= Miniopterus aelleni =

Miniopterus aelleni is a bat in the genus Miniopterus that occurs on Anjouan in the Comoros and in northern and western Madagascar .

It is a small brown bat ; its forearm length is 35 to 41 mm (1 @.@ 4 to 1 @.@ 6 in) . The long tragus (a projection in the outer ear) has a broad base and a blunt or rounded tip . The uropatagium (tail membrane) is sparsely haired . The palate is flat , and there are distinct diastemata (gaps) between the upper canines and premolars .

Populations of this species have historically been included in Miniopterus manavi , but evidence published in 2008 and 2009 indicates that M. manavi is a complex of five separate species , including the newly described M. aelleni . M. aelleni has been found in forests and caves in karstic areas . Its distribution overlaps that of M. griveaudi , also formerly included in M. manavi .

= = Taxonomy = =

In a 1995 contribution to Faune de Madagascar on Malagasy bats , Randolph Peterson and colleagues listed four species of Miniopterus on Madagascar and the nearby Comoros , including the small Miniopterus manavi with a broad distribution on both Madagascar and the Comoros . However , during the first decade of the 21st century , molecular studies have revealed that Miniopterus , a widespread genus in the Old World , is much more species @-@ rich than previously thought . A 2008 study comparing sequences of the mitochondrial cytochrome b and D @-@ loop markers found two distinct , unrelated groups within the supposed M. manavi from the Comoros ; both groups were also found on Madagascar . The next year , Steven Goodman and colleagues revisited the group with more extensive sampling on Madagascar . They separated three species within the former " M. manavi " : M. manavi itself in the Central Highlands , M. griveaudi (previously a subspecies of M. manavi) on Anjouan , Grande Comore , and northern and western Madagascar , and the newly described Miniopterus aelleni on Anjouan and northern and western Madagascar . The specific name aelleni honors Prof. Villy Aellen of the Natural History Museum of Geneva , who has done much research on African bats . Within M. aelleni , Goodman and colleagues found some differentiation (3 @.@ 4 % sequence divergence in cytochrome b sequences) between individuals from Montagne d 'Ambre in northern Madagascar and those from Anjouan and Ankarana , near Montagne d 'Ambre ; the cytochrome b divergence between M. aelleni and other Malagasy Miniopterus is 7 to 10 % .

Later in 2009 , Goodman and colleagues described two more species of M. manavi @-@ like Malagasy Miniopterus : M. brachytragos from northern Madagascar and M. mahafaliensis from the southwest . On the basis of cytochrome b sequences , they found that M. aelleni was most closely related to a clade of M. brachytragos , M. manavi , and another recently described Malagasy species , M. petersoni . The five recognized species of M. manavi @-@ like bats are not each other 's closest relatives , but apparently acquired their similarities through convergent evolution . At some places (for example , Namoroka) four cryptic species of M. manavi @-@ like bats , including M. aelleni , occur together .

= = Description = =

Miniopterus aelleni is a small , brown Miniopterus species . The head may be slightly lighter in color than the body . Some hairs on the underparts have buff tips . Miniopterus griveaudi is similar in color , but M. manavi is darker and M. brachytragos and M. mahafaliensis are lighter . The tragus (a projection on the inner side of the outer ear) is long and has a broad base with a crest at the side , and ends in a blunt to slightly rounded tip . In M. manavi and M. griveaudi , in contrast , the base is narrower , in M. mahafaliensis , the sides of the tragus are parallel , and M. brachytragus has a short , blunt tragus sparsely covered with hair . The wing membrane is also brown , but the uropatagium is lighter . The wing membrane and uropatagium are attached to the upper leg at the same level , above the ankle . The uropatagium is sparsely covered with thin , but clearly visible hairs . In

contrast , M. manavi , M. mahafaliensis , and M. brachytragos have densely covered uropatagia and that of M. griveaudi is almost naked . Individuals from Anjouan have significantly shorter hindfeet than those from Madagascar , but otherwise the two populations cannot be distinguished on the basis of external characteristics .

In the skull , the rostrum (front part) is short and line @-@ shaped , but longer than in other manavi @-@ like species . The central groove in the nasal depression is relatively narrow . The frontal bones are rounded and bear a well @-@ developed sagittal crest . Further back on the braincase , the lambdoid crest is also prominent . The middle part of the palate is flat , as in M. manavi but unlike in M. brachytragos , M. griveaudi , and M. mahafaliensis , which have a curved palate . At the palate 's back margin is a long , thin posterior palatal spine . Miniopterus aelleni has 36 teeth in the dental formula 2 @.@ 1 @.@ 2 @.@ 33 @.@ 1 @.@ 3 @.@ 3 (two incisors , one canine , two premolars , and three molars in both upper toothrows and three incisors , one canine , three premolars , and three molars in the lower toothrows) . As is characteristic of Miniopterus , the first upper premolar (P2 ; P1 and P3 are missing) is smaller and more simplified than the second (P4) . There are clear diastemata (gaps) between the upper canine (C1) and P2 and between P2 and P4 , which are weaker or absent in M. griveaudi and M. manavi . Behind C1 , the toothrows are about parallel , not divergent as in M. manavi . The third upper molar (M3) is more compressed than in M. manavi and M. griveaudi . In some measurements of the skull and teeth , Anjouan specimens are larger than those from Madagascar .

The animal has a karyotype of 46 chromosomes , with a total of 50 major arms on the autosomes (non @-@ sex chromosomes) . The karyotype is conserved among species of Miniopterus ; the number of chromosomes and arms is identical in M. aelleni , the Malagasy M. griveaudi and M. gleni , and even the Asian M. fuliginosus .

= = Distribution and ecology = =

Miniopterus aelleni is known to live from 4 to 225 m (13 to 738 ft) above sea level in northern and western Madagascar , at 1 @,@ 100 m (3 @,@ 600 ft) on Montagne d 'Ambre , northern Madagascar , and from 220 to 690 m (720 to 2 @,@ 260 ft) on Anjouan in the nearby Comoros . On Madagascar , it has been recorded in forest and caves in karst areas ; its distribution broadly overlaps that of M. griveaudi and the two have been found in the same roost sites on several occasions . On Anjouan , M. aelleni is less common than M. griveaudi ; there , it is known from four specimens only , all collected in 2006 . These come from two nearby sites : a rocky area near a river and a disturbed forest . These animals , collected in late November , were in reproductive condition , with two females pregnant and a third lactating . M. griveaudi were reproductively active at the same time , suggesting that the reproductive seasons of the two do not differ significantly . Although some ecological and behavioral data has been published on Miniopterus manavi , the recognition of several cryptic species within this group , more than one of which may occur in any given locality , renders the association of these data with any of the individual species uncertain ; however , species of Miniopterus generally feed on insects . Because M. aelleni is widespread and occurs in many protected areas on Madagascar , Goodman and colleagues inferred that its conservation status is secure .