RESEARCH ARTICLE

Anurans in Polo Reserved Forests of Gujarat state, India: Two New Geographical Records

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Study Area: Sabarkantha district, Gujrat, India .

Coordinates: 23.73° - 24.15° N; 73.1° - 73.4° E

Key words: Amphibian, Sono- taxonomy, Frog, Toad, Morphometry, Habit Classification

Abstract

Anurans are very mysterious fauna of animal kingdom. The current study represents the preliminary checklist of frogs and toads of Polo forest, a reserved forest of north Gujarat, mostly covered by dry deciduous vegetation. Our literature survey revealed that the herpetofauna including anurans is least explored fauna in northern Gujarat except few stray notes and checklist prepared before almost two decades hence there are vital chances in the change in species composition with respect to lesser- known fauna like amphibians. The area was surveyed by line and strip transects as well as visual encounter and sono-taxonomical methods in order to record the presence of anuran species. The study shows ten species of anurans belonging to four families; among which two are newly recorded species in this area. The study can be an initiation to arrange baseline data regarding anuran's checklist, which can be extended to all the herpetofauna and other diversity too. Taxonomy of unidentified anuran species can also be determined in future.

Introduction:

Gujarat is one of the diversified landscaped states of India, which is covered by dry deciduous forest in north, west and eastern parts, moist deciduous forest from the southern part, coastal belt in the west and desert covering from north to western edge (Champion & Seth, 1968). Anuran fauna is ever supposed as tremendous but mysterious fauna. Amphibians belong to the superclass Tetrapoda. Class amphibia classified into three orders viz. apoda, anura and urodela (Boulenger, 1890; Daniel & Sekar, 1989; Dutta, 1997).

The current study depicts the status of anurans (frogs and toads) in Polo forest of Sabarkantha district, Gujarat state. Polo is one of the most cash forests with a higher amount of timber vegetation, which has some very good patches of *Tectona grandis* and many other timber plants. The study area is having a good population of amphibians due to Vanaj irrigation dam in the central part of the forest. It is famous tourism destination due to its archaeological importance. Sarkar (1984), Naik & Vinod (1993), Sarkar & Ray (2000) were the pioneer of describing the anurans of north Gujarat including Sabarkantha. After Sarkar & Ray (2000), a very long gap made us more enthusiast towards the inventory of anurans checklist. Variations among

species population could be based on temporal changes (Hanski, 1982). The present research will provide the baseline information on the anurans in the study area and fill the gap of information as well as give direction for future research on herpetofauna in the study area. We have documented ten species of amphibians, including two toads and eight frogs among which two were considered as a new record from this area.

Methodology:

The study area is located in the north-eastern part of Gujarat state, Sabarkantha district a wildlife division. The forest covers approximately 400km² of the area. The area was surveyed in core and buffer zone of the forest with around 600 km² of dry deciduous vegetation. The study area is entitled as reserved forest (Rodgers *et al.*, 2000), which shares one boundary with Fulwari ki naal wildlife sanctuary of Rajasthan state.

It is a preliminary work carried out during our field survey for sloth bear occurrence through strip transects during which the amphibians were also been recorded through visual encounters. Moreover, we also used sono-taxonomical methods to locate the anurans (Sharma, 2015).

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The study area was divided into 30 grids of 25 km² (Fig.-1). Each grid was surveyed with minimum two feet transects during monsoon and post-monsoon season of the year 2016 (Dharaiya, 2009). Our current work is going on sloth bear habitat distribution and ecology, for that we collected GPS points of signs of sloth bear in the study area. In sono- taxonomical method, the call of anuran was recorded at maximum frequency and the behaviour of calling pattern and vocal expressions were recorded (Dutta, 2015). The visual encounter was performed as opportunistic sampling during the field surveys. Further, GPS locations were also recorded to generate the spatial information.

The anuran species were identified using the standard references (Boulenger, 1890; Daniel & Sekar, 1989; Dutta, 1997; Dutta, 2015). However, the individuals not properly identified were captured to record the morphometric characters and then released without harming them.

Results and Discussion:

All the species recorded are least concern according to the IUCN red list status. The population trend of most of the anuran recorded found stable except *Duttaphrynus melanostictus* (Schneider, 1799) is increasing.

