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Cover: Coromandal Sacred Langur *Semnopithecus priam* - made with acrylic paint. © P. Kritika.



Historical and contemporary perpetuation of assumed occurrence reports of two species of bats in Rajasthan, India

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Abstract: *Hesperoptenus tickelli* (Blyth, 1851) and *Rhinopoma muscatellum* Thomas, 1903 have been reported to occur in Rajasthan. Yet, there has been no empirical evidence of the occurrence of these bat species in the state. A comprehensive literature review reveals that the inclusion of these bats in accounts of chiropteran species in Rajasthan is due to the historical and contemporary perpetuation of assumed occurrence reports.

Keywords: Chiroptera, empirical evidence, *Hesperoptenus tickelli*, inclusion, literature review, *Rhinopoma muscatellum*.

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INTRODUCTION

The state of Rajasthan in northwestern India has an established history of exploration and study when it comes to the animal group Chiroptera. The observers in the early period of exploration were not necessarily systematic, and some chiropteran species recorded during this period in Blanford (1888–91), Ryley (1914), and Wroughton (1918) were never documented in the state afterwards. Post-independence, there were initial contributions by Prakash (1963a,b, 1973), Agrawal (1967), Biswas & Ghosh (1968) and Sinha (1970, 1973, 1975, 1976, 1977, 1996; Khandal et al. 2022).

Sinha (1980) was the first to conduct a systematic pan-Rajasthan study of Chiroptera in the state, apropos extensive surveys in the field and a detailed perusal of published literature. There were since also further contributions to the list of chiropteran species documented in the state by Sinha (1981), Sharma (1986), Bhupathy (1987), and Senacha & Dookia (2013). Srinivasulu et al. (2013) also authored a very detailed chapter on species believed to occur in the state (Khandal et al. 2022).

Khandal et al. (2022) nevertheless documented that there was no empirical evidence for the occurrence of three species: *Eptesicus serotinus pachyomus* Tomes, 1857, *Barbastella darjelingensis* Hodgson, in Horsfield, 1855 and *Myotis blythii* Tomes, 1857. An extensive survey of published literature revealed that the three species were not initially claimed to occur in Rajasthan at all, and that their inclusion in accounts on chiropteran species occurring in Rajasthan was a result of the perpetuation of assumed occurrence information (Khandal et al. 2022).

Tickell's Bat *Hesperoptenus tickelli* (Blyth, 1851), has not been reported for over a century in Rajasthan. Why has this species never been encountered in the state afterwards? Bates & Harrison (1997) raised the possibility of the occurrence of the Small Mouse-tailed Bat *Rhinopoma muscatellum* Thomas, 1903, in Rajasthan, but why did Bates & Harrison (1997) themselves mark the locality with a "?" in an accompanying distribution map? The authors therefore propose a review of published literature like the one in Khandal et al. (2022), on *H. tickelli* and *R. muscatellum*, to determine precisely why there might be no empirical evidence for their occurrence in Rajasthan.

OBSERVATIONS

Tickell's Bat *Hesperoptenus tickelli* (Blyth, 1851)

Bates & Harrison (1997) in their book 'Bats of the Indian Subcontinent', mentioned the locality of Nasirabad in Rajasthan for *H. tickelli* by citing "INDIA: Rajasthan: Nusserabad" (Blanford 1888–91). However, Bates & Harrison (1997) do not show this locality on their distributional map for *H. tickelli* and it is not specified why. This species occurs in India, Sri Lanka, Bhutan, Nepal, and Myanmar; within India, it occurs in localities in Maharashtra, Goa, Karnataka, Odisha, Jharkhand, Chhattisgarh, West Bengal, and the Andaman Islands (Bates & Harrison, 1997). However, it is not in Blanford (1889–91) but in Dobson's (1878) 'Catalogue of Chiroptera in the British Museum' that we first see mention of the locality "Nusserabad, India" in connection to specimens of *Vesperugo tickelli* from the "E.I. House Collection". This is the first mention of specimens from the ambiguous location in India—Nusserabad. There is also no mention of the name of the collector or the date of collection of these specimens, and in a span of almost a century and a half since, no reports of occurrence from 'Nasirabad' nor any other locality in Rajasthan.

