

The Malay Weasel *Mustela nudipes*: distribution, natural history and a global conservation status review

J. W. DUCKWORTH, B. P. Y.-H. LEE, E. MEIJAARD and S. MEIRI

Summary

The Malay Weasel *Mustela nudipes* inhabits only the Sundaic sub-region of South-East Asia and has never been studied in the field. Overall, it is recorded only rather rarely. Given major declines in many better-known Sundaic forest vertebrates, records were collated from as many sources as possible to re-evaluate its conservation status. The collation was not exhaustive, but allowed clear conclusions:

1. Malay Weasel has been recorded recently almost throughout its historical range (Borneo, Sumatra and the Malay—Thai peninsula) with the exception of several small areas with only limited recent survey; hence, no range contraction is suspected.
2. Occurrence was confirmed from Brunei, whence no major international collection contains a specimen.
3. The purely Sundaic distribution was confirmed, although the species extends further north in peninsular Thailand (to 10°N) than often believed.
4. Although several specimens from Java have been catalogued and some recent sources include Java in the range, the only specimen with an authoritative Javan locality turned out to be an Indonesian Mountain Weasel *M. lutreolina*. It is safe to assume that Malay Weasel does not inhabit Java.
5. Absence from Java and the distribution in mainland South-East Asia imply a restriction to areas lacking a marked dry season.
6. Malay Weasel inhabits a wide altitudinal range, from sea-level up to at least 1,700 m on Borneo and 1,300 m on Sumatra and the Malay—Thai peninsula, with many records from hill areas. Although the species's dependence on forests remains unclear, the highland records are significant because forest loss and degradation rates of the Sundaic highlands lag significantly behind those of the lowlands.
7. Records came from a wide range of natural vegetation types. Most were from lowland and hill dipterocarp forests, but this cannot be seen to indicate an altitudinal preference because these are the predominant natural habitats in the species's range and host most biological fieldwork. Tropical heath forest (*kerangas*), swamp forest, montane forest and montane scrub were also used.
8. Many records came from degraded areas, including in plantations of exotic trees, with two from urban or suburban settings. While it cannot yet be concluded that populations can persist independent of natural forest, the species is clearly not highly selective in the habitats it uses.
9. No observer reported seeing the species often; even at sites with the highest overall search effort, records were few. Yet the species has been found in most areas with substantial fieldwork.
10. Direct observation indicates that the species is not typically shy, while all methods combined (camera-traps, live-traps, location of road-kills) have low recording rates, indicating that Malay Weasels probably live at low density. The reason for the paucity of camera-traps records is unclear.

11. Contrary to previous statements, Malay Weasels are widely active by, and throughout the, day; indeed there is evidence for only occasional nocturnal activity.
12. Malay Weasels forage singly, on the ground, and in habits seem typical of non-aquatic congeners.
13. Although the effects on Malay Weasel of major ongoing habitat change are unclear, it is evidently less immediately threatened by forest loss than are many other Sundaic species. Within remaining habitat, no threats specific to it were detected, despite occasional killing as a poultry thief and for medicinal use, and undoubtedly some level of by-catch in snaring for other species. It should not be listed as internationally threatened.
14. The conservation priority for Malay Weasel is to study use of anthropogenic habitats to give a clearer predictive ability for future conservation status trends. Because it remains so little-known, it would benefit from studies of its general natural history.

Introduction

The genus *Mustela* includes about 17 species varying, in conservation terms, from perceived vermin (e.g. Stoat *M. erminea* and Least Weasel *M. nivalis* in at least parts of their native Holarctic distribution and, especially for Stoat, in its introduced range of New Zealand; (King, 1991; King *et al.*, 1996; McDonald & Harris, 1999) to one species needing chronic support to avert its extinction (Black-footed Ferret *M. nigripes*; Reading *et al.*, (1997). Several species remain very poorly known, e.g. Indonesian Mountain Weasel *M. lutreolina* (van Bree & Boeadi, 1978; Lunde & Musser, 2003; Meiri *et al.*, *in prep.*), while another South-East Asian taxon, the 'Björkegren's Weasel' *M. (nivalis) tonkinensis* has not been found since the holotype was collected and is of disputed taxonomic status (Björkegren, 1941; Abramov, *in press*). Even for other weasels in South-East Asia, conservation status remains unclear, with recent records greatly extending historically known ranges (e.g. Yellow-bellied Weasel *M. kathiah* and Stripe-backed Weasel *M. strigidorsa*; Duckworth & Robichaud, 2005; Abramov *et al.*, *in prep.*).

Malay Weasel *Mustela nudipes* is known historically from the Sundaic sub-region of South-East Asia: Borneo, Sumatra and the Malay—Thai peninsula (Chasen, 1940; Lekagul & McNeely, 1977; Corbet & Hill, 1992), but not, despite repeated statements of occurrence, from Java (see below). Its pelage varies in colour but despite earlier speculation (e.g. Chasen & Kloss, 1931) this shows no geographical basis, and the species is monotypic (Brongersma & Junge, 1942; Hill, 1960). Recent re-measurement of skulls indicates no geographical variation in size although few were measured from the Malay—Thai peninsula (SM, own data).

There are a fair number of historical Malay Weasel specimens (Appendix 1 lists all specimens and historical records traced). Brongersma & Junge (1942) gave a synonymy and exhaustive bibliography of records and mentions of the species. Davis (1962) recorded that "nothing is known of [its] habits", and Lekagul & McNeely (1977) called it "little known". Like other South-East

Asian species of *Mustela*, it has never been studied alive. In recent years, many little-known medium-sized tropical mammal species have been detected through sight and camera-trap records (see Cutler & Swann, 1999) incidental to general surveys or specific studies of other species. Such records are not readily obtainable by third parties, and few camera-trap studies publicly document or disseminate results of non-target species, even though such data have significant information value for conservation (Kawanishi, 2001). Such dispersion of information hinders assessment of global or national conservation status and needs.

Malay Weasel was considered threatened in Malaysia by Ratnam *et al.* (1991), because of perceived rarity and restriction to good forest, but Meijaard *et al.* (2005) traced too little information to include it in a recent review on the effects of logging on Sundaic forest wildlife. The most recent global conservation action plan for small carnivores (Schreiber *et al.*, 1989) did not consider Malay Weasel a conservation priority, but this should not instil complacency: there is little congruence between the Sundaic bird species listed as globally threatened or near-threatened in the contemporary edition of the global red-list of threatened birds, by Collar & Andrew (1988), compared with those so listed in the most recent edition, by BirdLife International (2001). This is because forest conversion, degradation and fragmentation in Sundaic South-East Asia, particularly of lowland areas, is proceeding at such a rate (e.g. BirdLife International, 2001; Holmes, 2000; Jepson *et al.* 2001; McMorro & Talip, 2001; Lambert & Collar, 2002; Curran *et al.*, 2004; Fuller, 2004; Aratrakorn *et al.*, 2006; Kinnaird *et al.*, *in press*) that Wells (1985) warned of “bird communities facing wholesale collapse through the mass conversion of natural forest to other uses”. As this dire prognosis has been, and continues to be, validated by subsequent events, BirdLife International (2001) red-listed as Vulnerable or Near-Threatened all forest-dependent Sundaic endemic birds that are restricted to lower altitudes and for which there is no strong evidence of adaptability to degraded and fragmented forest, no matter how abundant those species are within their natural habitat. This approach should logically be applied to forest-dependent species endemic to Sundaland of groups other than birds. Hence, for these various reasons, and following the need stated by Franklin & Wells (2005) the present work collates records of Malay Weasel and assesses the species’s current conservation status.

Methods

Modern records

Unpublished field records were traced through personal contact and correspondence with wildlife biologists and naturalists resident or spending long periods in the Sundaic region, especially those camera-trapping wildlife. These were supplemented with appeals on the e-mail list-serves of the IUCN/SSC Small Carnivore Specialist Group and the Oriental Bird Club (Oriental Birding). The latter targeted the many field ‘birders’ (there is no equivalent group of ‘mammalers’), who, through dedicating much leisure time to seeking birds (especially rare and little-known species) in the field, become adept at field identification through cautious use of morphological and vocal characters. Birders formed the backbone of many current range and status assessments for South-East Asian birds in BirdLife International (2001), and many are increasingly interested in ‘large’ (= field-identifiable, *sensu* Dorst & Dandelot, 1970) mammals. Malay Weasel is likely to be well recorded by field birders because (*contra* previous studies) it is probably largely diurnal (see below). Being morphologically extremely distinctive

(South-East Asia has no other white-headed bright orange mammal, let alone an obviously weasel-shaped one), sight records from observers of known general reliability were considered acceptable. However, following Meijaard (1997), listings in grey literature (e.g. management plans and consultancy reports) were not accepted unless there was primary detail of the records.

Electronic searches were made in the ‘JSTOR’, an internet-based journal archive database which covers several international journals pertaining to mammalogy and tropical ecology and biology. Key phrases used in the search were “Malay Weasel”, “*Mustela nudipes*” and its synonym “*Gymnopus leucocephalus*”. In addition, searches were made in relevant local and regional journals and newsletters that are not indexed in major journal search engines. These journals and newsletters include *Brunei Museum Journal*, *Journal of Wildlife and Parks* (Malaysia), *Malayan Nature Journal*, *Natural History Bulletin of the Siam Society*, *Pangolin*, *Sabah Museum Journal*, *Sabah Society Journal*, *Sarawak Museum Journal*, *Small Carnivore Conservation* and *Tropical Biodiversity*. This will not have traced all published records, but the capture of recent unpublished incidental records was the priority to lay the status baseline, because many of these will otherwise be lost to future researchers.

With each record particular attempt was made to determine altitude, because in the Sundaic region hill and montane forests are under much lower threat than are lowland forests (BirdLife International, 2001). For records outside tall forest, the distance to such habitat was assessed where possible, because individuals of even forest-dependent species may use non-forest habitats when dispersing or displaced by habitat perturbation; such records may even be frequent if the disturbed habitats are close to tall forest and form part of an individual’s home range. Mere presence in disturbed and secondary habitats cannot be assumed to equate to a self-sustaining population there: a false security over a species’s adaptability may be bred if these animals in fact represent wanderers or sink populations from natural habitats.

Historical records

To allow comparison with current range, data on museum specimens were collated. Collection managers were contacted, published lists of holdings (e.g. Majuakim, 1999; Kool & Yakup Nawi, 2005) checked, and internet databases searched of c. 50 museum collections, to derive for each specimen the locality, altitude, date, collector and any other relevant notes. Identity and provenance were investigated for each specimen apparently a geographical outlier. The museum search is certainly not complete with, for example, no time to source data concerning those specimens in Russian museums (A. Abramov, *in litt.* 2006).

