Bulletin of Environment, Pharmacology and Life Sciences
Bull. Env. Pharmacol. Life Sci., Vol 8 [2] January 2019 : 146-154

Online ISSN 2277-1808
Journal's URL:http://www.bepls.com
CODEN: BEPLAD
Global Impact Factor 0.876
Universal Impact Factor 0.9804
NAAS Rating 4.95

ORIGINAL ARTICLE **OPEN ACCESS**

Study of Anuran diversity of Ranthambore, Hadoti and Tonk regions of Rajasthan

Sarvat Nishat Khan[1] and Saba Khan[2]
1. Institute of Information and Computer technology, Tonk, Rajasthan
2. Biological Sciences Department, Faculty of Science & Art - Rabigh,
King Abdulaziz University (KAU), Saudi Arabia

ABSTRACT
The present study was carried out explore the anuran diversity of Ranthambore, Hadoti and Tonk regions of Rajasthan. Frogs and toads were collected from the study area and were identified by the help of their specific identification features besides using essential laboratory equipments. The species collected were classified as per the standard classification system. A total of eleven anuran species in the Ranthambore, Tonk and Hadoti regions of Rajasthan were identified. These belonged to four families namely, dicroglossidae, bufonidae, microhylidae and rhacophoridae. Family dicroglossidae included Rana hexadactyla, Rana cyanophlyctis, Rana limnocharis, Rana tigrina, Rana breviceps and Rana rolandae. Family bufonidae included Bufo melanositctus Schneider and Bufo andersoni Boulenger. Family microhylidae included Microphyla ornata and Uperdon systoma. Family rhacophoridae included Polypedates maculates.
Keywords: Anuran diversity, Microhylidae, dicroglossidae, bufonidae

Received 12.08.2018 Revised 22.10.2018 Accepted 08.01.2019

INTRODUCTION

Rajasthan is situated in northwest part of India, between the latitude 23°3' and 30°12' N and longitude 69°30' and 78°17'. It experiences a mean annual rainfall of 573mm and temperature ranging from 2 to 46°C. The Aravali range forms the chief topographical feature in Rajasthan, which diagonally bisects the state into 3/5th western arid region and the 2/5th eastern semi arid zone.

Present study, is an attempt to find out the anuran diversity of Ranthambore, Tonk and Hadoti region of Rajasthan state and to correlate their distribution in reference to their habitat pattern.

Study Area

Ranthambore National Park, Tonk and Hadoti region is taken as study area, because till now no systematic studies has yet been done on these parameters of these regions. Only common frogs and toads have been reported in Ranthambore, while in Hadoti region only only 8 species from Kota and Baran region heve been reported so far; namely *Rana tigerina, Rana cyanophylictis, Rana breviceps, Rana limnocharis, Bufo melanostictus, Bufo stomastictus* and *Microhyla ornate* [6]; and *Polypedates masculatus* from Hadoti region [23]. Eleven species have been reported from Tonk tehsil of Tonk district [11].

Ranthambore National Park is one of the largest and most famous national parks in northern India. It is situated in Sawai Madhopur district of southeastern Rajasthan, about 130 km from Jaipur, which is also the nearest airport. Ranthambhore was established as the *Sawai Madhopur Game Sanctuary* in 1955 by the Government of India, and was declared one of the Project Tiger reserves in 1973. It was declared a national park in 1980. In 1984, the adjacent forests were declared the *Sawai Man Singh Sanctuary and Keladevi Sanctuary*, and in 1991 the tiger reserve was enlarged to include Sawai Man Singh and Keladevi sanctuaries.

The park lies at the edge of a plateau, and is bounded to the north by the Banas River and to the south by the Chambal River. There are several lakes in the park. It is named for the historic Ranthambhore fortress, which lies within the national park. The park covers an area of 392 km^2, and is famous for its tiger population, and is one of India's Project Tiger reserves. Other major wild animals include the tiger, leopard, nilgai, dhole, wild boar, sambar, hyena, sloth bear and chital. It is also home to wide variety of trees, plants, amphibians, birds and reptiles.

