

*Sciurus colliaei*. By Troy L. Best

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*Sciurus colliaei* Richardson, 1839

Collie's Squirrel

*Sciurus colliaei* Richardson, 1839:8. Type locality "San Blas in California" [Nayarit, Mexico—Miller, 1924:219].

*Sciurus sinaloensis* Nelson, 1899:60. Type locality "Mazatlan, Sinaloa, Mexico."

*Sciurus truei* Nelson, 1899:61. Type locality "Camoá, Rio Mayo, Sonora, Mexico."

**CONTEXT AND CONTENT.** Order Rodentia, Suborder Sciurognathi, Family Sciuridae, Subfamily Sciurinae, Genus *Sciurus*, Subgenus *Sciurus* (Wilson and Reeder, 1993). Based upon structure of the hyoid bones, *S. colliaei* also has been placed into the subgenus *Neosciurus* (Hoffmeister and Hoffmeister, 1991). The genus *Sciurus* contains 28 species (Wilson and Reeder, 1993). Four subspecies of *S. colliaei* are recognized (Anderson, 1962; Hall, 1981):

*S. c. colliaei* Richardson, 1839:8, see above.

*S. c. nuchalis* Nelson, 1899:59. Type locality "Manzanillo, Colima, Mexico."

*S. c. sinaloensis* Nelson, 1899:60, see above.

*S. c. truei* Nelson, 1899:61, see above.

**DIAGNOSIS.** In portions of its range, *S. colliaei* (Fig. 1) may be sympatric with *S. aberti*, *S. aureogaster*, and *S. nayaritensis*. Compared with *S. colliaei*, which does not have tufts on the ears, *S. aberti* has ears with pronounced tufts (the tufts are reduced in summer pelage). Compared with *S. colliaei*, which has two upper premolars and a venter that is whitish to grayish, *S. nayaritensis* has only one upper premolar (Hall, 1981) and an orange-hued venter. Compared with *S. nayaritensis* in Sonora, *S. colliaei* is smaller, has coarse-textured and shorter pelage, the skull of *S. colliaei* is <63 mm in length, and the zygomatic breadth is <36 mm (Caire, 1978).

The skull of *S. colliaei* (Fig. 2) is similar to that of *S. aureogaster*, but averages smaller; the jugals are slenderer, and the upper molars are narrower (Nelson, 1899). In Nayarit and Jalisco, differences between *S. colliaei* and *S. aureogaster* are not pronounced, particularly those between *S. aureogaster* from the Jalisco-Nayarit region on the Mexican Plateau and *S. colliaei* from adjoining lowlands of the Pacific coastal plain and highland spurs of the Mexican Plateau. Individuals are similar in external and cranial dimensions and in many features of the pelage. In *S. colliaei*, however, the variegated, blended buff and black extends over the back from the nape to the rump, the upperparts are brighter and darker, and the pelage is shorter and thinner than in *S. aureogaster*. In *S. aureogaster* from the Mexican Plateau, the variegated buff and black is restricted to the nape and rump, forming either distinct or pale and inconspicuous patches. The back is gray in most individuals of *S. aureogaster*, but some have a buff suffusion between the nape and rump patches (Musser, 1968).

*Sciurus colliaei*, *S. variegatoides*, and *S. yucatanensis* are strikingly similar in color and pattern of pelage. For example, the range of variation in features of the pelage of some populations of *S. yucatanensis* from Yucatán fall within that of populations of *S. colliaei* from northern Nayarit and Sinaloa; individuals of these two species are practically indistinguishable from one another in pelage (Musser, 1968).

In color and pattern, *S. variegatoides* from Chiapas and Guatemala closely resembles the southernmost population of *S. colliaei* (*S. c. nuchalis*). Like *S. c. nuchalis*, *S. variegatoides* has variegated buff and black upperparts that cover the sides and thighs. However, the white or buff-tinged postauricular patches of *S. variegatoides* are larger and more distinct than in *S. colliaei*, the upperparts are paler (not as black), the feet are white and slightly peppered instead of black or frosted black, the underparts are white, and the tail is

variegated buff. The Chiapas-Guatemala population of *S. variegatoides* also resembles *S. colliaei* in external dimensions, but is appreciably smaller in cranial measurements, and sphenopalatine vacuities occur more frequently (Musser, 1968).

