

## Conservation, Protection and Utilization Strategies for Amphibians from Satara District of Maharashtra including Ghats

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### ABSTRACT

Amphibians are specialized for living in aquatic and terrestrial ecosystems but, they are facing more difficulties in both systems due to pollutions, climatic change and interference of man to natural habitats of amphibians. Therefore, conservation, protection and utilization strategies of amphibians have been studied from Satara district especially, from the river sides of Koyna and Krishna. In-situ and ex-situ strategies have been given in the paper.

**Key words :** Amphibians, conservation, protection, utility, Koyna & Krishna rivers, Satara, Ghats

### INTRODUCTION

Although amphibians are specialized for living in water and land ecosystems, they are well suited in water than land ecosystems (Sathe, 2014). Since they cannot regulate their internal body temperature, they have more difficulties on land ecosystem. Therefore, many species are going to extinct due to transformation of natural habitat to land for cultivation and urbanization. Amphibians have very economic role in pest management. Therefore, amphibians should be protected, conserved and utilized for the betterment of nature and humans. From India, 219 species of amphibians have been reported; 134 species are endemic to India. From Western Peninsula 92 species are reported to be endemic and 9 are critically endangered. Therefore, the present paper enlightens the conservation, protection and utilization strategies of Amphibian. Review of literature indicates that Daniel (1963, 1965), Dutta (1992, 1997), Chandra and Deuti

(1997), Sathe (2014), Sathe *et al.* (2006), Sathe & Bhoje (2014) etc. worked on Indian amphibians.

### MATERIAL AND METHODS

#### Study area :

Satara district of Maharashtra, India is located between 17.5° - 18.01° North latitude and 73.33° - 74.74° longitude as a part of Deccan plateau covering 10,492 sq.km. area at 900-2150 m from sea level and with prominent rivers Koyna and Krishna. Both, Koyna and Krishna river areas have been selected for present study. Ghatmatha, Koyna, Patan and Karad on Koyna river bank and Mahabaleshwar, Wai, Dhoni, Karad and Rethare Bk. on the bank of Krishna river were identified and in-situ and ex-situ conservation strategies for amphibians have been adopted during the years 2012-2015.

#### In-situ conservation :

In-situ conservation is conserving species in its original habitat and habitat itself. Natural habitat protection, provision of food and provision of mate were important methods in in-situ conservation of amphibians. The dynamic conditions of the habitat like changing seasons, availability of food, diseases and their carriers, competitors or predators etc. have been studied by spot observations.

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### Ex-situ conservation :

Ex-situ conservation refers to the maintenance of species that are highly endangered or threatened with immediate extinction, in stable state outside their original habitat viz. Breeding them in captivity particularly zoos and laboratories. Ex-situ populations are much smaller and live in conditions different from those in their natural habitats. They are therefore, susceptible to random processes subjected to danger of inbreeding through the breeding of close relatives, and face a risk of unnatural selection pressure, leading to loss in genetic variability.

Froggery, breeding of amphibians (frogs) in zoos or laboratory, gene bank of amphibians , DNA clubs, establishment of farming centers, local protection centers, Tribal population efforts, student efforts, encouragement through mechanical sources (like light) etc. are important methods of ex-situ conservations of amphibians.

## RESULTS

### Froggery :

In the laboratory, froggery was started with a minimum of a dozen of frogs. This founder population increased by number of at least 250-500 individuals. Sex ratio was mentioned as (m:f, 1:1) cross breeding was prevented in closely related species. For breeding, a tank of depth 2.5 ft. and 10 ft. x 10 ft was used with sufficient water and hydrilla plants. The tank was covered with iron mesh cage of 12.5 ft x 12.5 ft and 6 ft. height. The frogs were allowed to mate and produce progeny production. The adult frogs were then released in the various habitat of frog both in forest and plain ecosystems of rivers of Satara district namely Koyna and Krishna.

### Breeding of frog in zoos / Laboratories :

Small groups of frogs have been allowed to breed in the man-made habitat, break water tanks (Figure-11) and later, released into the target areas of Koyna and Krishna rivers for their conservation and protection.

