

Recent records of the Javan Small-toothed Palm Civet *Arctogalidia (trivirgata) trilineata*

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Abstract

Small-toothed Palm Civet *Arctogalidia trivirgata* is widespread and often locally common in mainland South-east Asia, Borneo and Sumatra. By contrast the Javan taxon, *A. (t.) trilineata*, was said in 1937 to be among the least-known larger mammals of Java, a description still apt today. Several Javan Small-toothed Palm Civets watched and photographed in a large fig tree at Cikaniki research station, Gunung Halimun National Park, West Java, Indonesia, in 2008–2010 may constitute the first explicit field records of the taxon for decades. Some animals (probably young) were beige-coloured (a form of pelage unknown in congeneric populations outside Java), while even the darker ‘typically pelaged’ animals (presumably adults) differ from Small-toothed Palm Civets elsewhere in pelage colour and pattern. The last taxonomic revision of the genus was in 1952, in an era of broad species inclusion, and a modern investigation would doubtless consider the distinctive Javan form a full species endemic to the island. The paucity of modern records may indicate a small population and/or localised distribution, or it may simply reflect limited published spot-lighting survey information from Java coupled with low interest in the taxon as ‘only’ a subspecies. The civet is one of several endemic crepuscular or nocturnal mammals of uncertain conservation status, reflecting a generally low level of international interest in the island’s threatened mammals. Surveys to assess current status and conservation needs, if any, of the civet are strongly warranted. Identification of the civet by pelage features may need great care, given the similarity in markings of a group of young civets (photographed at a menagerie in Bali) to Javan Small-toothed Palm Civets which were apparently closer to Common Palm Civet *Paradoxurus hermaphroditus* in build and proportions.

Keywords: conservation status, field identification, Gunung Halimun National Park, Indonesia, survey needs, taxonomic uncertainty

Catatan terbaru mengenai musang akar *Arctogalidia (trivirgata) trilineata*

Abstrak

Musang akar *Arctogalidia trivirgata* mempunyai persebaran yang cukup luas dan banyak dijumpai di daratan Asia Tenggara, Borneo dan Sumatera. Namun demikian, untuk anak jenis asal Pulau Jawa *A. (t.) trilineata*, sejak tahun 1937 dinyatakan sebagai salah satu kelompok mamalia P. Jawa yang tidak banyak diketahui. Deskripsi mengenai jenis inipun masih banyak diperdebatkan hingga kini. Beberapa perjumpaan dan hasil foto dari jenis ini dari sekitar stasiun penelitian di Cikaniki, Taman Nasional Gunung Halimun, Jawa Barat, Indonesia, sejak 2008 hingga 2010, merupakan catatan lapang pertama selama dekade terakhir ini. Beberapa individu (kemungkinan umur muda) berwarna coklat keputihan (keadaan warna tidak jelas untuk jenis di luar P. Jawa). Demikian pula dengan individu yang berwarna lebih gelap (kemungkinan dewasa), menunjukkan pola corak bulu dan warna yang berbeda dengan kelompok musang akar lainnya. Revisi terakhir dari taxa ini dilakukan tahun 1952. Di masa kini, dengan penelitian modern, tidak menutup kemungkinan kelompok P. Jawa ini adalah jenis terpisah yang endemik. Kurangnya catatan di era modern ini memungkinkan suatu populasi kecil dan atau persebaran yang terlokalisasi, ditunjang oleh kurangnya perhatian pada takson ini, menjadikan kelompok ini tercatat hanya sebagai anak jenis. Musang merupakan salah satu dari satwa malam dengan status konservasi yang belum jelas. Ini merupakan gambaran dari rendahnya perhatian dunia terhadap mamalia yang terancam. Survey untuk memetakan kondisi populasi dan kebutuhan langkah konservasi, apabila perlu, terhadap musang ini sangat dibutuhkan. Identifikasi musang melalui karakter rambut memerlukan kehati-hatian, mengingat kesamaannya dengan kelompok lain pada umur muda (foto dari Bali), seperti antara musang akar dengan musang luwak Civet *Paradoxurus hermaphroditus*.

