

# THE STUDY OF AMPHIBIAN FAUNA AND MORPHOLOGICAL CHARACTERS OF FAMILY: RANIDAE (THE TRUE FROGS) IN INDIA

<sup>1</sup>Dr.S.V.Subba Reddy, <sup>2</sup>Dr.M.Sudhakara Reddy, <sup>3</sup>Dr.M.Muniya Naik, <sup>4</sup>Dr.A. Jayasankar, <sup>5</sup>V .Uday Kiran, <sup>6</sup>P.Sandhya<sup>7</sup> Dr.R.Sivasankar

<sup>1,2,5,6,7</sup>Dept. of Zoology, Loyola Degree College, Pulivendula. A.P

<sup>3</sup>S.G.Govt.Degree College, Piler, Chittoor (Dt), A.P

<sup>4</sup>P.V.K.N.Govt.College, Chittoor (Dt), A.P

## ABSTRACT

Amphibian studies in India have traditionally focused on survey and taxonomy. Widely read Indian Journals that carried articles on amphibians during the past were the journal of the Bombay Natural History Society, current sciences, Science and culture and the periodicals of Zoological Survey of India. While most of these journals continue to dedicate some of their pages to reporting amphibian research in India. there are a number of popular magazines (horn bill, Sanctuary, Environ) that carry articles on amphibians from time to time. All these periodicals have together added considerably to our knowledge of amphibian distribution, taxonomy, food, breeding and metamorphosis, ecology (to a limited extent) and vocalization. The most important function of amphibians in nature has been grossly underestimated. While on the one hand they are active predators, on other hand they constitute a vital link in the food chain of life by serving as prey base for apex predators in the ecosystem. A total of 10 families are represented among Indian amphibians of which family Ranidae is most represented followed by *Rana tigrina*, *Rana hexadactyla*, *Rana cyanophlycits* and *Rana limncharis* (Cricket frog). In general, studies on the amphibians are very important.

**Key Words:** Amphibian fauna, Morphological characters, *Rana tigrina*, *Rana hexadactyla*, *Rana cyanophlycits* and *Rana limncharis* .

## INTRODUCTION:

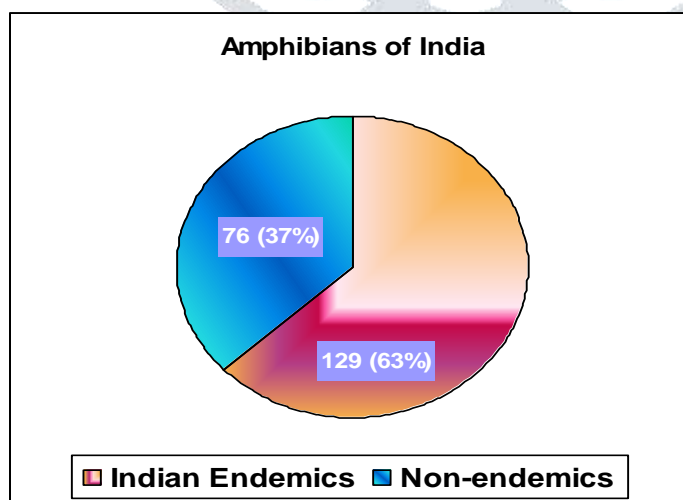
The Amphibians originated about 300 million years ago in the Devonian Period of Palaeozoic era. They were flourished in the Carboniferous period which was the age of Amphibians. They occupy an intermediate position in vertebrata phylogeny. They were neither fully aquatic nor fully terrestrial, but show a sort of compromise of the two environments. On the one hand they were an advance on the relatively primitive fish from which they were derived, and, on the other hand, they rank lower on the evolutionary scale than their descendents, the amniotes. Nobel described Amphibia as “cold blooded vertebrates having smooth or rough skin rich in glands which keeps it moist. If scales are present they are hidden in the skin”.( Stebbins *et al.*,1995).

