Albino microchiropteran, *Rhinopoma microphyllum* kinneri sighted in a bat colony inhabiting abandoned mines

Bats play a vital role in both natural and managed ecosystems but represent the most neglected order of land mammals worldwide and rarely feature on the priority list of any wildlife conservation strategy framed in India or globally. Insectivorous bats consume a huge number of nocturnal insects in agro and semi-urban ecosystems of India but are not prioritized as an important species in the integrated pest management strategy. With at least 109 species, India has an incredible diversity of bats[1]. This includes one of the largest in the world, the Indian flying fox (*Pteropus giganteus*); one of the rarest, Salim Ali's fruit bat (*Latidens salimalii*); and one of the most colourful, the orange and black painted bat (*Kerivoula picta*). Gujarat and Rajasthan have dry deciduous forests, scrub land, sandy/salty desert, semi-arid patches of vegetation and irrigated/non-irrigated agricultural fields that house wild fauna[2]. Arid climate species such as the tomb bats (*Taphozous* sp.) and mouse-tailed bats (*Rhinopoma* sp.) are common in these areas[2]. Bat populations have lost countless traditional roosts such as caves, rock carvings, old buildings and old tree hollows due to anthropogenic activities. Over the past 100 or more years, displaced bats have gradually moved into abandoned mines, which often provide microclimates similar to caves. In regions, where natural caves no longer exists, mines represent neo-habitats that have concentrated colonies of bat populations formerly distributed in smaller numbers across the landscape[3]. Such mines are now key to the life history of bats and are critical for many purposes such as rearing young in the summer, winter hibernation, gathering for social activities (such as courtship and mating), and night roosting (bats temporarily rest to digest their prey between foraging bouts)[4]. Mines also serve as crucial rest stops between changing seasons and during migration. Large, complex and dangerous mines, with multiple entrances, often harbour the most significant populations. The complexity and associated airflow of these mines provides a range of internal temperatures suitable for bats[4].

Our study area consists of deserted mines (22°24′22.95″N–73°37′05.24″E, 56.5 m above msl located in central Gujarat along the border of the Jambughoda Wildlife Sanctuary. Historically, these mines were dug in the pre-independence era for mining of manganese ore. But after the legal ban on mining post-independence, they have now transformed into a neo-habitat for wildlife due to their proximity with the sanctuary. Wild animals such as leopard (pugmarks seen), sloth bear (scat), jungle cat, rusty spotted cat, porcupine, palm civet or python (sighted and photographed) use these shelters as a transit hideout and thus share a common niche with bats (Devkar, pers. observ.). These mines are like straight tunnels of varying sizes passing through the hills but some mines form an interconnecting network of tunnels with different temperature zones ideal for bats to hibernate or use them for maternity purposes. Results envisaged here are based upon a year-long survey conducted in one of the mines, Sipa mine. The Sipa mine is located approximately 58 m above the ground level (length – 98.12 m; 110 m above msl), is open at both ends and is oriented in north–south direction. Midway, the mine has two lateral ramifying branches. The branch on right being 60 m long from the branch point whereas the branch on left is measurable up to 45 m and then tapers into an inaccessible 0.4 m broad tunnel. The average height of the main and branch tunnels is 2.10 m and the diameter is 2.65 m. Most of the bat colonies are concentrated on roofs of these two lateral branches of the mine. This study site was approached on foot, and diurnal and nocturnal surveys were conducted (once in 15 days) from August 2008 to July 2009. Live bat specimens ($n = 25$) were randomly collected with a hoop net (during September–October) from 10 different locations of the mine and morphometic details of fore arm, tail length, ear, condyle canine length, upper tooth row length, body weight, sex (male/female) and pelage colour were recorded at the location. Because this was a pilot survey, we were officially permitted to collect not more than 25 specimens for morphometry. All measurements were recorded using a digital vernier caliper and later specimens were released back into the Sipa mine. Care was taken to minimize stress resulting due to handling. Specimens were not collected during the breeding and post-breeding seasons. Character matrix obtained (Table 1) was then compared with standard identification key[5] and the species was confirmed as *Rhinopoma microphyllum* kinneri.

