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Mongabay Series: Beyond Protected Areas

Habitat loss due to tourism in the Western Ghats pushes endangered frogs to the edge

by Spoorthy Raman on 6 June 2023

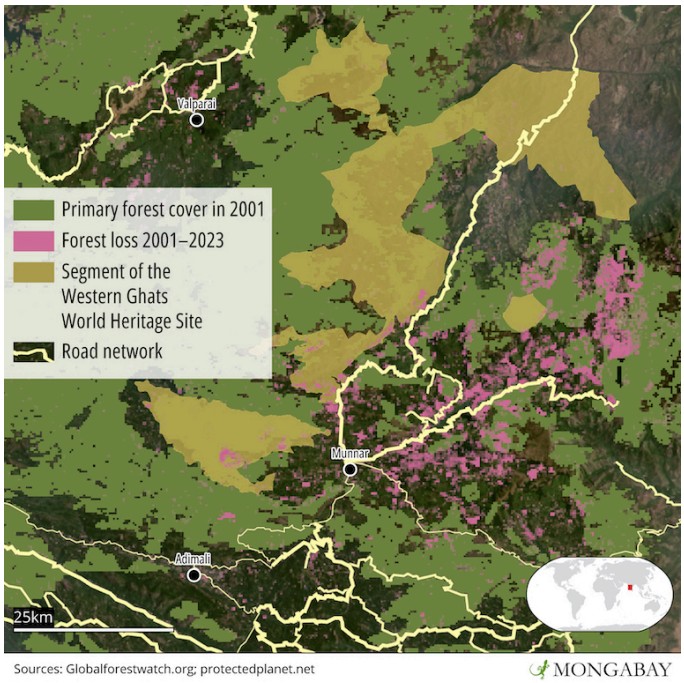
- *India's Western Ghats, a global biodiversity hotspot, is home to many endemic and endangered species of amphibians.*
- *Deforestation due to infrastructure and plantation expansion in the southern Western Ghats threaten the region's amphibian species, many of which have highly restricted habitats.*
- *Adding to their woes is an increased risk of landslides in parts of Kerala due to erratic, heavy monsoon rains and erosion due to loss of forest.*
- *To save them, experts are calling for a systematic taxonomic survey of amphibians in the region and for legal protection of endangered species.*

The picturesque Munnar in Kerala, with its lush green tea gardens carpet rolling hills, sits at the south of biodiversity hotspot that is the Western Ghats. Coffee and cardamom plantations intersperse the tea gardens, giving this lofty range the name Cardamom Hills. Groves of eucalyptus, black wattle and acacia — trees grown for firewood and timber — are peppered within these plantations.

Patches of shola forests — stunted tropical montane forests which once covered all these hills — lie scattered across the landscape as remnants of the past. Today, forests blanket just over half of Idukki, the district where Munnar is located, and are mostly found

inside protected areas, including Eravikulam National Park, Anamudi Shola National Park, and Periyar National Park.

The cloud-kissed hills and verdant valleys of idyllic Munnar beckon many wanderlusts with love for nature. But as tourism booms in the town and around, roads, electric lines and other infrastructure have mushroomed, and forested land is increasingly encroached (https://www.dailypioneer.com/2021/india/kerala-forest-official-blames-politicians-for-massive-deforestation.html) upon to make way (https://india.mongabay.com/2019/02/it-is-all-about-encroachment-in-the-hills-of-munnar/) for more resorts and plantations. While protected areas provide a safe haven to charismatic animals, like the elephants (*Elephas maximus indicus*) that often wander into tea plantations or the endemic Nilgiri tahrs (https://www.wwfindia.org/about_wwf/priority_species/threatened_species/nilgiri_tahr/) (*Nilgiritragus hylocrius*), tiny frogs and toads — often inconspicuous but highly diverse — are at risk of being lost in the shuffle.



