

Extinction process of the sambar in Peninsular Malaysia

Kae Kawanishi¹, D. Mark Rayan², Melvin T. Gumal³ and Chris R. Shepherd⁴

¹ Corresponding author: Malaysian Conservation Alliance for Tigers: kae@malayantiger.net

² WWF-Malaysia, Malaysia: mdarmaraj@wwf.org.my

³ Wildlife Conservation Society-Malaysia Program, Malaysia: mgumal@wcs.org

⁴ TRAFFIC Southeast Asia, Malaysia: chris.shepherd@traffic.org

Abstract

In Peninsular Malaysia, the sambar has lost more than 50% of its historical range in the past century and only a quarter of its current habitat is protected. Although multiple hunting moratoria have existed for five decades, the sambar has been relentlessly poached for local meat consumption. It now persists in only a few areas that receive active protection. Given the massive decline of its historical habitat, current rarity, and the lack of capacity and resources for large-scale restocking, effective protection as well as interest in forest restoration, we believe that the process of extinction will be exacerbated for this species in Peninsular Malaysia. Thus we recommend that the IUCN Red List authority review the Red List category of sambar, presently listed as Vulnerable (VU), but which would warrant listing as Endangered (EN) A2cd, and possibly A4cd, if these observations in Malaysia reflect global trends across the full species' range.

Resumen

En Malaysia Peninsular, el ciervo sambar ha perdido más de 50% de su distribución histórica en el siglo pasado, y solamente un cuarto de su hábitat actual es protegido de conversión. A pesar que moratorios múltiples de caza han existido sobre las últimas 5 décadas, el sambar ha sido cazado furtivamente para el consumo local de la carne. Ahora persiste solamente en algunas pocas áreas que reciben protección activa. Dado la disminución masiva de su hábitat histórico, bajos números y la falta de capacidad y recursos para su re-introducción en una escala grande, protección efectiva e interés en la restauración de bosques, creemos que el proceso de extinción probablemente va a aumentar para esta especie en Malasia Peninsular. Entonces, recomendamos que la autoridad de la Lista Roja de la UICN repase la categoría del sambar, listada actualmente como Vulnerable (VU), pero que podría merecer categorización como En Peligro (EN) A2cd y posiblemente A4cd, si estas observaciones en Malasia reflejan las tendencias globales del rango entero de la especies.

Keywords: conservation, extinction, IUCN Red List, poaching, protection, reintroduction, wild meat

Introduction

Ungulates (Artiodactyla), in particular, are disproportionately threatened with extinction compared with most other mammals, especially in Southeast Asia, largely due to massive overhunting (Corlett 2007). Large ungulate (species > 5 kg) populations have declined in recent decades due to commercial poaching to supply local and regional demand with meat, antlers and other body parts, causing many site-level extirpations in the region (Bennett &

Gumal 2001, Steinmetz *et al.* 2010, WWF 2013). This scenario is particularly relevant to the sambar in Peninsular Malaysia. A quick literature search in journals on wildlife ecology and conservation reveals a lack of focus on this species, which borders on negligence by Malaysia's conservation and academic community. Here, we present the sambar's status based on best available information in Peninsular Malaysia to garner greater national and global efforts for its conservation.

Biogeography and Taxonomy

Peninsular Malaysia represents the southern end of the continental distribution of Asia's largest deer species. According to the IUCN Red List (Timmins *et al.* 2008), it is treated as the same subspecies, *Rusa unicolor cambojensis* Kerr 1792, as found in Indochina. However, the Thai–Malay Peninsula populations have been completely isolated from northern populations due to forest loss in much of southern Thailand and thus, the sambar, as well as most other non-volant terrestrial species of the peninsula, cannot feasibly experience rescue effects regionally. Due to clear morphological differences among subspecies, Timmins *et al.* (2008) predicted a taxonomic revision, and Groves & Grubb (2011) propose two separate species of sambar: *Cervus unicolor*, in Sri Lanka and most of mainland South Asia and *C. equinus* in Southeast Asia and China. Because India contains the greatest number of sambar, this taxonomic change, if adopted, will necessitate an IUCN Red List category for *C. equinus*.