**GENERAL CHARACTERS.** The upperparts of Collie's squirrel are yellowish gray, coarsely grizzled, and heavily overlaid with black. The sides are paler than the back, the postauricular patches vary from white to buff, and the underparts usually are white (rarely whitish-orange or orange). The nape, shoulders, legs, and ears are variable, but usually are either dark gray or of some shade approximating rufous. The base of the tail is like the back, and the remainder of the tail is black above with a wash of white. Ventrally, the tail is grizzled grayish or blackish yellow, edged with white. There are no melanistic individuals known, and there are north-south clines of increasing size and pigmentation. There are two upper premolars, except that in northern populations P3 is absent on one or both sides in >50% of individuals (Anderson, 1962; Hall, 1981; Musser, 1968).

Individual variation in *S. c. colliaei* mainly is confined to intensity of the yellow or buff hues of the back. Some individuals have feet and toes that are whiter than others and are grayer on the flanks. In spring and summer, some individuals have a rusty brown color on the back. Coloration of *S. c. nuchalis* is variable in the amount of gray or yellow on the back, and the principal variation in *S. c. truei* is in intensity of the rusty color of the ears (Nelson, 1899).

Compared with *S. c. colliaei*, *S. c. nuchalis* has ears that are more yellowish or rusty, the nuchal area is yellower than the rest of the back, the crown, lumbar region, and rump are more heavily washed with black, the median line on the lower surface of the tail is grizzled rusty rufous or suffused with a paler shade of grizzled rusty rufous, and the pelage is coarser and harsher, with the grizzling on the back consequently coarser. Compared with *S. c. colliaei*, the skull of *S. c. nuchalis* is similar, but larger, with proportionately larger auditory bullae and broader, heavier jugals. Compared with



FIG. 1. Photograph of *Sciurus colliaei*. Courtesy of C. Sánchez-Hernández.