Time considerations precluded a search for records published between Brongersma & Junge (1942) and the 1980s, although some electronically-available journals were searched as far back as the early 1900s. However, it is a fair assumption that any published records significantly extending the known geographic range would have been incorporated in faunistic reviews such as Lekagul & McNeely (1977) and Corbet & Hill (1992).

Records and Discussion

Appendix 2 lists all field records (most of which are recent) of Malay Weasel received, split by country/island. Fig. 1 maps the post-1989 records. Robertson & Bell (*in prep.*) traced no animals held in zoos anywhere in the world.

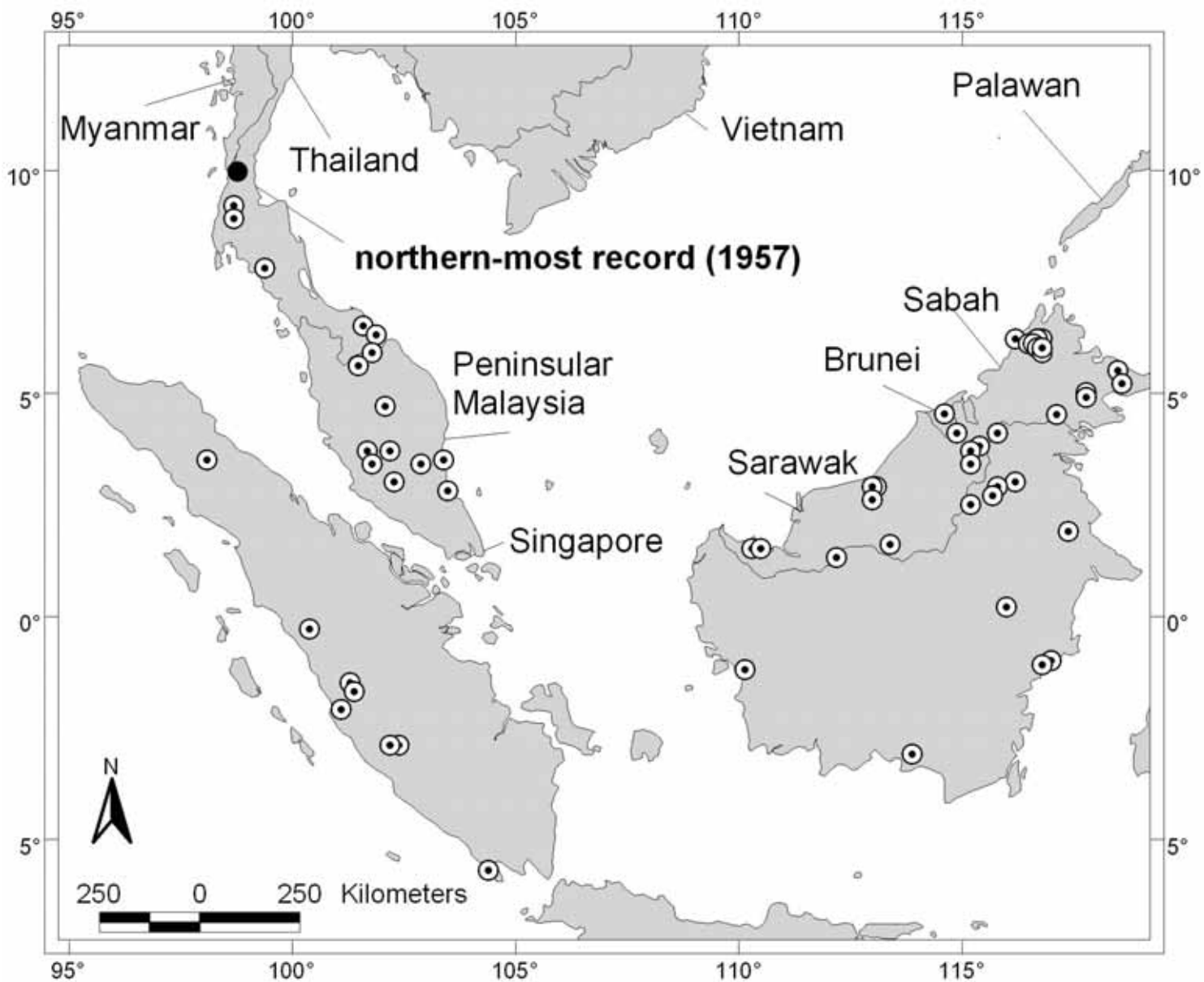


Figure 1. Locality records of Malay Weasel from 1990 onwards.

Geographical range

Recent records (most of those in Appendix 2; Fig. 1) come from almost throughout the historically-known range (Appendix 1): there is little suggestion of a range contraction, even if recent records are restricted to post 2000, i.e. well within the era of major habitat conversion. Records past and recent have been scattered across Borneo, Sumatra and peninsular Malaysia (Brongersma & Junge, 1942; Hill, 1960; Medway, 1969; 1977; Payne *et al.* 1985; Appendices 1, 2). The only major political unit with a historical specimen (in Lyon 1911) for which no modern record was traced is South Kalimantan province (Appendix 2). The limited recent survey in these provinces forestalls any inference from this. Also, no recent record was traced from most of eastern Sumatra, although there are several historical specimens (Appendix 1; e.g. Schneider, 1905; Hill, 1960). This part of the island has not received extensive conservation surveys recently, and much of what has occurred was in the area's globally important swamps, habitats perhaps suboptimal for this weasel. Although most dry-land forest has been cleared, significant patches do persist (e.g. Berbak national park and Way Kambas) and it would be premature to consider the species extinct in this region.

No historical specimen was traced from Brunei. Hence, recent records (Appendix 2) may be the first from the country.

Recent records expand the known Thai range, a country with only one pre-1955 record; nowadays it is easy to forget that, until recently, “mammals in [Thailand] remain relatively little known” (Thonglongya, 1974). All Thai records fall in the peninsula, confirming that the species is strictly limited to the Sundaic subregion. The only Thai record in Lekagul & McNeely (1977) is a 1909 specimen from Trang province (7°35'N, 99°45'E; Appendix 1; Hill, 1960), doubtless responsible for the species's northern limit in the generalised range maps in Lekagul & McNeely (1977) and Corbet & Hill (1992). Local people's reports, apparently of Malay Weasel, were listed by Boonratana (1988) for Khao Phanom Bencha National Park (8°13-19'N, 99°53-58'E) and Mu Ko Phetra National Park (6°45'-7°08'N, 99°23-49'E), but these should not be taken as verified presence (see Duckworth, 1997). Several subsequent records (Appendices 1, 2) indicate that the species is probably widespread in southern peninsular Thailand, and extend the range north to 10° (through a 1957 specimen from Ranong province). Even this northern margin, by comparison with the better-known northern limits of Sundaic birds (Round *et al.*, 2003), would be fairly far south for a non-montane Sundaland endemic. Birds as a whole were much better collected than were small carnivores, but even so the historical records underestimated the northern penetration for many species (Round *et al.*, 1982). Thus, the weasel may yet be found further north into peninsular Thailand and perhaps in adjacent

Myanmar (in Thaninthayi [Tenasserim] division); another Sundaic small carnivore, Banded Linsang *Prionodon linsang*, extends north to at least 15°29'N (Steinmetz & Simcharoen, in press).

The southernmost parts of Vietnam extend into the latitudinal range of Malay Weasel (Fig. 1). However, they lack any notable Sundaic affinity (e.g. Lunde & Nguyen Truong Son, 2001) and it is unsurprising that an extensive collation of small carnivore records (including specimens housed in-country) by S. I. Robertson (verbally 2006) found no evidence of the species in Vietnam.

Mistaken geographical range records

Most modern sources exclude Java from Malay Weasel's range (e.g. Lekagul & McNeely, 1977; Corbet & Hill, 1992), although others do list the island (Payne *et al.*, 1985; Wozencraft, 2005); Melisch (1992) left the issue unresolved. Although Desmarest (1822) gave Java as the origin of the specimen upon which he named the species, this was very soon doubted. Following the statement of Vigors (1830), that "it is probable that the specimen sent by M. [onsieur] Diard from Batavia [=Jakarta, Java] had been originally imported from Sumatra", Robinson & Kloss (1919) fixed a new type locality as West Sumatra. Müller (1839-1840) had earlier drawn attention to the geographical sloppiness of some contemporary French zoologists, and pointed out that various capable naturalist-explorers had spent time on Java without finding this weasel, and that indigenous people appeared not to recognise it. The type (MNHN mounted skin CG 2001-355, skull A 1948 [I-1106]) was collected on "Java" in May 1821 by P. Diard (G. Veron, *in litt.*, 2005); but Diard was also responsible, among other longstanding confusions, for the type localities of Pontianak (Borneo) for Northern Smooth-tailed Treeshrew *Dendrogale melanura* (Schlegel & Müller, 1843-1845), which occurs no closer to Borneo than Cambodia (Timmins *et al.*, 2003); and Sumatra for Lesser One-horned Rhinoceros *Rhinoceros sondaicus*, although his specimen evidently came from Java (Rookmaaker, 1983).

Dammerman (1940) retained the possibility that Malay Weasel might inhabit Java, but Brongersma & Junge (1942) stated categorically that there were no claims from the island since the original. However, there are at least two other purported Javan specimens (Appendix 1).

One (BMNH 46.3.5.4; skin and associated skull) was purchased from the Leadbeater merchants in London by the Zoological Society, probably in the 1850s. The museum register records no locality, but 'Java' crept in somewhere, on both skin and skull. Presumably the merchants, seeing the type locality as Java, simply listed their specimen from there (D. M. Hills verbally, 2006); 'ornamental' addition of data on a specimen's origin was evidently relatively common in this era (Mearns & Mearns, 1998). This specimen bears a note in an unidentified hand as "probably the specimen described by Gray, P.Z.S. 1865: 119 as *Gymnopus leucocephalus* var."; yet Gray (1865) spoke of Borneo and Sumatra as this form's range, and so BMNH 55.12.24.217 (skin; with presumed associated skull BMNH 58.5.4.586), labelled "Probably the type of *Gymnopus leucocephalus* Gray Proc. Zool. Soc. 1865: 119", is more likely to be Gray's type, as deduced by Hill (1960) through comparison of pelage and morphometrics. This specimen also lacks locality data (with skin, skull or register); it was purchased by the British Museum, also from the Zoological Society's collection.

A *Mustela* skull labelled as a Malay Weasel held in the Berlin Museum für Naturkunde (MZB 48082) was collected in January 1935 from the Ijang Plateau, East Java. The locality is not

in doubt, but on morphology it is in fact an overlooked specimen of *M. lutreolina* (Meiri *et al.*, in prep.).