Threats

Poaching and Unsustainable Legal Hunting

Overhunting to the point of local extirpation, similar to that already observed in East Malaysia (Bennett & Gumal 2001), is increasingly threatening wildlife in Peninsular Malaysia. Poaching is a primary threat to the survival of this species, especially for the meat, which is favoured throughout the Sundaic region (Timmins *et al.* 2008). Unlike wild pigs *Sus* or tapirs *Tapirus indicus* that are not consumed by the majority of Malaysians due to religious or superstitious taboos (Kawanishi *et al.* 2003), the meat of sambar is highly prized by all ethnicities in Malaysia. The sambar is hunted for personal consumption, sales to restaurants and trophies (DWNP 1992a). There are no sambar farms in Peninsular Malaysia and thus wild sambar meat is 'laundered' as farmed Javan rusa, *R. timorensis*, to evade enforcement. However, sambar meat is considered superior and sold to trusted customers at a higher premium.

Their foraging behaviour, typically outside closed forest interiors, brings them closer to humans at the forest/cultivation ecotones or by roadsides where they are either shot or hit by cars. Sambars are also easily lured using artificial salt licks or baiting stations and are also prey to indiscriminate snares set for large mammals-- a practice widespread and chronic in Malaysia. Surveys of commercial trade in wild meat carried out by TRAFFIC in

2012 found as many as 20 restaurants selling sambar meat out of 242 restaurants investigated across Peninsular Malaysia (Caillabet *et al.* unpubl.) despite a moratorium in place since 2009 prohibiting sambar hunting.

Sambar are killed by local as well as Indochinese poachers (MYCAT 2012a), presumably since their own wildlife supplies are rapidly diminishing (WWF 2013). The number of poachers is on the increase as indicated by media reports, police reports at district police stations and also comments from indigenous people. These Indochinese poachers are also seen regularly in East Malaysia.

The steady decline in the number of hunting licenses issued over the past five decades despite the popularity of the deer meat is another indication of the decline in sambar and the unsustainability of the hunting. The number of licenses issued for sambar in the early 1960s was >600 annually (Medway 1965), 519 in 1982 (Habsah 1984), 373 in 1992 (DWNP 1992b) and 122 in 2006 (DWNP 2006). Meanwhile, perhaps to compensate the declining sambar, red muntjac hunting licenses showed slight increases (Kawanishi 2008).

The diminishing sambar population is corroborated by local people. According to an interview-based survey conducted by TRAFFIC between 2006 and 2007 on the perception of hunters and dealers in 18 villages across Peninsular Malaysia, more than 80% of the total of 61 respondents felt that between 2000 and 2005 the local sambar populations were either reduced or extirpated (Goldthorpe & Neo 2011). Over-hunting was given as the primary reason for depletion of the sambar, its being hunted at an unsustainable level throughout the year despite the 11-month closed season.

An assessment of the trend in hunting licenses and results of 23 camera-trapping studies submitted to the Malaysian Government in 2008 (Kawanishi 2008) alarmed policy makers who then instituted a 6-year hunting moratorium starting in 2009 (Kawanishi *et al.* 2013). Similar hunting moratoria where no licenses were issued for legal hunting were in place in 1963-1967 (Khan 1967), 1977-1982 (Habsah 1984), and 1994-1996 (Kawanishi 2008), but the sambar population has not recovered. It will take more than hunting moratoria to recover the population that has been subjected to five decades of over-exploitation both legally and illegally (Khan 1967, 1968; Habsah 1984; Zaaba *et al.* 1991) and neglect from the conservation community.

Habitat Loss

Although habitat loss and degradation is not currently the immediate threat to extinction in Southeast Asia, it was the main contributing factor in the 20th century. Logging roads now enable poachers to gain easier access into

forests once almost impenetrable. This coupled with the direct impacts of loss, fragmentation and degradation is having an acute impact.

Of the 131,800 km² total land area in Peninsular Malaysia, 57,000 km² (44%) is forested, comprising 48,900 km² Permanent Reserved Forests (PRF), 5,900 km² Protected Areas (PA), and 3,000 km² state or privately owned forests (Forestry Dept. 2012). When the sambar was globally listed as VU in the IUCN Red List 2008, Peninsular Malaysia had already lost more than 90% of lowland rainforest to agriculture, industry and settlements (Marshall 1973, Aiken *et al.* 1982, DWNP 2010).