Four high rainfall districts of south-eastern Rajasthan, namely Kota, Bundi, Baran and Jhalawar are called Hadoti. Hadoti also known as Hadauti, Hadaoli, or Hadavati. It is a region of Rajasthan state in western India. The biggest cities are Bundi and Kota.It includes the districts of Bundi, Baran, Jhalawar and Kota, and is bounded on the west by the Mewar, on the northwest by Ajmer regions of Rajasthan, and on the south by the Malwa, on the east by the Gird regions of Madhya Pradesh state.
Tonk district is situated in between the Jaipur and Kota on the national highway number 12. High fluoride contents in the groundwater is a distinguishing feature of this area, which attract attention to study the effects of high fluoride on the reproductive behaviour of amphibians.

MATERIAL AND METHODS

Frogs and toads were collected from the study area and were identified using essential laboratory equipments like camera and microscopes besides Identification keys and anesthetizing agents. The photographs of adults were taken for identification of different anuran species found in the study area. Easily visible characters, habits and habitat were used in identification of the species. Fine details were observed under microscope and their special features were studied. All species encountered were identified up to species level using the keys of Bossuyt and Dubois [3], Daniels [4].

RESULTS AND DISCUSSION

The results of the present study reveal the presence of eleven anuran species in the Ranthambore, Tonk and Hadoti regions of Rajasthan. These belonged to three families namely, dicroglossidae, bufonidae and microhylidae. Family dicroglossidae included *Rana hexadactyla, Rana cyanophlyctis, Rana limnocharis, Rana tigrina, Rana breviceps* and *Rana rolandae.* Family bufonidae included *Bufo melanositctus* Schneider and *Bufo andersoni* Boulenger. Family microhylidae included *Microphyla ornata* and *Uperdon systoma.* Family rhacophoridae included *Polypedates maculates.*

(A) Rana hexadactyla Lesson

Rana hexadactyla lesson is also known as euphlyctis hexadactylus, green skin Frog or five finger frogs
Kingdom : animalia
Phylum : chordate
Class : amphibua
Order : anura
Family : dicroglossidae
Genus : rana
Species:hexadactylus

Distribution

The *Rana hexadactyla lessonis* mostly found in jaipur districts.

Remarks

a) It have finger slender, first extending a little beyond second, toes webbed to the tips, fourth toe not very much longer than third or fifth
b) Inner metatarsal tubercles are small and there are no outer tubercles
c) Male with two external vocal vesicles

Fig 1: **Rana hexadactyla Lesson**

(B) *Rana cyanophlyctis* Schneider

Rana cyanophlyctis Schneideris also known as Indian skipper frog or skittering frog.
Kingdom : animalia
Phylum : chordata
Class : amphibua
Order : anura

Family : dicroglossidae
Genus : rana
Species : cyanophlyctis

Distribution
Rana cyanophlyctis Schneideris mostly found in districts of Barmer, ganganagar, udaipur, sirohi, jaisalmer, jodhpur, nagaur, Pali, sikar, ajmer, Jaipur.

Fig 2: *Rana cyanophlyctis* Schneideris

Remarks
a) Male Rana cyanophlyctis Schneider's length is 52 – 61 mmand the female's length is 50 – 70 mm
b) They are leave in water and rarely seen outside of the water
c) They have the ability to leap out of the water from a floating position
d) Fingers are slender and pointed
e) Head moderate
f) Interorbital space much narrower than the upper eyelid
g) Subarticular tuberclessmall
h) The skin is brown or olive above, dark spotted or marbled , two blackish streaks on the hinder side
i) Seldom absent beneath often speckled with blackish.
j) Specimens from Udaipur districts are reddish brown and from Nagaur districts are olive
k) Skin with small tubercles distinct rows of pores.

(C) Rana limnocharis wiegmann
Rana limnocharis wiegmann is also known as crab eating frog or fejervarya frog.

Fig 3: *Rana limnocharis*

Kingdom : Animalia
Phylum : Chordata
Class : amphibia
Order : anura
Family : dicroglossidae
Genus : Rana
Species : limnocharis

Distribution

Rana limnocharis wiegmann is mostly found in districts of jaipur, Udaipur, pali, nagaur, sirohi.

Remarks

a) Rana limnocharis wiegmann's largest size is 24 mm.
b) Crab eating frog can thrive in brackish water, and its tadpoles can even survive in pure seawater.
c) They got dark browneass skin.

(D) Rana tigrina Daudin

Rana tigrina daudin is also known as hoplobatrachus tigerinus.

