Short Note

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First record of a giant muntjac *Muntiacus vuquangensis* (Cervidae) from Cambodia

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Abstract: The giant muntjac *Muntiacus vuquangensis* is a Critically Endangered ungulate that was first described by science in the early 1990s. The species’ current known distribution extends along the Annamite Mountains in Laos and Vietnam. Here, we report the first confirmed record of the giant muntjac in Cambodia. We recorded a camera-trap photograph of a male giant muntjac in Virachey National Park in northeastern Cambodia. Our record likely represents an isolated population near the western edge of the species’ distribution, about 300 km from the closest confirmed populations.

Keywords: Annamites; Cambodia; giant muntjac; *Muntiacus vuquangensis*; Virachey National Park.

The extant giant muntjac *Muntiacus vuquangensis* was first described in 1994 based on partial skulls and antlers collected around Vu Quang Reserve, Vietnam (Tuoc et al. 1994). About the same time it was also described in Laos based on numerous antlers and even a captive individual (Evans and Timmins 1995; Schaller and Vrba 1996). When Tuoc et al. (1994) first described this species, they named it *Megamuntiacus vuquangensis*. They justified the designation of a new genus of muntjac based on its unusually large and morphologically distinct antlers, along with differences in mtDNA between the giant muntjac and other muntjac species (Schaller and Vrba 1996; Tuoc et al. 1994). It was subsequently grouped with other muntjac under *Muntiacus* by McKenna and Bell (1997), and this grouping was later confirmed by more detailed analysis of the mtDNA variation among all the muntjac species (Amato et al. 2000). Four years prior to the description of the extant new species, Wei et al. (1990) described a novel large muntjac species based on subfossil antlers from a Chinese Neolithic site in the Yangtze delta dated from 6000 to 7000 years ago, and named it *Muntiacus gigas*. Turvey et al. (2016) compared these remains, along with other subfossil remains of *M. gigas* from eastern China, and concluded they did not differ from extant *M. vuquangensis*, and therefore the latter should be classified as *M. gigas* because it was described first. However, we follow the IUCN (Timmins et al. 2016) and Mattioli (2020) who retained *M. vuquangensis*.

Extant populations of giant muntjac have been confirmed only along the main north-south range of the Annamites in both Laos and Vietnam, in evergreen and semi-evergreen forests (Timmins et al. 2016). In Cambodia, the giant muntjac is known only from trophy antlers seen in villages and markets during the 1990s in Mondulkiri Province, eastern Cambodia (Timmins et al. 2016). However, camera trap surveys in presumably favorable habitat of that area during the early 2000s failed to detect the species (Timmins et al. 2016). Thus, there is slight doubt over the origin of these trophy antlers, because their occurrence there could have been the result of heavy trade with Vietnam, although it is also possible that giant muntjac might have already been hunted out of Mondulkiri Province by the early 2000s (Timmins et al. 2016). The most recent IUCN map for giant muntjac includes parts of Mondulkiri Province as well as extreme northeastern Cambodia, although these areas represent potential range based on suitable habitat (Timmins et al. 2016).

Recent records suggest the range of the giant muntjac has declined since the 1990s due to over-hunting and
habitat loss, and current populations only occur in small, fragmented, and declining populations (Timmins et al. 2016). Consequently, the species was recently uplisted to Critically Endangered by the IUCN (Timmins et al. 2016). During the last decade there have been only a few sites where the presence of giant muntjac was confirmed with camera-trap photographs, including central Laos (Saola Working Group 2017), central Vietnam (Leibniz Institute for Zoo and Wildlife Research 2018; Timmins et al. 2016; Viet Nature Conservation Centre 2016) and southern Vietnam (A. Tilker, Leibniz Institute for Zoo and Wildlife Research, unpublished data; Figure 3).

We report the first confirmed record of the giant muntjac from Cambodia. From 6 March to 30 May 2021 we conducted a systematic camera-trap survey in Virachey National Park (VNP; 3381 km²) in northeastern Cambodia which covers a western extension of the Annamites (Figure 1). We used a mix of camera models that included Cuddeback Model G-5024, Panthera V6, and the Victure HC200 Trail Camera. We established a grid with 50 camera stations, with paired cameras set at each station, covering an area of approximately 160 km². Stations were unbaited and spaced approximately 2 km apart within the grid along trails and ridgelines. The target species was mainland clouded leopard Neofelis nebulosa; therefore, camera traps were set to trigger at the height of about 40 cm above the middle of the trail. Habitat included a mix of evergreen and semi-evergreen forests, along with a few patches of grassy uplands, with elevation of camera stations ranging from 263 to 950 m (mean = 483 m). Total sampling effort included 5937 trap days from 46 stations (cameras from four stations were stolen).

