= Monticolomys =

Monticolomys is a genus of rodents within the subfamily Nesomyinae of the family Nesomyidae , and is closely related to Macrotarsomys . The only species , Monticolomys koopmani , also known as the Malagasy mountain mouse or Koopman 's montane voalavo , is found in the highlands of eastern Madagascar . A small mouse @-@ like rodent , M. koopmani is dark brown on the upperparts and dark gray below . It has small , rounded , densely haired ears and broad feet with well @-@ developed pads . The long tail lacks a tuft at the tip . The skull is delicate and lacks crests and ridges on its roof .

First collected in 1929 , Monticolomys koopmani was not formally described until 1996 , but it is now known to have a broad distribution . Active during the night , it occurs in both montane forest and human @-@ disturbed grasslands and feeds on fruits and seeds . A scansorial animal , it climbs trees but also lives on the ground . Although habitat destruction may pose a threat , it is classified as " Least Concern " on the IUCN Red List .

= = Taxonomy = =

A specimen of Monticolomys koopmani was captured in 1929 during the Mission Zoologique Franco @-@ Anglo @-@ Américaine to Madagascar , but the rodents obtained by the expedition were never studied in detail . It was not until the 1970s that Karl Koopman and Guy Musser recognized that the animal ? whose skin had landed at the American Museum of Natural History in New York , while the skull was at the Muséum national d 'histoire naturelle in Paris ? represented an otherwise unknown species . However , they never published their results . In 1993 , Steven Goodman rediscovered the species on Madagascar and in 1996 he and Michael Carleton finally published a formal description . They named the animal Monticolomys koopmani , as the sole member of a new genus . The generic name Monticolomys means " mountain @-@ dwelling mouse " and refers to the animal 's montane habitat , and the specific name koopmani honors Karl Koopman for his many contributions to mammalian systematics . Common names in use for the animal include " Koopman 's Montane Voalavo " and " Malagasy Mountain Mouse " .

The indigenous rodents of Madagascar , the Nesomyinae , prior to the discovery of Monticolomys comprised seven very distinctive genera ? so distinct from each other that some have found it difficult to accept that they are closely related . Monticolomys , however , does not follow this pattern , in that it is similar and closely related to the gerbil @-@ like genus Macrotarsomys of western Madagascar . This relationship was originally proposed by Goodman and Carleton based on morphology , and was strongly supported by a DNA sequence analysis (based on the cytochrome b gene) published in 1999 . While this study provided some weak support for a relationship between the Macrotarsomys ? Monticolomys clade and the giant jumping rat , Hypogeomys , a later study based on the IRBP gene instead placed Macrotarsomys ? Monticolomys sister to a clade containing four other nesomyine genera ? Eliurus , Voalavo , Gymnuromys , and Brachytarsomys .

= = Description = =

Monticolomys koopmani is a small , mouse @-@ like rodent , and quite different in appearance from most other nesomyines . It has a thick , soft fur , which appears dark brown on the upperparts . The cover hairs (which comprise most of the fur) are tricolored : for the basal two thirds of their length , they are plumbeous gray ; the middle is ochraceous ; and the tip is dark brown to black . The longer guard hairs , which are most common towards the middle of the back , are completely black . The fur of the underparts appears dark gray , and is not sharply demarcated from the upperparts . There , the hairs are also plumbeous at the bases , but the tips range from white to yellowish @-@ brown . The mystacial vibrissae ? whiskers above the mouth ? are medium @-@ sized . The short , rounded ears are densely covered with grayish hairs . Monticolomys has broad hindfeet bearing prominent pads and long outer digits . There are white hairs on the upper sides of the metapodials and digits , and long ungual tufts ? tufts of hair surrounding the bases of the claws ?

are present . The thumb of the forefeet bears a nail , but claws are present on the other digits . The long tail is covered with small scales and light brown hairs . The tail lacks a distinct tuft at the tip , as is present in Eliurus and Macrotarsomys . Females have six mammae . Head and body length is 84 to 101 mm (3 @.@ 3 to 4 @.@ 0 in) , tail length is 116 to 143 mm (4 @.@ 6 to 5 @.@ 6 in) , hindfoot length is 23 to 25 mm (0 @.@ 91 to 0 @.@ 98 in) , ear length is 15 to 20 mm (0 @.@ 59 to 0 @.@ 79 in) , and body mass is 18 @.@ 5 to 27 @.@ 5 g (0 @.@ 65 to 0 @.@ 97 oz) .

