

CONSERVATION STATUS OF SMALL ASIAN MONGOOSE
HERPESTES JAVANICUS (É. GEOFFROY SAINT-HILAIRE, 1818)
(MAMMALIA: CARNIVORA: HERPESTIDAE) IN LAO PDR

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ABSTRACT. – Small Asian Mongoose *Herpestes javanicus* (É. Geoffroy Saint-Hilaire, 1818) is not much recorded through conventional (evergreen-forest-centred) wildlife surveys in South-east Asia, and available literature contains few records from Lao PDR. Collating records from the country reveals a wide distribution in the lowlands of its centre and south, and persistence in areas whence most other wild mammals (other than murids and bats) have been eradicated, including extensive farmland and suburban areas. Records from largely natural habitats are in or adjacent to deciduous biomes: the species is indeed rare in or absent from evergreen forests, hence the paucity of records during conventional survey. It evidently survives through rather evasive behaviour, and while populations may be much below carrying capacity, the paucity of records does not reflect a cause for conservation concern. It remains unclear whether the species inhabits the extensive hill and mountain ranges of Lao PDR.

KEY WORDS. – Distribution, habitat use, hunting pressure, Javan Mongoose, Laos.

INTRODUCTION

The Small Asian Mongoose *Herpestes javanicus* (É. Geoffroy Saint-Hilaire, 1818) s.l. is a pest species in many areas outside its native Asian range, so has been well studied in such regions (e.g., Nellis, 1989; Simberloff et al., 2000 and references therein). However, it is unlikely that *H. javanicus* sensu lato (constituted sensu, e.g., Corbet & Hill, 1992), contains only one species (Taylor & Matheson, 1999; Veron et al., 2006), and the introduced populations belong to, and nearly all of the field research concerns, the segregate Small Indian Mongoose *H. auro punctatus* (Hodgson, 1836). Considerably less information is available for Javan Mongoose *H. javanicus* sensu stricto, which is believed to be the form across most of South-east Asia (Veron et al., 2006). Within the latter region, a recent review of mammal status in Lao People's Democratic Republic (Lao PDR; Laos) stated that the species is "apparently rather local: Duckworth (1997) traced few [only 13–14] recent records, and Delacour (1940) no historical ones" (Duckworth et al., 1999: 192).

(In fact there are two hitherto not explicitly published specimens, from 1932; see below.) A more recent review of small carnivores from neighbouring Myanmar (Than Zaw et al., 2008) did not record Small Asian Mongoose (both '*H. auro punctatus*' and *H. javanicus* sensu stricto may occur there; Veron et al., 2006) at all during extensive camera-trapping at sites spread across the country, although it is a pest around Yangon, and concluded (p. 21). that the "lack of camera-trap records reflects the focus on tall forest habitat...in mainland Southeast Asia it lives mainly in deciduous forests and secondary, semi-open, habitats, with few, if any, records from closed evergreen or semi-evergreen forest (Wells, 1989; Duckworth, 1997; R. J. Timmins verbally, 2006)". This opens a potential conservation concern, at least in Lao PDR, because species not supported by (semi-)evergreen forest are exposed, throughout their range in the country, to very high hunting levels, and many have been effectively eradicated from large parts of the country. This includes generally robust birds such as crows *Corvus* Linnaeus, 1758, and mynas *Acridotheres* Vieillot, 1816 (Fuchs et al.,

2007), which often reach pest proportions in other parts of tropical Asia. And thus, among small cats, the Jungle Cat *Felis chaus* Schreber, 1777, is probably the rarest species in Lao PDR, because, although it is not the only one which lives outside tall forest, it is regionally unique in that it does not have reservoir populations in such habitat (Duckworth et al., 2005).

