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First Documentation of Nest and Immature Juvenile Black-eared Squirrel *Nannosciurus melanotis* (Rodentia: Sciuridae) in the Wild

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Abstract
Black-eared Squirrel *Nannosciurus melanotis* is a pygmy squirrel that range from Sumatra, West Java, Borneo and its smaller adjacent islands. On 11 November 2020, we conducted a biodiversity survey in Tanggerang Village (02°00'S, 110°39'E), Jelai Hulu Subdistrict, Ketapang District, West Kalimantan Province. In this survey, we observed and documented a nest and immature juvenile of *N. melanotis.* The scraggly-looking nest contains of the inner layer of fiber materials and with outer leafy branches. The diameter of the nest *c*. 10-15 cm, and placed *c.* 250 cm underground. This finding is a constitute first breeding record for *N. melanotis*.

Keywords: Black-eared Squirrel, breeding, Callosciurinae, *Nannosciurus melanotis*, rodent.

Introduction

There are around 6,495 species of mammals worldwide and more than 40% of them are in the order Rodentia or rodents (Kay & Hoekstra 2008; Burgin *et al.* 2018). Among the order Rodentia, the squirrels (Family Sciuridae) are the third diverse highest taxa of rodents (Wilson & Reeder 2005). This family consists of 60 genera and 292 species that represent small to the medium animals (10-130 cm), gliding and arboreal, mostly granivorous and herbivores rodents with the well developed mandibles (Michaux *et al.* 2008; Koprowski *et al.* 2016). However, despite there is a wide awareness of the presence of some taxa of these mammals, little attention is invested in their species-specific description and differences, their consequent conservation, global prosperity, and even basic study (Steiner & Huettmann 2023).

Most squirrels have distinctive coloration, but identification is complicated by extensive variation in colour within some species, particularly in *Callosciurus* (Francis 2008). Indonesian Archipelago is a center of rodents taxa (Ceballos & Ehrlich 2006; Setiawan *et al.* 2022, 2023). There are more than 170 species of squirrels, and new forms are being discovered regularly (Francis 2013; Balakirev & Rozhnov 2019). Based on DNA, Southeast Asia's squirrels are divided into three subfamilies, including Callosciurinae, Ratufinae and Sciurinae (Steppan *et al.* 2004).

Nannosciurus is a single genus of pygmy squirrels found in Sumatra, West Java, Borneo and its smaller adjacent islands (Payne *et al.* 1985; Koprowski *et al.* 2016). Black-eared Squirrel *Nannosciurus melanotis* is only one species in *Nannosciurus* genus (Steiner & Huettmann 2023). There are four subspecies recognized for *N. melanotis*, including *N. melanotis melanotis* (West Java), *N. melanotis bancanus* (Bangka, and likely Belitung); *N. melanotis borneanus* (Borneo); and *N. melanotis pulcher* (Sumatra and Lingga Archipelago) (Burgin *et al.* 2020). As with other pygmy squirrels in Southeast

Asia, the ecology of *N. melanotis* remains a mystery. Koprowski *et al.* (2016) reported that there is no information available on breeding for *N. melanotis*. In this paper, we report our documentation of nest and immature juvenile *N. melanotis* from West Kalimantan, Indonesia.

Methods

On 11 November 2020, we conducted a field survey in Tanggerang Village (02°00'S, 110°39'E), Jelai Hulu Subdistrict, Ketapang District, West Kalimantan Province. The habitat is remaining heath forest (hutan kerangas) and surrounded by plantations, particularly rubber and oil palm plantations (Fig. 1-2). There is also agroforest plantation, the local rubber plantation combined with high fruit trees (e.g. Mango *Mangifera indica*, Durian/Duren *Durio* spp, Nangka/Cempedak *Artocarpus* spp and etc.). When searching for wildlife, one of us held onto a tree to keep his body balanced. This caused the tree to shake, and suddenly something fell. We checked something that had fallen, and it yielded to be a small mammal. On the tree that was being held, there was a small nest in the middle of the branch (Fig. 3-4). This small mammal seems to have fallen from its nest due to the shaking that occurred when the tree was held.

