

SMALL CARNIVORE CONSERVATION



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Mustelid, Viverrid & Procyonid Specialist Group



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Otter civet (*Cynogale bennettii*) - Foto: J.W.W. Louwman

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We are particularly grateful to Walter Rasmussen for reading the manuscripts and improving the English style.

The aim of this publication is to offer the members of the IUCN/SSC MV&PSG, and those who are concerned with mustelids, viverrids, and procyonids, brief papers, news items, abstracts, and titles of recent literature. All readers are invited to send material to:

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Small carnivores in Laos: A status review with notes on ecology, behaviour and conservation

J.W. DUCKWORTH

INTRODUCTION

Among the few historical accounts of the mammals of Laos the most extensive are those of Osgood (1932) and Deuve (1972). Small carnivores remain one of the least-known groups of higher vertebrates in the country. However, Laos lies in the second most important core area identified for threatened mustelids and viverrids in the world, with five species classified as being of Conservation Concern probably occurring there: Back-striped Weasel, Spotted Linsang, Owston's Palm Civet, Lowe's Otter Civet and Large-spotted Civet (Schreiber *et al.*, 1989). Schreiber *et al.* (1989) considered the first four so little known that they were priorities for status surveys throughout their world range, but little new distributional information has been published on any of them since. Political upheavals and restrictions on visitors in the 1970's and 1980's prevented mammal observations in Laos and therefore Schreiber *et al.* (1989) considered that a national survey of threatened small carnivores was of the highest national priority.

The political climate relaxed from 1988 and a number of general wildlife surveys have since been made (Cox *et al.*, 1992; Duckworth *et al.*, 1994; Duckworth, in press b; Evans & Timmins, in prep.; Duckworth *et al.*, in press; Evans *et al.*, in prep.; Tizard *et al.*, in prep.). Most used opportunistic field observation by day as the main method and thus few small carnivores were recorded. Other methods were sometimes used, but their intensity varied widely between sites, depending on a variety of factors: most surveys were general inventories of birds and where possible large mammals and it was not appropriate to focus on individual species or groups.

In the continuing absence of the national survey specifically for threatened small carnivores suggested by Schreiber *et al.* (1989), this paper attempts to present or summarise all recent records from Laos of all species in the families Mustelidae and Viverridae. Leopard Cat, the only cat species observed frequently in Laos, is included for comparison. The scanty historical information is also summarised. As there is also a paucity of information on the general ecology and behaviour of many species, these are also discussed. Finally, a section on conservation focuses primarily on prioritising future survey needs, since assessment of other conservation aims is handicapped by lack of information on basic distribution.

The taxonomy and nomenclature follow Schreiber *et al.* (1989) except that *Herpestes javanicus* and *H. auro-punctatus* are treated as conspecific under the former name, following Wells (1989) and Corbet & Hill (1992). For species not considered by Schreiber *et al.* (1989), Corbet & Hill (1992) is followed.

BACKGROUND INFORMATION ON LAOS

Laos is a landlocked country of 236,800 sq. km with a human population of only 4.58 million (National Statistical Centre, 1995). It lies in the Indochinese subdivision of the Indomalayan Realm, almost entirely in the three sub-units known as Central Indochina (10a), North Indochina (10b) and Annam

(5b) by MacKinnon & MacKinnon (1986). The country is still comparatively well endowed with natural habitats, although habitat clearance is accelerating as the human population is expanding by 2.4% per year (National Statistical Centre, 1995). This is one of the fastest growth rates in the world and means that population density in agricultural land is near the regional average (Salter, 1993). Natural resource exploitation accounts for about 70% of the country's foreign earnings (Salter, 1993).

From October 1992 to July 1996, wildlife surveys lasting two weeks or more investigated the following areas and their surroundings (Fig. 1, Table 1): the Vientiane Forestry College Training and Model Forest in Sangthong District (TMF) (Duckworth, in press b); Phou Khao Khouay National Biodiversity Conservation Area (PKK), Nam Kading NBCA (NK), the Nakai Plateau (NP), the Xe Namnoy drainage basin (XNN) and Bolaven Southwest PPA (BSW) (Duckworth *et al.*, in press); Houay Nhang Nature Reserve (HN), Phou Xang He NBCA (PXH), Dong Hua Sao NBCA (DHS) and Xe Pian NBCA (XP) (Duckworth *et al.*, 1994); Nam Theun Extension Proposed Protected Area (NTX), Hin Namno NBCA (HNN) and Xe Sap PPA (no carnivore records) (Tizard *et al.*, in prep.), Nakai-Nam Theun NBCA (NNT) and Xe Bang-Nouan NBCA (XBN) (Evans & Timmins in prep.); Phou Xiang Thong NBCA (PXT) and Dong Kanthung Proposed Protected Area (DKT) (Evans *et al.*, in prep.). Some sites were visited more than once; the citation is to the fullest description of each. Shorter surveys and incidental observations at many other sites had limited potential to detect small carnivores.

These areas are all in the southern two-thirds of the country and information is still very limited on wildlife in Laos north of 18°40'N. Even south of this, coverage of habitats was not representative: most work was in semi-evergreen and evergreen forests in hilly terrain at low to medium altitudes. Deciduous forests, limestone areas, wetlands, higher montane areas and little-disturbed forest on the Mekong plains have all been little surveyed. Areas close to villages or of extensively degraded habitat were poorly covered, because their importance to wildlife was assumed to be lower than that of areas less affected by people, and because their habitat is under less threat.

FORESTS

Mature forest was believed to cover over 45% of Laos as late as 1993 (Salter, 1993), and this proportion, although ever dwindling, is much higher than in neighbouring Vietnam, China and Thailand (Collins *et al.*, 1991). Cambodia and Burma may retain forests of similar extent, but political instability in these countries restricts surveying and hampers establishment of a functional network of protected areas. Laos thus has a special opportunity in protection of the region's forest carnivores.

Forest cover differs greatly between the south and centre of the country and the north (Collins *et al.*, 1991). In the mountainous north, the shifting cultivation of hill-tribes has produced a mosaic of cultivation and various successional habitats, with some districts now reduced mainly to grassland by excessive burning and agriculture. Many valley bottoms are

