

Amphibians of Pakistan



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Pakistan is generally an amphibian-poor country because of its prevailing arid environmental conditions. However, with the humid riparian conditions in the Indus Valley, torrents and streams in the northern Himalayan sub-mountainous region, and the subterranean water channels in the western Balochistan highland, there are 25 amphibian species known from Pakistan (KHAN, 2002, 2004, 2006). They belong to four families: Bufonidae, Megophryidae, Microhylidae, and Ranidae.

This article is an overview of the amphibian fauna of Pakistan, with notes on their morphology, distribution, and habits.

Family Bufonidae

Toads in Pakistan are represented by eight species of the genus *Bufo*. Toads are essentially nocturnal, but also become active in the daytime during breeding season. They usually emerge at sunset from holes and crevices between stones, in brick walls, and in the ground. They roam widely through vegetation, feeding on insects and their larvae, earthworms, juvenile toads, worm snakes, etc. The toads are attracted to lit areas under lampposts to feed on photophilic arthropods. They also venture freely into inhabited houses where usually hide under household articles, occasionally emerging to catch houseflies, cockroaches, and spiders.

Under drought conditions toads aggregate in remaining damp spots, and especially around hand pumps where water can splash on their bodies. The toads squat against the moist soil by pushing their hind legs out to the sides and pressing their hindquarters down.

Evening temperatures of 13°C (55°F), a downpour, and flow of rainwater are enough to trigger breeding activity. Toads are the first amphibians to arrive at flooded areas, where males soon begin very noisy choruses. Breeding usually takes place in the waters brought with July and August monsoon rains, but if the rains are late, the water in irrigation channels and recently watered fields is readily used for the purpose.

The call of *Bufo stomaticus* consists mainly of repeated guttural notes, “cree, cree, cree, cree, cree.” The calls of other species are similar, with different tones — e.g., *Bufo melanostictus* is a “curr, curr, curr.” Several groups of calling males become established in different areas of the water body. The females, which are fewer in number than the males, move in the vegetation around the calling males. When a female comes close to a male, he at once jumps onto her to secure a firm nuptial hold. But other males in the group try to do the same, zealously jump over each other in their attempts to mate, and there is much kicking and tugging to dislodge rivals. The embracing pair is grabbed from all sides by aggressive males, and the tussling group may roll on the ground or float in the water for a long time until, perhaps due to fatigue, the males thin out. The first male’s ability to hold on tightly, together with the ability of the female to move quickly away to a quieter



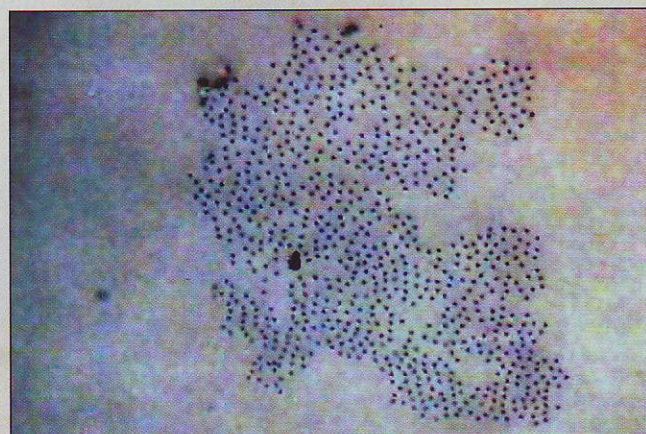
Burrowing frog, *Sphaerotheca breviceps*



Olive toad, *Bufo olivaceus*



The Indus toad, *Bufo stomaticus*



Sphaerotheca breviceps spawn

Key to the toads of the family Bufonidae in Pakistan

- 1 a. Cranial crests present 2
- b. Cranial crests absent 3
- 2 a. Supraorbital crest only is present;
 - tympanum indistinct *Bufo himalayanus*
 - b. Supraorbital, canthal, postorbital, and orbitotympanic crests present, tympanum distinct *Bufo melanostictus*
- 3 a. Tympanum distinct 4
- b. Tympanum indistinct *Bufo surdus*
- 4 a. Tibial gland absent 5
- b. Tibial gland present 6
- 5 a. Dorsum with green pattern 7
- b. Dorsum uniformly olive *Bufo olivaceus*
- 6 a. Tarsal fold a weak spiny line *Bufo stomaticus*
- b. Tarsal fold present *Bufo latastii*
- 7 a. Body with green spots *Bufo viridis zugmayeri*
- b. Body with zigzag green blotches *Bufo pseudoraddei*

spot with the male on her back, helps to ensure their successful mating. The female deposits eggs in a double gelatinous string, which she winds around submerged vegetation.

