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RESEARCH ARTICLE

Ecological impacts on the status of Marsh Crocodiles in Manghopir Karachi

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Abstract

The present study of ecological impacts on Marsh crocodiles in Manghopir was carried out in the months of January to December 2008. In order to assess, the microbial contamination, detection of pollutant indicator organisms in water samples, to determine the physico-chemical parameters were performed. The detection of different physico-chemical parameters which are temperature of air and water, electrical conductivity, total dissolved solids, calcium, magnesium, bicarbonate, chloride, sodium, potassium, sulphur, carbonate, biological oxygen demand, dissolved oxygen were analyzed with the recognized standard method of WHO collected water samples from the Manghopir Karachi. Marsh crocodiles are reported endangered around the world due to the vulnerability of marshy habitat to increase pollution and environmental deterioration. Toxic chemical contaminants were estimated below the detection range, while some other chemicals were found within the normal level recognized by WHO. The range of contamination, proximity to pollution source and the metabolic capacity of Marsh crocodiles suggest that the species is under threatened due to toxic chemicals in the pool of Manghopir Karachi.

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Introduction

Manghopir is situated in Gadap town Karachi and positioned in the hilly areas in between districts of Karachi Sindh and Lasbela Balochistan, Pakistan. The area has the oldest Sufi shrine and globally known as Manghopir, the original name of Sufi saint is Khawaja Sakhi Hassan Sultan. His history is spread over 700 years old. Near the shrine of MP, there are two hot and cold springs and the crocodile's pool is filled by these two springs. The temperature of these both sulphur springs was recorded between the 43 °C (110 F) to 54 °C (130 F). Hot spring has some medicinal qualities because warm water spring passing through the sulphur rocks and it is used for skin disease patients due to presence of medicinal properties. Many people come from long distances areas regularly and stay there to have a bath to cure from skin diseases. Nearby shrine of MP, there is a crocodile's pool, measuring about 400 feet (120 m) long and 200 feet (61 m) wide and 15-20 feet depth, which nourished by an underground stream.

Scientific analysis also states that the water of hot spring is naturally saturated with carbon dioxide, besides containing some sulphur and other skin friendly nourishments, which are no doubt suitable for many skin diseases. The globally endangered and most important reptilian species of crocodilian, the Marsh crocodile is inhabitant in MP Karachi (WWF-Pakistan, 2007). Ecological studies were carried out by different scientists on the different lakes of Sindh and this study was carried out in the crocodile's pool of MP in 2008. This study on water quality was carried out first time in Sindh, Pakistan. Some previous ecological studies were carried out in Chotiari Wetland Complex (CWC) by (Jafri, 1997; Leghari et al., 1995 and 1999). Ecological changes in aquatic life depend upon the physico-chemical characteristics of water bodies. The present study provides the information and influence of physico-chemical factors on Marsh crocodiles. Before the construction of Chotiari Reservoir, some biological and limnological studies on the Bakar Lake were

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carried out by (Jafri, 1997; Leghari et al., 1997, 1999a and 1999b). The aim of present study is to determine the water quality and its impacts on crocodile population in MP Karachi.

Material and Methods

Water samples were collected from the midstream. Two sampling stations were selected from the crocodile's pool and springs for water samplings. Samples were collected from crocodile's pool S1 and Springs S2. Sampling was carried out from 11:30 am to 3:00 pm at monthly intervals. Physico-chemical parameters such as temperature of water, depth and transparency, the secchi disk measurement was carried out in water samples. In the laboratory, to determine the chemical factors the mercury thermometer was dipped into the water samples to a depth of 15 cm for 2-5 minutes, pH of water was measured with Orion Model 420 A pH meter, electrical conductivity, total dissolved solids and salinity of water samples was measured by WTW 320 conductivity meter. The total alkalinity, total hardness, chlorides and phosphate were determined by using the standard methods for the examination of water samples (APHA, 1976). To determine the calcium, carbonate, bicarbonate the titration method (2310) was applied. The magnesium and potassium was examined with Spectrometer. The biological oxygen demand was determined with Winkler method and dissolved oxygen was examined with Oxygen Meter (Jenway Model 9071).

