Nature Watch

Secrets of the Shieldtails

Kartik Shanker

Kartik Shanker spent two years in the Upper Nilgiris studying small mammal and herpetofaunal communities. His interest in snakes was inspired by the 'snake catching' Irula tribe near Madras.

Shield tails are a group of snakes belonging to the family Uropeltidae, endemic to the Western Ghats and Sri Lanka. They are small, beautiful non–poisonous snakes with bright colours, found at high altitudes in the 'shola' forests. They spend much of their life burrowing 1–2 metres beneath the surface, in search of their favourite food, earthworms. Loss of habitat has been a major cause for their decline and many of the species may now be endangered.

Introduction

The Western Ghats are well known for their biodiversity; much has been written and said about their wide array of plants and animals, especially the high degree of endemism and the rare and endangered mammals. Less however is known about the herpetofauna (amphibians and reptiles) of these hills. There are 117 species of amphibians, of which about 90 are endemic. Some, like the tree frogs found in the higher altitudes, are poorly studied. However, the least known amongst the unique fauna of the Western Ghats may well be the *shieldtails*.

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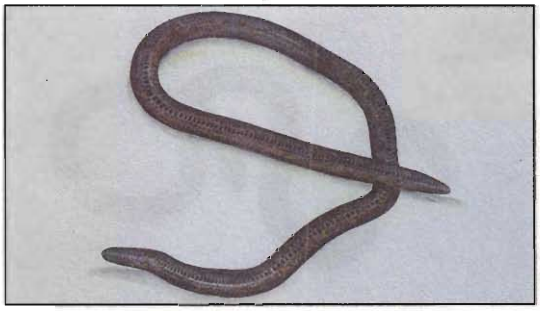
The shieldtails are a group of non-poisonous snakes belonging to the family *Uropeltidae*. These snakes are found in the Western Ghats and Sri Lanka and nowhere else in the world. There are about 45 species belonging to 7 genera, of which 35 are found in the Western Ghats. They are highly colourful snakes, and each species has its own distinct marking.

Uropeltids are found in the higher reaches of the Western Ghats, usually at 1500 metres or higher. They inhabit the



shola forests, which are the natural vegetation of the area. However, they are also found in the different plantations which have become a common feature of the hills. Uropeltids have evaded extensive study because of their excessively secretive nature. They burrow 1 to 2 metres below the soil, and stay there for much of the year, emerging only during the rainy season to mate. Besides, they are also nocturnal which makes them even more difficult to observe.

Figure 1 The genus Uropeltis has 19 species, the most amongst the uropeltids. The species are widely distributed over the Western Ghats, Eastern Ghats and in Sri Lanka.

Figure 2 *Uropeltis pulneyensis:* ***This species is found in the Palanis and the hills of South Kerala. The snakes are often found beneath the muddy black soil on the edges of hill streams in and around Kodaikanal.***

Montane Homes

Uropeltid snakes are generally found in areas of high elevation and low temperature. The Western Ghats, where most of the uropeltids are found, have a short dry season of 3 to 4 months followed by rains from the Southwest monsoon and the Northeast monsoon. Rainfall seems to limit the distribution of the shieldtails, because it affects the development of forest vegetation. The vegetation in the upper reaches of the Western Ghats is of the *shola-grassland* type. The sholas are tropical montane–stunted evergreen forests, which are surrounded by grasslands. These grasslands are spotted with *Rhododendron nilagiricum* and also feature riverine tracts. The uropeltids are found largely in the forests.

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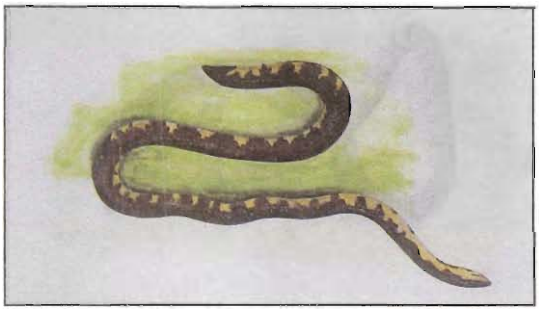
Much of the habitat in the Western Ghats has been replaced by plantations of tea, wattle, pine and eucalyptus. Tea plantations were first introduced by the British and have taken over much of the landscape over the past 150 years. In the last 50 to 100 years, the forest departments have shown



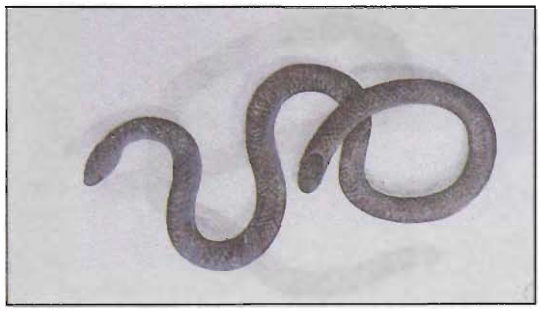


Figure 3 Uropeltis ocellatus: ***This species is common in the Nilgiris and Anamalais. It appears to have adapted to different habitats, including cardamom plantations. In Anamalais, they were dug out of clay soils, clinging to tubers in inundated fields.***

Figure 4 Uropeltis ceylanicus: This species has three different colour forms. It is one of two species whose range extends to the eastern ghats. The other is Uropeltis ellioti.