Lao PDR is a landlocked South-east Asian country of 236,800 km² with a human population density relatively low by regional standards, but growing fast. Semi-evergreen or evergreen forest is the climax habitat in most areas, with extensive deciduous forest mainly in the centre and south (Vidal, 1956–1960). Most of the north ('the northern highlands') is rugged terrain, as is the eastern boundary formed by the spine of the Annamite mountains. Plains occur beside the River Mekong (which forms much of the country's western border) and its major affluents. Lao PDR has been estimated to retain about 41.5% forest cover (Department of Forestry, 2005), a relatively high figure for tropical Asian countries. Up to 1950 mammals were collected only patchily, and little reliable information was generated between 1950 and 1988. During 1989–1998, many areas of the country were surveyed for large (= identifiable without invasive survey) mammals (including small carnivores), birds, habitat condition and human use of natural resources, and surveys continue at reduced levels.

This review collates records of Small Asian Mongoose *Herpestes javanicus* sensu lato from Lao PDR to assess its national conservation status, with particular attention to determining habitat use and reflection of the possible causes why relatively few records are generated during typical wildlife survey.

SURVEY AREA AND METHODS

Recent wildlife surveys covered Lao PDR from the far north to the far south (Fig. 1) and focussed on large (>1,000 km²) tracts of little-encroached forest that were declared or potential National Protected Areas (NPAs; see Berkmüller et al., 1995; Robichaud et al., 2001). Each survey area was typically visited only once, for a few weeks to, at most, a few months (see timings and effort levels in Timmins & Duckworth, 1999: Table I, Timmins & Duckworth, 2008: Table 1). Data were also gathered on wildlife occurrence outside these formal survey areas opportunistically whenever possible, e.g., during leisure time, on journeys, and when based in towns and villages.

Field activity was prioritised towards globally and regionally (near-)threatened species, but many data were generated about other species, such as mongooses, in the process. The surveys were based around extensive diurnal direct field observation, which is probably the most time-efficient technique for understanding the coarse distribution and abundance of mongooses in the context of a general wildlife survey: although we traced no large-sample study, all evidence suggests that *H. javanicus* sensu stricto is overwhelmingly

diurnal (e.g., Lekagul & McNeely, 1977; Suzuki et al., 2006), and '*H. auropunctatus*' certainly is (Nellis, 1989). Over 300 person-weeks of direct observation were undertaken by the end of 1998 (Timmins & Duckworth, 1999: Table I). During survey, animals were sought opportunistically, to maximise chances of finding rare species. Only records of direct sightings of live animals or their remains are included. Lao PDR supports many species of small carnivore (Duckworth, 1997) and there has been no demonstration that village reports or field signs (tracks, faeces) of mongooses can reliably be identified to species or even, by at least most surveyors, to genus. In particular, although the Lao name *chon fon* is often associated with mongooses, both JWD and W. G. Robichaud (in litt. 2009) have seen it used for the superficially somewhat similar Stripe-backed Weasel *Mustela strigidorsa* Gray, 1853.

