Journal of Lost Species

The Manipur bush rat *Hadromys humei*: a poorly known endemic rodent at risk of extinction

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Abstract: The genus *Hadromys* comprises two poorly known rodent species: *Hadromys humei* from north-eastern India and *Hadromys yunnanensis* from China. Despite being described more than a century ago, *H. humei* remains one of the least studied murid rodents in South Asia. The last confirmed record dates to field investigations conducted in Manipur in 1945, and as of 2026, the species is considered lost, with no confirmed records from the wild for 76 years. Endemic to northeastern India, it has never been recorded from a protected area and is suspected to be threatened by habitat loss, fragmentation, fire, and broader land-use change. Current knowledge of the species is based largely on historical records and secondary literature, with no genetic studies conducted to date.

Keywords: *Hadromys humei,* lost species, rediscovery strategy, extinction risk.

Conservation Statement: The Manipur bush rat (*Hadromys humei*) is an endemic rodent known from only a few historical records in northeastern India and is categorised as Endangered by the International Union for Conservation of Nature (IUCN). The species is now considered lost, with no confirmed records from the wild for the past 76 years. Knowledge of its current distribution, population status, and ecology remains limited, and it has never been reported from a protected area. Targeted surveys in historical localities, together with ecological and molecular studies, are urgently needed to confirm the continued persistence of *H. humei* and inform future conservation planning.

সাৰাংশ : হাইড্রামিজ (Hadromys) গণৰ অন্তর্গত দুটা অতি কম পৰিচিত ৰোডেণ্ট বা দাঁতেৰে কাটি খোৱা সৰু স্তন্যপায়ী প্রজাতি হৈছে-উত্তৰ-পূব ভাৰততে পোৱা হাইড্রামিজ হোমেই (*Hadromys humei*) আৰু চীনত পোৱা হাইড্রামিজ য়ুনানেনচিছ (*Hadromys yunnanensis*)। এশ বছৰতকৈও অধিক পূর্বে বর্ণনা কৰা হোৱা সত্ত্বেও হাইড্রামিজ হোমেই দক্ষিণ এছিয়াৰ ভিতৰতে আটাইতকৈ কম অধ্যয়ন কৰা ম'ৰিড ৰোডেণ্টসমূহৰ অন্যতম হৈ আছে। এই প্রজাতিটোৰ শেষ নিশ্চিত তথ্য ১৯৪৫ চনত মণিপুৰত চলোৱা ক্ষেত্রভিত্তিক অনুসন্ধানৰ পৰা পোৱা গৈছিল। ২০২৬ চনলৈকে যোৱা ৭৬ বছৰত প্রাকৃতিক পৰিৱেশত এই প্রজাতিটোৰ কোনো নিশ্চিত উপস্থিতিৰ তথ্য পোৱা নগ'লেও, ইয়াক

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'হেৰুৱা প্ৰজাতি' হিচাপে গণ্য কৰা হৈছে। উত্তৰ-পূব ভাৰতৰ স্থানীয় এই প্ৰজাতিটো এতিয়ালৈকে কোনো সংৰক্ষিত অঞ্চলৰ পৰা নিশ্চিতভাৱে নথিভুক্ত হোৱা নাই। বাসস্থান ধ্বংস আৰু খণ্ডিতকৰণ, বনজুই তথা ব্যাপক ভূমি-ব্যৱহাৰৰ পৰিৱৰ্তনৰ ফলত এই প্ৰজাতিটোৰ অস্তিত্বলৈ ভাবুকি আহিব পাৰে বুলি আশংকা কৰা হৈছে। বৰ্তমান এই প্ৰজাতিটোৰ বিষয়ে থকা জ্ঞান মূলতঃ ঐতিহাসিক তথ্য আৰু গৌণ সাহিত্যৰ ওপৰত নিৰ্ভৰশীল। আজিলৈকে হাইড্ৰামিজ হোমেইৰ ওপৰত কোনো জিনীয় অধ্যয়ন সম্পন্ন হোৱা নাই। সেয়েহে, হাইড্ৰামিজ হোমেইৰ বৰ্তমান অস্তিত্ব নিশ্চিত কৰা, ইয়াৰ পৰিসৰ, বাসস্থান আৰু পৰিৱেশগত বৈশিষ্ট্য পুনৰ নিৰূপণ কৰা তথা সংৰক্ষণৰ অৱস্থা মূল্যায়ন কৰাৰ বাবে লক্ষ্যভিত্তিক ক্ষেত্ৰ-সমীক্ষা আৰু আণৱিক বা জিনীয় অধ্যয়ন অতি প্ৰয়োজনীয়।

