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Callosciurus prevostii (Rodentia: Sciuridae)

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Abstract: Prevost's squirrel, *Callosciurus prevostii* (Desmarest, 1822), is a diurnal, medium-sized, arboreal squirrel. Its distribution extends from peninsular Thailand and Sumatra to northern Sulawesi, Borneo, and adjacent islands. It inhabits secondary forests, fruit orchards, as well as palm and coconut plantations. Fruit is the main component of its diet, but some arthropods are also eaten. The International Union for Conservation of Nature and Natural Resources lists *C. prevostii* as "Least Concern" due to its wide distribution and tolerance for some degree of habitat modification.

Key words: arboreal rodent, sciurid, southeastern Asia

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Callosciurus prevostii (Desmarest, 1822)

Prevost's Squirrel

Sciurus prevostii Desmarest, 1822:335. Type locality "L'Inde;" restricted to "Malacca, Malaya" by Moore and Tate (1992:289).

Sciurus rafflesii Vigors and Horsfield, 1828:113. Type locality not given; restricted to "Sumatra, probably Bencoolen, West Sumatra" by Chasen (1940:128).

Sciurus redimitus van der Boon Mesch, 1829:243. Type locality "India orientali;" restricted to "Sumatra" by Moore and Tate (1992:289).

Sciurus rufogularis Gray, 1842:263. Type locality "China;" corrected to "Sumatra" by Bonhote (1901:169).

Sciurus rufonigra Gray, 1842:263. Type locality "India;" restricted to "Labuan Island, N.W. Borneo" by Chasen and Kloss (1925:99) using Motley and Dillwyn (1855).

Sciurus rafflesii var. *borneoensis* Müller and Schlegel, 1842:86. Type locality "Borneo."

[*Sciurus rafflesii* var.] *indica* Müller and Schlegel, 1842:86. Type locality "Malakka," Malaysia. First reference to Malacca, now considered the type locality of *C. prevostii*.

Sciurus erythromelas Temminck, 1853:248. Type locality "Célèbes, Gorontalo et Kema," now Sulawesi.

Sciurus rufoniger Motley and Dillwyn, 1855:6. Unjustified emendation of *Sciurus rufonigra* Gray, 1842.

Sciurus prevostii sumatranus Schlegel, 1863:25. Type locality not given; restricted to "Sumatra" by Chasen (1940:128).

Sciurus prevostii bangkanus Schlegel, 1863:26, pl. I, fig. 2. Type locality "Banka," Indonesia.

Sciurus prevostii borneoensis: Schlegel, 1863:26. Name combination.

Sciurus atricapillus Schlegel, 1863:27, pl. II, fig. 1. Type locality "Bornéo, dans le district de Kapouas, dans l'intérieur, à quatre degrés environ à l'est de la ville de Pontianak."



Fig. 1.—An adult *Callosciurus prevostii* from Taman Negara Sungai Relau Park, Peninsular Malaysia. Used with permission of the photographer, Graeme Guy, who retains the copyright.

