

Squirrels of Sulawesi: An introduction

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ABSTRACT

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TABLE OF CONTENTS

Part 1: Checklist of squirrel species; Giant squirrels; Beautiful squirrels; Dwarf squirrels; Long-nosed squirrels; Part 2: Some similar animals from around Indonesia; Tarsiers; Tree shrews; Flying squirrels; Colugos; Sugar gliders; Cuscuses; References.

VERSION HISTORY

Version 2 [31 July 2014] Checklist updated to accord with Musser et al. (2010) and to a greater or lesser extent all thumbnail descriptions revised.

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Squirrels of Sulawesi: An introduction

by David Mead

This article has two parts. The first part comprises thumbnail sketches of the twelve squirrel species found on the island of Sulawesi, as they are currently recognized. The second part is a description of some other small mammals which may potentially be confused with squirrels, at least during the initial phases of lexicography research before the live animal is encountered.

My source for squirrel species present on Sulawesi is Musser et al. (2010). This publication, more than thirty-five years in the making, must be regarded as the authoritative work on squirrel species of Sulawesi, and should be consulted whenever further information is required.

Although the Indonesian terms *bajing* and *tupai* are often used synonymously, I follow the Indonesian version of Wikipedia and use the term *bajing* to refer to squirrels, and restrict the reference of *tupai* to tree shrews (see below).

Part 1: Checklist of squirrel species

Across Sulawesi and its offshore islands there are twelve species of squirrels. A number of these species, however, have a limited geographic distribution. Therefore in any particular area only a few species are likely to be present.

The twelve squirrel species of Sulawesi belong to four different genera. These four types can be referred to as giant squirrels (one species, endemic), beautiful squirrels (two species, non-endemic), dwarf squirrels (seven species, endemic), and long-nosed squirrels (two species, endemic). Giant, beautiful, and dwarf squirrels are arboreal and can be referred to as 'tree squirrels.' Long-nosed squirrels on the other hand are adapted to living on the forest floor, and can be referred to as 'ground squirrels.'

Giant squirrels

The genus *Rubrisciurus* comprises only a single species, which is endemic to Sulawesi. Formerly this species was classified as *Callosciurus rubriventer* until being placed in its own genus.

1. *Rubrisciurus rubriventer* (Müller and Schlegel, 1844)
Sulawesi giant squirrel, red-bellied squirrel = *bajing besar sulawesi*

This squirrel is widespread on Sulawesi, including the Sangir Archipelago (Riley 2002), both at low elevations and at higher elevations up to 1500m. This squirrel can be identified by its large size (head and body length is 25 to 30 cm) and

prominent black ear tufts (Ellerman 1940:353).¹ Its general coloring is brownish red with a reddish orange underside (see Musser et al. 2010:34 for additional details).² It nests in tree hollows and forages for seeds, fruit and insects in the lower canopy and on the ground.

Beautiful squirrels

The designation ‘beautiful squirrels’ comes from the genus name, which originates from a combination of Greek *callo* ‘beautiful’ and *skiouros* ‘squirrel.’ Squirrels of this genus are so named because of their often brilliant coloring.

2. *Callosciurus notatus* (Boddaert, 1785)
plantain squirrel = *bajing kelapa*, *bajing nyiur*, *bajing pinang*, *bajing kampung*

Plantain squirrels are distributed from Malaysia and Thailand through western Indonesia, including Sulawesi. They are adaptable to different environments, including cities, and are said to be widespread on the smaller islands. They feed on fruits including mangoes, jackfruits and coconuts, and may locally be considered pests. Plantain squirrels are grey-brown above and orange on the underside, with a distinctive white and black stripe on both sides. Head and body length is around 20 cm, tails are roughly the same length.



plantain squirrel

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3. *Callosciurus prevostii* (Desmarest, 1822)
Prevost’s squirrel, Asian tri-colored squirrel = *bajing gading*, *bajing tiga warna*

Prevost’s squirrel is distributed from southern Thailand to Indonesia, including Sumatra, Borneo and adjacent small islands. It has also been reported from northern Sulawesi, where it was likely introduced from Borneo by humans. This squirrel is variable in coloring,³ but can generally be described as black above and reddish-orange

¹ In addition the skull has been described as having very prominent parietal ridges, which unite to form a sagittal crest (a ridge of bone along the midline of the top of the skull) (Ellerman 1940:353). Whether these features are also visible in the live animal is unknown to me.

² The genus name *Rubrisciurus* means ‘red squirrel,’ while the species name *rubriventer* means ‘red belly.’

³ An idea of this variability can be gleaned from Plate 24 in Payne, Francis and Phillipps (1985).

below, often with white thighs and flanks. On Sulawesi it is easily recognizable as the only squirrel with a black coat.