Hence, there is no plausible evidence of occurrence on Java, and W. C. Wozencraft (verbally, 2006) confirmed that the island was listed in Wozencraft (2005) through editorial error. Malay Weasel's absence from Java could indicate that it needs year-round high humidity and cannot persist in non-evergreen vegetation formations. During Pleistocene glacial periods, such non-evergreen vegetation, e.g. open woodlands, were much more extensive on Java than on Borneo and Sumatra (Bird *et al.*, 2005). Several tropical rainforest mammals like orang-utans *Pongo* spp., Siamang *Symphalangus syndactylus* and Asian Tapir *Tapirus indicus* inhabited Java about 70,000 years ago but disappeared during the last glacial maximum (see Meijaard, 2003b). Evidence is insufficient to determine whether Malay Weasel showed a similar pattern, or simply never occurred on Java. Current absence from Java is consistent with its strictly Sundaic Thai range: off the peninsula, Thai forest is highly seasonal, even evergreen formations having marked dry seasons, and Sundaic bird species are almost absent (Round *et al.*, 2003).

There was also a confused period when the species was considered to inhabit Palawan and some other Philippine islands, through Grevé's (1894) misreading of Everett's (1893) statements (Brongersma & Junge, 1942), but this notion has evidently been successfully squashed. Coincidentally, a subsequent specimen labelled from Luzon, the Philippines (Museum of Vertebrate Zoology, University of California, Berkeley, USA; MCZ 109781) was obtained by C. G. Sibley on 1 January 1945, but C. Conroy (*in litt.*, 2006) clarified that this specimen was purchased in a market; it could have originated anywhere.

Altitudinal range

Most Malay Weasel records, past and recent, come from the lowlands, with several at sea level; many are also in the lower hills (Appendices 1, 2). This pattern, rather than indicating differential abundance, may simply reflect the predominance of observer effort (including time on roads) at lower and middle altitudes. Payne *et al.* (1985) mentioned occurrence of Malay Weasel up to 1,700 m on Gunung (= Mount) Kinabalu, Sabah. There are various other highland historical records (Appendix 1: also, Robinson & Kloss, 1919; Davis, 1962). Recent site records include at least six, from several different massifs, within 1,000-1,500 m, and three (all from Kinabalu) at 1500 m or over, with the highest from c. 1,700 m.

Habitat type and quality

Past assessments of Malay Weasel habitat have been too general to be informative, e.g. "forests" (Payne *et al.*, 1985), while the usually exhaustive Lekagul & McNeely (1977) gave no speculation whatsoever. Comprehensive reviews of small carnivores on small islands covering the species's range (Meijaard, 2003a; Meiri, 2005) traced no records, suggesting that fairly large areas are needed to retain populations; this would follow if the population density is low (see below). The recent records (Appendix 2) come from all stages of human encroachment of habitat, from deep within extensive primary forest to sites remote from any old-growth forest, or even mature secondary growth. There are records from various plantation types (although all records with precise information were located close to primary forest), and two records even came from urban or suburban settings. Over three-quarters of recent records are from lowland and hill mixed dipterocarp forest; this proportion may simply reflect the large extent of such forests and concentration of wildlife survey within them. Records also come from tropical heath forest (*kerangas*), swamp forest, montane forest and, at even higher

altitude, montane scrub. Although Banks (1949) stated that Malay Weasel was “confined entirely to old jungle” and Ratnam *et al.* (1991) allowed it “a general requirement for good lowland forest”, the current records suggest no restriction, within a climate of year-round high humidity, to forest of a particular type or condition, or even, apparently to forest itself. The generally low levels of wildlife survey in anthropogenic non-forest habitats (including plantations of exotics) mean that further information from sites remote from forest is a high priority: it is conceivable that the non-forest records here might all represent dispersing animals or sink populations. The absence from Java and non-peninsular Thailand (see above) indicates absence from areas lacking a marked dry season. We traced no recent records from south-eastern Borneo, where the climate is markedly drier than on the rest of the island; survey effort is too low to infer absence from this area, but confirmation of occurrence here would be of particular interest. The historical record from Cantung (formerly, Tjantung) in 1908 (Lyon, 1911; Appendix 1) was among the parts of Borneo with the lowest rainfall; however, dryness was doubtless moderated by the then extensive swamp forests.

Abundance

No site was traced where Malay Weasel was regarded as commonly seen. Today, few wildlife surveyors and researchers, even those who have spent years in the region, have seen the animal more than once or twice. There are several cases where the species has been found at a site only after very lengthy survey; e.g. at Krau, Malaysia, the weasel was not recorded in the early 1970s (Medway & Wells, 1971; Medway, 1972) but was added to the mammal list in the 1990s (DWNP, 1995, cited in Sahir Othman & Lim, 2000). Wherever it occurs, the weasel is seen at best infrequently.

Low sighting rates could indicate genuinely low densities (as suggested by writers from Banks [1949] to Wulffraat *et al.* [2006]), extreme shyness and/or some other behavioural trait rendering the species rarely seen. Although U. Treesucon (*in litt.*, 2006) found in his 2-3 sightings that Malay Weasels were very shy, and disappeared as soon as they saw him, as did the sole ones seen by C. Chin, *in litt.* (2005; despite initial lack of vigilance) and S. Myers (*in litt.*, 2006), several other observers (Franklin & Wells, 2005; C. R. Robson, *in litt.*, 2006; J. W. K. Parr, *in litt.*, 2006; H. S. Moeller, *in litt.*, 2006) specifically commented on the animal’s lack of awareness of nearby people. Indeed, J. Holden (*in litt.*, 2006) had an animal walk right past him at close range as he hammered a camera-trap post into the forest floor; another time, a weasel walked up to investigate him. Banks (1980) considered that its decided smell of ammonia coupled with an appearance as a giant hairy caterpillar, “the yellow fur puffed out all round the body [is] a sort of warning to wantons”, and its behaviour fits this speculation.

Camera-traps results should not be affected by shyness, but from the relatively high effort across Malay Weasel’s geographic range in the last 15 years we have traced only a single record (Appendix 2, reproduced on this issue’s cover). While some surveyors, many of whom are after much larger mammals such as Tigers *Panthera tigris*, set a horizontal detection beam rather too high for low-slung animals like weasels (e.g. Holden, *in press*), others, including S. T. Wong (*in litt.*, 2006), aim cameras obliquely towards the floor and so photograph even small rodents; yet S. T. Wong has only camera-trapped one Malay Weasel in over 2000 photographs of wildlife, even though several other observers have seen the species recently in the same area (Appendix 2). Many other camera-trap studies in the species’s range have failed to find it at all (e.g. van Schaik & Griffiths, 1996; Azlan, 2003; Franklin & Wells, 2005; Wulffraat *et al.*, 2006; Holden, *in press*). A tropical Asian congener,

Stripe-backed Weasel, also is also camera-trapped only rarely, even where other techniques suggest it to be not uncommon (Abramov *et al.*, *in prep.*).

Perhaps Malay Weasel is not prone to venture into open areas, instead spending most time within field-layer vegetation: B. Hagen (1890: 96), who saw it several times, specifically noted it as sneaking through the shrubs. Such behaviour would inhibit direct sight records, and explain the low photographic capture rates, because most camera-traps are aimed at open areas (wildlife trails, stream edges, forest paths etc.). Consistent with this, J. Payne (*in litt.*, 2006) pointed out that while he once saw one Malay Weasel run across a road, he has never seen the species dead on a road, compared with frequent road-kill civets (Viverridae) and Sunda Stink Badgers *Mydaus javanicus*, and speculated that this may indicate a reluctance to cross roads. The several sightings of road-kills and of animals running across roads (Appendix 2) might seem to contest this, but this weasel’s bright colour means that it is likely to be noticed and remarked upon, even by people with no particular interest in small carnivores. It is likely that had records of all small carnivores seen on roads been collated, Malay Weasels would have formed a very small proportion of the total.

A general elusiveness or low density is indicated by Harrison’s (1969) wide-ranging mammal collections during 1947-1957. He used several methods including traps (many kinds) and shooting. Yet, in the 10 years of research, only one individual of *M. nudipes* was collected. Set against this, Hoogstraal *et al.* (1969) were able to check seven Malay Weasels during the Malayan Tick Survey, an average number by comparison with other small carnivores. There is no evidence for markedly higher earlier densities a century or so ago, when natural habitats in the weasel’s range were far more extensive, human populations far lower, and hunting much less severe: when leafing through many of the early reports of mammal collection expeditions to Sundaland, the low proportion collecting Malay Weasel is striking by comparison with those securing other diurnal mustelids such as Yellow-throated Marten *Martes flavigula* and otters. There seem to be no large series of specimens, and the closest allusion to it being numerous may be Hose’s (1893: 27) statement that the species “is very rare in the Baram district [Sarawak, Borneo]...but it is more common near Kuching, where Dr Haviland obtained several fine specimens”. Even though, for example, Schneider (1905) caught the species at all his seven collecting sites on Sumatra, this was over a three-year survey (1897—1899) and hence is consistent with today’s situation, where the species has been found in many, even most, sites with high survey effort, but never commonly. However, A. Greiser Johns (*in litt.*, 2006) never found Malay Weasel in all the years he spent surveying and re-surveying the Sungei Tekam area (West Malaysia) and considers it one of the few mammal species genuinely absent there. Nothing, in habitat terms, obviously distinguishes Sungei Tekam (4°00’N, 102°35’E; see Johns 1986) from many other sites that do hold the weasel.

An adequate assessment of the species’s real abundance, and variation in status across its geographic, altitudinal and habitat range, is not possible from a collation of incidental records. It would probably require targeted *Mustela* trapping. What is clear is that even intensive surveys using camera-trapping or direct observation which do not find the species should not conclude it absent.

Diel activity pattern

The preponderance of recent daytime observations of Malay Weasel, against only two by night (Appendix 2; a further report of nocturnal activity, from Danum valley in Ahmad [2001], is a tabular

coding which lacks detail of individual records and has been excluded from Appendix 2), may reflect nothing more than the concentration of field effort by day. Precise timings give no suggestion of a crepuscular pattern, with many records from the heat of the day. Further data are needed to determine whether the weasel is cathemeral or effectively diurnal. Payne *et al.* (1985) mentioned activity by both day and night, whereas Lekagul & McNeely (1977) opined that it is generally nocturnal; neither presented supporting data. There have been sufficient spot-lighting surveys at sites known to hold the species to conclude that it is not readily found by night: e.g. in Danum valley, Sabah (which provided several day-time records), M. J. Heydon (*in litt.* 1996) surveyed for hundreds of hours by night and recorded most species of nocturnal Bornean mammal that are identifiable in the field (including four species of cat) but saw no weasels. However, if Malay Weasel's eye-shine is only weak (we traced no information on this) and the animal is prone to move unobtrusively within vegetation (see above), it might be rather difficult to find by spot-lighting.

Group size

Nearly all Malay Weasels were seen singly, although C. R. Robson (*in litt.*, 2006) saw two scurrying and chasing together (Appendix 2). This accords with the generally solitary nature of *Mustela*, as based mainly on studies of temperate species, proposed by Powell (1979). A reported sighting from Berau, East Kalimantan, of an adult and young Malay Weasel (Engström & Pamungkas, 2002) in fact refers to Yellow-throated Marten (*L. Engström, in litt.*, 2006).