Fig 4: *Rana tigrina*

Kingdom : Animalia
Phylum : Chordata
Class : Amphibua
Order : Anura
Family : dicroglossidae
Genus : Rana
Species : tigerinus

Distribution

Rana tigrina tigrina daudin is mostly found in districts of nagaur, Udaipur, jaipur, ganganagar.

Remarks

a) Rana tigrina is solitary and nocturnal in nature
b) They prefer freshwater wetlands and aquatic habitats
c) Yellowish color in most specimens and other gets green
d) Skin with dark spots disposed in longitudinal series on back , lower parts white
e) Toes entirely webbed, inner metatarsal tubercle not digit form but compressed and large
f) Head moderate

(E) Rana breviceps Schneider

Rana breviceps Schneider is also known as sphaerotheca frog or breviceps frog

Fig 5: *Rana breviceps*

Kingdom : animalia
Phylum : chordata
Class : amphibua
Order : anura
Family : dicroglossidae
Genus : rana
Species : tigerinus

Distribution

Rana breviceps Schneider mostly found in districts of jodhpur, Udaipurand Nagaur.

Remarks

a) Rana breviceps Schneider's male got length is 63 mm and female got 44 mm.
b) They mostly got yellow color and other got brown color.
c) The specimen from Jodhpur is green above and the other one from Udaipur is brown.
d) A yellow vertebral streak is present in the specimen from jodhpur.
e) Skin with longitudinal folds in both the specimens.

(F) Sphaerotheca rolandae

Fig 6: *Rana breviceps*

Kingdom : Animalia
Phylum : Chordata
Class : Amphibua
Order : anura
Family : dicroglossidae
Genus : Sphaerotheca
Species : rolandae

Distribution

This species is widely distributed over much of India and Sri Lanka. It is present from sea level up to 200m above sea level. It is a largely sub-fossorial species found in loose soil within dry forest, scrubland and agricultural areas. Adults can be found in cracks in mud and inside sand heaps. It is an explosive breeder in temporary monsoon pools.

Remarks

a) Snout-vent length of males: 32-43 mm, females: 34-50 mm.
b) The body is short and stocky.
c) Upper surface light brown or yellow, marbled with dark brown. Interorbital bar black or dark brown.
d) Some specimens with vertical yellow bars on upper lip; yellowish-white line from behind eye and above tympanum to groin.
e) Limbs with cross-bars. Dorsum with or without a white or yellowish vertebral line or band.
f) Vertebrally yellowish white or light brown.
g) Throat of mature males dark bluish-black or blotched in brown.
h) Two vocal sacs.

Family Bufo

The family bufo included *Bufo melanositctus* Schneider and *Bufo andersoni* boulenger

(G) Bufo melanositctus Schneider

Fig 7: ***Bufo melanositctus***

Bufo melanositctus Schneider is also known as duttaphrynus melanostictus or javanese toad
Kingdom : animalia
Phylum : chordata
Class : amphibua

Order : Anura
Family : Bufonidae
Genus : Duttaphrynus
Species : melaanostictus

Distribution

Bufo melanositctus Schneider is mostly found in districts of Sirohi, Udaipur and Jaipur

Remarks

a) *Bufo melanositctus* Schneider's length is 22 – 24 mm
b) The dorsal side is yellow or brown and the spines and ridges are black
c) The underside is unmarked or spotted
d) There is no skin fold along the tarsus
e) The dorsal side is covered with spiny warts
f) The top of the head has several bony ridges there are central ridge , supra orbital and postorbital
g) The ear drum is very distinct and at least as wide as two thirds the diameter of the eye

(H) *Bufo andersoni*

Bufo andersoni is also known as baltistan toad or bufo latastii.

Fig 7: ***Bufo melanositctus***

Kingdom : Animalia
Phylum : Chordata
Class : Amphibia
Order : Anura
Family : Bufonidae
Genus : Bufo
Species : latastii

Distribution

Bufo andersoni is mostly found in districts of Jaipur, Jaisalmer, Jodhpur, Nagaur, Udaipur, Bikaner, Ganganagar

Remarks

a) Bufo andersoni boulenger's length of male is 35 – 78 mm and female is 39 – 91 mm.
b) The parotids are large and fat.
c) They are mostley found in temperate forests , intermittent rivers , freshwater marshes , arable land and ponds.
d) The skin of upper surface with regular flate warts but without spines.
e) They have mostly olive grey color but some specimens have brownish color .
f) Specimens from Nagaur are olive grey and specimens from Jaipur and Udaipur are brown.