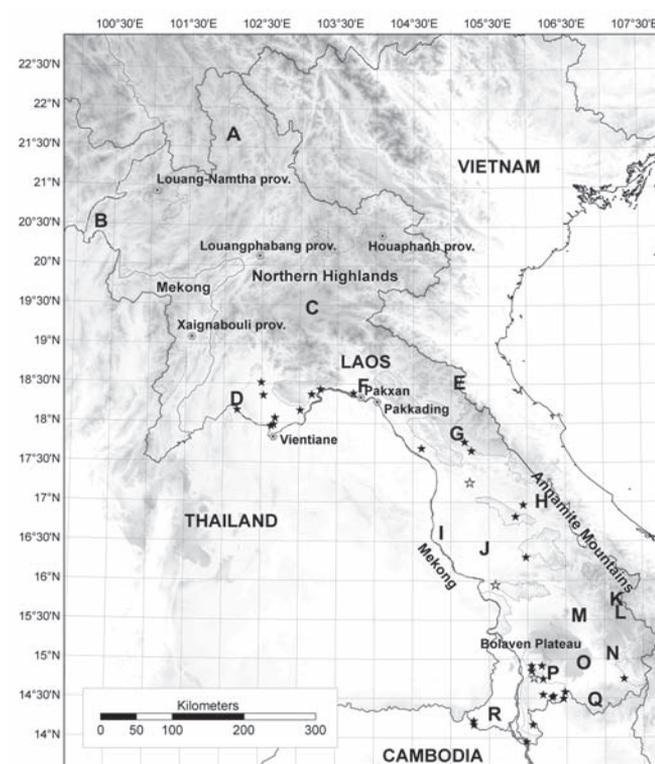


Fig. 1. Lao PDR, with locations of post-1990 Small Asian Mongoose records, survey areas, and sites mentioned in the text. Filled stars: confirmed records; open stars: provisional records. Increasing altitude is represented by increasing darkness: areas of level terrain are therefore areas of uniform shading. Dotted outlines indicate national protected areas (all surveyed to at least some extent). Survey areas outside NPA system: A, Phongsali town and surrounds; B, Upper Lao Mekong and Bokeo plain; C, Xiangkhouang plateau, Phou (= Mount) Gnouan and Phou San; D, Muang (= District) Sangthong, Vientiane municipality; E, Nam Theun Extension proposed NPA (= former Nam Chat–Nam Phan provincial protected area); F, Pakxan wetlands; G, Nakai plateau; H, Muang Vilabouli, Savannakhet province; I, western Savannakhet lowlands and Mekong; J, central Savannakhet lowlands; K, Phou Ahyon; L, Dakchung plateau; M, Salavan town and surrounds; N, Phou Kathong proposed NPA; O, Xe (= River) Namnoy catchment and Bolaven Southwest proposed NPA; P, Muang Pathoumphon, Champasak province; Q, Nam Ghong provincial protected area; R, Dong Khanthung proposed NPA. In addition various sites around Vientiane received at least moderate coverage.

Table 1. Records of *Herpestes javanicus* from Lao PDR.

