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Distribution, Threats and Conservation Strategies of Anurans at Central Aravalli foothills of Ajmer, Rajasthan India.

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Abstract: *Ajmer is located in the center of Rajasthan (INDIA) between 25 ^{0} 38 " and 26 ^{0} 58 " north Latitude and 73 ^{0} 54 " and 75 ^{0} 22" east longitude covering a geographical area of about 8481sq km surrounded all sides by Aravalli hills.*

Amphibians, particularly anurans, are of immense ecological and economical importance.Amphibian species diversity is highest in Tropics. But now these are declining at fast rate. The initial release of Global Amphibian Assessment (GAA) in 2004 reported amphibian species had been analyzed in order to assess their conservation status and distribution.

Ajmer has hot dry summer and cold bracing winter. The winter extends from November to February and summer extends from March to June followed by rainy season till mid September.

The temperature varies from 2 ^{o} c in winter and 49 ^{0} c in summer. The normal annual rainfall is 527.3mm. The total population of the district is 2180526 persons .

Ajmer is abode of certain flora and fauna that are particularly endemic to semi-arid and are specially adapted to survive in the dry waterless region of the state.

The Amphibian species identified were Euphlyctis cyanophlyctis, Hoplobatrachus tigerinus, Fejervarya limnocharis, Sphaerotheca breviceps, S. Rolandae, Duttaphrynus melanostictus, D. stomaticus, Microhyla ornata, Uperodon systoma.

Key words: *Faunal diversity, Amphibians, Aravalis, Ajmer.*

I. Introduction

Geographical Identification of the Area : Rajasthan

Geographical identification of RAJASTHAN

Ajmer is located in the center of Rajasthan (INDIA) between 26^0 16'N-74^0 25' E & 26^0 27'N-74^0 42'E with an area of 8481sq km2 (Heron 1953). surrounded all sides by Aravalli hills . The average altitude of the central Aravalli is 550 m .The Ajmer valley of Aravalli foothills itself drains westwards into Luni river and the ridges East to Ajmer drains to the Banas river. It experiences the a mean annual rainfall of 573mmBut scanty and uncertain. Temperature ranges 2^0 C – 46^0 C. The summers are extremelyhot in this part, However Aravallis has witnessed many climatic changes in the recent past, particularly the rainfall, temperature fluctuation and shift of weathers. Recent studies on identification and monitoring of anurans based on their call characteristics have shown great potential as a supporting feature to the traditional methods of taxonomy (Sonotaxonomy). The status of population of these anuran specieswas categorised in 4 groups (MC- Most common; CO- Common; NC- not common; RA-Rare) and population trend categorized as stable; decline, and sharply decline along the IUCN and red data list status (Table 1). The Anurans show highest diversity among Indian Amphibians inhabiting all types of

habitat such as Aquatic, semiaquatic, fussorial, terrestrial, semiarboreal and arboreal.The Amphibians of India show a high level of endemism. In 2010, Zoological Survey of India has documented a total of 311 amphibian species in India (Dinesh et.al.2010). Of which 9 species are found in Ajmer.

The initial release of Global Amphibian Assessment (GAA) in 2004 reported amphibian species had been analyzed in order to assess their conservation status and distribution.

The results of the study provide a baseline for global amphibian conservations, and real ready designing strategies to save declining worlds amphibian population. In June 2007 GAA list total 5918 amphibian species in the world of which 88% are frogs and toads. Of these 30% (1590) were listed vulnerable, endangered or critically endangered. Central America, Caribbean, Australia and some parts of Asia are the areas that have suffered most decline habitat loss is the main cause of decline. It is believed that due to its hot climatic conditions and arid habitat very little scope is there for the amphibians to thrive in this part of India. Due to this reason very few or negligible studies have been done on Amphibian fauna from this region.(McCann 1942 a, 1942b, Mansukhani & Murthy 1964; Sharma 1995a, 1995b ; Sharma 1997 ; Sharma 1999 ; Sharma & Agnihotri 2002 ; Sharma & Khan 2002 ; Sharma et.al. , Sharma 2005,

Sharma and Dube 2005, Sharma 2008, Sharma and Mehra 2007, 2009, Sharma & Sharma 2009 ; Sharma et.al. 2010a, 2010b).

Aravalli Mountain range is a typical ensialic Mountain range of oldest proterozoicRocks which has an age span between 2500 and 850 million years (Roy & Jakhar 2002). The purpose of this study is to determine total no. of species of frogs and toads of Ajmer.

II. Methods

The present study was carried out during 2013-2014. The identification of species was mainly based on the morphometric observations and high resolution close-up photographs using still and video digital cameras (Nikon Coolpix; Sony, H50 , Sony DCR-VX2200E) using standard diagnostic keys (Boulenger 1890; Dutta 1992; Chanda 2002; Daniel 2002; Daniels 2005). Since digital documentation at micro level observations have become so precise, authentic and stable, that killing, fixation and preservation of animals for identification was totally avoided by implementation of humane methods Keeping in view ethical issues and relevant legislations (Sathyanarayana 2010a, 2010b; Sharma et.al. 2011).