Kata kunci: identifikasi lapang, Indonesia, ketidakpastian taksonomi, status konservasi, survey, Taman Nasional Gunung Halimun

Introduction

The Small-toothed Palm Civet *Arctogalidia trivirgata* occurs from north-east India though mainland South-east Asia to the islands of Sumatra, Borneo and Java (Pocock 1939, Schreiber *et al.* 1989, Corbet & Hill 1992). Within this large range, three subspecies-groups are often distinguished (e.g. Corbet & Hill 1992): the northern, *leucotis*, group; the Sundaic, *trivirgata*, group; and the Javan *trilineata* (standing alone from other subspecies). The former two remain widespread and common, even in heavily hunted areas such as Lao PDR, and are not of conservation concern (e.g. Duckworth 1997, Belden *et al.* 2007).

By contrast, the status of *A. (t.) trilineata* is poorly known: Bartels (1937) described it as one of the least observed and collected larger mammals of Java, and this is still apt. Natural history notes were given in Bartels (1937, 1941) and Grey Owl (1942). Schreiber *et al.* (1989) knew of only about two dozen museum specimens of *A. (t.) trilineata* and traced only one record, in 1978, for then-recent decades. Neither the present authors, nor their close correspondents, know of any records since 1978 other than those documented here. Its conservation status might, therefore, be of grave concern, although it may simply be much under-recorded, particularly because as a mere subspecies of a widespread and common species (as it is currently generally treated) the impetus

for observers to document their observations, or search for the animals in the first place, is no doubt much lower than if it were seen as a species endemic to Java. Therefore, the present compilation documents recent records of Small-toothed Palm Civet in Java in a taxonomic and conservation context.

Recent records

Two observers, JAE and JH, independently photographed Small-toothed Palm Civets feeding at a large fruiting fig *Ficus* by the Cikaniki research station, Gunung Halimun National Park (NP), West Java (6°44'48.50"S, 106°32'15.18"E; 1,000 m altitude). JAE visited this area on 15–16 June and 3–4 July 2008, and 20–21 July 2009: he saw palm civets each time, concluding from multiple checks that they were in the tree continually from dusk to dawn on those nights. Maxima in view at one time were four Common Palm Civets *Paradoxurus hermaphroditus* and five Small-toothed Palm Civets. Of the latter, at least three were typical in colour of the genus (Fig. 1), but two were beige in tone (Fig. 2). JH saw at least two beige Small-toothed Palm Civets (Fig. 3) and a Common Palm Civet on the night of 4–5 July 2010 during repeated checks at the tree between dusk and midnight; at least one beige Small-toothed Palm Civet was present the next night. Suyanto (2003: 73) listed Small-toothed Palm Civet for Cikaniki but reference to Yossa *et al.* (1991) suggests that this may have been based solely on local people's reports. Moreover, an earlier account of the area's mammals (Yoneda *et al.* 1998) stated that the species was not camera trapped, seen or found by any other method there, although neither the methods used, nor their coverage and intensity, were fully detailed.

Gunung Halimun NP comprises about 400 km², over 600–1,927 m a.s.l., of largely primary submontane forest and retains a rich mammal fauna including much decreased species such as Javan Gibbon *Hylobates moloch* and the Javan race of Leopard *P. pardus melas* (Suyanto 2003). Cikaniki research station is in the interior of the park. The animals observed by JAE fed by 'fruit-pressing' (see Duckworth & Nettelbeck 2008), squeezing out juice from the fig in the mouth, then dropping the residue.