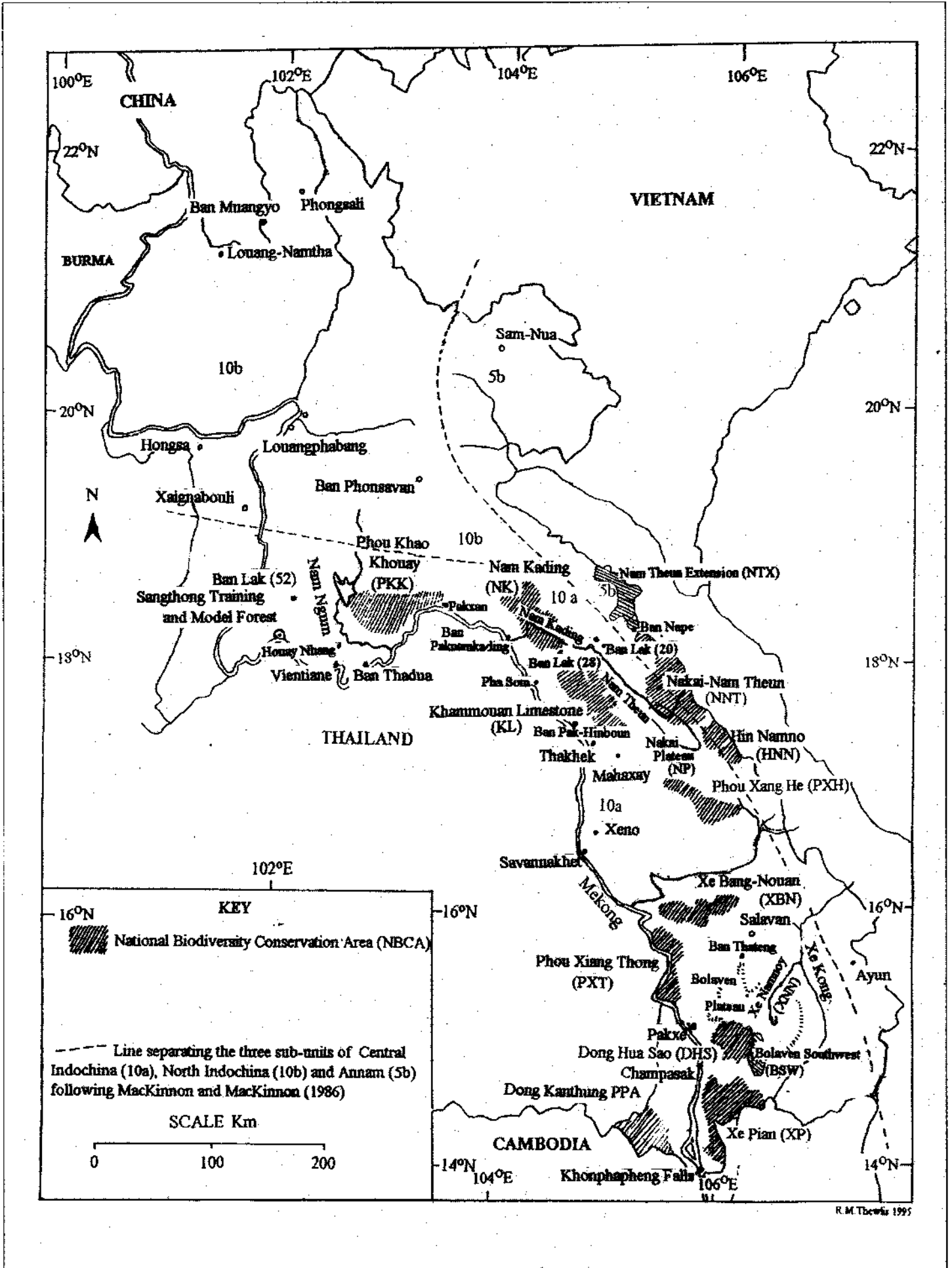


Figure 1: Laos showing most localities mentioned in the text. Some localities from historical sources have not yet been traced.

Table 1: Lao sites surveyed for wildlife in 1992-1996.

Site	Main (and maximum) altitudes surveyed / m	Area / sq. km	Dates	Survey effort / person-weeks
Vientiane Forestry College Training and Model Forest	170-250	355	February - March and June - July 1996	8
Phou Khao Khouay NBCA	500-800	1390	October - November 1994	5
Houay Nhang NR	200	8	October - November 1992	14
Nam Kading NBCA	300-800 (-1500)	1570	December 1994 - April 1995	15
Nam Theun Extension	500-1300	645	January - April 1994; April - May 1996	3 in 1994; 6 in 1996
Nakai-Nam Theun NBCA (excluding Nakai Plateau)	300-1500 (-2200)	3445	January - April 1994; May 1996	7 in 1994; 3 in 1996
Nakai Plateau (see also NNT)*	500 - 700	1400	January - May 1994; January - March 1995; February 1996	10 in 1994; 13 in 1995; 1 in 1996
Hin Namno NBCA	200-550 (-710)	765	January 1996	2
Phou Xang He NBCA	200-500 (- 800)	1140	March - April 1993	6
Xe Sap PPA	1000-1900	n/a	May 1996	2
Xe Bang-Nouan NBCA	200-700 (- 1000)	1325	June - July 1994	6
Phou Xiang Thong NBCA	100-450	995	March 1996	12
Dong Hua Sao NBCA	250-1280	900	May - July 1993, February 1996	15 in 1993; 12 in 1996
Xe Namnoy Catchment	150-850 (-1000)	800	March - April 1995	10
Bolaven Southwest PPA	150-600 (-850)	620	April 1995	2
Xe Pian NBCA	150 - 300 (- 700)	2375	November 1992 - March 1993; May 1993; May 1995, September 1996	62 in 1992-93; 2 in 1995; 1 in 1996
Dong Khanthung PPA	80-140	1000	April - May and August 1996	2

* A quarter of the Nakai Plateau lies within the Nakai-Nam Theun NBCA, but records are detailed separately here for clarity.

The size of the area to be included in Xe Sap is under review.

Only sites where surveys lasted for two weeks or more are included. Figures refer only to time where the primary focus of activity was the direct diurnal observation of wildlife. Time for other purposes (e.g. counterpart training, habitat recording, village interviewing and others) is not included as this table aims to indicate the effort against which the sightings discussed in the text should be viewed.

heavily cultivated. Only about 35% of north Laos was considered to be forest by the Lao-Swedish Forestry Co-operation Programme (1992) and little of this is in extensive blocks of primary forest. Clearance has extended well over 1,000 m on some mountains (Salter, 1993).

South and Central Laos are dominated by various ethnic groups who use permanent wet-rice cultivation, usually mixed with shifting cultivation of hill-rice and vegetables at forest-edge sites. This more site-restricted agriculture has left large forest areas intact, even in the flatter lowlands (especially south of the Bolaven Plateau), although most alluvial plains are deforested or dominated by dry dipterocarp forest. Many mountain and hill ranges retain extensive, barely encroached, forests, although the Bolaven Plateau and hill areas to its east are extensively degraded.

A wide range of forest habitats occurs in Laos which are determined by altitude, rainfall and edaphic factors. They range from upper montane forest, through semi-evergreen and mixed deciduous forest to relatively open dry dipterocarp forest. These are all described by Round (1988), who is used here as a base for forest classification. In parts of Laos, some forests as low as 300 m are predominantly evergreen, whereas in Thailand only semi-evergreen formations are found today at these altitudes (Round, 1988). In Laos they extend up to at least 1,800 m, having similarities at higher altitudes with the hill evergreen forest of Round (1988). Wet evergreen forest is not described by Round (1988) but occurs locally in eastern Laos (Evans & Timmins, in prep.). In some areas (e.g. around Ban Nalay (PXH) and in part of the middle Xe Namnoy valley) a stunted semi-evergreen forest resembling the *kerangas* of Borneo (see Whitmore, 1984) grew: trees were small (canopy below 20 m; few large stems) and

usually had small leaves. This vegetation, as with *kerangas*, probably arises from a lack of nutrients in the underlying soil. There were many other types of semi-evergreen and evergreen forests but these were not systematically distinguished at night.