Total ten species belonging to eight genera from four different families viz. Bufonidae, Dicroglossidae, Microhylidae, Rhacophoridae were recorded during the study (Fig.-2). In updating to the previous list of eight species from north Gujarat recorded by Sarkar (1984), two new species viz. *Polypedates maculatus* (Gray 1830) and *Uperodon systoma* (Schneider, 1799) are described with their morphometrics (Table-2). The morphometric measurements were carried out as described by (Jamdar et

al., 2010; Nair & Kumar, 2013; Chowdhary et al., 2014; Hazra, 2016). The Figure-3 depicts that out of all the species recorded, four were aquatic, three were the land dweller, three were diggers and one was the climber on the bases of their habit and habitat. It was also observed that the amphibian fauna are facing a significant threat of anthropogenic activities like other wildlife. We found several road kills of amphibians particularly anurans during our field work.

Six anuran species was recorded by Naik & Vinod (1993) including *Bufo melanostictus* (Schneider, 1799), *Bufo stomaticus* (Lütken, 1864), *Rana cyanophlictis* (Schneider 1799), *Rana hexadactyla* (Lesson, 1834), *Rana tigerina* (Daudin, 1803) and *Rana limnocharis* (Gravenhorst, 1829) from the north Gujarat region. Sarkar & Ray (2000) have added two more species (*Microhyla ornata* Dumeril & Bibron, 1841 and *Rana breviceps* Schneider, 1799) for the same region. Both of the newly recorded species *Polypedates maculatus* (Gray, 1830) and *Uperodon systoma* (Schneider, 1799) are endemic to Indian subcontinent only. *Polypedates maculatus* (Gray, 1830) is widely distributed in Gujarat state. Previously this species has been recorded from Jambughoda Wildlife Sanctuary (Panchmahal), Vansda National Park (Navsari), Ratanmahal Wildlife Sanctuary (Dahod) in Gujarat state as well as Udaipur, Sirohi, Dungarpur and Banswara districts of Rajasthan (Sharma, 1999; Vyas, 1999; Vyas, 2004a; Vyas, 2004b; Sharma & Mehra, 2007). *Uperodon systoma* (Schneider, 1799) is recorded only from south Gujarat, however, it was recorded from several parts of Rajasthan states (Sharma, 1999; Sharma & Mehra, 2007).

Figure-1: Map of Study area with locations from where the anurans were recorded

Figure-2: Familywise number of species recorded

Figure 3: Classification of the species on the basis of their habit

Out of 18 species of anurans recorded from entire Gujarat (McCann, 1938; Sarkar & Ray, 2000; Vyas, 2004c; Vyas, 2012), we recorded ten from the Polo forest. Although our observation suggests that the area should be surveyed with special emphasis on herpetofauna may enrich the current checklist and provide baseline information for species specific conservation strategies.

Table-1: Checklist of anurans in Polo forest with two new records

No.	Common Name/ Group/Family	Scientific Name/ IUCN Status	References (Figure)
1	Common Asian Toad/ Toad/ Bufonidae	<i>Duttaphrynus melanostictus</i> /LC	Naik & Vinod, 1993 (Fig.- 4a)
2.	Indian Marbled Toad Toad/ Bufonidae	<i>Duttaphrynus stomaticus</i> /LC	Sarkar, 1984; Naik & Vinod, 1993 (Fig.- 4b)
3.	Indian Skipper Frog Frog/Dicoglossidae	<i>Euphlectis cyanophlectis</i> /LC	Sarkar, 1984; Naik & Vinod, 1993 (Fig.- 4c)
4.	Indian Green Frog Frog/Dicoglossidae	<i>Euphlectis hexadactyla</i> /LC	Naik & Vinod, 1993
5.	Indian Cricket Frog Frog/Dicoglossidae	<i>Fajervarya</i> sp.	Sarkar, 1984 (Fig. 4d)
6.	Asian Bull Frog Frog/Dicoglossidae	<i>Hoplobatrachus tigerinus</i> /LC	Sarkar, 1984; Naik & Vinod, 1993 (Fig.- 4e)
7.	Indian Burrowing Frog Frog/Dicoglossidae	<i>Sphaerotheca brevipes</i>	Naik & Vinod, 1993 (Fig.- 4f)
8.	Ornate Narrow Mouthed Frog/Frog/Microhylidae	<i>Microhyla ornata</i> /LC	Sarkar, 1984 (Fig.- 4g)
9.	Narrow Mouthed Frog Frog/Microhylidae	<i>Uperodon systoma</i> /LC	Current Report (Fig.- 4h)
10.	Indian Tree Frog Frog/Rhacophoridae	<i>Polypedates macuatus</i> /LC	Current Report (Fig.- 4i)

