

Recent records of Large-spotted Civet *Viverra megaspila* from Peninsular Malaysia

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Abstract.

To date there have been few published records of Large-spotted Civet *Viverra megaspila* across much of its range. It is one of the least known small carnivore species in Peninsular Malaysia, where there have been no published records of this species since 1985. Here we present new photographic evidence of Large-spotted Civet in Peninsular Malaysia from a camera-trap study and a road-killed animal. This represents a significant finding of this species after a lapse of more than 25 years. Our findings also support the suggestion that this species is likely tolerant or has adapted to human disturbance and habitat modification, since both records were found in and around palm oil plantations bordering evergreen forest. However, to what extent it uses palm oil plantations is unknown and further studies are needed to determine this.

Keywords: camera-trapping, forest fringe, oil palm, road-kill, small carnivore

Introduction

Large-spotted Civet *Viverra megaspila* is listed as Vulnerable on *The IUCN Red List of Threatened Species* (Duckworth *et al.* 2008). It is distributed across mainland South-east Asia, with records from Myanmar, Thailand, Vietnam, Lao PDR (Laos), and Peninsular Malaysia (Schreiber *et al.* 1989, Duckworth 1994, Robertson 2007, Chutipong *et al.* 2014), Cambodia (Gray *et al.* 2010), as well as South China (Francis 2008, Lau *et al.* 2010). Despite its wide distribution across South-east Asia, there is a lack of information regarding the species' conservation status and country-specific distribution patterns in parts of its range (Jenks *et al.* 2010). Since the late 1990s, Cambodia, Thailand, Myanmar, Vietnam and Lao PDR have all confirmed the presence of Large-spotted Civet via camera-trapping

surveys (Austin 1999, Nguyen *et al.* 2004, Lynam *et al.* 2005, Gray *et al.* 2010, Jenks *et al.* 2010, Chutipong *et al.* 2014, Gray *et al.* 2014). The species is distributed in lowland habitats and it is threatened by forest conversion as well as wildlife hunting (Duckworth *et al.* 2008). It is considered one of the regional priorities for small carnivore conservation and the species is in decline across its range (Robertson 2007, Than Zaw *et al.* 2008, Chutipong *et al.* 2014, Gray *et al.* 2014)

Large-spotted Civet is one of eleven Viverridae (civets) species that can be found in Peninsular Malaysia, and has been classified as Endangered on a national level under the Red List of Mammals for Peninsular Malaysia (DWNP 2010). There have been four known published confirmed records of this species from the country, in addition to one known museum specimen of an unconfirmed origin. Three of these published records originate from north-west Peninsular Malaysia (Robinson & Kloss 1920, Asakawa *et al.* 1986, Gaubert 2003), whilst another record was obtained from Kuala Lumpur which is located in the central-west portion of the Peninsula (Robinson & Kloss 1920). The last published Malaysian record of the species was that of a road-kill found in Sungai Petani in 1985, Kedah state (Asakawa *et al.* 1986). There is one museum specimen exhibited at the Perak Museum in Taiping, Perak state; however, the details and origin of the specimen are unknown.

Here, we provide two new locality records for the species in Peninsular Malaysia, one from a rapid camera-trap survey in and around a palm oil estate in Kedah state, and another from an incidental road-kill detection in Perak state.

Materials and methods

Study site

A rapid camera-trap survey was conducted within the Sungai Dingin Palm Oil Estate (Sungai Dingin Estate) and Gunung Inas Forest Reserve which are both located in Kedah state, north-west Peninsular Malaysia (Figure 1). Sungai Dingin Estate encompasses an area of about 32 km², and does not exceed 200 m asl. During the survey, most of this plantation comprised mature palm oil trees, while some sections were newly replanted or recently cleared for replanting. To the east, Sungai Dingin Estate shares a border of approximately 20 km with Gunung Inas Forest Reserve (362 km²; Ross 2010), where a ridge from this forest reserve extends westward through the palm oil estate. Gunung Inas Forest Reserve is dominated by evergreen forest and is part of the Bintang Hijau Mountain Range. It is classified as a production forest, and timber extraction is permitted, though there was no active logging within the study site at the time of the survey.