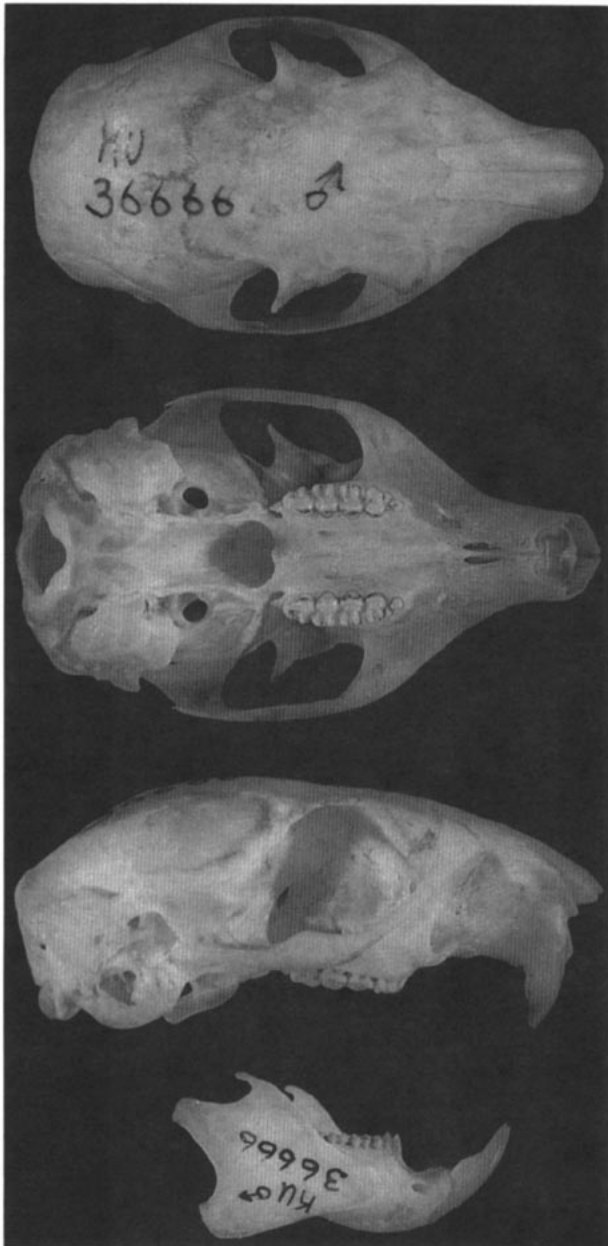


FIG. 2. Dorsal, ventral, and lateral views of cranium and lateral view of mandible of *Sciurus c. colliaei* from Aticama, 3 m elev., Nayarit, Mexico (male, University of Kansas Museum of Natural History 36666). Greatest length of cranium is 61.7 mm.

*S. c. colliaei*, the skull of *S. c. sinaloensis* is larger and more massive, and the rostrum is heavier. Compared with *S. c. colliaei*, the skull of *S. c. truei* is proportionately broader with a flatter braincase, broader interorbital area, shorter and heavier rostrum, nasals that are shorter and more deeply emarginate posteriorly, broader and vertically expanded jugals, and auditory bullae that are larger and scarcely depressed on the inner anterior border (Nelson, 1899). Averages and ranges of external and cranial measurements (in mm) of *S. c. colliaei*, *S. c. nuchalis*, *S. c. sinaloensis*, and *S. c. truei*, respectively, are: total length, 499 (448–537), 525 (466–578), 512 (500–524), 502 (440–534); length of tail, 252 (215–280), 262 (233–300), 249 (241–267), 260 (203–287); length of hind foot, 64 (59–67), 67 (61–71), 59 (57–60), 64 (58–67); occipitonasal length, 58.4 (56.3–63.1), 60.8 (56.8–64.6), 59.1 (56.5–62.1), 56.3 (54.4–58.6); zygomatic breadth, 33.2 (31.5–35.1), 34.9 (31.1–37.6), 34.1 (32.3–36.1), 32.5 (30.9–33.8); breadth of braincase, 24.0 (22.6–26.1), 24.9 (23.0–27.2), 24.4 (23.2–25.6), 23.5 (22.2–24.4); interorbital breadth, 18.8 (17.1–