WETLANDS

Much of Laos is mountainous and supports no wetlands other than rivers. Some major basins retain extensive stretches of river in good condition, but most floodplain areas have been converted to rice paddies. Remaining lakes and marshes almost all experience high levels of human use: fishing, harvesting of grasses, paddy rice farming and/or heavy grazing by domestic buffaloes. Subsistence human use of rivers is heavy and a projected massive programme of hydro-electric dam construction is likely to destroy so much riverine habitat that not one major river basin will remain intact (Berkmüller, 1995). Up to 17 dams have been proposed for the Lao part of the Xe Kong catchment alone (Japan International Co-operation Agency, 1993). The likely effects on small carnivores, even otters, are unknown, but are highly unlikely to be positive.

Despite these pressures, Laos still has regionally significant extents of three wetland types: slow-flowing lowland rivers, marshes and open woodland studded with pools. The most notable area is centred on the Xe Pian catchment but includes also other parts of the Xe Kong basin and the lowlands of Dong Hua Sao NBCA. The Nam Theun-Nam Kading system is particularly important for its riverine habitat.

LIMESTONE KARST

Limestone karst is extensive in north and central Laos (particularly in Khammouan Province). The steep topography of

karst discourages large-scale human use of the area. However, in some areas, farmers walk substantial distances across the outcrops to cultivate pockets of deeper soil. Such sites would otherwise support stands of tall forest, which may be important refuges for species ranging into poorer forest nearby.

OTHER HABITATS

Other habitats are almost all of recent artificial origin and are likely to support only carnivores whose status is of little immediate conservation concern as they are likely to have benefited from a major recent expansion of habitats.

METHODS

A variety of methods was used to maximise detection of a wide range of species but even so it is highly unlikely that the full species complement of small carnivores is not yet known for a single site in Laos.

DIURNAL FIELD OBSERVATION

The major survey method at all sites was opportunistic field observation by day (see Duckworth *et al.*, in press). Most work was on foot but whenever possible streams were travelled in hand-paddled pirogues. Observations were usually made by single observers who worked throughout the day, with a peak in the first few morning hours. Sitting and waiting (particularly at productive spots such as fruiting trees, pools etc.) was alternated with prolonged walking. Direct field observation allowed identification to species, characterisation of the locality (vegetation type, altitude, microhabitat etc.) and incidental observation of the animal's behaviour, but sighting rates were so low that to assess the status of each species at each site would take prohibitive amounts of time.

NOCTURNAL TRANSECTS

Extensive nocturnal transects were walked at many sites, although for external constraints they were sometimes not performed. The methodology, described in Duckworth *et al.* (1994), allowed for calculation of contact frequencies, although for reasons discussed in Duckworth (in press a) these were not converted into notional population densities.

STATIC NOCTURNAL OBSERVATIONS

At a few sites, platforms were built overlooking features such as saltlicks. All-night moonlit watches were performed (see Duckworth *et al.*, 1994), but so few animals were seen that observers frequently fell asleep. The method was therefore used rarely.

INTERVIEWS

Many mammals are seen so infrequently that it may seem more efficient to survey them by questioning hunters than to attempt to search for them directly. Considerable effort with this technique in Laos has shown that its interpretation requires considerable care, even for distinctive and well-known species such as tiger *Panthera tigris*. Information on the presence or abundance of species may be exaggerated by the interviewee in an effort to 'please' the interviewer, or suppressed through concern at possible consequences, such as imposition of hunting controls. People may simply forget about the less dramatic species or give little-considered answers in an effort to move onto something they find more interesting, like the marital status of the interviewer.

Problems are particularly acute with small carnivores since most have obvious confusion species, as in many other wildlife groups; although Evans *et al.* (in press) considered that interviewing was an efficient technique for locating areas holding White-winged duck *Cairina scutulata*, an easily identifiable and popular quarry species, Desai & Vuthy (1996) and Timmins *et al.* (in prep.) found that the newly-described Large-antlered muntjac *Megamuntiacus vuquangensis*, also popular quarry, could not be surveyed by interviews as villagers were not consistently capable of separating it from Indian muntjac *Muntiacus muntjak*. Binturong is probably the only small carnivore in Laos sufficiently distinctive for local reports to be considered as reliable records, and then only occasionally. Even hog badger and ferret badgers are not consistently differentiated in a way interpretable to interviewers (and in north Laos, badger may be a further potential confusion). The pitfalls of deriving information on mammal status from interviews with Lao villagers are considered in more detail in Duckworth (1996).

Wemmer & Watling (1986) considered that most interview-derived information about small carnivores in Sulawesi (where only three species occur) was too unreliable to use as a basis for confirmed records, and a similar conservative approach has been followed here.

SURVEYING MARKET TRADE AND TROPHIES AND REMAINS IN VILLAGES

Lao villagers frequently retain mammalian parts (antlers, feet, tails, teeth etc.) as trophies, but with small carnivores (which are perceived as much less significant than their larger relatives) this is too rare for it to be a useful survey technique. Small carnivores are, however, frequently sold as food and although many are partially prepared for eating, or even ready-roasted, markets potentially provide useful information. The major problem is to establish the provenance of an animal in trade. For example, Bergmans (1995) gives locality records of several mammal species from "Ban Lak". In fact, this place is called Ban Lak (52), or Ban Lak-Hasipsong, (and must be known by its correct name, as there are numerous other villages called Ban Lak (n), which merely means "village at km n") and it is a major wildlife trading post for its surroundings to at least 40 km. As rather few animals sold there actually are caught there, it is misleading to give this as a locality. It is clear that Bergmans, asking the question "where does this come from?" received an answer analogous to 'Hartwells' showroom in the next town' (the information a Lao villager would probably want, answering the question in the spirit of 'where can I get one too?') rather than 'The Triumph motor factory in Coventry' (the information a wildlife surveyor wants). Problems are particularly acute at the market in Ban Lak (20), a town set amid a wide range of altitudes and habitats; animals are likely to come to it from anywhere between 400 m and 1,500 m altitude, and from a wide variety of forests, dry or wet, evergreen or deciduous, broadleaf or coniferous.

Animals frequently change hands several times between capturer and seller. The seller usually has little knowledge, and less interest, in a specimen's origin, although sometimes out of politeness he provides replies. Furthermore, some may be transported considerable distances; Salter (1993) reported a man in Salavan boarding a plane for Vientiane with a caged Coral-billed ground cuckoo *Carpococcyx renauldii*. Lowe's otter civet is so poorly known that any information, even of an individual in trade but bereft of information on capture locality, would be useful, but for most species market-derived information may cloud rather

Table 2: contact frequencies for nocturnal small carnivores at all sites in Laos surveyed during 1992-1996.