মূল শব্দ: হাইড্ৰামিজ হোমেই, হেৰুৱা প্ৰজাতি, পুনৰ আৱিষ্কাৰৰ কৌশল, বিলুপ্তিৰ আশংকা।

সংৰক্ষণ সম্পৰ্কীয় বক্তব্য: মণিপুৰ বুশ ৰেট (*Hadromys humei*) উত্তৰ-পূব ভাৰতৰ মাত্ৰ কেইটামান ঐতিহাসিক তথ্যৰ পৰা জনাজাত এক স্থানীয় (Endemic) তীক্ষ্ণদন্তী প্ৰাণী। আন্তঃৰাষ্ট্ৰীয় প্ৰকৃতি সংৰক্ষণ সংঘ International Union for Conservation of Nature (IUCN)-এ এই প্ৰজাতিটোক 'বিপন্ন' (Endangered) হিচাপে শ্ৰেণীভুক্ত কৰিছে। বিগত ৭৬ বছৰত বন্য পৰিৱেশত এই প্ৰজাতিৰ কোনো নিশ্চিত তথ্য পোৱা নোযোৱাৰ বাবে বৰ্তমান *H. humei*-ক বিলুপ্তপ্ৰায় বা 'হেৰাই যোৱা' (lost) প্ৰজাতি হিচাপে গণ্য কৰা হৈছে। এই প্ৰজাতিটোৰ বৰ্তমানৰ পৰিসৰ, জনসংখ্যাৰ অৱস্থা আৰু পৰিৱেশগত বৈশিষ্ট্য সম্পৰ্কে এতিয়াও পৰ্যাপ্ত তথ্য উপলব্ধ নহয়। তদুপৰি, কোনো সংৰক্ষিত অঞ্চলৰ পৰাও এই প্ৰজাতিৰ উপস্থিতিৰ তথ্য এতিয়ালৈকে পোৱা হোৱা নাই। ঐতিহাসিকভাৱে এই প্ৰজাতিটোৰ উপস্থিতি নথিভুক্ত হোৱা অঞ্চলসমূহত লক্ষ্যভিত্তিক অনুসন্ধান চলোৱাৰ লগতে ইয়াৰ পৰিৱেশগত বৈশিষ্ট্য আৰু আণৱিক (Molecular) অধ্যয়ন অতি জৰুৰী। এনে গৱেষণাৰ জৰিয়তে *H. humei* প্ৰজাতিটো এতিয়াও বন্য পৰিৱেশত টিকি আছে নে নাই, সেয়া নিশ্চিত কৰাৰ লগতে ভৱিষ্যতৰ সংৰক্ষণ পৰিকল্পনা প্ৰস্তুত কৰাত সহায়ক হ'ব।

INTRODUCTION

The Manipur Bush Rat, *Hadromys humei* (Thomas, 1886), is an endangered rodent species endemic to northeastern India (Molur and Laginha Pinto Correia 2016). Historically, the species has been recorded only from Bishnupur and Senapati districts of Manipur (Roonwal 1949, 1950; Thomas 1886) and from Angarakhata, Assam (Hinton and Lindsay 1926) (Table 1; Fig. 2). Knowledge of the geographic distribution of *Hadromys humei* remains limited, and information on its habitat and natural history is equally scarce.

Natural History

The only detailed ecological observations that are available of *H. humei* are those of Roonwal (1949, 1950), who reported that most individuals from the Imphal region of Manipur were collected in oak parkland habitats. Based on photographs provided by Roonwal, Musser (1987) described this habitat as consisting of scattered scrub-like oak trees (9 to 12 m high) on dry, undulating hillsides. The ground beneath the trees was covered with tall grasses reaching 3 to 3.7 m in height, while shrubs were sparse and epiphytes absent. The soil was described as loamy, rocky, and poor in humus. Apart from the dense grass cover, the landscape appeared park-like because of the gently rolling hills and widely spaced trees (Musser 1987).