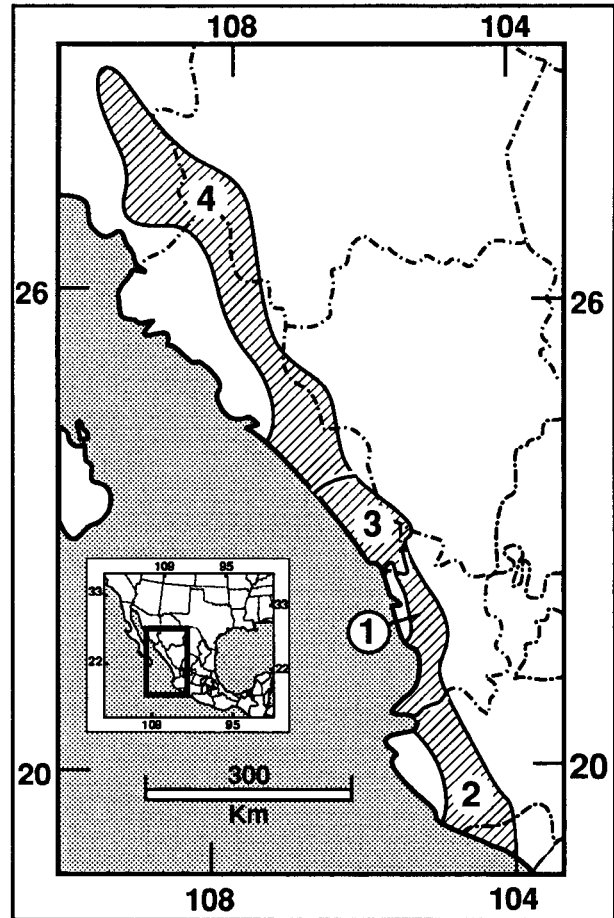


FIG. 3. Distribution of *Sciurus colliaei* in western Mexico (Hall, 1981): 1, *S. c. colliaei*; 2, *S. c. nuchalis*; 3, *S. c. sinaloensis*; 4, *S. c. truei*.

20.6), 19.8 (16.9–22.5), 18.7 (17.7–20.1), 18.2 (17.2–18.9); alveolar length of maxillary toothrow, 11.5 (10.8–12.5), 11.8 (11.0–12.6), 11.6 (10.7–12.4), 11.1 (9.8–11.9—Anderson, 1962).

**DISTRIBUTION.** Collie's squirrel occurs along the lowlands and mountains of the Pacific Coast from southern Sonora through Sinaloa and Nayarit to northwestern Colima, and along the Pacific slopes of the Sierra Madre Occidental in Chihuahua, Durango, and parts of Sinaloa (Fig. 3). The elevational range is from sea level (e.g., Barro de Navidad, Jalisco) to 1,290 m in Chihuahua (Barranca de Cobre), 1,980 m in Sinaloa (south of Revolcaderos), and 1,950 and 2,190 m on the Sierra de Autlán and Sierra de Cuale, respectively, of Jalisco (Musser, 1968). Much of the range of *S. colliaei* is in the arid tropical lowlands and lower slopes of adjacent mountains along the west coast of Mexico, seldom >900 m elev. (Hall, 1981; Nelson, 1899). One subspecies (*S. c. nuchalis*) is endemic within the Trans-Mexican neovolcanic belt (Fa and Morales, 1991).

**FOSSIL RECORD.** The genus *Sciurus* evolved by the early Miocene (Black, 1972). No fossils of *S. colliaei* are known.

**FORM AND FUNCTION.** The dental formula is  $i\ 1/1, c\ 0/0, p\ 1.2/1, m\ 3/3$ , total 22 or 24 (Hall, 1981). The sphenopalatine vacuities are ca. 0.5 mm in diameter (Musser, 1968), and the average ratio of length of vibrissae to width of head is 1.593 (Ahl, 1987).

The forefeet have four large toes with claws and three-lobed pads, and the hind feet have five large toes with claws. The tracks rarely are observed because Collie's squirrel only comes to the ground occasionally (Ceballos and Miranda, 1986). The four pair of mammae are arranged as follows: one pectoral; two abdominal; one inguinal (Nelson, 1899).

The hyoid apparatus consists of a single basihyal and paired thyrohyals, ceratohyals, and stylohyals; the basihyal is thick, tri-

angular in cross-section, long, and fuses with the short thyrohyals at an early age (Hoffmeister and Hoffmeister, 1991).

As in other *Sciurus*, the proximal end of the baculum is not bulbous, the shaft is nearly straight, and there are no spines or dorsal knob at the distal end (Bryant, 1945). The baculum of *S. colliaei* (Fig. 4) is most like bacula of *S. aureogaster*, *S. variegatoides*, and *S. yucatanensis*. The basal portion of the shaft is circular or nearly so in cross section. The shaft tapers distally to its smallest diameter. At this point, the shaft usually curves dorsally and expands into a broad circular disc that is concave on the right side and convex on the left. Ventral to this expanded disc is a definite spur. In *S. colliaei*, the baculum resembles that of *S. aureogaster*, but has a relatively heavier shaft. The slight differences might come within the range of intraspecific variation. There was a small spur anterior to the main spur in one of the two bacula examined. A tuberosity, posterior to the spur, was present in both specimens examined. The posterior edge of the disc was rounded; it formed ca. 90° angle with the shaft. There was a dorsal keel on the shaft of one baculum. Measurements (in mm) of two bacula from Jalisco were: length, 10.9, 12.1; length of expanded tip, 3.0, 3.2; height of expanded tip, 3.3, 3.5; height of base, 3.3, 3.1; width of base, 2.8, 2.9 (Burt, 1960).