An examination of 'A Catalogue of the Mammalia in the Museum of The Hon. East India Company' by Horsfield (1851), only includes a reference to a "dried specimen" for *Nycticejus isabellinus* that had been presented by the Asiatic Society of Bengal with the description "Hab. Central India". Anderson's (1881) 'Catalogue of Mammalia in the Indian Museum, Calcutta' provides details of the specimens collected from Chaibasa (Jharkhand) (type specimen) by S.R. Tickell in 1842, the Andaman Islands by R.C. Tytler in 1864, Singhbhum (Jharkhand) by an unnamed museum collector in 1869, Surguja (Chhattisgarh) by W.T. Blanford in 1871, and from Jashpur (Chhattisgarh) and Tenasserim (Myanmar) by W.T. Blanford in 1871 and 1878, respectively. There is no mention of any specimen collected from 'Nusserabad'. It is Blanford (1888–91) who first connected Rajasthan to this species, "Peninsula of India (Nusserabad in Rajputana; Bombay; Chybassa; Jashpur, Sirguja in SW Bengal)" for *Vesperugo tickelli*.

Blanford (1888–91) thus connected the ambiguous locality of Nusserabad which was first mentioned by Dobson (1878) as just "Nusserabad, India" to "Rajputana". Blanford (1888–91) cited the published literature on this species at the time (Blyth 1851, 1863; Horsfield 1851; Kelaart 1852; Dobson 1876, 1877, 1878; Anderson 1881) in his account. Therefore, it appears that the inclusion of Rajputana (now Rajasthan) was

assumed by Blanford (1888–91). What could have informed such an assumption by Blanford (1888–91)? As seen in Khandal et al. (2022) there were (and still are) several towns called ‘Nasirabad’ in India (at least three outside of Rajasthan in Uttar Pradesh, Maharashtra, and Madhya Pradesh in modern-day India). In British India (including modern-day Pakistan), the number of localities named ‘Nasirabad’ would climb to at least six. So why specifically ‘Nasirabad’ in Rajasthan?

Although he is not named in accounts connected to this species (Blyth 1851, 1863; Horsfield 1851; Kelaart 1852; Dobson 1876, 1877, 1878; Anderson 1881; Blanford 1888–91; Wroughton 1918; Ellerman & Morrison-Scott 1951; Sinha 1980; Bates & Harrison 1997; Srinivasulu et al. 2013), it was the association of the reputed cavalry officer-cum-specimen collector Captain W.J.E. Boys to the cantonment town of Nasirabad in Rajasthan, that drove early naturalists to perpetuate similar assumptions in connection to three other bat species (Khandal et al. 2022). It is therefore possible that a similar sequence of events transpired because of the absence of a precise locality and collector information for the relevant specimens in Dobson’s (1878) account. Following Blanford’s (1888–91) inclusion of ‘Rajputana’ to the occurrence area of this species, Wroughton (1918) was the next to further perpetuate this assumption. In the Bombay Natural History Society’s Mammal Survey of India, Burma (Myanmar) and Ceylon (Sri Lanka), Wroughton (1918) wrote “Other localities: Rajputana, Thana district, Bombay; Kanara; Madras (Jerdon) (B.M.)” for this species. Therefore, like Blanford (1888–91), it appears that Wroughton (1918) also interpreted Dobson’s (1878) “Nusserabad, India” to mean Rajputana (B.M. = British Museum), for Jerdon (1874) does not mention any locality in Rajasthan for this species. All the specimens obtained in the survey, however, were obtained from other parts of India (Wroughton 1918; Bates & Harrison 1997). Like Wroughton (1918), Ellerman & Morrison-Scott (1951) further perpetuated the assumption of ‘Rajputana’ in the occurrence area of this species in their checklist of Palearctic and Indian Mammals—1758 to 1946, “India—Rajputana, Orissa, Bombay, Madras, Ceylon, Bengal, Bhutan duars (Blanford also quoted it from the Andaman Islands and Moulmein district, Burma)”.

Sinha (1980), however, wrote the following on the occurrence of *H. tickelli* in Rajasthan, “RAJASTHAN: Wroughton (1918) and Ellerman & Morrison-Scott (1951) include “Rajputana” (=Rajasthan) in its range of distribution, but no precise localities are mentioned. I have not been able to collect any’ example but as

informed by J.E. Hill (Brit. Mus.), the exact locality of this species is Nasirabad (Rajasthan)”. Sinha (1980) thus ignored Dobson (1878) and Blanford (1888–91) in his review of literature but relied on the late J.E. Hill of the British Museum. J.E. Hill was consistent with Blanford’s (1888–91) assumption by connecting Nasirabad or Nusserabad to Rajasthan. Hill it should be noted however, also perpetuated similar assumptions with other bat species (Khandal et al. 2022).