Location; co-ordinates; altitude ¹	Date; time	Habitat ¹	Reference ²
Ban Thalot, Vientiane province; 18°31'N 102°30'E; 180 m	19 Sep.2008; 17h00	Edge of village amid hai fields and secondary scrub; pre-clearance forest-type unclear	A. Johnson*
Nong Fangdeng, Vientiane province; 18°24'N 102°29'E; 170 m	20 Jul.2009; 10h25	in scrub-strip between swamp and cornfield; pre-clearance forest deciduous	JWD
PK 105 on route 13, Bolikhamxai province; 18°26'N 103°17'E; 150 m	1 Dec.2007; 13h25	On main road amid rice paddies and tanks; pre-clearance forest-type unclear	A. Johnson*
PK 155 on route 13, Bolikhamxai province; 18°23'N 103°43'E; 150 m	28 Sep.2008; 15h55	On main road amid rice paddies; pre-clearance forest-type unclear.	J. W. K. Parr*
Ban Thabok substation, adjacent to Phou Khaokhoay NPA; 18°22'N 103°10'E; 160 m	within 1996–2000; afternoon	Road through tree-lined agriculture; pre-clearance forest-type unclear	J. W. K. Parr*
Ban Kokhe, Muang Sangthong, Vientiane municipality; 18°10'N 102°11'E; 190 m	27 Nov.2005; 16h00	A bund in dry rice paddies close to secondary scrub; degraded semi-evergreen and deciduous forest nearby	RJT & TT*
Nong My, Muang Pakngum, Vientiane municipality; 18°10'N 103°01'E; 140 m	2 Feb.2009; 08h00	Under pool-side bamboo amid degraded deciduous dipterocarp forest	JWD
Houay Nhang Nature Reserve; ~18°04'N, 102°41'E; 175 m	1992; daytime	Area: degraded fragment of deciduous and semi-evergreen forest amid ricefields	Duckworth, 1997; K. P. Berk Müller*
Ban Sokkham, Muang Xaisettha, Vientiane town; 17°59'N 102°40'E; 165 m	In or before 2004; daylight, c.4 Jul.2010; 16h30	Interface of a garden with secondary woodland; pre-clearance forest-type unclear; peri-urban	T. E. Hansel*
Ban Saphangmo, Vientiane town; 17°58'N 102°38'E; 165 m	Oct. or Nov. 2007; 17h30	On a paved road between rice paddies and scrub; pre-clearance forest-type unclear; peri-urban	A. Johnson*
Ban Don (relocation site) ³ , Nakai plateau; 17°40'N 105°15'E; c.530 m	31 Jan.2007; n/a	Area: mix of semi-evergreen and deciduous forest, with much agriculture	Dersu, 2008 ⁴
Nong Bian, Nakai plateau; 17°46'N 105°11'E; 530 m	3 Feb.2007; 15h30	Coarse tussock-grass of grazed seasonally dry marsh, amid secondary semi-evergreen and deciduous forest	Dersu, 2008; RJT
Route 13 near Nong Hoy, Khammouan province; 17°41'N 104°37'E; 160 m	25 Apr.1995; 11h00	On a newly resurfaced main road amid ricefields, scrub and relict deciduous forest	Duckworth, 1997; JWD*
[Dong Phouxoy PFA, Khammouan province; ~ 17°15'N 105°15'E; lowland]	[5 Apr.2005]	[Non-forest patch amid deciduous forest, far from village]	Poulsen et al., 2005
Muang Vilabouli market, Savannakhet province; 16°58'N 105°57'E; n/a	5 Dec.2008; n/a	Not known; procured in town market, evidently sourced locally	K. P. Aplin ⁴
Ban Phongsavang, Phou Xang He NPA; 16°49'N 105°51'E; 200 m	27 Mar.1993; c.07h00	Scrub amid degraded mixed deciduous forest	Duckworth, 1997; RJT
Near Keng Samat, Dong Phou Viang NPA; 16°18'N 105°59'E; 150 m	6 Nov.2007; 15h35	Thick pek bamboo <i>Vietnamosasa</i> (= <i>Arundinaria</i>) <i>pusilla</i> understorey of deciduous dipterocarp forest	JWD*
[West of Keng Sung near Xe Bang-Nouan, Xe Bang-Nouan NPA; 15°57'N 105°35'E; 250 m]	[30 May1994; daylight]	[Degraded lowland forest, mostly deciduous]	Duckworth, 1997; RJT
Ban Nongpop, Dong Hua Sao NPA; 14°55'N 106°03'E; 200 m	4 Jul.1993; c.07h30	Degraded mixed deciduous forest	Duckworth, 1997; RJT
Ban Houayton, Dong Hua Sao NPA; 14°55'N 106°11'E; 280 m	8 Jul.1993; afternoon	In scrub by a rice field, surrounded by degraded semi-evergreen and mixed deciduous forest	Duckworth, 1997; RJT
Ban Thongpa, Muang Pathoumphon, Champasak province; 14°51'N 106°03'E; 140 m	16 Dec.2007; 15h40	Bamboo, ruderals and cultivation, c.300 m from houses; amid degraded mixed deciduous–semi-evergreen forest	JWD
Xe Xou lowlands, Dong Ampham NPA; ~ 14°45'N, 107°15'E; 145–250 m	16 Jan.1997	Grass in a degraded mosaic of semi-evergreen and deciduous forest	Davidson et al., 1997; D. Davenport

Table 1. Cont'd.