Prevost's squirrel

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Dwarf squirrels

The genus *Prosciurillus* comprises five species, all of which are endemic to Sulawesi, and which can be referred to in a general way as Sulawesi dwarf squirrels (*bajing kerdil sulawesi*). The genus was named by Ellerman in 1947, who saw resemblances between certain Celebes specimens and the pygmy squirrel genus *Sciurillus* of South America.⁴ As formulated by Ellerman it originally contained only a single species, *P. murinus*. In 1958 Moore transferred additional species to this genus, but downplayed the South American link, suggesting instead that *Prosciurillus* shared its closest link with the Indo-Malayan genus *Callosciurus* (the ‘beautiful squirrels’ mentioned above).

The defining characteristics of genus *Prosciurillus* are tied up with tooth orientation and ratios between certain skull measurements (Moore 1958:1–2). However, squirrels of this genus can be recognized on Sulawesi by their smaller size relative to other tree squirrels. They are also without stripes or bands along the sides of the body.

4. *Prosciurillus murinus* (Müller and Schlegel, 1844)
Sulawesi pygmy squirrel, Celebes pygmy squirrel, Celebes dwarf squirrel, northern dwarf squirrel

This is the smallest of Sulawesi's squirrels; head and body length is generally less than 13 cm (range 10 to 15 cm), tail is shorter than the body. Body fur is dark olive brown with a gray-drab underside. It is without any distinctive markings and along with *P. abstrusus* (see below) generally darker than other Sulawesi dwarf squirrels. *P. murinus* is distributed across Sulawesi from the Sangir Archipelago (Riley 2002) to southeastern Sulawesi (Moore 1958:3) at both low and high elevations.⁵ It forages in the lower forest canopy.

⁴ *Sciurillus* means ‘little squirrel’ (diminutive of Latin *sciurus*).

⁵ Three subspecies have been recognized: *P. m. murinus*, *P. m. griseus* (specimens taken from near Bum-bulan, southern coast of Gorontalo) and *P. m. necopinus* (Lembeh Island off the northern tip of Sulawesi), but after a re-examination of the evidence Musser et al. discount all subspecies (2010:1565–158).



Celebes dwarf squirrel at
Tangkolo Nature Preserve,
North Sulawesi

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5. *Prosciurillus abstrusus* (Moore, 1958)
South Sulawesi tree squirrel, Mekongga dwarf squirrel, secretive dwarf squirrel

Except for “slightly duller upperparts and underparts” (Musser et al. 2010:158), *P. abstrusus* resembles its close relative, *P. murinus*, in size and color. Its most distinguishing characteristic is the white-colored fur on the back of its ears (the white fur does *not* extend into tufts).

This species is known solely from specimens collected in 1932 at 1500 and 2000 m elevation in the Mekongga mountains of Southeast Sulawesi. Musser and his colleagues hypothesize that *P. murinus*—which otherwise occurs across Sulawesi—may be replaced at high elevations in the Mekongga mountain range by *P. abstrusus* (Musser et al. 2010:158).

The following five species are of ‘modest size,’ larger than *P. murinus* and *P. abstrusus*. For the novice, they are most easily distinguished by coat coloring (see also the comparison table in Musser et al. 2010:57). All five species forage in the upper forest canopy.

6. *Prosciurillus leucomus* (Müller and Schlegel, 1844)
pale dwarf squirrel, whitish dwarf squirrel

P. leucomus ranges across Sulawesi’s northern peninsula, from Minahasa as far south as the ‘neck’ of this peninsula just above Palu, occurring at both low and high elevations. It is brown to gray above and orange-red below, with black tufts on the ears. Its most distinguishing feature are the white to light gray ‘nape patches’ found behind the ears, although these patches are not present in all individuals.

7. *Prosciurillus alstoni* (Anderson, 1879)
Alston’s dwarf squirrel

P. alstoni ranges from the eastern part of the core of Sulawesi through its eastern and southeastern peninsulas, including Kabaena and Buton islands. *P. alstoni* may

be restricted to lowland forests, since specimens have yet to be collected at elevations above 1200 m (Musser et al. 2010:82).

P. alstoni is brown to gray above. Its underside is typically reddish brown (sometimes described as ‘brick red’ and ‘approaching chestnut’), that is to say, generally darker than in related *Prosciurillus* species of Sulawesi, although the underside is reddish orange in some specimens. Its most distinctive feature is “the beautiful pure white tufting to the ears” (Jentink 1883:118, cited in Musser 2010:79), even though white tufts are not present in all individuals.

