ANURAN FAUNA OF RAJIV GANDHI NATIONAL PARK, NAGARAHOLE, CENTRAL WESTERN GHATS, KARNATAKA, INDIA.

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INTRODUCTION

There are about 6780 species of amphibians in the World (Frost, 2011). Approximately 314 species are known to occur in India and about 154 from Western Ghats (Dinesh et al., 2009; Biju, 2010). However, the precise number of species is not known since new frogs are being added to the checklist. Amphibian number has slowly started declining largely due to the anthropogenic activities. Habitat degradation and improper agricultural activities are the major threats to amphibians. However, survey on amphibian diversity is limited to certain parts of Western Ghats in Karnataka (Krishnamurthy and Hussain, 2000; Aravind et al., 2004; Gururaja et al., 2007; Kuromoto et al., 2007; Biju and Bossuyt, 2009). Therefore, anuran species diversity analysis has been undertaken for the first time in Rajiv Gandhi National Park, Nagarhole (12°15'37.69"E 76°17'34.4"N), one of the hot spots for wildlife in the Nilgiri Biosphere Reserve of Western Ghats in Karnataka State. The national park covers an area of 643.4 sq km with a core zone of 192 sq km. The terrain is undulating with an altitude ranging from 701 to 959 m asl. Monsoon is erratic, but it generally rains from June to September with an annual rainfall of about 1,440mm and temperature range is 14°C-33°C. The water sources in this park include the Lakshmamantirtha river, Sarati Hole, Nagar Hole, Balle Halla, Kabini river, four perennial streams, 47 seasonal streams, four small perennial lakes, 41 artificial tanks, several swamps, Taraka dam and the Kabini reservoir. The predominant vegetation in the Nagarhole National Park is of southern tropical mixed deciduous both moist and dry with small patches of semi evergreen and evergreen type (Lal Ranjit, 1994). Diversity, distribution pattern, habitat specificity, abundance and global threat status of the anurans recorded in the study area are discussed.

MATERIALS AND METHODS

Anuran species diversity survey was undertaken for the first time during January 2009 to December 2009. The survey team comprised of a group of 6-9 men including local people and forest department officials having thorough knowledge about the area. We surveyed in all important water bodies and perennial rivulets, streams and through patches of forest during day and early night hours. The methodology adopted in the present study was in accordance with the standard methods like quadrat method and visual encounter survey (VES). Seasonal samplings were done randomly from different habitats by using handpicking and pit fall trap methods. Micro-habitats such as grass, water, leaf litter, shrubs, canopy cover, bare ground, tree trunk, under boulders, under logs were searched for specific habitat type to understand their ecological niche and distribution pattern. Morphometric details of the recorded anurans were gathered using digital caliper (Mitutoya, Japan) photographed, and identified using the keys given in Boulenger (1890); Dutta (1997), Radhakrishnan (1997), Das (2000) and Daniel (2005). The systematic classification is based on Frost
(2011). Taxonomic features, habitat preference, distribution pattern, abundance in the study area and threat status of the species studied are recorded.

RESULTS AND DISCUSSION

Based on the systematic analysis a total of 26 species of anurans belonging to 14 genera 8 families have been recorded in the study area. They include 4 each in the genus Raorchestes, and Fejervarya, 3 species in the genus Hylarana and 2 each in Nyctibatrachus, Rhacophorus, Microhyla, and Duttaphrynus, 1 each in Hoplobatrachus, Indirana, Euphlyctis, Micrixalus, Clinotarsus, Pseudophilautus and Polypedate. The systematic account, taxonomic features, habitat preference and distribution pattern of the species studied are given bellow.

SYSTEMATIC ACCOUNT

Order DORYLAIMIDA Pearse, 1942
Class AMPHIBIA Gray
Order ANURA Fischer von Waldheim
Family BUFONIDAE Gray
Genus: Duttaphrynus Frost, Grant, Faivovich, Bain, Haas, Haddad, de sa, Channing, Wilkinson Donnellan, Raxworthy, Campbell, Blotto, Moler, Drewes, Nussbaum, Lynch,Green and Wheeler
1. Duttaphrynus melanostictus (Schneider, 1799)


Measurements : SVL: 110.0 mm to 148.0 mm. (n=4, M-2, F-2).