The range of topography, climate and vegetation encountered in India is clearly reflected by the rich biodiversity of its fauna, including that of class Amphibia. The imperative need to add more information to the biosystematics of fauna and flora of Western Ghats has also been emphasized at the 1993 Indo – British workshop on Biodiversities held at Bangalore (*Zoos Print*, 1998). Because the Western Ghats are considered to have the richest diversity of amphibian species in the whole tropical Asia (*Krishnamurthy and Sakuntala*, 1993).

The amphibian fauna of India consists of 205 species. These include one Salamander (Caudata), about 20 Caecilians (Gymnophiana) and a little over 180 species of frogs and toads (Anura). General consensus is that there are more species in Peninsular India – many being endemic to the Western Ghats i.e. nearly 129 (63%) and 76 (37%) are non-endemics (*Zoos print*, 1998).

Amongst the tropical and third world countries, India are certainly the most privileged when we consider the state of natural history studies. The long history of biodiversity inventorying in the country has yielded a remarkable amount of data in the form of published literature, museum collections and currently in a variety of electronic media too. While quality of such forms of data is not equally good across the wide spectrum of India's biodiversity, information available on Indian Amphibians is reasonably complete.

Animals, the silent sentinels, stand watch over the world's environmental health. Every day, animals demonstrate intricate connections between them, us and surroundings. *O'Brien* (1993) defined animals as indicators or sentinels. Sentinels are “organisms whose known characteristics can be measured to assess the extent of environmental implications and to provide early warning to those implications.



**Number of Indian Amphibians = 205**

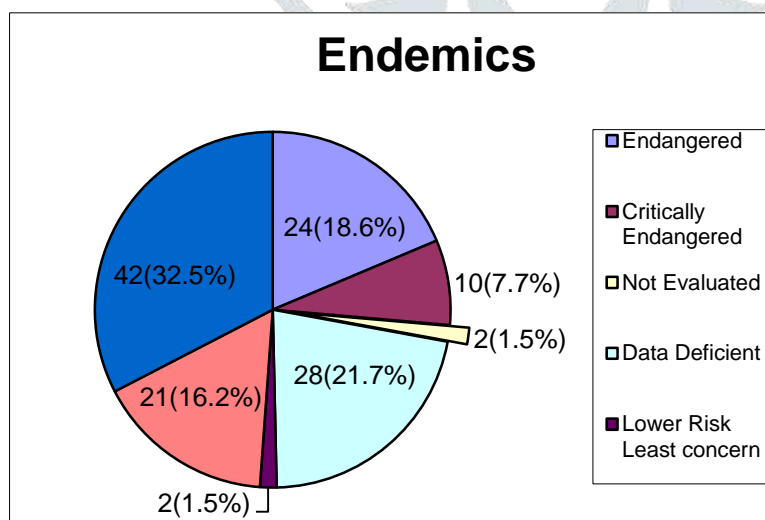
**Table I:** Status of assessed Amphibians in India

Category	Endemic	Non-Endemic
1. Extinct (Ex)	- 0 -	-0-
2. Extinct in the wild (EW)	- 0-	-0-
3. Critically Endangered (CR)	10	-0-
4. Endangered (EN)	24	18
5. Vulnerable (VU)	42	4
6. Lower Risk – near threatened (LR-nt)	21	36
7. Lower Risk – least concern (LR – lc)	2	6
8. Lower Risk – conservation dependent (LR – cd)	- 0-	-0-
9. Data deficient (DD)	28	11
10. Not evaluated	2	1
<b>Total</b>	<b>129</b>	<b>76</b>

