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Environmental Impact of Water Quality on Fish Production in Haleji Lake, District Thatta, Sindh, Pakistan

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Abstract: Present research aims to examine the environmental influence of excellence of water on the production of fish in Lake Haleji of Thatta District Thatta, Pakistan through November 2017 to January 2018. Various parameters related to excellence of water such as pH, temperature, oxygen concentration, salinity, conductivity, total dissolved solids and chloride were taken into account twice in month from sampling sites for entire period of investigations. Results of Investigations revealed that the values of temperature deviate from (20- 23°C and average was22±1.0), pH (7.3-7.9 and average was 7.62±0.09), dissolved oxygen (4.0 – 5.3 mg/land average was 5.3±0.19), chloride (65-69 mg/land average was67 ±0.27), conductivity (950-1240and average of 1162.5±60.15), salinity (0.3) and TDS (total dissolved solids) were deviated from 410-549mg/land average was 525.7±19.13) obtained from entire sites of study.

The fish production was determined in terms of L/W analysis. The three dominant experimental fish exhibited following equation

Log W= - 2.68 + 3.74 × Log L (*Notopterus chitala*) (r = 0.93)

Log W= - 0.60+ 2.12 × Log L (*Notopterus notopterus*) (r = 0.97)

Log W= - 1.36 + 2.48 × Log L (*Aorichthys aor*) (r = 0.97)

The length weight analysis revealed that *Notopterus chitala* (b=3.74) showed better growth followed by *Aorichthys aor* (b=2.48) that exhibited closed to ideal.

Finally, it could be concluded that the water quality factors of Lake Haleji Lake were considered to be in the recommended limits reported by (WHO 2012) and are ideal for the growth, production and survival of aquatic organisms particularly fish.

Keywords: Water quality, Fish Production, Haleji, Environment, Parameters.

1. INTRODUCTION

Fish is a high-protein and highly appreciated food item, but fresh fish is frequently difficult to obtain (Doe, 1998). The importance of fish and other aquatic products is widely recognized, and development programmes have devoted much effort to stimulating increased production of these products. Many of these efforts have targeted fish culture, operations and efforts for the enhancement of fisheries, which serve as basis of increasing fish availability. The animal protein about 16% could be consumed universally through the fish and land animals (Dudegeon, *et al*., 2006). The lakes are not only regarded as important freshwater resource for purpose of drinking but equally important for fisheries as well (Muyodi, *et al*., 2010) District Thatta of Sindh province possesses two freshwater lakes, Keenjhar and Haleji (Mangan, *et al*., 2013), that are also recognized globally as wild life sanctuary of migratory birds for their rescue, breeding, passage and over-wintering (Khan. *et al.*, 2012). It is assessed that freshwater resources of Sindh account 65% of total freshwater resources of Pakistan and contains about 120 kinds fish are found in Sindh.

The determination of chemical nature of any water body is termed as key to success of fish culture system which is mainly depending upon primary production, ecological and trophic status and of the water body Carpenter, and Kitchell, 1996) Likewise, the saltishwater bodies possess very insufficient number of particular zooplanktons. It is found in the variety of environments such aslentic and lotic environments. (Ellis *et al.*, 2011). However, pollution caused by expulsion of excess is a major cause in the destruction of the water quality condition. (Knight, 2000). The monitoring of water quality and biological parameters of Haleji Lake is of significant to explore for the attention and attraction reference line data for future strategies, development and restoration of the Ramsar sites.

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2. MATERIALS AND METHODS

Sampling sites

Four stations were selected at Haleji Lake for water sampling during the period of November 2017 to January 2018 **(Fig. 1).**

Station1. Water board colony
Station 2. Main center
Station 3. Qasim Mirbhar
Station 4. Makdoom ji Golai

Monitoring of water quality parameters of Haleji Lake

The water sample collection was performed by the method described by (Dastagir, *et al.,* 2016). Water quality parameter including temperature (T), power of hydrogen ion (pH), concentration of dissolved oxygen (DO), chloride, conductivity, salinity and total dissolved solids (TDS) were recorded twice in a month at 8:00 AM from four sampling sites during the entire period of investigation. The temperature and DO were checked on the sites. The samples of water were taken into labeled disposable bottles to the Fresh Water Biology and Fisheries, department, University of Sindh for subsequent determination of certain factors. The water quality parameters were evaluated by the automatic (digital) analyzer (Model No. C- 6020).

Analysis of Length and weight

Fish samples were collected from the catch of local fishermen of Haleji Lake during November 2017 to January 2018, about 958 fish of different species were collected. All procured fish were packed with ice then conveyed to the University of Sindh Jamshoro for subsequent studies. Sampled fish were subjected to measure length by using of fish measuring board and weight on electronic balance. The sample was sub dived at 5 cm length intervals for the determination of L/W. For the analysis following formula was used as suggested by LeCren (1994)

$W = aL^b$

Where, W = denoted as weight in grams, L = for the determination of on mm scale, a denoted as = constant and b = termed as an exponential of two variables.