Area-site	Habitat	Altitude /meters	Month of survey	Time/ hours	Ease/ trees	Ease/ ground	Obs. line	From	CPC/ cont.	StPC/ cont.	LIC/ cont.	Other small carnivores found	Small Carnivore Contact Freq.	Total contacts	Small Carns as % of total	Rat nos
TMF-B. Namiang	sef, deg	200	6-7/92	8	high	low	road	foot	1	-	-	1 LC	[4]	2	[100%]	low
PKK-M. Hom rd	sef, deg	500	10-11/94	53	high	mid	road	foot	-	2 (3)	-	2* LC	[17½]	16	19%	n/r
Houey Nhang	sef, deg	200	10/92	20	low	low	trail	foot	1	-	-	-	[20]	1	[100%]	mid
NK-TH road	sef/ef	380	12/94-1/95	22½	high	low	road	foot	1	-	-	-	[22½]	4	[125%]	high
NK-TH road	sef/ef	380	3/95	20½	high	low	road	foot	-	6 (7)	-	1 sp.	3	19 (20)	37%	high
NK-TH road	scrub	380	1/95	3½	mid	mid	road	foot	-	-	-	-	[1]	1	[0%]	mid
NK-TH road	scrub	380	3/95	6¾	mid	mid	road	foot	-	-	-	-	[1]	0	-	mid
NK-Nam Ao rd	sef/ef	380	4/95	22¾	high	mid	road	foot	3 (4)	-	-	1 sp.	[5¾]	15 (16)	27%	high
Ban Lak 28	lime. f.	180-400	3/95	8½	mid	mid	road	foot	1	-	-	1 LC	[4¼]	3	[67%]	n/r
NTX-log road	wet ef	800-1300	4/96	39¼	high	low	road	foot	5	-	-	4* MPC, 1 sp.	4	20	50%	v. low
NNT-Navang logging road ef	sef, deg; pine; scr	700-1300	4/94-4-5/96	68½	mid	high	road	foot	5	9 (11)	4	1 SL, 2 MPC, 2 LC, 3 sp. 2¾	4	53	49%	low
Nakai Plateau	sef, deg; pine; scr	520	2/94-2-3/95	47	high	high	road	foot	1	1	6	1 SIC, 1 LC, 1 MPC	4¼	28	39%	n/r
NP-Nam Mon	sef	520	3/95	8	high	mid	river	boat	2*	-	-	1 sp.	[2¾]	16	19%	n/r
PXH-Corridor	ef/sef	200	3-4/93	78¼	high	low	road	foot	6*	10*	2	1 LSC, 1 LC, 3 sp.	3½	73	32%	high
PXH-Corridor	scrub	200	3-4/93	8	high	mid	road	foot	-	-	-	-	[1]	2	[0%]	n/r
PXH-B. Nalay	low sef	200	4/93	3¼	high	low	road	foot	1	-	-	-	[3¼]	5	[20%]	n/r
PXH	ddf	200	4/93	16½	v. high	v. high	road	foot	-	-	-	2 SIC	[8¼]	3	[67%]	n/r
PXT	mdf/sef	250	3/96	12	high	high	rd/trl	foot	1	-	-	1(2) sp.	[6]	13 (15)	15%	n/r
DHS-Bol Plat.	ef	900-1100	6/93	10	high	high	trail	foot	-	-	1	-	[10]	3	[33%]	n/r
XNN-mid. val	low sef	300-700	4/95	12½	high	high	road	foot	3(4)	-	-	1 sp.	[3]	19	21%	low
XNN-mid. val	mdf	300-400	4/95	10¼	high	high	road	foot	1	-	-	1 sp.	[5]	9	22%	low
XNN-mid. val	scrub	300-400	4/95	3	high	high	road	foot	1	-	-	-	[3]	1	[100%]	n/r
XNN-Bol Plat.	sef/ef	800-900	3/95	10	high	high	rd/trl	foot	2	-	-	1 LC	[3¼]	4 (5)	[75%]	n/r
XP-H. Tapkua	sef	250-400	2/93	46¼	low	v. low	trail	foot	9*	1	-	1 SIC, 1 sp.	3¾	20	60%	high
XP-H. Saoc/Kua	sef	180-200	12/92	30	v. low	v. low	trail	foot	6	1	-	-	4¼	12	58%	high
XP-North Zone	mdf, deg	150	1/93	11½	mid	high	road	foot	-	-	-	-	[1]	7	0%	n/r
XP-Dong Kalo	ddf	80	2/93	4¼	high	high	road	foot	-	-	-	-	[1]	4	[0%]	n/r
XP-B. Nongkhe	mdf, deg	80	2/93	4¼	high	high	road	foot	-	-	-	-	[1]	3	[0%]	n/r
XP-XK Plains	mdf/sef	80	3/93	1	high	low	river	foot	1	-	-	-	[1]	1	[100%]	n/r

- Area-site abbreviations: TMF, Vientiane Forestry College Training and Model Forest, Sangthong District; PKK, Phou Khao Khouay NBCA; NK, Nam Kading NBCA; NP, Nakai Plateau; PXH, Phou Xang He NBCA; PXT, Phou Xiang Thong NBCA; DHS, Dong Hua Sao NBCA; XNN, Xe Namnoy catchment; XP, Xe Pian NBCA.
- B., Ban (= village); M., Muang (= district capital village); H., Houay (= river or stream); TH road, access road to Theun Hinboun Dam Site; Bol. Plat., Bolaven Plateau; mid. val., valley of the middle; Xe Namnoy, XK Plains, Xe Kiang Plains.
- Habitat abbreviations: ddf, dry dipterocarp forest; ef, dry evergreen forest; lime. f., limestone forest; mdf, mixed deciduous forest; low sef, low-stature sef; sef, semi-evergreen forest; wet ef, wet evergreen forest; deg, degraded (can be added to any forest type).
- Altitude: the altitude indicates the surveyed altitudinal range, not the total range in the area.
- Month of survey: a dash (-) indicates that the survey ran between the months indicated; a comma (,) separates two discrete survey periods.
- Time: times are given to the nearest quarter-hour.
- Ease/trees and Ease/ground: refers to the ease with which animals could be detected and identified in the trees and on the ground respectively.
- Species abbreviations: CPC, Common Palm Civet; LC, Leopard Cat; LIC, Large Indian Civet; LSC, Large-spotted Civet; MPC, Masked Palm Civet; SIC, Small Indian Civet; SL, Spotted Linsang; sp., unidentified to species; StPC, Small-toothed Palm Civet.
- Numbers represent the number of contacts, with the number of individuals (if different) given in parentheses. An asterisk (*) indicates that contacts probably involved repeated sightings of individual animals.
- Small Carnivore Contact Freq.: the number of hours per contact with a small carnivore; figures based on fewer than six contacts are bracketed to indicate their unreliability.
- Total contacts: the total number of contacts with all mammals (excluding rats, bats and shrews).
- Small Carns as % of total: the percentage of all contacts that were small carnivores; figures based on fewer than six contacts (total) are bracketed to indicate their unreliability.
- Rat nos: an estimate of ground-living rodent density (based on the numbers of rustlings heard).