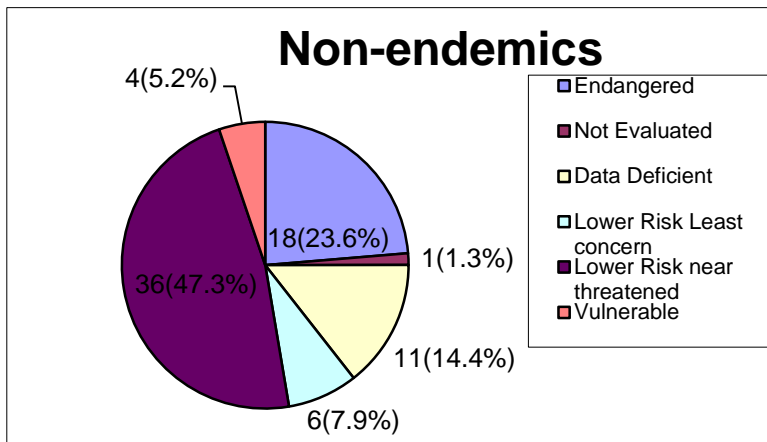
**Source:** Subbareddy S.V. (2007)

Amphibian studies in India have traditionally focused on surveys and taxonomy. In the past many European and Indian naturalists, chief amongst them being, G.A. Boulenger, Charles Mc Cann, C.R.N. Rao and B.R. Sesachar and Bombay Natural History Society contributed immensely to Amphibian survey and taxonomy. However, after independence such studies were more or less the sole concern of the Zoological Survey of India.

