STUDIES ON AMPHIBIAN POPULATION DECLINE, A GLOBAL CONCERN.

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Abstract

Amphibians are sensitive to environment change and habitat loss. Mostly due to habitat loss, pollution, disease and environment change amphibian population is declining in a faster rate. If the trend continues, within next few decades a considerable number of amphibian species will be either extinct or critically endangered. This may cause an imbalance in the natural food chain and thus ecological imbalance may emerge.

Key Words: Amphibia, population decline, habitat loss, ecological imbalance.

Introduction

Global climatic changes and habitat loss due to natural process or due to anthropogenic interactions have massive adverse effects over biodiversity. Decline in population that trends to mass extinction of some fauna is an alarming issue to biologists. Some vertebrates such as amphibians are facing severe threat of extinction in some region of the world. It is a matter of concern, as amphibians have potential capability to affect the structure and functions ecosystem (Matt et al. 2006).

As Amphibian possesses soft moist naked and glandular skin, therefore, they are much more susceptible to adverse changes in their surrounding habitat. Even a minute change in environmental parameter may play considerable impact on them. In this regard, amphibians constitute a unique alarming group of vertebrates containing more than 7,000 known species. According to 2004 IUCN Red List of threaten species (Baillie et al., 2004), nearly one-third (32%) of the world's amphibians are threatened. From evolutionary point of view, extinction is a routine phenomenon. History of extinction of Amphibians on earth is not new, yet in just the last two or three decades there have been an alarming number of extinctions, nearly

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168 species are believed to have gone extinct and at least 2,469 (43%) more have populations that are declining. This indicates that the number of extinct and threatened species will probably continue to rise (Stuart et al. 2004).

Being a tropical country, India has climatic support to harbour considerable number of amphibian fauna. In fact amphibian diversity is highest in the tropics, especially in the Amazon. Brazil has the most described species, over a 1,000 species. By contrast, the United States is nearly the same size as Brazil with about a third of the amphibian species. Whatever may be, like other parts of the world; Indian amphibian fauna are declining day by day faster than imagine.

Importance of Amphibians

From scientific, economic and ecological point of view amphibians have great importance. They are least harmful in nature and never destroy agricultural crops, fruits, vegetation, etc. Farther more, their food mainly consists of small insects and their larvae, snails, etc., which are pests of cultivated crops and vectors of diseases. Therefore a decline in amphibian population can have an adverse effect on the ecosystem as a whole. In addition to that, a number of amphibian species are being used for biological laboratories as well as in educational institutions.

Causes behind Amphibian Populations Declining

No doubt, habitat loss is the most important factor behind amphibian population decline. If forests are ruined due to urbanization or increased agricultural need, it is quite natural that species that once lived there disappear.

There are so many cases where the habitat is protected and amphibians are still disappearing. It is a clear indication that not only habitat loss, but also some other factors are playing decisive role in amphibian population decline.

An emerging disease called chytridiomycosis and global climate change are thought to be the biggest threats to amphibians. Chytridiomycosis is a disease caused by the fungal chytrid pathogen *Batrachochytrium dendrobatidis*. This pathogen is associated with the global loss of hundreds of species of amphibians and represents a spectacular loss of biodiversity; some say the worst in recorded history.

Some factors such as habitat destruction, alteration and fragmentation (Fisher and Shaffer 1996), Davidson et al. 2001, Marsh and Trenham 2001), introduced species (Vredenburg 2004, Kats and Ferrer 2003) and over-exploitation (Jennings and Hayes 1985, Lannoo et al. 1994) are obviously shared with other types of endangered species on our planet and are part of to the global biodiversity crisis. However, amphibians have also declined in relatively "pristine" and protected environments

(Wake 1991, Crump et al. 1992, Lips 2000). These more complex and elusive mechanisms include climate change (Pounds et al. 1999, Kiesecker et al. 2001, Carey and Alexander 2003), increased UV-B radiation, chemical contaminants (Hayes et al. 2002, Blaustein et al. 2003), emerging infectious diseases (Daszak et al. 2003). The underlying mechanisms behind these factors are complex and they may be working synergistically with more straight forward factors, such as habitat destruction and introduced species, to exacerbate declines (Kiesecker et al. 2001, Blaustein and Kiesecker 2002). Researchers are finding that there is not a single overarching cause for global declines, instead all of these factors are threatening amphibian populations and the threat tends to vary depending on the location. If we are going to prevent further extinctions, research must move forward quickly and be used effectively in management by governments and non-governmental organizations around the world.

