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Alarming habitat loss in the westernmost range of *Tylotriton himalayanus* in Nepal

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The Himalayan salamander (*Tylotriton himalayanus*), listed as Vulnerable on the IUCN Red List, occurs across the eastern Himalayas, including Nepal and the Darjeeling–Sikkim region of India (Khatiwada et al., 2021). It inhabits cool, shaded mid-hill wetlands, marshes, and forest ponds at elevations of 1,500–3,000 m (Khatiwada et al., 2015). Breeding takes place in clean, slow-flowing or still water with abundant aquatic

vegetation, while adjacent moist forests and grasslands provide essential foraging and shelter habitats (Bedi et al., 2021).

The species faces increasing threats from habitat loss, wetland conversion, and anthropogenic disturbance, factors that have driven its Vulnerable status (ASG, 2021). In Nepal, these pressures are particularly severe, as wetlands are frequently drained for agriculture, infrastructure expansion, and tourism development, resulting in the direct loss of breeding sites and fragmentation of remaining habitats.

Within Nepal, *T. himalayanus* is restricted to the eastern mid-hills, particularly in Ilam, Panchthar, and Dhankuta. On our finding, the Chaubise area (1,200–1,800 m) of Dhankuta marks its westernmost known distribution limit. This landscape, characterized by scattered wetlands and remnant forest patches, also harbors a high diversity of amphibians. The patchy network of wetlands such as Budhabare Wetland, Kangada Lake, Dhapad Lake, Raja Lake, and Rani Lake, once formed a crucial habitat corridor for amphibians. However, these sites have undergone extensive

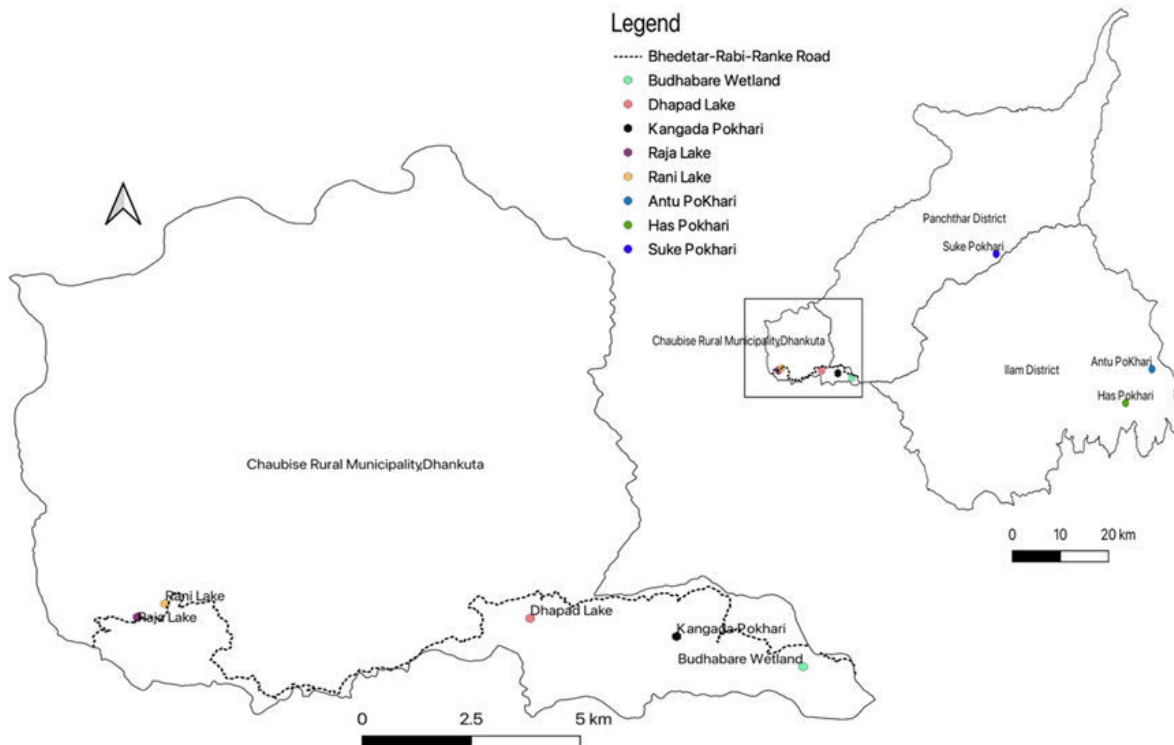


Figure 1: Chaubise wetland cluster and destroyed wetland of Ilam and Panchthar district as vanishing habitat for *Tylotriton himalayanus*.