### Status of Amphibians in India



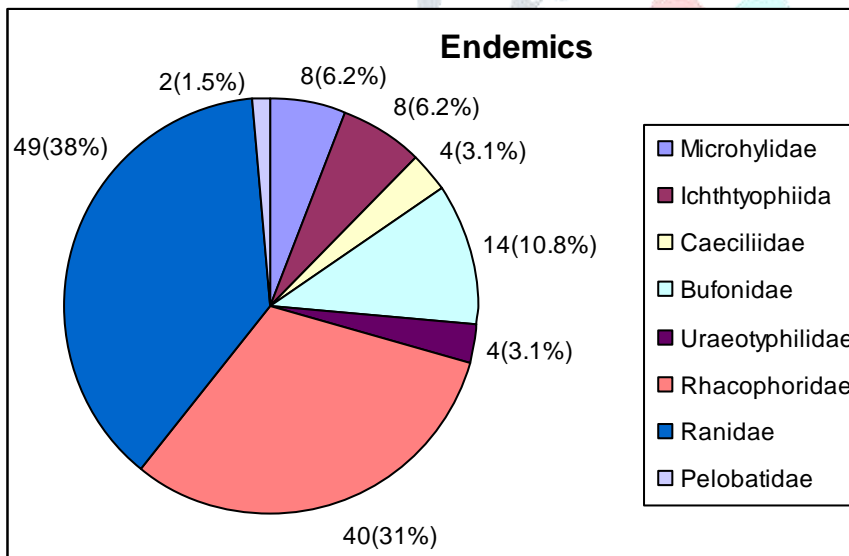
**Number of Indian endemics = 129**

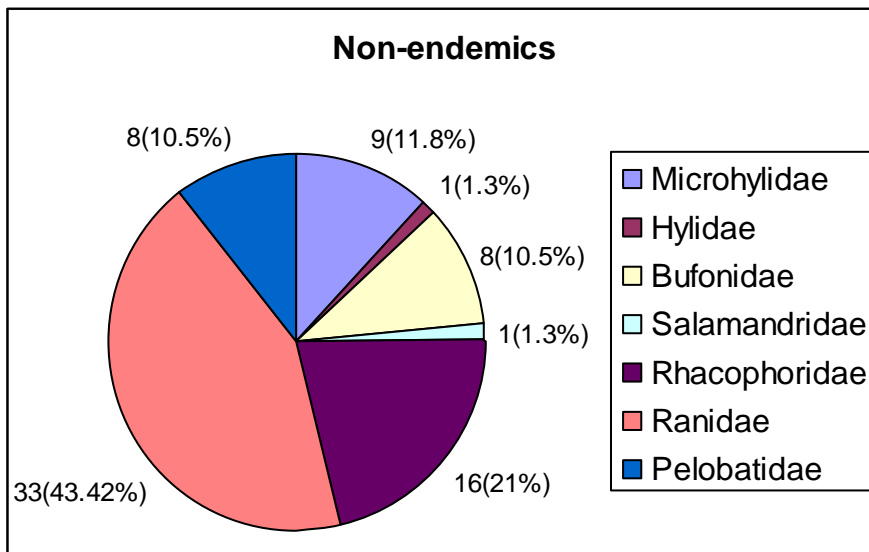


**Number of non-endemics = 76**

A total of ten families are represented among Indian Amphibians of which family Ranidae is the most represented followed by Rhacophoridae and Bufonidae. One taxon each represents families Hylidae and Salamandridae (both are non-endemics).

### Families of Amphibians represented in India





**Source:** Subbareddy S.V. (2007)

But distribution of frogs disrupts the ecological balance and increases incidence of pest outbreaks, necessitating the use of poisonous pesticides. The millions of frog legs that are slaughtered every year would have consumed several hundred thousand tonnes of insects and saved a great deal more than Rs. 10 crores in pesticides use and several times more in available ecological disruption where the costs are incalculably higher (Vijaya Joseph and Jayantha Rao, 1987;1990;1991a).

Subject to authors opinion, amphibian fauna of India consists of 200 – 205 species. These include one Salamander (Caudate), 20 about Caecillians (Gymnophiana) and a little over 180 species of frogs and toads (Anura). They are nearly 129 (63%) are endemics and 76 (37%) are non-endemics in India (Zoos print, 1998).

## **MATERIALS AND METHODS:**

### **Procurement of the experimental animals:**

Collections were made either during late evening, nights or early hours of the day. The habitats surveyed ranged from agricultural fields through semi-evergreen and low-altitude evergreen forests to high elevation evergreen forests of the area. During each collection, all aquatic, semi-aquatic, terrestrial and arboreal habitats were intensively searched for the presence of amphibians. Care also taken to search remote microhabitats, such as rock crevices, areas covered by butterflies, leaf litter, fallen and decaying wood, shrub-root basis and temporary water bodies formed during monsoons. At every collection, only a sub sample of each new species seen was preserved in formaldehyde for identification. The remaining frogs after collection were examined for



morphological structures in both males and females. Then they were released into their respective natural habitats.

### **Maintenance of frog**

Healthy frogs, weighing  $50 \pm 3$  gms were collected from the pond, acclimated to the laboratory conditions in large glass aquaria with water (Temperature  $27 \pm 2^\circ\text{C}$ ;  $\text{P}^{\text{H}}$   $7.0 \pm 0.2$ , light period – 12 hours) for 7 days. They were fed with cockroaches and earthworms *ad libitum*, with change of water daily.

## **RESULTS AND DISCUSSION:**

### **FAMILY: RANIDAE (THE TRUE FROGS)**

Ranids are slender, narrow-waisted frogs with a smooth and slimy skin, upper toothed jaw, long bifid tongue, horizontal pupil, long legs and broadly webbed pointed toes. They are characterized by the absence of an additional cartilaginous segment between the ultimate and penultimate toe segment. Most are aquatic or semi-aquatic. There are also arboreal species of true frogs, and the family includes some of the very few amphibians that can live in brackish water. (CAI, HONG-XIA ET AL., 2007)

The family includes 47 genera and 667 species world wide. Nine genera and 83 species occur in India, of which the genus *Rana* is by far the largest consisting 47 species. There are seven species of *Rana* found in and around Tirupati and some part of Andhra Pradesh.

