

**OCORRÊNCIA E PADRÃO DE ATIVIDADES DE *CERDOCYON THOUS* (LINNAEUS, 1766)  
(CANIDAE) NO PARQUE ESTADUAL DAS SETE PASSAGENS, MIGUEL CALMON, BAHIA,  
BRASIL**

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**Resumo:** O cachorro-do-mato (*Cerdocyon thous* Linnaeus, 1766) é uma espécie amplamente distribuída no Brasil, sendo encontrada em todos os biomas e em diversas fitofiosionomias. Este estudo teve como objetivo verificar os hábitos de forrageio da população de *Cerdocyon thous* no Parque Estadual das Sete Passagens (PESP), Miguel Calmon, Bahia. Para esse fim, foram instaladas quatro armadilhas fotográficas próximas à trilhas e pequenos córregos. Em cada ponto, as armadilhas ficaram dispostas por 30 ou 60 dias ininterruptos. Foram registrados 16 indivíduos de *C. thous* na área estudada, em um esforço amostral de 12.240 horas de monitoramento. A densidade absoluta da população foi de 0,007 Indivíduos/km<sup>2</sup> e a frequência relativa foi de ~0,24 Km<sup>2</sup>. Verificou-se que a espécie forrageia em períodos diurno e noturno, mas a atividade é mais ocorrente durante à noite. A população desta espécie parece estar rarefeita na área estudada. Estes dados indicam que a espécie pode não ter se estabelecido ou, em casos mais agravantes, que está sendo exterminada lentamente do PESP. Assim, propõe-se que as atividades de fiscalização sejam intensificadas na zona de entorno do parque, já que em suas proximidades existem fazendas e a espécie costuma ser alvo de retaliação por fazendeiros como forma de evitar a predação dos animais domésticos por esta espécie.

**Palavras-chave:** Caatinga, Forrageio, Densidade Populacional, Cachorro-do-mato.

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**OCCURRENCE AND ACTIVITY PATTERNS OF THE CRAB-EATING FOX *CERDOCYON THOUS* (LINNAEUS, 1766) (CANIDAE) IN THE SETE PASSAGENS STATE PARK, BAHIA, BRAZIL**

**Abstract:** The crab eating fox (*Cerdocyon thous*) is widely distributed in Brazil and the species is found in all biomes and several vegetation types. This study aimed to verify the foraging habits of the *Cerdocyon thous* population in the Seven Passagens State Park, Miguel Calmon, Bahia (PESP). For this purpose, four camera traps were installed near trails and small streams. At each point, the traps were set for 30 or 60 days at a time. Sixteen different individuals of *Cerdocyon thous* were recorded in the study area, in a sampling effort of 46.848 camera hours of monitoring. The absolute population density was 0.007 individuals/km<sup>2</sup> and the relative frequency was ~ 0.24 km<sup>2</sup>. The species was found to forage during the day and night, but mainly during the night. The species seems to be rare in the studied area. The data indicate that the species may not have yet settled or, more seriously, is being eradicated from the PESP. Therefore, we advise that surveillance enforcement must be intensified in the surroundings of the park, as there are farms in the vicinity and the species is often the target of retaliation by farmers as a way to avoid its predation of domestic animals.

**Keywords:** Caatinga. Foraging. Population density. Crab-eating fox.

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## **PATRONES DE PRESENCIA Y ACTIVIDAD DEL ZORRO CANGREJERO *CERDOCYON THOUS* (LINNAEUS, 1766) (CANIDAE) EN EL PARQUE ESTATAL SETE PASSAGENS, BAHÍA, BRASIL**