Habitat : Found under logs of dry deciduous forest; Recorded months: February, April, May, July, August, October and December.

Distribution in India : Throughout India (Dutta, 1997).

Out side India : Recorded from South Asia (Frost, 2011).

Remarks : Very common; Status: Least Concern (LC).

2. Duttaphrynus microtympanum
(Boulenger, 1882)


Measurements : SVL: 50.0 mm to 80.0 mm. (n=5, M-3, F-2).

Habitat : Found under boulder of dry deciduous forest; Recorded months: January, March, June, August and October.

Distribution in India : Maharashtra, Kerala, Tamil Nadu (Dutta, 1997).

Remarks : Endemic to Western Ghats; Very rare; Status: Vulnerable (VU).

Family DICROGLOSSIDAE Anderson
Sub-family DICROGLOSSINAE Anderson
Genus Euphlyctis Fitzinger

3. Euphlyctis cyanophlyctis (Schneider, 1799)


Measurements: SVL: 26.0 mm to 32.0 mm. (n=6, M-3, F-3).

Habitat : Found in slow moving stream of semi evergreen forest; Recorded months: April, June, August, September and December.

Distribution in India : Throughout India (Dutta, 1997).


Remarks : Very common south Asian species; Status: Least Concern (LC).

Genus Fejervarya Bolkay


Measurements : SVL: 28.0 mm to 34.0 mm. (n=4, M-2, F-2).
Habitat: Found in semi aquatic margins of semi evergreen forest; Recorded months: July, August, September, October and November.

Distribution in India: Mangalore and Kodagu (Kuramoto et al., 2007).

Remarks: Endemic to Western Ghats; Common; Status: Not evaluated (NE).


Measurements: SVL: 27.0 mm to 32.0 mm (n=6, M-3, F-3).

Habitat: Found in semi evergreen forest; Recorded months: July, August, and September.

Distribution in India: Mangalore and Kodagu (Kuramoto et al., 2007).

Remarks: Endemic to Western Ghats; Common; Status: Not evaluated (NE).


2007. Fejervarya kudremukhensis Kuramoto, Joshy, Kurabayashi and Sumida, Current Herpetology, 26(2) : 81-105

Measurements: SVL: 40.0 mm to 50.0 mm (n=8, M-5, F-3).

Habitat: Found on the forest floor of semi evergreen forest; Recorded months: June, July, August, September and December.

Distribution in India: Chickmagalur and Kodagu (Kuramoto et al., 2007).

Remarks: Endemic to Western Ghats; Rare; Status: Not evaluated (NE).


2007. Fejervarya mudduraja Kuramoto, Joshy, Kurabayashi and Sumida, Current Herpetology, 26(2) : 81-105

Measurements: SVL: 44.0 mm to 51.0 mm (n=8, M-5, F-3).

Habitat: Found along the sides of streams of semi evergreen forest; Recorded months: June, July, August, September, October and November.

Distribution in India: Chickmagalur and Kodagu (Kuramoto et al., 2007).

Remarks: Endemic to Western Ghats; Very common; Status: Not evaluated (NE).

This species was placed earlier in the assemblage of Fejervarya limnocharis species complex. F. caperata, F. granosa, F. kudremukhensis and F. mudduraja are regarded as cryptic species that are difficult to identify by morphological traits alone (Kuramoto et al., 2007).

Genus Hoplobatrachus Peters

8. Hoplobatrachus tigerinus (Daudin, 1802)


Measurements: SVL: 65.0 mm to 108.0 mm (n=4, M-2, F-2).

Habitat: Found in ponds of semi evergreen forest; Recorded months: May, June, July, August, September, October and December.

Distribution in India: Throughout India (Dutta, 1997).


Remarks: Very common; Status: Least Concern (LC).

Family Micrixalidae Dubois, Ohler and Biju

Sub-family Micrixalinae Gunther

Genus Micrixalus Boulenger

9. Micrixalus saxicola (Jerdon, 1854)


Measurements: SVL: 23.0 mm to 31.0 mm (n=4, M-2, F-2).

Habitat: Found on the fallen logs near stream of moist deciduous forest at 890 m asl; Recorded months: August, September and November.