On 11 April 2021 at 11:38 am we recorded one independent event of a male giant muntjac from one station at an elevation of 835 m (Figure 2). This event included a total

![Figure 2](image2.jpg)
of eight photographs of the front and rear of the individual. This station was placed on a game trail at a natural salt lick within evergreen forest, and was located 1.7 km from the border with Laos. The elevation and habitat of our record is consistent with previous confirmed records for the species in other areas of its distribution (Timmins et al. 2016). In contrast to the single record of the giant muntjac, we recorded 168 independent photographs from 33 stations (72% naïve occupancy) of the northern red muntjac (*Muntiacus vaginalis*). We distinguished the giant muntjac from the northern red muntjac using characters listed in previous papers (Schaller and Vrba 1996; Timmins et al. 1998), including the giant muntjac having shorter and thicker pedicels, longer and thicker antlers (including longer and thicker brow tines), and a shorter and more triangular tail compared to the northern red muntjac.

The VNP comprises a western extension of the Annamite Mountains (Figure 3), and this area was previously assumed to be suitable habitat for giant muntjac (Timmins et al. 2016). Our record is about 300 km from other currently known populations in the main range of the Annamites, suggesting it represents an isolated population at the western edge of its distribution (Figure 3). Nevertheless, only a single photographic event was obtained during our survey, suggesting that giant muntjacs are rare in VNP. Indeed, previous camera surveys in VNP from 2014 to 2020 failed to detect this species in 36 camera stations over 12,500 trap days (McCann et al. 2020). The rarity of giant muntjac in VNP is especially evident when compared to the high number of photographs and high occupancy of the northern red muntjac that we recorded.

Reasons for the rarity of giant muntjac in VNP are likely the same that contribute to its rarity in other parts of its distribution. Although hunters may not be specifically targeting this species, it is victim to the thriving hunting and wildlife trading culture in all range states (Timmins et al. 2016). A snaring crisis is occurring throughout Laos, Vietnam, and Cambodia, which is decimating populations of numerous wildlife species (Gray et al. 2018). Snare densities are particularly high in Vietnam (Amato et al. 2000; Evans and Timmins 1995; Gray et al. 2018; Ibbett et al. 2020; Leibniz Institute for Zoo and Wildlife Research 2018, Mattioli 2020; McCann et al. 2020; McKenna and Bell 1997; Rostro-Garcia et al. 2018; Saola Working Group 2017; Schaller and Vrba 1996; Steinmetz et al. 2014; Timmins et al. 1998, 2016; Tuoc et al. 1994; Turvey et al. 2016; Viet Nature Conservation Centre 2016; Wei et al. 1990), and in adjacent areas (Timmins et al. 2016), which is causing drastic declines in large mammals in places such as eastern Cambodia (Rostro-Garcia et al. 2018); thus, snaring might be impacting wildlife in VNP as well. Compared to northern red muntjac, giant muntjac appears to be more sensitive to hunting, possibly due to physiological aspects such as its larger body size and presumably lower fecundity (Timmins et al. 2016). Because giant muntjac primarily uses lower elevation compared to northern red muntjac, it might be more susceptible to human impacts (Timmins et al. 2016), although differences in human impacts between higher and lower elevations in VNP are unknown.

Given that the giant muntjac is Critically Endangered and known extant populations appear to be small and declining (Timmins et al. 2016), any new population is of conservation value. Therefore, our discovery should be followed up with conservation action by the Cambodian government. Our survey also documented several other species in VNP that are classified as Threatened by the IUCN, including dhole *Cuon alpinus*, mainland clouded leopard, Asian black bear *Ursus thibetanus*, sun bear *Helarctos malayanus*, Asian elephant *Elephas maximus*, sambar *Rusa unicolor*, gaur *Bos gaurus*, Sumatran serow *Capricornis sumatraensis*, Sunda pangolin *Manis javanica*, red-shanked douc *Pygathrix nemaeus*, northern pig-tailed macaque *Macaca leonina*, and stump-tailed macaque *M. arctoides*. Therefore, increasing protection efforts in
VNP will not only help save the only known population of giant muntjac in the country, but also important populations of several other threatened species as well. The highest priority would be to reduce snaring and other forms of poaching in VNP, which is easily said but extremely difficult to carry out. It will likely need to involve increasing law enforcement efforts (e.g., number of rangers, km patrolled), including the establishment of ranger teams specialized in finding and removing snares (Ibbett et al. 2020). Importantly, outreach and engagement with local communities also will be necessary to reduce snaring and other forms of poaching within VNP (Steinmetz et al. 2014).

We camera-trapped in an area that covered only 5% of VNP. Therefore, we also recommend additional camera surveys in VNP so that more areas of the park can be covered. Additional surveys in VNP will allow for a more complete understanding of the occurrence and distribution of giant muntjac in northeastern Cambodia, which ultimately could lead to better efforts to conserve this population. Because our record was so close to the Laotian border, there probably is a transboundary population of giant muntjac in the area encompassing Cambodia, Laos, and possibly Vietnam. We recommend systematic camera surveys in the protected areas adjacent to VNP in both Laos (Nam Ghong Provincial Protected Area) and Vietnam (Chu Mom Ray National Park). If this species is found in adjacent protected areas, then hopefully a transboundary collaboration could be made to protect better this remote area for giant muntjac and other threatened species.

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**References**