The skull is small and delicate . The front part , the rostrum , is narrow and relatively long . The nasal bones are rounded at the front , but blunt at the back . The zygomatic plate ? a bony plate at the side of the skull ? is narrow and extends back to the front margin of the first upper molar (M1) . The jugal bones constitute much of the thin zygomatic arches (cheekbones) . The interorbital region , between the eyes , is narrow and hourglass @-@ shaped . There are no crests or ridges on the interorbital region or on the braincase . The incisive foramina , openings in the front part of the palate , extend back to a point between the front roots of the M1s . The bony palate itself is broad and lacks many indentations and protuberances present in other species . Its posterior margin is at the level of the upper third molars (M3s) . There is no alisphenoid strut , so that the masticatory @-@ buccinator foramen and the foramen ovale accessorium , two openings on the underside of the skull , are fused . There are 13 thoracic (chest) , 7 lumbar (abdomen) , 4 sacral (hip) , and 38 caudal (tail) vertebrae .

The upper incisors have orange enamel and are opisthodont , with the cutting edge of the tooth inclined backwards . The root of the lower incisors extends though the mandible (lower jaw) to a low capsular process at the back of the jawbone . The molars are brachyodont (low @-@ crowned) and bear distinct cusps . The second molars , although decidedly smaller than the first , are similar in their crown morphology , but the much smaller third molars are reduced and more distinct from the first molars in morphology . The molars lack accessory crests and other features . Each of the upper molars is three @-@ rooted , whereas the lowers have two roots . The molars are quite similar to those of Macrotarsomys , and differ only in minor details .

= = Distribution and ecology = =

The range of Monticolomys is now known to extend across the mountain ranges of eastern Madagascar from the Tsaratanana Massif south to Andohahela , at 800 to 2 @,@ 200 m (2 @,@ 600 to 7 @,@ 200 ft) above sea level . It occurs in montane forest , but also in degraded grassland , where it is among the first species to return after fires . At Ankaratra , where the species was recorded in 1929 , it occurred in such grassland , where the nesomyine Brachyuromys betsileoensis was also found . The animal was again recorded at Ankaratra in 1996 , this time in a heavily disturbed forest , where it occurred with Eliurus minor and the introduced black rat (Rattus rattus) . At Andringitra , the animal was recorded in high montane forest together with six other nesomyines ? Brachyuromys ramirohitra , Eliurus minor , Eliurus tanala , Eliurus webbi , Gymnuromys roberti , and Nesomys rufus ? as well as the black rat . At Andohahela , Monticolomys was found at an altitude of 1 @,@ 875 m (6 @,@ 152 ft) in sclerophyllous forest . Its distribution corresponds to the High Mountain Domain , a region defined on the basis of plant distributions . This region is now discontinuous , but the High Mountain Domain habitat was continuous from mountain to mountain as recently as the early Holocene . Subfossil remains of Monticolomys have been found in Mahajanga Province (northwestern Madagascar) . Monticolomys koopmani is morphologically uniform across its wide distribution .

Monticolomys is nocturnal and solitary and produces litters of up to three offspring . It is scansorial , spending time on the ground but also climbing in vegetation . In Andringitra , two specimens were captured on a liana 2 m (6 @.@ 6 ft) over the ground , and a third was caught on the ground together with two shrew tenrecs (Microgale taiva) . All five specimens from Andohahela were trapped on the ground , as was the specimen caught in Ankaratra in 1996 . Its diet includes fruits and seeds ; in captivity , it eats Agauria fruits .

= = Conservation status = =

As Monticolomys koopmani is now known to be a widespread , common species occurring in at least one protected area (Andringitra National Park ; it may also occur in Ankarana Special Reserve) , it is listed on the IUCN Red List as " Least Concern " . However , fires pose a threat in montane forest and , at lower elevations , its habitat is being converted into agricultural land .