***Rana tigrina* or *Rana tigerina* Daudin:-** It belongs to Phylum - Chordata ; Sub-Class – Lissamphibia ; Order – Anura and Family – Ranidae. Now it is referred as “*Limnoectes tigerinus*”. It is commonly called as “Indian Bull Frog” (Fugler, Charles M.; 1985). It is common throughout South India. They are semi-aquatic, good swimmers and hide among grasses, bushes and hollows at the edge of the ponds, ditches and canals. Females are larger in size. Males are smaller than females. The body color is olive green with leopard like spots and a median vertebral stripe runs from the tip of the snout to the cloaca. Head is as long as broad. The snout is somewhat pointed and projects beyond the mouth. Nostril is almost equidistant from the tip of the snout and the eye. Ear drum is distinct nearly equal to the diameter of the eye. Fingers are without webs, the first finger is longer than the second. Tip of fingers and toes is longer than the second. Tips of fingers and toes are not sharply pointed. Toes are fully webbed but the web does not reach the tip of the third toe. The fifth toe is with an outer fringe of web. Joints between the segments of the fingers and toes are not very prominent. Inner pedal tubercle is short and blunt. Outer pedal tubercle is absent. The lower side is smooth with no porous warts on

the flanks. A skin fold runs from behind the eye to the shoulder. They are more active at night, though it is usually found in daytime (Plate 1.1 Fig. A & B).

#### LEGEND FOR PLATE 1.1, *Rana tigrina*



**Fig. A: Dorsal view**



**Fig. B: Ventral view**

***Rana hexadactyla* Lesson:-** I It belongs to Phylum - Chordata ; Class – Amphibia: Sub-Class – Lissamphibia ; Order – Anura and Family – Ranidae. It is commonly called as “The Green Frog or Pond Frog”. (Dutta *et al.*, 2004). Now it is referred as “*Occidozyga hexadactyla*”. It is common in South India. This frog is generally found floating in the old ponds with floating green aquatic vegetation like *Wolfia*, *Pistia* and *Lemna* grow abundantly in which it can hide properly to protect itself from the predators. The female is larger in size than male. The body color is bright grass green with or without pale yellow vertebral stripe from snout to cloaca. Head is almost as long as broad. Snout is flat and rounded, hardly projecting beyond the mouth. Nostril is nearer to the tip of the snout than the eye. Ear drum is distinct, nearly equal to the diameter of the eye. Longitudinal folds are absent on the back of the body surface. Fingers are without webs. The first finger is longer than or equal to the second. Tips of the fingers and toes are pointed. Toes are fully webbed. An elongated and digit like, pointed inner pedal tubercle is present, hence the species name *hexadactyla* (six digits). Outer pedal tubercle is absent. Skin is smooth above. Two rows of large porous warts are present on the flanks. They are more active during night time, when they probably come in search of food

(Plate 1.2 Fig. A & B).

**LEGEND FOR PLATE 1.2, *Rana hexadactyla***



**Fig. A: Dorsal view**



**Fig. B: Ventral view**

***Rana cyanophlyctis* Schneider:-** It belongs to Phylum - Chordata ; Class – Amphibia; Sub-Class – Lissamphibia ; Order – Anura and Family – Ranidae. It is commonly called as “Skipping frog” (Frost, Darrel R ; 2016). Now it is referred as “*Occidozyga cyanophlyctis*”. It is a common South Indian species. It is found in most of the ponds, ditches and other water bodies in and around Tirupati. These are medium sized frogs. Females are larger than males. The color of the body is either grey or Olive green with darker rounded spots on the back and stripes on the limbs. The belly is white with black spots. Head is broader than long. Snout is rounded. Nostril is equidistant from the tip of the snout and the eye. Ear drum is distinct, nearly equal to the diameter of the eye. Fingers are without webs, the first finger is equal to the second. Tips of the fingers are pointed. Joints between the segments of the fingers and toes are less prominent. Toes are fully webbed. Tips of the toes are swollen and rounded. A pointed toe like inner pedal tubercle is present. Outer pedal tubercle is absent. Small warts are present on the upper side. Glandular longitudinal folds are absent on the back but a prominent skin fold runs from behind the eye to the shoulder. Belly is smooth with a single row of porous warts on each flank. They float passively in water with only the nostrils projecting above the surface but when disturbed, can skip smoothly over the water for some distance and then float above surface with the hind legs held parallelly



(Plate 1.3 Fig.A & B).