Van Bemmelen (1952: 39) concluded, from examining 16 Small-toothed Palm Civet skins and mounted specimens from Java, and observing an adult female with two young, that individuals of the Javan taxon darkened with age, "passing from pinkish buff via avellaneous, cinnamon buff, clay colour and buckthorn brown to wood brown". At his time of observations, JAE was unaware of this text, and independently considered that the beige animals were youngsters based on their size and build. The recently photographed animals are not identical in appearance with each other, for example, in colour of the distal half of the tail (compare Fig. 2 with 3). Apparent differences in body pelage colour at Cikaniki (compare Fig. 3 with 2), while perhaps in part reflecting different lighting, and JAE's aging of those animals, are consistent with van Bemmelen's (1952) conclusion that animals darken with age.

CRS saw one live Small-toothed Palm Civet for sale in a Jakarta pet market during trade surveys spread over a few days (recording in total 37 carnivores) in April 2010, but it did not resemble the Javan taxon. In its pelage, particularly its dark head, it was typical of animals on Sumatra and it quite plausibly came from that island; many animals traded in Java come from other islands in Indonesia (Shepherd *et al.* 2004, Shepherd 2006). Further visits by CRS and by B. Yaap and M. Hill in Javan markets in

2010 found no other Small-toothed Palm Civets.

Field identification

With a good view, Small-toothed Palm Civet is so distinctive in head structure and thus facial expression it cannot be confused with any native genus within its range. Similarly, the tail, very long even for a palm civet, and looking tubular and softly woolly, differs from other South-east Asian species. In Java, the only conceivable native confusion species is Common Palm Civet, although the heavy live animal 'pet' trade means that non-native species are sometimes seen at large (e.g. Masked Palm Civet *Paguma larvata*; Brooks & Dutson 1994).

Because their build looks identical to that of typically-pelaged animals, the beige animals are readily identifiable as Small-toothed Palm Civets on some photographs (Figs 2–3). From other angles, identification from a single image is more difficult. For example, the apparent head shape of individuals in some images (Fig. 4) led RWi, JWD and C. P. Groves (*in litt.* 2010) initially to suspect the animals might be Common, not Small-toothed, Palm Civets, until seeing other images of each series. Under good field conditions, there should be no difficulty identifying animals because the features of build should be apparent at most angles, in addition to the very different styles of arboreal motion of the two species (see Duckworth 1997).

Common Palm Civet is so variable in pelage that numerous invalid taxa have been named; Corbet & Hill (1992) listed nearly 40 species-level synonyms of which only a small proportion are likely to represent valid races. This variability suggests that beige-toned Common Palm Civets might occur. In this context is an extraordinary further recent civet record. During March 2010, RWü visited an advertised 'marine turtle conservation facility' at Tanjung Benoa, Bali, Indonesia. This turned out to be a third-class commercial tourist attraction, where visitors can handle Brahminy Kite *Haliastur indus*, Wreathed Hornbill *Aceros undulatus* and pythons *Python*. A dark, locked box, opened only after some insistence, held four subadult palm civets (Fig. 5). The people at Tanjung Benoa had no idea what these animals were, and RWü made no enquiry about their origin; they are likely to have been bought at a street market, with no possibility of determining their origin, even to island.

The identity of these Bali captives is uncertain, even though two clear photographs were taken and three heads in different postures can be seen (in the two images, each animal is in almost the same respective position). The captives do not resemble, in build of either head or tail, typical Small-toothed Palm Civets. The ears seem too close together, including on the animal looking directly at the camera where the appearance should be least distorted by orientation. While their overall facial mien looks also unlike Common Palm Civet to most observers, whether this reflects anything structural, rather than being a side effect of their strange colour, is difficult to judge. They are young animals, which tend to have scrawnier-looking tails than do adults (e.g. Fig. 6): the tails of these animals could be consistent with either genus. An odd head-shape as an effect of age seems less plausible, and is not suggested by young Small-toothed Palm Civets from Borneo and Sumatra (Fig. 6). Moreover, eyes are noticeably larger in adult Small-toothed Palm Civets than in adult Common Palm Civets, and these young Small-toothed Palm Civets from the other Greater Sunda islands have eyes looking of almost tar-

sier *Tarsius*-like size, not at all like the small ‘currants’ of the Bali captives. The photographs of the animals in typical pelage at Gunung Halimun NP do not suggest that there are any differences in head shape between Javan Small-toothed Palm Civets and the other congeneric taxa. In sum, structurally, the Bali captives look more like Common Palm Civets than Small-toothed Palm Civets.