**ONTOGENY AND REPRODUCTION.** In southwestern Chihuahua, a female Collie's squirrel had three embryos 5 mm in length on 24 May (Anderson, 1972). In Durango on 11 June, a female had three embryos with a crown-rump length of 37 mm, and another female was lactating (Jones, 1963). In Jalisco, breeding occurs in March and April, and young are present in April (Ceballos Gonzales, 1989). In Sonora, young were active by 9 April (Burt, 1938).

**ECOLOGY.** Collie's squirrel is common in thick forests along the Pacific coast from Guerrero to Sinaloa (Ceballos Gonzales, 1989). In the northern part of its range, *S. colliaei* inhabits the coastal plain and some more elevated areas such as canyons that lead to the coastal plain (Anderson, 1962). The habitat of Collie's squirrel primarily is tropical or subtropical forests as follows: coquito palm (Arecaceae) forests intermixed with figs (*Ficus*) and other native tropical broadleaf trees surrounding lagoons; tropical deciduous forest on slopes below the oak-pine (*Quercus-Pinus*) belt of the Sierra Madre Occidental and western margins of the Mexican Plateau; cloud forests of pine, oak, fir (*Abies*, *Pseudotsuga*), and hardwoods such as basswood (*Tilia*), walnut (*Juglans*), and alder (*Alnus*) on the Sierra de Autlán. To the north, *S. colliaei* occurs farther inland. In Sonora, Collie's squirrel occurs in oak forests on upland slopes, thorn and short-tree forests, and in riparian formations in canyons that dissect the Sierra Madre Occidental (Burt, 1938; Caire, 1978; Musser, 1968). In Jalisco, *S. colliaei* is found in most forest habitats (thorn, deciduous, arroyo, riparian, and palm forests) including perennial crops, but seems to be more abundant in native palm (*Orbygnia cohune*) and arroyo forests (Ceballos Gonzales, 1989).

Collie's squirrel is a frugivore and herbivore (Ceballos and Miranda, 1986). In Colima, it feeds on nuts of coquito palms and figs (Musser, 1968), and in Jalisco, it was eating or carrying fruits or nuts of *Spondias purpureae*, *Orbygnia cohune*, and *Cocos nucifera* (Ceballos Gonzales, 1989).

Nests of twigs and leaves may be in hollow trees or on the bushy terminal parts of tree limbs (Burt, 1938; Caire, 1978). In Colima, large globular leaf nests were common in tall figs and other broadleaf trees (Musser, 1968). In Jalisco, nests were either drays constructed of sticks and leaves in trees or cavities located in old termite nests or trunks (Ceballos Gonzales, 1989).

Where the range of *S. colliaei* meets the ranges of *S. aberti* and *S. nayaritensis* in Sonora, *S. colliaei* occupies scrubby, subtropical canyons leading out of the Sierra Madre Occidental onto the coastal plain at lower elevations than *S. aberti* and *S. nayaritensis* (Anderson, 1962; Caire, 1978). *S. colliaei* and *S. nayaritensis* are sympatric on the Sierra de Cuale, Jalisco (*S. colliaei* occurred in a canyon in subtropical broadleaf vegetation and *S. nayaritensis* on the slopes in pines), and they have been observed together in Sinaloa. *S. colliaei* and *S. nayaritensis* probably are sympatric elsewhere along the western margins of the Sierra Madre Occidental northward to Chihuahua (Musser, 1968).

