Assessment of Physico-Chemical Parameters in the Wild Amphibian Environment of Taluka Kotri, District Jamshoro, Sindh-Pakistan

Kalsoom Shaikh[1,2*], Ghulam Sarwar Gachal[1], Saima Qayoom Memon[3], Naveed Ahmed Sodho [2,] Muhammad Yusuf Shaikh[1]

[1]Department of Zoology, University of Sindh, Jamshoro 76080, Pakistan
[2]Institute of Advanced Research Studies in Chemical Sciences, University of Sindh, Jamshoro 76080, Pakistan
[3]Dr. M.A. Kazi Institute of Chemistry, University of Sindh, Jamshoro 76080, Pakistan

Abstract: Water contamination has negative impact on amphibians worldwide and Taluka Kotri is one of those areas of District Jamshoro, where amphibian environmental study was never conducted. In this context, present study was proposed to record the physico-chemical nature of ponds wherein amphibians dwelled continually in the past. The field surveys and water analysis was carried out from March to October during 2011 through 2013 using scientific instrumentation and standard procedures. Present investigation revealed unsuitable water quality for am-phibian in ponds as value of EC (2280.4±734.6), TDS (1557.7±501.0), T-Hard (361.6±70.8), T-Alk (310.1±50.6), Cl (320.5±58.9), SO_4 (394.2±87.0), PO_4 (395.2±103.4), NO_2 (3.6±1.2), NO_3 (6.0±2.7) and K (70.3±8.2) were extremely high up to dreadful level, although values of pH (8.0±0.6) and CO_2 (18.7±3.7) were normal. This contam-inated environment needs urgent implementation of conservation actions for the survival of amphibian fauna.

Keywords: Amphibian environment, District Jamshoro, Pakistan, physico-chemical parameters, Taluka Kotri

INTRODUCTION

The problematic extinction and decline of amphibians are recorded in many countries of the world and it is believed that amphibians are threatened and declining more rapidly than overall species of birds and mammals (Stuart et al., 2004). About 168 amphibian species have been waned and at least more than 43% amphibian population is on the verge of decline (Stuart et al., 2004). This threatened status of amphibians showed that more extinction has resulted in recent times in several countries of the world. It is also known that population of amphibians has been declining drastically since 1950 but the mortality rate has become extremely higher for the last 20 years. According to IUCN assessment; Latin American countries including Colombia, Ecuador and Mexico have largest number of threatened amphibian species, while in Haiti and Caribbean about 92% and 80% species are at the risk of extinction (Stuart et al., 2004).

A comprehensive assessment of IUCN based on conservation status of amphibian fauna indicated the increasing rate of threatened amphibian species from 1996 to 2014 in 60 different countries of the world (Stuart et al., 2004). The IUCN has disclosed the total percentage of threatened species are (88%), lower estimate of threatened species (31%), best estimate of threatened species (41%), and upper estimate of threatened species including number of threatened and Data Deficient of extant evaluated species are (56 %) (Stuart et al., 2004). This deteriorated status of amphibian fauna has mainly been associated with several kinds of pollutants contaminating water bodies.

Number of physical, chemical and biological properties determine the quality of water either safe or unsafe for aquatic animals which develop and respire in water. Pollution creates major global problems affecting not only single species but also the whole biological community (Paulu et al., 2009).

Habitat degradation and chemical contamination was previously studied prevailing in some areas of Pakistan and it was also discovered that environmental conditions threat amphibian populations very badly (Kalsoom et al., 2014a, 2014b, 2014c and 2015; Khan and Nazia 2012).Therefore, present study was aimed to investigate the physical and chemical quality of water

*Corresponding Author: shaikhkalsoom2014@gmail.com

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in Taluka Kotri areas so that amphibians threatened status may be confirmed and in case of any instability, their ambient parameters may be managed properly.

MATERIALS AND METHODS

Filed surveys were conducted in whereabouts of Taluka Kotri of District Jamshoro, where local people helped in confirming the permanent habitats of amphibians in six agricultural ponds. Water sampling was carried out from

March to October in year 2011, 2012 and 2013 diurnally between 09am to 05pm by following the instructions of EPA, 2004. Water samples were kept in well stopper polyethylene plastic bottles. Plastic bottles, prior to use were soaked in 10 % HNO3 for 24 hours, washed and then rinsed with ultrapure water obtained from ELGA Lab water system. All water samples were stored in insulated cooler containing ice and delivered to the laboratory for physico-chemical analysis.