In pelage, the Bali captives fit neither species as typically seen. They are similar in overall tone to the beige Gunung Halimun NP Small-toothed Palm Civets. However, the irregularity of their dark dorsal lines, of which, moreover, there seem to be more than the three typical of Small-toothed Palm Civet, looks more like Common Palm Civets’ typical markings: Small-toothed Palm Civets’ stripes are generally straighter and with distinct edges when the stripe itself is prominent (e.g. Fig. 7). However, other than strongly leucistic animals, Common Palm Civets invariably have a defined pattern of dark fur over much of the face (Fig. 8). The Bali captives show no such markings. Leucism can be expressed patchily over an animal (Fig. 8, animal second from left), so occasional Common Palm Civets might appear with dark marks weak on the head but strong on the back; but this form of pigment abnormality seems unlikely to produce several animals so similar in appearance.

The head markings on the Bali captives resemble those of a Javan Small-toothed Palm Civet mount held at Rijksmuseum voor Natuurlijke Historie (National Museum of Natural History; ‘Naturalis’), Leiden, Netherlands (Fig. 9): in this mount and the lower-right animal in Fig. 5, the pattern of dark and light is very similar, including the small dark smudge anterior to the eye, and the light intrusion up from the side of the head into the dark rear-cap, between its front margin and the ear. The captives’ close similarity in overall colour and precise markings pose a major identification risk to identifying Small-toothed Palm Civets in Java by pelage, on the assumption (based on build) that they are not Javan Small-toothed Palm Civets.

In 2010, CRS saw traders in the Jati Negara market, Jakarta, dying macaques *Macaca*, civets and mongooses *Herpestes* blonde with hydrogen peroxide. Lightened Common Palm Civets were seen shortly afterwards by C. Furrage and B. Yaap (*in litt.* 2010); apparently, their novelty value commands higher prices in the pet trade. This activity cannot account for the appearance of the Bali captives, as it does not eliminate the mask (Fig. 10). It might present an additional problem in field identification of palm civets on Java, especially in markets and in any areas where such animals might escape or be released.

Taxonomic notes

The last taxonomic investigation of *Arctogalidia* was by van Bemmelen (1952). He examined a large proportion of available Sundaic specimens, but gave little consideration to those of northern South-east Asia, for which he relied largely on Pocock (1933, 1939). He employed rarely-used terms for his findings, with his ‘greges’ (singular, ‘grex’) corresponding to subspecies-groups, and ‘gregal forms’ being less distinctive than greges, but not sensibly placed within any grex. He concluded that the genus was monospecific, the single species being divisible into three: the gregal form *A. t. trilineata* was considered to show stronger affinity with grex *A. t. leucotis* than with its geographical neighbour, grex *A. t. trivirgata*. This trifold arrangement was maintained, but using

conventional taxonomic terms, by Corbet & Hill (1992) and each is hereafter referred to as a ‘subspecies-group’ even though *A. t. trilineata* is a race on its own (that is, in a group of one). During his examination, van Bemmelen (1952) was able to remove a considerable amount of the confusion (based upon specimens with incorrectly inferred locations) in previous accounts of the genus.

Despite substantial individual variation within *Arctogalidia* populations (Pocock 1933), van Bemmelen (1952) found consistent morphological differences between the three subspecies-groups. The Indochinese races have thinly furred ears, with large bright pale pink patches on the skin, whereas the non-Javan Sundaic races have densely furred ears with both fur and skin dark. Indochinese animals are also paler, with bolder dark dorsal lines, than are non-Javan Sundaic populations (Fig. 11; also Low 2010; also < <http://www.youtube.com/watch?v=uVIIHbMZMac> > for footage accompanying Wilting *et al.* 2010). Additionally, Indochinese animals have dark head fur confined to the muzzle, whereas on non-Javan Sundaic animals much of the head and usually also the nape are darker than the rest of the dorsum (Corbet & Hill 1992). These differences are readily apparent on field sightings.