**Resumen:** El zorro cangrejero (*Cerdocyon thous*) está ampliamente distribuido en Brasil y la especie se encuentra en todos los biomas y en varios tipos de vegetación. Este estudio tuvo como objetivo verificar los hábitos de alimentación de la población *Cerdocyon* *Cerdocyon* en el Parque Estatal Seven Passagens, Miguel Calmon, Bahía (PESP). Para ello, se instalaron cuatro cámaras trampa cerca de senderos y pequeños arroyos. En cada punto, las trampas se colocaron durante 30 o 60 días a la vez. Se registraron dieciséis individuos diferentes de *Cerdocyon* *Cerdocyon* en el área de estudio, en un esfuerzo de muestreo de 46.848 horas de cámara de monitoreo. La densidad de población absoluta fue de 0,007 individuos / km<sup>2</sup> y la frecuencia relativa fue de ~ 0,24 km<sup>2</sup>. Se encontró que la especie se alimentaba durante el día y la noche, pero principalmente durante la noche. La especie parece ser rara en el área estudiada. Los datos indican que es posible que la especie aún no se haya asentado o, lo que es más grave, está siendo erradicada del PESP. Por lo tanto, aconsejamos que se intensifique la vigilancia en los alrededores del parque, ya que hay granjas en las cercanías y la especie suele ser objeto de represalias por parte de los agricultores como forma de evitar la depredación de animales domésticos.

**Palabras clave:** Caatinga. Búsqueda de comida. Densidad de población. Zorro cangrejero.

### **INTRODUCTION**

Populational estimates studies are important to guide how to manage wildlife populations (Tomas and Miranda, 2006; Cheida and Rodrigues, 2014), providing information on activity patterns, such as when the individuals are active, and whether they are moving alone or in groups (Yasuda, 2004; Cheida et al., 2006; Dias and Bocchiglieri, 2016). Despite several studies have addressed aspects about the canids ecology, few studies have been published about the neotropical members of the family (Motta-Junior et al., 1994; Girman et al., 2001; Dalén et al., 2005).

The crab-eating fox (*Cerdocyon thous* (Linnaeus, 1766)) is a medium-sized (4-7 kg), generalist neotropical canid with a broad distribution in South America in a wide variety of habitats including tropical and subtropical forest, open woodlands, and savannas (Tchaika et al., 2007). It also occurs in anthropic areas from Colombia and Venezuela to Paraguay, northern Argentina, Uruguay, and throughout Brazil, except the lowlands of the Amazon basin (Courtenay and Maffei, 2004). Despite inhabiting several vegetation types, the species shows preference for areas of savanna (Trovati et al., 2007). In Brazil, *Cerdocyon thous* is widely distributed in high densities (Beisiegel et al., 2013), and occurs in sympatry with the hoary fox (*Lycalopex vetulus* (Lund, 1842)), the maned wolf (*Chrysocyon brachyurus* (Illiger, 1815)) and the bush dog (*Speothos venaticus* (Lund, 1842)) (Juarez and Marinho-Filho, 2002; Jácomo et al., 2004), all of them common in areas of campo, open woodlands, *cerrado* (grassland savanna) and *caatinga* (semi-arid scrub forest), and transition area between *caatinga* and *cerrado* (Cheida et al., 2006).

The crab-eating fox is reported to be more active at night (Jácomo et al., 2004; Dias and Bocchiglieri, 2016), with a high temporal overlapping with the hoary fox (Bocchiglieri et al., 2011). Therefore, knowing the period in which the species is active is important to evaluate the interspecific interactions that can lead to competition and/or competitive exclusion (Bocchiglieri et al., 2011). The crab-eating fox is a versatile species exhibiting a generalist diet and opportunistic hunting behaviour, feeding on fruits (Pardini et al., 2006), eggs, crabs, small mammals and even insects (Tchaika et al., 2007).

Throughout this range, the crab-eating fox is subject to constant persecution by ranchers over presumed depredation on sheep and other small livestock, and many are also killed on roads. Therefore, information on occurrence, habits and habitat of *C. thous* in a protected area allows increasing knowledge on its ecology and conservation status.