Results

Values for physico-chemical parameters in water samples were collected from two sampling stations crocodile pool and springs for water samplings. Water samples were collected from two sampling stations of Crocodile Pool (S1) and Springs (S20) in MP Karachi during January to December 2008 (Table 1-2).

Temperature of air/water °C: It is the most important physical parameter which is directly related to chemical reaction in water bodies. The temperature of water bodies is major parameter that directly influences the aquatic biodiversity and it also reduces the dissolved oxygen in water bodies. It was observed that the highest temperature of air recorded during the month of July 33 °C and lowest level was found during the month of January 22 °C (Table 1-2). Temperature of water was recorded the highest in July 29 °C and lowest was found in January 19 °C (Table 1-2).

pH: The lowest range of pH was recorded from June to September. The highest level observed in January and February. The observed level of pH was 7.0 to 7.9 respectively (Table 1-2).

Electrical Conductivity: The EC was recorded highest 4790 us/cm in October and lowest was recorded 2465 us/cm in September (Table 1). However, fluctuation was observed in water samples due to flow of rain water in sampling stations. The standard level of EC is 400 us/cm, as the quality of water depends upon TDS.

Total dissolved solids: The TDS level was observed highest 2619 mg/l in March and lowest was observed 1659 mg/l in October (Table 1).

Turbidity: The highest level of turbidity was observed 70 in August and lowest was recorded 0.3 in December (Table 1-2).

Calcium: The highest level of calcium was recorded 508 mg/l in January while lowest was recorded 60 mg/l in April (Table 1-2).

Magnesium: The highest level of magnesium was recorded 153 meq/l in October while lowest level was recorded 43 meq/l in June (Table 1).

Hardness: The highest range of hardness was observed 1592 mg/l in January and lowest was observed 350 mg/l in June (Table 1).

Bicarbonate: The highest level was recorded 960 mg/l in October while lowest level was observed 335 mg/l in March (Table 1).

Alkalinity: The highest level was observed 19.2 mg/l in October and lowest was observed 6.80 mg/l in March (Table 1).

Chloride: The highest level was recorded 646 mg/l in June and lowest was recorded 319 in January (Table 1).

Sodium: The highest level was observed 733 meq/l in March and lowest was observed 43 meq/l in January (Table 1-2). Concentration of sodium increases in winter while level decreases in summer season.

Potassium: The highest level was observed 24 mg/l in September and lowest level was observed 12 mg/l in March (Table 1-2).

Sulphate: The highest level was observed 860 mg/l in March and lowest level was observed 240 mg/l in

December (**Table 1**).

Table 1. Water analysis of (S1. Crocodile's Pool) for the year of 2008

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Date	5	12	23	14	10	5	15	12	16	9	10	12
Time	12:00	12:10	12:20	12:00	12:40	11:30	1:00	1:40	1:10	12:30	1:30	2:30
Temp: air° C	22	23	27	26	30	32	33	28	28	27	24	23
Temp: H ₂ O °C	19	20	24	23	27	28	29	25	25	24	20	20
pH	7.9	7.5	7.0	7.09	7.2	7.4	7.1	7.62	7.3	7.05	7.08	7.09
EC mu/scm	3750	3840	4030	3614	3845	4420	3184	2778	2465	4790	3842	3250
TDS mg/l	1910	2148	2619	1952	2135	2373	1898	1659	1872	2580	2278	1947
Turbidity	58	60	62	58	62	60	68	70	62	56	58	60
Ca mg/l	400	180	80	92	80	68	76	84	70	64	137	379
Mg meq/l	74	76	78	73	58	43	48	56	90	153	110	85
Hardness mg/l	1305	720	420	530	475	350	738	1298	960	790	986	1298
HCO ₃ ppm	450	410	335	350	585	700	558	378	595	960	676	472
Alkalinity mg/l	9.00	7.50	6.80	7.0	12.4	14.00	11.5	7.60	9.40	19.2	15.3	9.4
Cl mg/l	319	435	553	534	590	646	545	443	476	512	532	569
Na meq/l	58	165	733	458	684	855	498	207	518	680	518	233
K mg/l	19	18	17	14	20	21	22	21	24	19	21	23
SO ₄ mg/l	480	570	860	427	496	576	438	336	475	684	515	240
Co ₃ ppm	0	0	0	0	0	0	0	0	0	0	0	0
BOD mg/l	4.2	4.0	3.1	3.3	3.2	2.8	2.5	2.3	2.4	3.5	3.8	3.0
DO mg/l	3.8	4.2	5.6	5.1	4.8	5.2	5.0	5.1	4.9	4.3	4.4	5.3