Table 3:
Vertical distribution of nocturnal viverrids.

Storey	Large Indian Civet	Common Palm Civet	Small-toothed Palm Civet
Floor	13	15	0
Understorey	0	12	1
Mid-storey	0	14	8
Canopy	0	15	23

The numbers represent the number of contacts, not the number of individuals, in each category. Animals are classified according to their height in the vegetation on finding. Individuals not classified to storey, or observed by daylight, are not included in the table.

Table 4:
Methods of detection of nocturnal viverrids

Detection method	Large Indian Civet	Common Palm Civet	Small-toothed Palm Civet
Eyeshine seen	13	45	13
Body shape seen	0	1	0
Calls heard	0	2	6
Displaced vegetation or litter heard	0	5	10
Falling fruit heard	0	4	5

The numbers represent the number of contacts, not the number of individuals, in each category. Individuals not classified to detection method, or observed by daylight, are not included in the table.

Table 5:
Reactions of nocturnal viverrids to the observer.

Reaction	Large Indian Civet	Common Palm Civet	Small-toothed Palm Civet
Investigated	0	3	0
Indifferent	11	38	31
Evasive	2	15	3

The numbers represent the number of contacts, not the number of individuals, in each category. Individuals not classified to response, or observed by daylight, are not included in the table.

Table 6:
Detection methods of Common and Small-toothed Palm Civets.

Species	Animal detected	
	by sight	by sound
Common Palm Civet	46	11
Small-toothed Palm Civet	13	21

$X^2 = 14.86; P < 0.01$ (2-tailed).

Table 7:
Influence of vertical position on reaction of Common Palm Civets to observation.

Animal behaviour	Animal in	
	Floor / understorey	Canopy / midstorey
Indifferent to observer	14	24
Evaded observer	11	4

Animals are classified according to their height in the vegetation when found. $X^2 = 4.32; P < 0.10$ (2-tailed).

than clear the picture. For distributional purposes, such information should be regarded with extreme caution unless it was gathered by a team comprising both a surveyor nearly fluent in Lao and a Lao counterpart who understands the rationale behind the questioning.

TRACKS AND SIGNS

Searching for tracks and other signs of animals circumvents the difficulties of direct observation. Although appropriate for large and distinctive animals (most notably Asian elephant *Elephas maximus*), as with interviews the use of signs in small carnivore surveying is reduced greatly by the difficulties of making unambiguous species identifications (see, e.g. Wemmer & Watling, 1986; Rabinowitz & Walker, 1991).

In general, signs are useful for establishing the status of groups, notably otters and badgers. Otter footprints and spraint may be identifiable to species (see Kruuk *et al.*, 1993), but this has not been tested in Laos. Hog badger footprints might be identifiable but in the absence of knowledge of the Lao distribution of Eurasian badger should not be regarded as confirmed records. Searches for signs cannot be combined with direct observations without reducing the efficiency of both, so signs were sought only under specific (and rare) conditions.

Direct field observation was therefore the main method providing the modern data in this paper. Records derived from other methods are clearly marked, although this was not possible for historical sources. Coverage was uneven across months: almost no nocturnal work took place during May-October, with relatively little in November and December (Table 2). Diurnal observation was also highest in January - April (Table 1).

SPECIES ACCOUNTS

Species are split into three groups, five regularly recorded species, 16 species (and Leopard Cat) recorded too infrequently for analysis, and five hypothetical species, on the basis of known geographical range and habitat in other countries or unconfirmed records in Laos.

Following the urgings of Brockelman & Ali (1987) with respect to primates, distributional information is given in considerable detail. Site names follow the Lao Service Geographique d'Etat 1:100,000 series of maps, unless these maps do not name the locality; names used in other sources are related to these maps in the gazetteer in Thewlis *et al.* (in prep.), which also gives coordinates for sites outside NBCAs. Altitudes are given in the text for records by day and for those by night where a range is given for the site in Table 2. Some figures in Table 2 differ from those presented in Duckworth *et al.* (1994) following re-assessment and re-analysis.

Where more than one animal was recorded at a site per day, the individuals were together unless otherwise stated. In the numerical analyses, each sighting is treated as a single data point, irrespective of how many animals it involved.

In recognition of the generous contributions of other observers, records other than the author's are credited as follows: TDE, Tom Evans; Bill Robichaud; W. G. Robichaud; RMT, Richard Thewlis; RJTm, Rob Timmins; RJTz, Rob Tizard, and other observers as named.

Incorporation of Deuve's (1972) records presents some problems as for many species little indication is given of the primary basis on which status was assessed. Reference to Deuve & Deuve (1963) indicates that for species where no localities are listed, Deuve (1972) probably merely extrapolated information from regional works, particularly Tate (1947). Furthermore, it is unclear how many of Deuve's own records were based on direct field observation and how many on observation of traded specimens or indeed merely on reports from villagers.

REGULARLY RECORDED SPECIES

Each species account is split into: (1) recent records, (2) distribution, habitat and status, (3) historical information, (4) observations on behaviour and (5) information relevant to the design of survey methodology or the interpretation of survey results, (6, if appropriate) other remarks.

Yellow-throated marten *Martes flavigula*

RECENT RECORDS

- NK: one, freshly shot, near Keng Maiha on 12 Dec. 94; one on 18 Apr. 95 among riverside boulders (250 m) by the mouth of the Nam An (RJTm).
- NTX: a single (10h00) and two together on 26 Jan. 94 in wet evergreen forest (750 m) by the Nam Kwai (TDE, RJTm). Two records of 1-2 in wet evergreen forest (800-1,000 m) along the logging road in April 1996 (B. Sounthala, V. Phommavongsa).
- NNT: one on 23 Apr. 94 (RJTm) and 1-2 on four days during 1-6 May 96 (11h00, 06h05, 09h15 (two), 11h00) along the Navang logging road (1,000-1,300 m); all in evergreen forest.
- NP: one on 14 Mar. 94 (12h00) in semi-evergreen forest near Ban Namxot (TDE); two on 1 Feb. 95 (09h00) and singles on 6 and 7 Feb. 95 (16h00 and 11h15) in streamside forest / bamboo along the Nam Xot and Nam Mon; two on 2 Apr. 94 (07h00) and singles on 24 Feb. 95 (09h00) and 1 Mar. 95 by the Nam On (RJTm, RJTz); two on 16 Feb. 96 in dense secondary semi-evergreen forest (550 m) in Phek Phalam (RJTm).
- PXH: one on 7 Apr. 93 (06h45) in scrub near Ban Ngoikasan.
- BSW: one on 17 Apr. 95 (10h00) in tall semi-evergreen forest (350 m) west of Ban Nonghin (TDE).
- DHS: two on 11 Jun. 93 in evergreen forest (1,100 m) at the northwest Houay Namphak site (RJTm).
- XP: singles on 16 Feb. 93 (08h45) in semi-evergreen forest (400 m) in the Houay Tapkua valley (RMT) and on 4 Mar. 93 (10h00) by a small pool in riverine semi-evergreen forest (80 m) on the Xe Kong Plains (G. Anderson).
- Other: one on 3 Mar. 94 (17h00) in boulder-strewn dense forest (560 m) on Sayphou Loyang, a limestone outcrop near Ban Lak (20) (TDE).
- Trade: none was seen in markets.

