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Study of Physico-Chemical Parameters and Amphibia Fauna (Anurans) Population of Bhopal Lakes and Ponds

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ABSTRACT
All the 18 lakes and ponds in Bhopal district were studied in the present study. The pollutants and drastic environmental variation have also adversely effected and changed water qualities i.e. colour, hardness, turbidity, alkalinity, pH. COD, BOD and TDS etc. Aquatic life, thus, also is affected. Changes in morphology of amphibian, like- colour, pigmentation, length, weight mass, etc. may occur. This can not be ignored that the afore-mention variation may be responsible to develop new varieties or sub species.
Unfortunately, negligible work is done in relation to amphibian fauna of the area in recent-past. Though, appreciable limnological work is done, yet the amphibian fauna remained unexplored. The fauna study is of tremendous significance in determining population density and calculating sub specific diversity and conservation of ecosystem in Bhopal District.

Key Words: Amphibia Fauna, Lakes, Bhopal.

INTRODUCTION

Bhopal is known as city of lakes. It is embedded with 18 different lakes and ponds. These wet lands are of utter importance as they are the good and useful sources to mankind in different ways. Some are used for irrigation, some for potable water supply; raw water supply, recreation, amphibian, washing etc. With rapid urbanization, constant changes in demographic structure especially during second half of last century, all these water bodies have been subjected to various environmental problems. This resulted in deterioration of water quality through inflow of sewage, solid waste dumping, other anthropogenic activities thus affecting the biodiversity.

The entire surrounding of the water bodies is covered by deciduous forest. A sparsely bushy Jungle also exists at the basin of the reservoirs. Although, the district is rich in having natural water bodies, like lake, ponds, reservoir and rivers, very scanty work is available on the fresh water, amphibian fauna. These water bodies are main source of water supply, which is utilized for drinking, bathing, washing etc. But now days, these water bodies are highly polluted due to the Industrial effluents, insecticides, herbicides, weedicides, fungicides and other human activities. Nitrate, Calcium Chloride and non soluble Phosphate have increased to alarming level and decomposition of excessive bloom releases the methane and ammonia gases in water.

Study of biodiversity of amphibian fauna and their identification, is one of the interesting field of biological research, which gives us an idea abut the morphological variation and population diversity of fauna in polluted and non polluted site of any particular habitat.

MATERIALS AND METHODS

The water samples were collected during July 2011 to June 2012. The Method of water analysis would be adopted as per APHA standard method. Eleven Physico-chemical parameters were analyzed and Amphibians were grouped accordingly.

Amphibian, collected seasonally, from all polluted and non polluted selected sites by hand picking or fishing nets and would be preserved in 5-10% formaldehyde in glass or plastic bottle. Authentic keys for identification and classification of amphibian, would be used. The key for identification of amphibian is available in ZSI Jabalpur and Calcutta would be taken. Boulenger (1990), Amphibia fauna of British India, Annandale (1919); Dutta (1997) etc would be sought for amphibian identification.

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RESULTS AND DISCUSSION

The present investigation is planned to emphasize of physic-chemical component with fresh water amphibian fauna of Bhopal. the physico-chemical and biological parameters do not show favorable effect on the amphibian fauna of study areas, but decline of amphibian (anurans) population is also marked due to pollution and progressive eutrofication of the water bodies. Thus the water bodies are not suitable for the good of amphibian fauna. Fresh water bodies of the Bhopal district, present the maximum diversification regarding amphibian fauna. In the present study it is noticed that the protected areas play an important role in conservation of amphibian fauna. River sections with forest areas and heterogeneity in substrates shows maximum diversity Efforts would be made to find out the factors relating with the decline or increase in the biodiversity, for morphological variations and populations density.