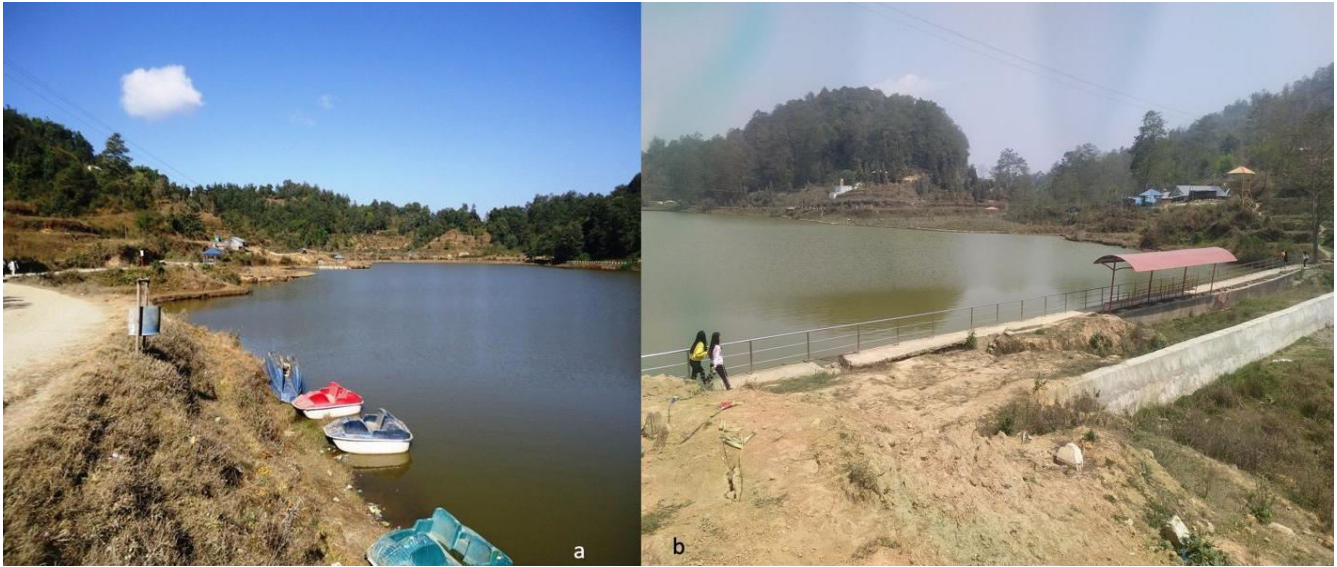


Figure 2: After construction of a large man-made pond with concrete dam (b), Rani Lake has started manual and motor boat facilities in 2024 (a). Photos: Bivek Gautam.

degradation and land-use change, significantly diminishing their ecological value.

Raja-Rani Lake, Dhankuta: From salamander refuge to recreation zone

The Raja and Rani Lakes, two adjacent water bodies collectively referred to as the Raja–Rani Lake, represent the westernmost distribution limit of the Himalayan salamander. The wetland’s marshy habitat, which is rich in aquatic vegetation, provides ideal breeding conditions for the species. However, over the past decade, Raja-Rani Lake has undergone extensive land-use change.

Historically, Rani Lake functioned as a swampy wetland covered with aquatic vegetation and retaining water nearly year-round until 2006. However, under the banner of “wetland conservation,” the government constructed a large artificial pond (~8 ha) by damming and adding concrete embankments, fundamentally altering the natural habitat (Ekantipur, 2025; Shrestha et al., 2017). This transformation shifted the site from a marshy amphibian habitat to a recreational area. Subsequent introduction of exotic fish and the development of boating facilities further compromised habitat suitability. Salamanders were still recorded in this location until around 2019, but surveys between 2020 and 2024 have failed to detect the species at Rani Lake.

Raja Lake has experienced similar degradation. Parts of the wetland have been encroached for material storage, the construction of a hospital and school, and

even converted into a football ground (Fig. 3b). Additionally, the Bhedetar –Rabi– Ranke highway was built along the eastern margin of the Lake, with road contractors depositing construction materials on-site. This activity caused significant siltation in the eastern section and further reduced suitable salamander habitat (Fig. 3a).

In May 2025, the Koshi Provincial Investment Authority invited investors to develop tourism infrastructure at Raja Lake, with projects valued at Rs. 2000 million (Reporters Nepal, 2025). Although details remain unclear, the local municipality appears prepared to lease the wetland for tourism-oriented construction. While *T. himalayanus* persists in some parts of Raja Lake, ongoing disturbance and impending large-scale development projects place the population at high risk of local extinction.