Major factors behind amphibian population decline (According to Young et al. 2001)

FACTOR	PROCESS(ES)
Habitat destruction, alteration and Fragmentation	Roads, introduced species, or other factors separate remaining populations of amphibians from each other.
Introduced Species	Non-native species prey on or compete with native amphibians.
Over-Exploitation	Amphibians are removed form the wild and sold internationally as food, as pets, or for medicinal and biological supply markets
Climate Change	Amphibians are extremely sensitive to small changes in temperature and moisture. Changes in global weather patterns (e.g. El Nino events or global warming) can alter breeding behavior, affect reproductive success, decrease immune functions and increase amphibian sensitivity to chemical contaminants.
UV-B Radiation	Levels of UV-B radiation in the atmosphere have risen significantly over the past few decades. Researchers have found that UV-B radiation can kill amphibians directly, cause sublethal effects such as slowed growth rates and immune dysfunction, and work synergistically with contaminants, pathogens and climate change.
Chemical Contaminants	Chemical stressors (e.g., pesticides, heavy metals, acidification and nitrogen based fertilizers) can have lethal, sublethal, direct or indirect effects on amphibians. These effects may include death, decreased growth rates, developmental and behavioral abnormalities, decreased reproductive success, weakened immune systems and/or hermaphroditism.
Disease	Diseases (such as chytridiomycosis) or increased susceptibility to existing diseases leads to deaths of adults and larvae. New chytrid diseases such as those caused by *Batrachochytrium salamandrivorans* seem to be particularly lethal to salamanders.
Deformities	There has been a recent and widespread increase of deformities (or malformations) in natural populations of amphibians; this is now perceived as a major environmental problem.
Synergisms	Multiple factors can act together to cause mortality or sublethal effects.

AMPHIBIAN SCENARIO IN INDIAN.

Distribution of Amphibians in India

Distribution of amphibian in India is not uniform. Northeast region and Western Ghats exhibit highest concentration of genera and species. The semi-deciduous forests of that area provide good habitats for a number of species. Yet, no endemic arboreal anuran species has been recorded from the Eastern Ghats of Orissa or Andhra Pradesh. The high diversity regions are also those that until relatively recently had large areas of tropical evergreen forests, structurally complex environments, providing the maximum number of micro habitats. The interaction between forest environments and diversity is clearly seen when the proportions of bush and tree dwelling frogs of Northeast India and Western Ghats are compared to those in the other regions. The most distinctive regional fauna are from the North Eastern India and the Western Ghats. (Chanda 1986, 1994, 1995), recorded largest concentration of 56 species from Northeast India, whose ranges extend mainly to Southeast Asia or China through Burma. In Western Ghats as already noted, the largest number of endemic forms occurs. Two of the genera and 13 out of 16 species being restricted to Peninsular region. Intensive collection and observation in the near future will certainly increase the number of endemics known from the East Peninsular and Gangetic Plains.

Despite the present gaps in the faunal lists of large areas and in the known ranges of individual species, it is clear that Indian amphibian species constitute three distributional types: (i) species confined to Western Ghats, the largest unit; (ii) species known in India, only from northeast and (iii) a set of essentially ubiquitous species that comprise the bulk of the known fauna between the Western Ghats and Northeast.

The Indian amphibian fauna has a number of endemic genera and species. In Western Ghats, a total of 92 species are found to be endemic and 35 species are endemic to Northeast India. One species, namely the Himalayan Newt, *Pleurodeles verrucosus* is at present included in Schedule II of the Indian Wildlife (Protection) Act, 1972 as amended from time to time. This species is known only from Darjeeling, Sikkim and Manipur. This is the only species of Salamander known from India and the population being in pockets is considered endangered. However, the exact population status of this species is not known. The Malabar tree toad, *Pedostibe tuberculosus* from Malabar (Kerala) and the Garo hills tree toad *Pedostibes kempi* from Tura, Garo hills, (Meghalaya) have also become extremely rare. (Alfred et al.1998, Chandr, 1998).

Major Threats to Amphibians in India

The ecosystem of our country has been adversely affected due to the modern agricultural technology. Significant changes in the quality of water in which the amphibians spend the sensitive part of their life has been changed due to the indiscriminate use of pesticides and artificial fertilisers. Due to urbanisation and industrial development, the natural habitats of the amphibians, such as wetlands, have been drastically reduced. In our country the natural habitats of the amphibians has also damaged due to extensive deforestation. Thus, the habitat destruction, over exploitation, indiscriminate capture of frogs and pollution have not only reduced the amphibian population of our country but also disturbed the ecological balance resulting in the multiplication of such insect vectors as mosquitoes which constitute major food item. As a result mosquito and vector-born disease spreading proportionately.

Summary

As amphibians have great impact on structure and function of ecosystem, therefore to conserve them, more research attention needed. To conserve the natural food chain and to maintain sustainable tropic structure in our ecosystem increased attention and consciousness about amphibian population is essential. We cannot resist natural extinction process, but our conscious people can slower it and can save biodiversity by minimizing adverse anthropogenic interaction and thus can check mass extinction of threatened amphibian population.

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