Results and Discussion

The small mammal was identified as Black-eared Squirrel *Nannosciurus melanotis* by its small size and well-defined morphological characters: the dorsum of this small mammal is plain pale gray, with a black stripe from nose to eye, a broad buffy stripe just below the black stripe extends to a buffy patch behind eye, and a second thin black stripe below buffy stripe extends to the mouth, back of ear and patch of fur just behind it are black, and facial stripe is whitish and slightly tinged with buffy (Fig. 3-4).

This small is identified as *N. melanotis* as the characters above fit well with descriptions and illustrations of appropriate field guides (Payne *et al.* 1985; Koprowski *et al.* 2016; Phillipps & Phillipps 2016). Looking at the condition of the small mammal which is rather weak and has lost orientation in moving, this is most likely an immature juvenile of *N. melanotis.* In Borneo, only one subspecies represent the island, the Bornean Black-eared Squirrel *N. melanotis borneanus* (Koprowski *et al.* 2016; Burgin *et al.* 2020).

Figure 1. The heath forest (kerangas forest) of typical habitat of a nest of *Nannosciurus melanotis* found in Ketapang Village, Jelai Hulu Subdistrict, Ketapang District, West Kalimantan (Photograph: Muhammad Iqbal).

Figure 2. The tree (dark red arrow) and condition of the site (near the small river) where the nest of *Nannosciurus melanotis* was found in West Kalimantan (Photograph: Muhammad Iqbal).

Figure 3. The position of a nest of *Nannosciurus melanotis* that is built in the middle of the branch (Photograph: Muhammad Iqbal).

Figure 4. The nest of *Nannosciurus melanotis* found in West Kalimantan. The scraggly-looking nests consist of leafy branches with an inner layer of fiber materials (Photograph: Muhammad Iqbal).

Figure 5. The immature juvenile *Nannosciurus melanotis* when just dropped from the nest (Photograph: Muhammad Iqbal).

Figure 6. The immature juvenile of *Nannosciurus melanotis* stays motionless near the tree of its nest (Photograph: Muhammad Sayidina Ali).

The location of study site had a plain lowland topography (*c.* 70 km from the coastline), which shows up to be essential habitat for the lowland mammals of Borneo (Meijaard & Sheil 2006; Schep 2014). The nest laid in the middle of a branch of possibly a Needlewood tree *Schima wallichii* (Fig. 3). This scraggly-looking nest contains of the inner layer of fiber materials and with outer leafy branches (Fig. 4). The diameter of the nest *c*. 10-15 cm, and placed *c.* 250 cm underground (Plate 1). The position of the tree is very close to flowing water in a small river. The area had a canopy cover of trees from the heath forest, and was quite a long distance from the path used by native people. The nest character seems typical for the tree squirrel (Wells *et al.* 2006), although the size of the nest is smaller.

There is no information available on breeding for *N. melanotis* (Koprowski *et al.* 2016). Since this publication, the authors still have no any additional info on the nesting or reproduction of this pygmy squirrel (Koprowski *pers.comm*). The documentation of nest and immature juvenile represents the first breeding information for *N. melanotis*. According to Koprowski & Nandini (2008), the equators, especially the forests of south and southeast Asia are the center of squirrel taxa; however, this area creates the fewest scientific documentation on squirrels. For this reason, it is no wonder if a lacked ecological information available, particularly on the breeding of *N. melanotis* from Sumatra, West Java, Borneo and its smaller adjacent islands. *Nannosciurus melanotis* is recently considered as Least Concern because it is abundant in suitable habitats, widespread and while it prefers undisturbed forest, it appears to be obedient to degraded and logged forest (Francis *et al.* 2016). However, further field surveys are required as in sequence to evaluate its ecological information, as if it is a lowland species its values listing close to Near Threatened.

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