Table-1 Physical Features (mean value)

S. No	Name of the Water Body	Water temperature (^{o}C)	Colour (Pt. Co. Unit)	Turbidity (FAU)	TDS (mg/l)
1	Upper Lake	20.8	12	7	128
2	Lower Lake	19.8	38	12	139
3	Shahpura Lake	20.6	52	22	156
4	Ayodhya Naqar Pond	21.1	58	21	188.6
5	Char lmil Pond	21.7	54	18	178.6
6	Damkheda Village	20.8	28	12	128.6
7	Hataikheda Reservoir	21.7	26	10	124.6
8	Halati Reservoir	22.7	28	12	112.8
9	Kaliasote	21.3	24	12	144.6
10	Kerwa Reservoir	21.5	12	6	124.6
11	Kolar Reservoir	22.3	8	4	110.6
12	Lendiya Talab	20.8	58	31	168.7
13	Lahorpur Reservoir	22.6	138	36	210.4
14	Munshi Hussain Khan	21.8	32	15	196.5
15	Motia Tank	21.3	42	18	178.9
16	Neelbad Tank	20.6	12	6	132.8
17	Siddiqui Hussain Tank	22.1	27	12	188.5
18	Saranqpani	20.9	64	17	156.8

The study will provide information of water pollution and morphological variation with population density of amphibian fauna. The population density of amphibian may help to know about the species which may be endangered, or at the verge of extinction in the locality. Due to pollution, human invasion and production of selective many species of amphibian has fallen to alarming level, because of this also the biodiversity of this region has become unaffordable.

The decline in amphibian population is a major concern throughout the world. The causes of catastrophic decline vary and include diseases, increased exposure to UV-B radiation, impact of urbanization, habitat destruction, pollution and specimen hunting Gupta (1975). As amphibian inhabits both terrestrial and aquatic habitats, a change in either or both the ecosystem can lead to a catastrophic effect in amphibian diversity. Thus, the widespread approach of surveys and preparation of checklist should be combined with quantitative estimates so as to devise potential conservation measures.

Monitoring and occurrence of amphibian fauna of Gwalior- Chambal region with impacts and their populations have been a basis for assessing the effect of environmental impacts (Saxena 1988). Amphibian fauna of an area may disappear for reasons such as habitat alteration, pollution and over fishing.

To have an insight into the various threats that contribute to the decline of a species or an assemblage of species, there has to be a basis data of the distribution and abundance of the species of an area, such information could be the basis of evaluation of past, present or future change in the species composition and abundance of the amphibian fauna.

Table-2 Chemical Features (mean value)

S. No	Name of the Water Body	DO (mg/l)	BOD (mg/l)	COD (mg/l)	Total Alkalinity (mg/l)	pH	Nitrate (mg/l)	Orthoph osphoate (mg/l)
1	Upper Lake	8.8	12	42	122	8.2	1.234	0.78
2	Lower Lake	16.4	12	102	132	7.8	2.778	6.45
3	Shahpura Lake	12.4	28	112	148	7.1	5.664	16.56
4	Ayodhya Naqar Pond	10.6	12.8	44	178	8.1	3.1.12	8.89
5	Char lmil Pond	10.2	22.8	78	164	8.4	4.114	7.89
6	Damkheda Village	12.8	12.5	56	168	8.2	2.217	5.45
7	Hataikheda Reservoir	7.6	24	88	122	8.1	0.778	7.12
8	Halati Reservoir	7.2	12	46	112	8.2	0.332	0.78
9	Kaliasote	8.2	10	38	122	7.6	3.212	7.64
10	Kerwa Reservoir	7.4	6	24	102	7.9	0.217	0.32
11	Kolar Reservoir	6.8	4.8	20.4	88	7.6	0.127	0.11
12	Lendiya Talab	6.4	56	178	188	8.5	8.154	8.12
13	Lahorpur Reservoir	6.4	56	144	168	7.1	5.654	6.55
14	Munshi Hussain Khan	8.8	54	178	178	7.2	7.114	5.64
15	Motia Tank	9.6	34	132	176	6.8	8.213	1.8
16	Neelbad Tank	6.8	16.4	64	172	7.4	1.884	4.3
17	Siddiqui Hussain Tank	8.4	38	188	156	6.9	5.563	8.42
18	Saranqpani	8.6	42	82	156	8.9	4.556	7.21

