Notes on the flexibility of foraging behaviour in Tayras *Eira barbara*

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Abstract

Based on direct field observations, images from camera traps, and analysis of faeces, I describe aspects of diet and foraging behaviour of Tayras *Eira barbara* in July 2004 and during September–December 2006 at La Selva Biological Station, Costa Rica. Tayra diet consisted primarily of *Musa* (introduced plantains and bananas) and Cacao *Theobroma cacao* fruits. Tayras visited an abandoned plantain plantation during day and night and were observed foraging individually or in pairs. Tayras cached unripe plantains and retrieved them once ripened. Tayras exhibit versatility of foraging behaviours and visited disturbed sites.

Keywords: camera-traps, Costa Rica, diet, disturbed sites, Mustelidae

Notas sobre la flexibilidad en el forrajeo del Tolomuco *Eira barbara*

Resumen

Algunos aspectos sobre el comportamiento de forrajeo del Tolomuco *Eira barbara* fueron estudiados en la Estación Biológica La Selva, Costa Rica, en Julio del 2004 y de Setiembre a Diciembre del 2006. Basándose en observaciones directas, cámaras trampa, y análisis de heces, la dieta de esta especie en La Selva, tiene un componente importante de frutos de *Musa* (plátanos y bananos que fueron introducidos al continente americano). Individuos que forrajeaban de manera solitaria o en parejas fueron observados durante el día y también en la noche en una plantación de plátano abandonada. Los Tolomucos almacenaron plátanos que no habian madurado y los recuperaron luego para consumirlos ya maduros. Algunos detalles sobre el forrajeo de tolomucos son mencionados en relación con el aprovisionamiento de frutos. Los tolomucos demuestran versatilidad en sus estrategias de forrajeo y en su habilidad de utilizar áreas perturbadas.

Palabras clave: áreas de disturbio, cámaras-trampa, Costa Rica, dieta, Mustelidae

Introduction

Mustelids are typically considered carnivorous, although several species consume much fruit (Zabala & Zuberogoitia 2003, Barrientos & Virgós 2006, Macdonald 2006). Most knowledge about the natural diet of Tayras *Eira barbara* comes from opportunistic observations, which suggest an omnivorous diet including invertebrates, small and medium-sized vertebrates, various fruits and honey (Janzen 1983, Presley 2000, Bezerra *et al*. 2009).

Once considered forest specialists (see Presley 2000), Tayras are now known also to frequent disturbed areas and human settlements near forests, and to forage in plantations and gardens, often damaging crops (Presley 2000, Guiracocha *et al.* 2001, Macdonald 2006, Soley & Alvarado-Díaz 2011). Besides eating ripe fruits, Tayras cache unripe plantains *Musa* × *paradisiaca* and Sapote *Pouteria sapota* fruits to eat them later, once ripened (Soley & Alvarado-Díaz 2011). Unripe fruits detached from the plant will only continue to ripen if picked at mature stages (Offem & Njoku 1993) and Tayras are able to select unripe plantains and Sapote fruits that are mature enough for caching. These fruits are cached out of sight (e.g. in bromeliads, cavities in trees or on the ground, and on top of tree stumps covered by tall grass), often in places likely to be less frequented by competitors, such as forestry plantations and pastures (Soley & Alvarado-Díaz 2011). These future-oriented behaviours raise important questions about cognitive abilities (i.e. mental processes) in mustelids and on how such abilities contribute to the natural history and ecology of this group. I here provide complementary data to an earlier study (Soley & Alvarado-Díaz 2011) and comment on Tayra foraging versatility in relation to their ecology.

Methods

Opportunistic observations of Tayra foraging behaviour were made at La Selva Biological Station, Costa Rica (10°26'N, 84°01'W), during July 2004 and September–December 2006. This protected area includes patches of primary and secondary forest, and abandoned pastures and plantations (McDade *et al.* 1994). Most observations occurred in a small (484 m^2) plantain plantation and in a forestry plantation lacking fruiting trees. The two plantations, separated by about 80 m, were surrounded by forest. These sites are described in detail by Raich *et al.* (2007) and Soley & Alvarado-Díaz (2011).