Location; co-ordinates; altitude ¹	Date; time	Habitat ⁴	Reference ²
[Ban Kele-2, Xe Pian NPA; 14°46'N 106°05'E; 150 m]	[16 Jan.2008; 16h10]	[In tall <i>Sesbania</i> of a drying pool amid severely degraded deciduous forest, c.500 m from village houses]	JWD
Near Bung-Gnai Kiatngong, Xe Pian NPA; 14°45'N 106°12'E; 150 m	3 Jan.1993; mid-day	Paddies bordering mixed deciduous forest	Duckworth, 1997; RJT
Houay Kua, Xe Pian NPA, 14°36'N 106°13'E, 140 m	within 1–7 Feb.1997; daylight	Area: little-encroached semi-evergreen forest	R. Steinmetz in litt., 2008
4 km north-east of Ban Somпой, Xe Kong Plains, Xe Pian NPA; ca. 14°38'N 106°29'E; 80 m	within 19–25 Apr.1991	Riverine vegetation by the Xe Kong; amid deciduous dipterocarp forest	Cox et al., 1991
Xe Khampho, Xe Kong Plains, Xe Pian NPA; 14°32'N 106°20'E; 80 m	1 Mar.1993; 17h00	On a sandbar across the river; flanked by mixed deciduous forest amid deciduous dipterocarp forest	Duckworth, 1997; T. D. Evans
Nong Puler, Xe Kong Plains, Xe Pian NPA; 14°31'N 106°19'E; 80 m	1 and 12 Mar.1993; daytime	Beside pool amid deciduous dipterocarp forest	Duckworth, 1997; RJT
Ban Somпой, Xe Kong Plains, Xe Pian NPA; 14°34'N 106°28'E, 90 m	21 Sep.1996; n/a	Drowned during heavy floods; in a water-filled boat on the river Xe Kong, amid deciduous dipterocarp forest	TT*
Houay Kaling, Xe Pian NPA; ~ 14°10'N, 106°04'E; within 90–120 m	within 9–13 May1991	Area: pool-studded deciduous dipterocarp forest	Cox et al., 1991
South-west of Ban Khiam, Dong Khanthung; ca. 14°13'N 105°18'E; 100 m	3 May1996; daylight	Ran across a road through scrub amid mostly deciduous dipterocarp forest	Duckworth, 1997; RJT
Houay Asam, near Ban Khem, Dong Khanthung, Champasak province; 14°13'N 105°18'E; 100 m	12 Feb.1998; daylight	Area: mostly deciduous forest with small areas of evergreen and cultivation	Round, 1998
Ban Khem and the border nongs, Dong Khanthung; ca. 14°10'N 105°18'E; 100 m	27–31 Mar.1997	Area: pool-studded deciduous dipterocarp forest	Wolstencroft, 1998
Khongphapheng falls; 13°57'N 105°59'E; 70 m	7 Feb.1993; daytime	Mekong riverside scrub; adjacent forest largely deciduous	Duckworth, 1997; RJT*

Records are listed north to south, then west to east, with some modification to keep those from each conservation management unit together. Lao-language elements in these place names: Ban = village of; Bung = swamp; Houay = stream; Nam = river; Keng = rapids; Muang = district of; Nong = pool or marsh; PK = point kilometrique; Xe = river.

¹ Square-bracketed records are provisional identifications. NPA = National Protected Area; PFA = Production Forest Area. Where the exact location is not available, the co-ordinates are preceded by the symbol ~, and the habitat is preceded by "Area:". Some altitudes have been corrected from Duckworth (1997). All records are single sightings which noted only single animals except 'P.K. 155' (duo); 'Houay Kaling' (seen on 1–3 occasions); and 'Ban Khem and the border nongs' (apparently seen several times). Because many animals were flushed and fled immediately, opportunity to assess true group size was usually low.

² An asterisk (*) indicates a record outside formal wildlife survey.

³ Reportedly dug from burrow, then killed by dog, about 2 km east of village.

⁴ Specimen now held at Australian National Wildlife Collection, Canberra.

RESULTS AND DISCUSSION

All recent field records of *H. javanicus* traced from Lao PDR are listed in Table 1. Most surveys (Fig. 1; references to reports in Timmins & Duckworth, 2008: Table 1) did not record this mongoose. Many records (12) came as incidental sightings outside formal wildlife survey. Little information from Lao PDR dates from before 1990. Only two extant historical specimens were traced: T. D. Carter collected singles on 31 January and 3 February 1932, under the broad locality of the Bolaven plateau, now held in the American Museum of Natural History (AMNH 87389 and 87390; all information D. P. Lunde in litt., 2006). AMNH 87389 is labelled as 2,500 feet (= 800 m) (D. P. Lunde in

litt., 2008). This is the generally used altitude for Thateng (15°26'N 106°23'E), where the expedition was based when on the Bolaven during which local people "poured in" through the gates bringing specimens (Legendre, 1932: 495); therefore the actual collection altitude cannot be known. Anon. (1962a, 1962b) listed a specimen from the Vientiane plain about 25 km along the road from Vientiane to Louangphabang (~18°09'N 102°30'E; ~170 m); this has probably perished. Deuve (1972) listed *H. javanicus* sensu stricto for all provinces bordering the Mekong and *H. auropunctatus* for four Mekong-side provinces in the north and centre; while it is indeed plausible that Small Asian Mongoose inhabited all the listed provinces, nothing can be done with these records, or with the assertion that both

