

APPENDIX

THE DISTRIBUTION OF AMPHIBIANS IN GUJARAT STATE, INDIA

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(with two text-figures)

ABSTRACT: The paper reports a collection of amphibians made from the state of Gujarat, in western India. A total of fifteen species, representing four families were found, including four species, *Rana keralensis*, *Kaloula pulchra*, *Microhyla rubra* and *Polypedates maculatus*, that are being reported for the first time from the state.

KEY WORDS: Amphibian, anuran, zoogeography, Gujarat, India.

INTRODUCTION

The amphibians of Gujarat have been greatly neglected even in the fundamental works on Indian amphibians of Boulenger (1890, 1920) and a few retrospective studies by the Bombay Natural History Society (e.g., McCann, 1938; Soman, 1960; Daniel and Shull, 1963) have provided short accounts of the amphibian fauna of Kutch and Surat Dangs. The first review of the amphibians of Gujarat was published by Sarkar (1984) in which nine species of anurans were dealt with, based on the material in the collection in the Zoological Survey of India.

As a result of our studies, spanning about eight years, 15 species of anurans belonging to seven genera and four families have been verified from Gujarat. Most of these species were recorded from the Shoolpaneshwar Wildlife Sanctuary, which is part of Rajpipla Forest Division, Bharuch District, situated on the left bank of the Narmada river. The recorded species include eight out of nine species reported by Sarkar (1984). Two more species, *Uperodon systoma* (Naik, 1984) and *Rana malabarica* (Naik and Patel, 1986) have been reported in addition to the species in the aforementioned work. Recently, we have recorded five more species from various parts of Gujarat: *Rana keralensis*, *Kaloula pulchra*, *Uperodon globulosus*, *Microhyla rubra* and *Polypedates maculatus*.

THE PHYSIOGRAPHIC UNITS WITHIN GUJARAT

Localities within Gujarat state from where amphibians have been recorded by earlier work-

ers and during the present work have been given in Table 1

The state of Gujarat lies in western India. Climatically, the state can be divided into six regions (Figure 1).

1. South Gujarat (between Bharuch and Vapi),
2. Central Gujarat (between Bharuch and Ahmedabad),
3. Ahmedabad and adjacent areas,
4. North Gujarat (including the districts of Banaskantha, Sabarkantha, Gandhinagar and Mehsana),
5. Saurashtra, and
6. Kutch.

The north-western boundary of Gujarat is occupied by the deserts of Kutch that border Rajasthan. The north Gujarat region is arid or semi-arid, and both north Gujarat and Saurashtra exhibits dry tropical and thorny vegetation, while central Gujarat and the region north of the Vindhyas show dry tropical deciduous vegetation. To the south of the Narmada, the vegetation is mostly moist tropical, as a result of its proximity to the Western Ghats region (Fig. 2).

SPECIES LIST FROM GUJARAT STATE

Fifteen species of amphibians have been verified by us from Gujarat (Table 2)

We did not find *Bufo viridis*, which was reported by Sarkar (1984). Our list includes seven species which were not dealt with in the afore-