Family microhylidae

(I) Microphyla ornata

Microhyla ornata (commonly known as the ornate narrow-mouthed frog, ornate narrow-mouthed toad, or ornamented pygmy frog) is a species of microhylid frog found in South Asia.

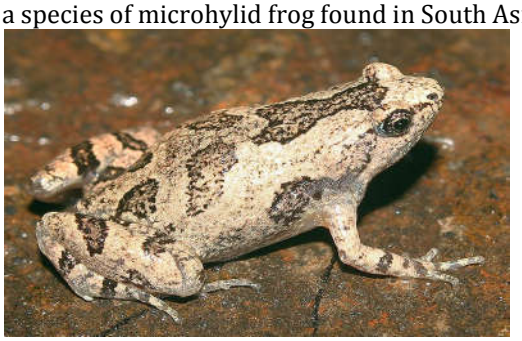

Fig8: *Microphyla ornata*

Kingdom : Animalia
Phylum : Chordata
Class : Amphibia
Order : Anura
Family : Microhylidae
Genus : Microphyla
Species : ornata

Distribution

This amphibian is distributed in Kashmir, Nepal, peninsular India and the Andaman and Nicobar Islands, Sri Lanka, and Bangladesh.

Remarks

a) Frogs of the genus *Microhyla* are small.
b) They can be identified by the typical arrow-shaped mark on their dorsal side.
c) They are generally of yellowish color with dark brown patch.
d) This species has a small head, no teeth and no discernible tympani.
e) The fingertips are spathulate and there is little webbing between the digits.
f) The males do not have nuptial pads.
g) The skin on the back is mainly smooth, but there are some granulations.

(J) Uperodon systoma

Uperodon systoma is a species of narrow-mouthed frog . These frogs have been observed in a number of habitats, such as dry forests, plains, gardens, and agricultural areas.

Fig 9: Uperodon systoma

Phylum : Chordata
Class : amphibia
Order : anura
Family : microhylidae
Genus : uperodon
Species : systoma

Distribution

This amphibian is found in Pakistan, India, Nepal, and Sri Lanka. It is known under many different common names: indistinct frog, marbled balloon frog, and lesser balloon frog.

Remarks

a) As the common names suggest *Uperodon systoma* have a very stout appearance with a relatively small head.
b) They grow up to 64 mm (2.5 in) in snout-vent length.
c) *Uperodon systoma* lack teeth.

Family rhacophoridae

(K) *Polypedates maculates*

Phylum : chordata
Class : amphibia
Order : anura
Family : rhacophoridae
Genus : Polypedates
Species : maculatus

Fig 10: Polypedates maculates

Distribution

It is widespread throughout Bhutan, India, Nepal, and Sri Lanka, as well as western and southern Bangladesh to Chittagong District; its range might also extend into nearby China and Myanmar.

Remarks

a) These frogs measure about 7–8 cm in body length.
b) They are mostly brownish, yellowish, greyish, or whitish above, with darker spots or markings, rarely with an hourglass-shaped figure on the back of the head and the front of the back.
c) The loreal and temporal regions are dark; there is a light line on the upper lip. The hind side of the thighs has round, yellow spots, which are usually separated by a dark-brown or purplish network.
d) The skin is smooth above, and granulated on the belly and under the thighs; a fold extends from the eye to the shoulder. Males have internal vocal sacs.
e) The snout is pointed with a rounded tip, about as long as the diameter of the orbit, the canthus rostralis is distinct, and the loral region is concave.
f) The fingers are barely webbed, and the toes are two-thirds webbed.