Distribution in India: Western Ghats of Kerala and Karnataka, South India at 400-1400 m asl (Dutta, 1997, Radhakrishnan, 1997; Krishnamurthy and Hussain, 2000; Chanda, 2002).
Remarks: Endemic to Western Ghats; Common; Status: Vulnerable (VU).

Family MICROHYLIDAE Gunther
Sub-family MICROHYLINAE Gunther
Genus Microhyla Tschudi

10. Microhyla ornata (Dumeril and Bibron, 1841)

Measurements: SVL: 23.0 mm to 28.0 mm (n=8, M-5, F-3).

Habitat: Near the margins of small stream of moist deciduous forest; Recorded months: June, July, August and September.

Distribution in India: Throughout India including Andaman and Nicobar Islands (Dinesh et al., 2009).

Outside India: Recorded in Japan, China, Pakistan, Nepal, Sri Lanka and Malaysia (Frost, 2011).

Remarks: Very common; Status: Least Concern (LC).

11. Microhyla rubra (Jerdon, 1854)

Measurements: SVL: 28.0 mm to 32.0 mm (n=4, M-3, F-1).

Habitat: Found in wet mud near small stream of semi evergreen forest; Recorded months: August, September and October.

Distribution in India: Goa, Karnataka, Tamil Nadu and (Dinesh et al., 2009).


Remarks: Rare; Status: Least Concern (LC).

Family NYCTIBATRACHIDAE Blommers-Schlosser
Sub-family NYCTIBATRACHINAE Blommers-Schlosser
Genus Nyctibatrachus Boulenger

12. Nyctibatrachus aliciae Inger, Shaffer, Koshy and Bakde, 1984

Measurements: SVL: 24.0 mm to 26.0 mm (n=6, M-4, F-2).

Habitat: Found in slow moving small streams of semi evergreen forest: Recorded months: August, September and October.

Distribution in India: Tamil Nadu (Kalakad-Mundanthurai Tiger Reserve), Karnataka and Kerala (Pomnudi Hills, Athirimala, Wayanaad) in the Western Ghats; Region of southwestern India, 300-1000 m elevation (Dutta, 1997; Inger et al., 1984; Krishnamurthy and Hussain, 2000; Chanda, 2002; Frost, 2011).

Remarks: Endemic to Western Ghats; Rare; Status: Endangered (EN).

13. Nyctibatrachus major Boulenger, 1882

Measurements: SVL: 42.0 mm to 44.0 mm (n=5, M-2, F-3).

Habitat: Found in slow moving streams of semi evergreen forest; Recorded months: July, August, September and October.

Distribution in India: Kerala and Tamil Nadu (Dutta, 1997; Pillai, 1978); Karnataka (Krishnamurthy and Hussain, 2000).

Remarks: Endemic to Western Ghats; Rare; Status: Vulnerable (VU).

Family RANIDAE Rafinesque
Sub-family RANINAE Rafinesque
Genus Clinotarsus Mivart

14. Clinotarsus curtipes (Jerdon, 1853)

Measurements: SVL: 51.0 mm to 54.0 mm (n=8, M-3, F-5).

Habitat: Found below the leaf litter of the forest floor in dry deciduous forest; Recorded months: June, July, August, September and October.

Distribution in India: It has been recorded from many protected areas in Kerala, Karnataka, Tamil Nadu and (Dinesh et al., 2009).
Nadu, Maharashtra and Goa (Dutta, 1997; Biju, 2001).

Remarks: Endemic to Western Ghats; Very common; Status: Near Threatened (NT).

15. Sylvirana aurantiaca (Boulenger, 1904)


Measurements: SVL: 35.0 mm to 45.0 mm (n=5, M-3, F-2).

Habitat: Found in slow moving streams of semi evergreen forest; Recorded months: May, June, July and October.

Distribution in India: Maharashtra, Kerala, Karnataka and Tamil Nadu (Frost, 2011).

Remarks: Endemic to Western Ghats; Common; Status: Vulnerable (VU).

16. Hylarana malabarica (Tschudi, 1838)


Measurements: SVL: 65.0 mm to 78.0 mm (n=3, M-2, F-1).