- Sciurus erythrogeus* Schlegel, 1863:29. Type locality “l’île de Célèbes ... dans les environs de Kéma,” now Sulawesi. Preoccupied by Waterhouse, 1842 (1843):129; a *Funisciurus* from Africa.
- Sciurus piceus* Peters, 1866:429. Type locality “Tenasserim,” Burma/Myanmar; corrected to “North Sumatra” by Chasen (1940:128).
- Macroxus rafflesii*: Gray, 1867:277. Name combination. [*Macroxus rafflesii*] var. *bangkanus*: Gray, 1867:277. Name combination.
- Sciurus*. *borneonensis* Gray, 1867:277. Unjustified emendation of *borneoensis* Müller and Schlegel, 1842.
- Macroxus sarawakensis* Gray, 1867:277. Type locality “Sarawak,” northern Borneo, Malaysia.
- Macroxus rufogularis*: Gray, 1867:277. Name combination.
- Macroxus rufogularis* var. *redimitus*: Gray, 1867:278. Name combination.
- Macroxus rufoniger*: Gray, 1867:278. Name combination.
- Sciurus atrocapillus* Gray, 1867:278. Unjustified emendation of *atricapillus* Schlegel, 1863.
- Macroxus atrocapillus*: Gray, 1867:278. Name combination.
- Sciurus*. *schlegelii* Gray, 1867:278. Replacement name for *Sciurus erythrogeus* Schlegel, 1863:29.
- Macroxus pluto* Gray, 1867:283. Type locality “Borneo, Sarawak.” Probably from North Borneo (Davis 1962).
- Sciurus prevostii sumatrana* Anderson, 1878:270. Unjustified emendation of *sumatranus* Schlegel, 1863.
- Sciurus prevostii bankana* Anderson, 1878:270. Unjustified emendation of *bangkanus* Schlegel, 1863.
- Sciurus borneoensis*: Anderson, 1878:270. Name combination.
- Macroxus (Callosciurus) sarawakensis* Anderson, 1878:270. Unjustified emendation of *sarawakensis* Gray, 1867.
- Sciurus prevosti* Thomas and Hartert, 1894:659. Unjustified emendation of *prevostii* Desmarest, 1822.
- Sciurus mimellus* Miller, 1900:218. Type locality “Pulo Wai, Tambelan Islands,” Pulau Uwi, South China Sea between Malay Peninsula and Borneo, Kepulauan Riau, Indonesia (Fisher and Ludwig 2012).
- Sciurus mimiculus* Miller, 1900:219. Type locality “Ste. Barbe Island,” Pulau Penjantan, South China Sea, between Sumatra and Borneo, Kepulauan Riau, Indonesia (Fisher and Ludwig 2012).
- Sciurus prevostii typicus* Bonhote, 1901:168. Type locality “Malay Peninsula; Singapore, Malacca, Penang.”
- Sciurus prevostii humei* Bonhote, 1901:168. Type locality “Klang, Selangor,” peninsular Malaysia.
- Sciurus prevostii kuchingensis* Bonhote, 1901:168. Type locality “Kuching, Sarawak,” Malaysia.
- Sciurus prevostii navigator* Bonhote, 1901:168. Type locality “Sirhassen Island” = Serasan Island, South Nатура Islands, E. Sumatra.
- Sciurus caroli* Bonhote, 1901:173. Type locality “Marudi River, Baram district,” Sarawak, Malaysia.
- Sciurus caroli griseicauda* Bonhote, 1901:174. Type locality “Mount Kalulong, Baram district,” Sarawak, Malaysia.
- Sciurus baluensis* Bonhote, 1901:175. Type locality “Mount Kina Balu, Borneo, alt. 1000 feet,” Sabah, Malaysia.
- Sciurus baluensis suffusus* Bonhote, 1901:175. Type locality “Tutong River, N.W. Borneo,” Brunei.
- Sciurus schlegelii* Bonhote, 1901:176. Unjustified emendation of *schlegelii* Gray, 1867.
- Sciurus rufoniger pluto*: Bonhote, 1901:176. Name combination.
- Sciurus navigator*: Miller, 1901:129. Name combination.
- Sciurus melanops* Miller, 1902:151. Type locality “Indragiri river, eastern Sumatra,” at Tjenako, Riau, Indonesia (Fisher and Ludwig 2012).
- Sciurus prevostii harrisoni* Stone and Rehn, 1902:132. Type locality “Goenong Soegi, Lampong District, Sumatra” = Goenoeng Soegih (Gunungsugih), Lampung District, Sumatra.
- Sciurus erebus* Miller, 1903:456. Type locality “Tapanuli Bay, northwestern Sumatra,” Sumatera Utara, Indonesia (Fisher and Ludwig 2012).
- Sciurus carinatae* Miller, 1906a:57. Type locality “Telok Pai, Karimata Island,” Kalimantan Barat, off west coast of Borneo, Indonesia (Fisher and Ludwig 2012).
- Sciurus condurensis* Miller, 1906b:260. Type locality “Pulo Kundur, Rhio-Linga Archipelago,” east coast of Sumatra, Kepulauan Riau, Indonesia (Fisher and Ludwig 2012).
- Sciurus carimonensis* Miller, 1906b:261. Type locality “Great Karimon Island, Rhio-Linga Archipelago,” 11 mi SW Tanjon Balie, Great Karimon Island, Straits of Malacca, Riau Archipelago, Kepulauan Riau, Sumatra, Indonesia (Fisher and Ludwig 2012).
- Sciurus bangkanus*: Lyon, 1906 (1907):589. Name combination.
- Sciurus mendanauus* Lyon, 1906 (1907):589. Type locality “Pulo Mendanau, west of Billiton Island, Malay Archipelago,” Kampong Petaling, Kepulauan Bangka Belitung, Sumatra, Indonesia (Fisher and Ludwig 2012).
- Sciurus proserpinae* Lyon, 1907:275. Type locality “Pulo Temaju, about four miles off the west coast of Borneo,” Kalimantan Barat, Indonesia (Fisher and Ludwig 2012).
- Sciurus borneoensis borneoensis*: Lyon, 1908a:552. Name combination.
- Sciurus borneoensis palustris* Lyon, 1908a:553. Type locality “north bank of the Kapuas River, below Pulo Limbang, western Borneo,” Kalimantan Barat, Indonesia (Fisher and Ludwig 2012).
- Sciurus sanggau* Lyon, 1908a:554. Type locality “Sanggau, western Borneo, south bank of Kapuas River,” Kalimantan Barat, Indonesia (Fisher and Ludwig 2012).
- Sciurus melanops penialius* Lyon, 1908b:637. Type locality “Pulo Penjalei, at the mouth of the Kampar River, eastern Sumatra,” Riau, Indonesia (Fisher and Ludwig 2012).
- Sciurus nyx* Lyon, 1908b:638. Type locality “Pulo Rupert, off east coast of Sumatra,” Riau, Indonesia (Fisher and Ludwig 2012).
- Sciurus prevostii wrayi* Kloss, 1910:148. Type locality “Genting, Kuala Lipis, Pahang,” peninsular Malaysia.