Carbonate: The concentration of carbonate was observed zero during whole year (**Table 1-2**).

Biological oxygen demand (BOD): The highest level was observed 4.8 mg/l in January and lowest level was observed 2.4 in September (**Table 1**).

Dissolved oxygen: The highest level was observed 5.9 mg/l in March and lowest was observed 3.8 mg/l in January (**Table 1-2**).

Discussion

Crocodile pool of Manghopir is shallow water, having a rocky and salty depth. The depth and area of crocodile's pool is variable depending upon the influx of rain and springs water. The water level varies with the seasonal change in the quantity of water which enters into the pool from the springs. Present depth has been recorded from 15-20 ft and its level decreases to 8-12 ft in the dry season. Seasonal fluctuation in physico-chemical parameters caused the similar rise in dissolved oxygen level has been observed in winter season (Singh et al., 1980). Due to causes of reduction in microbial decomposition of dead organic matter, low organismal respiration demand, increased growth of submerged

macrophytes and solubility of atmospheric oxygen by reduction in temperature (Rao, 1986). The result of pH and alkalinity values indicates that pool water remained slightly alkaline throughout the observation period due to sufficient amount of water comes from the springs. The permissible limit of hardness is recognized 200 mg/l by WHO. In water samples the hardness was observed little high range from above the guidelines of WHO (1984). This increase of hardness in the water could be due to the inflow of rain water. Salinity, conductivity and TDS were substantially high; this probability indicates that there could be some contamination and waste particles added into water. The chloride is a pollution indicating parameters i.e. related to sewage contamination with the degradation products. In the pool the level of chloride was observed in higher range. The level of chlorides recognized permissible range is 250 mg/l for drinking purpose. However, the range of Ca, Mg, Na, K, SO₄, HCO₃, CO₃, COD and BOD was observed in elevated concentration compared to the maximum acceptable limits (Table 1-2). The salinity of water is the main factor which can be effect on biodiversity (Khuhawar and Mastoi, 1995) and they have recorded the higher salinity of water in different water resources.