Condition Factor (Kn)

The ponderal index (K) was determined for the degree of wellbeing of the fish. It can be estimated from the length weight relationship formula K= W/W where W= observed weight and W= calculated weight to assess the condition of fish from Haleji Lake. Statistical analysis was conducted by combining the data.

3. RESULTS AND DISCUSSION

Physico-chemical parameters of Haleji Lake

The determination of quality of water is prerequisite of any water body that directly influences the primary productivity and stocking (Dastagir, *et al.,* 2016). The growth and activity of the fish is related to its body temperature that is similar to its water temperature and fluctuates with it. A relatively low water temperature can adversely affect fish in various aspects. The temperature in the present study ranged from 20-23°C from all sites during the entire period of investigations **(Table 1)** similar observation has been reported by (Dastagir, *et al.,* 2016). from Hanna Lake, Balochistan. The variation of hydrogen ion concentration (pH) in the investigations deviated from 7.3-7.9 it indicated the pH was alkaline, presumably due to reduced rate of photosynthetic activity, which reduces the assimilation of carbon dioxide (CO) and bi-carbonates Sawane, *et al.,* 2006) Similar results were reported by Adeyemo *et al.* (2008) from River of Nigeria. The oxygen content known as very vital factor for the assessment of fish growth and productivity of the water body (Taylor, and Miller, 2001) and aquaculture (Piper, *et al.,* 1982). The DO content in the present study was found to be between 4.2- 5.3 mg/l in all station throughout the study period of study. The present findings are in accordance with the results of Rao, (Rao, 2005). Generally the standard concentration of DO of wetlands is ranged between 4-5 mg/l for the rearing of fish population and other aquatic biota (Chapman, 1996). The chloride concentration of Haleji Lake was found between 65-69 mg/l (Jafri *et al.,* 1997 and Khuhawar *et al.,* 1998) reported chloride values of Haleji Lake (75 mg/l) and Keenjhar lake (38.9 mg/l) respectively. The above mentioned chloride values were found to be within range within the present results. In the present study the values of conductivity were varied between 950-1240 µs/cm in all sites. (Murhekar 2011) reported conductivity between 450- 1590 µs/cm from India and (Dastagir, *et al.,* 2016) reported from Hanna Lake, Pakistan. The ranges of the conductivity provided by above authors are in agreement with the present findings. The concentration of total dissolved solids (TDS) in the present study was observed 410 -549 mg/l. various authors reported TDS values from different water bodies and countries such as (Dastagir, *et al.,* 2016) (Chapman, 1996) (Kannan, *et al.,* 2005).

Table 1. Mean values of physico-chemical parameters of Haleji Lake throughout the study period.

	Temperature ^{o}C	pH	DO mg/l	Chloride mg/l	Conductivity µs/cm	Salinity mg/l	TDS mg/l
November	22	7.63	4.38	65	1012.5	0.3	410.25
December	20.5	7.56	4.35	67	1000	0.3	549.75
January	20.25	7.58	5.15	69	1026.75	0.3	477.25

Table 2. Data on condition factor of fishes in Haleji Lake throughout the study period.

	Notopterus chitala			*Notopterus notopterus*			*Aorichthys aor*		
Length groups (cm	ObsWt (cm)	Cal Wt (g)	Kn	ObsWt (cm)	Cal Wt (g)	Kn	ObsWt (cm)	Cal Wt (g)	Kn
20.1-25.0	2.09	1.47	1.42	2.43	2.32	1.04	1.95	1.91	1.02
25.1-30.0	1.38	2.48	1.00	2.49	2.41	1.03	2.20	2.26	0.97
30.1-35.0	2.58	3.19	0.80	2.67	2.66	1.00	2.43	2.43	1
Mean Kn			**1.07**			**1.02**			**1**

Obs. = observed weight
Cal. = Calculated weight
Kn = Condition factor

Table 3. Length- weight relationship of fishes from Haleji Lake throughout the study period.

	Notopterus chitala		*Notopterus notopterus*		*Aorichthys aor*	
Length groups (cm)	Mean length (cm)	Mean weight (g)	Mean length (cm)	Mean weight (g)	Mean length (cm)	Mean weight (g)
20.1-25.0	24.1 ± 0.71	180.2 ± 49.21	22.9 ± 2.26	252.5 ± 31.82	22.6 ± 1.98	119.8 ± 42.64
25.1-30.0	27.75 ± 3.18	257.75 ± 39.24	27.75 ± 1.77	372.8 ± 80.89	27.3 ± 2.62	198.05 ± 52.96
30.1-35.0	32.7 ± 2.47	327.5 ± 38.89	33.1 ± 2.83	484.4 ± 22.06	32.7 ± 2.33	309.8 ± 56.85

Length Weight Analysis

The weight-length relationship of the three different experimental fish namely: *Notopterus chitala, Notopterus notopterus and Aorichthyesaor* were enumerated at different length groups **(Table 2-3).** The value of these parameters were computed through equation suggested by LeCren (1951)

Logw = Log a + b Log L

Total length of fish was plotted against weight of body on logarithm scale which showed positive relation between length and weight and was calculated by use of least square method for both the sexes respectively **(Table. 5).**

Log W= - 2.68 + 3.74 Log L (*Notopterus chitala*) (r = 0.93)

Log W= - 0.60+ 2.12 Log L (*Notopterus notopterus*) (r = 0.97)

Log W= - 1.36 + 2.48 Log L (*Aorichthys aor*)(r = 0.97)

The length weight studyrevealed that *Notopterus chitala* (b=3.74) showed better growth followed by *Aorichthys aor*(b=2.48) that exhibited closed to ideal.

