

Sightings of Common Palm Civets *Paradoxurus hermaphroditus* and of other civet species at Phnom Samkos Wildlife Sanctuary and Veun Sai–Siem Pang Conservation Area, Cambodia

T. ISEBORN¹, L. D. ROGERS¹, B. RAWSON² and K. A. I. NEKARIS¹

Abstract

Night surveys are still sparse in Cambodia and therefore only limited data are available on the distribution, density and ecology of nocturnal mammals. In 20 km of nocturnal line transects in Phnom Samkos Wildlife Sanctuary (southwest Cambodia) in 2009, and 17.2 km in Veun Sai–Siem Pang Conservation Area (northeast Cambodia) in 2011, we encountered 14 Common Palm Civets *Paradoxurus hermaphroditus*, seven in each site. Mean linear encounter rate for Common Palm Civet was 0.35 animals/km (SE ± 0.17) in Phnom Samkos Wildlife Sanctuary and 0.39 animals/km (SE ± 0.21) in Veun Sai–Siem Pang Conservation Area. Other small carnivore species sighted during the surveys comprised Small-toothed Palm Civet *Arctogalidia trivirgata* and *Viverra/Viverricula* sp. Although there is no evidence that civets are commonly hunted for use in traditional medicine, they are caught opportunistically for local consumption. Further surveys in Cambodia could clarify trends in nocturnal mammal populations.

Keywords: anthropogenic pressure, night surveys, nocturnal mammals, traditional medicine

ការអង្កេតប្រទេសសត្វសំពោលក្រមុំ និងប្រទេសសត្វសំពោលផ្សេងៗទៀត នៅក្នុងជម្រកសត្វព្រៃភ្នំសំកុស និងតំបន់អភិរក្សភ្នំសៀមប៉ាង ក្នុងប្រទេសកម្ពុជា

សង្ខេប

ការអង្កេតពេលយប់នៅតែមានភាពខ្វះចន្លោះនៅក្នុងប្រទេសកម្ពុជា ដែល ជាលទ្ធផលការប្រមូលទិន្នន័យ ទៅលើ របាយ ដង់ស៊ីតេ និងលក្ខណៈជីវសាស្ត្រនៃថនិកសត្វក្រីចរនៅមានកំរិតនៅឡើយ ។ នៅក្នុងឆ្នាំ ២០០៩ ក្រុមស្រាវជ្រាវបានជ្រើសរើសវិធីសាស្ត្រដើរត្រង់ស៊ុក (Transects) ពេលយប់ នៅ ដែនជម្រកសត្វព្រៃភ្នំសំកុស(ភាគនាគីនៃប្រទេសកម្ពុជា)បានចំងាយ ២០គីឡូម៉ែត្រ និងក្នុងឆ្នាំ ២០១១ នៅតំបន់អភិរក្សភ្នំសៀមប៉ាង(ភាគឥសាននៃប្រទេសកម្ពុជា)បានចំងាយ១៧,២ គីឡូម៉ែត្រ ។ ក្រុម ស្រាវជ្រាវបានជួបប្រទះសំពោលក្រមុំ *Paradoxurus hermaphroditus* ចំនួន១៤ក្បាលនៅតំបន់ទាំងពីរ (ចំនួន៧ក្បាលក្នុងតំបន់និមួយៗ) ។ ជាមធ្យមការជួបប្រទះសំពោលក្រមុំនៅក្នុងការអង្កេតគឺមាន ចំនួន០,៣៥ ក្បាលក្នុងមួយគីឡូម៉ែត្រការ៉េ (SE ± 0.17) ក្នុងដែនជម្រកសត្វព្រៃភ្នំសំកុស និងចំនួន ០,៣៩ក្បាល ក្នុងមួយគីឡូម៉ែត្រការ៉េ (SE ± 0.21) ក្នុងតំបន់អភិរក្សភ្នំសៀមប៉ាង។ ក្រៅពីនេះមាន ប្រភេទថនិកសត្វមួយចំនួនទៀតបានជួបប្រទះផងដែរនៅក្នុងការសិក្សានេះ មានដូចជា សំពោលអុតខ្នង *Arctogalidia trivirgata* និង *Viverra/Viverricula* sp. ។ ទោះបីជាគ្មានការបញ្ជាក់ថាសំពោលជាទូទៅ ត្រូវបានគេប្រមាញ់សម្រាប់ប្រើធ្វើធុនសម្បូរណាស់ដោយ ក៏ប្រភេទនេះជាទូទៅត្រូវបានគេ ប្រមាញ់ សម្រាប់ធ្វើជាម្ហូបអាហារ ។ ជាពិសេសក្រុមស្រាវជ្រាវ បានផ្តល់អនុសាសន៍អោយមានការសិក្សា ថនិកសត្វក្រីចររបស់ខ្លួនទៀតដើម្បីតាមដាន និងត្រួតពិនិត្យការប្រែប្រួលនៃចំនួនរបស់វា ។