(https://imgs.mongabay.com/wp-content/uploads/sites/20/2023/05/22222346/2023_30_India-1.jpg)

"Kerala is home to more than 200 species of amphibians, including frogs, toads as well as caecilians," herpetologist Sandeep Das, who has studied the taxonomy and ecology of many amphibian species in the southern Western Ghats for over a decade, including the recently-rediscovered purple frog (*Nasikabatrachus sahyadrensis*), said in a Zoom interview with Mongabay. "It is tremendous and it's an amazing diversity compared to other parts of India."

Biologists have described dozens of new species in the region over the last two decades, including the Munnar bush frog (*Raorchestes munnarensis),* Malabar fungoid frog (*Hydrophylax malabaricus),* Griet bush frog (*R. griet*) and resplendent bush frog (*R. resplendens*). But this may be just the tip of the iceberg, with scientists suspecting over a hundred more new species lie in wait of discovery.

"The low elevation plains have some common species but the mountain ranges are home to several species which are endemic and restricted to these particular areas," herpetologist Rajkumar K.P. said in a Zoom

interview with Mongabay. He has studied the amphibians and reptiles in Periyar Tiger Reserve, and is now collecting data on the distribution, status and ecology of the galaxy frog (*Melanobatrachus indicus*). "More than 90% of them are endemic to the Western Ghats," he said.

The purple frog (Nasikabatrachus sahyadrensis), an ancient species that lived during the dinosaurs, calls small crevices around rocky streams home. Landslides can alter their habitats drastically. Photo by David V Raju/Wikimedia Commons.

The southern Western Ghats, of which Munnar and the surrounding protected areas are a part, is also home to many diverse woody plants. Like the region's frogs, some of these plants are found nowhere else on the planet. A study (https://doi.org/10.1098/rspb.2022.2513) of woody plant diversity in the Western Ghats published recently in *Proceedings of the Royal Society B* found that the forests are home to very old plant species that evolved over 60 million years ago, as well as much younger ones, calling the southern Western Ghats "a museum and cradle of diversity."

"Due to its historic climatic stability and variation in topography, both young and old lineages persist here," author Abhishek Gopal, from the CSIR-Centre for Cellular and Molecular Biology, said in an email to Mongabay.

Tree cover loss threatens endemic frogs

The vast amphibian diversity of the southern Western Ghats is now at risk. As frogs are extremely sensitive to small changes in their environment, climate change and other human-caused disturbances can decimate their numbers.

"For many endemic species, it's the microhabitat characteristic that matters," amphibian biologist K.V. Gururaja, who has studied the taxonomy and ecology of frogs across the Western Ghats for more than 25 years, said in a Zoom interview with Mongabay. "These species have serious issues with even the slightest change, like trees being removed or an agriculture field slightly extended."

"The general threats that amphibians are facing all over the world are the same here as well," Das said. "In the lower elevations, the major issue is habitat loss because those areas are being converted into human habitations at a larger scale than in the mountains."

The rolling hills of Idukki are no strangers to land use change. Beginning in the late 19th century, large swathes of montane shola forests were cut down by the British colonists to grow coffee, tea and spices like cardamom. Over the years, as plantations expanded, the forest cover shrank. A 2016 satellite-based study (https://link.springer.com/article/10.1007/s12524-015-0521-x) showed that in 1925, most (93.2%) of the landscape was forested, but by 2012, it dwindled to just over half (52.1%).

Tree plantations, a colonial legacy, carpet some of the rolling hills of the Western Ghats around Munnar. Photo by Bimal K/Wikimedia Commons.

Although Idukki is proportionally the most forested district in Kerala, data from Global Forest Watch (https://gfw.global/41xPgfS) show the district has lost 115 square kilometers (about 44 square miles) of tree cover in the last two decades (2001-2021), amounting to a nearly 3% drop in tree cover since the turn of the century.

This loss is despite the fact that logging of shola forests — both in and outside of protected areas — is legally prohibited.

"It's not easy for someone to just go and deforest at this point of time," Das said.