A pH meter (Model: Orion, 420) was used for the analysis of hydrogen ion concentration, whereas conductivity me-ter (Model: Orion, 115)was used to record the value of electrical conductivity (EC) and total dissolved solids (TDS). The concentrations of total hardness (T-Hard), total alkalinity (T-Alk), chloride contents (Cl) and carbon dioxide (CO2) were determined by titration procedures as instructed by Danial, 1948 and Sunita, 2002. The concentrations of sulphate (SO4), phosphate (PO4), nitrite (NO2) and nitrate (NO3) were evaluated using. Ultraviolet visible spectrophotometer (Model: Hitachi 200). The concentration of SO4 was evaluated through 420 nm wavelength of UV- visible light, whereas value of PO4 was detected at 880 nm. The quantity of NO2 and NO3 was absorbed respectively through 540 nm and 410 nm wave-length of ultra UV-visible light. The quantity of potassium (K) was analyzed using atomic absorption spectrophotometer (Model: Perkin Elemer Analyst 800). Scientific literature that helped in identification of water quality include Adolfo and Blaustein, 1999; APHA, 1992; Bakker and Weights, 1993; Boyeretal.,1995; EPA-USA,1986; EPD,2000; Karrakar, 2008; Kerry and Griffis, 2007; Pierce, 1985; Wurts and Durborow, 1992; Rouse et al., 1999 and Shirley et al., 1956.

RESULTS

Eight months study conducted during three years (2011-2013) revealed the variable value of physico-chemical parameters every month and even every year as arranged in Table 1-3

In year 2012, amphibian environment contained the parameters in following values i.e. pH (8.1±0.6), EC (2334.4±727.2), TDS (1595.5±473.4), T-Hard (372.5±62.3), T-Alk (311.2±47.9), Cl (332.7±51.0), SO4 (403.8±79.6), PO4 (409.5±100.0), NO2 (3.9±1.2), NO3 (6.4±2.52), CO2 (19.1±3.9) and K (71.5±8.0). The value of all the parameters was unfavorable for amphibians with exception of pH and CO2. The monthly variation in alue of parameters during year-2012 was similar to the variation as in year-2011 (Table2). Table 3: Water quality parameters of amphibian ponds during year-2013 Table 1: Water quality parameters of amphibian ponds during year-2011

During the year 2011, it was recorded that the value of EC(2241.1±773.6), TDS (1512.9±518.4), T-Hard (344.22±82.5), T-Alk (304.8±62.4), Cl (304.5±67.5), SO4 (372.6±96.3), PO4 (389.1±113.8), NO2 (3.0±0.9), NO3 (5.1±2.9) and K (67.8±8.2) was unfavorable, whereas pH (7.7±0.6) and CO2 (18.9±3.7) values were within permissible limit For the survival of amphibians. The maximum concentration of all the parameters was recorded in July, while minimum value was obtained in October each year, except CO2 that fluctuated in opposite to other parameters (Table 1).