- Sciurus armalis* Lyon, 1911:82. Type locality “Pulo Panebangan [Kalimantan Barat], off west coast of Borneo,” Kalimantan Barat, Indonesia (Fisher and Ludwig 2012).
- Sciurus pelapius* Lyon, 1911:82. Type locality “Pulo Pelapis (South Island) off west coast of Borneo,” Kalimantan Barat, Indonesia (Fisher and Ludwig 2012).
- Sciurus atricapillus atrox* Miller, 1913:23. Type locality “Talisaian Mountain, Dutch Southeast Borneo,” Kalimantan, Indonesia (Fisher and Ludwig 2012).
- [*Callosciurus*] *prevosti prevosti*: Robinson and Kloss, 1918:210. Name combination.
- [*Callosciurus*] *prevosti wrayi*: Robinson and Kloss, 1918:211. Name combination.
- [*Callosciurus*] *prevosti humei*: Robinson and Kloss, 1918:211. Name combination.
- [*Callosciurus*] *prevosti rafflesii*: Robinson and Kloss, 1918:211. Name combination.
- [*Callosciurus*] *prevosti melanops*: Robinson and Kloss, 1918:211. Name combination.
- [*Callosciurus*] *prevosti penialius*: Robinson and Kloss, 1918:211. Name combination.
- [*Callosciurus*] *prevosti harrisoni*: Robinson and Kloss, 1918:211. Name combination.
- [*Callosciurus*] *prevosti condurensis*: Robinson and Kloss, 1918:211. Name combination.
- [*Callosciurus*] *prevosti carimonensis*: Robinson and Kloss, 1918:212. Name combination.
- [*Callosciurus*] *prevosti bangkanus*: Robinson and Kloss, 1918:212. Name combination.
- [*Callosciurus*] *prevosti mendanauus*: Robinson and Kloss, 1918:212. Name combination.
- [*Callosciurus*] *prevosti carimatae*: Robinson and Kloss, 1918:212. Name combination.
- [*Callosciurus*] *prevosti sanggauus*: Robinson and Kloss, 1918:212. Name combination.
- [*Callosciurus*] *prevosti armalis*: Robinson and Kloss, 1918:212. Name combination.
- [*Callosciurus*] *prevosti pelapis* Robinson and Kloss, 1918:212. Unjustified emendation of *pelapius* Lyon, 1911.
- [*Callosciurus*] *prevosti borneoensis*: Robinson and Kloss, 1918:212. Name combination.
- [*Callosciurus*] *prevosti palustris*: Robinson and Kloss, 1918:213. Name combination.
- [*Callosciurus*] *prevosti proserpinae*: Robinson and Kloss, 1918:213. Name combination.
- [*Callosciurus*] *prevosti sarawakensis*: Robinson and Kloss, 1918:213. Name combination.
- [*Callosciurus*] *prevosti kuchingensis*: Robinson and Kloss, 1918:213. Name combination.
- [*Callosciurus*] *prevosti atricapillus*: Robinson and Kloss, 1918:213. Name combination.
- [*Callosciurus*] *prevosti atrox*: Robinson and Kloss, 1918:213. Name combination.
- [*Callosciurus*] *prevosti caroli*: Robinson and Kloss, 1918:213. Name combination.
- [*Callosciurus*] *prevosti griseicauda*: Robinson and Kloss, 1918:213. Name combination.
- [*Callosciurus*] *prevosti erythromelas*: Robinson and Kloss, 1918:214. Name combination.
- [*Callosciurus*] *prevosti schlegeli*: Robinson and Kloss, 1918:214. Name combination.
- [*Callosciurus*] *prevosti baluensis*: Robinson and Kloss, 1918:214. Name combination.
- [*Callosciurus*] *prevosti rufoniger*: Robinson and Kloss, 1918:214. Name combination.
- [*Callosciurus*] *prevosti pluto*: Robinson and Kloss, 1918:214. Name combination.
- [*Callosciurus*] *prevosti piceus*: Robinson and Kloss, 1918:214. Name combination.
- [*Callosciurus*] *prevosti nyx*: Robinson and Kloss, 1918:215. Name combination.
- [*Callosciurus*] *prevosti navigator*: Robinson and Kloss, 1918:215. Name combination.
- [*Callosciurus*] *prevosti mimelus* Robinson and Kloss, 1918:215. Unjustified emendation of *mimellus* Miller, 1900.
- [*Callosciurus*] *prevosti mimiculus*: Robinson and Kloss, 1918:215. Name combination.
- S[ciurus]. p[revosti]. rafflesii*: Chasen and Kloss, 1925:97. Name combination.
- S[ciurus]. p[revosti]. melanops*: Chasen and Kloss, 1925:97. Name combination.
- S[ciurus]. p[revosti]. harrisoni*: Chasen and Kloss, 1925:97. Name combination.
- S[ciurus]. p[revosti]. penialius*: Chasen and Kloss, 1925:97. Name combination.
- S[ciurus]. p[revosti]. condurensis*: Chasen and Kloss, 1925:97. Name combination.
- S[ciurus]. p[revosti]. carimonensis*: Chasen and Kloss, 1925:97. Name combination.
- S[ciurus]. p[revosti]. griseicauda*: Chasen and Kloss, 1925:97. Name combination.
- S[ciurus]. rufoniger pluto*: Chasen and Kloss, 1925:99. Name combination.
- Sciurus prevosti caroli*: Banks, 1931:Plate 12. Name combination.
- Sciurus prevostii caroli*: Banks, 1931:42. Name combination.
- Sciurus prevostii rufoniger*: Banks, 1931:124. Name combination.
- Sciurus prevostii atricapillus*: Banks, 1931:125. Name combination.
- Sciurus prevosti caedis* Chasen and Kloss, 1932:25. Type locality “Balambangan Island, North Borneo,” Sabah, Malaysia.
- Sciurus prevosti banksi* Chasen, 1933:195. Type locality “Baram,” Borneo Island, Sarawak, Malaysia.
- Sciurus prevostii rafflesii*: Chasen, 1940:128. Name combination.
- Sciurus prevostii piceus*: Chasen, 1940:128. Name combination.
- Sciurus prevostii nyx*: Chasen, 1940:129. Name combination.