Table 2 Morphometric measurements of newly recorded species from the study area

No	Chr.	Sp.1 (Fig.-4h) <i>Polypedates maculatus</i> Ind.1 (mm)	Ind.2 (mm)	Sp.2 (Fig.-4i) <i>Uperodon systoma</i> Ind.1 (mm)	Ind.2 (mm)
1.	SVL	61.73(±8.06)	55.44(±6.45)	52.21(±4.91)	46.14(±4.15)
2.	HL	17.39(±2.27)	15.57(±1.81)	8.72(±0.82)	7.68(±0.69)
3.	HW	20.71(±2.71)	18.67(±2.17)	11.92(±1.12)	10.54(±0.95)
4.	SL	14.72(±1.27)	13.01(±1.05)	5.45(±0.41)	4.18(±0.33)
5.	ENL	14.81(±1.93)	12.32(±1.43)	6.8(±0.64)	5.15(±0.46)
6.	NSL	3.07(±0.41)	2.96(±0.34)	2.1(±0.19)	1.8(±0.16)
7.	ED	10.96(±1.43)	8.85(±1.03)	5.97(±0.56)	4.89(±0.44)
8.	INL	8.34(±1.11)	6.89(±0.81)	4.85(±0.46)	4.31(±0.39)
9.	IOL	18.71(±2.44)	16.03(±1.87)	15.22(±1.43)	13.77(±1.24)
10.	FAL	37.64(±4.91)	33.8(±3.93)	32.47(±3.05)	29.72(±2.67)
11.	TD	8.18(±1.07)	6.77(±0.79)	2.7(±0.25)	2.5(±0.22)
12.	FLL	86.74(±11.32)	79.18(±9.22)	74.58(±7.02)	69.49(±6.25)
13.	HLL	109.56(±14.3)	101.42(±11.81)	83.02(±7.81)	77.4(±6.96)
14.	ThL	31.99(±4.18)	28.03(±3.26)	25.61(±2.41)	23.43(±2.11)
15.	TbL	33.32(±4.35)	29.83(±3.47)	27.97(±2.63)	26.12(±2.35)
16.	FL	44.25(±5.78)	43.56(±5.07)	29.89(±2.81)	27.91(±2.51)
17.	OR*	Narrowed waist; Stouted Forelimbs and terminal discs of fingers with rudimentary webbings; Pronounced webbing between 3rd & 4th finger; Slender Hindlimb adapted for jumping; Webbings is not upto discs level in hindlimb; Only 5th toe has webbing upto disc.			
		Rounded snout; Non- dilated fingertip with free fingers 2nd & 4th fingers are almost equal in size, bigger than 1st finger, while 3rd is longest; Two metatarsal tubercles at hindlimb adapted for digging; Webbing is at the base of toes in hindlimbs; 1st smallest, 4th longest all toes are nondilated.			

Chr.- Character; # figures in paranthesis shows the mean variation in morphometry from available literature
[SVL- Snout to Vent Length; HL- Head Length; HW- Head Width; SL- Snout Length; ENL- Length between Front of Eye and Nostril; NSL- Nostril Snout Length; ED- Eye Diameter; INL- Inter Narial Length; IOL- Inter Orbital Length; FAL- Length of Fore arm; TD- Tympanum Diameter; FLL- Fore hand Length; HLL- Hind limb Length; ThL- Thigh Length; TbL- Tibia Length; FL- Foot Length]

Conclusion:

Current survey could be considered as the baseline information on anuran diversity in the region of north Gujarat. During our survey, we realised that the agrochemicals, traffic mortality, habitat loss and wetland pollution are the major threats to species. As the newly recorded species are rare in the study area as well as in the Gujarat state, there is an urgent need for conservation action and long-term monitoring. Associated plants and soil conservation should be a first conservation action in order to sustain the population of *Polypedates maculatus* (Gray, 1830) and *Uperodon systoma* (Schneider, 1799).

Acknowledgements:

We acknowledge the Dy. Conservator of Forests of Sabarkantha & Aravalli Forest Div. of Gujarat for permission & logistic support. We also thanks to the Head, Dept. of Life Sciences, H.N.G. University, Patan, Gujarat for providing infrastructural facilities.

a- *Duttaphrynus melanostictus*; b- *Duttaphrynus stomaticus*; c- *Euphictis cyanophlictis*; d- *Fajervarya* sp.; e- *Hoplobatrachus tigerinus*; f- *Sphaerotheca brevipeps*; g- *Microhyla ornata*; h- *Uperodon systema*; i- *Polypedates maculatus*

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