Van Bemmelen (1952) wrote that the Javan taxon has ears entirely pale, lacks a pale streak down the muzzle, and often has light markings on the tail, whereas the Indochinese animals (which they generally resemble more than they do those of non-Sundaic Java) mostly have some dark on the ears, lack light tail markings and have a pale streak (often prominent) down the muzzle. Pale tail markings are apparent on some Cikaniki photographs, as is the lack of well-defined muzzle-streak, but there seems to be a diffuse, broad pale area across the rostrum (Fig. 12). In contrast to van Bemmelen’s (1952) statements, the ears on the Javan animals are largely dark, being pale only on the inside basal third of the pinna (Fig. 4b).

Two common loud calls given by the genus each differ somewhat between Bornean and Lao animals, although are recognisably homologous (Duckworth 1997). Bartels (1937) assumed that a long ‘miauing’ cry, usually repeated after short pauses, was from the Javan taxon. When a female of a pair he observed fell off a branch into low vegetation the male called to it with alternating quiet roars and high pitch calls. How these relate to calls transcribed for the genus elsewhere is not clear.

Van Bemmelen’s (1952) conclusion that the genus is monospecific should be taken in the general taxonomic thinking of the time: a “regrettable trend from about 1920 to 1980, when specific recognition was excessively restrained” (Brandon-Jones *et al.* 2004: 98). Under a phylogenetic species concept, all of van Bemmelen’s (1952) three main divisions (at minimum) constitute species (compare to, e.g., Groves 2007). Biological species concepts are fundamentally untestable with populations inhabiting different islands, as for the Javan taxon of *Arctogalidia* relative to its congeners. However, modern applications of biological species concepts are forced to consider some similar-looking taxa non-conspecific because they are sympatric and do not interbreed, so must be separate species under any concept (Tobias *et al.* 2010). Therefore, species as defined under modern revisions using biological species concepts are often less inclusive than in the mid-20th century. Such a revision would very probably consider van Bemmelen’s two greges and one gregal form as three separate species. This is particularly so given that the pelage differences between populations presented by van Bemmelen (1952) seem also to be accompanied by change in general pelage colour with age for the Javan form, but

not in the races outside Java. Van Bemmél's (1952) own investigations found no suspicion of comparable changes in the other Sundaic taxa, nor do modern observations suggest any (e.g. Fig. 6), and they have never been proposed to occur in the Indochinese taxa. Few modern taxonomic reanalyses of small carnivores have specified the species concepts under which their conclusions are drawn, making it difficult to compare the variation evident within *Arctogalidia* to that in other animals with perhaps similar levels of divergence (e.g. *Eupleres*; Goodman & Helgen 2010)

Speculations on conservation status

The Gunung Halimun NP records prove that *A. (t.) trilineata* survives. The lack of other recent records does not prove that it is rare: both the *leucotis* and *trivirgata* subspecies-groups are strictly arboreal and are therefore only very rarely camera-trapped, and because they are almost as strictly nocturnal, the only practicable technique by which to survey them is spotlighting. Otherwise, surveys are reliant on chance records of animals in hunters' bags, camps and houses, or, more demanding, baited live-trapping (e.g. Borissenko *et al.* 2004, Wells *et al.* 2005, Duckworth & Nettelbeck 2008, Wilting *et al.* 2010). Spotlighting may speedily prove the genus very common; for example, Belden *et al.* (2007) never detected Small-toothed Palm Civet in extensive camera-trapping and sign surveys in one area of Sarawak, but spotlighting there found ten individuals in two hours.