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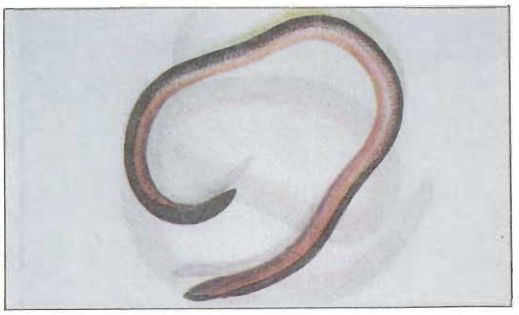
some concern about the protection of the sholas, but the grasslands have been largely ignored, and many of them have been replaced with wattle plantations.

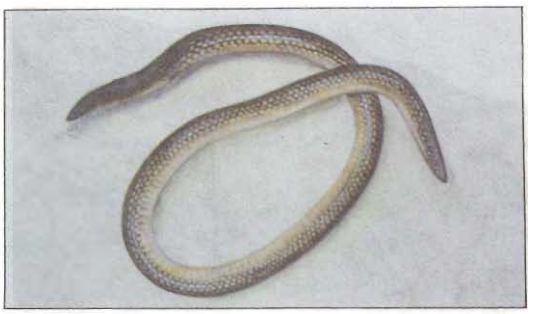
Painting a Picture

Uropeltids are small, fossorial, uniformly cylindrical snakes with a tapering head and tail. They are about 30–50 cm long and could, in fact, be mistaken for large earthworms, but for their flashy colours. The conical head has a keratinised tip and is slender, pointed and round in cross–section. The tail is short and blunt and in fact, they are also called 'rough tailed snakes'. The tail has a single enlarged and roughened shield, which may be fringed with less modified scales. The skin is superficially smooth and the scales are shiny and iridiscent, showing a spectrum from blue to orange. Most of the uropeltids have a black, brown or olive green dorsal surface. They have light or brightly coloured lateral lines or blotches, especially on the tail or the neck. The source of the pigments is within the integument. These features are believed to be highly adaptive to their lifestyle. Most uropeltids are extremely beautiful snakes, but their marvellous colours arouse both admiration and fear.

An Adaptationist Eye View

Uropeltids are essentially earth snakes living beneath the soil. Their 'wedge shaped head' serves as their 'tunneling device'. The keratinised ridge facilitates penetration and serves to





distribute stress. The head, led by the tip, drives a primary tunnel and the anterior vertebral column, with its S-shaped curvature, provides second stage widening. The snake's mode of tunneling is well suited for travel among root systems. As the uropeltids do live in tropical forests with a high density of woody plants, the soils are likely to have complex root systems and this adaptation becomes significant.

Figure 5 *Brachyiophidium rhodogaster:* ***This genus has a single species. It is found in the Palanis. It is usually found in humus and other decayed vegetable matter.***

Figure 6 *Plectrurus perroteti:* ***This shieldtail is common in the Nilgiris and Anamalais. It has been observed that the specimens found in sholas where they occur naturally are usually a uniform brown.***

These burrows are constructed during the rainy season, when the soil is soft. The burrows then harden, and the snakes wander in their network beneath the soil in search of their food, earthworms.

The *shield* on the tail helps form a plug to close the tunnel. Many shieldtails, when removed from the soil, have been found to have dirt capped caudal shields. The plug should serve to confuse and deter predators of the snakes.

The *chemical colours* of the snakes are produced by the chromatophores in the dermis. These could be explained by different adaptive arguments such as *flash colouration*; predators tend to avoid bright or flashy colours as these are usually indicative of poisonous animals. Another explanation for the colours could be head mimicry.

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The *coiling behaviour* of the shieldtails is interesting in this context. When excavated, they coil immediately around one's fingers or any available object, and rigidly project their tails. This must also happen when they are burrowing. The tails'

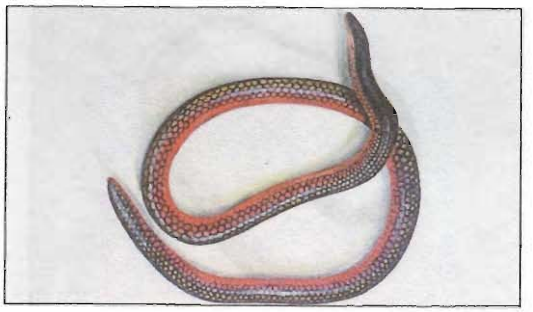

Figure 7 Plectrurus perroteti: ***The same species, when found in tea estates and plantations (and in sholas in some areas), is reddish below. Juveniles often have a yellow line on the dorsal surface of the tail.***

Figure 8 Thai Shola is the largest patch of montane evergreen forest in the Nilgiris. It adjoins a large tea estate; estates have been responsible for substantial habitat loss in the upper plateau of the Western Ghats, adversely affecting the uropeltids.

rhythmic movements, coupled with the lateral eyespots enhances its similarity to the head.