Table 2. Water analysis of (S2. Spring) for the year of 2008.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Date	5	12	23	14	10	5	15	12	16	9	10	12
Time	12:30	12:50	12:40	1:00	1:00	12:00	1:20	2:30	1:40	1:30	1:50	1:40
Temp: air °C	22	23	27	26	28	32	33	28	28	27	23	22
Temp: H ₂ O °C	19	20	24	23	25	28	29	25	25	24	20	19
pH	7.8	7.5	7.3	7.25	7.28	7.3	7.2	7.09	7.1	7.02	7.42	7.62
EC mu/scm	3310	3560	3730	3099	3276	3610	3464	3250	3120	3156	2958	2770
TDS mg/l	1680	1938	2489	1676	1845	2346	2166	1947	1863	1704	1684	1659
Turbidity	0.4	0.4	0.5	0.5	0.7	0.6	0.5	0.7	0.6	0.4	0.5	0.3
Ca mg/l	508	327	92	60	68	72	246	379	164	67	74	84
Mg meq/l	78	72	61	95	84	63	74	85	97	117	85	56
Hardness mg/l	1592	765	480	540	485	440	643	940	810	650	774	940
HCO ₃ ppm	401	390	360	490	412	360	384	472	412	340	352	378
Alkalinity mg/l	8.02	8.0	7.20	9.8	8.4	7.20	8.2	9.4	8.5	6.9	7.1	7.60
Cl mg/l	394	415	468	460	470	479	510	569	558	554	508	443
Na meq/l	43	315	635	568	592	627	432	233	285	376	314	207
K mg/l	15	18	12	19	18	17	16	16	15	14	16	17
SO ₄ mg/l	662	743	812	592	648	740	441	242	327	451	387	336
Co ₃ ppm	0	0	0	0	0	0	0	0	0	0	0	0
BOD mg/l	4.8	4.2	3.7	3.7	3.5	3.2	3.1	2.7	3.6	4.0	3.9	3.5
DO mg/l	4.0	4.2	5.9	5.3	5.2	5.8	5.2	5.3	5.1	4.5	5.2	5.4

The physico-chemical variables of MP Karachi when we have compared with other lakes of Sindh, Such as Keenjhar lake, (Chloride 38.9 mg/l, salinity 0.05 mg/l, alkalinity 200 mg/l; Khuhwar et al., 1998); Haleji Lake (Alkalinity 525 mg/l, chloride 75 mg/l, TDS 338 mg/l, Khuhwar et al., 1998); Hamal lake (Hardness 670 mg/l, chloride 1750 mg/l, alkalinity 275 mg/l, Khuhwar, 1998 mg/l); Bakar lake (TDS 580 mg/l, alkalinity 550 mg/l, hardness 210 mg/l, Jafri et al., 1997) and Hub Dam (Transparency 2.1-3.3 m, pH 6.8-7.5, dissolved oxygen 3.1-5.3 mg/l, salinity 0.15-25 ppt, dissolved solids 502 ppm, Iqbal and Kazmi, 1998) indicated that all these lakes retain the typical fresh water characteristics despite progressive eutrophication. In MP (Crocodiles pool), the process of eutrophication was observed high due to shallowness of basin and whole the range of chemical parameters gone up high, beyond the permissible limits recommended by WHO (1984). Crocodile's focuses their attention on of major issue is related with water pollution which concerned directly with the human health (Chang et al., 2012). The quality of water is the key factor to determine the biodiversity and its health (Gachal et al., 2001, 2004 and 2006).

The site is faced by many shortcomings within its impacts and prediction. The major threat is faced by crocodile population due to the quality of water and insufficient area of pool. The seasonal flooding and

heavy rain can destroy the nesting and eggs of crocodiles in their habitat (Santiapillai et al., 2001). The change in the water quality was recorded and hazard chemicals were detected during the analysis of water samples in the laboratory which causing the harmful effects on the species. It was witnessed that the current population in MP extremely disturbed with the interaction of large number of people and many people washed their clothes, showering of skin diseased people, low water level and quality and insufficient food amounts and usually reduces the suitability of the habitat for the crocodiles. The flourishing breeding has made the pond too small for the expanding crocodile population which is naturally rough and tough and famous for its longevity. The crocodile pool is not sufficient for the 116 crocodile population and they required a large sized pool for their healthy growth and survival. During our observation the water quality is not good for crocodile population.