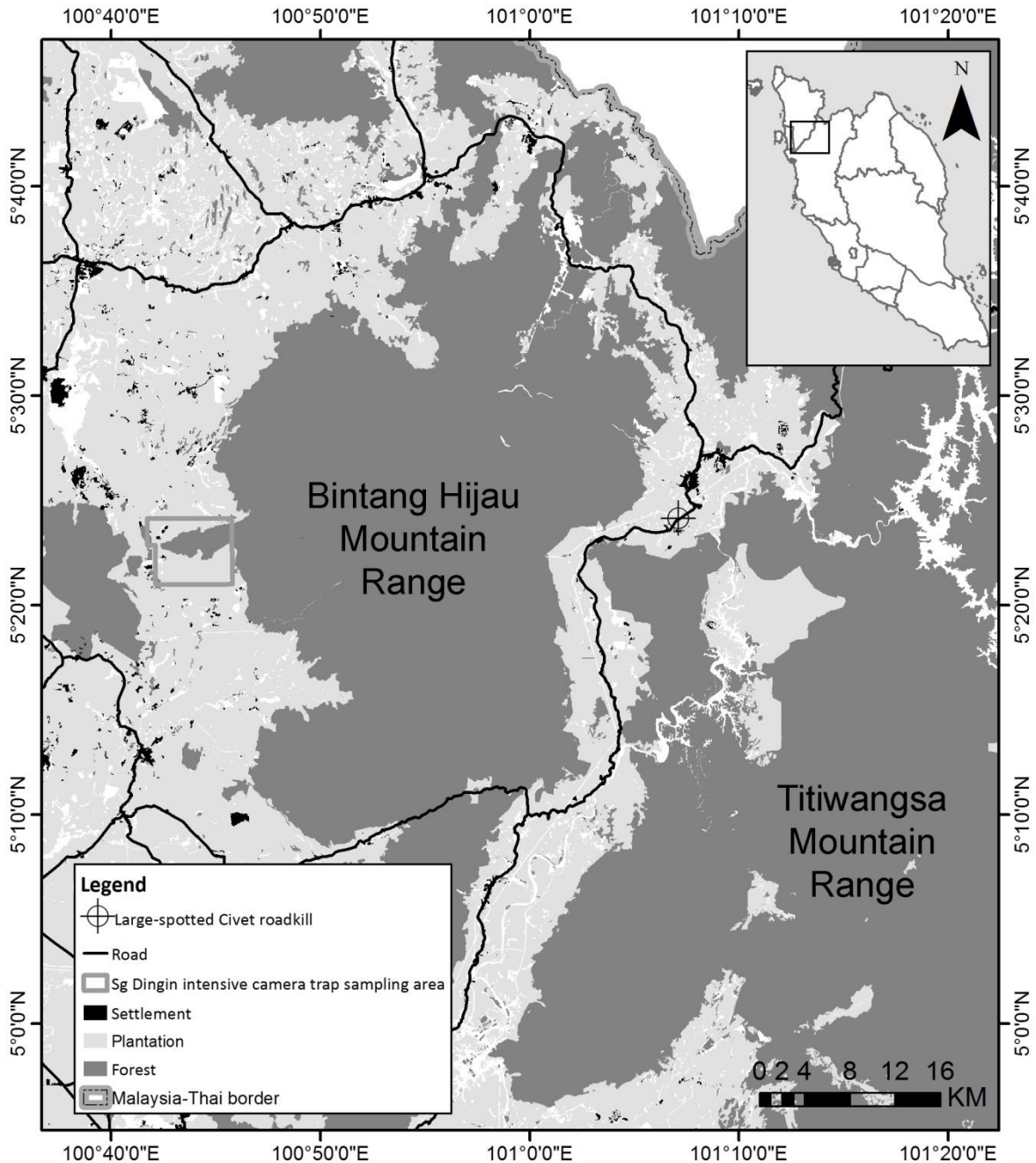


Figure 1. Camera-trapping site in Sungai Dingin, Kedah (August to November 2011) and road-kill location in Gerik, Perak (November 2014).

