

A note on a new habitat of the woolly flying squirrel *Eupetaurus cinereus* in the northern area of Pakistan

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The woolly flying squirrel *Eupetaurus cinereus* Thomas, 1888 is one of the most unusual and least known mammals in the world. This species is confined to the rocky mountainous area of northern Pakistan approximately over 3000 m elevation. It nests in the cliff caves that are normally inaccessible (Rasool 1996; Roberts 1997; Zahler and Woods 1997). *Eupetaurus cinereus* is the longest squirrel, with a head and body length of 450–600 mm and a tail of roughly equivalent length (Zahler and Woods 1997; Nowak 1999). Also, *E. cinereus* is the most massive gliding mammal, ranging from 1.4 to 2.5 kg (Zahler 1996; Zahler and Woods 1997).

The morphological traits of this species are described (Blanford 1891; Grassé and Dekeyser 1955; Schaub 1958; Ellerman 1961; McKenna 1962; Chakraborty and Agrawal 1977). For 70 years (from 1924 to 1994), there were no records of *E. cinereus* by scientists. Many people considered *E. cinereus* to be extinct (Zahler and Woods 1997). Zahler (1996) documented that this species still exists in the northern Pakistan. In addition to this rediscovery, he and colleagues (Zahler 2001; Zahler and Khan 2003) have reported its gliding behavior and dietary traits. The ecological characteristics and current distribution of *E. cinereus* are still unclear.

Zahler and Woods (1997) estimated that the distribution of *E. cinereus* might be as small as 100 miles east-to-west and 50 miles north-to-south in the northern area of Pakistan. They suggest the distribution of *E. cinereus* would be described as an area bounded by the Gilgit River in the north and the Babusar Pass in the south (Fig. 1). Zahler and Woods (1997) also referred, however, to the obscure information of the existence of *E. cinereus* in the upper Hunza Valley, outside of the distribution range mentioned above. They admit that the eastern and western limits of *E. cinereus* are not fully determined. With respect to the habitat of *E. cinereus*,

Zahler and Woods (1997) described the vegetation patterns of the sampling localities: 1) mixed forest of pine (*Pinus gerardiana* and *P. wallichiana*), spruce (*Picea smithiana*), juniper (*Juniperus excelsa*), and oak (*Quercus baloot*), and 2) grass and scattered *P. wallichiana* and *J. excelsa*. Because this species is well adapted to rocky mountain, *E. cinereus*, however, may occur in barren area with less grasses and more scattered trees.

To evaluate its habitat, we surveyed for *E. cinereus* in areas of different vegetation. Here, we refer to a new habitat and the wider distribution of this flying squirrel.

Materials and methods

We surveyed for *E. cinereus* at 'Jutal Nala (Nullah)', situated northeast of Gilgit, Pakistan (Fig. 1) on April 20–21, 2003. Based on information that local people had previously observed *E. cinereus*, we chose this study site. This is a dry rugged mountain with many steep rock cliffs. Jutal Nala is outside the distribution range of *E. cinereus* as estimated by Zahler and Woods (1997).

Results and discussion

A nest of *E. cinereus* was found in a rock cliff cave at about 3230 m elevation (36°02'37.7"N, 074°20'33.2"E). Around the cave, soil deposits were patchy and had some grasses (Fig. 2a). The main species of grass was *Ephedra gerardiana*. Juniper trees (*J. excelsa*) were scattered. *Pinus wallichiana* was not observed. This suggests this habitat as different from that described by Zahler and Woods (1997).