LEGEND FOR PLATE 1.3, *Rana cyanophlyctis*



**Fig. A: Dorsal view**

**Fig. B: Ventral view**

***Rana limnocharis***:- It belongs to Phylum - Chordata ; Class - Amphibia ; Sub-Class – Lissamphibia ; Order – Anura and Family – Ranidae. It is commonly called as “Paddy field frog “. (Frost, Darrel R ;2013). It is widely distributed in south India. This is a common terrestrial frog found in paddy fields and inside bushes near water. They are small medium sized frogs. Head is almost as long as broad. Snout is somewhat pointed and projects beyond the mouth. Nostril is nearer to the tip of the snout than the eye. Ear drum is distinct. Fingers are without webs, the first finger is longer than the second. Tips of the fingers and toes are swollen but not disc like. Joints between the segments of the fingers and toes are prominent. Toes are half webbed with three segments of the fourth toe free. A distinct oval inner pedal tubercle is present. Outer tubercle is less prominent. A prominent skin fold runs behind the eye to the shoulder. Belly is smooth. The body is olive-brownish or grayish above, usually with distinct darker markings

(Plate 1.4 Fig.A &amp; B).

LEGEND FOR PLATE 1.4, *Rana limncharis***Fig. A: Dorsal view****Fig. B: Ventral view**

***Rana crassa Jerdon***:- It belongs to Phylum - Chordata ; Class – Amphibia ; Sub-Class – Lissamphibia ; Order – Anura and Family – Ranidae. It is commonly called as “Jerdon’s Bull Frog”. South Indian bullfrog (Frost, Darrel R.; 2017). Now it is referred as “*Limnonectes crassus*”. These frogs are terrestrial, burrowing and nocturnal. They may be found during the day time in temporary pools of water during the breeding season. They are moderately large sized flabby – shaped burrowing frog. Head is little broader than long. Snout is pointed and projects beyond the mouth. Nostril is equidistant from the tip of the snout and the eye. Ear drum is distinct. Fingers are without webs. The first finger is longer than the second. Joints between the segments of the fingers and toes are not prominent. Legs are comparatively shorter than those of the bull frog (*Rana tigrina*). Toes are entirely webbed but deeply notched. Tips of the toes are pointed. A highly developed, strongly compressed, shovel-shaped inner pedal tubercle is present. Outer tubercle is absent. Skin of the back and limbs are highly granular with some interrupted warts. Six to fourteen glandular longitudinal folds are present on the back. Belly is smooth. The body color is greenish brown with darker stripes or patches on the back. The lower side is whitish with black spots or deep brown stripes on the throat

(Plate 1.5 A & B).

**LEGEND FOR PLATE 1.5, *Rana crassa* Jerdon**



**Fig. A: Dorsal view**

**Fig. B: Ventral view**

**CONCLUSION:**

Reduction in frog population can cause an increase in the spread of malaria, DENGUE, Encephalitis and other diseases which are carried by insects (Mosquito). Conservation of frogs has been taken up by many organizations. Indian Government had banned the export of frog legs and Indian Board for wild life had recommended that Rana species should be included in Schedule - II, Part-II: of wild life (protection) Act 1972, thus providing frog special status of protection. Conservation action and recommendations made by some Education Working group (Deuti *et al.*, 1998) have given by some suggestions.

1. Popularising Amphibians through television (wild life films depicting Indian Amphibians), cartoon films with animal of “foggy” character, quiz and radio (frog calls).
2. Zoos to exhibit Amphibians and sell stickers, posters, leaflets, Tee-shirts promoting Amphibian protection and conservation and general knowledge of amphibians.
3. Creating awareness among villagers of the ecological importance of Amphibians and their habitats by mass media (television, radio, newspapers) in cropping season.
4. Nature camps to be organised among students to promote “frog watching”.