DISTRIBUTION, STATUS AND HABITAT

Animals were recorded from many evergreen (both dry and wet) and semi-evergreen forest areas. All eight seen in extensive deciduous forest areas (Xe Kong Plains and Nakai Plateau) were in semi-evergreen stands, usually by water. One was seen in extensive scrub (canopy 2-3 m) some hundreds of meters from the nearest forest. Another left the forest and sat on a sunlit boulder at the edge of a small field. In Thailand it also favours forest (Lekagul & McNeely, 1977). Animals were found over the entire altitudinal range extensively surveyed (80-1,300

m); in Thailand, Lekagul & McNeely (1977) recorded it from 200-3,000 m.

Of well-covered sites where the animal was not recorded, the lack of records from Phou Khao Khouay NBCA may relate to the season of survey (see below), Houay Nhang, the Sangthong TMF and Xe Namnoy are heavily degraded and hunted areas, while Xe Bang-Nouan and Phou Xiang Thong NBCAs contain extensive areas of deciduous forests and survey in evergreen areas was limited.

HISTORICAL INFORMATION

One was collected at Ban Thateng (Osgood, 1932) and Deuve (1972) recorded it from Laos but gave no details.

BEHAVIOUR

Most sightings (16) were of animals on the floor, with three in the understorey and three in the canopy or midstorey. Compared with Black giant squirrel *Ratufa bicolor*, the only other diurnal arboreal mammal of comparable size in Lao forests, martens were noticeably quiet in their progress through the trees, even when fleeing.

Animals were usually seen singly (17 times, January - April) but seven times in twos (January - June); the species often hunts in pairs (Nowak, 1991), and sometimes as family parties (Lekagul & McNeely, 1977; Payne *et al.*, 1985).

No singles were heard to call, but groups did thrice. Two (May) called repeatedly over a five minute period with a grunting "hkumpf"; two (February) gave nasal "shu" calls; two (June) gave quiet "wup" calls.

This was the most frequently observed small carnivore by day. All 24 observations were by day although nocturnal activity may occur in areas with human disturbance (Corbet & Hill, 1992); it is also mainly diurnal in Thailand (Lekagul & McNeely, 1977) and Borneo (Payne *et al.*, 1985). Records came at all hours with little hint of a peak in the morning (of precisely-timed records, ten were at or before 10h00, with seven after).

SURVEY METHODOLOGY

As a diurnal species, records were not related to any standardised measure of observer effort. At most sites records were too infrequent to detect any genuine patterns in status. All animals except one calling group of two were detected by the sight of shaking vegetation or of the animal itself.

Activity levels probably vary with season: there were only three records in October - January (on 12 December and, twice, on 26 January), compared with 22 in February - June. This accords with the postulated reduction in activity among the nocturnal species (see below), although activity occurs throughout the winter in temperate areas (Lekagul & McNeely, 1977).

Many animals were oblivious to the observer; some investigated, but they usually fled after a look of 30 seconds or less.

Large Indian civet *Viverra zibetha*

RECENT RECORDS

- Nocturnal contact frequencies are given in Table 2.
- NTX: one on 15 May 96 (05h35, just past dawn) in scrub (645 m) by the Nam Chom (RJTz).

- NNT: four singles in April - May 1996 in evergreen forest (800-1,100 m) along the Navang logging road.
- NP: two singles near Nong Nyian on 4 Mar. 94 (TDE); four singles in March 1995 in semi-evergreen / pine forest mosaic.
- PXH: two singles in April 1993 in semi-evergreen / mixed deciduous forest in the Corridor.
- DHS: one on 19 Jun. 93 in evergreen forest (1,100 m) on Phou Pongkham (TDE).
- Trade: occasionally found in markets; several in menageries in Ban Lak (20).

DISTRIBUTION, STATUS AND HABITAT

Large Indian Civets were found in a wide range of habitats (from extensive primary evergreen through semi-evergreen / mixed deciduous mosaic to scrub) over most of the altitudinal range surveyed at night (200-1,100 m). The high frequency of records on the Nakai Plateau perhaps reflected merely the exceptional viewing conditions for ground-dwelling animals: flat terrain with many long straight stretches of road and open understorey. Lekagul & McNeely (1977) considered that it favoured secondary scrub; this is certainly not true for Laos, although two on the Nakai Plateau were both in bamboo scrub amid open areas of tall grass.

The lack of records from the Xe Namnoy Catchment and Xe Pian NBCA may be due to chance, rather than absence, as this species was found disproportionately less frequently than were the arboreal palm civets (see below). The lack of records from Nam Kading NBCA and Nam Theun Extension means little as survey roads in these areas had steep cliffs either side for long stretches and were little used by mammals on the floor.

HISTORICAL INFORMATION

Specimens were taken at Ban Muangyo and Ban Phonsavan (Osgood, 1932). Deuve (1972) reported this civet throughout Laos stating that during the dry season it occurred particularly around ricefields and villages, whereas in the wet season it was mainly found in open forest; it was never observed in dense forest. This latter claim is not a true reflection of the species, which was common deep in primary evergreen forest along the Navang logging road (NNT) and may have arisen partly through the ease of seeing the animal in more open habitats. Specific localities from Deuve (1972) are Savannakhet and surroundings, Xeno, around Pakxe, around Thakhek, several areas within Salavan Province, the Vientiane plains, the length of the road between Thakhek and Ban Paknamkading, the valleys of the Nam Ngum, Mekong and Louangphabang, around Ban Phonsavan and at Louang-Namtha.

BEHAVIOUR

All animals were on the floor (Table 3), where they foraged in a manner very similar to African Civet *Civettictis civetta* (see Duckworth, 1995). Although the species climbs capably, it rarely leaves the floor (Nowak, 1991) and extensive observations on one radio-collared individual in Thailand by Rabinowitz (1991) never located the animal off the floor.

All animals were single and calling was heard only once: one (May) gave a single hoarse otter-like "hah!", for no clear reason.

The sole observation in daylight was just after dawn; the others were spread through the night; it is nocturnal in Thailand (Lekagul & McNeely, 1977).

SURVEY METHODOLOGY

Large Indian civets were seen markedly less frequently than were Common and Small-toothed palm civets. They would be expected to have larger home ranges, and thus to occur at lower densities, than these two species, as they are bigger and more carnivorous (Rabinowitz, 1991). Nonetheless, the difference in real abundance is unlikely to be as great as the simple ratio between sighting rates: *Viverra* civets were invariably detected by eyeshine (Table 4) and in most areas the detectability of animals was markedly lower on the floor than in trees (where most palm civets were). In some areas (e.g. Phou Xang He NBCA) detection was most unlikely unless the animal was on the road itself, because of the dense fringing vegetation.

