

HOG DEER (*AXIS PORCINUS*) CONFIRMED IN THE WILD IN EASTERN CAMBODIA

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ABSTRACT

A small, localised population of Hog Deer *Axis porcinus* surviving in the wild has been confirmed through a reconnaissance camera-trapping survey during January–March, 2006, in Kratie Province, Cambodia. The deer are associated with a relatively small area of tall, floodplain grassland in a mosaic with other vegetation types, close to the Mekong River. Both the deer and their habitat are highly threatened regionally, yet both have received very little conservation attention. This oversight appears to extend globally to the species, which is in clear need of re-evaluation as a conservation priority.

Key words: *Axis porcinus*, Cambodia, camera-trapping, conservation status, Hog Deer, riverine grasslands

INTRODUCTION

Hog Deer *Axis porcinus* (Khmer *kdan*), once ranged throughout large areas of northern parts of the Indian Subcontinent especially along the valleys of the great rivers, and probably much of lowland mainland Southeast Asia (SCHALLER, 1967; PRATER, 1971; CORBET & HILL, 1992). The species has usually been reported from habitat consisting of wet or moist tall grasslands, often associated with medium-to-large rivers (BISWAS & MATHUR, 2000; DHUNGEL & O'GARA, 1991).

The subspecific taxonomy of Hog Deer has not been comprehensively reviewed (C. Groves, pers. comm., 2006), and characters for distinguishing subspecies have not yet been validated. The IUCN Red List (IUCN, 2006) does not list the species as such, but includes *A. p. porcinus* as LR/nt (low risk/near threatened), giving its range countries as extending from Pakistan east to China and south to Cambodia and Vietnam. The IUCN Red List also includes another subspecies, *A. p. annamiticus*, with range countries cited as Cambodia, China, Laos, Vietnam and Thailand, i.e., overlapping with *A. p. porcinus* (DSG, 1996). *A. p. annamiticus* is listed by IUCN as data deficient (DD), and is listed in CITES Appendix I. However, considering the cited inexplicable overlap of subspecies ranges, coupled with listings that seem to misrepresent the species' perilous status (see below), a careful review

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of the taxonomy and conservation status of *Axis porcinus* is needed to accurately inform international listings and conservation efforts.

Throughout its range Hog Deer is seriously depleted in both numbers and occupancy of historical range, but localised populations still occur, some at high density, across a relatively large area of northern India and parts of Nepal (BISWAS & MATHUR, 2000). It is of uncertain but greatly reduced occurrence in Pakistan and Myanmar (BISWAS & MATHUR, 2000), and believed extinct in Bangladesh (SEIDENSTICKER & HAI, 1983). The only Southeast Asian country in which multiple wild populations might persist is Myanmar, where there are several managed herds, but the present status of wild populations is not clear. Most large mammal surveys during the last decade (e.g. MCSHEA *ET AL.*, 1999; LYNAM, 2003), have targetted Tiger *Panthera tigris* and Eld's Deer *Cervus eldii*, probably missing suitable Hog Deer habitat. Unpublished information provided to JWD by various conservationists who have visited grasslands suggests that several populations persist at least in low numbers, but no healthy numbers were reported.

In Thailand, the Office of Environmental Policy and Planning (OEPP, 1997) lists the species as Endangered, reflecting the existence of a few re-introduced, wild-living populations, most notably in Phu Khieo Wildlife Sanctuary. Other sources consider that Hog Deer is extinct as a wild animal in Thailand (HUMPHREY & BAIN, 1990; J. Parr, pers. comm., 2006).

There are no recent records from Laos (DUCKWORTH *ET AL.*, 1999) and it is highly likely to be extinct in the country due to a paucity of surviving suitable habitat (RJT & JWD, own data). Additionally, intense and sustained hunting pressure over the past few decades has drastically reduced large mammal populations, especially in more accessible lowland areas containing what little prime Hog Deer habitat might remain (DUCKWORTH *ET AL.*, 2005; NOOREN & CLARIDGE, 2001; DUCKWORTH & HEDGES, 1998).

There are no confirmed recent records from Vietnam, where the extent of agricultural conversion of lowland plains compares to that in Thailand. Recent reports of Hog Deer occurring at one site in the central part of the country have not been confirmed (TORDOFF *ET AL.*, 2003).

At least two Hog Deer individuals were acquired during the 1990s by the Cambodian national zoo at Phnom Tamao (C. Poole, pers. comm., 1999). The zoo's collection consisted almost entirely of animals confiscated from wildlife trade within country, so a wild Cambodian origin for these Hog Deer is very likely, but not confirmed.