Roonwal also noted that the stomach contents of an adult male trapped in oak scrub mainly consisted of finely cut grass leaves, providing one of the few direct insights into the species feeding ecology and supporting interpretations based on its cranial and dental morphology (Musser 1987). The species is nocturnal and fossorial and is believed to feed primarily on tender shoots and leaves. Breeding has been reported during September and October (Musser 1987; Roonwal 1949, 1950).

Systematics

Taxonomic and systematic studies of Indian small mammals trace back to the British colonial era, with significant early contributions provided by Ellerman (1961), Agrawal (2000), Musser and Carleton (2005), and Molur et al. (2005). A major milestone in the taxonomy and systematics of small mammals in the Indian

Table 1. Confirmed historical records of *Hadromys humei* from northeastern India. Coordinates are shown as decimal degrees.

Locality	Latitude	Longitude	Year	Reference
Moirang, Bishnupur District, Manipur (Type locality)	24.48	93.75	1886	Thomas 1886
Angarakhata, North Kamrup (present-day Baksa District), Assam	26.67	91.57	1926	Hinton and Lindsay 1926
Imphal region, Senapati District, Manipur	25.26	94.02	1945	Roonwal 1949, 1950

subcontinent was the publication of Ellerman's comprehensive review in 1961. Small mammals have long attracted scientific interest because of their high diversity and wide distribution. However, their taxonomy and distribution in India, particularly in Assam, remain poorly documented because of limited research efforts (Chatterjee et al. 2020). Among the few key references, Choudhury's *Mammals of Northeastern India* (2013) stands out as a critical resource for understanding the taxonomy and distribution of the region's mammalian fauna.

The genus *Hadromys* (Rodentia: Muridae) currently includes two extant living species: the Hume's rat or Manipur bush rat, *Hadromys humei*, and the Yunnan hadromys, *Hadromys yunnanensis* (Yang & Wang, 1987) (Table 2). *Hadromys humei* was originally described as *Mus humei* by Thomas in 1886 from Moirang, Manipur, India, (Fig. 1) and was later placed under its current genus by Thomas (1911). The Yunnan hadromys, *H. yunnanensis* was described in 1987 from western Yunnan, China, as a subspecies, which was later elevated

Figure 1. Original illustration of Manipur bush rat *Hadromys humei* (as *Mus humei*) reproduced from Plate V of Thomas (1886).

Table 2. Distribution, habitat, elevation range, and conservation status of species under the genus *Hadromys*. † = Extinct Species.

Species	Common Name	Current Distribution	Historical / Fossil Distribution	Habitat	Elevation	Conservation Status	Reference
Hadromys humei	Hume's rat / Manipur bush rat	Northeastern India - historically recorded from Bishnupur and Senapati districts of Manipur, and Angarakhata (present-day Baksa District), Assam	Wider distribution during the Pleistocene inferred from fossil and biogeographic studies	Oak parkland, oak scrub, evergreen forest; dry undulating hills with tall grasses and loose loamy soil	100–300 m and 900–1,300 m asl	Endangered (Molur et al. 2016)	Agrawal 2000; Chatterjee et al. 2020; Choudhury 2013; Ellerman 1947; Hinton and Lindsay 1926; Mandal et al. 2005; Molur et al. 2005; Roonwal 1949, 1950; Thomas 1886; Talukdar et al. 2021
Hadromys yunnanensis	Yunnan Hadromys	Western Yunnan, China (especially Ruili County)	Believed to have had a wider distribution during the Pleistocene	Evergreen montane habitats (poorly studied)	970–1300 m asl	Data Deficient (IUCN 2016)	Smith and Xie 2008; Yang and Wang 1987
Hadromys loujacobsi †	Extinct Pleistocene Hadromys	Extinct	Fossil species described from Pabbi/Kharian Hills, Potwar Plateau, Punjab region, northern Pakistan	Pleistocene deposits	Unknown	Extinct	Musser 1987

to a species by Musser and Carleton (2005). The genus also includes an extinct Pleistocene species, *Hadromys loujacobsi* (Musser 1987), described from the type locality at Pabbi (or Kharian) Hills on the southeastern margin of the Potwar Plateau in the Punjab region of northern Pakistan (Table 2).

