

An observation of several Common Palm Civets *Paradoxurus hermaphroditus* at a fruiting tree of *Endospermum diadenum* in Tabin Wildlife Reserve, Sabah, Malaysia: comparing feeding patterns of frugivorous carnivorans

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Abstract

Common Palm Civets *Paradoxurus hermaphroditus* live solitarily and reportedly interact intra-specifically only rarely, other than as mother–young and as mating associations. Among three individuals observed feeding at a fruiting *Endospermum diadenum* tree, no aggression was noted between either of the two adult males and one female, but agonistic behaviour occurred between the males. Co-feeding seems to be rare in species of subfamily Paradoxurinae, except in Small-toothed Palm Civet *Arctogalidia trivirgata*. By contrast, co-feeding is more frequently observed in other frugivorous carnivorans, distributed in Central and South America, and in Central Africa. Within Asia, there are perhaps regional differences in incidence of co-feeding. These differences are probably based on differing patterns of fruit production between these places.

Keywords: agonistic behaviour, gregarious feeding, social interaction

Satu pemerhatian beberapa Musang Pandan *Paradoxurus hermaphroditus* pada pokok sendok sendok mata udang *Endospermum diadenum* berbuah di Simpanan Hidupan Liar Tabin, Sabah, Malaysia: perbandingan corak makan karnivora yang memakan buah-buahan

Abstrak

Musang Pandan *Paradoxurus hermaphroditus* hidup secara bersendirian dan interaksi intra-spesies jarang dilaporkan, kecuali perhubungan di antara ibu dengan anak dan di antara pasangan mengawan. Pemerhatian terhadap tiga individu Musang Pandan yang sedang makan di pokok *Endospermum diadenum* yang berbuah, menunjukkan bahawa tiada kelakuan agonistik di antara dua individu jantan dewasa dengan seekor betina. Tetapi, kelakuan agonistik telah diperhatikan berlaku di antara individu jantan. Kelakuan makan-secara-bersama jarang sekali dilaporkan terhadap spesies di bawah subfamily Paradoxurinae, kecuali Musang Akar *Arctogalidia trivirgata*. Sebaliknya, kelakuan makan-secara-bersama adalah lebih kerap diperhatikan terhadap spesies frugivora-karnivora yang terdapat di bahagian Amerika tengah dan selatan, dan juga Afrika tengah. Di Asia pula, mungkin terdapat perbezaan insiden kelakuan makan-secara-bersama iaitu bergantung kepada wilayah. Perbezaan ini mungkin disebabkan oleh perbezaan dalam pola penghasilan buah di wilayah-wilayah yang berlainan.

Introduction

Common Palm Civet *Paradoxurus hermaphroditus* is a carnivoran weighing 2–5 kg as an adult. It is widespread in tropical and subtropical Asia (Patou *et al.* 2010). It lives in a broad array of natural habitats and survives well in human-modified areas (Corlett 1998). It is highly frugivorous (Joshi *et al.* 1995, Grassman 1998, Su Su & Sale 2007, Nakashima *et al.* 2010a) and thus has been regarded as an important seed dispersal agent (Rabinowitz 1991, Nakashima & Sukor 2010, Nakashima *et al.* 2010a, 2010b). Due to its nocturnal habit, little is known about its social relationships in the wild.

Telemetry in the Royal Chitwan National Park in Nepal and Huai Kha Khaeng Wildlife Sanctuary in Thailand detected high male–male and male–female home-range overlap (Rabinowitz 1991, Joshi *et al.* 1995). So far, no studies have been conducted on social interactions between males, and between males and females. This paper reports male–male and male–female social interactions in one observation at a fruiting *Endospermum diadenum* tree in Tabin Wildlife Reserve (hereafter, Tabin).

Tabin (5°05'–5°22'N, 118°30'–118°55'E) lies about 50 km north-east of the town of Lahad Datu, in east Malaysian state

of Sabah, on the island of Borneo. Tabin was heavily logged in the 1970s and 1980s, leaving mainly regenerating mixed dipterocarp tropical rainforest dominated by pioneer species such as *Neolamarckia cadamba* and *Macaranga bancana* (Rajaratnam *et al.* 2007). Common Palm Civets inhabiting Tabin eat mostly fruits of pioneer plants such as *Leea aculeata*, *Endospermum diadenum* and some species of fig trees *Ficus* (Nakashima *et al.* 2010a).