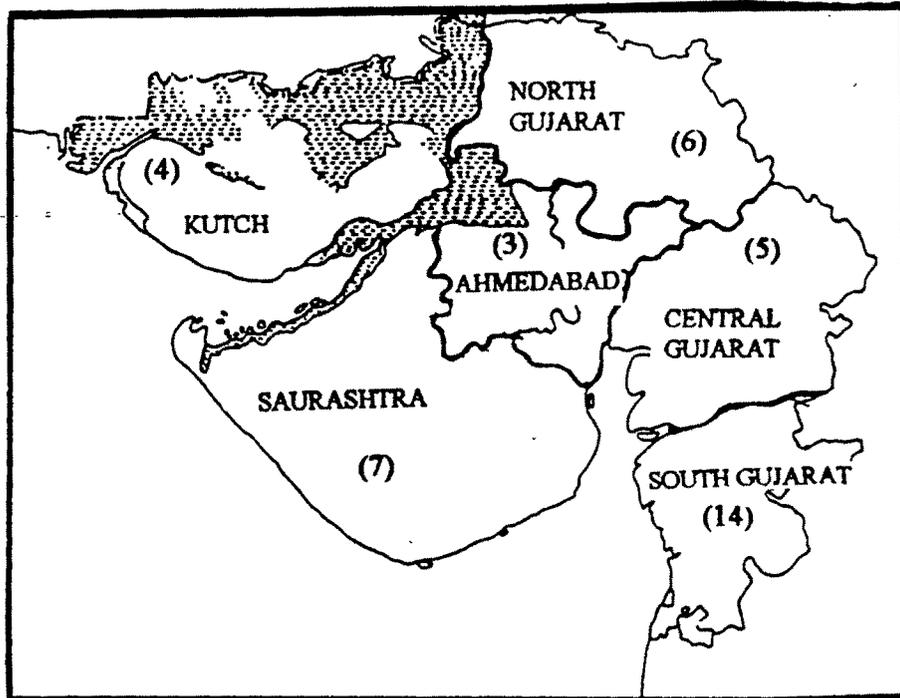


FIGURE 1: Distribution of amphibians in Gujarat. Numbers in parentheses are total species recorded from each district.

mentioned work, the distribution of which have been dealt with below:

Kaloula pulchra: Two examples were collected, one from near Mal-Samot village, Shoolpaneshwar Sanctuary (Naik *et al.*, 1992), the other from Panchmahal District of northern Gujarat by R. Vyas. Both were collected during the rains from tree-trunks. This beautiful microhylid is being reported from Gujarat for the first time.

Microhyla rubra: This microhylid appears to be rare in Gujarat, being collected from a single locality- the Sagai forest of Shoolpaneshwar Sanctuary. One was found resting under a stone during the day.

Uperodon globulosus: Four examples were collected from sites within the Shoolpaneshwar Sanctuary (from Piplod, Mosda and Sagai), from small stream beds, where they were buried less

than half a metre beneath the soil surface. The soil in the region is composed of loose sand and soft gravel, and therefore with a high water-retaining capacity. All frogs were found near termittaria. The occurrence of the species in the Dangs was reported by Daniel (1963)

Uperodon systoma: The presence of this species was reported by Naik (1984). One specimen was collected from a dried tributary of the river Vishwamitri, which passes through the University of Baroda campus.

Polypedates maculatus: The species is the sole representative of the family Rhacophoridae in the state of Gujarat. Two examples have been recorded from Surat and Bulsar and five from Sagai and Piplod areas of Shoolpaneshwar Sanctuary.

