



Records of Greater Hog Badger *Arctonyx collaris* from northern Vietnam and a discussion of its status in the country

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Abstract

The Greater Hog Badger *Arctonyx collaris* is found in a wide range of habitats across South-east Asia. The species is categorised as globally Vulnerable on account of its declining populations, resulting from various threats, such as hunting with dogs and snare-trapping. The species is mapped as Possibly Extinct in Vietnam in the IUCN Red List of Threatened Species, though the text account states that the species was considered extant in the country at the time of its assessment in 2015. Camera-trap surveys for ground-dwelling vertebrates in Cuc Phuong National Park and Pu Mat National Park have confirmed the presence of the species. These findings suggest that the species may persist in other protected areas in Vietnam, though probably at low population densities given the known and ongoing threats to the species in the country.

Keywords: camera-trap, Pu Mat National Park, Cuc Phuong National Park, Mustelidae

Introduction

The Greater Hog Badger *Arctonyx collaris* is a member of the family Mustelidae. Its range spans from north-eastern India to Myanmar, Lao PDR, Vietnam and Cambodia, and to peninsular Thailand, north of the Isthmus of Kra (Than Zaw et al. 2008, Gray et al. 2014a, Gray et al. 2014b, Duckworth et al. 2016, Akash et al. 2022). The species can be found in a variety of habitats, from montane forest to non-forested lowlands, including grassland-dominated floodplains; in South-east Asia, most records are from forested areas (Duckworth et al. 2016). As a result of taxonomic revisions within the genus *Arctonyx* (Helgen et al. 2008), most of the genus's historical records outside mainland South-east Asia are assigned to other species or are considered provisional. In north-east India, for example, most cranial records traced by Helgen et al. (2008) consist of Northern Hog Badger *Arctonyx albogularis* and Greater Hog Badger records, while almost all records in China are of Northern Hog Badger.

Little is known about Greater Hog Badger populations, though it is considered globally Vulnerable (VU) by the IUCN Red List of Threatened Species because of its decline, resulting from threats including, but not limited to, snare-trapping, hunting with dogs and opportunistic clubbing throughout its range. Although the text of the Red List assessment makes it clear that the species was considered extant in Vietnam, its distribution was mapped as Possibly Extinct in the country (Duckworth et al. 2016). The rigid protocol for Red List mapping requires the form of the map shown, as there is no shading class for more nuanced categorisations such as “widely extirpated within this

large area” or “surviving in only small remnants” (Will Duckworth, in lit. 2023).

Regionally, detection rates of Greater Hog Badger vary greatly between countries. In parts of Thailand and Cambodia, and in Nakai-Nam Theun National Park (NP) in Lao PDR, it is among the most commonly detected mammals (Chutipong et al. 2014, Coudrat et al. 2014, McCann et al. 2017, Association Anoulak 2020, Pla-ard et al. 2021). In Vietnam, however, the last verifiable record of a Greater Hog Badger in the wild was in 2004, in Pu Luong Nature Reserve, Thanh Hoa province (Do 2004; supplementary material and table 3 in Willcox et al. 2014). Since then, no other records have been published from Vietnam despite surveys in suitable habitats. However, recent camera-trapping results in Vietnam have shed a new light on the possible national status of Greater Hog Badger and we report some recent records herein.

Recent records in Vietnam

Greater Hog Badger captive records are scarce. The only known captive record of the species was on 10 May 2021, when the Carnivore and Pangolin Conservation Program in Cuc Phuong NP received one adult Greater Hog Badger (of unknown provenance) from Hoa Binh Province Forest Protection Department, which was confiscated from a local hunter. The animal died shortly after rescue because of a severe snaring injury. It is therefore unlikely that any of the hog badgers detected in the camera-traps, as described below, are released individuals. No instances of any other Hog Badger species were recorded.