Malaysia, Indonesia and Thailand are the world's top three producers of palm oil and rubber, the two main crops responsible for deforestation in Sundaic Southeast Asia. Agriculture and the construction industry contribute 4% and 16%, respectively, to Malaysia's GDP (EPU 2013). As almost all commercially viable alluvial lowland areas outside PAs and PRFs that could be drained had been cleared and converted to agriculture and settlements by 1992 (DWNP 2010), it had earlier appeared that further deforestation was less of a concern for large mammal conservation (DWNP 2008). This was incorrect as the recent 2011 government policies promote creation of industrial tree plantations via removal of native forests, even in PRFs (Lim 2012, MYCAT 2012b). These tree plantations are legally under the jurisdiction of each state with no requirement for consultation with the federal government or conservation NGOs. The habitat loss due to expansions of large-scale monoculture plantations and fragmentation due to road and railway construction is considered irreversible, or rather escalating, under current Malaysian economic growth models (MYCAT 2012b).

Population Decline and Process of Extinction

The National Red List assessment estimated the Area of Occupancy (AOO) for the sambar to be 52,490 km² based on the extent of sambar habitat still available in 2000, where occupancy was supported by data at a district level (DWNP 2010). Only 16% of the AOO was in PAs, managed either by federal or state park authorities (Table 1). This does not mean that they are protected on the ground, but at least their habitats are safe from conversion to monoculture plantations.

Table 1. Historical Extent of Occurrence (EOO) and current Area of Occupancy (AOO) for the sambar by different types of land category, extracted from the National Red List assessment conducted by the Department of Wildlife and National Parks Peninsular Malaysia (DWNP 2010).

| Land category | Extent of Occurrence | Area of Occupancy | | | |
|-------------------------|----------------------|-----------------------------|----------------------------|-----------------|--------|
| | | Private or state owned land | Permanent Reserved Forests | Protected Areas | Total |
| Area (km ²) | 103,064 | 8,691 | 35,415 | 8,383 | 52,490 |

EOO: The total historical extent of occurrence of the sambar prior to the 1970s based on the areas of the districts where the sambar has been recorded

AOO: The extent of available habitat within EOO that existed at the end of 2000. It is assumed that habitat quality is uniform and species density consistent over the whole habitat.

The sambar AOO gradually declined from 71,001 km² in 1980, 59,442 km² in 1990 and finally to the current 52,490 km², a 49% decline in its original habitat (areas including non-forested land) prior to the 1970s (DWNP 2010). We however feel this AOO is a gross over-estimation because: 1) the assumptions (Table 1) are not met; 2) a district is too large a spatial scale to assess sambar occupancy; and 3) unsustainable legal hunting and unabated poaching have resulted in many suitable sambar habitats being “empty” of them. Suitable habitats, actually occupied by sambar, declined by a much greater extent than 50%. Using the IUCN criterion, we argue that the sambar in Peninsular Malaysia was already in EN status at the beginning of the 21st century.

There has never been a nationwide population estimate of the sambar and it is thus impossible to document the numerical decline of the whole sambar population. We thus infer its status based on the best available information.

In 2008, biologists from WWF-Malaysia, Wildlife Conservation Society-Malaysia Program and the Malaysian Conservation Alliance for Tigers (MYCAT) looked at 23 camera-trapping studies conducted throughout Peninsular Malaysia between 1997 and 2008 to understand the conservation status of tiger prey species (Kawanishi *et al.* 2013). Most studies targeted tigers while a few were part of general biodiversity surveys. All cameras were set aiming at ground level to photograph medium-large terrestrial mammals. The data (10,145 wildlife photographs from 40,303 trap nights) showed that the sambar was rarely detected outside PAs and was rare even among the six large ungulates assessed.

The sambar was confirmed present in all PAs sampled (Taman Negara, Krau and Endau-Rompin) as well as Ulu Muda and Temengor PRFs. Of 414 photos of sambar, 346 (84%) were taken in PAs. It was not photographed in 15

other sites, which all fell within PRFs (Table 2), despite very intensive efforts (e.g. 9-month sampling, 7,631 trap-nights, etc). If sambar were still present, they were undetectable during the sampling period.