After regular monitoring of Sipa mine, it was inferred that the mine was inhabited by only one species whose population was about 50,000 during the non-breeding season (September–January) that increased to about 1 lakh during the breeding season and weaning period (February–August). Although these numbers are rough estimates, the records of their breeding/non-breeding cycles are in accordance with the published literature[5]. Successful breeding spell observed in these mines is indicative of their suitability as an ideal habitat for these microchiropterans. Indian subcontinent experiences a strong monsoon season from June to September but is dry throughout the rest of the year. This strong seasonality results in annual peaks in insect and fruit abundance that the bats track and adapt to through local migrations[2]. Hence, fluctuations in their populations observed by us can also be attributed to such seasonality. Other microchiropteran species observed in adjacent mines include *Taphozous melanopogon*, *Hipposideros fluvus*, *Megaderma lyra lyra* and *Rhinopoma hardwickei*.

Colour of any bat species is either due to colouration of its fur or pategia. The males bear brighter coloured hair around their neck extending up to the belly as compared to the females. Among the 1001 species of bat occurring in the world[6], complete albinism has been recorded in a total of at least 64 individuals from 38 species, with one to five individuals in each[7]. Albinism is characterized by the absence of melanin pigment resulting in pale skin. Eyes appear red due to reflection from the capillaries of retina. Due to high chances of predation albino individuals have less chances of survival in natural environments. An albino bat was sighted in Sipa mine on 10 June 2009 at 09.57 h (Figure 1). It was seen clinging to the roof of the mine in a crowded colony of *R. microphyllum*

Table 1. Character matrix of *Rhinopoma microphyllum* kinneri collected form Sipa mine near Jambughoda Wildlife Sanctuary, Gujarat

	Fore arm (mm)	Tail (mm)	Condyle canine length (mm)	Upper tooth row length (mm)	Body weight (g)	Ear (mm)
Male (n = 23)	68.9 ± 1.67	50.23 ± 1.94	18.89 ± 0.65	7.50 ± 0.08	35.6 ± 3.21	18.65 ± 0.18
Female (n = 4)	63.2 ± 2.96	48.66 ± 2.07	18.45 ± 0.66	7.45 ± 0.12	29.1 ± 2.94	17.22 ± 0.86

Values are mean ± SE.

Figure 1. Albino *Rhinopoma microphyllum* kinneri inside Sipa mine near Jambughoda Wildlife Sanctuary, Gujarat.

kinneri. Several photographs (with Canon 20X optical zoom 12.1 mp) of albino bat were taken from close proximity and was identified as an albino of *R. microphyllum* kinneri but the bat could not be physically captured because it got lost in the crowded colony. Previous reports suggest that most of the albino bat species recorded so far have been sighted inside sheltered roosts such as caves, mines, galleries or buildings[8]. Such roosts may be essential for the survival of albino bats to protect them against sunlight, water loss and predation by visually oriented predators[9]. Sighting of albino bat in the cul-de-sac extremity of Sipa mine is understandable and in accordance with these published reports. Albinism is rare in bats and has been reported in only six species from the Indian subcontinent, viz. *Rousettus leschenautli*, *Rhinopoma microphyllum* kinneri, *Rhinopoma hardwickei*, *Hipposideros* sp., *Hipposideros lankadiva* and *Hipposideros diadema nicobarensis*[10–14]. Although *R. microphyllum* kinneri is a commonly occurring species in western India, there is only one report on sighting of an albino specimen from Jodhpur, Rajasthan[11]. In this regard, our report of sighting of *R. microphyllum* kinneri is the first from Gujarat and only second from India.

Reports on microchiropterans, their migratory trends, traditional roosts, habitat and food preferences in western India are scanty. A study conducted in the Thar desert, Rajasthan, remains one of the most important piece of work done in western India for conservation of microchiropteran bats and their habitats[2]. Studies from Gujarat have been limited to local reports[15] or sighting and documentation of some species of bats such as the Indian false vampire[16] or Blyth's Horse shoe bat (*Rhinolophus lepidus*)[17]. These facts raise an urgent need to conserve bats and their neo-habitats that have now become the last refuge for surviving wild population of microchiropterans in India. The existing colony of microchiropterans survey here is probably the largest in central Gujarat and one of the significant 'solo bat species' congregations in western India. Due to lack of information on microchiropterans from western India, this study can be of importance for zoologists, conservation biologists and specifically for bat biologists.

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