

ECOLOGICAL STUDIES ON THE AMPHIBIANS OF GUJARAT

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ABSTRACT

The brief systematic account, details of material collected, geographical distribution, observations on the field ecology, food and association with other animals of nine species of amphibians (256 ex.) from Gujarat are discussed in the present paper.

INTRODUCTION

The amphibians of Gujarat are very little known in the Indian fauna. Even the fundamental work of Boulenger (1890 and 1920) contains no information on the amphibians of Gujarat. Mc Cann (1938), Soman (1960) and Daniel and Shull (1963) have published short accounts on the amphibians from Kutch area and Surat Dangs (Southern Gujarat) of the State. So, this will be first detailed account on the amphibians of the area. Collections have mostly been made by Dr. R. C. Sharma, Superintending Zoologist, Zoological Survey of India.

SYSTEMATIC ACCOUNT

Class : AMPHIBIA

Order : ANURA

Family : RANIDAE

1. *Rana hexadactyla* Lesson

(Pond Frog)

Material : 3 ex., Halwad and Jamnagar. Collected in February and March.

Measurements : Snout to vent length 30 mm. in all the examples.

Distribution : Gujarat : As above (first record). Elsewhere ; Punjab, Rajasthan, Maha-

rashtira, Goa, West Bengal, South India and Sri Lanka.

Ecology : The frogs prefer to live in shallow muddy rain water tanks with muddy bottom and embankments. The vicinity of the above collection spots exhibited perfect xeric environment and *Prosopis* and *Acacia* bushes were in abundance. As evidenced by the stomach contents the food of *Rana hexadactyla* in the said localities during February and March consists of large black ants *Camponotus* sp. and various species of beetles.

Remarks : Porous warts on neck, under the thighs and along each side of belly are most prominent. The dorsal region of head and body is quite smooth and light olive-green in colour.

2. *Rana cyanophlyctis* Schneider

(Skittering Frog)

Material : 127 ex., Palanpur, Deesa, Bhuj, Anjar, Patna, Himmatnagar, Viramgam, Dhrangadhra, Rajkot, Bhavnagar, Jamnagar, Godhra, Dwarka, Dantiwada, Ahwa, Melegaon and Veraval. Collected between January and December.

Measurements : Snout to vent length 22-65 mm.

Distribution : Gujarat : As above (new locality records), Bhuj, Ahwa and Waghai. *Elsewhere* : Widely distributed in India, Sri Lanka, Thailand, Malaya Peninsula, Nepal, Iran, South Arabia and Pakistan (Swat and Kalat Districts).

Ecology : Frogs are equally comfortable in running as well as stationary water. In various localities the frogs were found to be living in stagnant pools of water.

According to Minton (1966) this species in Pakistan feeds on aquatic invertebrates, diving beetles, odonata larvae, crustaceans, snails, terrestrial insects, muscid flies etc.

The species is found to be a predator on a smaller species of the same genus i. e. *Rana limnocharis* Wiegmann (Plate 4) and also devours its own tadpoles. As evidenced by the study of gut contents the food of this species in Gujarat consists of various species of aquatic and terrestrial beetles and their larvae, mainly of families Carabidae, Scarabaeidae, Curculionidae and Hydrophilidae ; large black ants (*Camponotus* sp.) ; Crickets, grasshoppers and various other orthopterous insects ; dipterous nymphs ; cockroaches ; earthworms ; spiders ; various hymenopterous insects ; earwigs ; large number of arthropod eggs ; many small to large red and black species of ants ; moths ; dragon flies and their nymphs ; bugs ; numerous pupae and adults of mosquitoes ; gastropod molluscs ; centipedes ; lepidopterous caterpillars ; numerous white ants ; seeds, grass and fibres of certain wild plants and *Acacia* leaves.

Remarks : In most of the examples ventrum is spotted with dark brown in adults whereas in young this ventral colour pattern is confined to the throat and chin only. The dorsum in most examples is dark-

olive to brown with dark-brown round spots, scattered irregularly. Some of the examples possess reddish-olive tinge in dorsal coloration.