Greater Hog Badger was recorded in Cuc Phuong NP and Pu Mat NP during camera-trapping surveys aimed at assessing the status of ground-dwelling

mammals and birds (Fig. 1, Table 1). In Pu Mat NP, from 2018 to 2020, a total of 15 camera-trap records, spaced in 60-minute intervals to prevent multi-counts (detections, hereafter), of Greater Hog

Badger were recorded, across four different surveys and using a variety of methods (Table 1). The camera-trapping session with the most detections was a fine-grid set-up in the Khe Choang area in 2018

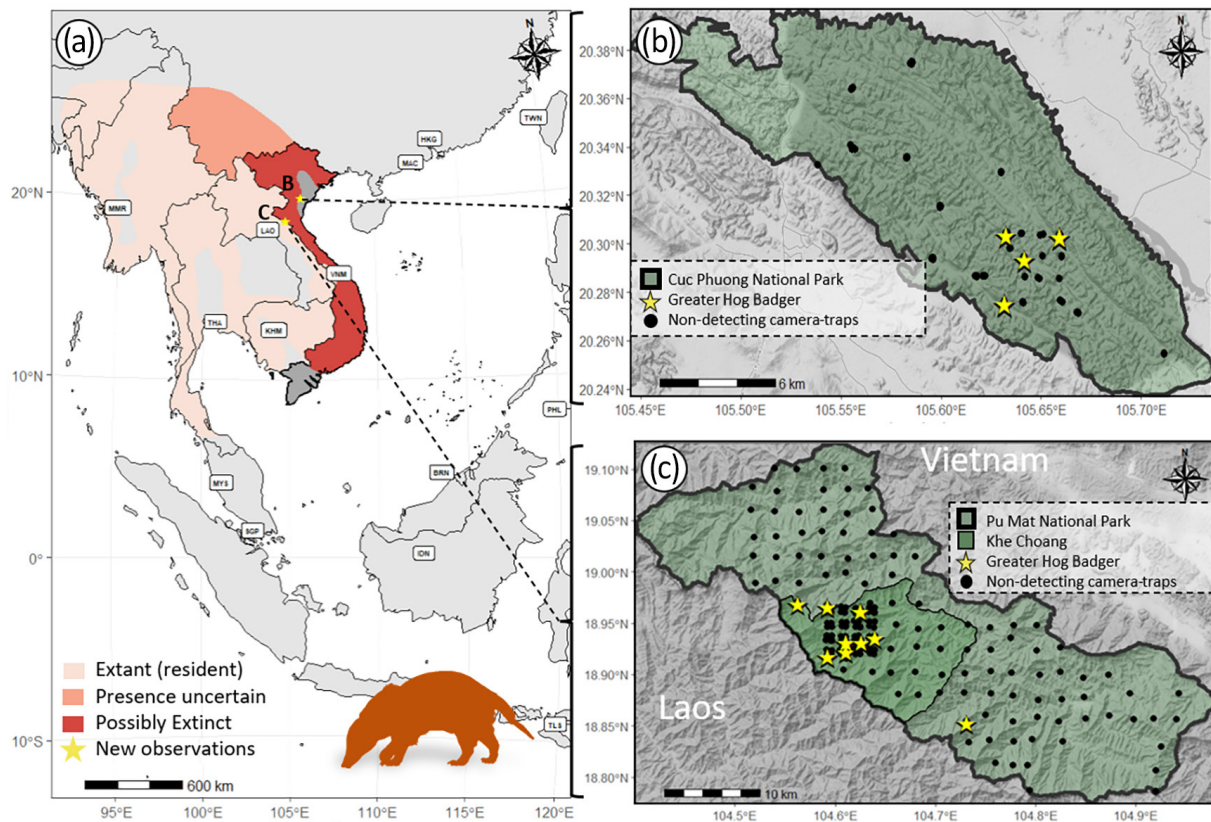


Fig. 1. (a) Greater Hog Badger *Arctonyx collaris* IUCN Red List distribution (Duckworth et al. 2016) in Asia with the location in Vietnam of the (b) 15 Pu Mat National Park (NP) camera-trap records from 2018-2020 and (c) nine Cuc Phuong NP camera-trap record locations from 2022. The species was considered to be widely extirpated in the Vietnam portion of its range map as of its 2016 assessment, for which the closest available map code is Possibly Extinct.

Table 1. Greater Hog Badger *Arctonyx collaris* records in Vietnam from Save Vietnam's Wildlife (SVW) and Leibniz Institute for Zoo and Wildlife Research (IZW) camera-trap surveys, and the Carnivore and Pangolin Conservation Program (CPCP) rescue centre in Cuc Phuong National Park (NP).