All observations were made between late February and mid-June.

Some animals were strikingly confiding, coming within a few feet of the observer. Active investigation was not observed and most animals seemed to be completely oblivious of the torchlight, but if they came close enough to smell the observer they ran off. Others fled rapidly from the sound of footsteps (Table 5).

Small-toothed palm civet

Arctogalidia trivirgata

RECENT RECORDS

- Nocturnal contact frequencies are given in Table 2.
- PKK: probably common in the one area surveyed.
- NK: common along the Theun-Hinboun access road, but unrecorded in the Nam Ao forest.
- NNT: common in evergreen forest along the Navang logging road (700-1,200 m) in 1996, with two records in scrubby forest margins; one recorded here on 16 Apr. 94 (TDE).
- NP: one in mature semi-evergreen forest near Ban Namxot on 1 Mar. 94 (TDE) was the only record despite substantial effort in 1995.
- PXH: common in evergreen/semi-evergreen forest of the Corridor; one on Phou Xang He (300 m) in similar forest on 31 Mar. 93; unrecorded in low-stature semi-evergreen forest.
- XP: common in semi-evergreen forest (180-400 m) but unrecorded in deciduous areas.
- Trade: small numbers in markets; one in a cage at a fish restaurant outside Vientiane.

DISTRIBUTION, STATUS AND HABITAT

This was one of the most commonly encountered nocturnal mammals in Lao evergreen and semi-evergreen forests, but there were no records from deciduous forests and it seemed to be very scarce in low-stature semi-evergreen forest. All six observations in Huai Kha Khaeng (Thailand) reported by Rabinowitz (1991) were in evergreen forest rather than the nearby deciduous forest.

The highest sighting rates were in the unlogged evergreen forest of the Theun-Hinboun dam access road (NK), but animals were also found in some extensively degraded areas (e.g. Phou Khao Khouay NBCA and the Corridor of Phou Xang He NBCA). The statements that it is indicative of the least disturbed forests (Lekagul & McNeely, 1977) or mature forests (Corbet & Hill, 1992) are not appropriate for Laos or at least some parts of Thailand (e.g. Khao Yai N.P.; J. W. Duckworth, unpubl. data 1995-1996) and almost a century ago Miller (1901) noted that the

species was common in coconut trees (which do not grow in mature forest) on Bunguran (Natuna Islands).

The lack of records from the Nam Ao forest (NK) and the Wet Forest logging road (NTX) is puzzling, but in view of the survey effort surely represents a real absence or scarcity at least in the latter. A purely altitudinal effect is unlikely as the species was common in the highest forest surveyed by night, the Navang logging road (up to 1,300 m); it was also recorded down to 150 m.

HISTORICAL INFORMATION

Deuve (1972) had only one record (a female with young seen by day in the plains of Champasak Province, in March; Deuve & Deuve 1963) but suspected, correctly, that this was because of the species' nocturnal habitats rather than a genuine scarcity. Osgood (1932) also traced few records, the single specimens from Paleng and Ban Phonsavan and two from Ban Thateng being the only ones then known from Indochina.

BEHAVIOUR

Typical behaviour of small-toothed palm civet contrasted greatly with that of Common, as they moved rapidly and boisterously through the trees, shaking vegetation noisily and often calling; they were rather reminiscent of Kinkajous *Potos flavus*. They were extremely agile and several times hung on or climbed down trunks head downwards. In contrast to common palm civet, resting animals were found only twice.

No animal was ever observed on the ground, and only one was seen in the understorey; most were found in the canopy (Table 3). This species is predominantly arboreal elsewhere: e.g. all six observations in Rabinowitz (1991) in Huai Kha Khaeng, Thailand, were of animals in trees and Van Bemmelen (1952) noted that it was "strongly adapted to arboreal life".

A dispute with a common palm civet is described under that species.

Six groups of two were seen, compared with 28 singles, but this may over-estimate the frequency of singles, as in some cases the second animal was not detected for several minutes, and so in other cases may have been overlooked entirely. Apparent courtship was seen on 25 Dec. 92 (XP) and on 1 Nov. 94 (PKK). In the first instance the two animals sat in the crown of a small tree in bodily contact for 20 minutes with frequent mutual licking and nuzzling interspersed with yawns. In the second, the two animals sat close, but not touching, on a major bough in the lower canopy for several minutes. Two other groups of two (March and May) were feeding, the other two (February and May) were merely observed passing through.

Two sorts of call were given frequently: soft but far-carrying clicking "t'suck" notes, and very loud, 1-2 second long, nasal, sneezing grunts. Such calling may be seasonal, as none of the four contacts prior to mid-February gave either of the usual calls (although one feeding on flowers in December gave several soft "weep" calls), while 14 of 29 at night between mid-February and June gave at least one call.

Animals were recorded throughout the night. There were fewer daytime records than with common palm civet. All were at Bouay Tapkua (XP): one at 07h00 (11 Feb. 93), on a very windy morning (TDE); two in the half-light on 22 Feb. 93 (RJTm) and one at 09h00 (24 Feb. 93) (G. Anderson). These three records

contrast with 34 by night.

SURVEY METHODOLOGY

This species is probably the nocturnal mammal most completely surveyed on transects in Laos because it can be found by so many different means: calls, crashing vegetation, falling fruit and eyeshine (Table 4). Because the first two can be detected from much greater distances than can eyeshine, small-toothed palm civets doubtless appear disproportionately common compared with species detected primarily by sight: thus, for example, equal counts of common and small-toothed palm civets would probably represent a higher population density of the latter than the former, as common palm civet was located by ear much less frequently (Table 6).

Very few were seen during October - January (four contacts) compared with the numbers in February - June (33), but precise assessment of this difference is not possible due to the numbers of survey sites involved.

Most animals seemed to be indifferent to the observer (Table 5), but reaction was sometimes difficult to judge as the animals were moving rapidly through the vegetation anyway. Only three showed clear evasive reaction: two stopped for a minute and then moved slowly off, and one fled rapidly. These three animals were all below 5 m in the vegetation. Only two other animals below 6 m were seen; thus, as with common palm civets, animals seem more likely to flee if they are low in the vegetation.

OTHER REMARKS

The race in Laos, *A. t. millsii*, is in the subspecies-group *A. t. leucotis*. Van Bemmelen (1952) discussed the differences in morphology (notably, with relevance to field observations, of ear pigmentation) of these animals from the *A. t. trivirgata* group (of the Sundaic subregion). Calls given by the latter (at least on Borneo) also differ markedly from those of *A. t. millsii*. In Similajau National Park, Borneo, animals called with a loud "guck", which resembled the initial note of a loud gecko, and loud, sucking, ear-piercing "sssnick", which lacked the nasal quality of the homologous call in Laos; a long drawn-out "squeeeeeee" was also heard, which had no obvious parallel in Lao animals. Calls of *A. t. leucotis* in Khao Yai National Park (Thailand) resemble those of animals in Laos.

