SCOOP!

INDIA'S SNAKE-MIMIC CATERPILLARS **WORMTONGUE!**

THE PERFECT IMITATION OF A VENOMOUS SNAKE'S HEAD - COMPLETE WITH STARING EYES AND A FLICKING TONGUE

A close-up of a caterpillar of the Common Mormon swallowtail butterfly Papilio polytes *shows its stunning defensive mechanism - when threatened the caterpillar everts a tongue-like organ called osmeterium which, together with tha fake "eyes" on its prothorax, complete the illusion of a venomous snake ready to bite.*

A caterpillar of the Common Mormon swallowtail butterfly Papilio polytes *is beginning to extrude the bright red, forked, snake tongue-like osmeterium from its prothorax.*

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Many caterpillars appear somewhat cute to us, because they are small, soft, chubby and often colorful – like little toys. But what appears so appealing to us are key features for predators like birds. To repel these predators caterpillars have evolved various strategies. Some just draw back in hiding-places most of the time to be out of reach. Others become invisible by blending in with their host plant by imitating leaves or twigs (camouflage or mimesis), or show warning colors indicating their venomous- or poisonousness (aposematism), or actively strike back with physical weapons like spines or toxic secretions. Again others imitate venomous or dangerous animals although being completely harmless in reality (mimicry). One such example of mimicry is displaying eyespots, that is imitating (mostly vertebrate) eyes on certain parts of the body, which is a widely used strategy in many animals in order to baffle and scare off predators. While also caterpillars of various moth and butterfly families make use of eyespots, the even more advanced imitation of a whole different animal, namely a snake, is rare and only well-elaborated in two families: the swallowtail butterflies (*Papilionidae*) and hawk moths (*Sphingidae*). But why snakes? Snakes are often venomous and therefore treated with caution by most potential predators. The rareness of snake mimicry in caterpillars is probably due to the fact that several special features in different body parts need to be met at the same time: a thickened or inflatable part towards one end of the body in defensive posture, the already mentioned eye spots in this inflatable part, a sufficiently big body size, a snake-

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Far left and above, a caterpillar of a Common Mormon butterfly Papilio polytes *showing the defensive action. Left, a caterpillar of the swallowtail butterfly Malabar Raven* Papilio dravidarum *displaying the same behavior.*

Left, a close-up portrait of a caterpillar of the Common Mormon butterfly Papilio polytes *shows its fake "snake eyes"; right, a ventral view of a caterpillar of the Malabar Raven* Papilio dravidarum *extruding the tongue-like osmeterium from its prothorax shows the stubby forelegs and the true eyes of the larva.*

Left, a latero-ventral view of a caterpillar of the butterfly Malabar Raven Papilio dravidarum *as it protrudes the osmeterium from its prothoracic segment; right, a dorsal view of the same species.*

Another view of a caterpillar of the swallowtail butterfly Malabar Raven Papilio dravidarum *as it everts the osmeterium from its prothoracic segment: the illusion obviously works only when the predator is facing the larva head-on.*

like body color and pattern, and at best a fake snake tongue. All that is featured in a couple of species in the swallowtail genus *Papilio*. If attacked these swallowtail caterpillars retract their head which inflates their thoracic segments and gives rise to the appearance of a snake's body shape. By doing so, often their eyespots "open" and thus become more conspicuous. A peculiar feature of all swallowtail caterpillars is the osmeterium, a red, orange or yellow, forked soft structure that is everted right behind the head capsule and often emitting smelly volatiles. In the snake-mimicking swallowtail caterpillars this osmeterium is reddish and as you can imagine looking like a snake's tongue that is flicking around. The eversion often goes along with raising the anterior part of the body and moving it rhythmically from one side to the other. This perfect snake mimicry enables the otherwise harmless caterpillar to rest all self-confident on the upper side of leaves where it usually finds the best growth conditions in terms of sunlight and warmth. Those species bear another interesting peculiarity which concern the larval development. The aposematic snake mimicry is not displayed from the very first instar on but is often not apparent earlier than in the final instar. In previous instars they are mimetic resembling bird droppings. Thus, the caterpillar is switching from a camouflaging to a mimicking fashion during its development. So next time you make a trip into the wild, beware and be aware of real and fake snakes!

This is how a predator - such as a small roving bird - would perceive a caterpillar of the swallowtail Malabar Raven Papilio dravidarum *as it emerges from the foliage - the illusion of the head of a snake lying in ambush is almost perfect.*