8. *Prosciurillus topapuensis* (Roux, 1910)
montane dwarf squirrel

P. topapuensis occurs in the mountains of the western half of Sulawesi’s central core. It is primarily a highland squirrel, although in the western part of its range it has been found at elevations as low as 350 m (Kulawi valley). Specimens have been collected eastward of the Napu valley and westward of the Kulawi valley (although its actual range could extend further), while the Latimojong mountains of South Sulawesi probably represent the southern limit of its range. The specific epithet *topapuensis* is derived from Mt. Topapu (between Bada and Rampi) where specimens were first collected.

P. topapuensis is brown to gray above, and some individuals have black ear tufts, similar to *P. leucomus*. Its most distinguishing feature is its underside, which is gray highlighted with silver or buff, without the orange or reddish hues characteristic of other moderate-sized *Prosciurillus* species. Its tail is also relatively short (85% to 94% of head and body length).

9. *Prosciurillus weberi* (Jentink, 1890)
Weber’s dwarf squirrel

Jentink (1890:115–116) describes the fur of the body and outside legs as reddish tinged with black, the neck and underbelly more reddish. The distinguishing characteristic of this squirrel is the black stripe along the midline of the back. This stripe is widest in the middle of the back and tapers toward the neck and the base of the tail. The tail ends in a black tip, and ears also have black tufts. This squirrel is known from specimens collected near Palopo in South Sulawesi. Beyond that it inhabits the lowland area fringing the northwestern corner of the Gulf of Bone, little is known about its actual distribution.

10. *Prosciurillus rosenbergii* (Jentink, 1879)
Sangihe squirrel, Sanghir squirrel

This squirrel is limited to the Sangir Archipelago including Siau. Jentink (1879:37) describes the body color as rusty brown, with a lighter colored underside but a darker colored tail. Head and body length is about 19 cm, tail as long as the body.

Long-nosed squirrels

The two species of Sulawesi ground squirrels, also known as long-nosed squirrels (*bajing moncong panjang*), distinguish themselves from other squirrels not only by their long snouts, but also by their relatively long, straight claws, their short tails (only fifty to seventy percent of head and body length), and their long and slender (rather than sturdy) hind feet (Archbold and Tate 1935:2).⁶ Interestingly, along the midline of the back of the neck, the hair is parted for about 3 or 4 cm exposing the skin, a feature not shared with any other squirrel species of Sulawesi. The genus name, *Hyosciurus*, is blended from Greek *hys*, *hyos* ‘pig’ and *skiouros* ‘squirrel,’ in reference to the long snouts, and on this account they are sometimes referred to as pig squirrels.

In the past it was thought that *H. heinrichi* (originally known from the Latimojong mountains) was a southern species, while *H. ileile* (originally known from Mt. Ile-Ile in the Gorontalo area) was a northern species, but after additional specimens were collected this understanding had to be revised.

11. *Hyosciurus heinrichi* (Archbold and Tate, 1935)
montane long-nosed squirrel, Celebes long-nosed squirrel, southern long-nosed squirrel, southern pig squirrel

Specimens of *H. heinrichi* are known from the Latimojong mountains, from the Takolekaju mountains (south of Lake Poso), and from mountains to the east of Lake Lindu. The full range of *H. heinrichi* is as yet unknown. Given the relatively high elevations at which all specimens to date have been collected, Musser and his colleagues hypothesize that “the species may occur only in the mountainous west-central core of the island” (Musser et al. 2010:165).

The fur of the upper body is chocolate brown flecked with buff. On the underside is an irregular strip of white, bordered by dark brownish-gray fur. In some individuals the white strip extends from the mouth all the way to the base of the tail and the inside of the thighs; in others the white is broken up into patches (Archbold and Tate 1935:3; Musser 2010:165, 166).

12. *Hyosciurus ileile* (Tate and Archbold, 1936)
lowland long-nosed squirrel, northern long-nosed squirrel, northern pig squirrel

Specimens of *H. ileile* have been collected in the Gorontalo area at 1700 m elevation, and in lowland and lower montane locations in the west-central region of Sulawesi, but “the species certainly has a broader distribution than present samples indicate, and should be sought elsewhere in the central core of the island, and on both the east-central and southeastern peninsulae” (Musser 2010:187).

⁶ Their long snouts and claws are adapted for digging through leaf litter and moss (Musser et al. 2010:178 ff.). Sulawesi ground squirrels also feed on the acorns of *Lithocarpus* species, and may be more abundant where *Lithocarpus* trees are plentiful (Musser et al. 2010:192–193).

A distinct difference from *H. heinrichi* is that the stripe on the underside is cream colored rather than white, and has a smooth margin (Tate and Archbold 1936:1). Musser et al. (2010:186–187) list ten other differences, including that *H. ileile* also has somewhat brighter upper parts, a shorter muzzle, and a heavier body.

Part 2: Some similar animals from around Indonesia

Someone once asked me: Are there flying squirrels, or any kind of flying mammal, on Sulawesi? The second part of this paper is in some ways an answer to that question. In order to answer it, however, I have gone outside the geographical boundaries of Sulawesi.

