	35631	7.51	0.384	0.635

Locations of seawater sampling: **PMBQ-FD, 12;** Port Muhammad Bin Qasim., **IH-FD,** 13; Ibrahim Haideri., **SC-FD,** 14; Seaview-Clifton., **KPT-FD,** 15; Karachi Port Trust., **HB-FD**-16; Hawke's Bay

Abbreviation and Unit: T; Temperature value measured in Celsius scale (˚C)., **CL;** Color value measured in Platinum Cobalt scale (Pt/Co)., **Tur;** Turbidity value measured in Nephelometric Turbidity Unit **(NTU)., Cond;** Conductivity measured in milligram per liter (mg/L)., **pH;** Power of Hydrogen Ion Concentration measured in moles per liter (moles/L). As in the case **PMBQ-FD-12** 1st phase Sample [H+] = 0.5 x 107 mol/L. mol/L, this is the pH of 7.30., TSS; Total Suspended Solids value measured in milligram per liter (mg/L)., **TDS;** Total Dissolved Solids value measured in milligram per liter (mg/L)., **DO;** Dissolved Oxygen value measured in percent (mg/L)., **TN;** Total Nitrogen value measured in milligram per liter (mg/L)., **TP;** Total Phosphorous value measured in milligram per

Table 4. Phase-2, Laboratory investigations of seawater of Karachi coastal regions-Pakistan

2nd Phase, November, 2015											
Karachi coastal regions		**Lab. Investigation Results**									
S. No	**Sample No.**	**T**	**CL**	**Tur**	**Cond**	**pH**	**TSS**	**TDS**	**DO**	**TN**	**TP**
1	**PMBQ-FD-12**	28	58	16.7	1149	6.9	560	26260	8.77	0.8	0.95
2	**IH-FD-13**	30.9	191	61.8	1572	6.3	731	39155	6.04	23.1	1.43
3	**SC-FD-14**	27.4	144	69.8	1307	7	420	35070	7.78	1.6	0.2
4	**KPT-FD-15**	27.5	75	5.91	1803	6.7	761	36911	8.63	20	1.08
5	***HB-FD-15***	26.9	21	7.61	1549	7.3	243	26800	8.53	0.2	0.1

localized eutrophication (Table 2 & 3). However, algal development over seawater of the Ibrahim Haideri coastal area was negatively impacted on the coastal seagrass, as seagrass provides food and shelter to marine fish species and other macro benthos. Although due to blockage of sunlight by thick algal covers over coastal water surface, seagrass and coral reef's growth was found impacted. This was the reason through which it was apparent that the marine fish communities and the other marine slowly yet completely migrated from this coastal zone. The results are tabulated in Table 3 and Table 4.

However, other existing marine life was also under impact due to the extreme environmental stress like deoxygenation of coastal water due to elevated biogeochemical processes often result of eutrophication. In this state mortality rate of coastal life increases (average dissolved oxygen level in a number of two seawater samples at Ibrahim Haideri and coastal areas of Karachi Port Trust-Kemari estimated to be 6.71 mg/L., & 6.99 mg/L).

In this way, adverse environmental conditions of this coastal zone of Ibrahim Haideri and coastal areas of Karachi Port Trust-Kemari were very similar. Marine ecosystem of this coastal region was also found to be suffering from same environmental conditions and, thus, causing a great loss of marine life.

4. CONCLUSION

It is concluded from the survey and laboratory investigations of seawater samples that Ibrahim Haideri coastal area and coastal area of Karachi Port Trust-Kemari has witnessed a negative impact owing to the localized eutrophication. The result is in contrast to the results obtained for regions like Port Muhammad Bin Qasim, Seaview-Clifton and Hawke's Bay Beach. The average ammonia, nitrogen level, TDS and TSS in number of two seawater samples of Port Muhammad Bin Qasim, Seaview-Clifton and Hawke's Bay beach were also estimated. However, as compared to Port Muhammad Bin Qasim, Seaview-Clifton and Hawke's Bay coastal zones, sewage effluent, solid waste disposal and industrial effluent runoff through Lyari river and Malir river was potentially impacted on normal ecology and coastal communities of fish and was found the main reason of fish mortalities and seafood contamination in these coastal areas like Ibrahim Haideri and areas of Karachi Port Trust up to Manora channel. One of the most common anthropogenic disturbances of marine ecosystems in the Arabian Sea in Karachi coastline Pakistan was observed. These were found main causes of eutrophication, this coastal pollution and contamination like eutrophication not only impacted on coastal ecology, but also impacted on coastal water quality and recreational facilities of these coastal zones of Sindh-Pakistan.

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