Few spotlighting data from Java seem to have been published. JAE has never seen Javan Small-toothed Palm Civet away from the particular fig at Cikaniki, despite spotlighting at Gunung Halimun NP (totalling about 20 hrs), Gunung Gede NP (about 70 hrs) and Carita (about 20 hrs) and observing many Common Palm Civets (30 or more), Javan Ferret Badgers *Melogale orientalis* (at least 40; only at Gunung Gede) and Red Giant Flying Squirrels *Petaurista petaurista* (at least 20), as well as several other mammal species less frequently.

At least some non-Javan races survive in both degraded and fragmented landscapes: for example a Small-toothed Palm Civet was observed by CRS on 10 February 2007 in Bukit Kiara Recreational Park, Kuala Lumpur, Malaysia (3°08'31"N, 101°38'01"E). This suburban area was a rubber estate until its 1980 establishment as a park, and today consists of overgrown rubber plantation and secondary forest, much used by joggers and cyclists. It is inconceivable that this animal could be an escaped captive, given that palm civets are so rare as pets in West Malaysia (CRS pers. obs.). Harrison (1968) also noted this species in rubber plantations in Selangor, Peninsular Malaysia, and in cocoa plantations in Sabah, Malaysia, although the latter were adjacent to primary forests and it is unknown if observations were of animals sedentary in the plantation or merely on foraging excursions. Van Bemmél (1952: 23) noted that populations persisted on "small islands with no or little maiden-forest". If the Javan taxon be similarly adaptable, then it might well remain fairly common. However, there is presently no reason to assume that the Javan taxon uses habitat as does its congeners and, for example, the ecological distribution of ferret badgers *Melogale* differs greatly between Borneo and elsewhere in South-east Asia (Schreiber *et al.* 1989).

All records of Javan Small-toothed Palm Civet traced by van Bemmél (1952) and Schreiber *et al.* (1989) were from West Java. Gunung Halimun NP is in the same province, but with so few records overall of the taxon, its range may be much underesti-

ated. Schreiber *et al.* (1989: 36) stated that it "is restricted to primary forests far from human settlements", but this statement also appears in Lekagul & McNeely (1977: 582) for Thailand (for where it is misleading; Duckworth & Nettelbeck 2008) and its applicability to the Javan taxon is unknown. The altitudinal range able to support the species is not known, although the regular occurrence at Cikaniki suggests that it is not dependent on lowland forests: in west Java, these are limited and highly fragmented (Schreiber *et al.* 1989). Species of mid altitudes have, on habitat grounds, better survival prospects.

In Indonesia, Small-toothed Palm Civet is Totally Protected, although relatively small numbers are traded (Shepherd 2008).

Conclusions and recommendations

Javan Small-toothed Palm Civet is one of several medium-large mammals on Java with few recent (and in some cases, historical) records and/or of clear conservation concern. As well as the extinction of the Javan population of Tiger *Panthera (tigris) sondaica* (Mazák & Groves 2006) and the remnant population of Lesser One-horned Rhinoceros *Rhinoceros sondaicus*, perhaps the only population left in the world (Hoogerwerf 1970, WWF Vietnam 2010), the endemic Javan race of Leopard is highly threatened (Santiapillai & Ramono 1992, Gippoliti & Meijaard 2007); the conservation status of the endemic Javan Slow Loris *Nycticebus javanicus* is almost unknown (Nekaris *et al.* 2008); the endemic Javan Chevrotain *Tragulus javanicus (sensu stricto)*, as defined by Meijaard & Groves 2004) is very little recorded recently and may be in steep decline (Meijaard in press); the Javan Warty Pig *Sus verrucosus* faces a high risk of extinction (Semiadi & Meijaard 2006); and Javan Rusa *Cervus timorensis*, until recently considered stable in population, declined steeply during the 2000s (S. Hedges *in litt.* 2008). Among other small carnivores, the Indonesian Mountain Weasel *Mustela lutreolina*, endemic to Java and Sumatra, remains known by fewer than two dozen specimens (Meiri *et al.* 2007 and references therein); the Javan Ferret Badger, endemic to Java and Bali, requires conservation status clarification but on information available (Duckworth *et al.* 2008) may not be seriously threatened; and the Javan race of Yellow-throated Marten *Martes flavigula robinsoni* is not well known (Schreiber *et al.* 1989), but does occur at Gunung Halimun NP (it was observed on about half of JAE's eight visits to date) and Gunung Gede (JAE). These taxa, in combination with the palm civet, propelled Java to the third most important global priority area for mustelid and viverrid (*sensu* conventional 1980s taxonomic thinking) conservation (Schreiber *et al.* 1989).