Habitat: Found on the forest floor of dry deciduous forest; Recorded months: October and November.

Distribution in India: Maharashtra, Kerala, Goa, Madhya Pradesh and Orissa (Dutta, 1997; Biju, 2001), Karnataka (Krishnamurthy and Hussain, 2000).

Remarks: Endemic to India; Rare; Status: Least Concern (LC).

17. Sylvirana temporalis (Gunther, 1864)


Measurements: SVL: 61.0 mm to 78.0 mm. (n=8, M-5, F-3).

Habitat: Found along the streams of semi evergreen forest; Recorded months: July, August and September.

Distribution in India: Kerala, Maharashtra, Tamil Nadu and Karnataka (Dutta, 1997; Biju, 2001).

Outside India: recorded in Sri Lanka (Frost, 2011).

Remarks: Endemic to Western Ghats; Common; Status: Near Threatened (NT).

Family RHACOPHORIDAE Hoffman
Sub-family RHACOPHORINAE Hoffman
Genus Raorchestes Biju, Yogesh, Dubois, Dutta and Bossuyt

19. Raorchestes charius (Rao, 1937)


*Measurements*: SVL: 27.0 mm to 29.0 mm. (n=5, M-2, F-3).

*Habitat*: Found on bushy plants of moist deciduous forest at 878 m asl. Recorded months: July, August and September.

*Distribution in India*: Found in Western Ghats of Karnataka. It was reported that this species is restricted to Chikmagalur at an elevation between 800 - 1,200 m asl, in Karnataka State, in the southern Western Ghats of India (Biju and Bossuyt, 2009).

*Remarks*: Endemic to Western Ghats; Rare; Status: Endangered (EN). This is the second record in the Western Ghats region.

20. *Raorchestes glandulosus* (Jerdon, 1854)


*Measurements*: SVL: 32.0 mm to 36.0 mm (n=6, M-4, F-2).

*Habitat*: Found on small forest tree of semi evergreen forest; Recorded months: July, August, October and November.

*Distribution in India*: It has been recorded in many protected areas including the Nilgiri Biosphere Reserve (which includes Silent Valley National Park and Wayanad Wildlife Sanctuary), Parambikulam Wildlife Sanctuary, Ponnudi Wildlife Sanctuary and Periyar Wildlife Sanctuary in Kerala, Kudremukh National Park in Karnataka, Indira Gandhi National Park and Kalakad Wildlife Sanctuary both in Tamil Nadu (Biju and Bossuyt, 2009).

*Remarks*: Endemic to Western Ghats; Common; Status: Data Deficient (DD). Biju and Bossuyt (2009) reexamined the type series of *Philautus neelanethrus* and considered this as new synonym of *P. luteolus* and again the genus *Philautus* is named as *Raorchestes* (Biju et al., 2010).


*Measurements*: SVL: 18.0 mm to 22.0 mm. (n=5, M-2, F-3).

*Habitat*: Found on herbaceous plants of moist deciduous forest; Recorded months: August, September and October.

*Distribution in India*: Recorded from Kodagu and Chikmagalur districts in Western Ghats parts of Karnataka (Biju and Bossuyt, 2009).

*Remarks*: Endemic to Western Ghats; Rare; Status: Data Deficient (DD).

Genus *Pseudophilautus* Biju, Yogesh, Dubois, Dutta and Bossuyt

23. *Pseudophilautus wynaadensis* (Jerdon, 1854)


*Measurements*: SVL: 31.0 mm to 34.0 mm. (n=6, M-2, F-4).
Habitat: Found on bushy plants of moist deciduous forest; Month of collection: July, August, and September.

Distribution in India: Recorded in Western Ghats parts of Kerala (Biju and Bossuyt, 2009). This species is restricted to tropical forests in the vicinity of Coorg in Karnataka, Wayanad and Ponmudi Hills in Kerala, in the southern Western Ghats of India. It has been recorded at elevations of 900 to 1200 m asl.

Remarks: Endemic to Western Ghats; Rare; Status: Endangered (EN). This species was recently revalidated (Bossuyt and Dubois, 2001). It was previously considered to be a synonym of Philautus variabilis. Specimens recorded as P. temporalis and P. leucorhinus from the Western Ghats of India are now named as Pseudophilautus wynaadensis (Biju et al., 2010).

