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SHORTER CONTRIBUTIONS

FIRST REPORTED CASE OF WHOLE-BODY MELANISTIC WOODCHUCK (*MARMOTA MONAX* [L., 1758]) IN VIRGINIA

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ABSTRACT

As part of a conservation effort targeting Allegheny woodrats (*Neotoma magister*) in Roanoke County, Virginia, we deployed game cameras at a private cave in August and September 2024. Image analyses revealed a whole-body melanistic woodchuck (*Marmota monax*) using the cave throughout the entirety of the camera effort. We sought to determine whether this incidence of extreme melanism occurred elsewhere in Virginia. After examining museum specimens, reaching out to wildlife rehabilitation centers, and investigating research-grade images from iNaturalist, we concluded that this is the first documented full-body melanistic woodchuck in the state. Our work emphasizes the value of combining incidental data from field efforts, historical and contemporary live and preserved individuals, and research-grade iNaturalist images to examine woodchuck pelage patterns across the Commonwealth.

Keywords: Images, iNaturalist, pelage coloration.

BACKGROUND

As part of a pilot project focused on imperiled Allegheny woodrats (*Neotoma magister* Baird, 1857) in western Virginia, we deployed one game camera outside a cave on private lands adjacent to Dixie Caverns in Roanoke County. The Rebel Yelp Cave lies on a south-facing slope on the mountain (37.249636 °N, -80.176362 °W). We deployed the camera on 5 August 2024 and retrieved it on 21 September 2024.

CASE OF FULL-BODY MELANISM

An examination of the images revealed a female woodchuck (*Marmota monax* [L., 1758]) with melanism across its entire body except for standard wild-type pelage coloration on its face and ears. We observed this individual almost daily during the entirety of the camera deployment. Common behaviors included stretching, carrying vegetation, sitting alertly, and investigating the camera (Fig. 1).



Figure 1. Wildlife camera images of a female full-body melanistic woodchuck (*Marmota monax*) from Roanoke County, Virginia, August-September 2024. This individual utilized a privately owned cave entrance for the entirety of camera deployment.

During this time, we also detected a larger female with standard pelage coloration at this location, though much less frequently (Fig. 2). We viewed brief interactions between the melanistic individual and Virginia opossums (*Didelphis virginiana* Kerr, 1792), raccoons (*Procyon lotor* L., 1758), and shared habitat with the other female woodchuck (though timing of images suggests the two did not directly interact on camera). Potential predators (Fig. 3) investigated the narrow, steep, muddy cave entrance when the melanistic woodchuck was presumably inside (based on the chronology of images), but no direct interactions were noted. Predators included coyotes (*Canis latrans* Say, 1823), gray foxes (*Urocyon cinereoargenteus* [Schreber, 1775]), and American black bears (*Ursus americanus* Pallas, 1780).

To get a sense of how unusual this pattern of melanism is in Virginia woodchuck populations, we examined pelage coloration in photos of woodchucks available on the iNaturalist website. Across 2947 photos (N=1723 unique photo events recorded between 17 June 2000 and 25 November 2024), no other woodchucks possessed this extreme melanistic color pattern. Although some individuals on iNaturalist possessed other seemingly common variations of

melanism including a darker head, dark front limbs and paws, and dark tail, none were as completely pigmented as our whole-body individual.



Figure 2. Comparison of a female full-body melanistic woodchuck (*Marmota monax*; top row) to a female wild-type pelage woodchuck (bottom row) that both made use of a privately owned cave in Roanoke County, Virginia, August-September 2024.

We also examined pelage coloration in woodchuck specimens from Virginia housed in the Mammal Collection of the Virginia Museum of Natural History. None of the 11 specimens were melanistic (L. Hightower, personal communication), nor were any of the 13 specimens in the Radford University natural history collection. Previous research, reaching out to multiple universities in Virginia regarding mammalian museum specimens, yielded so little return on investment that we opted not to pursue collections further (Powers et al., 2024). Finally, we reached out to the three largest wildlife rehabilitation centers in Virginia - The Wildlife Center of Virginia, Waynesboro (C. Pierce, personal communication), the Blue Ridge Wildlife Center, Boyce (K. Smith, personal communication) and the Southwest Virginia Wildlife Center of Roanoke, Roanoke (S. Garvin, personal communication). Although two of the three centers noted albinistic woodchucks from Virginia as past patients, none have ever received full-body melanistic individuals.



Figure 3. Potential predators active at the same location as a melanistic woodchuck (*Marmota monax*), at a privately owned cave in Roanoke County, Virginia, August-September 2024. Potential predators included: (A) coyote (*Canis latrans*), (B) juvenile American black bear (*Ursus americanus*), (C) gray fox (*Urocyon cinereoargenteus*), and (D) subadult/adult American black bear.

Incidences of extreme variations in pelage color have been documented in eight species within the genus *Marmota* and can vary greatly in the wild including albino, leucistic, blue, and melanistic individuals (Armitage, 2009). In *M. monax*, all color morphs except blue have been reported in the literature, and melanism frequencies in some populations have been as high as 16.1% (Armitage, 2009). Melanism has been suggested to be so common that this color morph could be considered a normal pelage variant (Grosvenor, 1960; Armitage, 2009).

Of the many factors that can contribute to pelage color variation in *Marmota*, a primary cause is different levels of pigment deposition during hair growth, which result in a spectrum of pelage colors, from albino to standard wild-type to full-body melanistic; Candille et al., 2007; Armitage, 2009). Although the mechanism of pigment variation is not fully understood, Mills (2024) found that melanism in hoary marmots (*M. caligata* [Eschscholtz, 1829]) was associated with the melanocortin-1-receptor (*MC1R*). A gene mutation at *MC1R* alters pigment deposition and can result in reduced banding in individual hairs. This mutation reduces the frequency of the standard wild-type phenotype in some populations of hoary marmots (Mills, 2024).

Factors responsible for the frequency of different color morphs in most wild populations are still relatively unknown in the literature, but some studies have suggested that high frequencies of melanism in some species could increase concealment from visual predators in certain habitats (e.g., camouflage, Mills, 2024). Additionally, thermoregulation is an important factor in pelage colors, as it affects the rate of heat absorption; this flexibility in color morphs may prove useful in light of changing climate conditions. Armitage (2009) suggested that geographic location plays a role in pelage coloration in *Marmota*, as heat transfer requirements vary across latitudinal and altitudinal gradients.

CONCLUSION

To our knowledge, our find appears to be the first reported case of full-body melanism in woodchucks in Virginia. Although partial melanism may occur in low frequencies in woodchuck populations across the Commonwealth, no published accounts of whole-body melanism appear in journal articles or image databases with research-grade confidence. Despite attempts to continue tracking this melanistic woodchuck from 4 November until 14 December 2024, wildlife cameras did not detect this female or any other woodchucks. It's unclear if a predation event occurred (Fig. 3), if the woodchuck began hibernating prior to November camera deployment, or if she selected a location outside of the camera's visibility to continue activity. We will revisit this location in late spring 2025 to try and answer this question.

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