During summer large numbers of toads are crushed by cars while crossing roads to reach potential breeding sites. Crows and other birds feed on the exposed viscera of the roadkill, leaving the skins of the dead toads behind. Toads are also preyed on by a number of animals that share the same habitat — e.g., the Indus Valley bullfrog, *Hoplobatrachus tigerinus*; the Bengal monitor, *Varanus bengalensis*; the desert monitor, *Varanus griseus*; the Indian rat snake, *Ptyas mucosus*; the buff striped keelback, *Amphiesma stolatum*; the common krait, *Bungarus caeruleus*; and the saw-scaled viper, *Echis carinatus*. To avoid predators, the toad escapes into a burrow or crevice. If no such hiding place is available, it buries itself in the loose soil.

Schools of dark *Bufo* tadpoles are a common sight in ponds and pools during monsoons. Typically the *Bufo* tadpole has an oval bulging body,

weak tail, high dorsal fin, and narrower ventral fin. The anteroventral oral disc has a 2(2)/3 labial tooth row formula; the beak is finely serrated with lateral oral papillae.

The Indus toad, *Bufo stomaticus*, is the most widely distributed toad in the Indo-Pakistan subcontinent, occurring from Bangladesh through the Ganges Plain, peninsular India, the upper and lower Indus Valleys, Balochistan, and across Afghanistan, Iran, and Muscat.

The Southeast Asian toad, *Bufo melanostictus*, is common and widely distributed in southeastern Asia, extending throughout northern and peninsular India. The populations in northern Pakistan have been distinguished as a new subspecies, *Bufo melanostictus hararensis* (KHAN, 2000).

The Himalayan toad, *Bufo himalayanus*, is a Highland Himalayan species found at elevations of 2,000–3,500 meters above sea level. In Pakistan it has been recorded from Azad Kashmir, Hazara Division.

The Iranian toad, *Bufo surdus*, is a little known species reported in

Pakistan along western Balochistan and around Quetta, but widely distributed in Iran.

The olive toad, *Bufo olivaceus*, has been recorded in the extreme western parts of Balochistan and adjoining Iran.

The highland toad, *Bufo latastii*, is extensively distributed in Nepal, Ladakh, Kashmir, and northern Indian Punjab. In Pakistan it is recorded in Ladakh in Baltistan between elevations of 2,600 and 3,000 meters.

The Balochistan toad, *Bufo viridis zugmayeri*, occurs around Quetta, and southward to Chagai, Balochistan.

The Swat toad, *Bufo pseudoraddei*, is a highland toad found in Passu, Swat, Karakoram Range, Gilgit Agency, and Baltistan, Pakistan.

Family Megophryidae

The representative of this family in Pakistan is distinguished from the rest of the amphibians in the country by its spiny, heavily tuberculated body. Sexually dimorphic, the male has strong forelimbs, dark brown nuptial spines on the first three fingers, a pair of dark brown spiny chest glands, a large spiny auxiliary gland, and spines on the cloacal region. Snout-vent length is 50–57 millimeters.

Dorsal coloration is gray-olive with indistinct dark brown triangular spots; the flanks are light yellowish; the limbs are spotted; the chest and abdomen are greenish yellow.

The Tibetan lazy toad, *Scutiger nyingchiensis*, is known from the Himalayas at elevations between 3,000 and 3,500 meters. It has been collected from Azad Kashmir, Gilgit, and the Dosai Plains in the north-western Himalayas.

Family Microhylidae

This is the family of narrow-mouthed frogs, also commonly known as ant frogs. They are represented in Pakistan by two species.

