Observations of Javan Small-toothed Palm Civets *Arctogalidia trivirgata trilineata* apparently feeding on the nectar of *Calliandra calothyrsus* flowers on Gunung Salak, West Java

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Abstract

Observations on Gunung Salak, West Java, Indonesia, of Javan Small-toothed Palm Civet *Arctogalidia trivirgata trilineata* apparently feeding on the floral nectar of the introduced tree *Calliandra calothyrsus* suggest that nectar may provide an important fall-back food to this species in disturbed habitats. Further studies could confirm the nectarivorous feeding habits of this palm civet and whether they contribute to the pollination of *C. callothyrsus*.

Keywords: diet, introduced food-plant, kaliandra, nectarivory, pollination, Viverridae

Pengamatan perilaku Musang Akar Jawa *Arctogalidia trivirgata trilineata* tampaknya makan nektar Bunga Kaliandra Calliandra calothyrsus di Gunung Salak, Jawa Barat

Abstrak

Pengamatan di Gunung Salak, Jawa Barat terhadap Musang Jawa-gigi kecil *Arctogalidia trivirgata trilineata* yang sedang makan nektar bunga Kaliandra *Calliandra calothyrsus* memberi kesan bahwa nektar bisa jadi menyediakan pakan pengganti yang baik terhadap spesies ini di habitat terganggu. Penelitian lebih lanjut diperlukan untuk memastikan perilaku memakan nektar dari spesies ini dan apakah mereka berkontribusi terhadap penyerbukan *C. callothyrsus*.

A Javan Small-toothed Palm Civet *Arctogalidia trivirgata trilineata* was observed on 7 March and a second on 14 April 2014 in flowering kaliandra trees *Calliandra calothyrsus* in secondary forest on the north face of Gunung (= Mount) Salak, West Java (6°40′S, 106°44′E) at an altitude of 1,110 m asl. Both civets were beige in colour (Eaton *et al*. [2010] discussed variation in pelage colour in this taxon). One sighting, a male, was observed at 21h53 and the other, presumed to be a female, at 23h12. The two sightings were less than 50 m apart. Both civets averaged heights of 5 m above ground and were observed for approximately 10 minutes, until moving off quickly through the trees and out of sight. Both civets remained inactive for a short time, probably owing to initial disturbance by the observers, but then suddenly became active again and proceeded to move with speed and agility amongst the terminal branches of the kaliandra tree feeding, apparently, on the floral nectar (Fig. 1). The trees were approximately 7 and 9 m tall respectively. Other kaliandra trees of varying sizes were in the vicinity, some with adjoining canopies. Each civet visited approximately 20–30 flowers during the observation periods. Depending on the position of the flower, the civets licked around the base of the flower directly, or pulled the flower towards the mouth with either one or both forepaws whilst the hind legs were supporting the body on another, sturdier, substrate. After feeding for a few seconds from each flower, the civet released the flowers, which did not appear to be damaged. It is possible that, rather than or as well as taking nectar, the civets were licking small invertebrates from the flowers. However, having witnessed Javan Slow Lorises *Nycticebus javanicus* feeding on *C. calothyrsus* nectar in the same manner at very close range, the authors are fairly certain this was not the case.

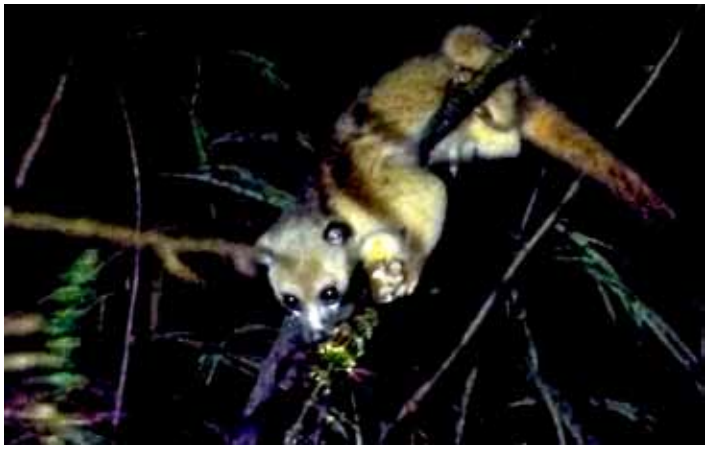

Fig. 1. Javan Small-toothed Palm Civet *Arctogalidia trivirgata trilineata* feeding at *Calliandra calothrysus* flowers, Gunung Salak, West Java, Indonesia, 14 February 2014.