Like Bates & Harrison (1997) before them, Srinivasulu et al. (2013) also include the assumed locality Nasirabad in Rajasthan for *H. tickelli* by citing Blanford (1888–91). “Blanford puts on record the presence of *Hesperoptenus tickelli* (Blyth, 1855) from Nasirabad.” Srinivasulu et al. (2013) thus also ignore Dobson (1878), who first wrote of specimens collected from the ambiguous locality of Nusserabad in India. Blanford (1888–91) was the first to connect Nusserabad to Rajputana or Rajasthan, causing every subsequent author to assume that *H. tickelli* had been documented in Rajasthan.

In addition, an examination of specimen deposits in the Natural History Museum of London (NHM) (separated from the British Museum in 1963), and the Muséum d’histoire Naturelle Genève revealed no specimens from Rajasthan (GBIF 2023a). Similarly, an extensive examination of the Journal of the Bombay Natural History Society (JBNHS) revealed no specimens from Rajasthan collected in surveys nor specimen donations in proceedings for this species (Wroughton 1899, 1912, 1913, 1915, 1917, 1918; Brosset 1962; Hill 1967).

Small Mouse-tailed Bat *Rhinopoma muscatellum* Thomas, 1903

While doubting the record of this species for India, Bates & Harrison (1997) nevertheless categorically articulated the possibility of *R. muscatellum* specimens being collected from a locality called Genji in Rajasthan, “Tamil Nadu: Genji (doubtful record, restricted to Coromandel coast by Van Cakenberghe & de Vree (1994) but possibly Genji in Rajasthan)”. Bates & Harrison (1997) also marked Genji in Rajasthan, along with a locality in Tamil Nadu with a “?” in a distributional map of *R. muscatellum* lending further credibility to this possibility. Considering that two species belonging to the same genus do occur in Rajasthan, namely *R. hardwickii* and *R. microphyllum* (Srinivasulu et al. 2013), the possibility of the occurrence of this species in Rajasthan has informally begun to gain plausibility. It is also possible that when viewed alongside occurrence reports in Afghanistan and Pakistan, a report from a locality in Rajasthan appeared

to be a plausible extension of its occurrence area to Bates & Harrison (1997).

According to Van Cakenberghe & de Vree (1994), the source Bates & Harrison (1997) cite for this assumption, this species was likely collected at a locality called 'Genji' on the Coromandel coast in southeastern India based on documentation provided with preserved specimens in the Museum National d'Histoire Naturelle in Paris. Curiously, however, they were unable to find a locality named 'Genji' in the area. While Van Cakenberghe & de Vree (1994) merely acknowledged that there was also a locality named "Genji" in Rajasthan and concluded that the specimens were from southeastern India, Genji in Rajasthan was nevertheless marked on their distributional map for *R. muscatellum*, thereby lending credence to the possibility that the specimens could have been collected in Rajasthan for the very first time. Van Cakenberghe & de Vree (1994) also add the following about both the collector and the specimens, "Mr. MAURICE MAINDRON – was in the neighbourhood of Pondicherry and Karikal in September 1901, the period in which these specimens were captured in Genji. Both localities are indeed situated on the Coromandel Coast". It should also be noted that early European naturalists in India were not necessarily consistent with the spellings of the names of localities (as we have already seen with Nusserabad or Nasirabad). While a locality spelt 'Genji' might not be located on the Coromandel coast in Tamil Nadu, the authors have noted a locality in close proximity to the coast named, 'Gingee' (12.2529°N, 79.4160°E) (Anonymous 2023). Thus, it is possible that this locality is what Maindron meant by 'Genji'.

Therefore, it is highly improbable that Maurice Maindron ventured to Genji in Rajasthan in 1900–1901. In addition to being inconsistent with what is documented about Maindron's travels (Van Cakenberghe & de Vree 1994), there is no documentation nor evidence of the occurrence of *R. muscatellum* in Rajasthan, despite a long history of chiropteran exploration in the state which has included numerous field surveys. In consideration of the above information, a contemporary survey of the field for *R. muscatellum* in Genji, Rajasthan appears unwarranted.