The height and width of the cliff cave was about 8.0 and 2.5 m, respectively (Fig. 2b). Unfortunately, we could not measure its depth, because it was too dangerous to approach the end of the cave. The nest, which

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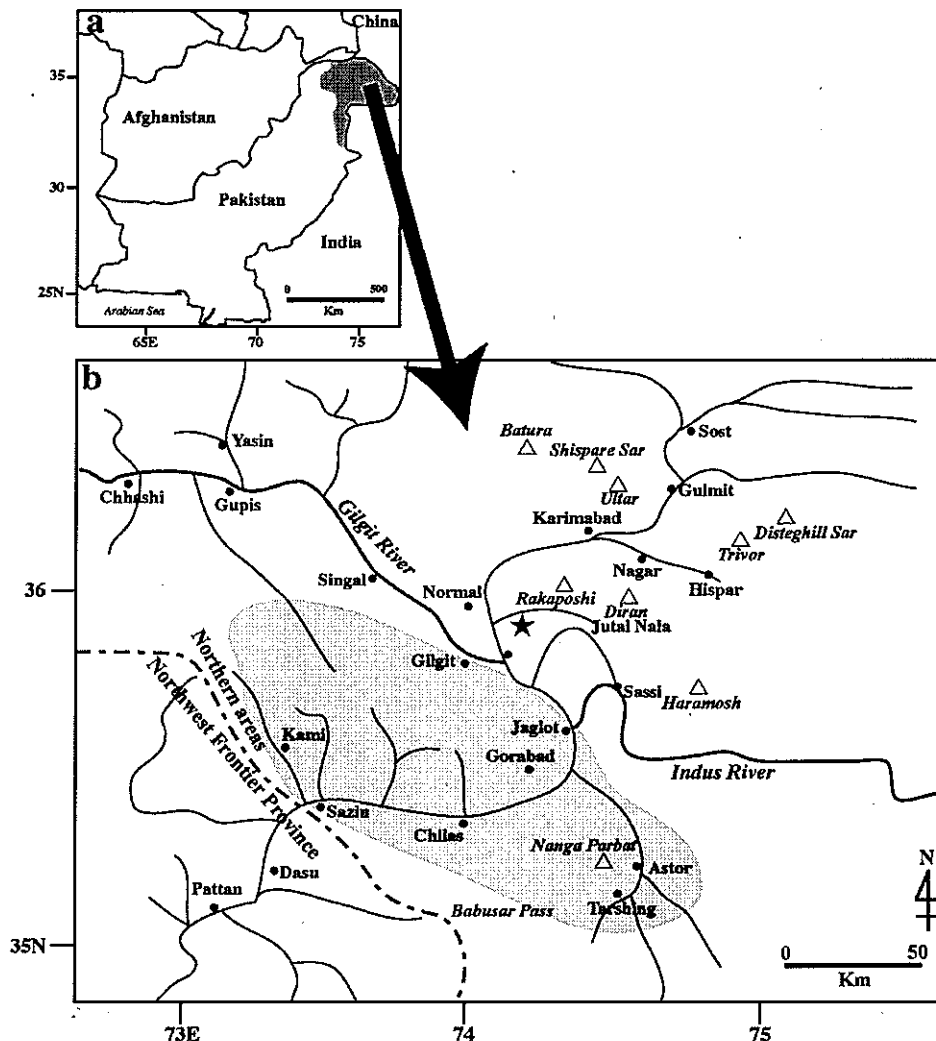


Fig. 1. Distribution of *Eupetaurus cinereus* in northern Pakistan: a) location of the study area in the Northern area of Pakistan (in gray), and b) study area showing location of study site on Jutal Nala (solid star), towns (solid circles), mountain peaks >7000 m in elevation (open triangles), and rivers. Distribution of *Eupetaurus cinereus*, as estimated by Zahler and Woods (1997), indicated in gray.

looks like flat 'bowl', was on a shelf in the cave (Fig. 2b). The major and minor axes of part of nest core were about 500 and 400 mm, respectively (Fig. 3). The height of nest (vertical distance from bottom to top in the bowl) was about 200 mm. The real size of nest must have been larger than these measurements. The nest was mainly composed of barks, branches, and grasses. The barks and branches were considered to be derived from *J. excelsa*, but it was difficult to precisely identify the specific name of the grasses. We also found many fecal pellets in the nest (Fig. 4a). Although we did not observe the living individual of *E. cinereus*, we considered these fecal pellets as produced by *E. cinereus* on the basis of their shape that was similar to those of other

large-sized flying squirrels such as *Petaurista alborufus* (Fig. 4b). Fecal pellets of *E. cinereus* were larger than those of *Petaurista* species, resulting from the larger body size of *E. cinereus*.