Common palm civet

Paradoxurus hermaphroditus

RECENT RECORDS

- Nocturnal contact frequencies are given in Table 2.
- TMF: one in a bamboo clump in heavily degraded semi-evergreen forest on 28 Jun. 96.
- HN: one on 16 Oct. 92 in degraded semi-evergreen forest.
- NK: common in the Nam Ao forest and present in the eastern part of the NBCA to the south of the Nam Kading. One in the Nam An valley (600 m) in April 1995 (J. Ellis).
- NTX: frequent along the logging road (800-1,200 m) in April 1996: one in wet evergreen forest (700 m) just north of Ban Nape on 19 Apr. 94 (TDE).
- NNT: common along the Navang logging road (1,000-1,300 m) in 1996: one there on 13 Apr. 94 (TDE).
- NP: rarely recorded in March 1995.
- HNN: one shot in secondary growth in the south of the NBCA, January 1996 (RJTm).

- PXH: common in evergreen/semi-evergreen forest and present in adjacent mixed deciduous forest.
- XBN: one shot near a village in the eastern lowlands, June 1994 (RJTm).
- PXT: one in the Houay Louang valley in mixed deciduous forest on 15 Mar. 96 (TDE).
- XNN: common in the middle Xe Namnoy valley and probably on the Bolaven Plateau up to at least 850 m.
- DHS: one shot on 4 Jul. 93 near Ban Sungsup (200 m) (RJTm); one in evergreen forest (1,000 m) at the northwest Houay Namphak site on 13 Jun. 93 (RJTm); two cubs (head-and-body length about 50 cm) sat in bushes about 1 m above the ground, in a coffee plantation (200 m) at dusk on 17 May 93, with no sign of any adult (TDE).
- XP: common in semi-evergreen forest and present in riverine forest in the Xe Kong plains and Dong Kalo (80-400 m).
- Other: one in a limestone gorge (350 m) 5 km east of Ban Lak (28) on 27 Mar. 95.
- Trade: much the commonest small carnivore in markets, especially Ban Lak-Hasipsong and Ban Lak (20); one at Hongsa on 10 Feb. 94 (Bergmans, 1995). Captives in Thakhek, Vientiane and Ban Lak (20) in 1994-1995 (RJTm).

DISTRIBUTION, STATUS AND HABITAT

Common palm civet was the most frequently seen carnivore at night and, with Slow loris *Nycticebus coucang*, the most widely-recorded nocturnal mammal. Other than sites surveyed only very briefly, only Phou Khao Khouay NBCA lacked records. Here, work by night was performed only in October and it would be unreasonable to consider the species absent. Records came from deep in blocks of little-touched forest (Xe Pian and Nakai-Nam Theun NBCAs) to the 800 ha relict patch of Houay Nhang (where it was the only large mammal seen at night); elsewhere it occurs regularly in degraded areas and was even considered to favour areas close to human habitation by Lekagul & McNeely (1977). It was recorded most commonly in evergreen and semi-evergreen forests but was also found in mixed deciduous forest and even scrub. Records came from 80-1,300 m, the entire altitudinal range surveyed at night; by contrast, in Borneo the species appears to be associated with lowlands (Payne *et al.*, 1985). Rabinowitz (1990a) and Rabinowitz & Walker (1991) claimed that common palm civet was an "open woodland species" in Huai Kha Khaeng (Thailand). The basis of this assessment is unclear but it is certainly not preferentially associated with such habitat in Laos.

HISTORICAL INFORMATION

Four specimens from Ban Thateng were listed by Osgood (1932) and Deuve (1972) recorded the species throughout south and central Laos and the valley of the Mekong.

BEHAVIOUR

Common palm civets were rather inactive and spent long periods lying on lower- or sub-canopy boughs, and sloping or fallen trunks. Animals were found about equally in four levels of vegetation from floor to canopy (Table 3), with most foraging animals in fruit trees or on the ground. In Borneo it is also less arboreal than small-toothed palm civet (Payne *et al.*, 1985).

Except during aggression, calling was rare: a single (February) gave repeated rising and falling moans, reminiscent of a ghost in a children's TV cartoon (TDE); one (June, by day) gave repeatedly a strange whistling call and also once a cough (RJTm); one (April) gave a series of one-note calls, each of which was a

forced- or strained-sounding prolonged wailing whine, with a thin weak start, ascending in pitch for one second and then even toned. A second animal sat nearby but did not call.

Animals were usually solitary (62 occasions), although twos were seen twice: once in a fruit tree and once they sat close to each other in the understorey (calling). An aggressive encounter was seen with a small-toothed palm civet on 19 Feb. 93 (05h15); loud screaming calls were audible from 150 m away and upon illumination the civets appeared to abandon a fight (TDE). Another displayed with a Masked palm civet on 19 Apr. 96 (at least 01h20-01h50); noises audible for 200 m like a distant wailing wind certainly came from the common palm civet, and one or other also made several sharp yowling calls. On illumination, the animals paused but 10 minutes later began calling again, upon which the common palm civet ran rapidly up a thin liane and perched 4 m above the masked palm civet, which remained on and near the ground, and appeared to be the victor. Both assumed crouched positions with their heads held back. A few minutes after the observer left, a third bout of yowling was heard. It was unclear over what the animals were fighting.

One fed in a fruit tree at the same time as two slow lorises and although passing within a few centimeters of them a few times, no reaction by either species was obvious.

The seven records by day (contrasting with 57 spread throughout the night), all of singles, were not all close to dawn or dusk: in XP on 22 Feb. 93 at 06h15 (RMT) and on 30 Nov. 92 at 10h40 (RMT); in DHS on 13 Jun. 93 at 08h00 (RJTm); in NTX on 19 Apr. 94 at 16h00 (TDE); in XP on 1 Feb. 93 at 16h30 (TDE) and resting in the midstorey of a small tree (XP) on the late afternoon of 10 Mar. 93 (RJTm); in NK in April 1995, time not noted (J. Ellis). One in XP emerged from its roost (a thick tangle 7 m above ground) at 18h30 on 9 May 93. It was not seen on five other evenings at the same site; civets do not regularly return to day-beds (Rabinowitz, 1991).

SURVEY METHODOLOGY

The species' tendency to use obvious sub-canopy resting sites made it easy to find, partly explaining the high counts relative to other species. Animals not seldom rested on the same perch on successive nights; care should be taken in interpreting contact frequencies because of this. The majority were detected by eyeshine (Table 4). The two found by call were both in aggressive encounters with other palm civets. They rarely made perceptible noise while moving through trees, in contrast to small-toothed palm civet: of the few found by the noise of passage, four were walking through leaf-litter and one was fleeing through bamboo.

Few were seen during October - January (nine) compared with the numbers in February - June (54), but precise assessment of this difference is not possible due to the variety of survey sites.

As with small-toothed palm civets, most common palm civets were unperturbed by the observer (Table 5). They seemed more likely to flee when low in vegetation or on the floor than when in the mid-storey or canopy (Table 7). Animals up trees fled only rarely and some permitted prolonged viewing from only a few meters.

OTHER REMARKS

Some animals showed a creamy tail tip, the extent of which