species occur sympatrically in Lao PDR, given his major errors even with readily identified species (e.g., Timmins & Duckworth 1999). In addition, J.-P. Pédrone (verbally, 2008), intermittently resident in Vientiane for decades, often noted mongooses, most or all this species, crossing roads on the Vientiane plain and south to about Pakkading (18°20'N 103°59'E; ~150 m) in the 1950s–1960s.

Geographical distribution, altitudinal range and biotopes.

– This spread of records (Fig. 1) shows that *H. javanicus* is widespread in lowland Lao PDR on and south of the Vientiane plain. The several generalised distribution maps showing it to occur throughout Lao PDR (e.g., Nellis, 1989) must have been based on assumption because no records can be traced for Lao PDR significantly north of Vientiane; that plotted in Veron et al. (2006: Fig. 2) for far northern Lao PDR is an error for Quang Tri, central Vietnam (G. Veron in litt., 2008). All Lao records with known altitude come from at or below 300 m, excepting those from the Nakai plateau at about 530 m: this plateau supports various lowland mammals and birds at atypically high altitude (Evans & Timmins, 1998; Khounbolin, 2005; Dersu, 2008). Given the heavy recent survey effort in hills and mountains, it seems that in Lao PDR *H. javanicus* occurs at least predominantly in the lowlands, even though elsewhere in its native range it can occur up to at least 2,100 m (Simberloff et al., 2000).

The records in little-encroached habitats were from open deciduous forests, but more records came from outside forest, in fairly- to severely degraded habitat at point of sighting: some sites were entirely anthropogenic. Only one record was certainly within evergreen or semi-evergreen forest, despite very heavy survey effort of such habitats in recent decades: in the Houay Kua area of Xe Pian NPA (R. Steinmetz in litt., 2008). This is within a few kilometers of the extensive deciduous Xe Kong plains, which provided many records; and Xe Pian NPA's semi-evergreen forests, heavily surveyed in 1992–1993 without any records of the mongoose, have generated occasional records of other mammals, such as Berdmore's Squirrel *Menetes berdmorei* (Blyth, 1849) and Small Indian Civet *Viverricula indica* (É. Geoffroy Saint-Hilaire, 1803), more typical of deciduous forests (Duckworth et al., 1994). Evidently open deciduous forest is this mongoose's natural habitat in Lao PDR, and, combining this with reports from Malaysia, Thailand and Myanmar (Wells, 1989; Austin & Tewes, 1999; Than Zaw et al., 2008), it is clear that this mongoose actively avoids evergreen and even semi-evergreen forest, at least in these parts of its range. Evergreen and semi-evergreen forests were listed by Robertson (2007) as habitats supporting the species in Vietnam, but the number of records on which this was based, and how many, if any, such records came from solely evergreen landscapes far from any deciduous areas, was not given. The relatively few records of the mongoose from little-encroached open deciduous forest compared with the number from disturbed areas suggests that, in Lao PDR, it is naturally an edge (including watercourse) species even within deciduous forest.

