

# INDIA'S AMPHIBIANS

by Indraneil Das

*India has an exceptionally diverse assortment of amphibians, with over 200 species having been described to date. This 'richness' of frogs, toads, caecilians (plus one salamander), is in part the result of the large area and the location of our country at the crossroads of two distinctive biogeographic realms, the Palearctic and the Oriental. The resultant habitat and climatic diversity have led to corresponding species diversity. The author writes that the amphibians here belong to nine families and 35 genera and that 58 per cent of the known species found here exist nowhere else on earth.*

Amphibians spend most of their lives on land, but must return to a watery medium to breed. Thought to have descended from air-breathing fish-like ancestors, their bodies are adapted to freshwater environments. Though there are around 2,600 species of amphibians alive today, these water-loving life-forms remain extremely delicate and highly susceptible to environmental degradation.

Thus, frogs, toads and salamanders are now some of the best biological indicators of environmental health. If populations of these wetland animals are on the decline, then we must presume all is not right on earth. An alarming decline of many of the world's amphibians is in fact already known from several parts of the world, including North America, South America and Australia. The degree of these population-declines, varies from region to region, and also within and among species. A variety of factors are suspected, including habitat destruction, pollution and acidic conditions. Nevertheless, declines from relatively pristine habitats have also been reported. In areas where habitats are not completely destroyed, declines may be due to global climatic change, pollution, viral infection, ultraviolet radiation and habitat fragmentation. Research is needed on amphibian populations to

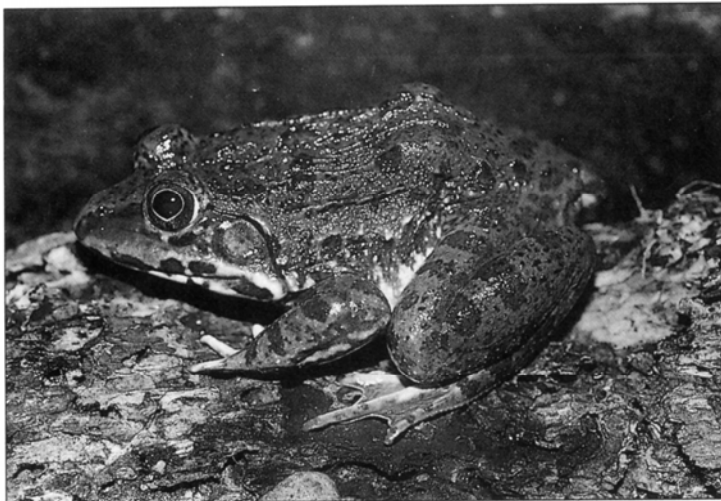
discover which populations are stable and which are not, and it is necessary to study the environmental differences between these sites. These studies are particularly important for point-endemic species known to be highly restricted in distribution and

therefore at greater risk from environmental and man-made changes of land and water.

While no climate-related declines in amphibian populations have been reported from India, populations of the larger ranid frogs have been hit hard by capture for the frog-

leg trade and by the use of pesticides. The biological status of most Indian amphibians is hazy. Nevertheless, the Action Plan of the IUCN/SSC South Asian Reptile and Amphibian Specialist Group recognizes five species in need of conservation attention: two are vulnerable and for three, the wild status is unknown. Additionally, all caecilians, those little-known legless burrowing amphibians, are considered vulnerable. Most of these are intimately linked to forests of northeastern India and the Western Ghats, which are threatened by logging and other land use alterations. Many other species, particularly from rainforest areas, are suspected to be in need of conservation attention, but we just don't know enough about them, or the threats they are facing.

Amphibians are living examples of evolution in action. The webbed feet of frogs are used for more than mere propulsion through water; they also serve as effective parachutes for species that glide from tree



Madras Croc Bank Trust

*Jerdon's bull frog, *Hoplobatrachus crassus* (above), one of several large-growing insect-eating species that used to be exploited for the frog-leg trade. Habitat destruction remains a major threat for the species..*

to tree in rainforests around the world. Extendible tongues are another improvement on the traits handed down from the fish-like ancestors of today's amphibians. The ability to make sounds is yet another example of evolutionary advance. An array of clicks, whistles, grunts and moans can be heard in the swamps of the world, each signaling a different meaning.

Clearly we have not even begun to understand amphibians, but we are nevertheless impinging on their future. While this may not be the place to launch into an action plan on the protection of amphibians and their habitats, one issue is clear: the surest way to protect amphibians is to protect wetland habitats. This one act could prevent the tragedy of extinction for several species, including those we have not yet documented. It should concern us that we are still scratching the surface of the biology of these and related creatures in India even as many of them are slipping away from us.