It should also be noted that the collector of the specimens, Maurice Maindron (1857–1911) had embarked on "25 years of almost continuous travel" after his employment by the Museum National d'Histoire Naturelle in Paris in 1875. His travels took him to, "New Guinea (1876–1877), Senegal (1879 and 1904), India (1880–1881, 1896, and 1900–1901), Indonesia (1884–1885), Djibouti and Somalia (1893),

and Arabia (1896)" (Beolens et al. 2011). Considering that Maindron did indeed travel to other parts of the range of *R. muscatellum* such as 'Arabia', it is possible that the specimens were collected in a locality in west Asia (possibly the Persian Gulf where the species is known to occur today) and subsequently mislabelled. This is not out of the realm of possibility, as Benda & Mlíkovský (2008) noted that errors by curators did occur in the British Museum historically (Khandal et al. 2022). Therefore, we are of the opinion that Bates & Harrison (1997) were prudent in considering this record of *R. muscatellum* to be "doubtful" for India. Koopman (1993) excluded India and mentioned its distribution only from "Oman, W Iran, S Afghanistan, perhaps Ethiopia". Following this exclusion, Alfred et al. (2002), Srinivasulu & Srinivasulu (2012), Srinivasulu et al. (2013), and Talmale & Saikia (2018) also did not include *R. muscatellum* in the Indian chiropteran list.

As with *H. tickelli*, an examination of specimen deposits in the Natural History Museum of London (NHM), and Muséum d'histoire Naturelle Genève also revealed no specimens from not only Rajasthan, but none from India (GBIF 2023b). A review of the Journal of the Bombay Natural History Society also revealed no specimen deposits from Rajasthan in surveys and proceedings.

DISCUSSION AND CONCLUSION

Our literature review reveals that even though these two species were never reported from Rajasthan, their inclusion among chiropteran species occurring in the state was a result of the perpetuation of assumptions, with reports of their occurrence in the state perpetuated simply because of their being published. The report of *H. tickelli* follows a pattern of perpetuation observed in Khandal et al. (2022), while the report of *R. muscatellum* serves as a contemporary example of a similar phenomenon. However, it is important to note that historical observers were not systematic (Boshoff & Kerley 2010), and Blanford (1888–91) who first assumed that *H. tickelli* was reported from Rajasthan serves as a pertinent example. This is however by no means an isolated incident.

Blanford (1888–91) also claimed that *Hipposideros diadema* Geoffroy, 1813 had been "found by Mr. V Ball at Udaipur". Udaipur is located in southern Rajasthan. This report of occurrence in Rajasthan curiously does not follow the pattern of perpetuation observed in this review with *H. tickelli* and the three species observed

in Khandal et al. (2022). Despite extensive chiropteran surveys, to date there is no evidence of the occurrence of *H. diadema* in Rajasthan, and it is only known to occur in, “the Nicobar Islands and Myanmar to Thailand, Malaysia, Indonesia, New Guinea, northern Australia and the Philippines” (Bates & Harrison 1997). The fact that the report of *H. diadema* does not follow the same pattern of perpetuation as *H. tickelli* and the three species observed in Khandal et al. (2022) only buttresses the notion that historical observers were not systematic and at times resorted to data selection and interpretation methods that can only be described as arbitrary.

There could be multiple causes for error with the reporting of occurrence localities, and then the perpetuation of erroneous occurrence reports. The report of *H. diadema* could very well have been the result of species misidentification by the collector. Misreading and misinterpretation of existing literature is yet another causal factor. For example, Khandal et al. (2023) documented that an erroneous citation led to the perpetuation of the false report that the first occurrence record of *Hipposideros lankadiva* in Rajasthan was from the Bhim Bharak caves in Jodhpur district. A literature review by Khandal et al. (2023) revealed that the cited text mentioned another species altogether, *Hipposideros fulvous* by Wason (1978).

Assumptions, however, can skew the reporting of occurrence localities and further result in the perpetuation of erroneous results. Boshoff & Kerley (2010) have documented that a paucity of geographical knowledge by historical observers can misinform historical occurrence data. The pattern of the perpetuation of the possibility of the occurrence of *R. muscatellum* in Rajasthan by Van Cakenberghe & de Vree (1994) and Bates & Harrison (1997) has shown that this is also possible in contemporary scientific literature. Historical occurrence data bears relevance to conservation biology and thus can have policy and management implications (Boshoff & Kerley 2010). The perpetuation of erroneous historical occurrence data can therefore have very damaging consequences for ecosystems. Therefore, pending the documentation of empirical evidence of occurrence, *H. tickelli* must be omitted from accounts of Chiroptera occurring in Rajasthan, and *R. muscatellum* from accounts of Chiroptera occurring in India.

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