Methods

A rapid biodiversity assessment was conducted within the Sungai Dingin Palm Oil Estate, using a combination of sign surveys and camera-traps. The sign surveys were primarily used to determine the occurrence of large mammal species within the study site and not for confirming the presence of Large-spotted Civet or other small carnivore species, for which sign-based records, unless supported by DNA analysis, are unreliable (*e.g.*, Davison *et al.* 2002). An area of 57 km² was sampled across three pre-defined habitat zones: palm oil

plantation (27 km²), evergreen forest (20 km²) and forest edge (10 km²). A total of 57 camera-traps were set, with an average inter-trap distance of 670 m between locations. The camera-traps were set to be operational for 24 hours a day throughout the sampling period of three months (August to November 2011), and were set at elevations ranging from 30–640 m asl. All of the camera-traps were set within a period of several days, and the stations were maintained throughout the entire study period. Of the 57 camera-traps locations, 27 were located inside the plantation, 10 were at the forest edge and 20 were set within the forest reserve. Camera-traps were mounted to trees at an approximate height of 40–50 cm above ground, facing locations suitable to photograph mammals such as plantation trails, ridges, old logging roads, and other trails which had evidence of animal usage. Commercially-made camera-traps, Reconyx Hyperfire (HC500), were used in all surveys.

Results

From a total of 5,090 camera-trap nights, Large-spotted Civets were recorded at two different camera-trap stations within the palm oil estate (Table 1), which had a total sampling effort of 2,527 camera-trap nights. These two camera-trap stations were less than 1 km away from the border of Gunung Inas Forest Reserve.

Table 1. Large-spotted Civet *Viverra megaspila* records from the camera-trapping site in Sungai Dingin, Kedah state (August – November 2011) and the road-kill record near Gerik town, Perak state (November 2014).

Coordinates (DD MM SS)	Elevation (m asl)	Date	Time	Notes
5° 22' 06" N 100° 42' 42" E	77	24Sep2011	01h59	A male was camera-trapped once at this location within a palm oil plantation less than 1 km away from forest edge.
		07Sep2011	03h16	
		19Sep2011	06h02	
5° 23' 30" N 100° 42' 42" E	72	22Sep2011	01h22	A female was camera-trapped six independent times at this location within a palm oil plantation, less than 1 km away from the forest edge.
		25Sep2011	05h10	
		29Sep2011	04h05	
		20Nov2011	23h56	
5° 24' 54" N 101° 07' 42" E	120	15Nov2014	23h59	A fresh road-kill of a female was found by a roadside surrounded by palm oil plantations and settlements.

Based on their unique spot patterns, which were manually identified by experienced field researchers, two individuals were identified. A male, sexed based on the presence of external genitalia visible in some of the camera-trap photographs, was recorded once at an elevation of 77 m asl (Figure 2). A female, sexed on the absence of any external genitalia, was photographed during six independent events at a separate camera-trap location, at an elevation of 72 m asl. The distance between these two camera trap stations was approximately 2.5 km, and all of the photographs were taken from around 24h00 to 06h00. Independent events are defined here as consecutive camera-trap photographs of an individual of the same species taken more than 30 minutes apart (see O'Brien *et al.* 2003).

As for the sign surveys, only very few small carnivore tracks were found during the sign surveys.



Figure 2. The male Large-spotted Civet captured on camera-trap (Photo: WWF-Malaysia/Ching Fong Lau).

A female Large-spotted Civet road-kill (Fig. 3) was found on 24 November 2014, along a 5–6 m wide paved road near Gerik town, Perak state. The road-kill was in an area that was surrounded by palm oil plantations and less than 50 m from human settlements. The closest and largest forest blocks (greater than 100 km²) from the road-kill locality are approximately 3 km to the east (Air Cepam Forest Reserve within the Titiwangsa Mountain Range) and about 4.5 km to the west (Bintang Hijau Forest Reserve within the Bintang Hijau Mountain Range). At the time of discovery at approximately midnight, the carcass was still fresh. The Large-spotted Civet carcass was not collected.