Table 2: Water quality parameters of amphibian ponds during year-2012

Table 1: Water quality parameters of amphibian ponds during year-2011

Parameters	Value	March	April	May	June	July	August	September	October
pH	Range	7.0-7.9	6.7-8.5	7.2-8.0	7.5-8.2	7.5-9.0	7.2-9.0	7.0-8.8	6.7-8.5
	Mean	7.5	7.6	7.7	8.1	8.3	7.8	7.6	7.3
	Stdev	0.3	0.8	0.3	0.8	0.7	0.8	0.3	0.3
EC	Range	1173.0-2977.0	1189.5-2982.7	1242.0-3022.5	1282.5-3250.8	1359.0-3528.9	1262.5-3409.0	1210.0-3238.7	1178.5-3180.5
us cm-1	Mean	2164.7	2186.5	2218.6	2361.6	2444.9	2294.3	2192.5	2065.8
	Stdev	815	821.5	825	870	879.2	853.6	802.7	762.6
TDS mg L-1	Rang	785.9-1994.6	800.0-2008.4	835.8-2050.0	850.2-2136.7	910.5-2258.0	900.5-2210.8	878.5-2185.1	818.9-2062.0
	Mean	1450.3	1466.4	1515.5	1581.1	1646.1	1527.1	1487.5	1429.4
	Stdev	546	541.6	553.3	570-7	599.7	564.2	540.4	538.1
T-Hard mg L-1	Rang	209.5 400.0	200.0-438.5	215.1-448.5	233.5-450.7	250.8-478.5	244.9-458.08	230.3-450.0	209.5-400.0
	Mean	315.6	331.6	345	366.8	379.3	358.4	345.4	311.7
	Stdev	76.6	88.8	84.6	85.1	87.8	85	87.7	92
T-Alk-mg L-1	Rang	180.0-367.0	185.8-370.5	200.9-375.5	220.1-386.5	252.0-400.0	250.0-380.9	233.5-350.8	200.0-310.8
	Mean	281.6	291.8	3.5	325.8	338.5	316.7	304.9	274.5
	Stdev	84	78.7	46	51.1	58.9	65.4	71.7	42.2
Cl	Rang	200.0-350.8	180.5-375.3	200.5-382.0	200.0-392.8	250.0-415.6	231.5-400.0	200.9-388.7	200.0-350.8
mg L-1	Mean	283.2	294.1	308.7	326.5	340.9	318.1	301.4	263
	Stdev	60.4	72.1	70.1	66.7	63.2	74.1	69.9	71.2
SO4 mgL-1	Rang	200.0-453.2	215.8-480.0	225.0-480.8	245.2-485.5	262.0-500.0	250.8-485.5	235.0-480.0	200.1-455.8
	Mean	347.3	363.1	370.6	392.1	407.2	387.2	369.9	3439
	Stdev	107.6	105.6	95.4	97	100.4	104	107.4	97.5
PO4 mg L-1	Rang	150.8-478.5	200.0-510.8	210.7-525.5	225.5-545.0	250.9-550.7	209.8-532.5	185.5-500.0	150.8-478.5
	Mean	358.1	380.7	388.6	410	428.5	402.9	386	357-9
	Stdev	120.9	122.1	121.2	119.6	112.2	120	122.1	128
NO2 mg L-1	Rang	1.5-3.9	1.9-3.8	2.0-4.0	2.3-4.2	2.5-5.0	2.2-4.8	2.4-2.0	1.5-3.9
	Mean	2.5	2.8	3	3.4	3.6	3.3	3	2.4
	Stdev	0.9	0.0	0.8	0.9	0.9	0.7	0.8	0.9
NO3 mg L-1	Rang	1.5-8.2	1.8-8.5	1.8-8.5	2.0-8.8	2.8-10.2	2.5-10.0	2.1-9.8	1.9-8.8
	Mean	4.4	4.7	5.3	5.9	6.2	5.5	5	4.1
	Stdev	3.1	3.1	3	3.1	3.2	3.22	2.9	3.1
CO2 mg L-1	Rang	14.9-24.2	14.2-24.6	12.9-22.7	14.2-24.6	12.0-23.0	14.3-24.3	12.8-25.0	14.9-24.2
	Mean	19.8	19.4	18.9	17.8	17.7	18.7	19.3	20
	Stdev	3.7	3.8	3	3.7	3.9	4.1	3.9	5.2
K	Rang	52.0-70.5	55.0-74.5	59.0-75.5	62.9-78.0	65.8-82.0	61.8-80.5	59.0-70.3	50.5-70.3
mg L-1	Mean	61.9	65.1	69.4	72.7	75.3	71.4	67.6	59.2
	Stdev	7.2	7.2	7	7.2	6.6	5.9	6.9	6.6