The diet of Small-toothed Palm Civet is predominantly fruit complemented with small animals (Duckworth & Nettlebeck 2008, Shepherd & Shepherd 2012). Whilst the Javan subspecies *A. t. trilineata* is one of the most poorly documented larger mammals in Java, two recent observations of it feeding on the fruits of *Ficus* and *Cinammomum sintoc* also suggest strong frugivory (Eaton *et al*. 2010, Moore 2011). Nectar feeding had not previously been recorded in this taxon. Northern Small-toothed Palm Civet *Arctogalidia trivirgata* of subspecies-group *leucotis* has been observed feeding at flowers (misleadingly described in Duckworth [1997: 9] as "feeding on flowers"): on 3 November 1992, one was watched for 20 minutes in the crown of a small 15 m tree (below the semi-evergreen forest canopy),

licking the 'bottlebrush-like' flowers (i.e. with stamens projecting beyond the corolla, giving external anthers). This was presumably taking nectar but it was not possible to exclude that small invertebrates were being licked up (J. W. Duckworth *in litt*. 2014). Alleged nectarivory in other carnivores has been witnessed only in Yellow-throated Marten *Martes flavigula* feeding on *Cynometra polyandra* in North-east India (Nandini & Karthik 2007), Common Palm Civet *Paradoxurus hermaphroditus* feeding on nectar of Silk-cotton tree *Bombax ceiba* in Nepal (Joshi *et al*. 1995) and Masked Palm Civet *Paguma larvata* feeding on *Mucuna birdwoodiana* in Hong Kong (Lau 2012).

The genus *Calliandra*, in the family Leguminosae, originates from Mexico, Central and South America, and *C. calothyrsus* was first introduced to Indonesia from Guatemala in 1936 by Dutch botanists (MacQueen 1992, Chamberlain & Hubert 2001). *Calliandra calothyrsus* is used principally as a source of cattle fodder and fuel wood, but also for manure, erosion control and honey production (Chamberlain & Hubert 2001, Syamsuwida *et al*. 2014). If sufficient moisture is available, *C. calothyrsus* can flower throughout the year, although flowering usually peaks between November and January (Chamberlain & Hubert 2001).

Calliandra calothyrsus trees were abundant at the location of the sightings on Gunung Salak (Mirmanto *et al*. 2008) and are found up to elevations of 1,400 m asl. This fast-growing invasive species was introduced as a potential shade tree for coffee, but now thrives in lower-level disturbed forests, where it is harvested by locals for livestock feed and fuel wood (NRC 1983). The extremely wet climate in West Java, and particularly in the Gunung Salak region (annual rainfall 4,000–5,000 mm) enables *C. calothyrsus* to flower all year round. *Calliandra calothyrsus* becomes florally receptive during late afternoon and nectar is produced during the night, suggesting an evolved dependence on nocturnal visitors for pollination (Chamberlain & Hubert 2001). Owing to the morphology of *C. calothyrsus* flowers (Fig 2), small insects such as bees and wasps can reach the nectar without coming into contact with the reproductive parts (Chamberlain & Hubert 2001). Larger insects or mammals that rub against the stamens whilst feeding are therefore the more likely pollinating agents.