The regression analysis exhibited by *Notopterus chitala* showed positive allometric type of growth closed to ideal 3(b= 3.74).Numerous researchers have performed

regression analysis in different fish species and countries like. The finding of above researcher supports present observation. The co- efficient of condition (K) was observed for three fish species and found varied between 1- 1.07.It indicated that the fish of Haleji Lake is found to be in better growth condition showing *Notopterus chitala* (K=1.07) and *Notopterus Notopterus* (K=1.03) showed slightly better condition than that of species. It was noticed during the present investigations that the Kn values found higher in small group of fish than that of large group fish. Similar observations have been reported by several authors from Pakistan and elsewhere.

4. CONCLUSION

It was resolved from the analysis of water quality factors (environmental impact) that the water quality of Haleji Lake was noted to be within the recommended limits by (WHO 2012) and also found ideal for the survival, production and growth of fish and aquatic biota.

REFERENCE:

Adeyemo, O., O. Adedokun, R. Yusuf, and E. Abeleye, (2008) Glob. Nest.I. J., 10 326 Pp.

Biney, C. A.T. Amuzu, D. Calamari, N. Kaba, I. L. Mbome, H. Naeve, P.B.O. Ochumba, O. Osibanjo, V. Radegonde, and M.A.H. Saad, (1994). Document Technique Du Cpca

Chapman, D., (1996) UNESCO and WHO by E &FN Spon, London.,.

Carpenter, S. R., and J. F. Kitchell, (1996) Cambridge University Press.

Cone, R. S. (1989) Transactions of the American Fisheries Society., 118510 Pp.

Dastagir, G., S. Jalbani, N.T. Narejo, and P. Khan: (2016) Pak. J. Anal. Environ. Chem., 17 1795 Pp.

Dashmona, N., and D. phill. (1990). Thesis, HNB Garhwal University.

Dudgeon, D., A. H. Arthington, M.O. Gessner, Z.I. Kawabata, D. J. Knowler, C. Lévêque, R J. Naiman, A. H. Prieur Richard, D.Soto, and M.L. Stiassny, 81 **(**2006) Biological reviews., 163 Pp.

Doe,**.** P. E. (1998). Cambridge University Press

Ellis, B. K., J. A. Stanford, D. Goodman, C. P. Stafford, D. L. Gustafson, D. A. Beauchamp, D. W. Chess, J.A. Craft, M. A. Deleray, and B. S. Hansen, (2011) Proceedings of the National Academy of Sciences., 108 , 1070 Pp.

Ikusemiju, K., A. Oki, and M. Graham-Douglas, (1983) Hydrobiol., 10255.

Jafri, S. (1997) Department of Fresh Water Biology and Fisheries, University of Sindh, Jamshoro12 Pp.

Khan. M. Z., A. Begum, S. A. Ghalib, A. R. Khan, R. Yasmeen, T. F. Siddiqui, A. Zehra, D. Abbas, F. Tabassum, and S. Siddiqui, (2012) Canadian J Pure and Applied Sci.,6, 913 Pp.

Knight, T. (2000) Ecology.,81 286 Pp.

Khuhawar, M., G. Mastoi, T. Jehanger, and M. Komber, (1998) Proc. Conf. Imp. Environ. Pollut. Lakes of Sindh,(IEPLS'1998), Sindh, Pakistan., 12 Pp.

Kannan, V., R. Ramesh, C. Sasikumar, and J. Environ (2005) biol., 26, 269 Pp.

Le Cren, E. (1951) J. Ani. Ecol., 201 Pp.

Muyodi, F. J., R. E. Hecky, J.M. Kitamirike, and R. Odong, (2010) Lakes & Reservoirs Research & Management.,14, 247 Pp.

Mangan, T., R. Brouwer, H. D. Lohano, G. M. Nangraj, **(**2013) Journal of Sustainable Tourism., 21, 473 Pp.

Murhekar, G. H., (2011) Int. J. of Res. Chem. Environ., 1 183 Pp.

Narejo, N., S. Rahmatullah, and M. M.Rashid, (2003) Indian J Fish., 50 81Pp.

Piper, R. G., I.B. McElwain, L.E. Orme, J. P. McCraren, L.G. Fowler, and J. R. Leonard, **(**1982). Fish hatchery management

Rao, P. (2005). Easter. Econ. Ed., Prentice-Hall of India Private Limited, New Delhi., 280 Pp.

Sawane, A., P. Puranik, and A. Bhate, (2006) J. Aquat. Biol. 21, 105 Pp.

Taylor, J. C., and J. M..Miller, (2001) J. Exp. Mari. Biol. Ecol., 258, 195 Pp.