Genus Polypedates Tschudi

24. Polypedates pseudocruciger Das and Ravichandran, 1998


Measurements: SVL: 50.0 mm to 80.0 mm (n=2, M-2).

Habitat: Found on the tree of evergreen forest at 856 m asl. Recorded months: August and October.

Distribution in India: It has been reported from a number of protected areas in Western Ghats regions of Tamil Nadu, Karnataka and Kerala. It is recorded from elevations of 200 - 950 m asl. (Biju, 2001; Frost, 2011). Remarks: Endemic to Western Ghats; Common; Status: Least Concern (LC).

Genus Rhacophorus Kuhl and Van Hasselt

25. Rhacophorus lateralis Boulenger, 1883


1931. Rhacophorus (Rhacophorus) lateralis Ahl, Das Tierreich, 55 : 165.

Measurements: SVL: 39.0 mm to 52.0 mm (n=4, M-3, F-1).

Habitat: Found on the trees of evergreen forest. Recorded months: August, September and October.

Distribution in India: Kerala, Karnataka, Tamil Nadu and Goa. It has been recorded from numerous protected areas including Indira Gandhi National Park in Tamil Nadu, Periyar Tiger Reserve, Wynaad Wildlife Sanctuary and Parambikulam Wildlife Sanctuary, all in Kerala, and Kudremukh National Park and Nagarhole Wildlife Sanctuary, both in Karnataka (Dutta, 1997; Krishnamurthy and Hussain, 2000).

Remarks: Endemic to Western Ghats; Rare; Status: Least concern (LC).

SUMMARY

It is for the first time a systematic anuran species diversity survey has been undertaken in Rajiv Gandhi National Park (Nagarahole), Central Western Ghats, Karnataka, India. As per the survey nearly 26 species of anurans belonging to 14 genera, 7 subfamilies and 8 families have been recorded. The list include, 2 species in the family Bufonidae, 6 species in the family Dicroglossidae, 1 species of Micrixalidae, 2 species of Microhylidae, 2 species of Nyctibatrachidae, 4 species of Ranidae, 1 species of Ranixalidae and 8 species belonging to the family Rhacophoridae. Of these nearly 20 species are endemic to Western Ghats of India and Sri
Lanka. Duttaphrynus melanostictus, Euphlyctis cyanophlyctis, Hoplobatrachus tigerinus, Microhyla ornata and Microhyla rubra are reported earlier from other part of south and southeast Asia. The species Hylarana malabarica is endemic to Indian subcontinent and has been reported from many parts of India including Western Ghats. As per the IUCN threat status the species that are recorded in the study area belong to 4 endangered, 2 near threatened, 5 vulnerable, 2 data deficient and 9 least concerned species. The remaining 4 species restricted to Western Ghats, whose population density, threat and conservation status are not evaluated. While conducting the survey it was possible to record outside the study area in the nearby semi evergreen, moist deciduous forests and coffee plantations anurans like Euphlyctus hexadactylus, Ramanella triangularis, Raorchestes akroparallagi, Raorchestes chromasynchysi and Raorchestes ponmudi. Hence, it is evident from this preliminary survey that there are many more cryptic species yet to be studied for their habitat preference, distribution pattern, abundance and conservation status.

REFERENCES


Duttaphrynus melanostictus

Fejervarya granosa

Duttaphrynus microtynpanum

Fejervarya kudremukhensis

Euphlyctis cyanophlyctis

Fejervarya mudduraja

Fejervarya caperata

Hoplobatrachus tigerinus
Micrixalas saxicola

Nyctibatrachus major

Microgyia ornata

Clinotarsus curtipes

Microgyia rubra

Hylarana aurantiaca

Nyctibatrachus aliciae

Hylarana malabarica
Hylarana temporalis

Indirana beddomil

Raorchestes charius

Raorchestes glandulosus

Raorchestes luteolus

Raorchestes tuberohumerus

Pseudophilautus wynadensis

Polypedates pseudocruciger
Rhacophorus Lateralis

Rhacophorus malabarica

Manuscript Received: 11 November 2011; Accepted: 19 March 2012