Location	Method	Date range of session (Y-M-D)	No. of camera traps	Trap nights	Records ^a	No. of stations with a record	Source/reference
Cuc Phuong NP	Systematic (fine grid)	2021-10-19 to 2022-01-05	28	1564	9	4	SVW
Khe Choang core area – Pu Mat NP (2018)	Systematic (fine grid)	2018-04-19 to 2018-07-11	128	8910	9	5	IZW/SVW
Khe Choang core area – Pu Mat NP (2021)	Systematic (fine grid)	2021-05-08 to 2021-08-30	128	13234	2	2	SVW
Pu Mat NP	Systematic (coarse grid)	2018-08-08 to 2019-03-24	220	16288	3	3	IZW/SVW
Pu Mat NP	Targeted (Owston's Civet <i>Chrotogale owstoni</i>)	2019-05-08 to 2019-11-15	21	3902	1	1	SVW
CPCP Rescue Centre	Rescued individual	2021-05-10	NA	NA	1	NA	SVW

^a Notionally independent detections, separated by a minimum of 60 minutes.

(nine records). All Greater Hog Badger detections in Pu Mat NP, except one, occurred in the Khe Choang area despite a coarse-grid camera-trapping set-up providing full coverage of the protected area. In Cuc Phuong NP, in late 2021, two camera-trap survey designs ran concurrently: one fine-grid (1.5×1.5 km) set-up and one stratified set-up in which stations were located across different types of habitats. All nine Greater Hog Badger records were detected in the fine-grid set-up, which was in a relatively mountainous and hard-to-access area. However, this result could be due to the quantity of camera-trap stations in a small location compared to the stratified set-up. The two methods were carried out with relatively similar effort in camera-trap-nights: 1858 nights in the fine-grid set-up and 2067 in the stratified set-up.

In Cuc Phuong NP, Greater Hog Badger was detected in limestone evergreen forest habitat at an altitude range of 230 m to 340 m asl, with the average being 290 m (camera-traps were set between 123 and 411 m, average 256 m). In Pu Mat NP, the species was detected in evergreen forest habitat between 610 m and 1110 m, averaging to 850 m (camera-traps

were set between 220 and 1763 m, average 780 m; Fig. 2). These records are in line with current literature on the species, where it has been recorded from the extreme lowlands to 2300 m asl (Duckworth et al. 2016). The records from Pu Mat NP mark the highest known altitudes at which the species has been detected in Vietnam, which previously stood at 950 m asl (Robertson 2007).

The activity periods reflected in the camera-trap records showed a difference between Pu Mat NP and Cuc Phuong NP. Greater Hog Badger was detected more often during the morning and afternoon in Pu Mat (mean 14h19; range 10h03 – 17h41) and during the evening and night in Cuc Phuong (mean 00h41; range 03h44 – 20h45).

Discussion and recommendations

Greater Hog Badger records in Pu Mat NP are concentrated in and around the Khe Choang area. In 2017, Khe Choang was chosen as a priority area for Save Vietnam's Wildlife (SVW) following discussions with Pu Mat NP about which area within the park was relatively safe for Sunda Pangolin *Manis*