### Gene Bank of Frog (Figures 1-6):

Some species of the genera *Bufo*, *Rana*, *Uperodon* (Fig.1) and *Euphlyctis* (Fig.4) were maintained as a part of maintenance of gene bank. Then used (Fig.8) for fulfilling natural population in target area. The Amphibian fauna found in and around area of Krishna and koyna rivers refer to *Uperodon systema*, *Duttaphrynus melanostictus*, Purple balloon frog, *Euphlyctis cyanophlyctis*, *Ramanella* sp and *Polypedates* sp.

### DNA Clubs :

DNA clubs for amphibians have been maintained for their protection and conservation in centers like SGM,

Karad. Theoretical approaches have been demonstrated in common people and college students.

Figure-1. *Uperodon systema*



Figure-2. *Duttaphrynus melanostictus*



Figure-3. Purple balloon frog



### Establishment of farming centers by farmers (Figure-10):

Since amphibians are very potential biocontrol agents of insect pests in various crop systems including Paddy and Sugar cane. Amphibian farming centres were established along the bank of rivers Koyna & Krishna in Satara (Fig.9) both in forest and plaine parts which encouraged the population of amphibians

specially Toads, Uperodon and Rana which were found useful for insect pest control in the region.

**Figure-4. *Euphlyctis cyanophlyctis***



**Figure-5. *Ramanella sp***



**Figure-6. *Polypedates sp.***



#### **Removal of harmful grasses or animals :**

Harmful grasses and predator animals of amphibians have been removed from the habitats of amphibians from river sides of Satara district from time to time leading to increase the population of *Toad*, *Rana* and *Uperodon* and other amphibians and suppression of insect pests in paddy fields especially with toads.

#### **Community conservation centres :**

Community conservation centre have been started by the people for awareness and actual participation in conservation of protection of amphibians. A mass participation of community in exhibition programmes has been noted in study area.

#### **Centre of conservation and protection by Local Community :**

A very good response was achieved by local community for protection and conservation of amphibians in such Centre's and Centre's were found to be popular knowledge resource Centre's for amphibians.

#### **Tribal population efforts :**

The awareness programme for tribal population was started leading to protection, conservation and utilization of amphibians for the betterment of humans and environment in study area. About 10% tribal population is living in the fields and are largely associated with forestry which responded positively in the programme.

#### **Student efforts :**

Habitat protection and conservation programmes was carried out at various places of river banks of Satara district with the help of college students at fortnightly. Students actively participated in these programmes and acquired good knowledge about amphibian group of animals and their role in environment. Protection of natural habitats and construction of new artificial habitats have been made through college students.

#### **Use of mechanical (light) source :**

At night, a very large number of insects were attracted to light. Such insects were very good diet for frogs. Therefore, light sources have been used for fulfilling the diet of amphibians at night at various habitats of amphibians from river side of Satara district which has increased the population of amphibians and protected various crops from insect damage in the study area.

#### **Habitat protection (Figure-7):**

Amphibians breeding habitats have been located on the bank of Koyna and Krishna river study spots and have been protected from destruction from man and other animals and natural forces like rain, flooding, wind etc. For protection of habitats and soil irrosions, plantation programmes have been adopted.

#### **Provision of mate :**

In adverse conditions sex ratio (male : female) is imbalanced. It should at least 1:1 for production of appropriate number of females. Therefore, provision of additional mates have been made at various study centres which resulted in increase of toad populations.

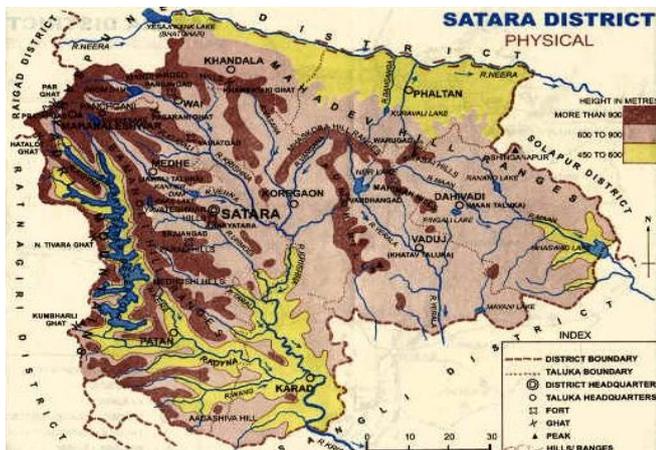
**Figure-7. Habitat protection**



**Figure-8. Release of froglet**



**Figure-9. Koyna and Krishna rivers**



**Figure-10. Habitat manipulation**



**Figure-11. Breeding tanks for frogs**



**Provision of food :**

In natural habitat when there was scarcity of food, additional food to amphibian have been provided by providing insects. Amphibians largely subsists on insect diet. Use of light sources provided sizable insects to amphibians.