Table 2. Comparison of the total number of photographs of the sambar collected in 23 camera-trapping studies conducted between 1998 and 2008 by two of the main forest categories in Peninsular Malaysia, Protected Areas and Permanent Reserved Forests (PRFs). Data on muntjac and tapir are included to show the relative rarity of sambar, especially in PRFs.

| | Total trap nights | No. sites surveyed | No. sites where sambar detected | No. sambar photos | No. muntjac photos | No. tapir photos |
|----------------------------|--------------------------|---------------------------|--|--------------------------|---------------------------|-------------------------|
| Protected Areas | 19,883 | 5 | 5 | 346 | 697 | 580 |
| Permanent Reserved Forests | 20,420 | 18 | 3 | 68 | 1044 | 590 |

Adopted from Kawanishi et al. 2013

More recent and even more intensive camera-trapping (Appendix 1) and sign surveys in some of the nation's largest PRFs show no record of the species in areas where the sambar was legally hunted up until 1983 (Habsah 1984).

Even in PAs, the declining trends in the sambar's area of occupancy and abundance are expected to continue into the future, following the pattern of the now-possibly-extirpated Sumatran rhinoceros *Dicerorhinus sumatrensis* in Peninsular Malaysia. In 1951, the Chief Game Warden of Malaya noted that "We have every reason to believe that Sambur [*sic*] are in a very strong position," in King George V National Park (Fetherstonhaugh 1951), now known as Taman Negara, the country's largest national park at 4,343 km². In the early 1970s, the sambar was still common in the park (Khan 1971). It now occurs at very low densities (Kawanishi & Sunquist 2004) and in western Taman Negara, the abundance index based on camera-trapping rates and estimated occupancy based on camera-trap and sign-survey data have all declined over the past 12 years (Table 3), despite a slight increase in patrol efforts and maintenance of an open grass field with provision of salt cubes by the government. In the same period, the tiger population in the area has plummeted from an estimated seven individuals to one.

Table 3. Sambar data from camera-trapping studies in western Taman Negara, Peninsular Malaysia, collected over the 12-year period in the same 200-km² sampling area, using the same sampling methodology (Kawanishi & Sunquist 2004) except that sambar occupancy was analyzed using PRESENCE (Hines 2006) instead of CAPTURE software (Otis *et al.*, 1978, White *et al.*, 1982, Rexstad & Burnham, 1991).

| Date | Total camera-trap night | Total no. Photo | Total no. Detection* | Abundance Index | No. individual stag | Crude density estimate | Occupancy estimate** (Standard Error) |
|-----------------|-------------------------|-----------------|----------------------|-----------------|---------------------|------------------------|---------------------------------------|
| 4/1999 – 5/2000 | 4336 | 20 | 12 | 0.28 | 3 | 0.20 | 0.54 (0.19) |
| 12/2010-11/2011 | 7582 | 19 | 11 | 0.15 | 2 | 0.01 | 0.19 (0.10) |

*A detection is a trap night with any number of photographs of sambar taken at each camera-trap site.

**Based on the camera-trap and sign-survey data.

This pattern of vanishing sambar in western Taman Negara is corroborated by track-encounter rates by wildlife survey teams over the past few decades throughout the park and also coincides with the disappearance of the bearded pig *Sus barbatus* in its entirety (Kawanishi *et al.* 2006), and now, quite possibly, of the Sumatran rhinoceros (DWNP 2009, DWNP 2011, DWNP 2012, Tan 2012).

Exceptions to this pattern are the Endau-Rompin landscape that has been intensively patrolled by a multi-agency enforcement team since 2010 (Gumal *et al.* 2010), and the Royal Belum State Park that has been regularly patrolled by army personnel since the 1960s due to the earlier presence of communists. Darmaraj (2012) attributes a high tiger density in Belum to the abundant sambar, unmatched elsewhere (Appendix 1, Table 2).

A comparison of camera-trapping data between areas under low to medium protection (Appendix 1, Locations 5 and 6) and under high to very high protection (Appendix 1, Locations 7 and 8) within the contiguous Endau-Rompin landscape reveals that the former have no images of sambar. The latter areas, encompassing both PA and PRF, have received greater political support for wildlife: a royal mandate banning hunting of all wildlife and continuous reporting by administrators and NGOs. There, sambar and other wildlife persist but relentless poachers continue to nibble at the population.