3. *Rana tigerina* Daudin (Indian Bull Frog)

Material : 7 ex., Bhuj, Anjar, Mehsana, Veraval and Rajkot. Collected between September and October.

Measurements : Snout to vent length 69-97 mm.

Distribution : Gujarat : As above (new locality records), Bhuj, Surat Dangs in Southern Gujarat and Baroda. *Elsewhere* : Rajasthan, Base of Himalayas through Punjab, Uttar Pradesh to South India, Orissa, Bihar, West Bengal, Assam and Tripura. Sri Lanka, Burma, Thailand, South China, Nepal, Taiwan and Pakistan.

Ecology : In Gujarat the Bull frogs prefer to live in tanks with muddy bottom and in shallow wells. The frogs were observed feeding near the banks of ponds. Wadekar (1963) states that the diet of these frogs at Baroda comprises cockroaches, termites, silverfish, mole crickets, earwigs, bugs, beetles, moths, house flies and various dipterous larvae, ants, spiders, snails, earthworms, millipedes, centipedes, juveniles of its own kind, house lizards, small birds, mouse, paddy grains and leaves of onion. According to Minton (1966) its food in Pakistan consists of belestomids, dytiscids, snails, small frogs, including its own kind.

On the examination of the stomach contents of the material included here it was found that the food of this species in Gujarat during September and October consists of beetles of the families Scarabaeidae, Carabidae

and Elateridae ; locusts, *Schistocerca gregaria* ; grasshoppers ; large lepidopterous caterpillars various species of small to large ants ; winged termites ; earwigs ; bugs ; dragon flies and their nymphs ; spiders ; Crustacea-Conchostrea ; scales of reptiles ; seeds and fibres of some wild plant ; grass. The present observations add various new items to the known range of its food.

Remarks : In most of the above examples the dorsal longitudinal warts are most prominent and ridge like. In the examples from Anjar the cream coloured line on the thigh and tibia is absent. While in the examples from Bhuj a most prominent cream line on the outer dorsal aspect of thigh is present which is continuous upto the foot joint through the inner aspect of tibia. In the frogs from Mehsana a faint cream line on thigh does not extend on tibia ; in adult the throat is densely spotted with dark-brown, margins of the lower jaws are with a series of brown spots, general dorsal colour is light-brown with a raddish tinge and the complete dorsum and upper surface of thighs are provided with dark brown irregular spots, a dorsolateral white band originates from the level of axilla and reaches upto the groin. The examples from Veraval exhibit a general greenish black colour with longitudinal series of dark-black spots with white or yellow centres, inner aspects of the thighs are with black cross-bars (with yellow or white shades in middle), outer aspects of thighs speckled with darker spots, a narrow cream stripe from snout to vent is present in both the examples but in one of them there are white lines along the outer margins of the thighs, in both the frogs upper lips are with dark spots and streaks whereas the lower lips are spotted with black. In all the Gujarat examples lower parts are dirty white.

4. *Rana limnocharis* Wiegmann

(Cricket Frog)

Material : 37 ex., Bhuj, Mehsana, Himmatnagar, Rajkot, Dwarka, Jasdan, Godhra, Veraval and Jamnagar. Collected between January to November.

Measurements : Snout to vent length 13-22 mm.

Distribution : *Gujarat* : As above (new locality records), Bhuj and Surat Dangs in South Gujarat. *Elsewhere* : Widely distributed in India, Sri Lanka, Southern Japan, Philippines, Indonesia, Malaya Peninsula and Archipelago, Borneo, Lombok, Eastern and Central China, West Nepal and Pakistan.

Ecology : In Gujarat Cricket frogs prefer to live in marshy and shallow water habitats, flooded agriculture fields and shallow pools on river beds. At Veraval numerous such tiny frogs were observed in a grassy damp plot of land where the water waste of the Indian Rayon factory is drained.

As evidenced by the study of the gut contents, the food of these frogs in Gujarat consists of various small orthopterous insects and their nymphs ; odonata larvae ; small beetles of families Scarabaeidae, Carabidae and Hydrophilidae ; mantids ; thysanurans ; muscid flies ; honey bees (family Apidae) ; small red ants ; eggs of arthropods ; spiders and isopod crustaceans.