Stdev.= Standard deviation

Table 2: Water quality parameters of amphibian ponds during year-2012

Parameters	Value	March	April	May	June	July	August	September	October
pH	Range	7.0-8.5	7.2-8.8	7.5-8.8	7.5-9.0	7.8-9.0	7.8-9.0	6.9-8.5	6.5-8.2
	Mean	7.9	8.1	8.3	8.4	8.5	8.2	7.9	7.5
	Stdev	0.6	0.6	0.5	0.6	0.5		0.6	0.7
EC	Range	1342.0-3382.9	1450.0-3525.0	1509.0-3580.0	1541.8-3420.0	1569.2-3692.1	1380.0-3380.2	1279.5-3350.8	1242.0-3282.5
us cm-1	Mean	2223.1	2315.3	2437	2484.4	2543.7	2343.6	2207.8	2120.6
	Stdev	789.8	763.8	738.4	777.1	774.9	789.1	783.4	772.4
TDS mg L-1	Rang	867.5-2105.0	880.5-2450.2	950.0-2300.8	1000.8-2265.0	1025.6-2342.0	900.0-2200.8	881.5-2185.0	860.5-2009.5
	Mean	1530.7	1595.4	1681.7	1683.2	1730.8	1640.5	1526.8	1374.9
	Stdev	528	473.3	480	499.6	494.2	587.6	473.3	446.3
T-Hard mg L-1	Rang	245.5-410.5	258.7-450.8	300.0-466.2	320.8-470.2	350.1-482.5	300.8-450.5	280.5-433.5	250.2-400.0
	Mean	362.6	365	388	395.4	411.2	381.1	340.1	336.8
	Stdev	58.4	73.2	64.8	58.3	54.9	56.7	63.7	63.8
T-Alk-mg L-1	Rang	240.8-345.5	250.2-360.2	252.8-372.5	258.5-400.0	270.5-410.8	250.5-387.5	244.2-370.0	200.0-350.8
	Mean	298.8	312.3	312.6	327.2	343	316.8	297.9	272.5
	Stdev	36.5	38.6	42.3	51.1	49.8	50.8	48.2	55.3
Cl	Rang	233.5-380.2	257.9-400.2	277.5-420.5	289.1-400.9	300.8-433.7	272.5-385.5	260.5-367.5	245.0-355.8
mg L-1	Mean	315.3	329	353.4	355.5	373.8	330.8	309.3	294.9
	Stdev	39.6	39.6	55.5	42.5	46.2	55.5	57.6	44.2
SO4 mgL-1	Rang	250.0-470.5	275.5-500.8	289.2-515.5	299.5-500.0	309.5-525.8	280.5-490.0	250.3-475.5	350.0-470.1
	Mean	388.9	400.9	413.9	431.2	443.9	413.1	375.3	363.1
	Stdev	79.5	80.9	82.7	74.4	78.8	76.2	84.9	94.2
PO4 mg L-1	Rang	180.9-487.7	200.0-490.9	250.0-509.2	300.0-550.0	300.0-550.8	285.5-582.5	277.9-570.5	235.8-550.0
	Mean	393.8	406.6	423.2	433.1	442.6	416.7	384.6	375.7
	Stdev	114.6	103.1	104.2	91.9	91.1	98.4	119.7	118.4
NO2 mg L-1	Rang	2.4-8.0	2.8-5.0	3.0-5.5	2.7-5.6	3.2-5.7	2.0-5.2	1.9-5.0	1.4-4.3
	Mean	3.5	3.8	4.2	4.3	4.6	3.9	3.5	3.1
	Stdev	1.2	1	1.1	1.2	1.1	1.3	1.1	1.2
NO3 mg L-1	Rang	2.2-9.0	3.0-10	4.2-10.2	4.0-10.5	4.5-10.8	3.8-10.0	3.5-9.8	3.9-9.0
	Mean	6.1	6.4	6.7	6.9	7.2	6.6	5.6	5.6
	Stdev	2.6	2.9	2.5	2.6	2.6	2.5	3	2.6
CO2 mg L-1	Rang	12.5-22.8	14.2-22.9	14.5-24.5	12.9-23.1	12.0-24.0	13.5-24.0	14.0-24.5	14.7-236.0
	Mean	19.9	19	18.5	18	17.6	18.6	20.3	20.9
	Stdev	3.8	4.1	4.5	3.9	3.8	3.5	4.2	4.4
K	Rang	54.8-78.8	68.8-80.0	68.2-82.5	68.5-83.8	70.5-85.0	65.0-78.9	57.8-75.5	50.5-72.2
mg L-1	Mean	68.2	70.9	76.3	76.2	78.6	72.4	66.8	62.8
	Stdev	9.1	5.7	5.4	6	5.2	7	6.5	7.8