The floral nectar of *C. calothyrsus* comprised the primary diet of six rehabilitated and released *Nycticebus javanicus* on Gunung Salak (Moore 2012). Preliminary studies of two wild *N. javanicus* also suggest a high reliance on this species in this habitat (Yayasan IAR Indonesia, unpublished data). Various species of nectar-feeding bat (Pteropodidae) inhabit Gunung Salak (Prawiladilaga *et al*. 2008), but whilst bats are known pollinators of this species elsewhere (MacQueen 1992), feeding on *C. calothyrsus* flowers on Gunung Salak was only observed occasionally by the monitoring team during the over three years of nightly monitoring of released Slow Lorises.

The diet of *A. t. trilineata* is still relatively unknown owing to its nocturnal nature, typically high canopy feeding and general lack of study. The extent to which *A. t. trilineata* uses the nectar of *C. calothyrsus* as a food source in this disturbed habitat is uncertain. As with *N. javanicus* on Gunung Salak, introduced *C. calothyrsus* may provide an alternative or fallback food source for *A. t. trilineata* when preferred/original food trees have been logged. Java's huge human population and accompanying demand for raw materials has contributed to extensive clearance and disturbance of indigenous forests (Smiet 1992). If *A. t. trilineata* can adapt to the increasingly prevalent anthropogenic and disturbed habitats in Java by feeding on introduced species, this could prove an important factor to its continued survival. Whether *A. t. trilineata* contributes to the pollination of *C. calothyrsus* remains to be seen. With only these couple of short sightings available at a single location, further studies into the extent of nectarivory of this subspecies would be most informative.

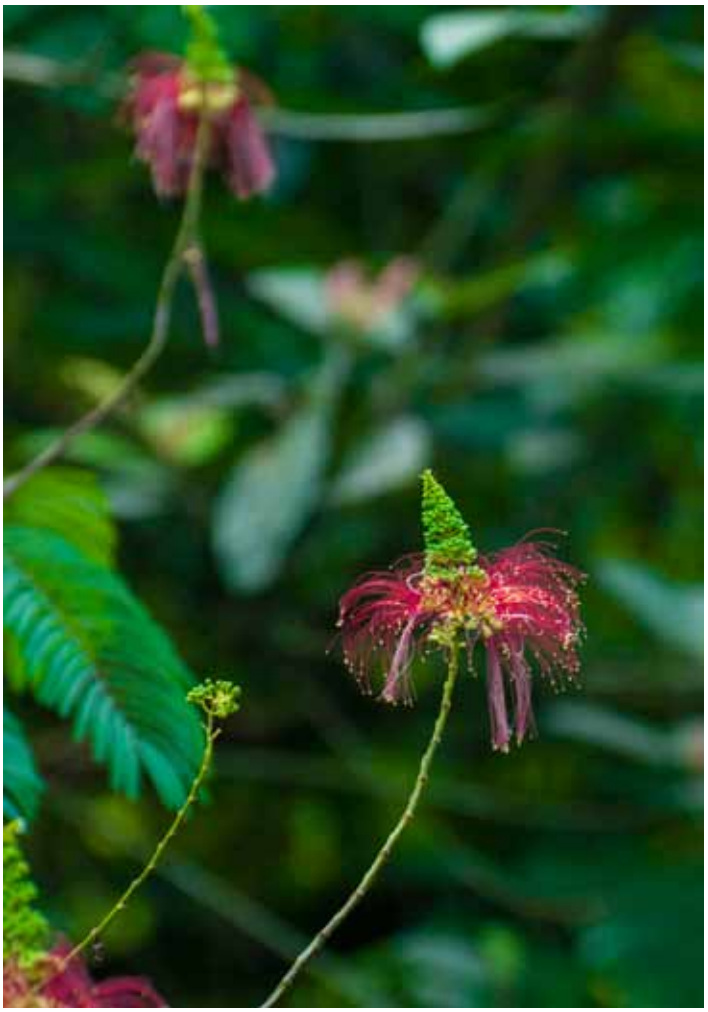

Fig. 2. Flower of kaliandra *Calliandra calothyrsus*, Gunung Salak, West Java, Indonesia, 3 February 2013.

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