To study Tayra diet at La Selva, 11 faeces were collected (10 at the plantain plantation and one at the forestry plantation). Faeces were assigned to Tayra based on volume, shape and place of deposition. They are easily distinguishable from those of the other common medium-sized mammals at this site, White-nosed Coati *Nasua narica*, Common Opossum *Didelphis marsupialis* and Collared Peccary *Pecari tajacu.* To monitor Tayra visits, six motion-sensitive cameras were installed at the plantain plantation, facing the fruit bunch or the pseudostem of a plantain plant. Traps occasionally registered a Tayra visit repeatedly, by taking successive pictures, usually separated by 1-min intervals. Based on these successive pictures, the longest that a Tayra remained in a fruit bunch was 8

min. Thus, pictures separated by intervals greater than 20 min were considered independent visits.

Results

Seven of the 11 faeces contained seeds of Cacao *Theobroma cacao* and one also contained remains of an *Ameiva* lizard. The remianing four faeces were comprised entirely of digested *Musa* (plantain or banana) fruits.

During 31 days with 4–8 hours' observation each, Tayras were observed on 16 occasions (nine at the plantain plantation and seven at the forestry plantation). On 13 occasions they were observed foraging alone and on three occasions in twos. One duo was attempting to cache an unripe plantain at the forestry plantation, and another was retrieving a ripe plantain from a cache at the forestry plantation; both of these observations were described in Soley & Alvarado-Díaz (2011). Also, on 6 November 2006 two Tayras were observed together at the plantain plantation; one walked towards a plantain fruit bunch and picked up a plantain (of unknown ripeness) while the other appeared to wait about 8 m away, at the edge of the plantation. The Tayras left the plantation together (one carrying the plantain) and were again seen about 1 min later at the forestry plantation, but quickly disappeared.

All plants with fruit bunches (n = 42) had Tayra claw markings, even if fruits were unsuitable for eating or caching. Claw marks of the other clawed medium-sized mammals that were common at these plantations, White-nosed Coati and Common Opossum, differ markedly in size and shape from those of Tayra. A male Tayra was once observed inspecting three fruit bunches at the plantain plantation before leaving the site; all three bunches contained immature plantains, and the Tayra picked no fruit.

Pelage patterns of Tayras can be quite uniform, so it was often impossible to distinguish individuals from camera pictures. However, based on variations in facial profiles, fur coloration and scars, at least five individuals visited the fruit bunches in 2006. Two cameras at fruit bunches with unripe, mature fruit registered at least seven different visits in one day. The average daily number of visits per camera was 1.9 ± 1.6 (n = 11 cameras) and cameras registered pictures by both day and night. Three dens similar in appearance to the description of Tayra dens by Janzen (1983) were observed within 200 m of the plantation.

Discussion

All Tayra faeces examined had remains of Cacao or *Musa* fruits, so it appears that at La Selva during September to December, the diet of Tayras includes a strong fruit component (no faeces were found in July 2004). At this site, small abandoned plantations of Cacao, banana and plantain are intermixed with primary and secondary forests, so fruit availability might be greater than in surrounding areas. Similar conditions of mixed agricultural and forest ecosystems occur in other places in Costa Rica, and mammals including Tayras also frequent these sites (e.g. Talamanca, Guiracocha *et al.* 2001; Península de Osa, pers. obs.).

Although it is unknown how many Tayras were present at La Selva, it is likely that the species is common in this area because of the high abundance of food and number of observations reported. Ripe fruits are consumed by many species at La Selva, and Tayras may reduce competition for plantains by caching unripe fruits: unripe plantains at this site are not consumed by other species unless they fall to the ground (where they are consumed by peccaries; Soley & Alvarado-Díaz 2011). Occasionally whole plants with fruit bunches fell to the ground, a consequence of weakening of the pseudostem through claw-damage from repeated use by Tayras. These unripe fruit bunches were consumed by peccaries within two days.