Stdev.= Standard deviation

Table: Water quality parameters of amphibian ponds during year-2012

Parameters	Value	March	April	May	June	July	August	September	October
	Range	7.0-8.0	7.0-8.5	7.2-8.8	7.5-9.0	8.0-9.4	7.9-9.	7.5-8.8	7.0-8.8
ph	Mean	7.6	8	8.2	8.5	8.6	08.4	8.2	7.8
	Stdev	0.4	0.6	0.5	0.5	0.6	0.6	0.6	0.6
	Range	1258.0-3250.5	1370.4-3450.2	1385.3-3465.8	1428.9-3480.5	1462.0-3565.8	1450.4-3501.8	1395.8-3482.4	1350.8-3450.2
EC us cm-1	Mean	2102.4	2214.7	2269.6	2329.4	2410.9	2317.5	2267.8	2213.6
	Stdev	751.7	764.6	777.7	755.5	786.9	766.1	764.3	776.1
	Rang	850.3-1990.4	900.5-2315.8	911.8-2350.0	950.8-2392.0	1000.8-2558.2	955.8-2470.0	900.2-2400.2	881.5-2352.0
TDS mg L-1	Mean	1436.3	1539.7	1566.9	626.5	1687.2	1593.7	1558	1509.7
	Stdev	489.6	554.3	561.8	575.1	596.1	554.6	556	547.2
T-Hard mg	Rang	240.0-400.0	250.4-440.8	282.5-455.8	294.5-466.2	318.5-480.5	300.0-461.5	290.5-450.5	278.5-400.8
L-1	Mean	324.1	351.3	370.8	388.6	408.3	385.4	368.7	346.1
	Stdev	65.8	70.8	66.8	63.1	64.4	67.7	56.3	47.5
T-Alk-mg	Rang	225.8-325.5	250.2-350.5	270.9-358.3	279.8-370.2	290.5-400.5	278.2-388.5	266.8-360.5	250.0-350.3
L-1	Mean	380	301.2	318.5	332.1	345.2	326.8	312.5	298
	Stdev	34.3	34.9	38.4	42.5	38.8	33.9	32.7	38.6
	Rang	200.9-350.8	210.7-380.7	250.0-394.6	278.5-400.7	300.2-425.2	282.5-400.0	250.9-389.5	375.5-238.5
Cl mg L-1	Mean	283.6	306.1	327.1	344.3	362.2	341.7	323.7	305.6
	Stdev	57.8	53.1	54.3	47.1	45	46.4	54.5	65
	Rang	237.2-452.2	245.0-481.5	258.0-500.0	300.0-500.9	348.0-535.1	320.5-510.0	300.5-500.0	280.9-487.5
SO4 mg L-1	Mean	363.4	392.5	411.1	430.2	447.1	420.8	403.8	382.1
	Stdev	87.2	84	79.7	79.1	76.2	81.3	95.2	91
	Rang	159.4-465.5	170.5-482.1	200.0-490.2	220.5-500.2	280.5-509.0	250.9-492-8	241.5-450.8	200.0-438.5
PO4 mg L-1	Mean	352.2	369	391.1	405.7	426.9	401.2	385.5	365.6
	Stdev	85.6	115.1	111.1	91.6	88.5	105.6	81.8	121.4
NO2 mg L-1	Rang	1.8-4.0	2.0-4.9	2.5-5.3	2.8-5.7	3.8-6.5	3.5-6.0	3.0-5.3	2.6-5.0
	Mean	2.9	3.8	4.2	4.8	5.1	4.3	3.9	3.3
	Stdev	1	1.1	1.2	0.9	1	1	0.9	1.1
	Rang	2.0-8.8	2.4-9.5	2.6-10.0	3.0-10.2	4.4-10.5	4.0-10.0	3.5-9.3	3.3-8.8
NO3 mg L-1	Mean	5.4	6.2	6.6	6.9	7.4	6.8	6.5	5.8
	Stdev	2.9	2.4	2.4	2.5	2.5	2.8	2.9	3
	Rang	13.7-23.5	12.9-23.5	13.8-22.6	12.8-22.0	12.0-22.1	13.6-21.8	14.0-24.2	14.5-25.0
CO2 mg L-1	Mean	20.3	18.2	17.6	17.2	17.2	17.5	18.2	19.2
	Stdev	4.6	4	3.6	3.9	3.4	3.5	2.9	3.9
	Rang	50.8-75.5	58.0-77.9	62.0-80.2	65.5-82.2	68.8-85.5	65.5-82.8	65.0-79.7	52.8-70.8
K mg L-1	Mean	63.4	69.4	72.5	76.1	78.6	74.8	71.8	65.5
	Stdev	6.5	7.3	6.7	5.9	6	6	5.4	9

Stdev.= Standard deviation

Highly concentrated parameters in year 2013 were EC(2265.7±713.8), TDS (1564.7±517.0), T-Hard (367.9±63.8),T-Alk (314.3±39.36), Cl (324.3±54.7), SO_4 (406.3±82.0),PO_4 (387.1±96.0), NO_2 (4.04±1.2), NO_3 (6.4±2.6) and K(71.5±7.9). It was recorded that the value of pH (8.2±0.6) and CO2 (18.2±3.6) was within normal range. The manner of seasonal variation in the value of parameters was again alike previous years (Table 3).

The physico-chemical study of three years was compared to highlight the variation in water quality and also to record the rate of pollution each year (Figure 1-12).