**ACKNOWLEDGEMENTS:**

The authors thankful to the Department of Zoology Sri Venkateswara University, Tirupathi (A.P) for providing necessary facilities to carryout this work. The authors also thank the Ex-Principal, Prof. K. Jayantho Rao, for their constant Encouragement.

**REFERENCE:**

1. Stebbins, Robert C.; Cohen, Nathan W. (1995). *A Natural History of Amphibians*. Princeton University Press. ISBN 978-0-691-03281-8
2. Deuti, K. Deshpande, S.C. Gupta, R.C and M.R. Yadav (1998): Amphibians of India – Report summary. Zoos print. Volume XIII, No. 12: P: 28-29.
3. Krishnamurthy, S.V and K. Shakuntala (1993): Amphibian fauna of Shingeri Taluk (Chickmagalure district, Karnataka) *J. Indian. Inst. Sci.* 73: 443.
4. Subbareddy S.V. (2007). Survey of Amphibians and impact of Synthetic pyrethroid Fenvalerate on *RANA TIGRINA* (Indian Bull frog). ). Ph.D. Thesis ,Sri Venkateswara University.Tirupathi.
5. O'Brien, D.J., (1993): The use of mammals as sentinels for Human Exposure to toxic Contaminants in the Environment, *Environ. Health Perspect*, 99: 351 – 369.
6. Vijaya Joseph, K and K. Jayantha Rao (1987) : Conservation of frogs an immediate step to a balanced ecosystem. Proc. Natl. Cont. Futurology.
7. Vijaya Joseph, K and K. Jayantha Rao (1990) : Toxic effects of aldrin on histopathology of intestine in the frog. *Rana hexadactyla*. *J. Ecbio.* 2 (2) : 161 – 165.
8. Vijaya Joseph, K and K. Jayantha Rao (1991a) : Protein degradation and related enzyme profiles on a sublethal toxicity of aldrin tissues of *Rana hexadactyla*. *Ecotoxicol. Environ. Safety.* 22 (1) : 32-35.
9. CAI, HONG-XIA; CHE, JING; PANG, JUN-FENG; ZHAO, ER-MI; ZHANG, YA-PING (2007): paraphyly of chinese *amolops* (anura, ranidae) and phylogenetic position of the rare chinese frog, *amolops tormotus*. *Zootaxa* 1531: 49–55
10. Fugler, Charles M. (April 1985). "Proposed management of the Indian bull frog, *Rana tigrina*, exclusive to Bangladesh". *Food and Agricultural Organisation of the United Nations (FAO)*. 1: 40 – via Food and Agricultural Organisation.
11. Deuti, K. Deshpande, S.C. Gupta, R.C and M.R. Yadav (1998): Amphibians of India – Report summary. Zoos print. Volume XIII, No. 12: P: 28-29.
12. Dutta, Sushil; Manamendra-Arachchi, Kelum (2004). "*Euphlyctis hexadactylus*". *The IUCN Red List of Threatened Species*. IUCN.
13. Frost, Darrel R. (2016). "*Euphlyctis cyanophlyctis* (Schneider, 1799)". *Amphibian Species of the World: an Online Reference. Version 6.0*. American Museum of Natural History. Retrieved 24 August 2016.
14. Frost, Darrel R. (2013). "*Fejervarya limnocharis* (Gravenhorst, 1829)". *Amphibian Species of the World 5.6, an Online Reference*. American Museum of Natural History. Retrieved 22 July 2013.
15. Frost, Darrel R. (2017). "*Hoplobatrachus crassus* (Jerdon, 1853)". *Amphibian Species of the World: an Online Reference. Version 6.0*. American Museum of Natural History. Retrieved 6 January 2018.