Studies about the crab-eating fox, when carried out through photo-trapping, have been complemented with the use of bait, for it tends to attract the animals (Santos et al., 2013; Cheida and Rodrigues, 2014). Being an opportunistic species with an omnivorous diet, the species is attracted to both vegetable and animal bait (Almeida et al., 2008; Beisiegel et al., 2013). In this work, we used camera traps data to study the occurrence and the foraging habits of the crab-eating fox in the Sete Passagens State Park, in the Miguel Calmon of the State of Bahia, Brazil.

## MATERIALS AND METHODS

### Study area

The Sete Passagens State Park (PESP) encompasses 2.821 ha and is located in the county of Miguel Calmon, Bahia, Brazil (11°39'02 "S e 40°53'16 "W). The park lies within the hydrographic basin of the Itapicuru River, and despite located in a dry area, it stands out for its hydrological importance (INEMA, 2000). The vegetation of the area consists of a mosaic of *caatinga*, *cerrado*, *campos rupestres* and montane semideciduous forest (Sugai, 2014).

The *caatinga* vegetation of PESP is located in the lowest parts of the surroundings of the Protected Area. There the arboreal *caatinga* is predominant, with some species, such as *Cesalpinia pyramidalis* Tul., *Senna macranthera* (DC. ex Collad.) H.S. Irwin and Barneby, *Spondias tuberosa* Arruda, *Cnidocolus* spp. Pohl, *Commiphora leptophloeos* (Mart.) J. B. Gillett, *Mimosa* spp. L., *Anadenanthera colubrina* (Vell.) Brenan, *Myracrodruon urundeuva* Allemão, and *Capparis jacobinae* Moric. ex Eichler, *Capparis Yco* (Mart.) Eichler, *Jatropha* spp. L., being considered dominants (SEMARH, 2008).

*Cerrado's* vegetation occurs sporadically, and most of the times is mixed with the *caatinga*. It is characterized by shrubs and trees, most of them of the families Poaceae, Cyperaceae, Asteraceae and Loganiaceae. Shrubs and sub-shrubs of a variety of families, with the predominance of the Euphorbiaceae, Asteraceae, Melastomataceae, Myrtaceae, Humiriaceae and Malpighiaceae can also be found (SEMARH, 2008).

The *campos rupestres* consist of an open vegetation type of arboreal and shrub species that occurs at altitudes above 1.000 m. In the PESP this vegetation presents an abundance of species of the families Asteraceae, Clusiaceae, Eriocaulaceae, Euphorbiaceae, Lamiaceae, Lythraceae, Ochnaceae, Verbenaceae and Xyridaceae (SEMARH, 2008).

Montane semideciduous forests are mainly composed of arboreal species of the Sapotaceae, and of the species *Oreopanax capitatus* (Jacq.) Decne and Planch. (Araliaceae) and *Roupala montana* Aubl. (Proteaceae), which are indicators of marshy environments (SEMARH, 2008).

### Data analysis and collection

Data was collected between March 2016 and July 2017, with the aid of four camera traps (Moultrie). The camera traps were set up scattered within dense forest patches, gallery forests and *campos rupestres*, during 30 to 60 consecutive days. The set up sites were chosen next to foot paths and small streams, along which wild mammals tend to move. The camera traps were installed at least 200 m apart and 30 to 40 centimeters above the ground, and preset to work 24 hours round, recording date, time and temperature. Images obtained by each camera at less than an hour of interval were considered a single record.

During data collecting, vegetable (mango, banana, and apple) and animal (bacon) baits were placed in camera trapping stations on the day of installation camera, in order to test the attractiveness of the baits on the species. The baits were not replaced in the following days. The fruits and the bacon were cut in small slices and placed either on top of a rock or directly onto the soil. Fruit skins were randomly disposed along paths, in order to lure the animal towards the bait. It was also sought to record of any spoor of the animals, such as feces, carcasses, regurgitations, besides surveying, whenever possible, any sightings of the animal.