Microhabitat and behaviour

All sightings specifying microhabitat were on the floor or around ground-level objects such as logs and rocks. There is no suspicion that the species climbs; its morphology supports Medway's (1969) assumption that it is ground-living, in common with most or all congeners. Brongersma & Junge (1942) speculated that it might be semi-aquatic (as are the European Mink *M. lutreola* and American Mink *M. vison*), based on one seen beside a stream and another slain with a paddle as it swam across the Bruny tributary of the upper river Mahakam (Jentink, 1898; van Balen, 1914); Banks (1931, 1980) had similar musings. However, plenty of carnivores are encountered close to streams (including many modern records of this species: Appendix 2) because they may both hunt in stream-side habitats and drink water (as noted by C. Chin, *in litt.*, 2005; Appendix 2), and time has lent no support to the suggestion that it might be semi-aquatic.

Most sightings have been of animals running across roads, forest trails or landslides, and hence too brief to illuminate behaviour. Banks (1949) described it as having an "eerie, silent, caterpillar-tractor gait, fast without loitering, and most conspicuous weaving it way from side to side in the jungle...". Foraging animals were noted as running on the ground, sometimes jumping onto old, fallen, logs (U. Treesucon, *in litt.*, 2006, S. Myers, *in litt.*, 2006), and rummaging in leaves below a tree (C. R. Robson, *in litt.*, 2006). C. R. Robson (*in litt.*, 2006) saw one animal disappear into a hole, while E. Lading (*in litt.*, 2006) saw one emerge from a crack, and P. D. Round (*in litt.*, 2006) saw one pop out of a space beneath a boulder and then nip back in again. One in Sumatra darted along a river bank and disappeared into a root-mass overhanging the river (J. Holden, *in litt.*, 2006). In 1908, W. L. Abbott shot one as it was trying to enter a "cave" (Lyon, 1911).

Hence, in its use of the habitat and behaviour, it seems to be a typical non-aquatic *Mustela*.

Threats

No threats specific to Malay Weasel are obvious. It does not seem to be taken into captivity as a pet or ratter (e.g. E. L. Bennett [*in litt.*, 2006] visited many long-houses in Sarawak and never saw one). It was identified by villagers in the Malinau area of central Borneo as of minor medicinal use (Sheil *et al.*, 2003), specifically, from Bulungan (the same region), with uses as: food; burning fur to exorcise ghosts; medicine for children; skin for hat; and trophy. Out of the 18 villages that were interviewed for this study, five reported use of the species by at least one informant's household during the past year (Puri, 2001). An animal collected by a Kenyah hunter with dogs and spears in East Kalimantan had the orange fur burned as medicinal exorcism of evil spirits. The meat was not eaten because of its foul odour (Puri, 1997).

It is doubtless caught as by-catch in snaring operations for quarry mammal species (see Holden, *in press*). Equally, it is reported to raid village chickens (Jentink, 1898; van Balen, 1914; Allen & Coolidge, 1940), but killing by farmers would be unlikely to drive population-level declines given the distribution of farmed chickens relative to the overall available habitat. Moreover, it enjoys in some areas a positive rural perception, e.g. around Kerinci-Seblat national park, villagers welcomed the species as a predator of crop-pest rats (Franklin & Wells, 2005).

There is no suggestion that it is strongly susceptible to forest degradation through logging and other forms of encroachment. Indeed, the several recent records from highly degraded, even suburban, areas (Appendix 2) suggest that the species may not even be tied to forest. It seems most unlikely to need primary forest (although more records are needed for conclusive demonstration of this; see above). Given that so much Sundaic forest conversion took place in the last two decades, some extinctions set in train by this change will not yet have occurred (see Tilman *et al.*, 1994, Brooks *et al.*, 1999). Hence, longer-term data will be needed for complete security over this species; but such a caveat could, and probably should, be applied to almost any Sundaic forest vertebrate. There are few data to tell whether Malay Weasel might persist in plantations of exotics or in other entirely deforested landscapes: it seems quite possible that it will inhabit oil palm estates, such plantations in Sumatra supporting very high densities of some rat species, and consequently their python predators (Shine *et al.*, 1999). Malay Weasel eats even quite large rodents (e.g. Franklin & Wells, 2005), although its diet has not been studied; a grass lizard was recorded by Jentink (1898), and Medway (1969) considered it strictly carnivorous, perhaps by inference from congeners, and despite Banks's (1931) suggestion that it might eat a bit of fruit. Although it was not found in oil palm plantations by Duckett (1976), a lack of records cannot imply absence, for a species so rarely seen even in heavily surveyed areas (see above). Of more concern, Leopard Cats *Prionailurus bengalensis* in such habitat die from haemorrhaging through eating rats poisoned by Warfarin and other anti-coagulant baits (Duckett, 1976), and this would presumably affect other mammalian predators such as this weasel.

Conclusions

On the basis of the records collated, there is no evidence that Malay Weasel should be considered of elevated conservation concern. However, it remains poorly known ecologically, and further information (particularly on its use of the oil palm and rubber plantations that now cover so much of its range) would be useful to make a more informed assessment. However, this is not a specific priority among small carnivore conservation in South-East Asia. Overall,

the call in McDonald & King (2000) for “fundamental ecological studies to be undertaken on most mustelids, so that well-informed decisions may be taken by future managers” remains entirely appropriate for this species.

Acknowledgements

This review depended upon observers supplying their records, and without mass participation could have drawn no conclusions. Hence, we offer many thanks to the following for their information (in some cases negative) and/or discussion about the species: Mohd. Azlan J. bin Abd. Gulam Azad, Reza Azmi, Elizabeth Bennett, Henry Bernard, David Bishop, Arthur Blundell, Ramesh Boonratana aka Zimbo, Tomas Carlberg, Cynthia Chin, the Earl of Cranbrook, Lisa Curran, Charles Davies, Geoffrey Davison, Vladimir Dinets, Dan Duff, Ruth Dunlop, Linda Engström, Charles Francis, Neil Franklin, Gabriella Fredriksson, Belden Gimán, Christian Gönner, Antonia Gorog, A. Greiser Johns, Melvin Gumal, Frank Hawkins, Hans Hazebroek, Simon Hedges, Matt Heydon, David Hoddinott, Jeremy Holden, Jason Hon, John Howes, Simon Husson, Ben Jarvis, Henrik Juul, Budsabong Kanchansaka, Kae Kawanishi, Krys Kazmierczak (Oriental Birding e-group), Engkamat Lading, Frank Lambert, Glenda Larke, Norman Lim, Clive Mann, Andrew Marshall, David and Nancy Massie, Mike Meredith, Hans Skotte Moeller, Susan Myers, Vincent Nijman, Johnny Parr, John Payne, Edward Pollard, Herman Rijksen, Scott Robertson, Craig Robson, Philip Round, Ken Scriven, Nico van Strien, Djoko Susatmoko, Uthai Treesucon, Rob Tizard, Géraldine Veron, Ahmad Zafir Abdul Wahab, Konstans Wells, Siew Te Wong, Chris Wozencraft, Stephan Wulffraat, Masatoshi Yasuda and Shigeki Yasuma.

The specimen review involved visits to and correspondence with the irreplaceable mammal collections of various museums, and we thank (acronyms are expanded in Appendix 1): Poul Hansen (Aarhus Natural History Museum, Denmark); Vincent Nijman and Adri G. Rol (ZMA, Amsterdam); Surachit Waengsothorn (TISTR, Bangkok); Angela Ross (Ulster Museum, Belfast, U.K.); Chris Conroy and Eileen A. Lacey (MVZ, Berkeley); Robert Asher (ZMB, Berlin); Gono Semiadi (MZB, Bogor); Georges Lenglet (IRSNB, Brussels); Gabor Csorba (HNHM, Budapest); Ray Symonds (University Museum of Zoology, Cambridge, U.K.); Judith Chupasko (MCZ, Cambridge, U.S.A.); William Stanley and Michi Schulenberg (FMNH, Chicago); Clara Stefen (SMTD, Dresden); Gordon Jarrell (University of Alaska, Fairbanks—Museum of Natural History, U.S.A.); G. Storch (Senckenberg Museum, Frankfurt, Germany); Giuliano Doria (MSNG, Genoa); Glasgow Museum, U.K.; Petra Ruud (Göteborgs Naturhistoriska Museum, Sweden); Hamburg Zoologisches Institut und Zoologisches Museum, Hamburg, Germany; Bernice P. Bishop Museum, Honolulu, Hawai`i, U.S.A.; Jaffit Majuakim (SMKK, Kota Kinabalu); Hitomi Hongo and Yutaka Kunimatsu (Primate Research Institute, Kyoto University, Japan); Thor Holmes (University of Kansas Museum of Natural History, Lawrence, U.S.A.); Jan Dawson (New-Walk Museum, Leicester, U.K.); Chris Smeenk and Hein van Grouw (RMNH, Leiden); Daphne Hills and Paula Jenkins (BMNH, London); Joan Hutton (Horniman Museum, London); Texas Tech University, Lubbock, Texas, U.S.A.; Muséum d’Histoire Naturelle, Lyon, France; Richard Kraft (Zoologische Staatssammlung München, Germany); Eileen Westwig and Robert Randall (AMNH, New York); Michel Gosselin and Darlene Balkwill (Canadian Museum of Nature, Ottawa); Malgosia Nowak-Kemp (Oxford University Museum of Natural History, U.K.); Risto Tornberg (Zoological Museum, University of Oulu, Finland); Géraldine Veron (MNHN, Paris); Francis Renoult

(Laboratoire d’Anatomie Comparée, Paris); Suzanne McLaren (Carnegie Museum of Natural History, Pittsburgh, U.S.A.); John Maunder (Newfoundland Museum, St. John’s, Canada); Hokkaido Museum, Sapporo, Japan; Paul W. Collins (Santa Barbara Museum of Natural History, U.S.A.); Jeffrey Bradley (UWBM, Seattle); David Harrison (Harrison Zoological Institute, Sevenoaks, U.K.); Yang Chang Man, N. Sivasothi and Kelvin Lim (ZRC, Singapore); Olavi Grönwall (NRM, Stockholm); Doris Morike (Staatliches Museum für Naturkunde, Stuttgart, Germany); Yen-jean Chen (National Museum of Natural Sciences, Taipei, Taiwan); Tsila Shariv (National Museum of Natural History at Tel-Aviv University, Israel); Hideki Endo (National Science Museum, Tokyo); Judith Eger and Susan Woodward (Royal Ontario Museum, Toronto, Canada); Lesley Kennes (Royal British Columbia Museum, Victoria, Canada); Craig Ludwig and Byrdena Shepherd (USNM, Washington D.C.) and Haji Bahrin Haji Bolhassan (Natural History Section, Brunei Museums, Negara Brunei Darussalam).