### The conservation of amphibians

Though the export of frogs legs has been banned, millions of frog are still collected by trappers. One reason is the demand from biology labs. There is little data available on the impact of harvesting of edible frogs or of frogs and toads caught for class dissection, but it would be reasonable to presume that in some habitats this has already taken a serious toll of frogs. The fact that we know so little about the natural history of Indian frogs and toads, except perhaps the half a dozen widespread species that dwell in human-altered habitats, comes in the way of a tangible action or recovery plan.

Why do we know so little about frogs, toads and salamanders? For a variety of reasons. Their small size, lack of charismatic appeal and generally cryptic habits (most species are active at night in unlogged rainforests) makes it difficult to locate (leave alone study) them. Habitat inaccessibility is another problem. Rainforest areas can be incredibly difficult to work in and even making a list of amphibian species is sometimes impossible. It could, for instance, take a biologist a lifetime to prepare a complete list of amphibians in a single, relatively small patch of rainforest in the New World. The situation in the humid forests of South Asia is no different, with many species being seasonally active and existing in low densities (which impedes ecological studies and results in lower species-richness figures for forests in short-term studies). Although new techniques are being discovered, such as drift-fences on the forest canopy, methods currently available fail to effectively sample tree-dwelling species or species that live underground.

Some degree of knowledge about amphibians does enable us to contemplate possible action. The salamander population in western Nepal and eastern India is, for instance, known to be sensitive to the acidification of its habitat. The melting of acid-accumulated snow, studies reveal, affects the species at the egg and larval stages. Clearly steps to counter such acid build-up is integral to their survival. Extremely delicate creatures, they are also vulnerable to threats such as the draining of wetlands for housing, agriculture and water supply. Borrow, and dump-pits for projects in or near wetland habitats can therefore seriously affect the future of amphibians. The introduction of the common carp and catfish has been recorded as being detrimental to salamanders, as has the replacement of primary forests with plantations of the exotic *Cryptomeria japonica*. Such avoidable and damaging decisions are often taken out of ignorance of the consequences. Making known the worth of amphibians, therefore, becomes one very immediate aspect of conservation action. Pollution in the shape of domestic sewage, pesticides and fertilizers, of course, has a very direct and adverse effect on amphibian survival. Pesticides, metals, even concentrated sewage can kill amphibians and affect their breeding biology. Keeping our waterways clean and free of toxins, in any event, is clearly in our own interest and using amphibians as indicators of the environment in which we live is a useful and easy way for us to monitor the circumstances which affect our own health. Even the use of water bodies by cattle serves to loosen the soil, thereby killing amphibian eggs and larvae. While it may not be possible to keep domestic animals away from village-used water bodies, it should be recognised that our protected area network is crucial to the supply of *Rana tigerina*, as much as it is to *Panthera tigris*! As for deforestation, we know that it kills indiscriminately. All wild creatures are pressured when forests, grasslands and other natural habitats are degraded.

More specifically, known populations of amphibians require special protection from acidification, land-filling and siltation. Some measures to counter such threats include contour-terracing and wire-crate walling along selected identified sections such as the lake banks in Nakha Pani, Nam Thing and Margaret Hope in northern Bengal. There are hundreds of other such sites where threats exist and hundreds more where a little planning could avert major problems. Clearly the nation needs to debate its develop-

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*The Indian painted bull frog, Kaloula taprobanica (overleaf), is found in South India and Sri Lanka. The amphibian is often found in drains during the monsoons and its presence is most often detected by its peculiar honking calls.*



## Some Indian Amphibians

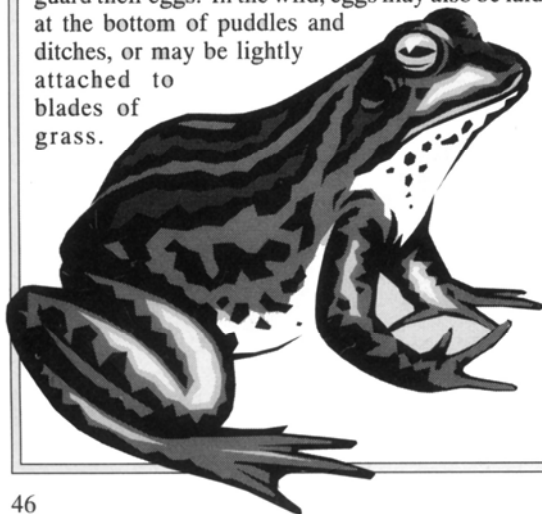
**Indian salamander or Himalayan newt,**  
*Tylotriton verrucosus*  
**Status: Vulnerable**

The Indian salamander or Himalayan newt is a medium-sized member of the family, attaining 95 cm. Its head is broader than long, and is surrounded by a prominent bony ridge. The dorsal crest is absent, the parotid glands are slightly concave and the nostrils are close to the tip of the rounded snout. There are 15-16 knob-like porous glands along the side of the body. The tail is greatly compressed, ending in a point. The colour is a uniform blackish brown, paler on the lips, snout, chin, throat and the under-surface of the limbs. The under-surface of the tail is dull orange-yellow.