Remarks : In all the Gujarat examples the dorsal region of head and body possesses dark distinct spots. Throat and ventral aspects of thighs are brick-red. Few examples from Jamnagar possess a faint cream vertebral stripe.

5. *Rana breviceps* Schneider

(Indian Burrowing Frog)

Material : 2 ex., Vijarkhi, Jamnagar. Collected in September.

Measurements : Snout to vent length 23-42 mm., width of head 18 mm.

Distribution : *Gujarat* : As above (new locality records), Bhuj and Surat Dangs in Southern Gujarat. *Elsewhere* : Rajasthan, Uttar Pradesh, Maharashtra, South India. Sri Lanka, North Burma, Eastern Nepal and Pakistan.

Ecology : The above examples at Vijarkhi were found hiding inside the subterranean muddy tunnels under a huge stone. The spot is situated on a hill slope roughly 70 metres high. The nearest pool of water from the spot of collection was about half a kilometre and surroundings on the whole constitute a dry, rocky habitat with plenty of xerophytic vegetation. Even the muddy tunnels from which these burrowing toad-like frogs were dug out, were perfectly dry and hard.

Minton (1966) states that the food of *Rana breviceps* in Pakistan consists of beetles and crickets. Present studies on the basis of gut contents reveal that their food in Gujarat during September consists of medium sized red ants ; beetles and larvae of families Curculionidae and Scarabaeidae ; bugs ; gastropod molluscs (*Gurulus* sp.) and certain wild fruits with flat, hard, oval and thorny seeds.

Remarks : In the above material the juvenile frog possesses a distinct longitudinal fold, along the back, half webbed toes, greenish-black dorsum and a yellow vertebral streak. The another bigger example which is an adult male possesses a robust body,

bulged eyes, tympanum half of the eye, irregular warts on the dorsum, half webbed toes, shoval-shaped inner metatarsal tubercle, warts on the belly, a distinct longitudinal fold along the back, brownish dorsum with darker spots and a prominent cream coloured vertebral stripe.

Family : BUFONIDAE

6. *Bufo melanostictus* Schneider

(Common Indian Toad)

Material : 20 ex., Vijarkhi, Jamnagar ; Ranavav, Porbandar ; Somnath, Veraval ; Girnar Hills, Junagadh and Rajkot. Collected in September.

Measurements : Snout to vent length 17-65 mm.

Distribution : *Gujarat* : As above (new locality records) Ahwa and Waghai. *Elsewhere* : Rajasthan, Karnataka (Dharwar), common in many parts of India. Sri Lanka, Burma, Southern China, Malaya Peninsula and Archipelago, Pakistan (Sind).

Ecology : Plenty of such toads were noticed in the vicinity of hilly areas like Vijarkhi, Ranavav and Girnar Hills (1500 metres). They always like to live in wet surroundings and hardly go far from water bodies.

Rangaswamy and Channabasavanna (1973) examined the gut contents of 362 individuals and found that their food consists of beetles ; ants ; wasps ; syrphids ; aphids ; muscid flies, their eggs, maggots and pupae ; lepidopterous caterpillars ; mantids ; cockroaches ; various orthopterans ; earwigs ; bugs ; spiders ; scorpions ; centipedes ; snails and slugs.

In present studies, as evidenced by the gut contents the food of this toad in Gujarat during September consists of earwigs ;

beetles ; bugs ; numerous small and big red ants ; large black ants, *Camponotus* sp. ; various hymenopterous insects ; lepidopterous larvae ; numerous white ants ; millipedes, and vegetable fibres of some wild plant. The present studies beside confirming the findings of Rangaswamy and Channabasavanna (1. c.) add few more items like termites and vegetable matter to the food list of this species. Many examples were found to be highly infested with nematodes.

Remarks : Dorsum possess spiny warts, well developed parotid glands, dark-brown black spotted colour on dorsum. In many examples throat and chin speckled with jet-black spots.

7. *Bufo stomaticus* Lütken

(Marbled Toad)

Material : 38 ex., Palanpur, Bhuj, Meh-sana, Himmatnagar, Jamnagar and Rajkot. Collected between September to November.