We particularly thank Nico van Strien for constructing and freely distributing the specimen database in van Strien (2001), which was of great value in directing our searches. Rob Tizard procured many of the less widespread literature. SM thanks Tamar Dayan and Daniel Simberloff for funding his museum visits, and JWD received funding through the EU Synthesys programme to visit NRM, Stockholm.

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***J. W. Duckworth, Wildlife Conservation Society**

International Programs; current address:

East Redham Farm,

Pilning, Bristol BS35 4JG, U.K.

B. P. Y.-H. Lee,

Central Nature Reserve - Conservation Division,

c/o National Parks Board, 1 Cluny Road,

Singapore 259569.

E. Meijaard,

The Nature Conservancy-East Kalimantan

Program, Samarinda, Indonesia and School for

Archaeology and Anthropology,

Australian National University,

Canberra, Australia.

S. Meiri, NERC Centre for Population Biology,

Imperial College London,

Silwood Park Campus, Ascot,

Berkshire SL5 7PY, UK.

* Contact for any additions or corrections to this account, including further records of the species. Email: boonhom@ocellata.com.

Appendix 1. Museum specimens of Malay Weasel.

Museum	Specimen number	Location	Co-ordinates + altitude	Date	Collector/Source	Reference	Other notes
THAILAND							
TISTR	54-1399	Ban Bang Non, Amphoe Muang, Ranong province	10°00'N, 98°40'E; foothills	26 May 1957 or a little earlier	Boonsong Lekagul	SW	Dense forest
BMNH	55.1595	Khao Chong, Trang province	7°35'N, 99°45'E	9 Dec 1909	H. C. Robinson?	H60; SM	
TISTR	54-1400	Pattani province	c. 6°52'N, 101°12'E	May 1955	Prayun Khananurak	SW	
WEST MALAYSIA							
BMNH	0.2.4.6	Perak	c. 5°N, 101°E	?	?	SM	
ZRC	4.1215	Perak	c. 5°N, 101°E	1935	Purchased from a Japanese taxidermist	BPYHL	
Not located	?	Larut, Perak	c. 4°48'N, 100°45'E	Before 1846	?	Flower, 1900	In 1900, in the Taiping museum, Perak, Malaysia
Not located	?	Kuala Kangsar, Perak	c. 4°45'N, 100°56'E	Before 1846	?	Flower, 1900	In 1900, in the Taiping museum, Perak, Malaysia
ZRC	4.1216	Fraser's Hill, Pahang	3°43'N, 101°45'E; 1,220 m	14 Jun 1932	S. Navaratnam	BPYHL	
USNM	489385	Bukit Lagdong forest reserve, Kepong, Selangor	3°14'N, 101°38'E	10 Dec 1960	Lim Boo Liat & I. Muul	SM	
USNM	489386	Bukit Lagdong forest reserve	3°14'N, 101°38'E	11 Jun 1969	Lim B. L. & I. Muul	SM	
BMNH	85.8.1.68	Klang, Selangor	3°02'N, 101°27'E	18 Apr 1879	W. Davison	Flower, 1900; H60; SM	
ZRC	4.1217	Golden Hope estate, Kajang, Selangor	2°59'N, 101°47'E	4 Apr 1916	E.W. Prior	BPYHL; SM	
ZMB	5472	Melaka	c. 2°24'N, 102°51'E	Not known	A. Meyer	R. Asher, <i>in litt.</i>	
BMNH	79.11.21.617	Melaka	c. 2°24'N, 102°51'E	?	T. Cantor	SM	
BMNH	71.4.10.1	Melaka	c. 2°24'N, 102°51'E	?	?	H60; SM	
BMNH	24.12.2.2	Triny?, Melaka	c. 2°24'N, 102°51'E	?	?	SM	
SUMATRA							
ZMA	5381	Serbodja (Serbodjadi), Deli	4°22'N, 97°44'E	19 Jun 1914	L. P. Cosquino de Bussy	B&J; SM	
Not located	?	Unter-Langkat	c. 4°00'N, 98°20'E	1897-1899	G. Schneider	S05	
ZMA	2055	Deli	c. 3°45'N, 98°41'E	1917	L. P. Cosq. de Bussy	B&J; SM	
ZMA	2056	Deli	c. 3°45'N, 98°41'E	1917	L. P. Cosq. de Bussy	B&J; SM	
ZMA	2057	Deli	c. 3°45'N, 98°41'E	1917	L. P. Cosq. de Bussy	B&J; SM	
ZMA	2058	Deli	c. 3°45'N, 98°41'E	1917	L. P. Cosq. de Bussy	B&J; SM	
RMNH	d (skeleton), e (skin)	Deli	c. 3°45'N, 98°41'E	8 Apr 1885	through B. Hagen	B&J; SM	
BMNH	99.11.13.2	Near Deli	c. 3°45'N, 98°41'E	?	?	SM	
Not located	?	Deli	c. 3°45'N, 98°41'E	1897-1899	G. Schneider	S05	
RMNH	1128; g (skin), g (skull)	Kampong Baru, near Medan, Deli	3°35'N, 98°40'E	Not known	through F. C. van Heurn	B&J; SM	Purchased from a local taxidermist on 12 Dec 1920
ZRC	4.1220	Timbang Serdang, NE Sumatra	3°35'N, 98°40'E	1935	M. Boogaarts	BPYHL; SM	

Museum	Specimen number	Location	Co-ordinates + altitude	Date	Collector/Source	Reference	Other notes
RMNH	a (skeleton), a (skin)	Tandung Morawa, Deli	3°33'N, 98°49'E	1882	through B. Hagen	B&J; SM	
ANSP	20233	Kutacane	3°30'N, 97°48'E; 200 m	1939	F. A. Ulmer	Miller, 1942	Obtained from locals
Not located	?	Bedagai river	3°30'N, 99°13'E	1897-1899	G. Schneider	S05; NJVS	
ZMA	5379	Assahan	c. 3°N, 99°E	1907	L. P. Cosq. de Bussy	V. Nijman, <i>in litt.</i>	
Not located	?	Danau Kota	0°25'N, 102°25'E	1897-1899	G. Schneider	S05	
Not located	?	Tanjung Butus	c.0°09'S, 104°22'E	1898	G. Schneider	S05; NJVS	
Not located	?	Japura	0°18'S, 102°20'E	1897-1899	G. Schneider	S05; NJVS	
AMNH	23089	Fort de Kock	0°19'S, 100°22'E	31 Mar 1904	?	SM	
BMNH	25.9.10.4	Fort de Kock	0°19'S, 100°22'E; 920 m	1 Sep 1925	E. Jacobson	H60; SM	
RMNH	1013; k	Fort de Kock, Agam, Padang highlands, West Sumatra	0°19'S, 100°22'E; 920 m	31 Jan 1918	E. Jacobson (coll. n° EJ397)	R&K; B&J; SM	
MZB	38	Padang Panjang	0°27'S, 100°25'E	1919	C. L van den Plas	Gono Semiadi	
Not located	?	Sungei Indragiri	c. 0°30'S, 103°30'E	1897-1899	G. Schneider	S05	
RMNH	991	Balum, Muara Labu, Padang highlands, West Sumatra	0°40'S, 100°57'E	Jul 1914	E. Jacobson (coll. n° 4379)	B&J; SM	
MZB	67	Padang Pariaman	0°45'S, 100°20'E	10 Apr 1921	Aziz Nasoetion	Gono Semiadi	
ZRC	4.1218	Mt Singalang, Kotagadang, Padang highlands, W Sumatra	c. 0°55'S, 100°38'E; 1,000 m	1 Oct 1917	E. Jacobson (coll n° EJ385)	R&K; BPYHL	
ZRC	4.1219	Kotagadang	c. 0°55'S, 100°38'E; 920 m	Nov 1924	E. A. Jacobson	BPYHL	
Not located	?	Padang	c. 1°S, 102°E	1897-1899	G. Schneider	S05	
RMNH	4252, i (skin), i (skull)	Jambi, South Sumatra	1°30'S, 103°00'E	1936	J. T. Hamaker (coll n° 238/38)	Dammerman, 1940; B&J; SM	Via MZB (n° 3635); type of <i>M. hamakeri</i> Dammerman
BMNH	26.3.12.1	Lebong	2°59'S, 104°23'E	?	?	H60	
RMNH	33703	Lampung, South Sumatra	c.5°S, 105°E	1930?; <1942	Not known?	B&J; SM	
ANSP	?	Lampung	c. 5°S, 105°E	Aug-Nov 1901	A. C. Harrison & H. M. Hiller	Stone & Rehn, 1902	ex-Sody Collection
ZMB	64199	Telukbetung	5°27'S, 105°16'E	Not known	Schlüter	R. Asher, <i>in litt.</i>	
ZMB	64200	Telukbetung	5°27'S, 105°16'E	Not known	Schlüter	R. Asher, <i>in litt.</i>	
RMNH	33702	Telukbetung	5°27'S, 105°16'E	Nov 1924	von Zengen	B&J; SM	ex-Sody Collection
FMNH	268	Not known	Not known	Not known	Not known	MS	Ex Ward's Nat. Sci. Estab. (16961)
HNHM	?	Sumatra: no precise locality	Not known	1882	?	G. Csorba, <i>in litt.</i>	
HNHM	?	Sumatra: no precise locality	Not known	1882	?	G. Csorba, <i>in litt.</i>	
IRSNB	3603	Sumatra: no precise locality	Not known	before 1942	Rookmaker	G. Lengles, <i>in litt.</i>	
ZMA	15791	Sinkara	Not traced	Unknown	Ross	V. Nijman, <i>in litt.</i>	
USNM	267386	Adji (perhaps Aceh?)	Not known	Not known	Not known	SM	
NRM	A584655	Sumatra: no precise locality	Not known	Not known	Not known	JWD	Ex Uni. Stockholm Zool. Inst. (n° Z 4655)
NRM	A580149	Telukbetung	5°27'N, 105°16'E or 1°23'N, 100°36'E	Not known	Schlüter, a dealer	JWD	