Java supports one of the densest human populations over an area of such size, and therefore warrants more serious international conservation attention than it has recently had. This oversight is perhaps because it now lacks mega-charismatic species like Tiger and Asian Elephant *Elephas maximus* (extinct on the island for several hundred years; Cranbrook *et al.* 2007), or large tracts of virgin evergreen forest. The most important action specifically for Javan Small-toothed Palm Civet, and moreover one that could be undertaken with relative ease, is to search for it. This recommendation was made by Schreiber *et al.* (1989) but has not been implemented.

The locations most important to search cannot sensibly be defined, because the historical records come from various altitudes and sites. The latter are all from West Java, making this a

sensible starting area. Hoogerwerf (1970: 414) wrote that "...it was only observed once for certain in Ujung Kulon, viz. on 18 July 1939; in the late afternoon two were seen on a forest path near the Tjikorang; they moved slowly away on the author's approach...". Such behaviour would be extraordinary in the other taxa of this arboreal, nocturnal, genus, and it should not be seen as typical of the Javan taxon without corroboration. Otherwise, the limited information available suggests that *A. (t.) trilineata* is as arboreal and nocturnal as are the populations elsewhere in the genus's range (van Bemmelen 1952; recent observations). Therefore, spotlight surveys would speedily inform whether the taxon is any sort of conservation priority (and would also give information on the loris and chevrotain). At least in Lao PDR, detection rates seem to vary with season, being higher in the hot season, partly because at that time of year Small-toothed Palm Civets frequently give characteristic loud calls, but also apparently reflecting higher general activity then (Duckworth 1997). There seems to be no information about possible such seasonality in Java, so if early spotlighting surveys fail to find the species, as well as seeking it at further sites, attempts at other times of year may be important. More intensive trade surveys could provide useful indications, but establishing origins of animals would be difficult, and interpreting numbers found would be no more easy. For an arboreal nocturnal species, a lack or rarity of trade records might reflect limited use of hunting techniques suitable to catch it alive, a genuine rarity of the animal, or some combination. Hence, field searches are essential.

One innovative method of detecting the animal could be examination of alimentary tracts of large snakes in the reptile skin trade industry on Java, which is large (R. Melisch *in litt.* 2010). Small-toothed Palm Civets have been found in the tracts of harvested Reticulated Pythons *Python reticulatus* in Sumatra (Shine *et al.* 1999) and although that study found them only rarely (two of 163 identified prey items), liaison with any investigations of large-snake diet in Java could result in records.

The identification of Small-toothed Palm Civet in Java requires great care and, unless it be documented to be widespread and at least reasonably common, records should be published making explicit the basis for identification.

The urgency for a detailed investigation of intrageneric taxonomy of *Arctogalidia* is, as with so much else concerning the Javan taxon, unclear. If *A. (t.) trilineata* be a taxon of conservation concern, then a misleading treatment as a mere subspecies will handicap conservation efforts on its behalf. However, if it be simply much overlooked, then given the various other impending mammalian conservation crises on Java urgently needing better information for effective conservation interventions, taxonomic investigation would be of low priority.

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Figures (on back cover)

Fig. 1. Adult Javan Small-toothed Palm Civet *Arctogalidia (trivirgata) trilineata*, Cikaniki Research Station, Gunung Halimun National Park, Java, 2 July 2008 (Photot: J. A. Eaton).