The common ant frog, *Microhyla ornata*, is tiny. It stays close to water, hiding under leaf litter during day, and emerging to hunt at night. It feeds on small insects such

Key to the species of the family Microhylidae in Pakistan

- 1 a. Tiny, 30 mm in body length; dorsum with a large branched blotch *Microhyla ornata*
- b. Medium sized, 50–60 mm in body length; dorsum with brown reticulation *Uperodon systema*



Bufo stomaticus



Bufo melanostictus



Bufo siachenensis



Bufo olivaceus



Bufo himalayanus



Bufo surdus



Bufo viridis zugmayeri



Scutiger nyingchiensis



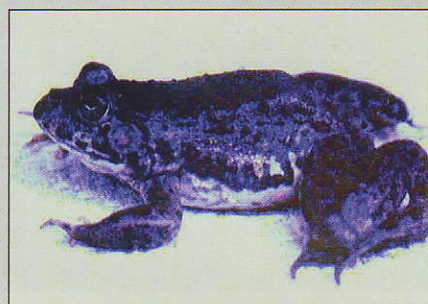
Paa hazarensis



Paa sternosignata



Sphaerotoca breviceps



Euphlyctis cyanophlyctis



Fejervarya limnocharis



Fejervarya syhadrensis



Hoplobatrachus tigerinus

as termites. The calling male sits away from the edge of the water, concealed in grass, and calls in a characteristic rasping voice, “bbratt, bbratt, bbratt” — very loud considering the

tiny size of the frog. The female deposits groups of tiny eggs, each measuring only 0.5–0.8 millimeters in diameter, embedded in a thick gelatinous mass that floats at the surface

of water. The delicate, transparent tadpoles form mid-stream swimming schools. Having no oral disc with chitinous structures, they filter plankton suspended in the water.

Key to the species of the family Ranidae in Pakistan

- 1 a. Toes half webbed 2
- b. Toes extensively webbed 4
- 2 a. Body toad-like, inner metatarsal tubercle shovel-shaped ... *Sphaerotheca breviceps*
- b. Body frog-like, inner metatarsal tubercle long 3
- 3 a. First finger hardly extending beyond second *Fejervarya syhadrensis*
- b. First finger longer than second *Fejervarya limnocharis*
- 4 a. Body with spines 5
- b. Body with folds *Hoplobatrachus tigerinus*
- 5 a. Nuptial spines on at least first two fingers 6
- b. Nuptial spines absent *Euphlyctis cyanophlyctis*
- 6 a. Pustules large, multispinulate; belly spiny *Paa sternosignata*
- b. Pustules small, unispinulate; belly spineless *Paa hazarensis*



Euphlyctis cyanophlyctis ventral side



Bufo stomaticus in breeding pool



Mis-amplexus: male *Bufo olivaceus* and female *Sphaerothera breviceps*



Paa hazarensis

The marbled balloon frog, *Uperodon systoma* is a larger species. It lives underground in termite and ant tunnels, feeding on the insects and their larvae. They emerge only during heavy rains for reproduction, when the males call from the surrounding grass. The call of this frog is described as sounding like the bleating of a goat.

The common ant frog, *Microhyla ornata*, has a wide range in northern and central Pakistan. It also occurs throughout India and most of south-eastern Asia.

The marbled balloon frog, *Uperodon systoma*, has a wide range in Bangladesh and northern peninsular India, but only a single specimen has been reported in Islamabad, Pakistan.

Family Ranidae

A heterogeneous array of ranid frogs are common in the Indo-Pakistan subcontinent and south-eastern Asia. Classification of these frogs has long posed problems for taxonomists.

Unlike frogs of the family Microhylidae, ranid frogs have wide-gaping mouths and feed on a variety of larger food items — including earthworms, other frogs, small snakes, small birds and nestlings, and even small mammals, in addition to insects. The tadpoles of ranids are large and macrophagous, with elaborately armed oral disc.

Ranid frogs are mostly aquatic or littoral (e.g., *Euphlyctis cyanophlyctis*). They frequent a variety of habitats with pooled water in the plains and

sub-mountainous regions of Pakistan. Some species (*Euphlyctis cyanophlyctis* and *Sphaerotheca breviceps*) are remarkably capable of adjusting to uncertain aquatic conditions in temperate arid parts of Pakistan. The species inhabiting the plains can tolerate wide ranges of pH and water quality, from freshwater to considerably brackish and even polluted refuse water.