- Sciurus prevostii penialius*: Chasen, 1940:129. Name combination.
- Sciurus prevostii melanops*: Chasen, 1940:129. Name combination.
- Sciurus prevostii carimonensis*: Chasen, 1940:129. Name combination.
- Sciurus prevostii condurensis*: Chasen, 1940:129. Name combination.
- Sciurus prevostii mendanauus*: Chasen, 1940:129. Name combination.
- Sciurus prevostii palustris*: Chasen, 1940:129. Name combination.
- Sciurus prevostii borneoensis*: Chasen, 1940:129. Name combination.
- Sciurus prevostii sarawakensis*: Chasen, 1940:129. Name combination.
- Sciurus prevostii sanggaus*: Chasen, 1940:129. Name combination.
- Sciurus prevostii carinatae*: Chasen, 1940:129. Name combination.
- Sciurus prevostii armalis*: Chasen, 1940:129. Name combination.
- Sciurus prevostii pelapius*: Chasen, 1940:129. Name combination.
- Sciurus prevostii proserpinae*: Chasen, 1940:129. Name combination.
- Sciurus prevostii banksi*: Chasen, 1940:129. Name combination.
- Sciurus prevostii griseicauda*: Chasen, 1940:129. Name combination.
- Sciurus prevostii baramensis*: Chasen, 1940:131. Type locality "Mt. Dulit, Baram district, Sarawak, 5,000 ft.," Malaysia.
- Sciurus prevostii atrox*: Chasen, 1940:131. Name combination.
- Sciurus prevostii rufonigra*: Chasen, 1940:131. Name combination.
- Sciurus prevostii pluto*: Chasen, 1940:131. Name combination.
- Sciurus prevostii caedis*: Chasen, 1940:131. Name combination.
- Sciurus prevostii mimiculus*: Chasen, 1940:131. Name combination.
- Sciurus prevostii mimellus*: Chasen, 1940:132. Name combination.
- Callosciurus baluensis medialis*: Allen and Coolidge, 1940:156. Type locality "Mt. Tibang, (central) Dutch Borneo," Sarawak, Malaysia.
- Callosciurus prevosti rafflesi*: Ellermann, 1940:365. Unjustified emendation of *rafflesii* Vigors and Horsfield, 1828.
- Callosciurus prevosti pelapis*: Ellermann, 1940:366. Name combination.
- Callosciurus prevosti caedis*: Ellermann, 1940:367. Name combination.
- Callosciurus prevosti banksi*: Ellermann, 1940:368. Name combination.
- Callosciurus prevosti sumatrana*: Ellermann, 1940:368. Name combination.
- Callosciurus prevosti redimitus*: Ellermann, 1940:368. Name combination.
- Callosciurus prevostii*: Sody, 1949:101. First use of current name combination.
- [*Callosciurus prevostii*] *piceus*: Sody, 1949:101. Name combination.
- [*Callosciurus prevostii*] *bangkanus*: Sody, 1949:101. Name combination.
- [*Callosciurus prevostii*] *mendanauus*: Sody, 1949:101. Name combination.
- [*Callosciurus prevostii*] *carinatae*: Sody, 1949:101. Name combination.
- [*Callosciurus prevostii*] *armalis*: Sody, 1949:101. Name combination.
- [*Callosciurus prevostii*] *waringentis*: Sody, 1949:101. Unjustified emendation of *waringensis* Sody, 1949.
- [*Callosciurus prevostii*] *sanggaus*: Sody, 1949:101. Name combination.
- [*Callosciurus prevostii*] *palustris*: Sody, 1949:101. Name combination.
- [*Callosciurus prevostii*] *borneoensis*: Sody, 1949:101. Name combination.
- [*Callosciurus prevostii*] *kuchingensis*: Sody, 1949:101. Name combination.
- [*Callosciurus prevostii*] *pluto*: Sody, 1949:101. Name combination.
- [*Callosciurus prevostii*] *atricapillus*: Sody, 1949:101. Name combination.
- [*Callosciurus prevostii*] *navigator*: Sody, 1949:101. Name combination.
- [*Callosciurus prevostii*] *humei*: Sody, 1949:101. Name combination.
- [*Callosciurus prevostii*] *erebus*: Sody, 1949:101. Name combination.
- [*Callosciurus prevostii*] *melanops*: Sody, 1949:101. Name combination.
- [*Callosciurus prevostii*] *penialius*: Sody, 1949:101. Name combination.
- [*Callosciurus prevostii*] *nyx*: Sody, 1949:101. Name combination.
- [*Callosciurus prevostii*] *condurensis*: Sody, 1949:101. Name combination.
- [*Callosciurus prevostii*] *carimonensis*: Sody, 1949:101. Name combination.
- [*Callosciurus prevostii*] *proscipinae*: Sody, 1949:101. Unjustified emendation of *proserpinae* Lyon, 1907.
- [*Callosciurus prevostii*] *pelapius*: Sody, 1949:101. Name combination.
- [*Callosciurus prevostii*] *caedis*: Sody, 1949:101. Name combination.
- Callosciurus prevostii waringensis*: Sody, 1949:103. Type locality "Riam, Kotawaringin, S.W. Borneo," Central Kalimantan, Indonesia.
- Callosciurus prevostii coomansi*: Sody, 1949:103. Type locality "Pematang Tudjuh, Northern bank Pungur Besar River, Pontianak district, W Borneo," West Kalimantan, Indonesia.

[*Callosciurus prevostii*] *bangkannus* Heaney, 1978:32. Unjustified emendation of *bangkanus* Schlegel, 1863.

C[allosciurus]. p[revostii]. borneensis Payne et al., 1985:82. Unjustified emendation of *borneoensis* Müller and Schlegel, 1842.

Sciurus prosperinae Corbet and Hill, 1992:289. Unjustified emendation of *proserpinae* Lyon, 1907.

CONTENT AND CONTEXT. Order Rodentia, suborder Sciuromorpha, family Sciuridae, subfamily Callosciurinae, genus *Callosciurus*. Number of subspecies is not known. Most named forms are distinguished based on coat color patterns, yet these are highly variable and may not indicate subspecific distinction.

We found 64 named forms with 16 unintended misspellings and 4 unambiguous synonyms; thus, a total of 44 subspecies is possible. Alphabetically, these 44 names with parenthetical synonyms or misspellings are: *armalis* Lyon, 1911; *atricapillus* Schlegel, 1863 (= *atrocapillus* Gray, 1867); *atrox* Miller, 1913; *baluensis* Bonhote, 1901; *bangkanus* Schlegel, 1863 (= *bankana* Anderson, 1878; *bangkannus* Heaney, 1978); *banksi* Chasen, 1933; *baramensis* Chasen, 1940; *borneoensis* Müller and Schlegel, 1842 (= *borneonensis* Gray, 1867; *borneensis* Payne et al., 1985); *caedis* Chasen and Kloss, 1932; *carimatae* Miller, 1906a; *carimonensis* Miller, 1906b; *caroli* Bonhote, 1901; *condurensis* Miller, 1906b; *coomansi* Sody, 1949; *erythromelas* Temminck, 1853; *griseicauda* Bonhote, 1901; *harrisoni* Stone and Rehn, 1902; *humei* Bonhote, 1901; *kuchingensis* Bonhote, 1901; *medialis* Allen and Coolidge, 1940; *melanops* Miller, 1902; *mendanaus* Lyon, 1906 (1907); *mimellus* Miller, 1900 (= *mimelus* Robinson and Kloss, 1918); *mimiculus* Miller, 1900; *navigator* Bonhote, 1901; *nyx* Lyon, 1908b; *palustris* Lyon, 1908a; *pelapius* Lyon, 1911 (*pelapis* Robinson and Kloss, 1918); *penialius* Lyon, 1908b; *piceus* Peters, 1866 (= *erebus* Miller, 1903); *pluto* Gray, 1867; *prevostii* Desmarest, 1822 (= *prevosti* Thomas and Hartert, 1894; *indica* Müller and Schlegel, 1842; *typicus* Bonhote, 1901); *proserpinae* Lyon, 1907 (*proscipinae* Sody, 1949; *prosperinae* Corbet and Hill, 1992); *rafflesii* Vigors and Horsfield, 1828 (= *rafflesi* Ellermann, 1940); *redimitus* van der Boon Mesch, 1829; *rufogularis* Gray, 1842; *rufonigra* Gray, 1842 (= *rufoniger* Motley and Dillwyn, 1855); *sanggaus* Lyon, 1908a; *sarawakensis* Gray, 1867 (*sarwakensis* Anderson, 1878); *schlegelii* Gray, 1867 (= *erythrogegnys* Schlegel, 1863; *schlegeli* Bonhote, 1901); *suffusus* Bonhote, 1901; *sumatranus* Schlegel, 1863 (= *sumatrana* Anderson, 1878); *waringensis* Sody, 1949 (= *waringentis* Sody, 1949); *wrayi* Kloss, 1910.