**Diseases :**

Amphibians were infected with certain protozoans, helminth and nematode parasites. Therefore, the survey and resurvey of parasitoids is essential part.

**Predators :**

Amphibians were predated from some reptiles such as snakes, and many small mammals like dogs, wolf etc. The amphibians were protected from predators by driving outside the habitat.

**Utilization of Amphibians :**

1. Amphibians are very good source for biological investigations since they live both, in aquatic and terrestrial ecosystems. Their physiology, embryology and molecular biology etc. are important component of biological knowledge.

2. Amphibians specially frogs and toads largely subsists on insect diet throughout the year and act as very potential biocontrol agents of many notorious insect pests of crop plants. Their role as biocontrolling agents of insect pests has undoubtedly great significance in pest management. Since pesticides lead several problems namely,

- i) Air, water, soil pollution.
- ii) Health hazards
- iii) Killing of insects like predators & parasitoids which act as biocontrol agents of insect pests.
- iv) Killing of honey bees and other pollinating insects which have a crucial role in increase of yield of the crops.
- v) Pest resistance
- vi) Pest resurgence
- vii) Secondary pest outbreak etc.

## DISCUSSION

The massive growth of human population and industrial development has rapidly destroyed world's natural resources due to over increasing demand. This has led to a very serious crisis for the natural environment and all the species of amphibians and other animals and plants. Some 1000 species of vertebrates and unestimated number of invertebrates today are threatened with extinction (Wheater *et al.*, 1993). Much can be done establishing and managing protected areas. According to Chakravarty and Sandhu (2003) there are many species whose natural habitats have already been depleted or destroyed. Hence, it is necessary to preserve all adequate samples of all major natural comities. Amphibians are at very high risk, they should be conserved and protected on priority basis. More the habitat destruction more the number of endangered species. In western Maharashtra including Satara and Western Ghats there are several water bodies and land ecosystems which are quite favourable for amphibians. Therefore, ban on amphibians (frogs) will not be the solution for endangered species but effective encouragement through In-situ and ex-situ conservation and protection will definitely solve the problem of endangered and critically endangered species. Their mass multiplication will certainly help for their utility in biological insect pest control as ecofriendly approach of pest management (Sathe, 2014).

Ex-situ conservation is aimed to multiply the species those are highly endangered or threatened with immediate extinction, in captivity and reintroducing them in their original habitat will be extremely helpful for protecting diversity (IUCN, 1980). According to Frankel and Soule (1981) almost all long lasting natural populations of wild animals are large to very large displaying a very high degree of variability in phenotype and in internal characters such as blood groups, enzymes and immune or defense system. Such variability is largely hereditary (Ryder *et al.*, 1981). Ex-situ populations are much smaller and live in conditions

different from those in their natural habitats and susceptible to random processes, subject to danger of inbreeding through the breeding of close relative and face a risk of unnatural selection pressure. However, ex-situ population may have adverse effects on population such as - inability to mate, inability to rear young, inability to hunt or forage, inability to escape from predators and loss of fear of man.

### Choice for ex-situ conservation :

- i) First choice is given to critically endangered species.
- ii) Those species in which husbandary and reproduction are well known.
- iii) The species which is having founder stock.
- iv) The species which play key role in habitat.
- v) The species of high taxonomic uniqueness.

Amphibian group of vertebrate animals is facing more difficulties on the earth than other groups both in aquatic and land habitat and are at high risk of endangeredness. Food, mate and shelter are the basic needs of organism (Londhe & Sathe, 2015; Kavane & Sathe 2015, Sathe 2015). Providing these basic needs Amphibians can be conserved.

Conservation, protection and utilization of amphibians can influenced by the basic needs. Hence, the present work will add great relevance.

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## Conflict of Interests

Authors declare that there is no conflict of interests regarding the publication of this paper.

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