ពាក្យគន្លឹះ: សំពោល ការសិក្សាពេលយប់ ថនិកសត្វក្រីចរ និងធុនសម្បូរណា

Introduction

Human activities in the Indo-Burma biodiversity hotspot are leading to major declines in mammal populations (Myers *et al.* 2000, Ceballos & Ehrlich 2002). With a tumultuous history of civil conflict over the last half-century, Cambodia withstood some of these declines, and stands out as retaining some of the largest tracts of forest in the region (Claridge *et al.* 2005). With a move to liberal democracy, forest loss has now increased dramatically, and the impact on biodiversity has become severe. Demands for timber, for non-timber forest products, for

animals in traditional medicines and for wild meat both locally and for illegal export, raise concern for fast-disappearing habitats and unsustainable exploitation of forest products (Platt *et al.* 2004, Ashwell & Walston 2008, Grismer *et al.* 2008).

The status of many nocturnal mammal species is still poorly understood in Cambodia, given the general focus on diurnal and sign-based mammal surveys (e.g. Mombert & Weiler 1999, Long & Swan 2000, Walston *et al.* 2001). Most research including nocturnal mammals in Cambodia has simply recorded species presence (e.g. Walston & Duckworth 2003, Holden & Neang 2009, Schank *et al.* 2009) with only a handful attempting to quantify abundance (Gray *et al.* 2010, Streicher 2010, Coudrat *et al.* 2011, Gray & Phan 2011, Starr *et al.* 2011). Population sizes of nocturnal mammals in Cambodia and threat levels to them are therefore mostly speculative.

One often largely overlooked family is the Viverridae (civets). Seven civet species are reported from Cambodia (with their threat status on *The IUCN Red List of Threatened Species*; IUCN 2011): the Vulnerable (VU) Binturong *Arctictis binturong*, VU Large-spotted Civet *Viverra megaspila*, Near Threatened (NT) Large Indian Civet *V. zibetha*, Least Concern (LC) Common Palm Civet *Paradoxurus hermaphroditus*, LC Masked Palm Civet *Paguma larvata*, LC Small Indian Civet *Viverricula indica* and LC Small-toothed Palm Civet *Arctogalidia trivirgata*.

The nocturnal, arboreal lorises *Nycticebus* are heavily hunted and traded in Cambodia for use in Khmer, Chinese and Vietnamese traditional medicine (Starr *et al.* 2010). Arboreal civets are likely to be hunted through the same processes, and although they may not be specifically targeted, populations are plausibly being affected. This note presents sightings of Common Palm Civets and other civet species in two sites in Cambodia.

Study areas

The Phnom Samkos Wildlife Sanctuary (= Phnom Samkos WS), in the Cardamom Mountains of southwest Cambodia (Fig. 1), encompasses 3,338 km² of protected forest (Daltry & Mombert

2000). LDR surveyed specifically in the lowland Samkos Basin close to the base camp at 12°21'N, 103°07'E, an area characterised by dry dipterocarp forest with occasional patches of semi-evergreen and evergreen forest. The Veun Sai–Siem Pang Conservation Area (= Veun Sai–Siem Pang CA) covers 550 km² in north-eastern Cambodia which, while the target of conservation activities, is not currently a legally designated protected area (Fig. 1). TI surveyed in the southernmost part of Veun Sai–Siem Pang CA (base camp: 14°01'N, 106°44'E) where broadleaf evergreen forest, semi-evergreen forest and mixed deciduous forest dominated by *Lagerstroemia* species are the prevalent forest types. Currently available habitat maps are insufficient to assess relative proportions of forest type along transects accurately at this scale. Both sites are subject to considerable illegal logging, hunting, fires (including burning for shifting cultivation), and often unsustainable collection of non-timber products by the local population.