In this section I briefly mention six other arboreal mammals. If while investigating squirrels your queries elicit multiple responses, or people tell you about other squirrel-like animals, you should check whether the reference may be to one of these other mammals. Although all six types of mammals are found in Indonesia, only tarsiers and cuscuses occur in Sulawesi.

Possibly there are still other mammals that should be added to this list—such as the trioks, striped possums and feather-tailed possums of New Guinea, the bandicoots of Maluku and New Guinea, or the mongooses of Borneo—but my experience is too regionalized to Sulawesi to comment further.

Tarsiers

On more than one occasion when eliciting the local term for ‘squirrel,’ I discovered that I had been misunderstood and had been given instead the term for ‘tarsier’ and vice versa. While tarsiers and squirrels are both small mammals with long tails living in trees, they are otherwise quite distinct. Tarsiers (family Tarsiidae) are primates with large eyes, are active at night, and feed primarily on insects. They have extremely long tails relative to their body size and, unlike squirrels, their tails are mostly hairless except for a tuft of fur at the end. Tarsiers are found in the Philippines, Sulawesi, Borneo and Sumatra.

Tree shrews

For ‘squirrel,’ many Indonesians use the terms *bajing* and *tupai* interchangeably. The Indonesian-language version of *Wikipedia*, however, restricts the reference of *bajing* to squirrels (family Sciuridae), and reserves the term *tupai* for tree shrews (family Tupaiidae).⁷ In actuality there are significant differences between these two families. For example squirrels are rodents, while tree shrews along with the colugos mentioned below are the closest mammalian relatives of primates. Tree shrews also largely dine on insects, versus squirrels, whose varied diet includes insects, fruits and seeds. Tree shrews are found in western Indonesia including Sumatra, Java, Bali, and Borneo, but do not occur east of Wallace’s line.

⁷ *Wikipedia Ensiklopedia Bebas*, s.v. “Bajing” <http://id.wikipedia.org/wiki/Bajing> and “Tupai” <http://id.wikipedia.org/wiki/Tupai> (accessed June 24, 2013).

Flying squirrels

Flying squirrels (*bajing terbang*) constitute a tribe (Pteromyini) within the squirrel family (Sciuridae). In Asia flying squirrels are distributed from India and mainland Southeast Asia to China, Japan and the Philippines. In Indonesia, however, flying squirrels are limited to Sumatra, Java and Borneo. Be careful not to confuse flying squirrels with colugos or sugar gliders, two other types of gliding mammals.

The only reference I have seen to flying squirrels in Sulawesi is the entry *sididung* ‘tupai terbang, flying squirrel’ in the Pendau lexicon (Becky Quick 2013:pers.comm.). The animal to which this term refers requires further investigation, since the island of Sulawesi is reportedly without any kind of gliding mammal, squirrel or otherwise.

Colugos (flying lemurs)

A colugo (family Cynocephalidae) is the size of a large squirrel with a slender build and membranes between neck, legs and tail which allows it to glide long distances. There are two (some now say four) species worldwide, distributed from the Malay Peninsula through Sumatra, Borneo and the southern Philippines. Colugos are also called ‘flying lemurs,’ although they are not true lemurs.

Sugar gliders

Sugar gliders, *Petaurus breviceps*, are a third type of gliding mammal found in Indonesia. Sugar gliders are the only species of genus *Petaurus* that occur in Indonesia. Several subspecies are recognized, distributed from Halmahera to New Guinea, the Bismark Archipelago and Australia. The name ‘sugar glider’ comes from its preference for sweet foods and its ability to glide. Head and body length is around 18 cm, with a tail slightly longer. Sugar gliders are marsupials, and like other members of genus *Petaurus* are sometimes called gliding possums, flying phalangers or wrist-winged gliders.

Cuscuses

Cuscuses are marsupial mammals found from Sulawesi eastward, including New Guinea and northern Australia. These ‘Australasian possums’ are divided into four genera. The bear cuscuses (genus *Ailurops*) and dwarf cuscuses (*Strigocuscus*) are limited to Sulawesi, while phalangers (genus *Phalanger*) and spotted cuscuses (*Spilococuscus*) occur further east.⁸ In my own experience from Sulawesi, only dwarf cuscuses, not the larger bear cuscuses, are likely to get confused with squirrels.

⁸ Some authorities (e.g. Tate 1945) consider these to be a single genus, *Phalanger*. The related brushtail possums (genus *Trichosurus*) and scaly-tailed possums (genus *Wyulda*) occur only in Australia. The common spotted cuscus, *Spilococuscus maculatus* Desmarest, was introduced by humans to Selayar Island off the coast of South Sulawesi (Whitten, Mustafa and Henderson 1987:434).

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