III. Observations

Recent studies on identification and monitoring of anurans based on their call characteristics have shown great potential as a supporting feature to the traditional methods of taxonomy (Sonotaxonomy). The status of population of these anuran specieswas categorised in 4 groups (MC- Most common; CO- Common; NC- not common; RA-Rare) and population trend categorized as stable; decline, and sharply decline along with the IUCN and red data list status (Table 1).

Table 1. Frogs and Toads of Ajmer Aravallis : Their status ,Population trends ,IUCN criteria, Red list criteria.

S.no.	Species	Common name	Current status	Population trend	IUCN criteria	Red list category
	Dicroglossidae					
1.	**Euphlyctis cyanophlyctis**	**Indian skipper frog**	**MC**	**Stable**	**LRnt/DD/N**	**LCver3.1**
2.	**Hoplobatrachus tigerinus**	**Indian Bull Frog**	**CO**	**declining**	**VU/DD/A1d**	**LCver3.1**
3.	**Fejervarya limnocharis**	**Cricket frog**	**NC**	**Declining**	**VU/DD/A1ac**	**LCver3.1**
4.	**Sphaerotheca breviceps**	**Burrowing frog**	**NC**	**Declining**		**LCver3.1**
5.	**Sphaerotheca rolandae**	**Rolands Burrowing frog**	**RA**	**Sharply declining**	**LRnt/DD/N**	**LCver3.1**
	Bufonidae					
6.	**Duttaphrynus melanostictus**	**Common Asian frog**	**NC**	**Stable**	**VU/DD/A1abc**	**LCver 3.1**
7.	**D. stomaticus**	**Marbled toad**	**MC**	**Stable**	**LRnt/DD/N**	**LCver3.1**
	Micrihylidae					
8.	**Microhyla ornata**	**Ornate narrow mouthed frog**	**CO**	**Declining**	**LRlc/DD/N**	**LCver 3.1**
9.	**Uperodon systoma**	**Marbled balloon frog**	**RA**	**Sharply declining**	**LRnt/DD/N**	**LCver3.1**

MC-most common,CO-Common,NC- Not common,RA-Rare.

Amphibians

Indian bull frog Hoplobatrachus tigrinus , Fejervarya limnocharus Indian skipper frog Euphylyctis cyanophlictis , Toad Duttaphrynus melanostictus , Common Indian toad Duttaphrynus stomaticus , Sphaerotheca rolandae, Sphaerotheca breviceps, Microphyla ornate , Uperodon systoma.

Dicroglossidae

Indian skipping frog Euphlyctis cyanophlyctis. Indian bull frog Hoplobatrachus igerinus. Cricket frog Fejervarya limnocharis . Burrowing frog Sphaerotheca breviceps. Rolands rog Sphaerotheca rolandae.

Bufonidae Common Asian toad Duttaphrynus melanostictus.Marbled toad Duttaphrynus stomaticus .Microhylidae Ornate frog Microhyla ornate. Marbled balloon frog Uperodon systoma.

IV. Results And Discussion

A total 9 species belonging to 3 families of order Anura was recorded (Table 1) from The study area along with some direct or indirect threats associated with the population of these anuran species.Out of 9 observed species Hoplobatrachus tigerinus (image 8) and Duttaphrynus melanostictus (image 6) are most common species with stable population trend.

Duttaphrynus stomaticus (image 5) and Euphlictis cyanophlictis (image 4) are not common with the stable Population trend. Fejervarya limnocharis (image 1) and Microhyla ornate (image 7) not common and population trend as decline. Spherotheca breviceps (image 2), Sphaerotheca rolandae (image 3) also show population trend as decline. Uperdoon systoma (image 9) occurred as rare and population observed as sharply decline at the central Aravalli foothills. There existed confusion in identification of Sphaerotheca breviceps and Sphaerotheca

rolandae but during the observation of preceding monsoon we could clearly distinguished both the species based on their call characteristics loud bawng—2 Sphaerotheca breviceps and breeee---2 Sphaerotheca rolandae. The calls were further confirmed with high resolution spectrograms and sound spectrum software (Raven Pro 1.4 beta version; Avisoft 5.0.16, Germany). Anuran species are showing specificity according to habitat and environment parameters. Anthropological activities such as urbanization; habitat loss and increased use of

pesticides are affecting the anurans at different levels.

Some species are ecologically hard because they are stable, while others are sensitive because sharply declining with concern to anthropogenic changes.Threats to anuran populationsThe Threats which were observed during study were categirized into 2 groups1 Mining,

Deforestation, Urbanization and other Anthropogenic activities.2. Landslides soil erosion (air and water), reduction in ground water level, desiccation of

Open water sources ponds, lakes, rivers and streams.