The amphibian fauna reported includes anurans of Bhopal division of Madhya Pradesh collected for the first time from some localities of Bhopal, Vidisha and Raisen district. A total of nine species belonging to 6 genera spread in 3 families have been reported. Among these, one species *Kaloula taprobanica, microhylidae* is a new record from this region (Gupta 1975). Daniel (1975) reported *Tomopterna breviceps* of two different colour forms. The brown variety was reported was recorded from Travancore area. But during our survey, both the varieties were collected from the one of some locality in western Ghat. Sarkar (1999) pointed out that *K. taprobanica* and *R. montana* are also found in Bundelkhand region as per the records of Bombay Natural History Society collection data. However, during the study period this species collected from sanctuary area as an injured form. I found a small population of both species in very restricted localities of this region. I have also collected tadpoles of *K. taprobanica and K. montana* from sanctuary valley, but could not locate clearly the adults. Distribution, population and present status of their species were also studied in this region, however it more extensive survey.

As a result of the extensive survey of the study area since from July 2011 to June 2012, I documented the presence of 13 species of frogs belonging to 15 genera and 5 families Family Ranidae was the most dominant with 61% of the total anuran species. Microhylidae is the next contributing 26%, while Bufonidae, Hylidae and Rahacophoridae, contributed to 9%, 2% and 2% respectively. Though Ranidae contributes only 61% of the total anuran species, its abundance is high.

Table -3 Biological Features

S. No	Name of the Water Body	Dominant amphibia fauna (anurans)	AB	Status IUCN-1990	Causes of threatened
1	Upper Lake	*Rana tigrinus* *Bufo bufo* *Rana esculenta* *E. cyaanophlycties* *F.limnocharis* *P. rufescens* *(Total No. of reported amphibia species -13)*	C Vc Vc Vc C C	LRnt Vu LRnt Vu Vu LRnt	F, Cult, Ur, Pl, Hd. F, S, Cult, Ur, Pl, Ind, Hd. F, S, Cult, Ur, Pl, Ind, Hd. F, S, Cult, Ur, Pl, Ind, Hd. F, S, Cult, Ur, Pl, Ind, Hd. F, S, Cult, Ur, Pl, Ind, Hd. .
2	Lower Lake	*Rana tigrinus* *Bufo bufo* *Rana esculenta* *E. cyaanophlycties* *F.limnocharis* *P. rufescens* *(Total No. of reported amphibia species -08)*	C Vc Vc Vc C C	LRnt Vu LRnt Vu Vu LRnt	F, Cult, Ur, Pl, Hd. F, S, Cult, Ur, Pl, Ind, Hd. F, S, Cult, Ur, Pl, Ind, Hd. F, S, Cult, Ur, Pl, Ind, Hd. F, S, Cult, Ur, Pl, Ind, Hd. F, S, Cult, Ur, Pl, Ind, Hd. .
3	Shahpura Lake	*Rana tigrinus* *Bufo bufo* *Rana esculenta* *E. cyaanophlycties* *F.limnocharis* *P. rufescens* *(Total No. of reported amphibia species -06)*	C Vc Vc Vc C C	LRnt Vu LRnt Vu Vu LRnt	F, Cult, Ur, Pl, Hd. F, S, Cult, Ur, Pl, Ind, Hd. F, S, Cult, Ur, Pl, Ind, Hd. F, S, Cult, Ur, Pl, Ind, Hd. F, S, Cult, Ur, Pl, Ind, Hd. F, S, Cult, Ur, Pl, Ind, Hd. .
4	Ayodhya Naqar Pond	*Rana tigrinus* *Bufo bufo* *(Total No. of reported amphibia species -02)*	C Vc	LRnt Vu	F, Cult, Ur, Pl, Hd. F, S, Cult, Ur, Pl, Ind, Hd. .
5	Char lmil Pond	*Rana tigrinus* *Bufo bufo* *(Total No. of reported amphibia species -02)*	C Vc	LRnt Vu	F, Cult, Ur, Pl, Hd. F, S, Cult, Ur, Pl, Ind, Hd.
6	Damkheda Village	*Rana tigrinus* *Bufo bufo* *(Total No. of reported amphibia species -02)*	C Vc	LRnt Vu	F, Cult, Ur, Pl, Hd. F, S, Cult, Ur, Pl, Ind, Hd.
7	Hataikheda Reservoir	*Rana tigrinus* *Bufo bufo* *(Total No. of reported amphibia species -02)*	C Vc	LRnt Vu	F, Cult, Ur, Pl, Hd. F, S, Cult, Ur, Pl, Ind, Hd.
8	Halali Reservoir	*Rana tigrinus* *Bufo bufo* *(Total No. of reported amphibia species -02)*	C Vc	LRnt Vu	F, Cult, Ur, Pl, Hd. F, S, Cult, Ur, Pl, Ind, Hd.
9	Kaliasote	*Rana tigrinus* *Bufo bufo* *(Total No. of reported amphibia species -02)*	C Vc	LRnt Vu	F, Cult, Ur, Pl, Hd. F, S, Cult, Ur, Pl, Ind, Hd.
10	Kerwa Reservoir	*Rana tigrinus* *Bufo bufo* *(Total No. of reported amphibia species -02)*	C Vc	LRnt Vu	F, Cult, Ur, Pl, Hd. F, S, Cult, Ur, Pl, Ind, Hd.