Since post-conflict wildlife conservation efforts have increased in Cambodia, beginning in about 1995, attention has focused on large mammals and waterbirds that depend on the extensive mosaic of open deciduous forests and grasslands covering much of northern and eastern Cambodia. Recent surveys have confirmed globally significant populations of several threatened species that have been extirpated or are now rare in surrounding countries, e.g., Eld's Deer *Cervus eldii* (TORDOFF *ET AL.*, 2005), Banteng *Bos javanicus* (TIMMINS & OU, 2001; MEN, 2002) and Jungle Cat *Felis chaus* (DUCKWORTH *ET AL.*, 2005). However, despite extensive surveys in what was thought to be suitable habitat, the continued occurrence of Hog Deer in the wild, in Cambodia, has not been confirmed until now. In the interim since the appearance of the zoo animals, and considering that most suitable floodplain grasslands had already been converted to agriculture or lay close to significant human population centres, it was recently suggested that the species could already be extinct, or would not be found before its extinction (TORDOFF *ET AL.*, 2005).

Here we present the results of reconnaissance camera trapping surveys conducted during January–March, 2006, which confirm the occurrence of a population of Hog Deer *Axis porcinus* in eastern Cambodia.

METHODS

As part of a provincial awareness-raising and wildlife monitoring project supported by WWF, technical staff of the Cambodian Forestry Administration (FA) were provided lists and photos of species considered as priorities for conservation, primarily for the global significance of their populations within the Lower Mekong Dry Forests Ecoregion (TORDOFF *ET AL.*, 2005), which includes much of Kratie, Mondulkiri, and Stung Treng provinces in Cambodia. Counterpart representatives from local communities were selected and trained by the project to use these lists as reference material in awareness-raising and information gathering activities across the deciduous forest landscapes of eastern Cambodia.

In December, 2005, the provincial and community counterparts received informal reports of *kdan* in an area near Kratie provincial town. These reports were followed by semi-structured interviews with hunters and elders in the source villages, including visual inspection of several sets of antlers reputed to be from local Hog Deer. Given good indications of the probable presence of Hog Deer in the vicinity, a reconnaissance camera trap survey was undertaken to confirm the local reports.

The survey area is situated on the west bank of the Mekong River, 8 km north of Kratie provincial town, approximately centered on 12° 38' 12" N, 105° 58' 36" E (see map, Fig. 1). Hog Deer were reported to use the zone of seasonally flooded grassland habitat that occurs between the settlement zone along the river and a slightly higher zone of primarily deciduous forest to the west.

On 23 January 2006, three CamTrakker camera traps (passive infra-red sensor) were set in suitable locations in the grassland identified by villagers as the main habitat for the Hog Deer. Trap sites were chosen to maximize opportunities of detecting Hog Deer, while also minimizing the risk of cameras being damaged or taken by people, based on the advice of selected local hunters. Cameras were set at a height of approximately 40 cm above the ground, and in locations that were clear of any non-ground layer vegetation for 8–10 m in front of the camera. Traps were located in a roughly linear pattern, approximately 350 m apart. Although local informants indicated more sites where Hog Deer occurred, the reconnaissance team felt that many sites risked loss or damage to the cameras. The film was removed from the three cameras on 9 February. Film was replenished on-site in two of the cameras, and the third camera trap was reset with new film in a different location, within 200 m. The second camera trapping period began on 9 February and film was collected on 16 March, 2006.

RESULTS

In the first survey, 23 January – 9 February, the three cameras were in place for 17 nights each, with no apparent malfunctioning or exhaustion of the film (see Table 1 for summary). Ten photos showing Hog Deer were obtained over the combined 51 trap-nights.