The various anuran species show distribution in different parts of India. *Rana tigerina* has been reported from Rajasthan, Orissa, Tamil Nadu, Maharashtra, West Bengal, Madhya Pradesh, Uttar Pradesh, Kerala, Assam, Punjab and Nicobar Islands [13, 14, 16, 8]. The above distribution pattern shows that it is most likely to be distributed all over India. *Rana limnocharis* has been reported from Rajasthan, Orissa, Maharashtra, West Bengal, Madhya Pradesh, Andhra Pradesh, Karnataka, Kerala, Assam and Gujarat [9, 17, 18, 16]. *Rana cyanophlyctis* has been reported from Rajasthan, Orissa, Maharashtra, West Bengal, Madhya Pradesh, Uttar Pradesh, Andhra Pradesh, Gujarat, Karnataka, Kerala and Assam [16, 17, 1, 2]. *Rana hexadactyla* has been reported from Rajasthan, Orissa, Tamil Nadu, Andhra Pradesh, Karnataka, Punjab, Assam, Gujarat, Kerala, Maharashtra and Tripura [8, 12, 10].

Rana breviceps is found in Rajasthan, Orissa, Tamil Nadu, Maharashtra, West Bengal, Karnataka, Kerala, Punjab, Madhya Pradesh and Gujarat [16, 8]. *Rana rolandae* has been reported from Orissa, Tamil Nadu, West Bengal, Madhya Pradesh and Kerala [9]. *Bufo melanostictus* is found in Rajasthan, Orissa, Tamil Nadu, West Bengal, Madhya Pradesh, Uttar Pradesh, Andhra Pradesh, Kerala, Assam and Gujarat [12, 15, 8, 18]. *Bufo andersonii* has been reported from Rajasthan, Orissa, Tamil Nadu and West Bengal [12, 9].

McCann [15] reported 5 species of amphibian fauna *i.e. Bufo melanostictus, Microhyla ornata, Rana cyanophlyctis, R. limnocharis* and *R. tigerina* from Sirohi district of Rajasthan. Later, Mansukhani and Murthy [12] reported 8 species belonging to 3 families of amphibians; they are: *Bufo andersonii* and *B. melanostictus* (of family Bufonidae); *Rana hexadactyla, R. cyanophlyctis, R. limnocharis, R. tigerina* and *R. breviceps* (of family Ranidae); and *Microhyla ornata* (of family Microhylidae). These observations were based on survey reports conducted by Zoological Survey of India during the years from 1941 to 1960.

Several researchers [1, 2, 27, 28, 6, 7, 20, 8] have worked on development biology and the various aspects of amphibian fauna of Rajasthan. Sharma [20] reported *Uperodon systoma* from Jaipur, and *Polypedates maculatus* [21] from Hadoti region. With it, the total number of anuran species reported from Rajasthan has gone to 10. Later, Sharma and Khan [24] added one more species *i.e. Rana rolandae* to the list, and now, the total number of anuran species in Rajasthan is 11. Our results are in concordance with the findings of these authors. Other works done on amphibian fauna of Rajasthan are related to its various aspects like biodiversity, teratology, sonotaxonomy and conservation [19-22, 24, 5].

CONCLUSION

The results of the present study reveal the presence of eleven (11) anuran amphibian species belonging to four different families in the aforementioned regions of Rajasthan. These results may be helpful in devising protective measures for the habitat conservation of these species.

