



AMPHIBIAN POPULATION DECLINE: A CASE STUDY FROM JAMMU AND KASHMIR, INDIA

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ABSTRACT

Climatic changes and contaminants are two of the most important factors affecting the populations of amphibians worldwide. For an ecosystem, amphibians play a major role in compiling the community and maintain the nature balance. Over the past few years, global decline in amphibian populations has gained much attention and globally studies are being made on the possible causes for the population decline. One such case study is the Karez frog, *Chrysopaa sternosignata* (Anura: Dicroglossidae) from Jammu and Kashmir state, India. The species inhabits the cold streams of Baderwah tehsil, district Doda (altitude 1500m-3000m) and has witnessed a great reduction in population size over the last three-four years. Climate change, habitat loss and toxicants are the possible causes for the reduction in population size. It is suggested that if the same factors are not strongly mended or conservation strategies not designed, we are soon going to find the species losing its 'Least Concerned' status.

KEYWORDS: climate change, habitat loss, toxicants, population decline, *Chrysopaa sternosignata*.

INTRODUCTION

Amphibians are perhaps one of the most successful groups of wildlife on the earth. They evolved before the reign of the dinosaur, and continued to thrive through climatic changes which resulted in the demise of other species. The unique biology of amphibians has been cited as one possible explanation for the current declines. Amphibians are intrinsically connected to water at one or more stage in their life cycle. The life history begins as the tadpole emerges from the egg, breathing oxygen through gills and consuming plant material. Most amphibians change into terrestrial adults. The carnivorous adult consumes insects, and breaths through lungs and the moist outer layer of skin. Every spring, amphibians emerge from hibernation to breed in wetlands. The biphasic lifestyle of amphibians makes them especially vulnerable to changes in the air, water, or land. The presence of amphibians in an ecosystem is generally considered to be an indicator of environmental health. The sensitive skin and complex life cycle of amphibians makes them susceptible to changes in environmental quality. Throughout the world, the disappearance of many amphibians has been recorded. In Australia, the once common Gastric Brooding Frog (*Rheobatra chussilus*) disappeared within its protected habitat. The Golden Toad in Costa Rica has also disappeared from a protected habitat. The toad lived in a square kilometre region of Costa Rica's Monteverde Cloud Forest Reserve. In the North American Rocky mountains, the Leopard Frog, *Rana pipiens*, has declined. The

possible causes of the population decline are suggested include habitat destruction, climatic change, ultraviolet radiation, diseases, toxicants, predation, invasive species, competition and collection for economic purpose (Blaustein *et al.*, 2003). But it is a synergistic action of multiple factors and not a single one that has led to such a devastating implication on amphibian population. *Chrysopaa sternosignata* (Anura: Dicroglossidae), commonly called as Karez frog, is found in Pakistan (Baluchistan and Kashmir), India (Kashmir), Afghanistan. Presently it enjoys the 'Least Concern' status in the IUCN red list. Recent studies on the population of this species, has shown that it has been affected badly and the possible causes suggested are: climatic change, habitat loss and chemical toxicants in the habitat.

DISCUSSION

Over the past 350 million years, amphibians, the descendants of lobe-finned fishes have radiated into most habitats on Earth. They inhabited diverse habitats and enjoyed these for long. Currently, mostly because of man-made reasons, one in three amphibian species faces risk of extinction. It comes as no surprise that amphibians are the most threatened group among the vertebrates on planet Earth. The amphibian fauna of India is also facing high risk of rapid extinction due to habitat destruction and other anthropogenic impacts. India has remarkable amphibian diversity. India has 342 amphibian species (Dinesh *et al.*, 2013), Zoological Survey of India. According to the IUCN Red list of threatened species, the global status of Indian amphibians is 23.68% Data deficient; 21.93% Not

Evaluated 30.12% Least concern; 2.63% Near Threatened; 7.02% Vulnerable; 9.36% Endangered; ; 4.97% Critically endangered and 0.29% Extinct. Out of the 342 species of known Amphibians from India, 75 species are yet to be evaluated and 81 species are still under the data deficient category. India has already lost 13% of its amphibians. This has placed India as the country with the maximum number of lost species in the world. The lost amphibian species are as recent as 18 years or as far back as 170

years. Many of the species have been placed into the red list of IUCN and require serious attention and conservation strategies for saving them for the future generations. Our study is based on one cold water frog species which is confined to a very small area of the world including India, Pakistan and Afghanistan (Frost, 2013). The species *Chrysopaa sternosignata*, commonly called as Karez frog, is a thoroughly aquatic species, inhabiting clear pools with flowing karez water (Fig. 1).