NOMENCLATURE NOTES. The generic name, *Callosciurus*, often translated as “beautiful squirrel,” is from the Greek *callo* for beautiful, *skia* for shadow, and *oura* for tail (Borrer 1960; Lurz et al. 2005). The species name, *prevostii*, honors the French geologist, Constant Prévost. Other common names are black squirrel (Davis 1962), tupai labang, tupai chelum, tupai bekarang (Banks 1931), and tricolored squirrel (Heaney 1978).

The above 44 named forms or subspecies associated with *prevostii* (64 names minus 16 misspellings minus 4 unambiguous synonyms) vary with those summarized in the literature: Robinson and Kloss (1918): 35 subspecies (excludes *banksi*, *baramensis*, *caedis*, *coomansi*, *indica*, *medialis*, *redimitus*, *rufogularis*, *sumatranus*, *waringensis*; treat *schlegelii* = *erythrogegnys*, *piceus* = *erebus*); Chasen (1940): 34 subspecies (excludes *coomansi*, *erythrogegnys* = *schlegelii*, *erythromelas*, *indica*, *kuchingensis*, *medialis*, *mimellus*, *redimitus*, *rufogularis*, *sumatranus*, *waringensis*; treats *piceus* = *erebus*); Ellermann (1940): 39 subspecies (excludes *baramensis*, *coomansi*, *indica*, *medialis*, *rufogularis*, *waringensis*; treats *schlegelii* = *erythrogegnys*, *piceus* = *erebus*); Heaney (1978): 39 subspecies (excludes *indica*, *kuchingensis*, *medialis*, *redimitus*, *rufogularis*, *sumatranus*; treats *schlegelii* = *erythrogegnys*, *piceus* = *erebus*); Corbet and Hill (1992): 40 named forms (excludes *baluensis*, *baramensis*, *erythromelas*, *medialis*, *schlegelii* = *erythrogegnys*, *suffusus*; includes both *erebus* and *piceus*); Thorington and Hoffmann (2005): 44 named forms (excludes *baluensis*, *baramensis*, *medialis*; treat *schlegelii* = *erythrogegnys*; includes both *piceus* and *erebus*, as well as both *rufonigra* and *rufoniger*).

DIAGNOSIS

Callosciurus prevostii typically has a tricolored pattern with a black or dark back and red belly separated by a distinct white stripe (Fig. 1). This pelage character readily distinguishes this species from other sympatric, medium-sized tree-squirrels. Several species of *Sundasciurus* co-occur with *C. prevostii*, but, where they do so, they are either smaller in size (length of head and body < 200 mm versus > 200 mm) or different in color with either a reddish back or a gray to white venter (Payne et al. 1985; Corbet and Hill 1992). *C. prevostii* also overlaps on the Malayan Peninsular with *C. caniceps* (gray-bellied squirrel), *C. erythraeus* (Pallas’s squirrel), and *C. notatus* (plantain squirrel—Thorington et al. 2012; Lurz et al. 2013). These species do not have the rufous venter of *C. prevostii*.

GENERAL CHARACTERS

Callosciurus prevostii is a medium-sized tree-squirrel without sexual dimorphism. Mean external measurements (mm or g, parenthetical *n*) for female and male *C. prevostii*, respectively, from Borneo were: total length, 477 (6), 469 (4); tail length, 243 (6), 231 (4); body mass, 433 (7), 439 (4—Banks 1931). Mean external measurements (mm, *n*, mixed sexes) from Banka and Mendanau (islands between Borneo and Sumatra) were: length of head and body, 249.4 (16); length of tail vertebrae, 229.1 (15); hind foot length, 57.3 (16—Lyon 1906 (1907)). Mean external measurements (mm, *n*) for female and males, respectively, from Sumatra were: length of head and body, 264.0 (27), 263.5 (29); length of tail vertebrae, 256.6 (27), 251.56 (29); hind foot length, 64.3 (24), 64.0 (25—Lyon 1908b). Mean external measurements (mm, *n*) for

females and males, respectively, from Borneo and adjacent islands were: length of head and body, 248.1 (44), 241.6 (46); length of tail vertebrae, 233.3 (43), 230.9 (45); hind foot length 59.5 (44), 59.2 (46—Lyon 1908a, 1911). Mean external measurements (mm, *n*) for adults of mixed sex from the north China Sea, Sumatra, Karimata Islands, Rhio-Linga archipelago, and Borneo were: length of head and body, 239.5 (63); length of tail vertebrae, 220.8 (63); hind foot length, 52.1 (63—Miller 1900, 1902, 1903, 1906a, 1906b, 1913). Mean percent of tail relative to length of head and body for 275 *C. prevostii* from multiple subspecies was 95.6% (range 69–128—Sody 1949). At Samarakan, a single adult male representing the subspecies *C. p. caroli* was received from a local hunter (total length, 51; body mass, 360 g—Bonhote 1901). Body mass is 250–500 g in Borneo (Payne et al. 1985).