The species constancy of occurrence was evaluated by Silveira-Neto's index (Silveira-Neto et al. 1976), using the adapted scale of Santos et al. (2008), where the species is considered Constant if found in more than 50% of the samples; considered Accessory if found between 25 and 50% and considered Occasional if registered in less than 25% of the samples.

Absolute density of the species was calculated using the formula:

$$D = \frac{N}{A}$$

In which:

N is the Total number of registered individuals;

A is the Total area (km) of the study area.

The species relative abundance was evaluated by the Fourier's method (Ayres, 1986), using the formula:

$$D = \frac{N}{(2 \times W) \times L}$$

In which:

D= Density (groups, subgroups or individuals);

N= Number of times it was observed;

L= Transect length;

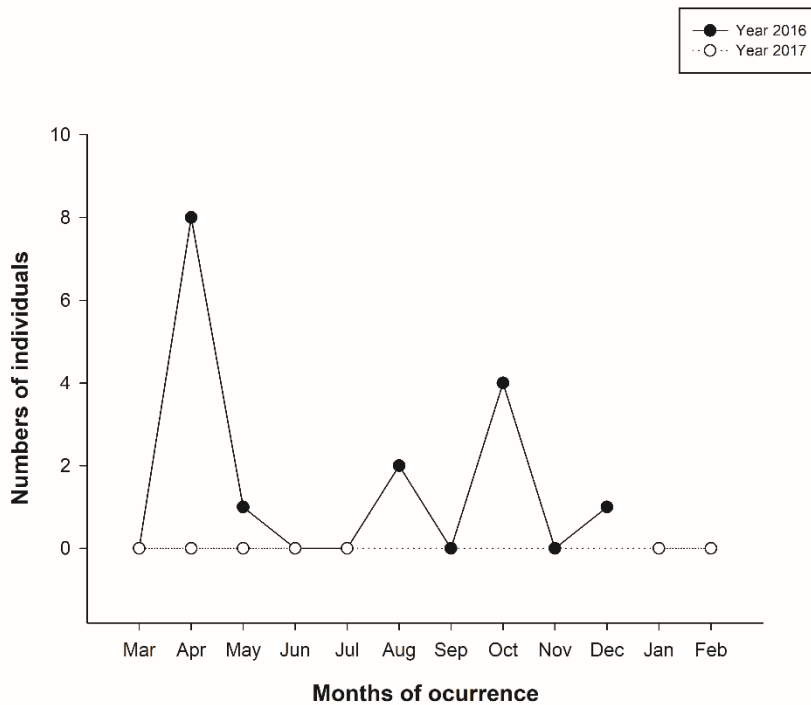
W= Transect width.

The activity patterns were evaluated based on each activity period (twilight, daytime or nighttime). Twilight was defined as the one hour interval before and after sunrise and sunset, with the times of sunrise and sunset obtained through Moonrise Program 3.5.