Discussion

Prior to our findings, there have been four known published records of Large-spotted Civet with locality details in Peninsular Malaysia; from Kuala Lumpur and Taiping (Robinson & Kloss 1920); Sungai Petani (Asakawa *et al.* 1986); and Penang (Gaubert 2003). Because of insufficient documentation, it is unknown whether the specimen in the Perak State Museum originates from any of the published records. The records detailed in this paper are the first confirmed published records of this globally-threatened small carnivore species in Peninsular Malaysia since 1985.



Figure 3. The female Large-spotted Civet road-kill (Photo: WWF-Malaysia/Christopher Wong).

Intensive camera-trap surveys conducted in the Belum–Temengor Forest Complex in the north-central region (Rayan *et al.* 2013; 40,161 trap nights), and Taman Negara National Park in the central region (Kawanishi & Sunquist 2004; 14,054 trap nights) of Peninsular Malaysia failed to detect Large-spotted Civet. It was also not recorded in other camera-trap studies spanning across multiple sites within Peninsular Malaysia (Mohd Azlan 2003, Lynam *et al.* 2005, Hedges *et al.* 2013). However, it should be noted here that most of these large-scale camera-trap surveys were focused on large mammals, and were conducted in national parks, state parks and forest reserves. Little camera-trapping survey effort has been invested in areas of habitat that have undergone human-induced disturbance, such as the edges of natural forest and palm oil plantations. We hypothesise that this could be one reason why this species has not been detected, despite the relatively large number of intensive camera-trap surveys in Peninsular Malaysia.

Our findings corroborate a recent publication stating that this species' Malaysian distribution is less extensive than described in Medway (1969), Corbet & Hill (1992) and Francis (2008), and is likely to be confined to north-west Peninsular Malaysia (Jennings & Veron 2011), which could be the southernmost limit of its global distribution. However, the outlier recorded from Kuala Lumpur (Robinson & Kloss 1920) is unable to be explained or verified. Historically, Kuala Lumpur was the centre of Malaysia's administration and commerce, hence plausible explanations on the origins of the outlier is that this specimen was obtained via trade, or has been misidentified; Large-spotted Civet has similarities to

Malay Civet *Viverra zibetha* and Large Indian Civet *Viverra zibetha*, and both of these latter species are distributed in Peninsular Malaysia (IUCN 2015). For example, one specimen claimed to be Large-spotted Civet, from Singapore, in the Muséum National d'Histoire in Paris was a Malay Civet (Chua *et al.* 2012).

Large-spotted Civet is thought to be a lowland species, with most of the field records obtained from areas below 300 m asl (Duckworth 1994, Jennings & Veron 2011, Chutipong *et al.* 2014, Gray *et al.* 2014). Our results are consistent with this, and all records were below 150 m asl. Large-spotted Civet is reported to be relatively tolerant of forest degradation and may be closely associated with forest edge habitats (*e.g.*, Duckworth 1994, Austin 1999, Jenks *et al.* 2010, Chutipong *et al.* 2014), and it has also been recorded from an extensive logged-over area (Lynam *et al.* 2005). Although previous records have been obtained from evergreen forest, semi-evergreen forest, Melaleuca dominated swamp forest and deciduous dipterocarp forest (*i.e.*, dry dipterocarp forest; Duckworth 1994, Austin 1999, Nguyen *et al.* 2004, Khounbouline 2005, Lynam *et al.* 2005, Gray *et al.* 2010, Jennings & Veron 2011, Chutipong *et al.* 2014), its precise habitat requirements and ecology remain poorly known (Austin 1999).

To our knowledge Large-spotted Civet has not been recorded in palm oil plantations or similar agricultural land, and the camera-trap records in this paper are the first published examples of this. The road-kill is likely to have originated from either the Titiwangsa Mountain Range or the Bintang Hijau Mountain Range; the latter is where the camera-trap records were obtained. The localities of these records suggest that the species is closely associated with forest edges or lowland forested areas that have been converted to plantations, and is likely to be using plantations as feeding grounds or movement corridors. More studies are needed to confirm this.