Mean cranial measurements (mm, *n*, Fig. 2) from *C. p. atricapillus* and *C. p. pluto* were: greatest length of skull, 54.9 (8); length from condyles to gnathion, 47.6 (8); basicranial length, 47.8 (8); zygomatic width, 34.3 (9); greatest breadth of braincase, 24.1 (9); least interorbital breadth, 22.1 (9); least postorbital breadth, 19.1 (9); length of nasals medially, 16.5 (9); breadth of combined nasals anteriorly, 8.1 (9); breadth of combined nasals posteriorly, 4.5 (3); diastema, 13.0 (9); length of foramina incisive, 3.1 (3); length of upper tooththrow, 10.4 (9—Glydenstolpe 1919). Cranial and mandibular measurements (mm) of the male type of *C. p. mendanauus* were: greatest length, 54; basal length, 46.5; basilar length, 43.5; palatilar length, 23.5; diastema, 13.5; zygomatic breadth, 33; interorbital constriction, 22; least depth of ramus of mandible in front of tooththrow, 5; maxillary tooththrow, 11.25; mandibular tooththrow, 11 (Lyon 1906 (1907)). Mean cranial measurements (mm, *n*) for other male and female *C. prevostii* from Banka and Mendanau were: upper length of skull, 55.1 (14); zygomatic breadth, 34.2 (14); interorbital constriction, 22.9 (14); length of upper tooththrow (alveoli), 8.5 (16—Lyon 1906 (1907)). Mean cranial measurements (mm, *n*) for females and males, respectively, from Sumatra were: greatest length of skull, 58.21 (27), 58.28 (29); interorbital constriction, 23.58 (27), 23.39 (29); zygomatic breadth, 35.78 (25), 35.21 (28—Lyon 1908b). Mean cranial measurements (mm, *n*) for females and males, respectively, from Borneo and adjacent islands were greatest length of skull, 55.68 (43), 54.90 (44); interorbital constriction, 22.16 (44), 21.85 (44); zygomatic breadth, 33.80 (42), 33.27 (44—Lyon 1908a, 1911). Mean cranial measurements (mm, *n*) for adults of both sexes from the north China Sea, Sumatra, Karimata Islands, Rhio-Linga archipelago, and Borneo were greatest length of skull, 54.7 (8); basal length (or condylobasilar length), 47.9 (9); basilar length, 44.6 (8); palatal length, 23.6 (6); diastema, 13.0 (5); length of nasals, 16.9 (7); breadth of nasals anteriorly, 8.3 (4); breadth of nasals posteriorly, 4.8 (3); interorbital breadth (or interorbital constriction), 21.9 (9); breadth between tips of postorbital processes, 29.5 (3); zygomatic breadth, 33.6 (9); mastoid breadth, 22.1 (3); breadth of palate between premolars, 7.1 (3); depth of rostrum at posterior extremity of nasals, 12.7 (3); mandibular length, 34.7 (9); depth of mandible at posterior root of large premolars, 8.1 (3); maxillary tooththrow, 10.5 (9); breadth across both upper incisors together at rim of alveoli, 5.2 (3); mandibular tooththrow, 10.5



Fig. 2.—Dorsal, ventral, and lateral views of skull and lateral view of mandible of an adult male *Callosciurus prevostii prevostii* (Field Museum of Natural History, Chicago [FMNH#43521]) from Rompin, Pahang, Malaysia. Greatest length of skull is 55.9 mm.

(9—Miller 1900, 1902, 1903, 1906a, 1906b, 1913). Mean length (mm) of the upper tooththrow for 112 *C. prevostii* from multiple subspecies was 10.58 (range 9.0–11.6—Sody 1949).

Callosciurus prevostii has many color variations, but all individuals have red bellies (Payne et al. 1985), and the dorsum is usually black. The back and belly are often separated by a white or fawn stripe of variable width (Banks 1978).

DISTRIBUTION

Callosciurus prevostii occurs (Fig. 3) on the Isthmus of Kra in southern Thailand, south through Sumatra and Borneo (including nearby islands), and east to Sulawesi (Corbet and Hill 1992;

FORM AND FUNCTION

Wilson et al. 2006; Thorington et al. 2012). Corbet and Hill (1992) specifically list the islands of Kundur, Great Karimon (Riau Island), Rupert, Penjalei, Bangka, Mendanau (Sumatra), Wai, Saint Barbe (Tambelan Island), Serasan (South Natuna Island), Karimata, Sanggau, Temaju, Panebangan, Pelapis, Labuan, Bangi, and Balembangan (Borneo). Its occurrence in northern Sulawesi (*erythromelas*, *erythrognys* = *schlegelii*) is considered “extralimital” by Laurie and Hill (1954:92) and “introduced” by Musser (1987:80) based on Laurie and Hill (1954). Rather than subspecies, known type localities for the 44 named forms are given on the distribution map (Fig. 3) because ambiguities in the literature make the distributions of subspecies uncertain.

The iris is dark brown (Banks 1931). The “thumb” has a nail rather than a claw (Banks 1931). Claws are paler at their tips (Banks 1931). An illustration of the baculum is available (Davis 1962; see also Corbet and Hill 1992). Three pairs of mammae are present (Moore 1961; Davis 1962). The tail is “of the flue-brush variety, hairs sticking out at right angles from the long axis of the tail and not feathery and flattened” (Banks 1931:45).

Body size is related to island size. “The smallest squirrels occur on the smallest islands and increase in body size on islands up to about 104 km².” On larger islands, “body