Das attributed tree cover loss seen in satellite data to conversion and removal of non-native eu
mainMap=eyJzaG93QW5hbHlzaXMiOnRydWV9&map=eyJjZW50ZXIiOnsibGF0IjoxMC4xMjg3
in the district. In total, Idukki lost nearly 1% of its old growth forests between 2002 and 2021, ac
Global Forest Watch data indicates habitat loss around Munnar has continued to the present d
category=summary&map=eyJjZW50ZXIiOnsibGF0IjoxMC4xMjAyNDM0OTkwMDUwNjIsImxuZ
and into 2023 (https://www.globalforestwatch.org/map/country/IND/17/3/?
category=summary&map=eyJjZW50ZXIiOnsibGF0IjoxMC4xMjAyNDM0OTkwMDUwNjIsImxuZ

"Every other day, new homestays and resorts are coming [up] everywhere around Munnar," Rajkumar said. "It's a big problem."

Gururaja said he's observed similar trends in other parts of the Western Ghats in the neighbouring Karnataka, where crops like cardamom have been failing in recent years, prompting farmers to sell their land.

"Whatever small land holdings were there, that's being sold out [for tourism]," he said.

The loss of green cover also concerns evolutionary biologists like Jahnavi Joshi, who led the study on the diversity of woody plants in the Western Ghats.

"We still do not fully understand the ecology of many of these species, and many species are still being discovered from this region," she said in an email to Mongabay, adding that these forests are "particularly vulnerable as the high diversity is also juxtaposed with high anthropogenic use."

Eravikulam National Park is home to a healthy population of the Nilgiri tahr (Nilgiritragus hylocrius), an endangered, endemic species in the southern Western Ghats. Photo by Charles J. Sharp/Wikimedia Commons.

Read more: Climate change could threaten the habitat of the endangered Nilgiri tahr (https://india.mongabay.com/2018/08/climate-change-could-threaten-the-habitat-of-the-endangered-nilgiri-tahr/)

As the landscape changes and highways are expanded to ease access, animals big and small are being affected: elephants have increasingly strayed (https://www.thehindu.com/news/national/kerala/fragmented-forests-leave-jumbos-jittery/article30832279.ece) into villages and frogs are losing access to their breeding grounds.

"Majority of them need water for breeding," said Das, and as infrastructure and road networks cut them off from the nearby streams, the effects can be devastating—especially for endemic species like the bush frogs, many of which feature on the IUCN Red List as critically endangered or endangered species.

"Widely distributed species are highly adapted to [withstand] changes in the landscape, but when we look at species that are specific to some microhabitat, they are highly affected by these kinds of fragmentations and deforestation," Rajkumar said.

While tea plantations in the region also change the landscape, studies (https://digitalcommons.fiu.edu/cgi/viewcontent.cgi?article=3962&context=etd) show they still provide safe refuge to some amphibians.

"Plantations are fragmented landscape habitats that are restricted, but they do support amphibians," Das said.

Recent unfettered development around Munnar, coupled with erratic monsoon rains due to the centuries of deforestation (https://frontline.thehindu.com/environment/pouring-hardship/article65778187.ece#:~:text=All%20over%20Kerala%2C%20the%20monsoon,thirds%20o has brewed (https://www.currentscience.ac.in/Volumes/119/11/1797.pdf) a perfect storm of lands region. In 2018, devastating landslides struck many parts of Kerala, including Idukki, affecting n more than 400. Landslides have since been a recurring phenomenon in many parts of southern scientists predicting an increase (https://scroll.in/article/970198/why-do-landslides-keep-occurı in landslides in the future, it's now an added risk for endemic frogs' survival.

"Landslides impact amphibians because most happen close to some of the biggest streams," said Das, citing an example of how such changes affect purple frogs, which are found near rocky streams in the lower elevations around Munnar. "Those kinds of areas change drastically with landslides," he said.

The galaxy frog (Melanobatrachus indicus), an endemic species found in high-altitude evergreen forest and shola forest, is considered a flagship species of Mathikettan Shola National Park in Idukki. Photo by Harikrishnan S./iNaturalist.

Landslides have also caused species to go downhill—literally and figuratively. For instance, some species of torrent frogs, typically found in higher elevations (over 1,000 meters or 3,280 feet) in the Western Ghats in northern Kerala, are now seen in areas around 100-200 meters in elevation.