Our records of Large-spotted Civet have given some insights on its current conservation status and distribution in Peninsular Malaysia. Our findings indicate that lowland forests bordering plantations could be important habitats for the Large-spotted Civet; these habitats and potential refuge sites should not be haphazardly converted to palm oil plantations or to other similar land uses. Wildlife hunting is also likely to be more prevalent in lowland forest areas close to human settlements; hence these potential threats to the species should be addressed by the relevant enforcement agencies. Nevertheless, further detailed studies on its ecology and distribution in Peninsular Malaysia are needed so that further conservation actions can be devised and applied to ensure the survival of this species in the country.

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References

- Asakawa M., Ohbayashi M. & Ow-Yang C. K. 1986. Studies on parasite fauna of Malaysia I. A redescription of *Strongylus brauni* Linstow, 1897, and the establishment of a new genus, *Viverrostrongylus*. *Japanese Journal of Veterinary Research* 34: 195–201.
- Austin S. C. 1999. Camera-trapping evidence of Large-spotted Civet *Viverra megaspila* in Xe Pian National Biodiversity Conservation Area (NBCA), southern Lao PDR. *Natural History Bulletin of the Siam Society* 47: 225–257.
- Chua M. A. H., Lim K. K. P. & Low C. H. S. 2012. The diversity and status of the civets (Viverridae) of Singapore. *Small Carnivore Conservation* 47: 1–10.
- Chutipong W., Tantipisanuh N., Ngoprasert D., Lynam A. J., Steinmetz R., Jenks K. E., Grassman Jr L. I., Tewes M., Kitamura S., Baker M. C., McShea W., Bhumpakphan N., Sukmasuang R., Gale G. A., Harich F. K., Treydte A. C., Cutter P., Cutter P. B., Suwanrat S., Siripattaranukul K., Hala-Bala Wildlife Research Station, Wildlife Research Division & Duckworth J. W. 2014. Current distribution and conservation status of small carnivores in Thailand: a baseline review. *Small Carnivore Conservation* 51: 96–136.
- Corbet G. B. & Hill J. E. 1992. Pp 206–207. *The mammals of the Indomalayan region*. Natural History Museum Publications and Oxford University Press, Oxford, U.K.
- Davison A., Birks J. D. S., Brookes R. C., Braithwaite T. C. & Messenger J. E. 2002. On the origin of faeces: morphological versus molecular methods for surveying rare carnivores from their scats. *Journal of Zoology* 257: 141–143.
- Duckworth J. W. 1994. Field observations of Large-spotted Civet *Viverra megaspila* in Laos with notes on the identification of the species. *Small Carnivore Conservation* 11: 1–3.
- Duckworth J. W., Timmins R. J., Olsson A., Robertson S., Kanchanasaka B., Than Zaw, Jennings A. & Veron G. 2008. *Viverra megaspila*. In IUCN 2013. *IUCN Red List of Threatened Species*. Version 2013.1. <www.iucnredlist.org>. Downloaded on 17 March 2015.
- DWNP [Department of Wildlife and National Parks]. 2010. *Red List of Mammals for Peninsular Malaysia*. Department of Wildlife and National Parks Peninsular Malaysia.
- Francis C. M. 2008. *A field guide to the mammals of South-east Asia*. New Holland, London, U.K.
- Gaubert P. 2003. [Systematics and phylogeny of the genus *Genetta* and enigmatic 'genet-like taxa' *Prionodon*, *Poiana* and *Osbornictis* (Carnivora, Viverridae): Characterization