Museum	Specimen number	Location	Co-ordinates + altitude	Date	Collector/Source	Reference	Other notes
BORNEO: MALAYSIA							
USNM	301102	Tenompok, Mt Kinabalu, Sabah	6°05'N, 116°33'E	1 Sep 1935	R. Traub	SM	
Not located	?	Kiau, Sabah?	6°02'N, 116°29'E?	?	?	A&C	See note 1
MCZ	36577	Mt Kinabalu, Sabah	6°00'N, 116°30'E	1 Jul 1937	J. Griswold	A&C	Via Vienna Museum
SMKK	NH 1226	Kg. Muruk, Ranau, Sabah	c. 5°55'N, 116°45'E	6 Feb 1971	?	JM	
SMKK	NH 1222	Kg. Lebodon, Tuaran, Sabah	5°51'N, 116°20'E	18 Jun 1971	?	JM	
SMKK	NH 1223	Kg. Lebodon, Tuaran	5°51'N, 116°20'E	25 Oct 1971	?	JM	
SMKK	NH 1224	Kg. Lebodon, Tuaran	5°51'N, 116°20'E	25 Oct 1971	?	JM	
SMKK	NH 1225	Kg. Lebodon, Tuaran	5°51'N, 116°20'E	25 Oct 1971	?	JM	
SMKK	NH 1218	Kg. Togudon, Penampang, Sabah	c. 5°51'N, 116°20'E	16 Oct 1971	?	JM	
SMKK	NH 1219	Kg. Togudon, Penampang	c. 5°51'N, 116°20'E	17 Dec 1971	?	JM	
SMKK	NH 1220	Kg. Togudon, Penampang	c. 5°51'N, 116°20'E	17 Dec 1971	?	JM	
SMKK	NH 1221	Kg. Togudon, Penampang	c. 5°51'N, 116°20'E	17 Dec 1971	?	JM	
SMKK	NH 1228	Penampang district, Sabah	c. 5°51'N, 116°20'E	17 Aug 1969	?	JM	
ZRC	4.1223	Betotan, Sabah	5°47'N, 117°52'E	4 Aug 1927	C. B. Kloss & F. N. Chasen	Chasen & Kloss, 1931; Davis, 1962; BPYHL	From "heavy forest"
SMKK	NH 1227	Mawao, Membakut	5°25'45"N, 115°47'15"E	7 Dec 1971	?	JM	
BMNH	99.12.9.28	Baram, Sarawak	c. 4°36'N, 113°59'E	15 Jun 1898	C. Hose	H60; SM	
MCZ	36719	Kalabakan river, Sabah	4°25'N, 117°29'E	6 Jul 1937	H. G. Deignan	A&C	Via Vienna Museum
Not located	?	Kalabakan river, Sabah	4°25'N, 117°29'E	1959	R. F. Inger	Davis, 1962; NJvS	
Not located	?	Sibuti river, Sarawak	c. 4°00'N, 113°43'E	before 1894	E. Cox	Hose, 1893; NJvS	
IRSNB	17261	Bario, Sarawak	3°45'N, 115°27'E	13 Oct 1971	King Léopold III & Gosse	G. Lengles, <i>in litt.</i>	
FMNH	88288	Bario, Sarawak	3°45'N, 115°27'E; 1,200 m	2 Nov 1947	T. Harrisson	Davis, 1958; MS	
FMNH	88289	Bario, Sarawak	3°45'N, 115°27'E; 1,200 m	12 Nov 1947	T. Harrisson	Davis, 1958; MS	
FMNH	88290	Pa Umor, Kelabit uplands, Sarawak	3°44'N, 115°31'E; 1,050 m	1 Jul 1948	T. Harrisson	Davis, 1958; MS; SM	
Not located	?	Pa Mein, Kelabit uplands, Sarawak	3°38'N, 115°31'E; 930 m	31 Nov (sic) 1922	E. Mjöberg?	Lönning & Mjöberg, 1925	
SMK	0170/9	Pa Mada, Kelabit uplands, Sarawak	3°35'N, 115°32'E	14 Mar 1970	Unknown	K&YN	
FMNH	88292	Pa Mada	3°35'N, 115°32'E; 1,120 m	1945-1949	T. Harrisson	Davis 1958; MS	
FMNH	88291	Pa Mada	3°35'N, 115°32'E; 975 m	1945-1949	T. Harrisson	Davis, 1958; MS	
SMK	0170/2	Gunung Dulit, Sarawak	3°15'N, 114°15'E	Oct 1891	C. Hose	K&YN	
Not located	?	Gunung Kalulong, Baram, Sarawak	3°14'N, 114°39'E	before 1894	C. Hose	Hose, 1893	Probably SMK 0170/2; Hose (1893) does not list Gn Dulit
SMK	0170/5	Lundu, Sarawak	1°45'N, 109°45'E	2 Aug 1924	Museum collector	K&YN	
FMNH	88607	Buya, 3rd division, Sarawak	1°43'N, 111°48'E	2 Nov 1955	T. Chavasse	MS; SM	

Museum	Specimen number	Location	Co-ordinates + altitude	Date	Collector/Source	Reference	Other notes
BMNH	55.738	Anyut Paku, Saribas, Sarawak	1°33'N, 111°13'E	19 Jul 1916	H. C. Robinson	H60; SM	
Not located	?	Kuching, Sarawak	1°33'N, 110°20'E	Before 1894	Dr Haviland	Hose, 1893; NJvS	Several specimens
MCZ	36747	Kuching	1°33'N, 110°20'E	22 Feb 1904	L. Fook Chong	A&C	Via Vienna Museum
SMK	0170/1	Kuching	1°33'N, 110°20'E	2 May 1900	Unknown	K&YN	Purchased
SMK	0170/7	Kuching	1°33'N, 110°20'E	16 Jun 1900	Unknown	K&YN	Purchased
SMK	0170/8	Sungei Sadong, Sarawak	1°33'N, 110°45'E	'26 May 1958'	'E. Mjöberg'	K&YN	Date or collector in error
BMNH	55.740	Sungei Pelandok, Paku, Saribas, Sarawak	1°30'N, 111°30'E	1 Apr 1917	H. C. Robinson	H60; SM	
SMK	0170/3	Mile 10, Penrissen, Kuching	1°25'N, 110°15'E	24 Apr 1896	Museum collector	K&YN	
SMK	0170/6	Gunung Penrissen, Sarawak	1°20'N, 110°15'E; 1,070 m	17 Feb 1924	E. Mjöberg	K&YN; Medway, 1977	
ZRC	4.1221	Bukar, Samarahan, Sarawak	1°16'N, 110°27'E	2 Nov 1919	Not known	BPYHL; SM	
Apparently lost	Not assigned	Sungei Sebangang region, Sarawak	1°15-35'N, 110°45'-111°00'E	1890-1893	F. S. Bourns	Timm & Birney, 1980	Referred to in field catalogue
BMNH	55.739	Entawa, Samarahan, Sarawak	1°07'N, 111°32'E	21 Nov 1919	H. C. Robinson	H60; SM	
SMK	0170/4	Nadai Rikut, State unknown	Not located	6 Jun 1969	Not known	K&YN	
MSG	2836	Unknown locality, Sarawak	Not known	1865	O. Beccari, G. Doria	G. Doria, <i>in litt.</i>	
MSG	2838	Unknown locality, Sarawak	Not known	1865	O. Beccari, G. Doria	G. Doria, <i>in litt.</i>	
SMK	0170/10	4th division, Sarawak	Not known	Not known	Not known	K&YN	
BORNEO: KALIMANTAN							
RMNH	d (skin), c (skull)	Pontianak	0°02'S, 109°20'E	19th century	P. Diard	B&J	
RMNH	N 119; e	Dingai, East Kalimantan	0°35'S, 117°17'E	14 Dec 1896	A. W. Nieuwenhuis (coll n° 119)	Jentink, 1898; B&J; SM	In Bruny river (Long Bloeh), upper Mahakam river
AMNH	106065	Riam (Kotawaringin), Central Kalimantan	2°29'S, 111°25'E	27 Nov 1935	J. J. Menden	SM	
USNM	151878	Cantung (=Tjantung), South Kalimantan	3°03'S, 115°58'E	31 Jan 1908	W. L. Abbott	Lyon, 1911; SM	
RMNH	c (skin), f (skull)	Banjarmasin, South Kalimantan	3°20'S, 114°36'E	1845	C. A. L. M. Schwaner	B&J	
RMNH	b (skin), b (skull)	Banjarmasin	3°20'S, 114°36'E	Not known	C. A. L. M. Schwaner	B&J; NJvS	
BORNEO: unknown							
IRSNB	1704	Not known	Not known	by 1832	Henrici	G. Lengles, <i>in litt.</i>	
IRSNB	1704b	Not known	Not known	by 1832	Henrici	G. Lengles, <i>in litt.</i>	
ZMB	4575	Not known	Not known	Not known	Gerrard	R. Asher, <i>in litt.</i>	
USNM	269062	Not known	Not known	1937?	Not known	Miller, 1942?	Possibly Borneo or Sumatra
ZRC	4.1224	Unknown locality, Sabah	Not known	Not known	Not known	BPYHL	

Museum	Specimen number	Location	Co-ordinates + altitude	Date	Collector/Source	Reference	Other notes
SMTD	B16847	Not known	Not known	before 1900	Not known	C. Stefan, <i>in litt.</i>	Ex. Leipzig Uni. zool. coll.
Unknown locality							
MNHN	Skin: CG 2001-355; skull A 1948 [-1-1106]	Not known, once stated to be Java; see text	Not known	May 1821	P. Diard	Desmarest, 1822; G. Veron, <i>in litt.</i> ; SM	Type of <i>Mustela nudipes</i>
BMNH	46.3.5.4	Not known ("Java" on label)	Not known	Before 1865	via Leadbeaters dealers	H60; SM	Perhaps the basis for Gray's (1865) un-named Var.
UWBM	Skull 14709; skin 14722	'Dutch East Indies'	Not known	1930 or earlier	Lex Weygers	J. Bradley, <i>in litt.</i>	Believed to be from one animal
ZRC	4.1222	Unknown locality	Not known	Not known	Mr Loong Tak	BPYHL	
MVZ	109781	Purchased in Luzon, collection locality unknown	Not known	Purchased on 1 Jan 1945	C. G. Sibley (purchaser)	C. Conroy, <i>in litt.</i>	
MNHN	CG 1838-486	Stated to be Java or Borneo	Not known	1836-1837	Expedition La Bonite	G. Veron, <i>in litt.</i>	
BMNH	Skull 58.5.4.86; skin 55.12.24.217	Not known	Not known	Before 1865	Not known	Gray, 1865; H60; SM	Type of <i>Gymnopus leucocephalus</i>

An unclear association between published data or comments and a museum specimen is indicated in the relevant columns by a '?' sign.

Where data are believed not to exist, a cell contains "not known"; where they may exist, the cell contains a '?' sign.

Individual notes

1, Text mentions specimen from 'Kiau' but (as taken by Medway 1977) perhaps this is an error for 'Kina[balu]', as specimen is not otherwise mentioned and is not in MCZ.

Reference codes:

A&C, Allen & Coolidge, 1940; B&J, Brongersma & Junge, 1942; BPYH, B. P. Y.-H. Lee, personal examination; H60, Hill, 1960; JM, J. Majuakim, *in litt.*, 2006; JWD, J. W. Duckworth personal examination; K&YN, Kool & Yakup Nawi, 2005; MS, M. Schulenberg, *in litt.*, 2006; R&K, Robinson & Kloss, 1919; S05, Schneider, 1905; SM, S. Meiri personal examination; SW, S. Waengsothorn, *in litt.*, 2006.