Fig. 2. Beige-coloured, presumed young, Javan Small-toothed Palm Civet *Arctogalidia (trivirgata) trilineata*, Cikaniki Research Station, Gunung Halimun National Park, Java, 16 June 2008 (Photo: J. A. Eaton).

Fig. 3. Beige-coloured, presumed young, Javan Small-toothed Palm Civets *Arctogalidia (trivirgata) trilineata*, Cikaniki Research Station, Gunung Halimun National Park, Java, (a) 5 July 2010, (b) 4 July 2010 (Photos: J. Hall).

Fig. 4. Beige-coloured, presumed young, Javan Small-toothed Palm Civets *Arctogalidia (trivirgata) trilineata*, Cikaniki Research Station, Gunung Halimun National Park, Java, (a) 4 July 2010 (Photo: J. Hall), (b) 16 June 2008 (Photo: J. A. Eaton). Note the dark pinnae except for the proximal interior, which is pink. At the angle of viewing of Fig.4a, the head structure is less obviously that of Small-toothed Palm Civet.

Fig. 5. Unidentified captive palm civets, Tanjung Benoa, Bali, March 2010 (Photo: R. Wüst).

Fig. 6. Small-toothed Palm Civets *Arctogalidia trivirgata*, showing structure of young animals in Borneo and Sumatra. (a) RT Setimbo, West Kalimantan (kept behind a village house

as a pet; caught locally), 25 October 2008 (Photo: B. Yaap); (b) Binyo-Penyilam Conservation Area, Bintulu, Sarawak, Malaysia, 2006 (Photo: Rose Ragai / Sarawak Planted Forests); (c) Bukit Tigapuluh forest block, border of Riau and Jambi provinces, Sumatra, October 2004 (Photo: N. Franklin, Sumatran Tiger Conservation Program).

Fig. 7. Javan Small-toothed Palm Civets *Arctogalidia (trivirgata) trilineata* in Museum Zoologicum Bogoriense, Cibinong, Bogor, Indonesia. Upper: MZB 7113 from Gamboeng, Pengalengan, Preanger, West Java, May 1912 (collector T. H. Kerkoeen; Photo: G. Semiadi).

Fig. 8. Common Palm Civets *Paradoxurus hermaphroditus*, Natural History Museum, London, UK, showing remarkable variation but presence of dark face-mask in all but the albino. Left to right: BMNH 58.5.4.1, origin unknown (via Zoological Society of London); BMNH 98.8.25.1 from Kondmals, Orissa, India, nineteenth century (Collector J. Taylor); BMNH 10.4.6.41 from Kangean island, Java Sea, 20 November 1909 (Collector: G. C. Shortridge); BMNH 81.12.2.3 from Kyeikpadein, lower Pegu, Myanmar, 25 August 1879 (Collector: E. Oates; Photo: J. W.

Duckworth, © Natural History Museum).

Fig. 9. Javan Small-toothed Palm Civet *Arctogalidia (trivirgata) trilineata*, Rijksmuseum voor Natuurlijke Historie, Leiden (Photo: R. Wirth).

Fig. 10. Common Palm Civet *Paradoxurus hermaphroditus*, bleached with hydrogen peroxide, Pramuka markets, Java, 19 June 2010 (Photo: C. Furmage).

Fig. 11. Small-toothed Palm Civets *Arctogalidia trivirgata* from (a) Phu Khieo Wildlife Sanctuary, Thailand ($16^{\circ} 22'17.26''N$, $101^{\circ}35'19.91''E$; 900 m asl), representative of the leucotis subspecies-group (17 March 2002; Photo: L. Grassman); and (b) Murud Kecil, upper Baram drainage, Sarawak, Malaysia ($3^{\circ}23'N$, $115^{\circ}13'E$), representative of the *trivirgata* subspecies-group (15 June 2004; Photo: WCS Malaysia).

Fig. 12. Javan Small-toothed Palm Civets *Arctogalidia (trivirgata) trilineata*, Cikaniki Research Station, Gunung Halimun National Park, Java; presumed adult, 2 July 2008 (Photo: J. A. Eaton).