On the cloudy evening of 20 August 2011, the crown of a relatively large fruiting *Endospermum diadenum* (about 50 cm diameter at breast height [DBH], about 30 m tall) was watched from about 20 m from the tree, from a concealed position on the ground to prevent animals detecting the observer. The tree was along the western boundary of Tabin, adjacent to a mature oil palm plantation 20 or more years old, and its canopy was connected to an adjacent (non-fruiting) tree (species not known; about 20 cm DBH) approximately 25 m tall. All observations were aided by 8×36 binoculars and a 120-lumen headlamp with red filter. The height of the tree and the locations of focal animals were measured by a laser rangefinder. Care was taken not to shine lights continuously or directly onto the focal animal. Sex was determined by visual check of the sexual

organ. On 19 August we had happened to find a Common Palm Civet feeding in the focal tree, so we decided to observe this tree the next night. Observation ran from 18h00 until 02h00.

Observations

At 19h55, a male Common Palm Civet (hereafter male 1) came to the tree and started foraging (28 m up). At 20h08, a female came to the tree and started foraging until 21h16 when it climbed down the tree. The male and female civets always stayed at least 5 m apart. No aggression was seen. After the female's departure, male 1 continued to forage in the tree. At 22h35, another male, smaller than male 1 (hereafter male 2) came to the tree and started foraging. Ten minutes later (22h45) male 2 climbed down the tree quickly, and growling was heard for nine minutes. The exact location of this growling was not clear, but during this time male 1 could be seen clearly, and was not growling. Male 1 continued to forage and did not climb down the tree. At 23h29, male 2 climbed up the tree again, and male 1 immediately made an aggressive move towards male 2. Male 2 reacted by climbing down the tree. Ten minutes later, male 2 climbed up the tree again and started feeding. Male 1 came close to male 2, but was not aggressive. At 23h43, male 2 stopped feeding and went down, crossing branches into the adjacent tree. They showed no particular behaviour to each other, until 23h48 when male 1 suddenly ran towards male 2 and both climbed down the adjacent tree. At this time, growling was heard. Then, male 2 was detected growling on a liana straddling the tree adjacent to the fruiting *Endospermum*. Male 1 was not observed thereafter. At 00h14 male 2 climbed into the fruiting tree and continued foraging, for 1½ hours (Fig. 1).

Discussion

Common Palm Civets live mainly solitarily (Joshi *et al.* 1995), but in addition to the obvious needs of mother–young and mating associations, may interact directly with each other, at least occasionally. Duckworth (1997) also observed two individuals close to each other in a fruiting tree in Laos. Moreover, he reported interspecific encounters of this species once each with two other species of subfamily Paradoxurinae, namely a Small-

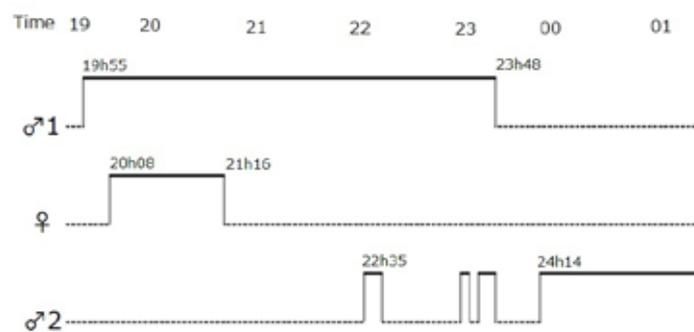


Fig. 1. Times of presence of three Common Palm Civets *Paradoxurus hermaphroditus* in a fruiting *Endospermum diadenum* tree, Tabin Wildlife Reserve, Sabah, Malaysia, on 20 August 2011. (Dashed lines indicate that the individual was not under observation and was, almost certainly, outside the fruiting tree. Vertical lines indicate that it was entering or leaving, respectively, the fruiting tree. Solid horizontal lines indicate its presence in the fruiting tree.)

toothed Palm Civet and a Masked Palm Civet. Both cases were accompanied by loud screaming calls. Rajamani *et al.* (2002) also reported an arboreal intra-specific interaction between Brown Palm Civets *Paradoxurus jerdoni*, involving two animals making loud prolonged spitting/brawling noises. In these cases the animals' sexes were not specified. Species of *Paradoxurus* may tend to vocalise when two animals encounter each other.