Museum acronyms:

AMNH, American Museum of Natural History, New York, U.S.A.; **ANSP**, Academy of Natural Sciences, Philadelphia, U.S.A.; **BMNH**, Natural History Museum, South Kensington, London; **FMNH**, Field Museum, Chicago, U.S.A.; **HNHM**, Magyar Neinzeti Muzeum / Hungarian Natural History Museum, Budapest; **IRSNB**, Institut Royal des Sciences Naturels, Brussels, Belgium; **MCZ**, Museum of Comparative Zoology, Harvard University, Cambridge, U.S.A.; **MVZ**, Museum of Vertebrate Zoology, Berkeley, California, U.S.A.; **MZB**, Museum Zoologica Bogoriensis, Bogor, Indonesia; **MNHN**, Muséum Nationale d'Histoire Naturelle, Paris; **MSNG**, Museo Civico di Storia Naturale "G. Doria", Genova (Genoa) Italy; **NRM**, Naturhistoriska Riksmuseet, Stockholm; **RMNH**, Rijksmuseum voor Natuurlijke Historie (National Museum of Natural History 'Naturalis'), Leiden, Netherlands; **SMKK**, Sabah Museum, Kota Kinabalu, Sabah, Malaysia; **SMK**, Sarawak Museum, Kuching, Sarawak, Malaysia; **SMTD**, Staatliches Museum für Tierkunde, Dresden, Germany; **TISTR**, Thailand Institute of Scientific and Technological Research, Bangkok; **USNM**, National Museum of Natural History, United States National Museum, Smithsonian Institution, Washington D.C.; **UWBM**, Burke Museum of Natural History and Culture, University of Washington, U.S.A.; **ZMA**, Zoologisch Museum, Universiteit van Amsterdam, Netherlands; **ZMB**, Museum für Naturkunde, Humboldt Universität zu Berlin; **ZRC**, Zoological Reference Collection, Raffles Museum for Biodiversity Research, Singapore.

Appendix 2. Field records of Malay Weasel.

Location	Co-ordinates + altitude	Habitat	Date(s)	Time of day	Observer, reference	Other notes
THAILAND						
Khlung Saeng WS, Surat Thani province	9°11'N, 98°39'E; lowland	Evergreen forest, near a stream	1999-2000	Daytime	B. Kanchansaka	One seen
Khao Sok NP, Surat Thani province	8°55'N, 98°38'E; 500 m	Tall forest, on a steep ridge-top	17 May 2004	Mid-morning	C. Davies	One seen in spiny palm understory
Klong Thom, Khao Phra Bang Khram WS, Krabi province	7°50'N, 99°22'E; 80 m	40-50 year secondary forest, 1.5 km from primary evergreen forest	1991-1993	Daytime, before noon	Uthai Treesucon	2-3 single animals seen
Khao Phra Bang Khram WS	7°50'N, 99°22'E; c. 100 m	Secondary monsoon evergreen forest	2003-2004	07h30	J. W. K. Parr	One seen
Budo, Narathiwat province	6°30'N, 101°38'E; c. 550 m	Mature hill-slope forest	13 July 2003	Daytime	P. D. Round	One seen
Charoen Pra Kiet WS, Narathiwat province	6°16'N, 101°53'E; lowland	Peat-swamp forest	1996	n/a	per B. Kanchansaka	One live-trapped
Hala Bala WS, Narathiwat province	5°55'N, 101°48'E; unknown	Evergreen forest	2004	n/a	per B. Kanchansaka	One live-trapped
WEST MALAYSIA						
Between Jeli (Kelantan) and Gerik (Perak)	c. 5°35'N, 101°30'E; not known	Trunk road through hill dipterocarp forest	4 Mar 2005	11h00	Ahmad Zafir Abdul Wahab	One seen, trying to cross the trunk road
Pergau, Kelantan	c. 5°27'N, 101°55'E; c. 200 m	Logged lowland dipterocarp forest on foothill slopes	Oct 1986	Daytime	G. W. H. Davison	One seen, crossing a logging trail
Merapoh, Taman Negara NP (western border)	4°41'00"N, 102°03'50"E; 150 m	Ecotone (hard) of primary lowland rainforest with oil palm plantation	1999	c. 15h00	K. Kawanishi	One on the ground in a brushy / grassy area; no canopy cover
Kuala Tahan, Taman Negara NP	4°23'N, 102°24'E; within 150-300 m	Primary lowland dipterocarp forest	within 1956-1973	n/a	Lim & Saharudin, 1990	One trapped
Fraser's Hill, Pahang	3°43'N, 101°45'E; c. 900 m	Road through hill forest	late Jul 2002	Daytime	C. R. Robson	Two animals, scurrying around by the roadside; oblivious to people
Fraser's Hill	3°43'N, 101°45'E; 1,250 m	Ridge-crest lower montane forest	1970s	Unknown	D. R. Wells	One seen
Krau WR, Pahang	3°43'N, 102°10'E; unknown	In or near little-disturbed dipterocarp forest	within 1990-1995	Unknown	Sahir & Lim, 2000	Cites DWNP (1995); no detail
Near Bukit Bangkong, south Pahang	3°30'N, 103°22'E; c. 10 m	Sandy, very degraded edge of peat-swamp forest	2003 or 2004	Broad daylight	G. Larke	One ran across a logging trail
Bukit Kutu WR, Selangor	3°27'N, 101°41'E; within 250-1,050 m	Primary lowland or hill dipterocarp forest	1975	n/a	Lim <i>et al.</i> , 1999a	One trapped
Upayapadu Concession, Pahang	3°26'50"N, 102°18'32"E	In or near peat-swamp forest	Feb 2004	Unknown	Per A. Greiser Johns	Sole record in extensive surveys of peat-swamp forests over four years (UNDP-GEF/FRIM 2004)
Tasek Chini NR, Pahang	3°25'N, 102°56'E; <75 m	Disturbed forest scattered with orchards, old rubber plantations and abandoned cultivation; some tall trees	1993 or 1994	n/a	Lim <i>et al.</i> , 1999b	One skull found
Genting highlands, Pahang	3°23'N, 101°47'E; c. 1,000 m	Upper hill dipterocarp forest	May 1999	n/a	Lim & Chai, 2002	One trapped
Old Gombak road, c. 12 km north of Gombak, Genting highlands	3°21'N, 101°49'E; c. 300 m	Roadside vegetation adjoining secondary hill forest	May 1980	c. 10h00	A. Greiser Johns	One seen

Location	Co-ordinates + altitude	Habitat	Date(s)	Time of day	Observer, reference	Other notes
Highway 68, c. 12 km from Gombak	3°21'N, 101°50'E; c. 200 m	Disturbed hill forest	Apr 1987	n/a	A. Greiser Johns	Road-kill
Templar Park, Selangor	3°14'N, 101°39'E; <250 m	Patchy forest	16 Jan 1980	Daytime	C. R. Robson	One seen foraging.
Pasoh forest reserve, Negri Sembilan	2°59'N, 102°17'E; 75-150 m	A 6 sq. km isolate of virgin lowland dipterocarp forest, abutting c. 14 sq. km of forest selectively logged in 1955-56	within 1981-1987	Unknown	Kemper, 1988	Field sighting(s)
Pasoh forest reserve	2°59'N, 102°17'E; 75-150 m	As above	within 1968-1974	n/a	Lim <i>et al.</i> , 2003	One caught in a banana-baited wire-mesh live-trap
10 km from Pasoh forest reserve	c. 2°59'N, 102°17'E; lowlands	Oil palm and remnant forest patches	c. 1996	n/a	K. D. Bishop	Fresh road-kill
Rompin, Pahang	c. 2°49'N, 103°29'E; <100 m	Logged lowland forest in gently undulating terrain	Feb 1990	Daytime	G. W. H. Davison	One seen crossing a logging trail
South of Tanjung Agas, Negri Sembilan	2°20'N, 101°59'E; sea-level	Freshwater swamp forest	Mar or Apr 1986	03h00	J. Howes	One seen along the coastal road
SUMATRA						
Ketambe	3°48'N, 97°32'E; c.350 m	Primary dipterocarp forest	1973	Late afternoon	Rijksen, 1978; H. D. Rijksen	One seen beside the river
River Bohorok, 10 km upstream of Bukit Lawang, Gunung Leuser NP	3°34'N, 98°05'E; c.100 m	Steep-sloped primary dipterocarp forest	10 Mar 2005	11h00	E. Pollard	One ran across a landslide
Sinabung	3°10'N, 98°24'E; unknown	Grassy, rugged terrain; distance to forest unclear	1971	n/a	H. D. Rijksen	Roadkill
Karo highlands	3°00'N, 98°25'E; c. 900 m	Unknown	1970s	Daytime	N. J. van Strien	At least one sighting crossing a road
Near Bukittinggi, west Sumatra	c. 0°19'S, 100°22'E; 900 m	Urban	Within 1996-2005	n/a	Holden, in press; J. Holden	Road-kill; 5 km from the nearest patch of 'forest'
Tandai, Kerinci Seblat NP	1°32'S, 101°21'E; 700 m	Old logged forest	1995	Mid-morning	Holden, in press; J. Holden	One beside a river bank
Gunung Tujuh, Kerinci Seblat NP	1°40'S, 101°25'E; 1,300 m	Montane scrub	May 1997	Mid-afternoon	Holden, in press; J. Holden	One seen
Tapan valley, Kerinci Seblat NP	2°06'S, 101°08'E; 150 m	Primary forest	Jan 1996	Mid-morning	Holden, in press; J. Holden	One seen
Kerinci Seblat NP (South Sumatra section).	2°57'S, 102°24'E; 800 m	Primary hill forest	25 Apr 1994	17h50	Franklin & Wells, 2005; N. Franklin	One beside a small, fast, river
Kerinci Seblat NP	2°27'S, 102°08'E; 380 m	Mix of rainforest and overgrown rubber plantation	12 Apr 1994	17h30	Franklin & Wells, 2005; N. Franklin	One darted along a river bank
Way Canguk RS, Bukit Barisan Selatan NP, Lampung province	5°39'32"S, 104°24'21"E; <100 m	Degraded primary rainforest	17 Mar 2000	Mid-morning	S. Hedges	One, apparently foraging
BORNEO: MALAYSIA						
Kampong Monggis or Kampong Tumbalang, Sabah	6°13'N, 116°45'E or 6°08'N, 116°53'E; 700 m	Logged forest (c.25-30 previously)	Within 2002-2004	Daylight	K. Wells	One seen