The Tayra's wide distribution range encompasses many habitats (Presley 2000) and aspects of their foraging ecology may have played an important role in their success (Soley & Alvarado-Díaz 2011). Tayra juveniles have a tendency to explore (Poglayen-Neuwall 1978, Presley 2000) and Tayras have a diverse diet requiring flexible foraging behaviour (Janzen 1983, Presley 2001); they can be active at different times of day (Presley 2000, González-Maya *et al.* 2009, Delgado *et al.* 2011), and can forage singly or in small groups, on the ground or in trees (Timm *et al.* 1989, Presley 2000, Delgado *et al.* 2011). An attribute of foraging behaviour that might have provided Tayras with an ecological advantage is their ability to cache fruits in secure places to reduce consumption by competitors (Soley & Alvarado-Díaz 2011).

It is not known if other populations of Tayras cache unripe fruits. *Musa* was introduced into the Tayra's geographical range only about the 16th century (Bassler 1926). It is possible that Tayras transferred the skill of caching native, unripe Sapote fruits to caching unripe plantains or the other way around, but it remains unknown whether the same individuals cache both types of fruit (Soley & Alvarado-Díaz 2011). Other mustelids are also known for their foraging versatility (Goswami & Friscia 2010), which enables them to exploit food sources that would otherwise be potentially unavailable. For example, Fishers *Martes pennanti* attack and kill North American Porcupines *Erethizon dorsatum* in a very specific manner (Powell 1993), Wolverines *Gulo gulo* cache the remains of large prey items (Macdonald 2006), and Sea Otters *Enhydra lutris* use stones as anvils to open hard-shelled molluscs (Alcock 1972).

The transmission of highly specialised foraging skills via social learning (mother–offspring associations) has been demonstrated in mongooses (Müller & Cant 2010). Tayras raised in captivity apparently improve preying tactics based on trial and error, starting gradually with wounded prey brought by their mothers (Poglayen-Neuwall & Poglayen-Neuwall 1976, Poglayen-Neuwall 1978). Since Tayras frequently forage in pairs or small groups (Presley 2000, Delgado *et al.* 2011), even when caching fruit (Soley & Alvarado-Díaz 2011), it is likely that social learning has contributed to transmission of this behaviour.

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RECENTLY PUBLISHED

Regional Red List status of carnivores in the Arabian Peninsula by D. Mallon & K. Budd, K. (eds). IUCN, Cambridge, U.K., and Gland, Switzerland; and Environment and Protected Areas Authority, Sharjah, U.A.E. 2011, vi + 49 pp.

A Regional Red List workshop for the carnivores of the Arabian Peninsula took place over 8–10 February 2011. The workshop was organised and funded by the Environment and Protected Areas Authority, Government of Sharjah, and was hosted by the Breeding Centre for Endangered Arabian Wildlife. More than 30 people from within and outside the region participated.

Twenty species of carnivores have been reported within the Arabian Peninsula, of which seven fall under the remit of the IUCN/SSC Small Carnivore Specialist Group (Marbled Polecat *Vormela peregusna*, Eurasian Badger *Meles meles*, Ratel *Mellivora capensis*, Indian Grey Mongoose *Herpestes edwardsii*, White-tailed Mongoose *Ichneumia albicauda*, Bushy-tailed Mongoose *Bdeogale crassicauda* and Common Genet *Genetta genetta*). Of these, Arabian peninsula populations of Marbled Polecat, Eurasian Badger and Bushy-tailed Mongoose were deemed Not Applicable for regional assessment (the former two are of only marginal occurrence in the region, and the mongoose has not been confirmed to occur at all). Of the four small carnivore species assessed, Ratel was categorised as Regionally Near Threatened, White-tailed Mongoose and Common Genet as Regionally Least Concern, and Indian Grey Mongoose as Regionally Data Deficient. All four are considered Least Concern globally