Table.3. cont…

11	Kolar Reservoir	*Rana tigrinus* *Bufo bufo* *(Total No. of reported amphibia species -02)*	C Vc	LRnt Vu	F, Cult, Ur, Pl, Hd. F, S, Cult, Ur, Pl, Ind, Hd.
12	Lendiya Talab	*Rana tigrinus* *Bufo bufo* *(Total No. of reported amphibia species -02)*	C Vc	LRnt Vu	F, Cult, Ur, Pl, Hd. F, S, Cult, Ur, Pl, Ind, Hd.
13	Lahorpur Reservoir	*Rana tigrinus* *Bufo bufo* *(Total No. of reported amphibia species -02)*	C Vc	LRnt Vu	F, Cult, Ur, Pl, Hd. F, S, Cult, Ur, Pl, Ind, Hd.
14	Munshi Hussain Khan	*Rana tigrinus* *Bufo bufo* *(Total No. of reported amphibia species -02)*	C Vc	LRnt Vu	F, Cult, Ur, Pl, Hd. F, S, Cult, Ur, Pl, Ind, Hd.
15	Motia Tank	*Rana tigrinus* *Bufo bufo* *(Total No. of reported amphibia species -02)*	C Vc	LRnt Vu	F, Cult, Ur, Pl, Hd. F, S, Cult, Ur, Pl, Ind, Hd.
16	Neelbad Tank	*Rana tigrinus* *Bufo bufo* *(Total No. of reported amphibia species -02)*	C Vc	LRnt Vu	F, Cult, Ur, Pl, Hd. F, S, Cult, Ur, Pl, Ind, Hd.
17	Siddiqui Hussain Tank	*Rana tigrinus* *Bufo bufo* *(Total No. of reported amphibia species -02)*	C Vc	LRnt Vu	F, Cult, Ur, Pl, Hd. F, S, Cult, Ur, Pl, Ind, Hd.
18	Saranqpani	*Rana tigrinus* *Bufo bufo* *(Total No. of reported amphibia species -02)*	C Vc	LRnt Vu	F, Cult, Ur, Pl, Hd. F, S, Cult, Ur, Pl, Ind, Hd.

Abbreviation- AB- Abundance, C- Common, Vc- Very Common, LRnt- Lower Risk near threatened, LRlc- Lower Risk least concern, Vu- Vulnerable, EN- Endangered, CR- Critically endangered.
F- Food, S- Sport, Cult.- Cultivable, Ur- Urbanization, Pl- Pollution, Ind- Industrialization, Hd- Habitat destruction.

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