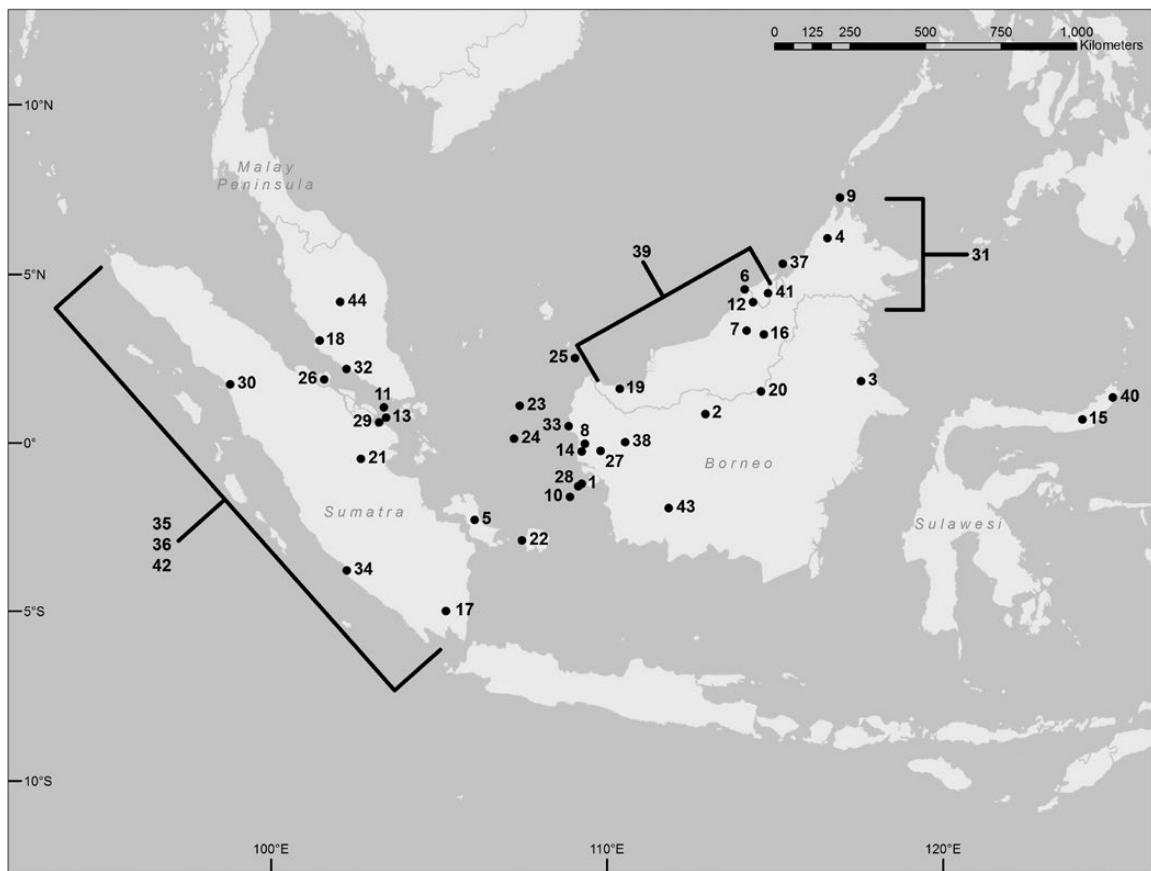


Fig. 3.—Type localities for 44 named forms of *Callosciurus prevostii* from original sources supplemented by Bonhote (1901), Miller (1903), Chasen and Kloss (1925), Chasen (1940), Heaney (1978), Payne et al. (1985), Moore and Tate (1992), and Fisher and Ludwig (2012). 1, *C. p. armalis* (Lyon, 1911); 2, *C. p. atricapillus* (Schlegel, 1863); 3, *C. p. atrox* (Miller, 1913); 4, *C. p. baluensis* (Bonhote, 1901); 5, *C. p. bangkanus* (Schlegel, 1863); 6, *C. p. banksi* (Chasen, 1933); 7, *C. p. baramensis* (Chasen, 1940); 8, *C. p. borneoensis* (Müller and Schlegel, 1842); 9, *C. p. caedis* (Chasen and Kloss, 1932); 10, *C. p. carinatae* (Miller, 1906a); 11, *C. p. carimonensis* (Miller, 1906b); 12, *C. p. caroli* (Bonhote, 1901); 13, *C. p. condurensis* (Miller, 1906b); 14, *C. p. coomansi* Sody, 1949; 15, *C. p. erythromelas* (Temminck, 1853); 16, *C. p. griseicauda* (Bonhote, 1901); 17, *C. p. harrisoni* (Stone and Rehn, 1902); 18, *C. p. humei* (Bonhote, 1901); 19, *C. p. kuchingensis* (Bonhote, 1901); 20, *C. p. medialis* Allen and Coolidge, 1940; 21, *C. p. melanops* (Miller, 1902); 22, *C. p. mendanauus* (Lyon, 1906 (1907)); 23, *C. p. mimellus* (Miller, 1900); 24, *C. p. mimiculus* (Miller, 1900); 25, *C. p. navigator* (Bonhote, 1901); 26, *C. p. nyx* (Lyon, 1908b); 27, *C. p. palustris* (Lyon, 1908a); 28, *C. p. pelapius* (Lyon, 1911); 29, *C. p. penialius* (Lyon, 1908b); 30, *C. p. piceus* (Peters, 1866); 31, *C. p. pluto* (Gray, 1867); 32, *C. p. prevostii* (Desmarest, 1822); 33, *C. p. proserpinae* (Lyon, 1907); 34, *C. p. rafflesii* (Vigors and Horsfield, 1828); 35, *C. p. redimitus* (van der Boon Mesch, 1829); 36, *C. p. rufogularis* (Gray, 1842); 37, *C. p. rufonigra* (Gray, 1842); 38, *C. p. sanggauus* (Lyon, 1908a); 39, *C. p. sarawakensis* (Gray, 1867); 40, *C. p. schlegelii* (Gray, 1867); 41, *C. p. suffusus* (Bonhote, 1901); 42, *C. p. sumatranus* (Schlegel, 1863); 43, *C. p. waringensis* Sody, 1949; 44, *C. p. wrayi* (Kloss, 1910). Base map from Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community.

size decreases significantly as island area increases” (Heaney 1978:41–42).

ONTOGENY AND REPRODUCTION

Average litter size from 9 litters was 1.55 young with a range of 1 to 3 (Hayssen et al. 1993). Five gestations were 46–48 days (Hayssen et al. 1993). In north Borneo, pregnant females were found in June and August, and a lactating female was found in August (Davis 1962). Lactating females were found the first 3 months of the year in Borneo (Banks 1931). Two neonates weighed 15.9 and 16.8 g (Hayssen et al. 1993). “Newborn young are altricial, hairless and grey with leathery skin and a thick membrane covering their eyes” (Xanten et al. 1988:284). Although without fur, pigmentation of the black back and chestnut belly were visible at age 14 days in a captive *Callosciurus prevostii* (Edwards 1978). Lateral stripe is pink in the juvenile rather than white as in adult pelage (Edwards 1978). Eyes open by 22 days after birth (Xanten et al. 1988).