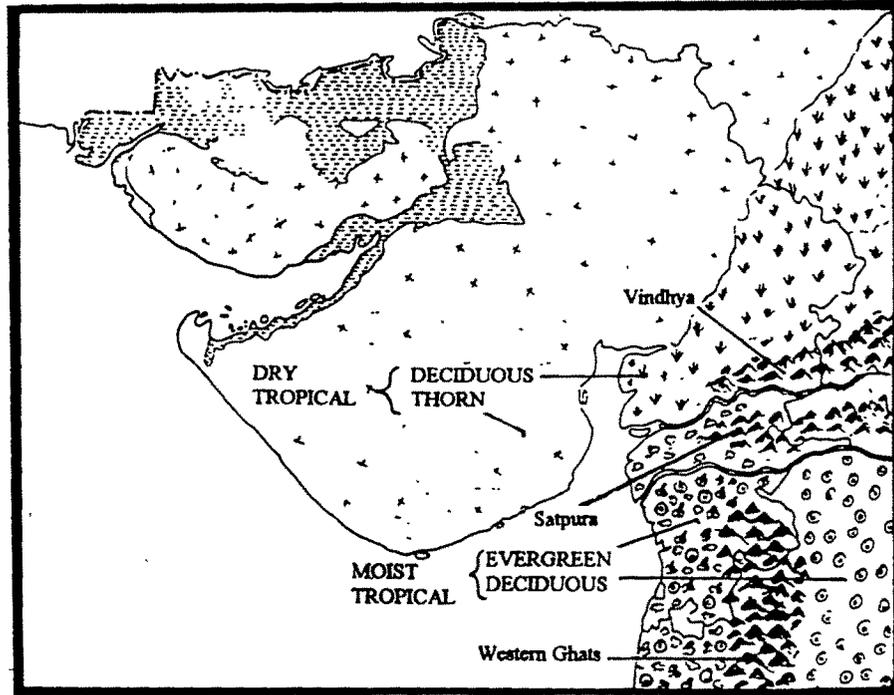


FIGURE 2: Vegetational zones in Gujarat.

Rana malabarica: The occurrence of this frog in Gujarat was reported by Naik and Patel (1986). The species was found in Navsari, a town in south Gujarat.

Rana keralensis We collected three examples of this species during the day from the rivulet that passes through the forested areas of Shoolpaneshwar Sanctuary (Sagar and Mosda). This little-known species was, until recently, considered an endemic of Kerala and Tamil Nadu, but Daniels (1992) has shown that the range of the species extends further north, through Karnataka to Maharashtra. Our studies reveal that the range of this species extends at least to the left bank of the Narmada river in Gujarat state. (Naik and Vinod, in press).

UNCERTAIN DISTRIBUTION RECORDS

Besides *Bufo viridis*, two species of amphibians that were reported by earlier workers are not

represented in our collection. *Rana lethui*, listed as occurring in the state by Inger and Dutta (1986) could not be located during our investigations. Daniel (1963) reported on the occurrence of an apodan, *Ichthyophis bombayensis* from Waghai in the Surat Dangs. We have explored the area but could not find this species.

SPECIES DIVERSITY AND GEOGRAPHICAL CORRELATES

The studies reveal that the distribution of amphibians within the state of Gujarat is non-uniform (Fig 1 and Table 3). Region 1 is rich in amphibian species diversity, south Gujarat supporting at least 14 species of anuran amphibian species. A majority of these are found in the Shoolpaneshwar Sanctuary. The central Gujarat region has six species, while the Ahmedabad region and its surroundings and Kutch appear to be impoverished, with only three and four species, respectively.

TABLE 1: The status of knowledge on the distribution of amphibians in Gujarat state. References to the collections by the Bombay Natural History Society (BNHS) and Zoological Survey of India (ZSI) are in the text

Family and species	Collection locality (BNHS and ZSI)	Collection locality (the present study)
RANIDAE		
<i>Rana cyanophlyctis</i>	Palanpur, Deesa, Rajkot, Viramgham, Dhangadhra, Godhra, Veraval, Jamnagar	Recorded from all districts
<i>Rana tigerina</i>	Bhuj, Anjar, Mehsana, Veraval, Rajkot	Recorded from all districts
<i>Rana limnocharis</i>	Bhuj, Mehsana, Rajkot, Dwarka, Jasdan, Veraval, Godhra	Surat, Navsari, Bulsar, Baroda, Savli, Sagai, Chota-Udaipur, Mal-Samot, Rajpipla
<i>Rana hexadactyla</i>	Halwad, Jamnagar	Surat, Navsari, Bulsar, Dangs, Bharuch
<i>Rana keralensis</i>	Not reported	Sagai, Mosda
<i>Rana malabarica</i>	Not reported	Navsari
<i>Tomopterna breviceps</i>	Vijarkhi, Jamnagar	Sagai, Namgir, Mosda, Piplod, Jamnagar
RHACOPHORIDAE		
<i>Polypedates maculatus</i>	Not reported	Sanki, Bulsar, Sagai
MICROHYLIDAE		
<i>Kaloula pulchra</i>	Not reported	Panchmahal, Mal-Samot
<i>Uperodon globulosus</i>	Dangs	Sagai, Piplod, Mosda
<i>Uperodon systoma</i>	Not reported	Baroda
<i>Microhyla ornata</i>	Palanpur, Bhuj	Mosda, Sagai, Namgir, Panchmahal
<i>Microhyla rubra</i>	Not reported	Sagai
BUFONIDAE		
<i>Bufo melanostictus</i>	Vijarkhi, Jamnagar, Ranavav, Somnath, Girnar, Junagadh, Rajkot, Veraval	Reported from all districts
<i>Bufo stomaticus</i>	Palanpur, Bhuj	Navsari, Baroda, Bharuch, Valsad, Kutch