REFERENCES

1. Agarwal, S. K. (1978). Studies on normal ontogenetic development and limb regeneration in an anuran amphibia. Ph.D. Thesis, University of Rajasthan, Jaipur.
2. Agarwal, S.K. and Niazi, I. A. (1977). Normal table of developmental stages of the Indian bull frog *Rana tigerina*. Proc. Nat. Acad. Sci. India, B2: 79-92.
3. Bossuyt, F. and Dubois, A. (2001). A review of the frog genus Philautus Gistel, 1848 (Amphibia, Anura, Ranidae, Rhacophorinae).Zeylanica, 6, 1-112.
4. Daniels, R.J.R. (2005). Amphibians of peninsular India. Universities Press, Hyderabad, pp. 268.
5. Dube, P. (2002). Eco-biological studies of amphibians around south-easteran plateau of Rajasthan. Ph.D. thesis. Maharshi Dayanand Saraswati University, Ajmer.
6. Dube, P. and Sharma, K.K. (2000). Study of amphibian biodiversity as described in Mundak Sukta of Rigveda. Paper presented in National seminar on "New millennium and Vedic Chintan" held on 25-27 Sept. at M.D.S. University, Ajmer.
7. Dube, P. and Sharma, K.K. (2001). Breeding preferences and pH correlation of Amphibians in south-eastern plateau of Rajasthan. Paper presented in National Symposium on status of India's faunistic diversity and environment held on 29-31 Dec. Haridwar, U.P.
8. Dutta, S.K. 1997. Amphibians of India and Sri Lanka. Odyssey Publication House: 1-338.
9. Dutta, S. K. and Routray, N. 1990. First record of *Rana hexadactyla* (Anura: Ranidae) from Orissa, with some comments on their ecology and distribution. Herpeton, 3: 5-6.
10. George, S, Samuel, J.M. and Josekumer, V.S.1996. Survey of the ambhibian fauna of Thattekkad Bird sanctuary Kerala Zoos' Print, 11(5): 7-8
11. Khan, S.N. 2004. Eco-biological and developmental studies of Anuran (Amphibia) biodiversity of some selected fluoride rich areas of Rajasthan. Ph. D. Thesis, M.D.S. Univ., Ajmer (Rajasthan).
12. Mansukhani, M.R. and Murthy, T.S.N. (1970). Fauna of Rajasthan, India, Part 6. Rec. Zool Surv. India, 62 (1-2): 51-60.
13. McCann, C. (1932). Notes on Indian batrachians. J. Bombay Nat. Hist. Soc., 36: 152-180.
14. McCann, C. (1934). Occurrence of the Six-toed frog (*Rana hexadactyala* Lesson) in Bombay Presidency.J. Bombay Nat. Hist. Soc., 37: 742.
15. McCann, C. (1943 a). A " Bushman's Holiday" in the Abu Hills. J. Bombay Nat Hist. Soc., 43(2): 206-217.
16. Ray, P. (1996). Amphibian diversity in and around Tehri Dam site, U.P. India. Zoos' Print, 11(5): 6.
17. Roy, D and Elepfandt, A.(1993). Bioacoustic analysis of frog calls frog north-east India: J. Biosci., 18(3): 381-393.
18. Sarkar, A.K. (1984). Ecological Studies on the amphibia of Gujarat Bull. Zool. Soc. India, 6(1-3): 87-93.
19. Sharma, S.K. (1990). Fauna and Flora of World Forestry Arboretum Jaipur. State Silviculture, Dept. of Forest, Rajasthan: 76.
20. Sharma, S.K. (1992). First record of *Uperodon systoma* from Rajasthan. J. Bombay Nat. Hist. Soc., 89 (1): 133-134.
21. Sharma, S.K. (1995 a). An overview of the amphibians and reptilian fauna of Rajasthan. Flora and Fauna, 1(1): 47-48.
22. Sharma, S.K. (1995b). Amphibians of Phulwari Ki Nal wildlife Sanctuary. J, Bombay Nat. Hist. Soc., 92(21): 271-272.
23. Sharma, S.K. (2005). Distribution of common tree frog *Polypededates masculatus* in Rajasthan. Newsletter of the Declining Amphibian Population Task Force - South Asia, Frog leg, No. 12.
24. Sharma, K.K. and Khan, S.N. (2002). "Amphibian biodiversity of fluoride rich areas of Rajasthan" National Seminar on Biodiversity and Sustainable Use bio resources, Barkatulla University, Bhopal M.P.; p.no. 127.
25. Sharma, K.K., Dube, P, Khan, S.N., Ghatak, S. and Bhobharia Y. (2004). "Amphibian Biodiversity of some specific ecological condition of Rajasthan and conservation strategies". Management of Aquatic resources for biodiversity maintenance and conservation, held in Jodhpur, Rajasthan (Abstract).
26. Sharma, K.K. and Khan, S.N. (2004 a). " Spade Footed Anurans of Rajasthan. " National Seminar of Environmental Management and it's impact on National development organized by Birla College, Kalyan and Society of Science of Environment Maharashtra, pp 29.
27. Shivpal, (1976). The role of thyroid hormone in appendage regeneration in anuran amphibians. Ph.D. Thesis, University of Rajasthan, Jaipur, India.
28. Shivpal and Niazi, I.A. (1979). A table of normal developmental stages of the larvae of the toad *Bufo andersonii* Boulenger. University Studies in Zoology, I: 8-17.

CITATION OF THIS ARTICLE

Sarvat Nishat Khan and Saba Khan. Study of anuran diversity of Ranthambore, Hadoti and Tonk regions of Rajasthan. Bull. Env. Pharmacol. Life Sci., Vol 8 [2] January 2019: 146-154