*Sciurus colliaei* is allopatric with *S. aureogaster* in Nayarit and Jalisco. There *S. colliaei* occurs in the lowlands and highland outliers of the Mexican Plateau and *S. aureogaster* is found only on the Mexican Plateau where it occurs only as low as 1,050 m

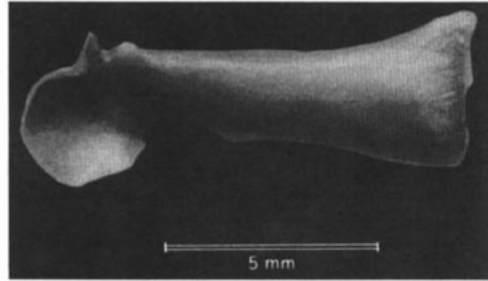


FIG. 4. Baculum of *Sciurus colliaei* from Sierra de Autlán, Jalisco, Mexico (modified from Burt, 1960).

elev. near La Toma (2-3 km N Tequila, Jalisco). Elevational and ecologic limits of the two species are unknown. In Colima, *S. colliaei* occurs with *S. aureogaster* in coquito palm forests intermixed with figs and other native tropical broadleaf trees along the northeastern margin of the Laguna de Cuyutlan. Both species were feeding on nuts of coquito palms and figs (Musser, 1968). In Jalisco, *S. colliaei* also occurs with *Baiomys musculus*, *Dasyops novemcinctus*, *Didelphis virginiana*, *Liomys pictus*, *Marmosa canescens*, *Nyctomys sumichrasti*, *Oryzomys couesi*, *O. melanotis*, *O. palustris*, *Osgoodomys banderanus*, *Pappogeomys bulleri*, *Peromyscus banderanus*, *P. perfulvus*, *Reithrodontomys fulvescens*, *Sigmodon mascotensis*, *Spermophilus annulatus*, and *Xenomys nelsoni* (Ceballos, 1990; Genoways and Jones, 1973).

The only ectoparasites reported from Collie's squirrel are the lice *Enderleinellus pratti* (Kim, 1966), *E. mexicanus*, and *Neohaematopinus sciurinus* (Ferris, 1951). No endoparasites are known.

**BEHAVIOR.** Collie's squirrel is largely arboreal, but it may be active on the ground. *S. colliaei* is most active in early morning and at sunset, remaining active throughout the day when overcast (Ceballos Gonzales, 1989). Nothing is known regarding genetics of *S. colliaei*.

**REMARKS.** *Sciurus colliaei*, *S. variegatoides*, and *S. yucatanensis* may be fragmented segments of one species whose geographic range once extended along the Pacific lowlands and uplands from Sonora to southern Guatemala, across eastern Guatemala into the Yucatán Peninsula, and throughout Central America to Panama. Geographic distributions of segments now represented by *S. yucatanensis* and *S. variegatoides* remain relatively intact, and the two may still connect geographically and genetically through eastern Guatemala and northwestern Honduras. The Pacific segment in Mexico, however, was fragmented, and the northwestern populations now represented by *S. colliaei* are at present separated from the southeastern populations (*S. variegatoides*) by a different, but closely related, species (*S. aureogaster*). Pelage features and known ecology of *S. colliaei*, *S. variegatoides*, and *S. yucatanensis* support this hypothesis. So too is the geographic distribution of external and cranial dimensions of the three forms. Although the three differ in these features, the extremes are encompassed in *S. colliaei*, which grades clinally from a small squirrel about the size of *S. yucatanensis* to one larger than *S. variegatoides*. The original, continuously distributed species may have been as variable in external and cranial dimensions (Musser, 1968).

*Sciurus* is from the Latin meaning squirrel (Jaeger, 1955). *S. colliaei* was named in honor of Dr. C. Collie, Surgeon of Her Majesty's Ship Blossom, who collected the type specimen during the ship's visit to San Blas in the winter of 1828 (Nelson, 1899; Richardson, 1839). *S. colliaei* also has been referred to as the Manzanillo, Sinaloa, Sonora (Nelson, 1899), and True's squirrel (Elliot, 1904).

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