Euphlyctis cyanophlyctis spends most of its time floating in the water, and skitters at the water surface. Other species remain hidden in aquatic vegetation in marginal waters. *Euphlyctis cyanophlyctis* is a common species, and remains active almost throughout the year, whereas other species are active only during summer, from March to September. Solitary *Euphlyctis cyanophlyctis* individuals call from permanent water bodies almost year round, although actual breeding activity is initiated in early summer when water temperatures rise to 10–15°C (50–59°F).

The calling males of a species usually gather in groups at the edges of ponds with marginal vegetation. Some sit on the wet ground; others float in the water. The calls of the different species are quite distinct. The call of *Euphlyctis cyanophlyctis* is “chuutt, chuutt, chuutt,” repeated several times; the call of *Hoplobatrachus tigerinus* is “kang, kang, kang”; the call of *Fejervarya limnocharis* and *Fejervarya syhadrensis* is “tak, tak, tak”; the call of *Sphaerotheca breviceps* is “kong-vong, kong-vong, kong-vong”; and the call of mountain frogs of the genus *Paa* is a loud trill, occasionally repeated.

When calling, the males are very active — calling and squeaking and continuously jumping over each other, causing quite a commotion in the water. They actively assault each other in their reproductive frenzy. When a male and female mate, they do not leave the site — the female may pair with several males, depositing eggs with each. The sizes of eggs vary; those of the genus *Paa* are large (2–3 millimeters in diameter) and



Hoplobatrachus tigerinus in defensive posture



Sphaeroteca breviceps male

attached to blades of grass or stones and rocks in the water.

Ranid tadpoles are large, with a strong muscular tail, and very well developed oral disc with variable number of rows of denticles.

The Karez Balochistan frog, *Paa sternosignata*, has a snout-vent length of 88–90 millimeters. This species abounds around Quetta and Mastung in Karez, where underground streams come to the surface in pools. It has also been reported from Afghanistan.

The Hazara torrenticole frog, *Paa hazarensis*, has a snout-vent length of 55–62 millimeters. It is known from fast-flowing streams in the Rush Valley in Hazara Division, NWFP, Pakistan.

The burrowing frog, *Sphaeroteca breviceps*, has a snout-vent length of 49–52 millimeters. It is distributed throughout India, Nepal, Bangladesh, Myanmar, and Sri Lanka. In Pakistan it is reported from the Himalayan foothills, and extends into the Potwar Tableland, with a spotty distribution in the riparian Punjab. This species has been collected from the Hab and Malir River Valleys around Karachi.

The southern cricket frog, *Fejervarya syhadrensis*, has a snout-vent length of 32–34 millimeters. It is common in the lower Indus Valley, and is widely distributed throughout southern India.

The alpine cricket frog, *Fejervarya limnocharis*, has a snout-vent length of 39–43 millimeters. It is distributed in the sub-Himalayan parts of Pakistan, descending into the waters of Potwar Tableland, most of the Punjab plains and some of the lower Indus Valley where it is scarcer. It ranges from Japan to Pakistan.

The Indus Valley bullfrog, *Hoplobatrachus tigerinus*, has a snout-vent length of 130–145 millimeters. It is the most common frog of the Indo-Gangetic plains. It frequents mostly cultivated areas and swampy wastelands. In Pakistan this species does not extend into Balochistan, but it has been reported in Afghanistan close to Khyber Pass.

The skittering frog, *Euphlyctis cyanophlyctis*, has a snout-vent length of 23–67 millimeters. It is one of the most widely distributed frogs of southern and southeastern Asia, ranging from Thailand to Nepal, throughout India and Sri Lanka, almost throughout Pakistan at elevations below 1,800 meters, and extending westward into Iran and Afghanistan. Its several races have been described from Pakistan. Its Saudi Arabian population has been described as a distinct species, *Euphlyctis ehrenbergii*.

Threats and conservation of Pakistan's amphibians

The causes of global amphibian declines are quite complex and vary from place to place. The usual culprits reckoned are depletion of the ozone layer, global warming, agricultural chemicals, and chytrid fungi as well as other implicated phenomena.

In Pakistan, amphibians are localized in areas that have more water.