The new habitat of *E. cinereus* was outside the distribution range reported by Zahler and Woods (1997). This makes it important to confirm the existence of *E. cinereus* in areas different from those reported by Zahler and Woods (1997). In spite of the ecological studies by Zahler and Wood (1997) and Zahler and Khan (2003), the behavioral biology of *E. cinereus* is scarcely known. Behavioral features of *E. cinereus* should be examined to determine its ability to adapt to more barren environments.

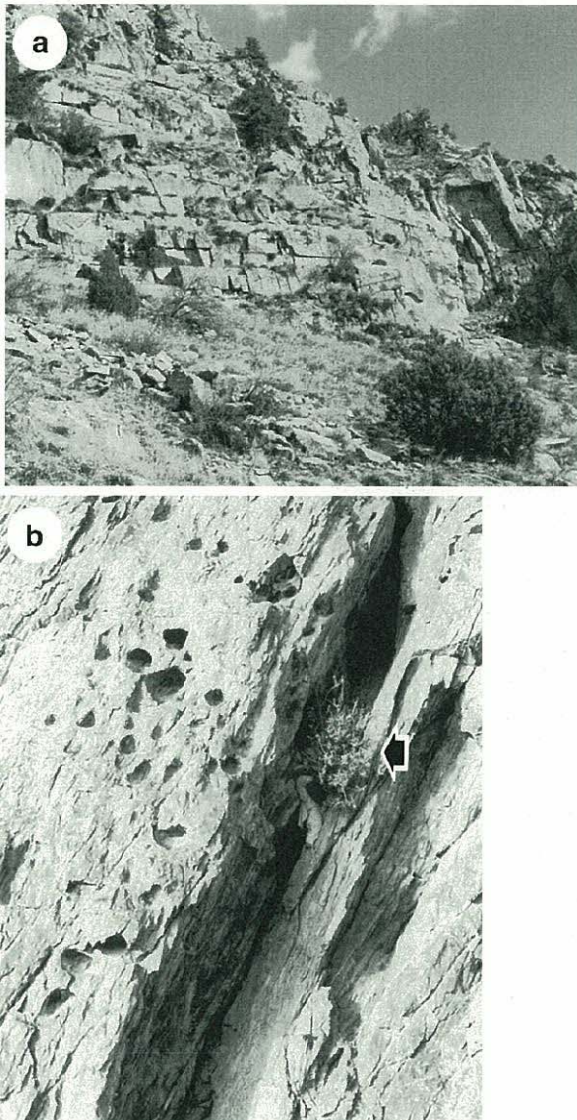


Fig. 2. A new habitat of *Eupetaurus cinereus* on Jutal Nala in northern Pakistan: a) the rocky cliffs in which the nest was found at about 3230 m elevation, and b) local people approaching the nest (indicated by arrow).

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Fig. 3. A part of the *Eupetaurus cinereus* nest found in the cliffs of Jutal Nala in northern Pakistan. Gun trigger (about 30 mm) indicates scale.

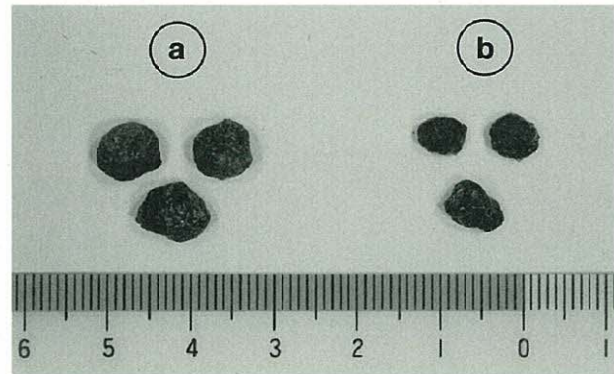


Fig. 4. Fecal pellets of large-sized flying squirrels: a) *Eupetaurus cinereus* and b) *Petaurista alborufus lena* of Taiwan.

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