The colour pattern of the snakes may also resemble some of the small elapid snakes of Sri Lanka. Although these venomous elapids are now too rare to suggest mimicry, the distributions of these snakes may have been greatly affected by agricultural advances in recent times. It is also suggested that the uropeltid colouration mimics that of some poisonous arthropods such as centipedes. The venomous coral snake, *Callophis nigrescens*, also occurs at a number of localities in the Western Ghats where uropeltids are also found. Though they share the cylindrical body and short tail, Callophis is much longer than uropeltids, and has a different colouration. However, one uropeltid, *Platyplectrurus trilineatus*, has a colouration similar to the coral snake.

Finally the *structural colours* of uropeltids may also be adaptive. They have an axially oriented stripe pattern. Such regular patterns are believed to help in the reduction of friction. In uropeltids, they may serve to keep particles from sticking to the surface and also as an anti-wetting device.

Earthworms seem to form a major part of the uropeltid diet. Stomach content analysis has shown that earthworms form 80-90 % of their diet.

In the Food Chain

Earthworms seem to form a major part of the uropeltid diet. They may take small quantities of earwigs, termites and caterpillars, but these are not significant. Stomach content analysis has shown that earthworms form 80–90 % of their diet.

***Figure 9** Montane evergreen patches or 'sholas' can be as small as half a hectare and uropeltids, being burrowing snakes would tend to be restricted to their patches.*

***Figure 10** Sholas are usually found in valleys. They are bordered by species such as* Rhododendron *and* Syzygium.

Coupled with the fact that uropeltid distribution is closely related to the presence and absence of earthworms, earthworms would appear to be an important part of their ecology.

Uropeltids are often killed by boars, which encounter them while digging for tubers. Mongoose may also eat these snakes. Birds, such as domestic fowl, pea fowl, jungle fowl and owls of various kinds feed on uropeltids.

Though uropeltids are known to be ovoviviparous, little else is known about their breeding and reproduction. Normal clutches seem to have 3 to 8 eggs, but there is a record of a specimen with 9 embryos. Development takes place in one oviduct, usually the right one.

Carl Gans studied allozymes, which are different electrophoretic forms of the same enzyme, at a number of genetic loci to evaluate genetic distances between the uropeltids genera and species. He also investigated variation in serum albumin in these taxa using immunological techniques. By this method he found uropeltids to be *genetically highly differentiated.* The phylogenetic tree most consistent with the immunological and electrophoretic data showed the Sri Lankan snakes to be monophyletic, and the Indian snakes to be paraphyletic with respect to those from Sri Lanka. A biogeographic scenario seems to indicate an early diversification in India, followed by an invasion into the lowlands of Sri Lanka. Subsequently, the uropeltids evolved in Sri Lanka to occupy montane biotopes there.

Suggested Reading

C Gans. Aspects of the biology of uropeltid snakes. In *Morphology and Biology of Reptiles* A.d'A. Bellairs and C.B.Box (Eds). Linnean Society Symposium Series. Academic Press, London. 3: 191-204. 1976.

M V Rajendran. Studies in Uropeltid Snakes. Madurai Kamaraj University, Madurai. 1985.

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Conservation

Uropeltids are a part of the rich array of fauna of the Western Ghats. Their importance is heightened by the high diversity within the group and their endemism. Many species have highly localised distributions, making them even more vulnerable, as local extinction would mean the extinction of the species. The decline of uropeltids in recent years may be attributed to the spread of plantations in the Western Ghats. Their habitat has been destroyed and the few remaining areas are highly fragmented. These snakes are also killed by humans, as the hill people believe they are poisonous.

Uropeltids could be performing important ecological roles; they are able to burrow in extremely hard soils, creating a complex network of tunnels. It is likely that these allow free passage of air to the deep soil and supply atmospheric air to the roots and rootlets of shrubs and trees.

Much of the credit for our present knowledge of uropeltids should go to the late Professor M V Rajendran, who pioneered studies in the basic biology and ecology of these snakes. However, it is quite clear that a lot more research needs to be done on this unique group of snakes. It is also evident that they need to be made a conservation priority if we are to preserve an irreplaceable part of our heritage and an important component of the montane ecosystem of the western ghats.

Figure 11 Hillstreams cut deep valley between the hills and sholas are usually found in these valleys. There are smaller perennial streams running through all the sholas. Some species of shieldtails are found in the damp soil near streams.

Figure 12 Sholas are dense forests, with stunted trees usually, a high density of shrub vegetation. The canopy cover is high and very little light seeps through. The shola forest floor is covered with leaf litter and fallen logs.