Conclusion

Restocking of sambar has been planned with a breeding programme initiated by the government since the 1970s. Historically however, large mammal reintroduction programmes in Peninsular Malaysia (e.g. Sumatran rhinoceros and gaur *Bos gaurus*) have met little success (Rabinowitz 1995, Tan 2012). The capacity and resources are lacking for large-scale restoration and protection of the original sambar habitat and for successful reintroduction of captive sambar. Under current economic and government priorities, this situation is unlikely to change.

Given the past massive decline of its habitat, current rarity and the unfavourable future scenario, we recommend that the IUCN Red List authority review the Red List category of sambar, which is presently listed as Vulnerable (VU), but would warrant listing as Endangered (EN) A2cd, and possibly A4cd, if these observations in Malaysia reflect global trends across the full species' range.

At the national level, we urge increased conservation effort by: 1) upgrading the status from 'Protected' to 'Totally Protected Species' under the wildlife legislation, 2) intensifying on-the-ground protection in priority conservation areas; and 3) collaborating with NGOs and universities for field research to monitor populations, so that effectiveness of conservation interventions can be measured.

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Appendix 1. The total number of the sambar photographs obtained in recent 10 camera-trapping studies in the three priority conservation areas in Peninsular Malaysia identified in the National Tiger Conservation Action Plan and qualitative indication of the level of protection, threat of forest conversion and hunting pressure. Data on muntjac are added for comparison. The priority areas from north to south are: Belum-Temengor (1 and 2), Greater Taman Negara (3 and 4), and Endau-Rompin landscape (5-10).

| Location | State | Forest category * | Sampling period | Study area | Total trap nights | Sambar photos | Muntjac photos | Level of protection effort | Threat of forest conversion | Hunting pressure |
|--|--------|-------------------|-----------------|------------|-------------------|-----------------|----------------|----------------------------|-----------------------------|------------------|
| 1. Royal Belum State Park | Perak | PA | 08/2010-04/2011 | 400 | 17758 | 1519 | 6912 | Low | None | Medium |
| 2. Temengor | Perak | PRF | 08/2009-05/2010 | 400 | 15969 | 11 | 1642 | None | Medium | Very high |
| 3. Taman Negara Merapoh | Pahang | PA | 12/2010-11/2011 | 200 | 7582 | 19 | 513 | Low | None | Medium |
| 4. Sg Yu-Ulu Jelai | Pahang | PRF | 9/2009-12/2010 | 200 | 5715 | 0 [#] | 439 | None | Medium | High |
| 5. Endau-Rompin State Park Pahang | Pahang | PRF** | 07/2013-01/2014 | 170 | 1255 | 0 | 285 | Medium | None | Medium |
| 6. Lesung-Endau | Pahang | PRF | 07/2013-01/2014 | 90 | 1198 | 0 | 204 | Low | Medium | High |
| 7. Endau-Rompin Johor National Park | Johor | PA | 07/2013-12/2013 | 400 | 2516 | 0 ^{##} | 204 | Very high | None | Low |
| 8. Labis-Mersing-Lenggot-Kluang-Ulu Sedili-Panti | Johor | PRF | 07/2013-12/2013 | 2100 | 7591 | 15 | 802 | High | Medium | Medium |
| 9. Ulu Sedili Acacia Forest Plantation | Johor | State land | 07/2013-12/2013 | 15 | 324 | 0 | 24 | Low | Already converted | High |
| 10. Endau-Rompin corridor | Johor | State land | 07/2013-12/2013 | 40 | 443 | 0 | 15 | Low | Very high | Medium-high |

* Forest categories are: 1) Protected Areas (PAs)- Gazetted under the National Parks Act or protected area enactment and managed by the Department of Wildlife and National Parks Peninsular Malaysia or state park agencies for conservation and recreation; 2) Permanent Reserved Forests (PRFs) managed by state Forestry Departments for timber production and protection of water catchment areas; and 3) state land forest that has no protected status.

** Unlogged recreation forest.

No sambar tracks were detected during intensive sign surveys on 300m transects.

In this long-term study, cameras are set only on paths confirmed to be used by tigers, indicated by previous images, scent-marking or tracks. Sambar tracks were detected during intensive sign surveys on 300m transects.