A lowland distribution in Lao PDR would reflect the general rarity of deciduous forest in the country above 500 m (Timmins et al., 1998), although this does occur locally in the north-west (Vidal, 1956–1960), in areas so far barely surveyed for wildlife. North of Vientiane most land is rugged and lies above 300 m, even much of the course of the Mekong. Human activity has, however, provided vast areas of scrub and ruderals across Lao PDR's northern highlands, as it has in other highland areas such as the Bolaven plateau and Annamite spine, which would appear to be superficially suitable. Forests of the northern highlands are relatively well surveyed, but non-forest habitats there are not. Survey effort in the latter (detailed in Duckworth et al., 2002; Fuchs et al., 2007) has been just about low enough that *H. javanicus* might simply have been overlooked by chance. However, K. Aplin (in litt. 2008; see Aplin et al., 2006) "spent several months, in all, wandering around upland fields and forest edge habitats in Louangphabang, Louang-Namtha and Xaignabouli provinces, without seeing a single mongoose" and "also received large collections of heads taken from snared mammals in such habitats of Houaphanh province, again with no mongooses". Similarly, A. Johnson (verbally, 2008) has, in the course of administrating conservation projects within forest, travelled by car many hundreds of miles through degraded habitat and spent many hours within it around Nam Ha and Nam Et–Phou Louey NPAs, without ever seeing a mongoose. In adjacent Vietnam, Robertson (2007) traced several records from the general area of the northern highlands, but their density is (by eye) noticeably lower than in the predominantly lowland regions of the country (his Fig. 3.11w); moreover, as the highest altitude Vietnam record traced was 400 m (p. 76), there is no evidence for occurrence in the northern highlands of Vietnam (rather than lowland parts of this area) yet, either.

Abundance and resilience to human pressure. – At no site was *H. javanicus* commonly seen, but because most surveys focussed on little-degraded (semi-)evergreen forest, i.e. habitat not holding the species, only relatively few records would be expected even were it common in Lao PDR. This is exemplified by the Nakai plateau: this had 24 person-weeks of direct-observation survey in 1994–1996, placing it among the then most intensively surveyed sites in Lao PDR, but *H. javanicus* was not recorded (Timmins & Duckworth, 1999; Evans et al., 2000). A survey in 2007 involved several person-weeks specifically attending to habitats other than (semi-)evergreen forest and its rivers; it recorded nine large mammal species not previously known from the plateau, of which four, including this mongoose, are typical in Lao PDR of deciduous biotopes (Dersu, 2008). Therefore, *H. javanicus* may also have been overlooked in some or even many of the other areas surveyed during 1990s. By contrast, in all the 1990s survey areas where surveys spent significant time (at least several person-weeks) in deciduous biotopes, there were multiple records of *H. javanicus*: Xe Pian NPA, Dong Hua Sao NPA and the Dong Khanthung proposed NPA.

Anthropogenic habitats were, through assumed low conservation significance, little surveyed during the 1990s. This is best shown by the variety of bird species of such habitats then overlooked; status understanding still lags

well behind that of forest species (Duckworth, 2007; Fuchs et al., 2007). Although it is difficult to quantify the overall survey effort, *H. javanicus* records seem surprisingly few in such habitats. Sighting rates are genuinely low at least in Vientiane: none was recorded during about 170 mornings (each of 2–6 hours' duration) of direct-observation bird survey at multiple sites in and around Vientiane during 2003–2005 (locations in Duckworth, 2007), while T. E. Hansel (in litt., 2010) has lived in the same garden in outer Vientiane for years, keeping chickens (which might be assumed to attract mongooses), but has observed the species there only twice.

The extent to which the overall low sighting rate reflects a small population is debatable. Many individuals were remarkably shy (but some were not, e.g., that at PK 105 crossed route 13 only 15 m in front of a vehicle), and no doubt such behaviour allows *H. javanicus* to persist in the face of hunting heavy enough to have exterminated many other mammal and bird species widely in Lao PDR. Several records [Dong Phouyoy PFA; Dong Phou Viang NPA 2007; and Muang (= District) Pathoumphon 2007–2008] came during short-duration or village-centred activities when hardly any other mammals were seen other than squirrels (most of which have survived noticeably well in Lao PDR by comparison with larger mammals; Timmins & Duckworth, 2008), and sign-searches revealed massively depleted large mammal communities. This mongoose is about the only mammal species (other than bats and murids) that may be seen from main roads in Lao PDR. Various sightings were close to villages. In sum, this mongoose evidently shows high resilience to hunting, and while today's densities are probably substantially below what the habitat matrix would support if persecution ceased, there is no reason to conclude or even suspect that the animal is actually rare, still less under threat, in Lao PDR.