The species is found in a variety of habitats including rice fields, tea gardens and meadows covering the shores of lakes and ponds at altitudes of 1,200-2,250 metres.

A lentic (still or calm water-body) species, the salamander may also be found sheltering among bamboo stumps, where it feeds on invertebrates such as termites and woodlice, although during the monsoons it is also known to feed on algae, water beetles, bugs, and tree frog tadpoles. In Nepal, newts appear in rock pools for courtship after the first rains between February and March, remaining there throughout the rains (June to September), after which they metamorphose (August to October).

In captivity, the salamander is known to lay 16-60 eggs on aquatic weeds and females are known to guard their eggs. In the wild, eggs may also be laid at the bottom of puddles and ditches, or may be lightly attached to blades of grass.



They hatch in around 20 days. The salamander is the only amphibian covered by the Red Data Book of Indian Animals, which lists it as 'endangered'. Although not threatened as a species, the western populations from Nepal and eastern India are in need of conservation attention.

**Malabar black narrow-mouthed frog,**  
*Melanobatrachus indicus*  
**Status: Data Deficient**

A medium-sized (snout-vent length up to 34 mm) microhylid, the Malabar black narrow-mouthed frog is distinguishable from other members of the family in that it lacks ridges on the roof of its mouth. Its pupils are circular and the tongue oval in shape, not forked. The toes are webbed at the base, the ear drum is absent and the skin is pustular above and smooth below. The frog is black, the thigh has continuous or interrupted scarlet bands near the groin and a few blotches of the same colour are present on the chest, between the forelimbs and on the lower parts of the hind limbs.

This is one of the most enigmatic of the Indian frogs. Described in 1878, based on a few frogs found torpidly curled up into a ball under rotten logs at an altitude of over a thousand metres in the Anaimalais of the Western Ghats, the frog has never been collected since. Its larval stages are unknown. The closest relative of this species is found in East Africa. The 1994 Red List of Threatened Animals lists the species as indeterminate. An intensive search to locate the species should be made in appropriate habitats of the Western Ghats. When populations are discovered, field studies should address the habitat and conservation needs of the species.

**Malabar tree toad, *Pedostibes tuberculosus***  
**Status: Vulnerable**

With a snout-vent length of 35 mm, this small and slender toad has disk-like tips of fingers and toes. Parotid glands present and the ear drum is distinct, being one-third the diameter of the eye. Fingers and toes are webbed and the skin of the dorsum is warty. This toad is brownish-grey above, with darker sides, whitish, spotted with black below. A white band extends from the eye to the shoulder, and another band of the same colour on the flanks.

Like its relative in south-east Asia, it prefers living up in trees, but individuals are also likely to be found at

the ground level and on low vegetation, especially during the day. Once it finds a suitable pool of water, it is likely to lay its eggs in strings. The Malabar tree toad has been found in a variety of forest types, including evergreen, moist deciduous and moist semi-evergreen forest.

**Garo Hills tree toad**  
*Pedostibes kempi*  
**Status: Data Deficient**

Unlike the only other species of the genus from India, the Malabar tree toad, the ear drum is concealed in this species. The toad is listed as 'indeterminate' in the 1994 Red List of Threatened Animals. Field surveys to determine distribution, status and conservation requirements are urgently required as we may well be losing critical habitats without even knowing it.

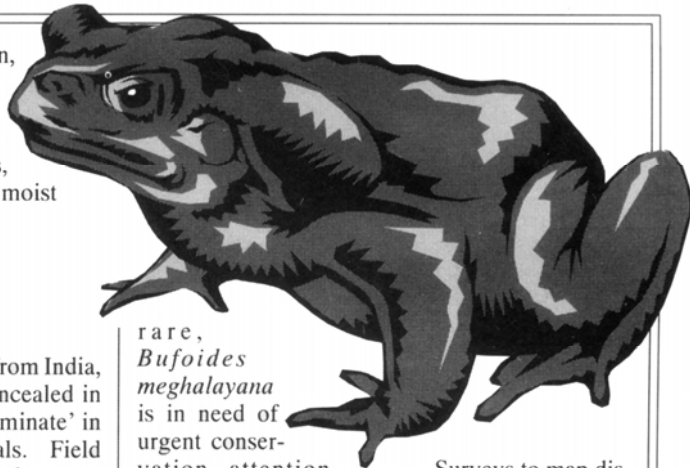
**Mawblang rock toad**  
*Bufoides meghalayana*  
**Status: Data Deficient**

A medium-sized toad (snout-vent length up to 47.2 mm), this creature has pronounced bony ridges on the forehead, warty skin, unwebbed fingers, but fully-webbed toes, a concealed ear drum and a cartilaginous sternum. It has no teeth on the upper jaw and no poison glands. The head is flattened, broader than long, the snout is short and conical and the eyes are directed downwards. Fingers and toes end with disks. The front of the tongue is free, not being attached to the mouth. The nostrils are positioned closer to the snout tip than to the eyes. The back of the toad is black to dark brown and the underside is greyish. Its tadpoles lack sucker-like oral disks.