Theses are the factors responsible for population decline of anuran fauna at Aravalli ranges.

Water bodies which are breeding grounds of anurans are transacted by roads and national highways has caused heavy mortality due to road accidents among the breeding individuals during rainy season.

Urbanization has taken away the habitat of deeper burrowing species such as Sphaerotheca breviceps, Sphaerotheca rolandae ; Uperodon systoma and those which inhabit short burrows and crevices . Hoplobatrachus tigerinus; Microhyla ornate; Limnocharis; Duttaphrynus stomaticus, Duttaphrynus melanostictus. The buildings and roads above their burrows and hiding places have permanently buried them in the ground where they are unable to come out during rainy season.

In some parts of Aravallis Euphylictis cyanophlyctis inhabit in cemented tanks , Khels as drinking water bodies for cattles, but due to scanty rains, less available water, these tanks are accumulating high TDS and Fluorides which adversely affect the early developmental stages of anurans.

Introduction of genetically modified crops and extensive use of fertilizers during monsoon period, which get accumulated in the water bodies which are breeding grounds of amphibians this results in mortality of developmental stages of anurans.

Deforestation and defragmentation have exposed the young ones to predator birds.Illegal use of anuran species in practical classes Schools, Colleges, Universities, has caused heavy loss of some species such as Euphlyctis cyanophlictis, Hoplobatrachus tigerinus. Although there is government ban on frogs dissection, still there are some institutes which are using these animals in practical classes.

Some Research scholars who are not familiar with ethical norms collect large number of breeding animals of a species During premonsoon and monsoon period they kill the animal in in formalin filled container for identification. Often more than 100 animals are collected for morphological observation this has resulted complete loss of some species In the study area.In some villages another cruel activity was observed by putting straw in cloaca (Uperodon systoma) & blowing air in the body until it bursts & animal is dead. This is done just for fun.These are the threats which were observed by investigators during field observation.

Results are encouraging but it will take many years to re-establish the species.