Location	Co-ordinates + altitude	Habitat	Date(s)	Time of day	Observer, reference	Other notes
Tuaran, Sabah	6°11'N, 116°14'E; 150 m	Not recorded	25 Dec 2004	n/a	S. Yasuma	Roadkill
Kinabalu park, Sabah	6°11'N, 116°40'E; 1,600 m	Montane forest	7 Jun 2001	Daylight?	D. Massie	One seen by tourist cabins
Kinabalu park	6°11'N, 116°40'E; 1,600 m	Small gully by entrance road	29 Feb 2000	10h00	S. Myers	One seen by park hostel
Kinabalu park	6°11'N, 116°40'E; 1,550 m	Emerged from a thicket and crossed a car-park	19 Mar 2000	Daylight	H. S. Moeller	One near Park headquarters
Silau-Silau trail, Kinabalu park	6°11'N, 116°40'E; 1,500 m	Streamside gully	19 Mar 2005	11h00	D. Hoddinott	One seen
Kinabalu park	6°05'N, 116°31'E; c. 1,700 m	Montane forest	Nov 1996	10h00	K. D. Bishop	One seen eating a large skink
Kinabalu park	6°05'N, 116°35'E; 1,370 m	Primary montane forest edge	4 Jun 1997	12h30	K. D. Bishop	One ran across the Kota Kinabalu road, near Mt Kinabalu entrance
Poring Hot Springs, Sabah	6°03'N, 116°42'E; 700 m	Primary forest	16 Mar 1996	c.08h00	T. Carlberg	One crossed a forest trail
Poring Hot Springs	6°03'N, 116°42'E; 700 m	Primary forest	Within 2001–2003	Daylight	K. Wells	One seen
Poring Low, Sabah	6°03'N, 116°42'E; c.700 m	Mature forest dominated by tall dipterocarps	No details	No details	Emmons, 2000	No details
Ranau, Sabah	5°55'N, 116°45'E; 700 m	Not recorded	28 Dec 1999	n/a	S. Yasuma	Roadkill
Sukau, lower Kinabatangan, Sabah	5°30'N, 118°30'E; 0–100 m	Inundated riverine forest to logged-over lowland dipterocarp forest	Jan 1990—Dec 1991	Daylight	R. Boonratana; Boonratana & Sharma, 1997	Several sightings of singles
Tabin WR (western border), Sabah	5°12'N, 118°37'E; c.500 m	Between mixed dipterocarp forest (c.25 years post- selective logging) and a large 15-year-old oil palm plantation	early 2000	07h00	H. Bernard	One crossed a dirt road, near human habitation
Ulu Segama forest reserve, Danum valley, Sabah	5°00'21"N, 117°50'11"E; 290 m	Selectively logged forest (in 1989); regenerating well; with <i>Macaranga hypoleuca</i> stands	15 Aug 2000	07h23	Siew Te Wong	Camera-trapped (two photos of one animal)
Danum valley, Sabah	4°57'N, 117°48'E; c. 250 m	Old-growth forest	c. Dec 2004	Unknown	K. Wells	One seen
Danum valley	4°57'N, 117°48'E; lowlands	Not specified	No details	No details	Emmons, 2000	No details
Danum valley	4°57'N, 117°48'E; 150 m	Primary tall dipterocarp forest, slightly hilly terrain	28 Jul 2005	06h00	K. D. Bishop	One ran across the Hornbill Trail, Borneo Rainforest Lodge
Bakapit, Sabah	4°57'07"N, 118°34'46"E; not known	Logged forest	1982	Daytime	J. Payne	One seen running across a logging road
Agathis camp, Maliau Basin conservation area, Sabah	4°44'40"N, 116°58'34"E; 210 m	Logged forest. c. 200 m from primary forest	Jun—Aug 2000	Late afternoon	Juul-Nielsen, 2000; H. Juul	One seen
Ulu Melinau, Gunung Mulu NP, Sarawak	4°08'N, 114°55'E; 50 m	Lowland riparian mixed dipterocarp forest; not disturbed since before 1890	1988	Daytime	M. Meredith	One seen
Near the Sarawak Chamber, Gunung Mulu NP	4°06'N, 114°53'E; 150 m	Primary mixed dipterocarp forest on Mulu Formation shale and sandstone	27 Dec 1991	Mid morning	H. Hazebroek	One by a 1 m diameter fallen bough
Pulong Tau NP, Bario, Sarawak	3°47'N, 115°26'E; 1,380 m	Mixed dipterocarp forest	27 Jul 2005	09h35	Engkamat Lading	One jumped from a hole in a slope into streamside bushes
Long Lellang water catchment, Baram, Sarawak	3°42'N, 115°13'E; c.1,400 m	Primary mixed dipterocarp forest; c.1.5 hrs' trek from the nearest hill padi farm	2003	10h30	C. Chin	One went to stream, drank, saw the observer, and fled

Location	Co-ordinates + altitude	Habitat	Date(s)	Time of day	Observer, reference	Other notes
Sebuloh area, upper Baram, Sarawak	3°25'N, 115°11'E; 600 m	Hill dipterocarp forest, unlogged, some old swidden	30 Oct 2004	Daytime	per. M. Meredith	One seen by Ms Norhayani Jalaweh
Sarawak Planted Forests, Tubau, Bintulu Division, Sarawak	2°55'43"N, 113°05'14"E; <500 m	Acacia plantation (3-4 yr) adjacent to natural forest	2005	19h14 (still daylight)	B. Gimán	One ran across skid road
Sarawak Planted Forests	2°55'30"N, 113°03'00"E; <500 m	Acacia plantation (7 yr) adjacent to natural forest	2005	Daytime	B. Gimán	One ran across skid road
Bukit Sarang conservation area, Sarawak	2°39'15"N, 113°03'12"E; <500 m	Mosaic of limestone, peat-swamp and riverine forest	2005	Daytime	B. Gimán	One along river bank
Samunsam WS, Sarawak	1°56'N, 109°36'E; 0-25 m	Primary lowland tropical forest with some very old regenerated agriculture	1984-1986	Daytime	E. L. Bennett	Various field sightings; ~no night-searching
Near Kapit, Sarawak	1°39'N, 113°24'E; 250-380 m	Hill mixed dipterocarp forest, selectively logged four years previously	During Sep-Nov 1991	Unknown	Dahaban <i>et al.</i> , 1996	One seen
Kuching, Sarawak	1°33'N, 110°20'E; lowlands	Suburban; adjacent to a <50 ha forest patch	2005	n/a	M. Gumsal	Road-kill. No extensive forest within 15 km
Near Universiti Teknologi MARA, at Jalan Meranek, Kota Samarahan, Sarawak	1°26'45"N, 110°26'31"E; <150 m	Disturbed ?tropical heath forest; clearings and settlements along the road	10 Jan 2005	11h00	J. Hon	One crossed a road
Sebarik area, Ulu Jengin, Batang Ai, Sarawak	1°17'N, 112°11'E; 200 m	Old secondary (swidden >30 yrs previously) hill dipterocarp forest	6 Aug 1992	Daytime	Kaya Lajan per. M. Meredith	Sole sighting in 335 km of transects (Meredith, 1995)
BORNEO: BRUNEI						
Tanajor, c. 20 km south of Sungei Liang, Serian	c. 4°32'N, 114°30'E; c. 100 m	Secondary fringe to primary forest	c. 9 Aug 1997	n/a	H. Juul	Road-kill; now a skin and skeleton in Brunei Forestry Museum
Sungei Melunchor, Tasek Merimbun, Tutong district	4°35'N, 114°41'E; not recorded	Not recorded	29 Jun 2002	n/a	M. Yasuda; Hj Bahrin Hj Bolhassan	Single, cage-trapped (oil palm bait); skin in Brunei Museum
BORNEO: KALIMANTAN						
Krayan, northern Kayan Mentarang NP, East Kalimantan	4°06'36"N, 115°48'00"E; c. 850 m	Old secondary lower montane forest	Within 1995-2005	Unknown	S. Wulffraat	Field sighting
Bulungan RS, East Kalimantan	3°00'N, 116°10'E; 200 m	Lowland dipterocarp forest	Sep or Oct 1998	Daytime	Hedges & Dwiyahreni, 1998	Field sighting of one animal
Lalut Birai RS, Kayan Mentarang NP, East Kalimantan	2°52'35"N, 115°49'10"E; 500-550 m	Lower mountain ridges with hill dipterocarp forest	1997 & 2002	Dusk (all records)	Wulffraat <i>et al.</i> , 2006; S. Wulffraat	Three singles seen (twice in 1997) in eight years of research
Lurah River [a tributary of the Bahau River], Kayan Mentarang NP	2°41'N, 115°41'E; 650-700 m	Hill dipterocarp forest	Within 1995-2005	Not recorded	S. Wulffraat	One seen
Long Peliran, on a tributary of the Bahau River, East Kalimantan	2°31'12"N, 115°14'38"E; c. 250 m	Secondary forest behind village	1990	n/a	Puri, 1997	Hunted animal, seen in village

Location	Co-ordinates + altitude	Habitat	Date(s)	Time of day	Observer, reference	Other notes
Km 44, Berau—Samarinda, East Kalimantan	1°53'N, 117°23'E; not recorded	Logged-over forest	Apr 2005	Once each, daylight and darkness	Djoko Susatmoko	Two singles seen, crossing a major dirt road (Trans-Kalimantan highway)
PT Limbang Ganeca, East Kalimantan.	0°12'N, 115°57'E; <200 m	Logged over forest (logged 4-6 years previously)	17 Aug 1998	c.08h00	C. Gönner	One seen by Nunuk Kasyanto
Bukit Soeharto, East Kalimantan	1°02'S, 117°02'E; 100 m	Degraded lowland forest	18 Oct 1990	n/a	S. Yasuma	Roadkill, c. 45 km from Balikpapan, on the highway to Samarinda
Bukit Soeharto	1°02'S, 117°02'E; 100 m	Degraded lowland forest	1990s	n/a	S. Yasuma	Field sighting, c. 50 km from Balikpapan, on the highway to Samarinda
Sungai Wain protection forest, East Kalimantan	1°06'05"S, 116°49'32"E; c.120 m	Small block of good-quality lowland dipterocarp forest	7 Dec 2002	Early evening	per G. Fredriksson	Sole sighting in 5+ yrs' fieldwork; identification provisional
Cabang Panti RS, Gunung Palung NP, West Kalimantan	1°08'S, 110°47'E; lowlands	Typically alluvial and sandstone forest near rivers	1980s—1990s	Daytime	Blundell, 1996; L. Curran	Several singles seen, most along Air Puteh
Sungai Sebangau catchment, Central Kalimantan	2°19'S, 113°54'E; sea-level	Selectively logged (<10yrs) peat swamp forest	Jul or Aug 2002; Sep 2004	Unknown	S. Husson; Page <i>et al.</i> , 1997.	Two singles seen

Abbreviations in site names:

NP = national park; NR = nature reserve; RS = research station; WR = wildlife reserve; WS = wildlife sanctuary.

Payne *et al.* (1985) also listed a locality of Sandakan, Sabah (5°45'N, 118°00'E), perhaps a recent field record; no specimen has been traced from the site.