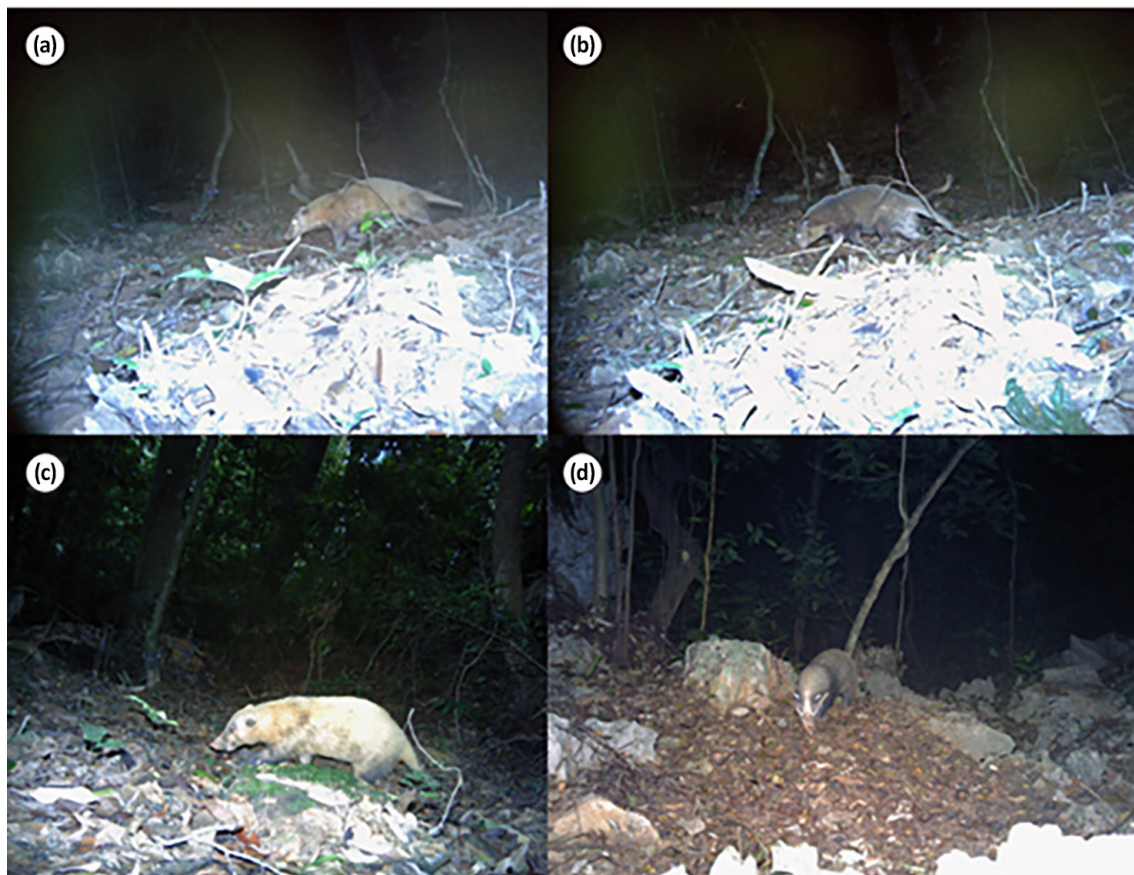


Fig. 2. Camera-trap images of Greater Hog Badgers *Arctonyx collaris* in (a-c) evergreen forest habitat in Pu Mat National Park (NP) and (d) limestone karst habitat in Cuc Phuong NP, Vietnam. (a) Khe Choang area (Pu Mat NP), 697 m asl, 11 June 2018; (b) Khe Choang area (Pu Mat NP), 697 m asl, 8 May 2018; (c) Khe Choang area (Pu Mat NP), 697 m asl, 10 May 2018; (d) Cuc Phuong NP, 277 m asl, 16 November 2021. Images (a) and (b) suggest variations in fur colouration among individuals even during the same season and in the same location.



javanica releases. To help secure the area, there has been increased patrolling effort in the area by the Forest Protection Department government rangers of Pu Mat NP and the anti-poaching team operated by SVW. These efforts have resulted in a marked decline in illegal hunting detections and a possible avoidance of the area by hunters during the last five years (2018–2023).

It is worth noting that in Pu Mat NP we have reproduced our fine-grid camera-trap surveys in other locations besides Khe Choang and have not detected any Greater Hog Badgers. In adjacent areas like Co Phat, we suspect that the lack of hog badger detections is due to the local communities that still reside within the protected area boundaries and still commonly use forest resources: illegal hunting detections are some of the highest in Co Phat. In Cuc Phuong NP, all detections of Greater Hog Badger were in the least accessible areas of the park, presumably because hunters might be discouraged by the logistically challenging vegetation and terrain. Additionally, Greater Hog Badger's known natural predators are Tiger *Panthera tigris* and Leopard *Panthera pardus*, both of which have been extirpated from Vietnam (Stein et al. 2020, Goodrich et al. 2022). Lack of non-human predators may contribute to the species's persistence amidst a worsening 'snaring crisis' in the country. However, the scarcity in the number of national records in recent years compared to other range nations, particularly Thailand, Lao PDR and Cambodia, is an indication that deforestation, agricultural sprawl and heavy hunting pressures have had impacts on the species's populations in Vietnam (Gray et al. 2014a, Gray et al. 2014b, Duckworth et al. 2016). Its persistence in Cuc Phuong NP is unexpected given the history of unclear park boundaries and hunting by relocated Muong ethnic people who continue to depend on forest resources for both subsistence and commerce and who engage in indiscriminate hunting within the protected area (Suntikul et al. 2010); the status of ground-dwelling mammals in the park is poor. Whether the differences in activity periods suggested by the camera-trap records in the two national parks are indicative of behavioural changes to avoid active hunting pressures in Cuc Phuong, or whether the differences are due to other biotic and/or abiotic factors, is uncertain.

The camera-trap records detailed in this paper confirm the persistence of the Greater Hog Badger in two national parks in Vietnam. We recommend that the species's status on the IUCN Red List distribution map is updated and that documentation of the species's detection throughout its range (especially for Vietnam) continue to be published or otherwise made accessible to researchers and the general public.

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