Methods

The records presented here were collected during population surveys of lorises. All nocturnal mammals seen were systematically recorded, with particular attention to civets, which are potential predators of lorises. Phnom Samkos WS was surveyed from April to July 2009 and Veun Sai–Siem Pang CA from April to June 2011, timings dictated by external constraints. The 17 transects (Table 1) were a minimum of 500 m apart. Transect preparation minimised cutting of vegetation (sufficient to allow passage for one person at a time) and other changes to microhabitat that might affect the distribution of animals. In Phnom Samkos WS transects were placed in three separate areas of the Samkos basin accessible by three small trails. The transects were all cut following the bearing of 220° running parallel to each other. In Veun Sai–Siem Pang CA, randomised transect positioning was prevented by the patchy habitat, so transects were positioned not to cross farm land and other large open areas assumed to be inappropriate habitat for lorises.

Transects were marked every 50 m with flagging tape and allowed to rest for at least 30 hrs before the first survey on that transect (as recommended by Peres 1999). Transect

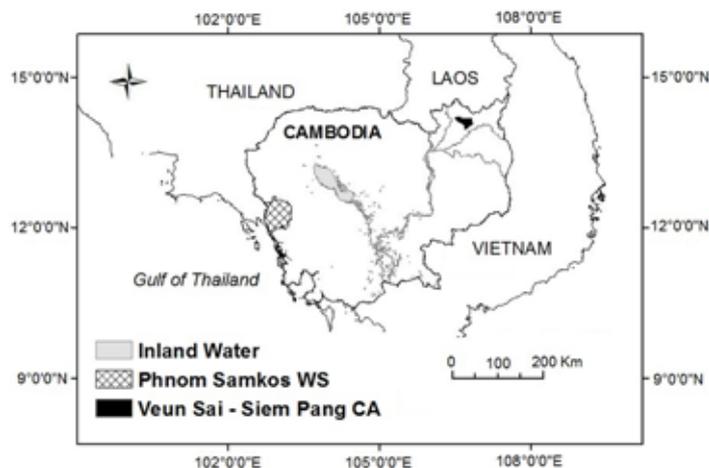


Fig. 1. Locations of the Phnom Samkos Wildlife Sanctuary and Veun Sai–Siem Pang Conservation Area within Cambodia.

lengths measured with a laser range finder (Bushnell® Sport 450) were confirmed with GPS reference points (Garmin: eTrexVista®HCx and GPSMAP®60CSx). Checking compass bearings approximately every 50 m ensured transect linearity. Surveys took place between 19h00 and 04h00. Most surveys were conducted simultaneously by two observers, but twice in Veun Sai–Siem Pang CA the team consisted of three, and once six, people. Observers walked randomly selected transects, determined by picking the number out of a hat. Each transect was walked at least twice, excepting two in Veun Sai–Siem Pang CA walked only once. Twice in Veun Sai–Siem Pang CA, transects were not completed due to heavy storms and were repeated on a different night; the uncompleted transects are included here because animals were seen during their early part. Observers walked 0.5–1 km/hr maintaining 10 m distance between each other, scanning all levels of vegetation and, in Veun Sai–Siem Pang CA, stopping for 5–10 min every 100 m to maximise probability of detection. The 4.5V head torches with red filter (Petzl®) for detection and identification of animals mostly used were not bright enough in open parts in Veun Sai–Siem Pang CA to penetrate the entire search volume effectively; here, locally purchased torches with white light were used for initial detection and identification of animals followed by closer observations using red light.

Species status at each site is expressed as the linear encounter rate per kilometer, which is calculated as the number of animals seen divided by distance walked. Linear encounter rates were calculated per individual transect-line and averaged to give a final figure for each site; this gives each transect-line equal weighting no matter how often it was walked. The encounter-rate approach is fraught with methodological difficulties, most significantly the assumption that viewing distance (i.e. detection function) is uniform along and between transects. These estimates are for general reference, and as a potential basis for monitoring in Veun Sai–Siem Pang CA if transects be repeated at a later stage.