The genus remains taxonomically poorly studied, and no modern revision integrating morphology, genetics, and phylogenetic analyses has been undertaken. Consequently, the evolutionary relationships within the genus and its affinities with other murine rodents remain uncertain. The absence of molecular data also limits understanding of divergence between *H. humei* and *H. yunnanensis*, historical connectivity among populations, and potential cryptic diversity within the genus.

Geography

Historically, *Hadromys humei* has been recorded only from Bishnupur and Senapati districts of Manipur (Roonwal 1949, 1950; Thomas 1886, 1911) and from Angarakhata, North Kamrup, (near Daranga and currently in Baksa District) Assam (Hinton and Lindsay 1926) (Table 1; Fig. 2). In contrast, *H. yunnanensis* is known from Ruili County in western Yunnan, China (Smith and Xie 2008) (Table 2).

Both species are believed to have had a wider distribution during the Pleistocene (Chaimanee and Jaeger 2000; Musser 1987). However, the current distribution and population status of both species remain poorly understood because of limited field studies and the absence of recent systematic surveys across much of their historical range (Chaimanee and Jaeger 2000; Chatterjee et al. 2020; Molur et al. 2005; Musser 1987).

STATUS

Hadromys humei is considered lost (Long and Rodríguez 2022), with the last confirmed re-

cords from 1945. The species is endemic to northeastern India and is categorised as an Endangered species by the International Union for Conservation of Nature (IUCN) Red List (Molur and Laginha Pinto Correia 2016). *Hadromys humei* is currently included under Schedule I of the Indian Wildlife (Protection) Amendment Act, 2022. Despite this high level of legal protection, the species has not been reported from any protected area within its known historical range.

Hadromys yunnanensis is endemic to China and is categorised as Data Deficient by the IUCN Red List (Johnston and Smith 2016), reflecting the limited information currently available on its distribution, ecology, and population status.

Evidence

The last confirmed specimen-based records of *H. humei* originated from fieldwork conducted between July and December 1945 during investigations of tsutsugamushi disease in the Assam-Burma war theatre by Roonwal and later reported in 1949 and 1950 (Table 2). These records remain among the few available sources of information on the ecology and distribution of the species, although the studies were not specifically focused on *H. humei*. As of 2026, it has been 76 years since *H. humei* was last confirmed in the wild (Table 1). Despite its apparent rarity and conservation significance, the species has never been systematically studied, and most subsequent references rely primari-