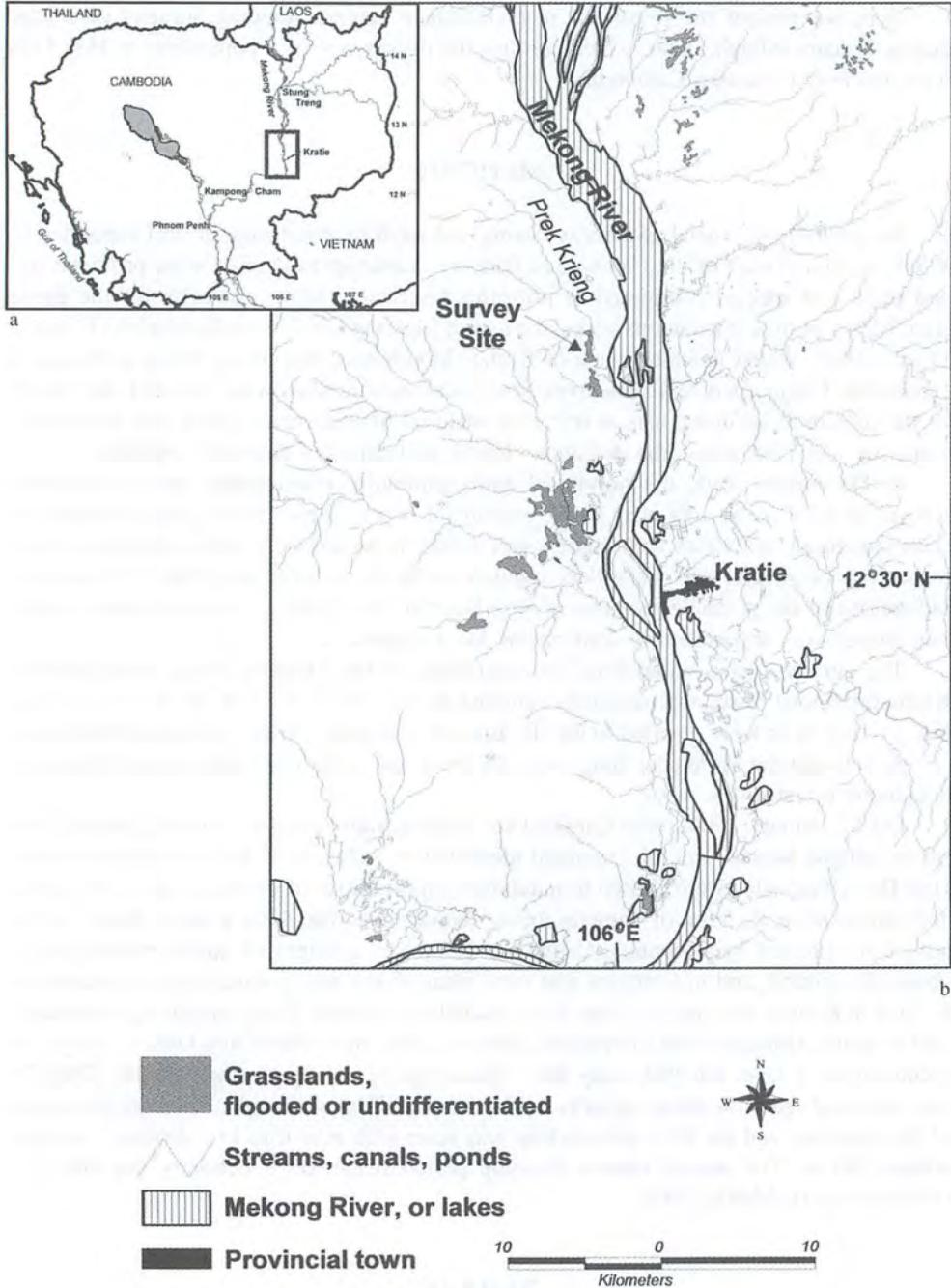


Figure 1. Locator maps of Hog Deer reconnaissance area in eastern Cambodia: a, Cambodia with the Mekong River and major tributaries, and survey area in outline box; b, situation of survey site, showing patchy distribution of grassland habitat along the Mekong River. Flooded grassland and Undifferentiated grassland categories follow imagery interpretation by JICA-Cambodia (2004).

In the second survey, 9 February – 16 March, the same three cameras were in place for 35 nights each with no apparent malfunctioning, and the film in only one camera was exhausted (unclear by what date). Eighteen photos showing Hog Deer were obtained. The date imprint function did not work on two of the cameras, so the exact date of each exposure is unknown for most of the Hog Deer photos.

Identification of *A. porcinus* from the photographs (Figs. 2–5) is based on general body shape and size, pelage color, and the morphology of the antlers in males. All the presumed adult individuals in the photographs appear significantly smaller and shorter-legged than adult Sambar *Cervus unicolor*, and closer in size to, though slightly larger than, adult Red Muntjac *Muntiacus muntjak*. Sizes of Hog Deer and their features were estimated by comparison of the deer with other objects in the photographs, including comparison with photographed Red Muntjac and people from the same sites.

Hog Deer pelage shows a more silken sheen and is not shaggy like that of Sambar. The color is brown, less red than Red Muntjac and less gray than Sambar. Full antlers can be seen in a total of four photos, and these resemble those of Sambar, but show the characteristic short and almost right-angled secondary tine of Hog Deer (e.g. TRENSE, 1989). These photos show no evidence of the neck gland characteristic of Sambar.