Results

In total 37.2 km were surveyed along transects: 20 km in Phnom Samkos WS and 17.2 km in Veun Sai–Siem Pang CA (Table 1). We confidently identified Common Palm Civets (seven each in Phnom Samkos WS and on transects in Veun Sai–Siem Pang CA), mainly as a solitary animal but once as a duo. In Veun Sai–Siem Pang CA five further Common Palm Civets were seen off-transects. Most Common Palm Civets were in evergreen forest, but two records in Phnom Samkos WS were in dry dipterocarp forest. While evergreen forest was the

Table 1. Night transects walked at Phnom Samkos Wildlife Sanctuary in 2009 and Veun Sai–Siem Pang Conservation Area in 2011, Cambodia.

| | Phnom Samkos WS | Veun Sai–Siem Pang CA |
|----------------------------|-----------------|-----------------------|
| Number of transects | 10 | 7 |
| Individual transect length | 1 km | 1.1–1.6 km |
| Total transect length | 10 km | 9.2 km |
| Total distance walked | 20 km | 17.2 km |
| Total survey effort | 25 hours | 29 hours |

predominantly surveyed habitat in Veun Sai–Siem Pang CA, in Phnom Samkos WS about 60% of surveyed transect was in dry dipterocarp forest. In Phnom Samkos WS Common Palm Civets were encountered mostly in trees, but twice on the ground. In Veun Sai–Siem Pang CA, they were detected at heights of 6–22 m above the ground (mean 12.6 m \pm 1.67). Behaviours at first contact included being alert/watching the observers; resting; playing socially and feeding on fruit.

Physical characteristics and behaviour of a civet seen further off the transect in Phnom Samkos WS corresponded to those described by Duckworth (1997) and Walston & Duckworth (2003) for Small-toothed Palm Civet *Arctogalidia trivirgata*. Initially, we assumed that the animal was a Masked Palm Civet *Paguma larvata* based on conversation with our local guide and his pointing to this species in *A field guide to the mammals of Southeast Asia* (Francis 2008). The animal was in lowland evergreen forest, making considerable noise as it moved around high in a tree. On 17 May 2011 in Veun Sai–Siem Pang CA in evergreen forest, facing each other on the thick branches of two neighbouring trees at 12 and 14 m above ground respectively, we saw a duo of civets with distinct black-and-white banded tails and neck-markings. They were not safely identifiable beyond *Viverra/Viverricula*. Both genera are almost invariably seen singly and on the ground, at least in the Mekong countries (J. W. Duckworth *in litt.* 2012), suggesting that perhaps they were in some reproductive association.

Mean linear encounter rates for Common Palm Civet were 0.35 animals/km (SE \pm 0.17) in Phnom Samkos WS and 0.39 animals/km (SE \pm 0.21) in Veun Sai–Siem Pang CA. These figures do not necessarily indicate a proportionate difference in density, because sighting distances along and between transects were not uniform.

Discussion

In the two study areas only three of Cambodia's seven civet species were found, echoing previous spotlighting studies: Streicher (2010), in Veun Sai–Siem Pang CA, also only confidently identified *P. hermaphroditus* although both *Viverra zibetha* and *V. megaspila* were subsequently camera-trapped at the site (BR pers. obs.). Starr (2012), in Monduliri Province for two years, only encountered *P. hermaphroditus* and possibly *Paguma larvata*. We certainly encountered *P. hermaphroditus* 'commonly' at both sites, but many civets' general *Red List* categorisation as LC is based on minimal field data: many nocturnal studies do not attempt to quantify their abundance.

Because detection varies between species, habitat types, observers and environmental conditions (Anderson 2001), for comparable results, survey methods should be standardised (Struhsaker 1981, Peres 1999). Density calculations are best achieved using DISTANCE software, which incorporates the probability of detection function (Buckland *et al.* 1993). This study's intended use of DISTANCE sampling for civet densities was prevented by the low number of encounters: 60–80 independent sightings, and never less than 40 are required (Buckland *et al.* 1993, 2001). Such sample sizes are frequently impossible to generate in nocturnal transect surveys of small carnivores in tropical forest (e.g. Mathai *et al.* in prep.).

Iseborn (2011) interviewed villagers from two ethnic groups, the Kavet and Lao, regarding their knowledge and atti-

tudes towards animals living in the Veun Sai–Siem Pang CA (42 hunters and 20 non-hunters, aged 17–67 years). Civets were never placed by hunters in the top ten desired prey species, nor were they mentioned in the context of traditional medicine use. Other relatively obscure nocturnal animals, including pangolins *Manis*, various lizards and snakes, and lorises, were preferred by hunters, reflecting their higher economic value. Despite this, non-target species were said usually to be caught when observed, suggesting that opportunistic offtake of civets may be high.