Figure 4: Value of total bardness

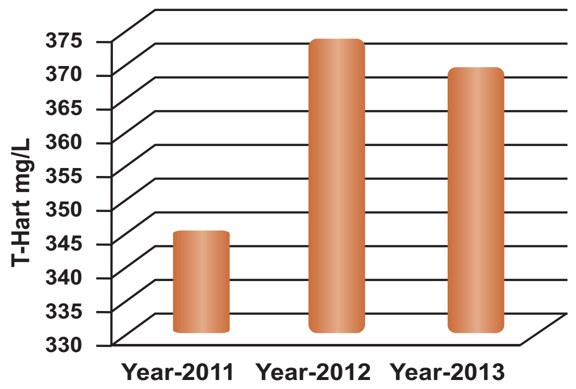


Figure 5: Value of total alkalinity

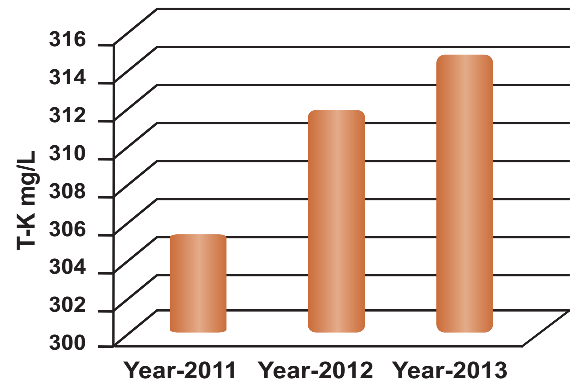


Figure 6: Value of chloride

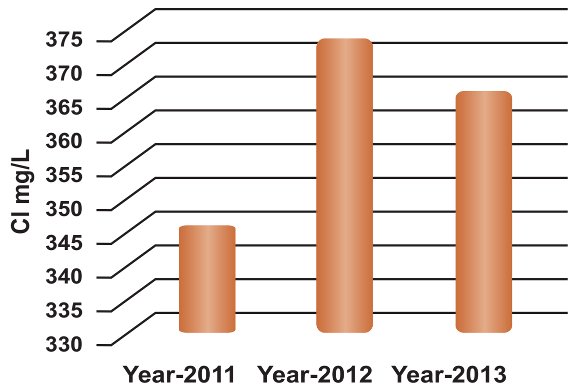


Figure 7: Value of sulphate

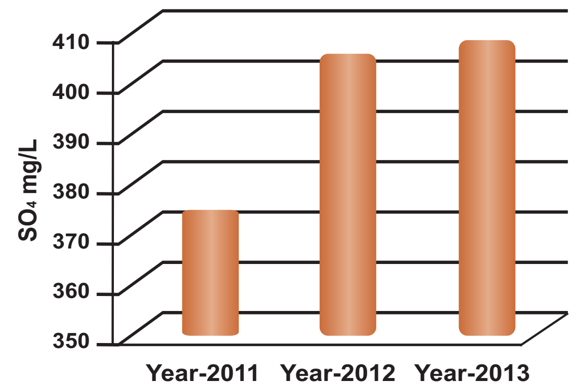


Figure 5: Value of alkalinity

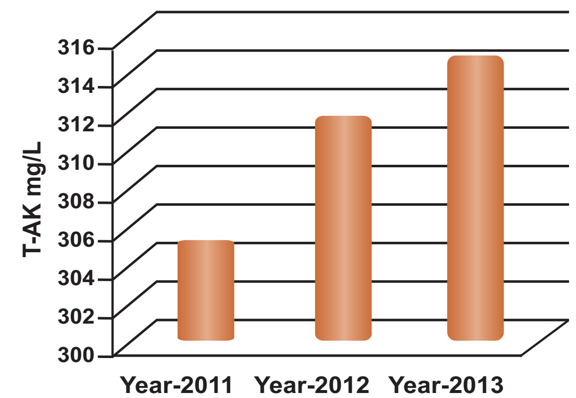


Figure 6: Value of chloride

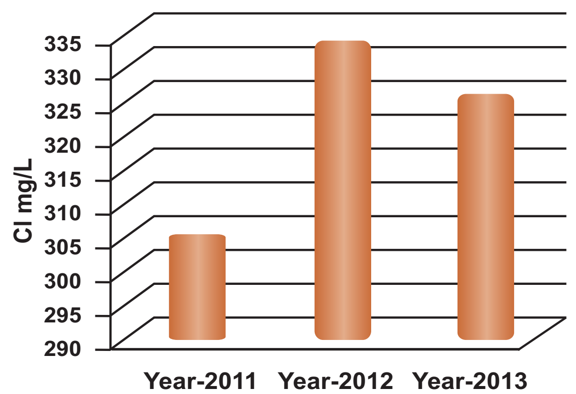


Figure 7: Value of sulphate

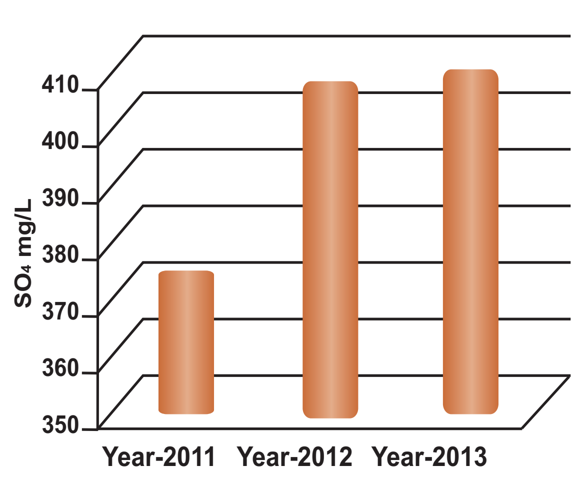


Figure 8: Value of phosphate

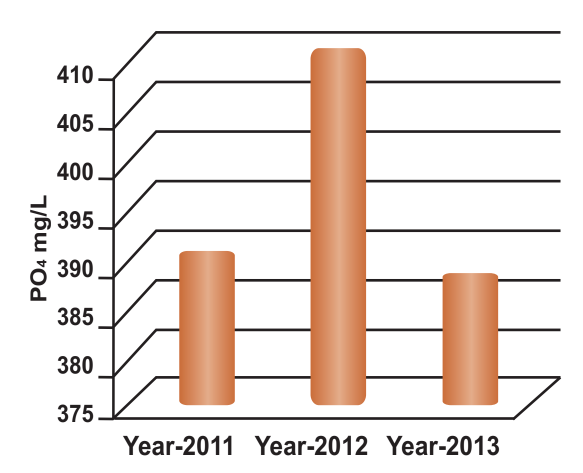


Figure 9: Value of nitrite

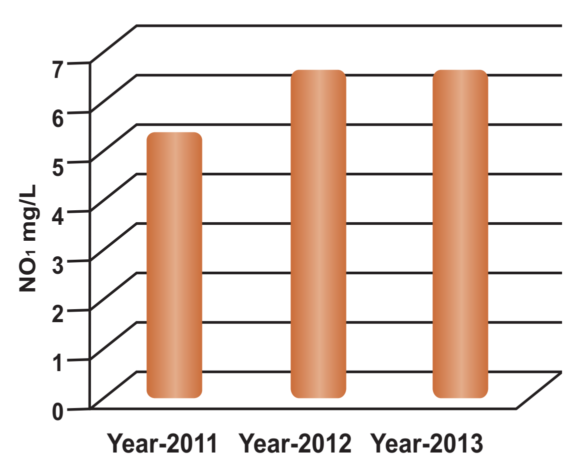


Figure 10: Value of nitrate

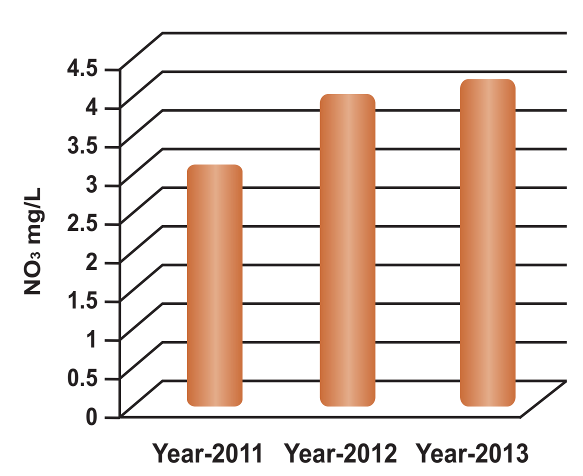