"They are [now] very rare in areas where they were initially found," said Das, adding that landslides can also bury and kill frogs.

In 2020, landslides struck Pettimudi, a village near Eravikulam National Park, home to galaxy frogs.

"It completely washed [out] one of the shola patches," Rajkumar said. While he can't tell if the galaxy frogs were found in those particular destroyed patches, "that kind of landslide can completely change its habitats, and the population will be washed away," he said.

Call for systematic studies and conservation

From lurking in leaf litter and living in streams to an arboreal life in the trees and feasting on decaying logs, frogs live in almost every kind of habitat in the Western Ghats. As major predators of insects, these amphibians help convey carbon through the forest's various food webs.

However, as streams are blocked by logging, dead trees are removed for firewood and land is cleared for plantations and housing, ecosystems that support entire species are at risk of blinking out of existence. In response, conservationists are endeavouring to speed up taxonomic research to better understand the amphibian biodiversity of the Western Ghats and more effectively protect the species most in danger of extinction.

"Our systematic study [of amphibians] has been very patchy," Gururaja said. In 2020, the Amphibian Specialist Group of the IUCN reassessed many frog species in the Western Ghats, some of which were listed as "data deficient" in earlier assessments. With the new assessment, "critically endangered species have reduced from 35 to 17, but endangered species have doubled," he said, adding that there are still gaps.

"We know what species we have but we do not know exactly their distribution range, breeding niche, behavior and ecology," Rajkumar added, citing the example of the Travancore bush frog (*R. travancoricus)*, a species once thought to be extinct but now found distributed across over 80 locations inside Periyar Tiger Reserve.

Once presumed extinct, the Travancore bush frog (Raorchestes travancoricus) was rediscovered in 2004 and is now categorised as endangered by the IUCN. Photo by Saurabh Sawant/Wikimedia Commons.

Researchers say India also lacks proper legal protection for its amphibians.

"We don't have any [protected areas] dedicated to frogs," said Gururaja, adding that the Indian Wildlife Protection Act 1972—aimed at protecting the country's biodiversity—lists a handful of freshwater frogs in its Schedule IV section, which bans hunting or trade of these species. And many of those that are listed are referred to by outdated scientific names, he said, "so even if you catch a frog now, if the scientific name is different, you cannot be [prosecuted] legally."

In the 2022 amendment (http://www.indiaenvironmentportal.org.in/files/file/wildlife%20protection%20amendment%20ac to the Act, species belonging to the *Nasikabatrachus* genus (like the purple frog), have been ad Schedule I and get as much protection as tigers or elephants per the law. But more such additi needed, researchers say.

"Giving legal protection by adding potential amphibian species into the schedule of Wildlife Protection Act, 1972 is one of the major actions that the authorities can do," Rajkumar said, adding, "species that are vulnerable to collection, pet trade, habitat destruction, etc., should be added."

Expanding awareness among the public of the biodiversity in their backyard and working with various stakeholders can also be effective conservation actions, experts say. In this direction, Das and Rajkumar are trying to convince Kerala to recognise the purple frog as its "state frog." Gururaja is on a similar endeavour (https://www.newindianexpress.com/states/karnataka/2021/nov/27/karnataka-would-soon-have-its-state-frog-2388796.html) with Karnataka to recognise the Malabar tree toad (*Pedostibes tuberculosus*) as its "state amphibian."

"We believe that only if the policy makers, protected area managers, and the general public are aware [is]conservation is possible," Das said.

"It's now time for us to move from charismatic species," said Gururaja, who is advocating for recognition of the threats frogs face today. "A tiger can run away easily from a forest if there's a change, but my frogs can't."

Read more: Habitat preservation in the Western Ghats can help enhance biodiversity in the hotspot (https://india.mongabay.com/2023/03/habitat-preservation-in-the-western-ghats-can-help-enhance-biodiversity-in-the-hotspot/)

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Banner image: The galaxy frog (Melanobatrachus indicus), an endemic species found in high-altitude evergreen forest and shola forest. Photo (https://uk.inaturalist.org/taxa/25189-Melanobatrachus/browse_photos) by David Raju/iNaturalist.

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