Apart from a Leopard Cat *Prionailurus bengalensis* in a tree in the dipterocarp forest in Phnom Samkos WS, no other small carnivore species were encountered directly. Only a few other nocturnal species were seen from transects (Phnom Samkos WS first, Veun Sai–Siem Pang CA second): Bengal Slow Loris *Nycticebus bengalensis* (n = 9, 0), Pygmy Loris *N. pygmaeus* (n = 0, 5), Indian Giant Flying Squirrel *Petaurista philippensis* (n = 3, 1), Lesser Chevrotain *Tragulius kanchil* (n = 15, 7) and Red Muntjac *Muntiacus muntjak* (n = 1, 0). In Phnom Samkos WS, muntjacs were frequently seen and heard out of survey time.

Hunting remains a chief threat to wildlife in Cambodia. Not only were head-torches, which facilitate nocturnal hunting, readily available at markets and small shops around both sites, but also traditional snares were seen in hunter's houses, and many people could be observed with domestic dogs *Canis familiaris*, with which they also hunted. Future nocturnal surveys in Cambodia should attempt to quantify civet abundance. The paucity of quantitative data from the region and the strong evidence of hunting urge more research to clarify nocturnal mammal conservation status in Cambodia. Further explorations into local ecological knowledge might clarify why at least some nocturnal mammal taxa in the country seem to occur at consistently low densities.

Acknowledgements

We would like to thank T. Eastoe, O. Nelson, T. Wood, E. Woodfield and the staff of the Cambodian branches of Conservation International and Fauna & Flora International as well as Ministry of Environment and Cambodian Forestry Administration for allowing access to the sites and their assistance with the logistics of carrying out the study. We are grateful to J. Mathai for his constructive comments and suggestions and to J. W. Duckworth for his advice during the writing process. We would also like to thank N. Hon for the translation and C. Coudrat and N. Hon for their contribution to the map. Funding was provided by Primate Society of Great Britain, Primate Conservation Inc. and Oxford Brookes University MSc Primate Conservation.

References

- Anderson, D. R. 2001. The need to get the basics right in wildlife field studies. *Wildlife Society Bulletin* 29: 1294–1297.
- Ashwell, D. & Walston, N. 2008. *An overview of the use and trade of plants and animals in traditional medicine systems in Cambodia*. TRAFFIC Southeast Asia, Greater Mekong Programme, Hanoi, Vietnam.
- Buckland, S. T., Anderson, D. R., Burnham, K. P. & Laake, J. L. 1993. *Distance sampling: estimating abundance of biological populations*. Chapman and Hall, London, U.K.
- Buckland, S. T., Anderson, D. R., Burnham, K. P., Laake, J. L., Borchers, D. L. & Thomas, L. 2001. *Introduction to Distance sampling*. Oxford University Press, Oxford, U.K.
- Ceballos, G. & Ehrlich, P. R. 2002. Mammal population losses and the extinction crisis. *Science* 296: 904–907.