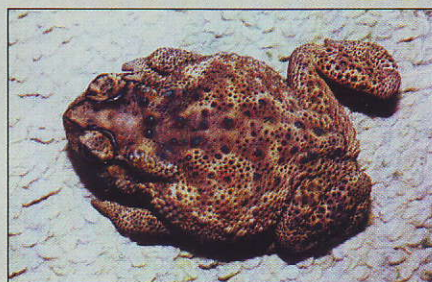
Karez Balochistan frog, *Paa sternosignata*



Sphaeroteca breviceps male, dorsal view

The annual monsoon rainy season is the boom period of amphibian activity, when they feed, reproduce, and move about. However, this is also the season when pests attack crops, and the consequential spraying of pesticides and agri-boost chemicals is most detrimental to the amphibians. In addition, considerable numbers of breeding amphibians are crushed by traffic as they cross roads to reach their potential breeding sites.

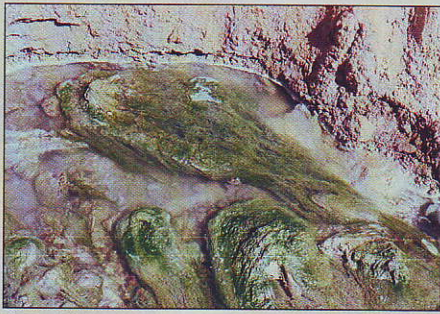
The widespread use of the species *Hoplobatrachus tigerinus* as model animal for demonstration of vertebrate anatomy has depleted natural population of this largest and beautiful



Bufo melanostictus



Hoplobatrachus tigerinus



Paa sternosignata, Karez channel natural habitat



Paa hazarensis (tadpoles in brook water)

amphibian of the Indus Plains. No amphibian is used as food in Pakistani culture.

To ensure and maintain healthy and prosperous amphibian communities, it is necessary to establish large swampy areas as wetlands and amphibian reserves free of roads throughout the plains of Pakistan. Where roads currently pass through potential amphibian breeding sites, construction of underpass "frog-ways" will considerably reduce amphibian road "slaughter."

Affinities of Pakistan's amphibian fauna

The Himalayan massif that overlooks the Indo-Gangetic plains creates a barometric vacuum in the Indo-Pakistan subcontinent in summer — attracting moist winds from the Arabian Sea, and thus initiating the monsoons cycle, the main important annual environmental feature of the subcontinent.

In geological history, the Indian Plate broke away from the vast Southern Hemisphere continent of Gondwanaland and carried with it species of Cretaceous fauna (probably similar to that of Africa) to the Eurasian mainland. This fauna soon became extinct without leaving a trace, probably because of new drier conditions. The family Microhylidae (narrow-mouth frogs) most probably had already separated from the family Ranidae when the Indian Plate broke off, and microhylid frogs are believed to be the only animals transported on the Indian Plate that have survived in the subcontinent.

The diversity of amphibian fauna of the subcontinent dates back to the Pliocene, when the physiographic

conditions in the Indo-Gangetic plains became conducive to animal colonization. During this period the subcontinent experienced extensive invasions of animals from the Palearctic and Oriental zoogeographic regions.

The cosmopolitan family Bufonidae has two major evolutionary lines. One is a South American broad- or thick-skulled group that evolved from a *Bufo melanostictus*-like ancestor in tropical South America during the Upper Cretaceous, and radiated out to North America. This line is represented in Pakistan by *Bufo melanostictus* and *Bufo himalayanus*. The other evolutionary line is of narrow- or thin-skulled toads evolved from a *Bufo calamita*-like ancestor in northern subtropical America. This line is represented in Pakistan by *Bufo stomaticus* and *Bufo viridis*. Toads of both groups crossed the Bering land bridge during the Oligocene and became established in temperate Eurasia, from where they radiated out into the subcontinent.

The Tibeto-Himalayan toads are represented in northern Pakistan by *Scutiger nyingchiensis*, and two subspecies of the *Bufo viridis*-species group, *Bufo pseudoraddei baturae*, and *Bufo pseudoraddei pseudoraddei*.

Views differ regarding the origin of the heterogeneous frog family Ranidae. Some believe it has a tropical African origin, and others believe it has a tropical southeastern Asian origin. Evidence is stronger in favor of the former view, which holds that the frogs radiated northwards during the Cenozoic, and by the Oligocene had established a secondary evolutionary center in southeastern tropical Asia, where they

underwent extensive radiation. By the mid Tertiary the physiographic conditions in the subtropical north became habitable and the ranids invaded Peninsular Indo-China, nearby islands, and the Indo-Pakistan subcontinent. ■

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