It is presently not clear whether *H. javanicus* inhabits the northern highlands. Several non-forest bird species relatively common in south and central Lao PDR in the 1990s [e.g., Red-wattled Lapwing *Vanellus indicus* (Boddaert, 1783), with habitat use and distribution in south and central Lao PDR similar to *H. javanicus*] are now very rare in the north, despite historical abundance there; this presumably reflects hunting (Fuchs et al., 2007). The collection record is too poor to assess the possibility of a comparable range contraction with *H. javanicus*.

National conservation status. – Even if this mongoose is restricted to lowlands and plains, Lao PDR contains substantial areas of suitable habitat (Fig. 1); if it uses degraded highland and evergreen areas, it could inhabit the entire country. Extensive conversion and degradation of dense forest in Lao PDR since the 19th century (e.g., Department of Forestry, 2005) has certainly increased the proportion of the country suitable for the mongoose. The heavy hunting levels may be the chief threat to the species in the country. It is rare in commercial trade in Lao PDR, and was not, for example, recorded during the intensive surveys of Srikosamatara et al. (1992) in and around Vientiane,

when wildlife trade was undertaken widely and openly. It is mentioned in Noreen & Claridge's (2001) comprehensive study of trade only as an exotic 'pet' in Vientiane. Additional such records, which are overall rather few, include one in a businessmen's hotel in Pakxan (18°23'N 103°39'E) in December 1994 and two young in a cage in the back of a parked pick-up in central Vientiane on 28 April 2009. Such small levels of domestic trade could not pose any threat to Lao populations. The extent to which international trade may be, or may become, a problem is unclear. The related civets are highly traded in neighbouring Vietnam and China (e.g., Bell et al., 2004), and there are indications of such trade in Small Asian Mongooses: a confiscation of 130 was taken to Soc Son centre, Hanoi province, on 3 March 2009 (U. Streicher in litt., 2009); in 2001–2002 there was a seizure in Ninh Binh province (northern Vietnam) of c.250 reportedly en route for China and trapped in Binh Dinh province (southern Vietnam); and a nature reserve in Hoa Binh province reported releasing over 100 in 2005 that had been seized in trade (S. Robertson in litt., 2010). In southern China itself, M. W. N. Lau (in litt., 2010) and colleagues have found the species in wildlife markets in Guangzhou, but not very often and usually in relatively small numbers (from several to dozens, but occasionally over 100). These seem to be wild-caught because many have leg injuries, but whether they were caught in South China or imported is unknown.

The species is probably killed in Lao PDR, presently, primarily as by-catch in trapping, or directly shot during general leisure-time hunting and, no doubt, to protect chickens from being killed. Economic changes in Lao PDR in the last 20 years (see ICEM, 2003) have, by stimulating entrepreneurial activity, greatly reduced the amount of leisure-time hunting by urban people, leading to major rapid population rises in urban birds such as mynas *Acridotheres*, doves *Streptopelia* Bonaparte, 1855, bulbuls *Pycnonotus* Boie, 1826 and others in Vientiane, from the severely depleted populations of the early 1990s (Fuchs et al., 2007). It is likely that mongooses are also benefiting from these changes. Continued, indeed enhanced, trade investigation would help clarify the perhaps emerging risks from this factor.

CONCLUSIONS

The relative rarity of *H. javanicus* records during the intensive wildlife surveys in Lao PDR of 1992–1996 (Duckworth, 1997) has continued and reflects a survey focus on little-encroached (semi-)evergreen forest, at the expense of the deciduous forests and anthropogenic landscapes which form the main Lao habitats of this species. Low sighting rates in the anthropogenic habitats reflect a mix of evasive behaviour and, presumably, reduced densities, reflecting the intense persecution of wildlife in Lao PDR. The low densities even in the most remote deciduous dipterocarp forest are probably not driven by hunting, given that it is equally scarce in such habitats in Cambodia, where relevant forms of hunting pressure are certainly minimal (RJT, pers. obs.); they may reflect lower prey density than in agricultural

areas, or perhaps an association with surface water, although no data exist to test these speculations. Sighting locations indicate that *H. javanicus* is resilient to human pressures, and it is likely to be benefiting from recent habitat trends of forest conversion and degradation. It is not nationally at any risk of extinction. It remains unclear whether it occurs in the highlands of Lao PDR.

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