## Results

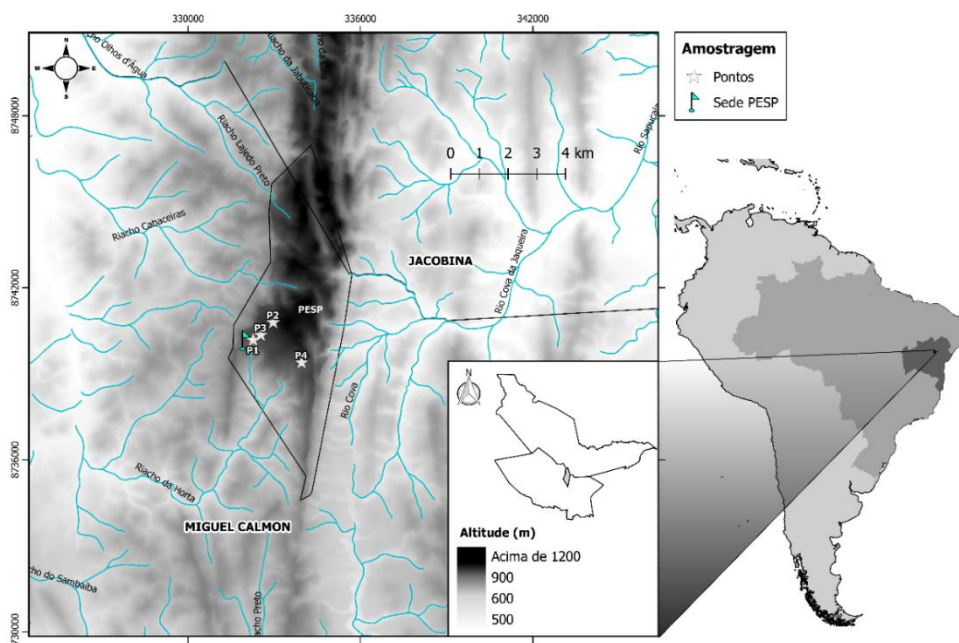
Were registered 16 crab-eating fox individuals during the study period, corresponding to 1.952 camera days, totalizing a sampling effort of 46.848 camera hours along a 6,88 km route. The specimens were registered only in April, May, August, October and December 2016 (Figure 1) in four locations within PESP (Figure 2). April was the month with higher rate of species occurrence, with eight individuals detected (Figure 1). Taking into consideration the frequency of detection, *C. thous* was considered Occasional (21%). The species absolute density was 0,007 individuals/ km<sup>2</sup>, and the relative frequency during the study, considering the route length, was of ~0,24 km<sup>2</sup>.

**Figure 1.** Occurrence and abundance of *Cerdocyon thous* between March 2016 and July 2017 in the Sete Passagens State Park.



Source: Authors' Collection.

**Figure 2.** Occurrence locations of the *Cerdocyon thous* in the Sete Passagens State Park.



Source: Authors' Collection.

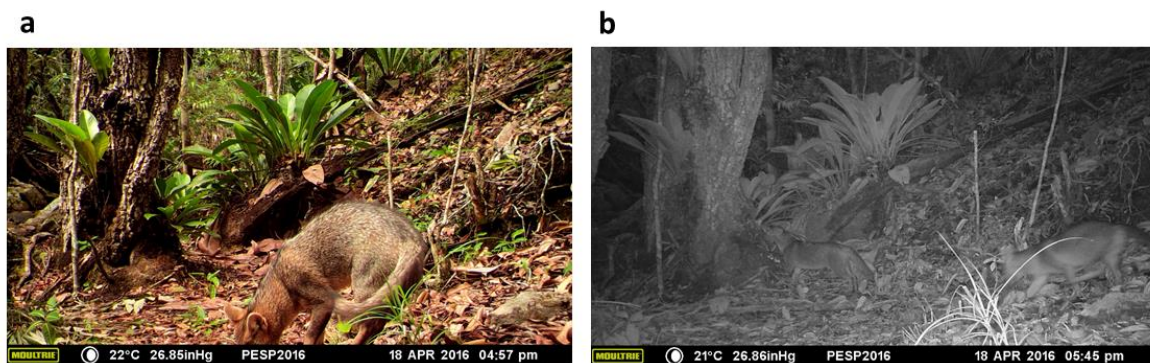
The species was not detected through spoor surveys in virtue of the soil compaction, which hindered the marking of footprints. Besides that, the large quantity of litter also precluded the finding of other traces (e.g. feces and regurgitations). The specimens were found both during daytime and

nighttime (Table 1; Figures 3 and 4), and foraging movement was more frequent during nighttime. It was observed that the animals looked for bacon first and then ate the fruits.