Figure 11: Value of carbon dioxide

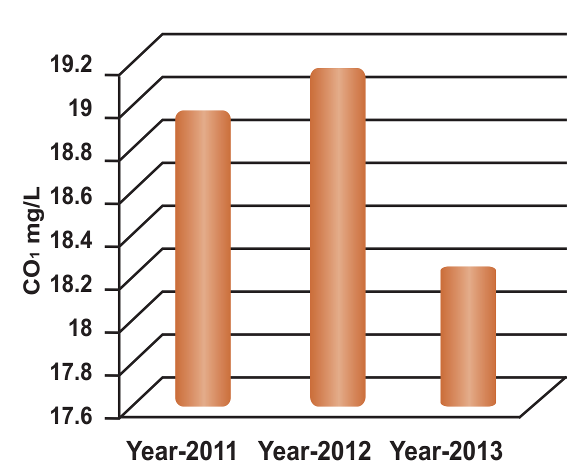
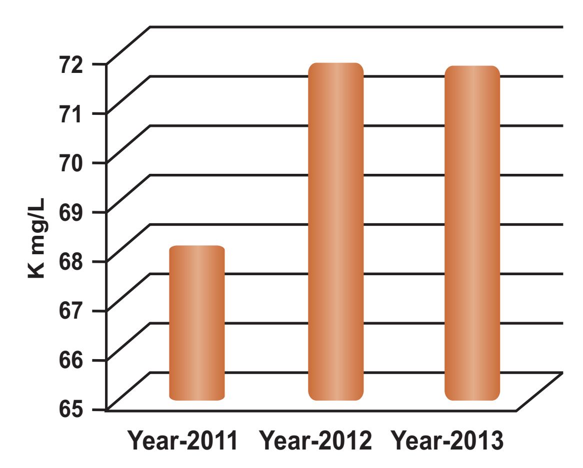


Figure 12: Value of potassium



It was determined that amphibian environment was comparatively less contaminated during the year-2011, whereas highest pollution rate were recorded in year 2012. Value of pH (8.2±0.6), T-Alk (314.3±39.36), SO_4 (406.3±82.0), NO_2 (4.04±1.2) and NO_3 (6.4±2.6) persisted highest in year-2013. Meanwhile maximum concentration of EC (2334.4±727.2), TDS (1595.5±473.4), T-Hard (372.5±62.3), Cl (332.7±51.0), PO_4 (409.5±100.0) and CO_2 (19.1±3.9) remained highest in year-2012, whereas concentration of K was approximately same in year 2012 (71.5±8.0) and 2013 (71.5±7.9).