A further complication is the land tenure system. The Raja–Rani Lake wetland complex (~30 ha) is under private ownership, situated amidst residential areas, local markets, and government facilities (Shrestha et al., 2017; Fig. 2b). This fragmented ownership, combined with limited government attention to salamander conservation and competing infrastructure priorities, poses major challenges to safeguarding this species.

Dhapad Lake: A vanishing habitat

Dhapad Lake, though referred to as a Lake, no longer retains an open waterbody; according to older villagers, it historically existed as a Lake but has since



Figure 3: Eastern edge of Raja Lake is degraded from heavy siltation resulting from Bhedetar-Rabi-Ranke Road construction (a), western part of wetland is degraded due to construction material deposition, urban encroachment and playground construction (b). Pictures taken in 2024. Photos: Bivek Gautam.

transformed into a marshy landscape. The site, situated in the headwater zone of the Chisang/Khadam River, is comprised of marshland at the center, surrounded by rangelands and bordered by dense *Castanopsis* forest to the east, south, and west. The Bhedetar–Rabi–Ranke Road passes to the north of the site. During the first survey in 2020, Dhapad Lake was observed as a natural marshy ground with a flowing stream, reflecting its wetland character despite the absence of a standing Lake (Fig. 4).



Figure 4: Natural landscape of Dhapad Lake in 2019. Photo: Bivek Gautam.

In 2022, the local municipality identified Dhapad Lake as a priority tourism development site, launching one of its largest municipal projects (Sangalokhabar, 2022). The natural marshland was converted into a set of artificial ponds (~3 ha) through damming of the stream (Sangalokhabar, 2022; Fig. 5b). By March 2025,

additional infrastructure (including concrete walkways, a temple, a community hall, parking space, and a traditional-style shelter, *falaicha*) had been constructed (Figure 5a). During field surveys, sand and gravel extraction and stockpiling were also observed near salamander habitat, a practice funded by both the Koshi Province and the local government (Sangalokhabar, 2025; Fig. 5a). These developments have significantly disrupted the ecological function of the wetland.

Furthermore, ongoing sand mining and deposition threaten to increase siltation in the wetland and downstream aquatic habitats. Local residents reported future plans for fish farming and boating at newly constructed Dhapad Lake, echoing interventions previously documented at Rani Lake. This broader pattern of converting natural wetlands into artificial ponds for recreation and commerce is also evident at other salamander habitats in Ilam and Panchthar, including Suke Pokhari, Antu Pokhari, and Has Pokhari (Fig. 1).

Conclusion

Since 2019, on our regular herpetological surveys conducted across the Chaubise Raja Rani Landscape we have observed a consistent decline in abundance of *Tylotriton himalayanus*. These findings indicate a rapidly deteriorating situation of the population dynamics across the whole range of the species, and underscoring the increasing urgency for conservation action. The transformation of critical amphibian habitats in eastern Nepal, particularly those supporting



Figure 5: Recent infrastructure development including paved walkways, temple, community hall and sand mining at Dhapad Lake (a), manmade pond structure (~3 ha) (b). Pictures tables in 2025. Photos: Bivek Gautam and Hari Lamjel.

Tylotriton himalayanus, highlights a broader trend of wetland loss due to regulated development and land-use change. Without urgent conservation action, such as community sensitization, stronger wetland policies, and habitat restoration, these populations may soon be extirpated. Documenting these changes and raising awareness is a crucial step in advocating support for the protection of Nepal's only salamander species and other unique amphibian species.



Figure 6: Himalayan salamander (*Tylotriton himalayanus*) observed in 2023 on a sand-dominated substratum near a stream close to Dhapad Lake. This shift from muddy to sandy substrate is likely due to ongoing siltation caused by infrastructure constructions and sand mining activities. Photo: Bivek Gautam.

Acknowledgments

This note is based on insights and data generated through multiple projects and field surveys conducted between 2019 and 2025, supported by the Nagao Natural Environment Foundation (NEF), Chaubise Rural Municipality, Katie Adamson Conservation Fund (KACF), the Amphibian Survival Alliance (ASA), and Re:wild. We are deeply grateful to Sudip Rai, Rijan Ojha, Bhairaj

Chamling, Ramchandra Limbu, Netra Koirala, Basanta Khadka, Abishek Simkhada, Jeevan Katwal, and Amaël Borzée for their invaluable assistance in the field. Their contributions greatly enhanced the scope and success of this work.

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