**Table 1.** Activity patterns of *Cerdocyon thous* in the Sete Passagens State Park.

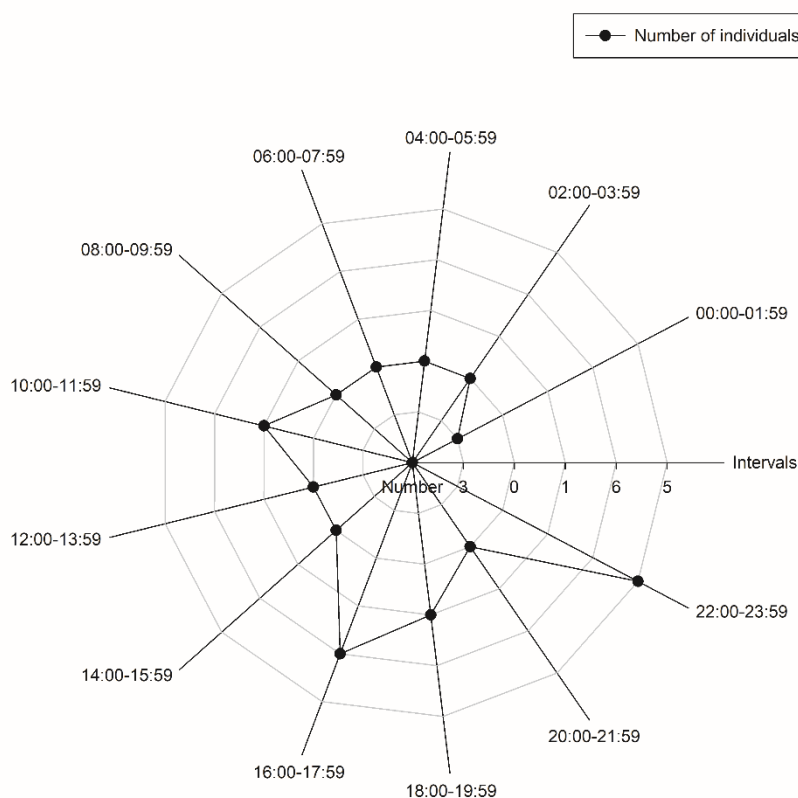
Date	N° of individuals	Foraging time
13 /04/2016	1	Night
18/04/2016	2	Day
18/04/2016	2	Night
19/04/2016	3	Night
10/05/2016	1	Day
12/08/2016	2	Night
04/10/2016	2	Night
06/10/2016	2	Night
20/12/2016	1	Night

**Figure 3.** *Cerdocyon thous* in the Sete Passagens State Park. A) daytime register; B) nighttime register.



Source: Authors' Collection.

**Figure 4.** Activity chart of the *Cerdocyon thous* in the Sete Passagens State Park.



Source: Authors' Collection

## DISCUSSION

The Sete Passagens State Park comprises zones that show potential for the occurrence of many mammal species; however, the area appears to be unfavorable for *Cerdocyon thous*. Although forest have high density cover, they don't guarantee the permanence of wildlife, since these areas can suffer both inside and outside human-driven impacts (Redford, 1992). The PESP, despite being gazetted as a protected area since 2000, its resident fauna is likely driven away by mining and agricultural activities in its surroundings (INEMA, 2000).

Although the crab-eating fox is a very inquisitive animal, and that would make its presence likely even in humanized environments (Andrade et al., 2008; Beisiegel et al., 2013), it is nevertheless infrequent in Sete Passagens State Park. We expected the species to be more abundant in the park, since it inhabits several vegetation types and has an omnivorous diet, consuming many different food items (Gehring and Swihart, 2003; Dias and Bocchiglieri, 2016) as small mammals and other vertebrates, fruits, and arthropods (Bueno and Motta-Junior, 2004; Gatti et al., 2006). Also, it is suggested that the lay outing of the cameras in a larger amount of time could have had elevated the chances of registering individuals of the same species in this study, especially in the dry period, since the animals do a bigger route in search of food (Lemos and Facure, 2011).