ECOLOGY

Population characteristics.—Population size fluctuate between years and seasons. Peak abundance in dipterocarp dominated, lowland primary forest in Sarawak, Malaysia occur after the peak of fruiting (Nakagawa et al. 2007). Of 4 sympatric *Callosciurus* species, *C. prevostii* is the 2nd most abundant in the Ulu Mida Forest Reserve, Kedah, Malaysia with an estimated overall density of 3.29 km⁻² (Saiful and Nordin 2004). The estimate of 2.98 km⁻² from hill dipterocarp production forest in Sarawak (Zainuddin 1996, not seen, cited in Saiful and Nordin 2004) is low compared to estimates of 14.6 km⁻² from lowland dipterocarp forest in central Kalimantan, Indonesia (McConkey and Chivers 2004). *C. prevostii* was present both before and after selective logging in a dipterocarp forest (Dahaban et al. 1996).

Callosciurus prevostii occurs in tall and secondary forests but will enter gardens and plantations (Payne et al. 1985). It occupies the middle story of the forest (Banks 1978). In Malaysia, *C. prevostii* was trapped in primary lowland forest dominated by dipterocarp trees in the emergent and canopy layers and species of Euphorbiaceae, Burseraceae, and Myristicaceae in the understory (Nakagawa et al. 2007). In this habitat, animals forage predominantly in the canopy but were occasionally observed on the ground (Nakagawa et al. 2007). In Selangor, oil palm estates are preferred habitat (Harrison and Traub 1950). At Sarawak from an area of disturbed logged forest interspersed with forest plantation of *Acacia mangium*, a specimen of *C. p. sarawakensis* was obtained from a local hunter (Wilson et al. 2006). *C. p. pluto* inhabits primary and old logged forests rather than clearings, newly logged forests, cultivated areas, or towns (Davis 1962).

Diet.—*Callosciurus prevostii pluto* eats arthropods (5–40%; ants, termites, and beetle larvae), as well as fruits

and nuts (Davis 1962; Banks 1978; Payne et al. 1985). Finely divided pieces of pulpy fruits were present in the stomachs of 5 animals (Davis 1962). *C. prevostii* eats flowers and fruits of *Gonystylus bancanus* (Ismail et al. 2011) and fruits of *Durio* (Nakashima et al. 2008). In a captive zoo setting, feral mice were eaten (Xanten et al. 1988).

Diseases and parasites.—Knowledge about parasites and diseases in this species is highly limited. Two captive animals lived 19 years, 2 months and 21 years, 1 month (Weigl 2005; Gorbunova et al. 2008). Endoparasites include *Eimeria callosciuri* in *Callosciurus prevostii* from Malaysia (Colley 1971) and alveolar echinococcosis, caused by the fox tapeworm *Echinococcus multilocularis*. The latter was detected in a *C. p. borneoensis* found dead in an outdoor enclosure at Zürich Zoo (Staebler et al. 2007). *C. prevostii* tested positive for eggs of *Dicrocoelium dendriticum*, *Capilaria hepatica*, an unidentified *Strongyloides* species, a pinworm (*Syphacia*), a gastrointestinal nematode (described as “Nippostrongylus-like”), and the cestode *Hymenolepsis diminuta* (D’Ovidio et al. 2014, 2015).

BEHAVIOR

Callosciurus prevostii is arboreal, only descending to the ground to cross gaps in the trees, and diurnal, with most activity in the early morning and late afternoon (Davis 1962; Payne et al. 1985). *C. prevostii* does not curl its tail over its back but carries it unbent behind and somewhat upwards (Banks 1931). When animals move, the forefeet are splayed out horizontally, whereas the hind feet are vertical (Banks 1931). When animals sit, the ischial region touches the back of the leg rather than the substrate (Banks 1931).

The large, magpie-like nest has a thick outer layer of fairly big sticks and an inner layer lined with shredded bark and a few grass-like bents; the entrance is usually low on one side of the bundle (Banks 1931). Young are “carried in the mouth by the scruff of the neck like a cat with a kitten” (Banks 1931:46).

Callosciurus prevostii does not emit bird-like whistles but has a call described as “a series of chuckles” (Banks 1978:199). It is active and noisy (Banks 1931). When eating, “the food is held between the palms of the two ‘hands’ and pieces chipped off by the lower pair of incisor teeth working against the upper pair” (Banks 1931:46).

In captivity, “prior to mating the male chases the female, emitting clicking and high-pitch ‘twitter’ vocalisations to which she responds with a high-pitched twitter and screeches as the pursuit continues. This behavior continues for three to four-and-a-half hours with as many as ten mating encounters taking place, each encounter including one to three copulations” (Xanten et al. 1988:284).

GENETICS

Diploid number (2n) of chromosomes is 40 with a fundamental number (FN) of 70. Autosomal chromosomes include 6

pairs of metacentrics, 10 pairs of submetacentrics, and 3 pairs of acrocentrics (Oshida and Yoshida 1994). The medium-sized X chromosome is submetacentric and the small Y chromosome is metacentric (Yong et al. 1975; Oshida and Yoshida 1994; Oshida et al. 1996).

Cytochrome *b* sequences were used to investigate both the phylogenetic relationships of several *Callosciurus* species (Oshida et al. 2001, 2011) and the phylogeographical characteristics of *C. prevostii* in southeast Asia (Oshida et al. 2016). In both phylogenetic analyses, *C. prevostii* formed a well-supported lineage with *C. nigrovittatus*, the black-striped squirrel. Two nuclear genes (*c-myc* and *RAG1*) were sequenced from *C. prevostii* (Steppan et al. 2004). Novel sequences for *RNase1*, a gene which encodes secretory proteins, were identified in 4 squirrel species including *C. prevostii* (Siegel et al. 2009).

CONSERVATION

The International Union for the Conservation of Nature and Natural Resources *Red List of Threatened Species* lists *Callosciurus prevostii* as a species of “Least Concern” not only because it is common and widely distributed, but also because it is somewhat tolerant of habitat modification (Duckworth and Hedges 2008). However, the population trend is decreasing, and the remaining lowland habitat is under threat. In addition, the species is heavily hunted in parts of Sarawak for the pet trade (Duckworth and Hedges 2008).

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