Further support for identification of the Hog Deer come from six sets of antlers reputedly from local deer, kept by local hunters in their houses and measured by the reconnaissance team in March. The maximum curved beam length of these antlers was 48 cm, while the shortest was 16 cm, and four sets had lengths of 38 cm or greater. The beams and tines of these antlers were noticeably slimmer than those typical of Sambar. Pedicle

Table 1. Results of camera trap surveys in Kratie Province, Cambodia, January–March, 2006.

Camera position, number and film number	Duration	No. photos showing Hog Deer	No. individuals shown in film (not necessarily different individuals; some photos showed more than one deer)				No. photos showing other deer
			Adult male	Adult female	Fawn	Total	
1-04-395	23 Jan–9 Feb	3	2	1	1	4	1
2-17-399	23 Jan–9 Feb	4	2	2		4	1
3-21-398	23 Jan–9 Feb	3	1	2		3	1
4-04-3563	9 Feb–16 Mar	6	1	4	4	9	4
2-17-3567	9 Feb–16 Mar	3		3	1	4	4
3-21-3562	9 Feb–16 Mar	9	2	7	4	13	1
TOTALS		28	8	19	10	37	

diameter ranged from 2 to 3.5 cm (mean 2.5), and the inter-pedicle gap measured 6 to 7.5 cm, both measurements being again noticeably slimmer than those of Sambar. The secondary tine was relatively short, inward and backwardly directed in all, and characteristically almost right-angled in three.

Of the 28 photos showing Hog Deer, there are 37 animals pictured. It is impossible to say definitely how many separate, individual animals are represented, because in some cases the photos are too dark or not sharply focused, or the animals pictured are not presenting comparable views. Furthermore, individuals are indistinguishable comparing even the best of these photos.

The population seems to use an area of tall grassland seasonally inundated by floodwaters of the Mekong River during the May–October rainy season (Figs. 6, 7). The dominant grass is *Sclerostachya fusca* (Khmer *treng*), but including also *Imperata cylindrica* (*sbov*), *Sorghum propinquum* and other grasses. Associates include scattered trees of *Mitragyna* sp. (*khtum*), *Butea monosperma* (*cha*), *Barringtonia acutangula* (*reang teuk*), *Lagerstroemia floribunda* (*trabek prey*), *Hymenocardia wallichii* (*phnom phneng*), and a pteridophytic straggling vine, probably *Lygodium* sp. (*vor kranhanh*) [Gramineae taxa determined by J.F. Maxwell, other taxa determined by cross-reference of local Khmer names to published lists (PHON, 1999; MARTIN, 1971)]. The camera traps were set in grassland sites parallel to a small Mekong tributary, the Prek Krieng. The grassland habitat seems to currently occupy a narrow floodplain zone between the Mekong and slightly higher terrain inland, covered predominantly by deciduous dipterocarp forest. Interspersed patches of gallery semi-evergreen forest along the tributary, and agricultural land (both paddy rice and field crops) also occur between the Mekong and the deciduous forest. The *Saccharum* grasslands seem to stay moist longer in the dry season than surrounding woodlands and scrub vegetation. In January, 2006 they were still moist even after burning had begun on the dry fringes (Fig. 7). According to local people the *treng* grasslands do burn regularly in the dry season, but later than surrounding areas (i.e., in late March or April).

The total area of the flooded grassland habitat in the reconnaissance area is only about 12 km², following satellite imagery interpretation (JICA-CAMBODIA, 2004). But it is impossible to say, at this time, what the range of the Hog Deer population in the survey area is. As surveys continue, further sites with Hog Deer in this general area are being reported by local people.

DISCUSSION

The extent of general survey effort in Cambodia over the last 5 years in various grasslands, wetlands and forest types scattered through the deciduous forest mosaic of northern and eastern Cambodia suggests that if Hog Deer were present in significant numbers in existing conservation project areas they would have been detected. As a comparison, Eld's Deer was believed by many conservationists to be close to extinction in these landscapes in the late 1990s, but by 2003 Eld's Deer had been either confirmed, through camera-trapping or visual observation, or credibly reported in at least 16 sites scattered across the deciduous forest mosaic of Cambodia (TORDOFF *ET AL.*, 2005). Eld's Deer are still vulnerable, but local awareness and protection have improved, and there is reasonable cause for optimism concerning their recovery in the natural deciduous forest



Figure 2. Adult male Hog Deer *Axis porcinus*. Camera trap photo taken between 9 February and 16 March, 2006 (WWF Cambodia/Forestry Administration.)