DISCUSSION

One of the most important reasons that cause amphibians to decline is water contamination mainly due to agricultural, industrial and pharmaceutical chemicals leading amphibians towards massive mortality and eventual decline. The range of EC in study area was as high as the recommended limit i.e. 150 - 500 µS/cm (APHA, 1992; Boyer *et al*., 1995 and EPA-USA, 1986). The concentration of TDS (785.9-2558.2 mg L-1) was also analyzed high, making environment harsher for the amphibian fauna as it remained out of auspicious level of 50-250 mg L-1 (EPA-USA, 1986). Wurts and Durborow, 1992 studied amphibian fauna facing nutrient deficiency when TDS level of their habitat is lower than 50 ppm. Similarly, when TDS level is above 250 ppm, the amphibians get affected badly due to high concentration of nutrients containing harmful toxins. Most desirable range of T-Hard is recommended from 75 to 200 mg L-1 for the well survival of amphibians (Wurts and Durborow, 1992), however EPA-USA, 1986 suggested 150 -300 mg L-1 of hardness as unfavorable for them. Thus all the investigated amphibian habitations in Taluka Kotri were consisting of high value (178.0-482.5 mg/L) of the parameter in question.

For the suitable environment of amphibians, the favorable range of T-Alk lies between 50-150 mg L-1 (Wurts and Durborow, 1992), hence wherein study area 180.0 to 410.8 mg L-1 of T-Alk was out of optimum level during whole study period. The concentration of Cl was also high in whole area, ranging from 177.5 to 433.7 mg L-1. According to Karrakar, 2008; amphibians undergo 40% reduction in their survival when spawned in a pool with chloride concentration higher than 162 ppm. It was also recorded that the study area was concentrated with high value of SO_4. The value of this parameter is recommended within 50-100 mg L-1 for survival of aquatic animals (EPD, 2000), therefore the amphibian environment in Taluka Kotri containing 200.0-535.1 mg L-1 of SO_4 may have negative impact on them.

According to EPA-USA, 1986; PO_4 value should not exceed than 0.05 mg L-1 into lakes or other reservoirs where aquatic animals live. The Surface waters maintained at 0.01 to 0.03 mg L-1 of total PO_4 remain uncontaminated by algal blooms and when concentration of PO_4 increases higher (EPA-USA, 1986), it may not support aquatic animals. PO_4 concentration in studied amphibian ponds was completely out of suitable limit as it was concentrated from the value of 150.8 to 582.5 mg L-1. The experiments of Bakker and weights, 1993 and Kerry and Griffiis, 2007; proved that the amphibians exhibit reduced feeding activity, weight loss and decreased survival with 84.6% mortality when exposed to 1.0 - 2.0 mg L-1 of NO_2 and 9.1 mg L-1 of NO_3. Whereas Rouse *et al*., 1999; examined that NO_3 starting to affect negatively from the concentration of 2.5 mg L-1. Therefore NO_2 and NO_3 concentration in Taluka Kotri might not support amphibian life. The value of CO_2 in aquatic habitats was recorded within normal range (12-25 mg L-1), however concentration of K was out of suitable limit as recommended by the EPA-USA, 1986 and Shirley et al., 1956.

Previous studies have documented amphibian diversity of four species (Hoplobatrachus tigerinus, Euphlyctis cyanophlyctis, Allopa hazarensis and Bufo stomaticus) existing in district Jamshoro (Kalsoom *et al.*, 2012 and Shaikh *et al*., 2012, 2014). In same area the present analysis revealed high rate of pollution from 2011 to 2013. In this condition, amphibians may fail to interact successfully with their aquatic environment as these creatures are considered as “environmental sponges” for their semi-permeable skin. Their skin allows environmental toxins to be easily absorbed (Stuart *et al*., 2004) and therefore at all stages of their life cycle, these delicate animals remain extremely vulnerable to physico-chemical properties of their primary habitats.

Anthropogenic activities are main reason behind contamination of water bodies and therefore local people must be educated about the importance of wild animals which play important role in maintaining ecosystem with-in suitable status.

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