- Claridge, G., Chea-Leth, V. & Van Chhoan, I. 2005. *The effectiveness of law enforcement against forest and wildlife crime: a study of enforcement disincentives and other relevant factors in South-western Cambodia*. Conservation International, Phnom Penh, Cambodia.
- Coudrat, C. N. Z., Rogers, L. D. & Nekaris, K. A. I. 2011. Abundance of primates reveals Samkos Wildlife Sanctuary, Cardamom Mountains, Cambodia as a priority area for conservation. *Oryx* 45: 427–434.
- Daltry, J. & Momberg, F. 2000. *Cardamom Mountains biodiversity survey 2000*. Fauna & Flora International, Cambridge, U.K.
- Duckworth, J. W. 1997. Small carnivores in Laos: a status review with notes on ecology, behaviour and conservation. *Small Carnivore Conservation* 16: 1–21.
- Francis, C. M. 2008. *A field guide to the mammals of South-east Asia*. New Holland, London, U.K.
- Gray, T. N. E. & Phan C. 2011. Habitat preferences and activity patterns of the larger mammal community in Phnom Prich Wildlife Sanctuary, Cambodia. *Raffles Bulletin of Zoology* 59: 311–318.
- Gray, T. N. E., Pin C. & Pin C. 2010. Status and ecology of Large-spotted Civet *Viverra megaspila* in eastern Cambodia. *Small Carnivore Conservation* 43: 12–15.
- Grismer, L. L., Neang T., Chav T., Wood, P. L., Oaks, J. R., Holden, J., Grismer, J. L., Szutz, T. R. & Youmans, T. M. 2008. Additional amphibians and reptiles from the Phnom Samkos wildlife sanctuary in northwestern Cardamom Mountains, Cambodia, with comments on their taxonomy and the discovery of three new species. *Raffles Bulletin of Zoology* 56: 161–175.
- Holden, J. & Neang T. 2009. Small carnivore records from the Cardamom Mountains, Southwestern Cambodia. *Small Carnivore Conservation* 40: 16–21.
- Iseborn, T. 2011. *Preliminary field survey of Pygmy Slow Loris (Nycticebus pygmaeus) and Bengal Slow Loris (Nycticebus bengalensis); assessment of hunting pressure and local attitudes towards the two species in Veun Sai Forests, Cambodia*. Oxford Brookes University (MSc thesis), Oxford, U.K.
- IUCN 2011. *2011.2 IUCN Red List of Threatened Species*. <<http://www.iucnredlist.org/>>. Downloaded on 16 January 2012.
- Long, B. & Swan, S. R. 2000. *Cambodian primates: surveys in the Cardamom Mountains and North-east Mondulki Province*. Fauna & Flora International, Hanoi, Vietnam.
- Mathai, J. *et al.* in prep.. How useful are transect surveys for studying carnivores in the tropical rainforests of Borneo?
- Momberg, F. & Weiler, H. (eds) 1999. *Conservation status of the Cardamom Mountains in South-western Cambodia: preliminary studies*. Fauna & Flora International, Hanoi, Vietnam.
- Myers, N., Mittermeier, R. A., Mittermeier, C. G., da Fonseca, G. A. B. & Kent, J. 2000. Biodiversity hotspots for conservation priorities. *Nature* 403: 853–858.
- Peres, C. A. 1999. General guidelines for standardizing line-transect surveys of tropical forest primates. *Neotropical Primates* 7: 11–16.
- Platt, S. G., Heng S., Long K., Thorbjarnarson, J. B. & Rainwater, T. R. 2004. Population status and conservation of wild Siamese Crocodiles (*Crocodylus siamensis*) in the Tonle Sap Biosphere Reserve, Cambodia. *Natural History Bulletin of the Siam Society* 52: 133–149.
- Schank, C., Pollard, E. H. B., Sechrest, W., Timmins, R. J., Holden, J. & Walston, J. 2009. First confirmed records of Large-toothed Ferret Badger *Melogale personata* in Cambodia, with notes on country records of *Melogale*. *Small Carnivore Conservation* 40: 11–15.
- Starr, C. 2012. *Conservation and ecology of the Pygmy Loris (Nycticebus pygmaeus) in Eastern Cambodia*. University of Queensland (PhD thesis), Brisbane, Australia.
- Starr, C. R., Nekaris, K. A. I., Streicher, U. & Leung, L. K.-P. 2010. Traditional use of slow lorises (*Nycticebus bengalensis* and *N. pygmaeus*) in traditional medicines in Cambodia as an impediment for their conservation. *Endangered Species Research* 12: 17–23.
- Starr, C., Nekaris, K. A. I., Streicher, U. & Leung L. K.-P. 2011. Field surveys of the Vulnerable Pygmy Slow Loris *Nycticebus pygmaeus* using local knowledge in Mondulki Province, Cambodia. *Oryx* 45: 135–142.
- Streicher, U. 2010. *Field survey for lorises and civets in Veun Sai Forests, Ratanakiri Province, Cambodia*. Conservation International and Forestry Administration, Phnom Penh, Cambodia.
- Struhsaker, T. T. 1981. Census methods for estimating densities. Pp. 36–80 in National Research Council (ed.) *Techniques for the study of primate population ecology*. National Academy Press, Washington D.C., U.S.A.
- Walston, J. L. & Duckworth, J. W. 2003. The first record of Small-toothed Palm Civet *Arctogalidia trivirgata* from Cambodia, with notes on surveying this species. *Small Carnivore Conservation* 28: 12–13.
- Walston, J., Davidson, P. & Men S. 2001. *A wildlife survey of southern Mondulki province, Cambodia*. Wildlife Conservation Society, Phnom Penh, Cambodia.

¹Nocturnal Primate Research Group, Faculty of Humanities and Social Sciences, Oxford Brookes University, OX3 0BP, Oxford, U.K.

²Conservation International, PO Box 1356, Phnom Penh, Cambodia.
Corresponding author email: tiseborn@yahoo.com