The species was found breeding in cavities of rocks and in water collected in the leaf axils of the screw pine (*Pandanus* sp.) in Mawblang, near high rainfall belt of Cherrapunji, in the Khasi Hills of Meghalaya. The breeding season is believed to be between late May and July.

These toads float on the water during breeding and are lethargic during this protracted period, remaining in the position even during the early part of the day. Eggs number 23-40 in a batch and each egg is large, being over 4 mm in diameter. The rarity of the species at the time of collection was already noted and since its original discovery, the toad has not been seen.

Since this is a monotypic species and is obviously



rare,  
*Bufoides*  
*meghalayana*  
 is in need of  
 urgent conser-  
 vation attention.

Surveys to map distribution and ascertain habitat requirements are essential, in addition to specific conservation needs. Limestone quarrying and clearing of primary forests threaten the survival of the species. An intensive search in the Mawblang and Cherrapunji areas should be made to rediscover the toad. If found, the area should be strictly protected and studies initiated to understand its conservation requirements.

**Caecilians**  
**Status: Vulnerable**

Caecilians represent the order Gymnophiona, and are recognizable by their slimy, mucous-coated skins, lack of limbs and generally the presence of folds or annuli, separated by grooves around the body and of tentacles close to the eyes. Their secretive, fossorial (burrowing) nature has resulted in often vestigial eyes.

They are usually small in size and since they are only found in undisturbed evergreen forests caecilians are unknown even to many experienced naturalists. Caecilians produce a variety of sounds, including soft yelps, squeaks, smacking sounds and clicks, which help them find their way around. In India, caecilians are found in the wet forests of the Western Ghats, the foothills of the Himalaya and northeastern India.

Since all species from the region are linked to mesic forests, they are presumably affected by deforestation and other activities that result from human interference with tropical forests. Field surveys to map distribution, discover basic biological requirements and ascertain status of all species of caecilians are required.

(The illustrations are of unidentified species)



*The Peninsular caecilian, Ichthyophis peninsularis, is only found in undisturbed forests. The aquatic larvae of caecilians metamorphose into burrowing, earthworm-like adults which feed on worms and insects.*

Ecological roles in wild habitats apart, crop scientists and biologists have been stating for some time now that several species of amphibians play an important role in controlling invertebrate crop pests in rice paddies. Given the risks of chemical pesticides to humans and the environment, the control of these pests by biological control agents is desirable. Tree frogs in the wilderness actually help to disperse food plants which are also used by a variety of other lifeforms.

Many drugs, Indian, Unani (Greco-Roman) as well as western, are derived from amphibians. As we have seen, amphibians are excellent bio-indicators of environmental pollution,

ment strategies more intelligently. Instead of spewing more sulphur dioxide and nitrous oxides into the air through new thermal plants, for instance, we might be better advised to improve the efficiency of existing units so that emissions come down, while the sheer quantity of electricity units produced goes up. As in the case of water pollution (apart from the obvious benefit to vulnerable creatures such as amphibians) the overall health benefits to the public from cleaning up our air should be obvious.

helping us to detect excessive nutrient levels of water bodies, radioactive contamination and thermal and chemical pollution. India presents a wonderful opportunity for the study of the myriad amphibians around us. Hopefully, with every passing day, we will learn to appreciate these charming and often useful creatures and save them from the needlessly dark future towards which we seem to be nudging them today. In the process, of course, our own environment will have been greatly improved. ○

Educational campaigns in areas where viable populations of the species coexist with humans are overdue, in addition to the development of cheap protein sources that are not dependent on fish farming.

Apart from such obvious field actions, other processes such as large scale efforts to document the basic biology of the Indian amphibians, including information on species identity, distribution, dietary and microhabitat requirements, population size and conservation problems, is desperately needed. It is equally important that we encourage more biologists to become interested in studying these animals.

*Legs of the Indian green frog, Euphlyctis hexadactylus, on gruesome display. This leaf-eating frog, the only one of its kind in the world, grows large enough to justify collection and if the trade had not been banned it might well have been pushed to extinction.*