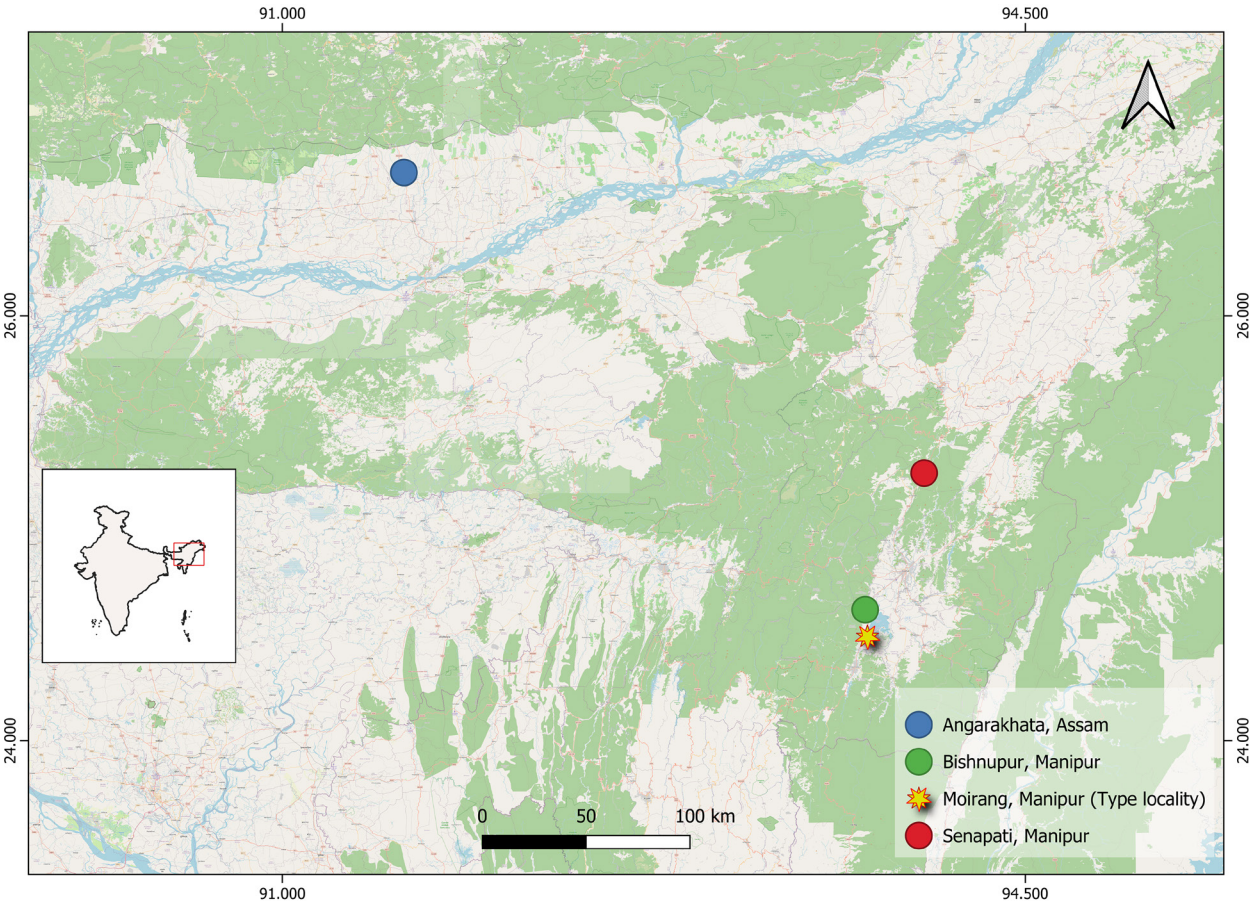

Figure 2. Historical collection localities of the Manipur bush rat *Hadromys humei* in northeastern India. Map prepared using QGIS 3.34.2 (QGIS Development Team) with OpenStreetMap as the basemap.

ly on historical records rather than recent field observations or newly collected specimens (Agrawal 2000; Chatterjee et al. 2020; Choudhury 2013; Ellerman 1947, 1961; Mandal et al. 2005; Molur et al. 2005; Talukdar et al. 2021).

Drawing on earlier records, Agrawal's 2000 taxonomic review and the 2005 *Conservation Assessment and Management Plan (C.A.M.P.)* report mapped the distribution of the species along the southern bank of the Brahmaputra near Meghalaya boundary, an interpretation later followed by the IUCN Red List assessment (Molur and Laginha Pinto Correia 2016). Choudhury (2013), following Ellerman (1961), reported its occurrence in Northeast India, with the distribution originally documented by Hinton and Lindsay (1926) from Angarakhata, Baksa District on the northern side of the Brahmaputra near Manas National Park (Fig. 2).

A critical gap remains: no genetic research has been conducted on the genus *Hadromys*, significantly limiting our understanding of its genetic diversity, taxonomy and evolutionary relationships. The lack of recent field studies and molecular data makes it difficult to assess the current distribution, population status, and conservation needs of *H. humei*.

Search effort

No targeted field surveys focusing specifically on *H. humei* have been reported from northeastern India since the historical collections reported by Thomas (1886), Hinton and Lindsay (1926), and Roonwal (1949, 1950) (Table 1). Most of the available information on the species comes from taxonomic accounts, review articles, and secondary literature rather than dedicated ecological or species-specific field studies (Agrawal 2000; Chatterjee et al. 2020; Choudhury 2013; Ellerman 1947, 1961; Mandal et al. 2005; Molur et al. 2005; Talukdar et al. 2021).