The high diversity of the amphibian fauna of south Gujarat can be attributed to the physiography and vegetation of the region. The Narmada river flows between the Vindhya and Satpura ranges, dividing the area into a northern continental and a southern peninsular regions. Floristically, south Gujarat, which is situated south of

the Narmada river, belongs to the west (Malabar) coast Kutch and most of Saurashtra within the continental region is part of the Indus plains, while central Gujarat and a large part of north Gujarat belongs to central India. The region south of the Satpuras ranging up to the Narmada river is part of the Deccan plateau. The soil,

TABLE 2: Amphibians recorded from Gujarat, India.

ORDER: ANURA

FAMILY: RANIDAE

1. *Rana cyanophlyctis* (Schneider, 1799)
2. *Rana hexadactyla* (Lesson, 1834)
3. *Rana keralensis* (Dubois, 1980)
4. *Rana limnocharis* (Gravenhorst, 1829)
5. *Rana malabarica* Tschudi, 1838
6. *Rana tigerina* (Daudin, 1802)
7. *Tomopterna breviceps* (Schneider, 1799)

FAMILY: RHACOPHORIDAE

8. *Polypedates maculatus* (Gray, 1834)

FAMILY: MICROHYLIDAE

9. *Kaloula pulchra* Gray, 1831
10. *Microhyla ornata* (Duméril and Bibron, 1841)
11. *Microhyla rubra* Jerdon, 1854
12. *Uperodon globulosus* (Günther, 1854)
13. *Uperodon systoma* (Schneider, 1799)

FAMILY: BUFONIDAE

14. *Bufo melanostictus* Schneider, 1799
15. *Bufo stomaticus* Lütken, 1862

climate, vegetation and flora of the continental region are different from the rain-fed evergreen forests of the Western Ghats of the peninsular region. The biota of the Malabar region is abundantly represented in the south Gujarat region, and among the amphibian fauna, the best representative of the Western Ghats species here is perhaps *Rana keralensis*. In summary, the ranges of many Western Ghats species extend up to the Narmada region, which has the highest amphibian diversity within the state of Gujarat.

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TABLE 3: Presence (+) or absence (-) of anuran amphibians in the eight physiographic units within Gujarat. Abbreviations are as follows: SG, South Gujarat; CG, Central Gujarat; AHM, Ahmedabad and adjacent areas; SAU, Saurashtra; NG, North Gujarat; KUT, Kutch.

Species	SG	CG	AHM	SAU	NG	KUT
RANIDAE						
<i>Rana cyanophlyctis</i>	+	+	+	+	+	+
<i>Rana hexadactyla</i>	+	-	-	-	+	-
<i>Rana tigerina</i>	+	+	+	+	+	+
<i>Rana keralensis</i>	+	-	-	-	-	-
<i>Rana limnocharis</i>	+	-	-	+	+	-
<i>Rana malabarica</i>	+	-	-	-	-	-
<i>Tomopterna breviceps</i>	+	-	-	+	-	-
RHACOPHORIDAE						
<i>Polypedates maculatus</i>	+	-	-	+	-	-
MICROHYLIDAE						
<i>Kaloula pulchra</i>	+	-	-	-	-	-
<i>Microhyla ornata</i>	+	-	-	+	-	-
<i>Microhyla rubra</i>	+	-	-	-	-	-
<i>Uperodon globulosus</i>	+	-	-	-	-	-
<i>Uperodon systoma</i>	-	+	-	-	-	-
BUFONIDAE						
<i>Bufo melanostictus</i>	+	+	+	+	+	+
<i>Bufo stomaticus</i>	+	+	-	+	+	+

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