- of the subfamily viverrinae and diversification patterns of study within the African continent*]. National Museum of Natural History (Ph.D. thesis), Paris, France. (In French)
- Gray T. N. E., Chanrattana P. & Chanrattanak P. 2010. Status and ecology of Large-spotted Civet *Viverra megaspila* in eastern Cambodia. *Small Carnivore Conservation* 43: 12–15.
- Gray T. N. E., Thongsamouth K. & Tilker A. 2014. Recent camera-trap records of Owston's Civet *Chrotagale owstoni* and other small carnivores from Xe Sap National Protected Area, southern Lao PDR. *Small Carnivore Conservation* 51: 29–33.
- Hedges L., Clements G. R., Sheema A. A., Yap W., Laurance S., Goosem M. & Laurance W. F. 2013. The status of small mammalian carnivores in threatened wildlife corridor in Peninsular Malaysia. *Small Carnivore Conservation* 49: 9–14.
- Jennings A. P. & Veron G. 2011. Predicted distributions and ecological niches of 8 civet and mongoose species in Southeast Asia. *Journal of Mammalogy* 92: 316–327.
- Jenks K. E., Wanghongsa S., Songsasen N., Leimgruber P. & Howard J. 2010. Camera-trap evidence of large-spotted civet in Khao Ang Rue Wildlife Sanctuary and Khao Yai National Park, Thailand. *Small Carnivore Conservation* 42: 19–21.
- Kawanishi K. & Sunquist M. E. 2004. Conservation status of tigers in a primary rainforest of Peninsular Malaysia. *Biological Conservation* 120: 329–344.
- Khounboline K. 2005. A Large-spotted Civet *Viverra megaspila* record from a mid-altitude plateau, Lao PDR. *Small Carnivore Conservation* 33: 26.
- Lau M. W. N., Fellowes J. R. & Chan B. P. L. 2010. Carnivores (Mammalia: Carnivora) in South China: a status review with notes on the commercial trade. *Mammal Review* 40: 247–292.
- Lynam A. J., Maung M., Po S. H. T. & Duckworth J. W. 2005. Recent records of Large-spotted civet *Viverra megaspila* from Thailand and Myanmar. *Small Carnivore Conservation* 32: 8–11.
- Medway L. 1969. *The wild mammals of Malaya and offshore islands including Singapore*. Oxford University Press, London, U.K.
- Mohd Azlan J. 2003. The diversity of mustelids, viverrids, and herpestids in a disturbed forest in Peninsular Malaysia. *Small Carnivore Conservation* 29: 8–9.
- Nguyen X. D., Pham T. A., Nguyen M. T. & Le H. T. 2004. Mammals. Pp. 85–103, 133–138 in Sage N., Kutcher S., Nguyen X. V., Wilson P. & Dunlop J. (eds) *Biodiversity survey U Minh Thuong National Park*. Agriculture Publishing House, Ho Chi Minh City, Vietnam.
- O' Brien T. G., Kinnaird M. F. & Wibisono H. T. 2003. Crouching tigers, hidden prey: Sumatran tiger and prey populations in a tropical forest landscape. *Animal Conservation* 6: 131–139.

- Rayan D. M., Mohamad S., Wong C., Siwan E. S., Lau C. F., Hamirul M. & Mohamed A. 2013. *Conservation status of tigers and their prey in the Belum-Temengor Forest Complex*. Report, Petaling Jaya, Malaysia.
- Robinson H. C. & Kloss C. B. 1920. Notes on Viverridae. *Records of the Indian Museum. Calcutta* 19: 175–179.
- Robertson S. I. 2007. *The status and conservation of small carnivores in Vietnam*. University of East Anglia (Ph.D. thesis), Norwich, U.K.
- Ross C. 2010. *Public Summary Report Initial RSPO Certification Assessment Sime Darby Plantation*. Sdn Bhd Management Unit SOU1 Kedah Darulaman, Malaysia.
- Schreiber A., Wirth R., Riffel M. & Van Rompaey H. 1989. *Weasels, civets, mongooses and their relatives: an action plan for the conservation of mustelids and viverrids*. IUCN, Gland, Switzerland.
- Than Zaw, Saw Htun, Saw Htoo Tha Po, Myint Maung, Lynam A. J., Kyaw Thinn Latt & Duckworth J. W. 2008. Status and distribution of small carnivores in Myanmar. *Small Carnivore Conservation* 38: 2–28.