Although mammal surveys and biodiversity assessments have been carried out across northeastern India over the past few decades, no published study has specifically targeted *H. humei*. Relatively little information is available in published survey reports regarding sampling methods, survey design, and target taxa, making it unclear whether approaches suitable for detecting small nocturnal and fossorial murid rodents were used. As a result, the lack of records of *H. humei* cannot be taken as evidence of the species' absence and may instead reflect the limited survey effort directed towards the species.

Many of the historical localities have also undergone habitat alteration and fragmentation, which may have affected both the persistence of the species and the likelihood of detecting any remaining populations. Dedicated field surveys using sampling methods appropriate for small terrestrial rodents, together with molecular approaches, are needed to verify the continued persistence, distribution, and conservation status of *H. humei*.

Threats

Hadromys humei is suspected to be threatened by habitat loss, fragmentation, anthropogenic fire, encroachment, and broader land-use change across its historical range (Molur and Laginha Pinto Correia 2016). The continued degradation of montane grassland and oak scrub habitats may further reduce habitat suitability for the species. However, because no contemporary ecological or population studies currently exist, the specific impacts of these threats on *H. humei* remain poorly understood (Chatterjee et al. 2020; Choudhury 2013; Molur et al. 2005).

Rediscovery strategy

Searches for *H. humei* should focus first on the historical localities, particularly Bishnupur and Senapati districts of Manipur and Angarakhata in present-day Baksa District near the Bhutan foothill-Manas landscape of western Assam (Hinton and Lindsay 1926; Roonwal 1949, 1950; Thomas 1886) (Table 1; Fig. 2). Surveys should also cover similar oak scrub,

grassland, and evergreen forest habitats across the Indo-Myanmar and Bhutan foothill-Manas landscapes. Post-monsoon and early winter (September-December) are likely the best periods for field surveys because small mammal activity is generally higher during this time. Since the species is thought to be nocturnal and fossorial, a combination of Sherman live traps, multi-capture live traps, pitfall traps, camera traps and night spotlighting would be useful. Signs such as burrows, feeding remains, and fecal pellets should also be documented, while any tissue or hair samples collected opportunistically may help future genetic studies. Re-examination of museum specimens and consultation with local communities and frontline forest staff could further help identify potential survey areas, although all records should be verified carefully because of possible confusion with similar murid rodents.

CONCLUSION

The species is interestingly reported from two different biomes with distinct habitat types and altitude. The location in Manipur is high altitude (900–1300 m) and temperate habitat, while that of Angarakata near the Bhutan border is the plains at the base of the foothills with altitude around 100 to 200 m and tropical moist and deciduous habitats historically. This also indicates that the species in question requires serious taxonomic attention as it may involve more than one species or the species is more widely distributed across Assam and Manipur.

Despite its conservation importance, very little is known about the status, ecology and distribution of *H. humei*. Rediscovering the species would not only confirm its continued survival but also help preserve a unique evolutionary lineage from the Indo-Myanmar region. Its apparent rarity may reflect the ongoing decline of montane grassland and oak scrub habitats, ecosystems that support several poorly known small mammal species. The species may also play an ecological role through soil alteration and vegetation dynamics associated with its fossorial behaviour. More broadly, it could serve as an indicator of the condition of remnant oak parkland ecosystems that are increasingly threatened by habitat fragmentation, land-use change, altered fire regimes, and climate change. Focused surveys, ecological studies, and genetic work are therefore urgently needed to better understand the species and its conservation requirements.

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Data accessibility

No new datasets were generated during this study. This is a review article based on published literature, historical records, museum-based references, and publicly available sources.

Author contributions

S.G. conceived the study, reviewed and compiled the available literature, analysed historical records, and prepared the initial draft of the manuscript. R.H.B. supervised the study and contributed to the overall interpretation and development of the manuscript. M.F.A. provided taxonomic and conservation perspectives, contributed to the rediscovery strategy framework, and critically revised the manuscript. S.S.T. contributed taxonomic expertise, relevant literature inputs, manuscript development, and editorial revisions. All authors read, reviewed, and approved the final version of the manuscript.

Ethical standards and competing interests

This study was based entirely on published literature, historical records, and secondary data sources. No animals were captured, handled, or disturbed during the preparation of this manuscript. The authors declare that they have no competing interests.

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