In Common Palm Civets, the degree of intraspecific co-feeding in the fruiting tree may vary by region or season. In Tabin, we conducted nocturnal surveys for nine months and observed a mother and baby feeding in the same tree once, and two male Common Palm Civets growling at each other in a fruiting tree of *Ficus racemosa*. In Kulen–Promtep Wildlife Sanctuary, Cambodia, Common Palm Civets visiting a salt-lick were photographed in groups of 1–5 individuals (Edwards 2012), but it is unclear if the group members were family or not (S. Edwards *in litt.* 2012). Also in Cambodia, Iseborn *et al.* (2012) surveyed in Veun Sai–Siem Pang Conservation Area, and never observed Common Palm Civets feeding in a group (T. Iseborn *in litt.* 2012). Meanwhile, at Guning Halimun, Java, Indonesia, although sex was not checked, four Common Palm Civets and five Small-toothed Palm Civets were observed feeding in the same tree together at once without interaction (Eaton *et al.* 2010, J. Eaton *in litt.* 2012).

The other species belonging to subfamily Paradoxurinae are widely distributed across Asia. Only Small-toothed Palm Civets *Arctogalidia trivirgata* are often seen foraging companionably in duos or even larger groups (e.g.: Duckworth 1997, Borissenko *et al.* 2004, Eaton *et al.* 2010, Moore 2011, MN pers. obs.). In Danum Valley Conservation Area, Sabah, Malaysia, we observed four individuals of this species feeding on *Ficus binendijkii* in June 2012, but could not specify their sex. Brown Palm Civets are usually solo but observations of two together are not unusual (Mudappa 2001, N. Prakash *in litt.* 2012). By contrast, but similar to Common Palm Civet, Binturong *Arctictis binturong* and Masked Palm Civet *Paguma larvata* seem in general to feed solitarily (MN pers. obs.). Unfortunately, there seems to be presently too little information on Golden Palm Civet *Paradoxurus zeylonensis* to determine its feeding sociality.

Other tropical continents hold several frugivorous carnivorans, namely Kinkajou *Potos flavus* and the olingos *Basaricyon* in Central and South America, and African Palm Civet *Nandinia binotata* (not closely related to Asian palm civets, despite its English name; Nyakatura & Bininda-Emonds 2012) in Central Africa. Ecological information on these carnivorans is patchy, but at least Kinkajou and African Palm Civet have been reported to feed gregariously. Kays & Gittleman (2001) reported that Kinkajous occasionally fed together with consistent social grouping in large fruiting trees in the lowland forest of Parque Nacional Soberania in the Republic of Panama. Male–female combinations followed by female–juvenile were most frequently observed. Interestingly, male–male combinations were also observed several times. Regarding African Palm Civet, Charles-Dominique (1978) reported that male–male and female–juvenile co-feeding combinations in fruit-trees. Meanwhile, males of both animals have been reported to fight each other, perhaps reflecting a dominance relationship. There is particularly little information on olingos, but at least Beddard's Olingo *B. beddardi* and Bushy-tailed Olingo *B. gabbii* have been observed in groups occasionally, and these

groups have also been reported feeding on individual fig trees (Mendes-Pontes *et al.* 2002, Gonzales-Maya & Belant 2010).

This information suggests that gregarious feeding of frugivorous carnivorans is less common in Asia than in South America and Africa. Within Asia, there may also be regional differences. Considering that fruit production differs between continents (van Schaik *et al.* 1993) and between regions (Wich & van Schaik 2000, Wich *et al.* 2011), these differences are probably based on variation in patterns of fruit production between these places. More field research is needed to allow confident generalisation of patterns of co-feeding in frugivorous carnivorans.

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