Measurements : Snout to vent length 21-61 mm.

Distribution : *Gujarat* : As above (new locality records) and Bhuj. *Elsewhere* : Rajasthan, Uttar Pradesh, Himachal Pradesh (Simla Hills), Kashmir, West Bengal, Bihar, Andhra Pradesh and Maharastra in India. Arabia, Bangladesh, Nepal, Burma, Sri Lanka and Pakistan (Sind, Baluchistan).

Ecology : In Gujarat these toads were in abundance in or near the human habitations. They were seen hunting on insects under mercury lights in the vicinity of water bodies at Jamnagar. These toads were seen in considerable number even during the day in the moist vegetation near the pools, tanks, lakes and rivers. At Lalparilake area, Rajkot all the 11 examples were collected from the

subterranean zig-zig muddy tunnels under a large stone.

As evidenced by the study of the gut contents of the above material the food of this most common toad in Gujarat during September to November comprises mainly the termites ; beetles ; big black ants ; *Camponotus* sp. ; small red ants (75% of the gut full in many examples) ; bugs ; earwigs ; lepidopterous larvae ; vegetable fibres and seeds of certain wild plants. It is worth recording that during the said period the main food of this toad in Gujarat consists of mainly the termites and ants of all kinds. This toad thus provides a most effective biological control for termites and many other insect pests of agriculture. Daniel (1963) records that in captivity they feed on termites but refuse larger prey.

Remarks : Most of the examples are spotted with black on the chest. General colour in life was dark-brown.

8. *Bufo viridis* Laurenti

(Green Toad)

Material : 18 ex., Dwarka and Bet Dwarka Islands. Collected in September.

Measurements : Snout to vent length 15-30 mm.

Distribution : *Gujarat* : As above (first record from India) *Elsewhere* : According to Minton (1966) the range of this species is from Germany to Mangolia and Central Siberia and South to Tibet, Iran, Israel, Egypt, Morocco and Pakistan (Baluchistan).

Ecology : These small flat toads in Gujarat choose to live in swampy grassy areas quite close to the sea coasts. Most of the examples were collected from the muddy tunnels under the large stones.

The study of the gut contents reveal that the diet of these small toads in Gujarat during September comprises mainly the black and red ants ; beetles of the families Curculionidae, Scarabaeidae and Hydrophilidae ; termites ; lepidopterous caterpillars ; aphids and isopod crustaceans.

Remarks : Dorsum, upper surface of legs, head and lateral aspects of body are greenish and possess numerous irregular black orange-centred spots. A spinose tubercle exactly in the centre of such spots is one of the marked features. In living examples the upper lip and ventrum was greenish and chest was spotted with black.

Snout is moderately acute ; parotid-glands elongated and kidney-shaped (the length is between 3-8 mm.) ; tympanum 1/3 of the eye ; basal and posterolateral margins of tympanum in all the examples are devoid of warts, tubercles and nodular glands ; and the portion as noticed is smooth (*Vs.* warts, tubercles or nodular glands are always present in this region in *Bufo stomaticus* and *Bufo melanostictus*).

Family : MICROHYLIDAE

9. *Microhyla ornata* (Dumeril & Bibron)

Material : 4 ex., Palanpur and Bhuj. Collected in October.

Measurements : Snout to vent length 13-15 mm.

Distribution : Gujarat : As above (new locality records for Palanpur) and Surat Dangs in Southern Gujarat. Soman (1960) recorded it from Bhuj (in a small pool of water calling at night). *Elsewhere* : Rajasthan, most of the Indian sub-continent, Kashmir. Bangladesh, Burma, Sri Lanka, Malaya Peninsula, Taiwan, Thailand and Southern China.

Ecology : All the above examples were collected from the flooded agriculture fields. The study of gut contents reveals that during September these tiny frogs devour nothing except small red ants.

Remarks : Dorsum reddish-brown ; tarsals and carpels with brown bands or annuli above ; thighs, tibio-tarsus and forelimbs are with dark brown bars or spots above ; lower parts uniform light brown. Toes are minutely webbed.

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