Figure 3. Adult female Hog Deer *Axis porcinus*. Camera trap photo taken between 9 February and 16 March, 2006 (WWF Cambodia/Forestry Administration.)



Figure 4. Adult male Hog Deer. Camera trap photo taken between 9 February and 16 March, 2006. (WWF Cambodia/Forestry Administration.)



Figure 5. Adult female Hog Deer and fawn. Camera trap photo taken between 23 January and 9 February, 2006. (WWF Cambodia/Forestry Administration.)



Figure 6. Habitat at the Hog Deer reconnaissance site in Kratie, 15 March 2006, late dry season; grassland mosaic with gallery forest along a small Mekong tributary in the background. Note that grass is still unburned, relatively late in the fire season. (R. Timmins).



Figure 7. Habitat at the Hog Deer reconnaissance site, 25 May 2006, early rainy season; grassland mosaic with riparian forest in background. By the end of the rainy season, the grasses at this site will probably grow to at least 1.5 m height. (WWF Cambodia/Forestry Administration.)

habitats.

In contrast, tall floodplain grasslands are rare or absent in existing conservation project areas in Cambodia. This fact and the discovery of Hog Deer in what is thought to be one of the largest patches of this habitat remaining, but which as yet is unprotected, indicates a significant oversight in conservation planning. Hog Deer may be an appropriate flagship species for this critically threatened habitat.

Despite the general survey effort to date, Hog Deer has largely been overlooked by conservation efforts regionally, and this gap is reflected in the apparently inaccurate and misleading IUCN Red Listings of both subspecies and the lack of a listing for Hog Deer at the species level. PEACOCK (1933) expressed concerns for the species, for a similar scenario of oversight in game management policies and practices in Myanmar. Likewise Clark (undated) in the 1930s raised concerns for the species in Vietnam, as did LEKAGUL & MCNEELY (1977) for Thailand.

Cambodia still has a relatively low human population density (approx. 72 per km² for the country; 12 per km² for northeastern provinces) with settlements concentrated on, and adjacent to, the extensive floodplains of the Tonle Sap and southern section of the Mekong River. During the current post-conflict period, however, the population is shifting, especially towards the more sparsely populated northeastern provinces. Land with access to permanent water is desirable for migrant farmers, especially grassland sites with a potential for conversion to paddy rice. This situation makes both the habitat and any remnant populations of Hog Deer extremely vulnerable.

Based on interpretation of satellite imagery (JICA-CAMBODIA, 2004), there are other sites along the Mekong that could provide suitable habitat for Hog Deer, and which have never been surveyed by wildlife conservationists. However, all these sites are located within 1–3 km of settlements. Given Cambodia's recent history of weak regulation of hunting and generally poor public understanding of conservation, there is a possibility that Hog Deer have been completely hunted out from all remaining habitat other than the present survey site.

In addition to the threats to habitat, hunting pressure in Cambodia and regionally is very high. This has resulted in widespread and massive declines in quarry species, especially those associated with open habitats such as grasslands and deciduous dipterocarp forests, even in large and intact forest blocks (DUCKWORTH *ET AL.*, 2005; BRICKLE *ET AL.*, in prep.). Cervid deer are especially at risk due to pressure from both a thriving bushmeat trade, and a demand for antlers, both locally as trophies and also in East Asian traditional medicine. Local people report Hog Deer to be more easily hunted than other game due to the Hog Deer's reported habit of trying to remain hidden (rather than fleeing) when threatened by hunters. The antler trade perhaps led to the early decline of Hog Deer regionally (CLARK, undated), but the bushmeat trade, coupled with habitat loss, may now be equivalent. Bushmeat is still widely and sometimes openly sold in larger towns and cities, including in Kratie provincial town.

The authors and our conservation partners will strive to establish effective conservation measures for this globally significant Hog Deer population in its natural habitat, using local community knowledge and support as a starting point for protection and management. The first priority is protection of the site and the deer, which involves immediate interventions to restrict hunting and habitat conversion. Applied research on local resource-use customs and Hog Deer habitat requirements is also needed, in order to prioritize threats and develop

a realistic local zonation with support of local communities. Surveys and systematic monitoring will be needed to determine population size and trends. As protection is improved, it will be possible to pursue much needed taxonomic research to improve our understanding of subspecific taxonomy of Hog Deer. And regionally it is very important to follow up on the unconfirmed report of Hog Deer in Vietnam and assess the species' status in Myanmar.

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