Image 1

Image 2

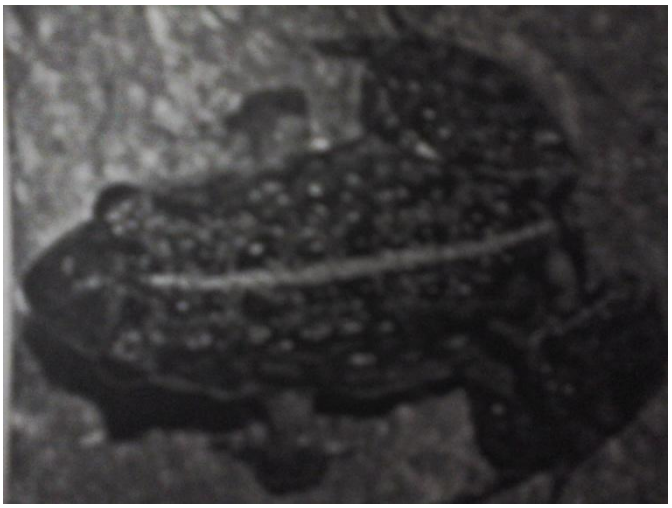

Image 3

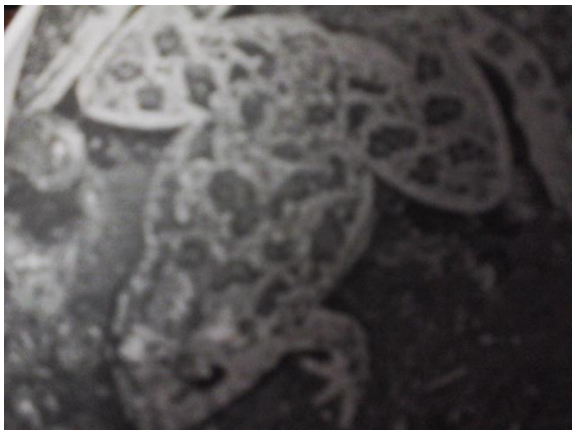

Image4

Image 5

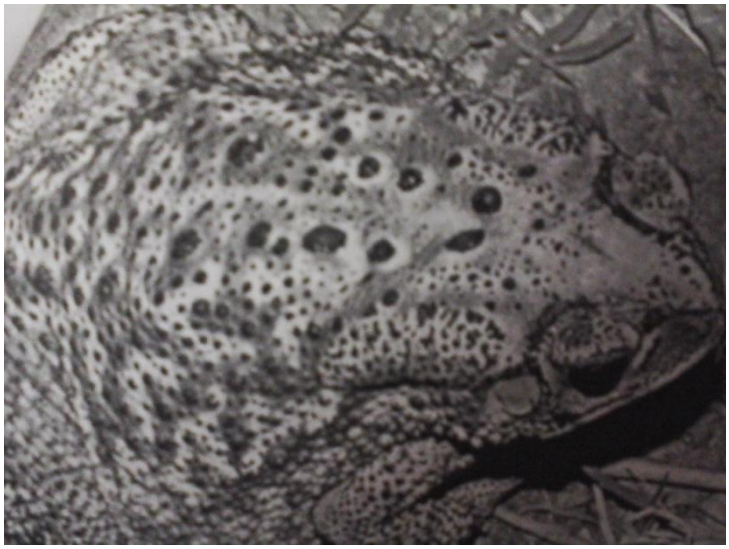

Image 6

Image7

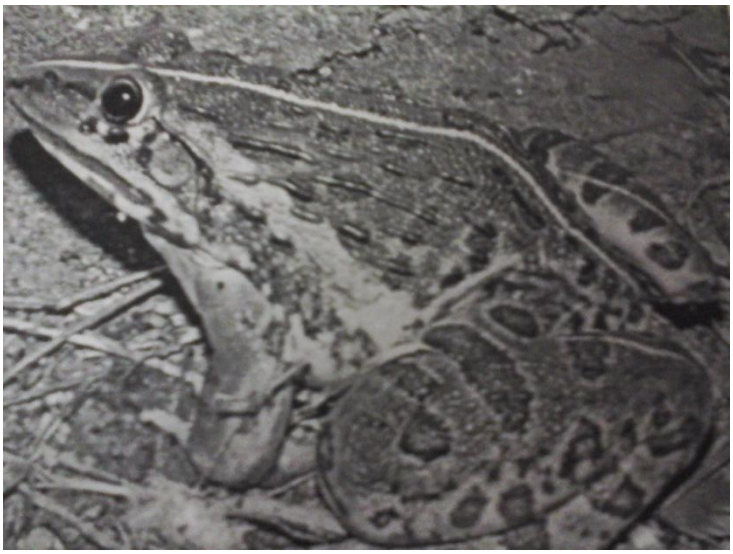

Image 8

Image 9

V. Summary and Conclusion

The anurans show highest diversity among Indian amphibians inhabiting all types of habitat such as aquatic, terrestrial, semiarborial and arborial.The amphibians of India show a high level of endemism. In 2010 , ZSI has documented a total of 311 amphibian species in India (Dinesh et al.) . Out of these 9 species are found in Ajmer. Around 5.56% of total area available for land utilization is covered under forest. Some species were heavily collected for international frog legs trade Legal export of this species from India to Bangladesh has been banned since 1896.

Still some illegal trade is going on. Loss of wetlend habitat, water pollution, drought, pesticides, agrochemicals, infrastructure development are main threats to amphibians. Aravalli Mountains are Marvellous to be viewed, since these are oldest Mountains of the world . But the faunal diversity is rapidly decreasing, due to mining and fast rate of urbanisation. Zinc mining and cutting of mountains to obtain rock for building houses and buildings is the main cause for loss of biodiversity . Fast steps should be taken and hard laws should be introduced to stop the loss of biodiversity.

VI. Conservations strategies and suggestions

Environmental Awareness and SEVA (Save Environment And Welfare of animals) and Rajputana society of natural history (RSNH) are developing awareness activities to prevent the threats.Efforts have been made to establish new habitat and reintroduce the species to their suitable habitat.

1. Strict laws should be imposed to stop minning and mountain cutting, since Aravallis are the oldest mountains of the world and habitat of many amphibians and it will lead to biodiversity loss.
2. The local people should be educated and made aware of effects and consequences of Biodiversity loss .
3. Documentation of biodiversity is an urgent requirement as latest statistics and data on floral and faunal biodiversity has not been compiled and documented.
4 .Degradation / Fragmentation of habitat extinction of species and destruction of unique habitat need to be monitored.
5. A programme " Eco –development " for in situ conservation of biological diversity involving local communities has been initiated in recent years, for sustained conservation of ecosystem by involving the local communities with maintenance of earmarked regions surrounding protected areas.
6. Increase allocation of financial resources for conservation of biodiversity.
7. To conserve representative ecosystem, a biosphere reserve programme should be implemented.
8. Aravallis should also be included in Biosphere reserves.
9.Major central acts relevant to biodiversity include forest act , and wildlife protection act, 1972, Forest conservation act 1980 and environment protection act 1986.
10. The author in collaboration with environmental awareness and animal welfare organizations such as Save Environment and Welfare of animals (Sewa) and Rajputana Society of Natural History (RSNH) to prevent all the above described threats. Efforts have been made to establish new habitat and introduce the species to suitable habitat Results re encouraging but it will take years and more efforts to regain what has been lost.

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