FIGURE 1. A live adult Karez frog **FIGURE 2.** A Dead body of Karez frog **FIGURE 3.** Neeru stream

When disturbed it jumps into the depths of the water and hides under gravel at the bottom or under dense marginal vegetation and thick floating algal cover. The frog never leaves the water; even in freezing winter when the upper water surface is frozen, it remains sluggishly active beneath in the unfrozen water. In summer it usually sits in the marginal vegetation or under undercut rocks along sides of streams (Khan and Ahmed, 1987). For the last four years, we have been investigating the reasons behind the dwindling population of this species. The cold water stream, Neeru stream (Fig. 3), of Bhaderwah, (District Doda, Jammu and Kashmir, India) are inhabited by two different species: the skitter frog- *Euphlyctis cyanophlyctis* in the lower less colder reaches (town) and *Chrysopaa sternosignata* in the higher much colder reaches near to glacier (hilly area). The species confined to the upper reaches is not free from the anthropogenic effect any more. The population size is much reduced over the last few years. During our expedition into the area, some dead bodies of the frogs were found frequently in the stream as well as along the banks (Fig. 2). Moreover the tadpole larvae during breeding period too were found dead in huge numbers. It was found that the frequency of dead frogs increased when fishing was done in the area. Actually people go fishing, for which they make small barrages and use the bleaching powder for catching fish. This accumulates in the place and finally directly kills the tadpoles fetching this water and indirectly causes molecular or physiological damage to the adults and kills them.

There is a complex of many factors which simultaneously play their role in population decline of amphibians (Han *et al.*, 2011). Habitat loss is another important factor responsible for the species loss. Some years back these frogs were abundant enough to be found in the waters easily. But due to human settlement household garbage, agricultural wastes and other effluents began to accumulate and the physiochemical as well as the biological profile of the stream was changed. The

protected natural habitat became the fowl one and the adaptation again took a huge toll over past years.

Climate change is an unavoidable fact currently. There are no two opinions about this fact that climate is showing us such unpredictable and devastating faces that it has become very difficult to survive for these highly sensitive species. Anthropogenic disturbances have created fluctuations in the thermal profile, pH adjustability, rainfall, humidity and other cofactors. They breed with the first downpour of monsoons but a delay in the onset of monsoons would disturb the whole life cycle in future. As an example in the year 2012, the monsoons could not arrive on time (expected time July 15) and finally it showed on the frog breeding. They did not breed on time and it was one and a half month late (September) when frogs found favorable rains and thermal conditions. The tadpoles could not get time to undergo perfect metamorphosis. While some were able to thrive better, others could not adapt to the rapidly cooling water because of falling temperatures. By that time snowfall at the glaciers causes water temperature fall too low that it became miserable for the newly formed sub-adults to survive better. Thus a huge population was lost. In addition to this, while people outside India think of using frogs for developing their economic profile, to our surprise we found people so ignorant about these frogs that they used to kill them whenever they saw them. This was because they were frightened by their large size (250g-800g) and huge jumps (4ft-6ft). Some people used to relate them to some mythical pearls which were believed to be found in their mouth. Thus ignorance and negligence of human beings play havoc on these frogs.

In conclusion, we can say that it is not a single factor that can be considered responsible for amphibian population declines. Many cofactors work together and bring about this population loss. Considering the intensity of the problem it is very crucial to check the possible causes and stop them, if we wish the frog to enjoy its 'least concerned' status. We suggest that well managed

conservation strategies should be designed for the species so that we can hope to save the species forever.

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