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References

- APHA. 14th ed. (1976):** Standard methods for the examination of water and waste water Washington, D.C.
- Chang, M.S., Gachal, G.S., Qadri, A.H. and Sheikh, M.Y. (2012):** Bio-ecological status, Management and Conservation of Marsh Crocodiles (*Crocodylus palustris*) in Deh Akro 2, Sindh–Pakistan. *Sindh Univ. Res. Jour. (Sci. Ser.) Vol.44 (2)*. pp: 209-214 (2012).
- Chang, M.S., Gachal, G.S., Qadri, A.H., Jabeen, T., Baloach, S. and Sheikh, M.Y. (2012).** Distribution and Population Status of Marsh Crocodiles, *Crocodylus Palustris* in Nara Desert Wildlife Sanctuary (NDWS) Sindh, Pakistan. *Sindh Univ. Res. Jour. (Sci. Ser.) Vol.44 (3)*. pp: 453-456 (2012).
- Gachal, G.S. and Slater, F.M. (2001):** Dolphins down the drain. *Wildlife*. 19: pp: 36-37.
- Gachal, G.S. and Slater, F.M. (2004):** Barrages, biodiversity & the Indus River Dolphin. *Pakistan Journal of Biological Sci.* 7 (5): pp: 797-801 (2004).
- Gachal, G.S., Slater, F.M., Memon, Z.N., Qadri, A.H. and Zuhra. (2006):** If the pollution load of the river can be reduced then it would benefit both human and wild life dependent upon river. *Pakistan Journal of Biological Sci.* Vol. 9. pp: 127-134.
- Iqbal, M., and Kazmi, (1988):** Ecology of limnetic crustacean zooplankton in Hub lake. M. Phil thesis. Department of Zoology, University of Karachi. pp: 117.
- Jafri, S.I.H. (1997):** Final report on Fisheries survey of Chotiari reservoir (Sanghar) and Tidal link lakes (Badin). Department of Fresh Water Biology and Fisheries, University of Sindh, Jamshoro, pp: 12-61.
- Khuhawar, M.Y. and Mastoi, G.M. (1995):** Studies on some physic-chemical parameters of Manchar lake Sindh. *J. anal. And Envi. Chem.*, 3: pp: 66-71.
- Khuhawar, M.Y., Mastoi, G.G., Jehanger, T.M. and Komber, M. (1998):** Study on some Wetlands of Sindh. (Proceedings) Impact of environmental pollution on lakes of Sindh. MUET Jamshoro, pp: 12-17.
- Leghari, M.K., Sultana, K. and Haga, M. (1995):** Diatoms from unexplored Diaper face of Nanga Parbat Part I. *Biologia*, 41: pp: 11-12.
- Leghari, M.K., Sahito, G.A., Arbani, S.N. and Leghari, M.Y. (1997).** Ecological survey of phytoplankton in Fresh water lake, Bakar (Distt, Sanghar), Sindh, Pakistan, *Sindh Univ. Res. J. (Sci. sr.)* 29 : pp: 83-94.
- Leghari, S.M., Jafri, S.I.H., Mahar, M.A., Lashari, K.H., Ali, S.S., Khuhawar, M.Y. and Jehangir, T.M. (1999):** Biodiversity of Chotiari reservoir (Distt. Sanghar) Sindh, Pakistan. *Proc. Semi. Aq. Biodiv. Pakistan*, pp: 139-157. (Eds. Q.B. Kazmi and M.A. Kazmi) MRC and Deptt. of Zoology, University of Karachi.
- Leghari, M.K. and Khuhawar, M.Y. (1999):** Seasonal variation of phytoplankton: part-I freshwater lake Bakar District Sanghar, Sindh. *Pakistan J. Plant Sci.* 5 (2): pp: 159-171.
- Rao, R.J. (1986):** Studies on the seasonal and diel variation in some physic-chemical conditions of a fresh water pond under prawn culture. *Proc. Nat. Symp. Fish and Env.* pp: 96-102.
- Santiapillai, C. and de Silva, M. (2001):** Status, Distribution and Conservation of Crocodiles in Srilanka: *Biological Conservations Vol 97 Issue 3*, 2001. pp: 305-318.
- Singh, R.N., Srivasta, N.P. and Desai, V.R. (1980):** Seasonal and diurnal variations in physic-chemical conditions of water and plankton in lotic sector of Rihand reservoir (U.P) J. in *Land Fish. India*, 12: pp: 100-111.
- W.H.O. (1984):** Guidelines for drinking water quality, Vol. II, Geneva, pp: 327.