Dias and Bocchiglieri (2016), in a *caatinga* protected area in northeastern Brazil, smaller than PESP (2.183 ha), registered 407 individuals of *C. thous*, 99 of them by camera trapping, after an equivalent effort of 3.398 camera days. Both areas have agricultural activities and domestic animals such as dogs in the surroundings. Although the capture effort is greater in the Dias and Bocchiglieri (2016) study, the capture effort employed in this study would likely capture more individuals if their presence in the park was more frequent. The potential conflict with dogs and also the presence of other carnivores (e.g. *Puma concolor* (Linnaeus, 1771), *Leopardus wiedii* (Schinz, 1821) and *Leopardus pardalis* (Linnaeus, 1758)) recorded in the PESP (Peixoto, 2019) may be affecting the *C. thous* dispersion in the park area. Food resources availability in the PESP does not appear to be a problem, the park is abundant in preys such as rodents, opossums (Peixoto, 2019), lizards and arthropods, which is reported to be consumed by this specie (Bueno and Motta-Junior, 2004; Di Bitetti et al., 2009; Dias and Bocchiglieri, 2016). The present data may be showing a decline in *C. thous* population or it is not yet established in the park.

One of the likely reasons concerning the few records of *C. thous* in the PESP, besides being often killed by farmers in retaliation to attacks on domestic animals, is that in Brazil this is one of the species most affected by road mortality (Lemos et al., 2011). Silva (2014) reported 15 *C. thous* killed in a five months period by being run over in an area 130km away from PESP. It's likely that the prevalence of road mortality is most associated with the replacement of native vegetation by grazing and farming fields, forcing the species to search for resources in those habitats (Barros et al., 2010), which are closer to the roads in this region. Another aggravating factor, especially in the *Caatinga* biome, is the traditional use of the fox fat against uterine diseases in domestic animals; for that, fox's fat is washed up and cleaned, and then introduced in the postpartum extravasated uterus of the animal (Barboza et al., 2007).

Although *C. thous* individuals have been detected during both daytime and nighttime, the sociability of group at foraging, whether in pairs or group, occurred more at night, corroborate with several studies (Di Bitetti et al., 2009; Bocchiglieri et al., 2011; Thoyses et al., 2013; Dias, 2014) about ecology of specie activity. It is a species that usually lives in pairs that share a territory and usually travel together (Montgomery and Lubin, 1978; Medel and Jaksic, 1988; Macdonald and Courtenay, 1996), but according to Cheida et al. (2006) and Rocha et al. (2008) does not usually share its prey, and this is a probable justification for single or double foraging. The double displacements recorded during the night in this study, may be indicative of *C. thous*'s cooperativity to facilitate the attack on larger prey (Montgomery and Lubin, 1978; Silva et al., 2018) like white tegu (*Salvator merianae* Duméril and Bibron, 1839), quite abundant in the PESP. Despite being an opportunistic animal consuming a variety of foods, the crab-eating fox prefers animal protein (Bueno and Motta-Junior, 2004; Cheida et al., 2006), as also noticed in this study, that between the fruits and bacon baits, there was an initial tendency for bacon consumption.

The *C. thous* broadly omnivorous diet makes it an important seed disperser, what makes its conservation important to the regeneration of degraded areas (Donati, 2004). However, like medium and large sized mammals in general, which are sensitive to environmental disturbances (Pardini et al., 2006) this fox is probably being affected by human activities in the surrounding area of the park (INEMA, 2000).

Due to seed consumption, *C. thous* is a potential seed disperser, what makes its conservation important to the regeneration of degraded areas (Donati, 2004). However, like medium and large sized mammals in general, which are sensitive to environmental disturbances (Pardini et al., 2006) this fox is probably being affected by human activities in the surrounding area of the park (INEMA, 2000). Therefore, even though there aren't specific actions for the species conservation, mainly because its population trend in Brazil is considered stable, prevention measures need to be applied concerning road kills in an attempt to alleviate the damage caused to the species (Beisiegel et al. 2013). In the region where PESP is located, besides the already mentioned measures, it's of vital importance to widen the area of environmental vigilance in the surroundings of the park. Beyond that, awareness sessions should be undertaken with the neighboring communities in an attempt to mitigate the human impacts on wildlife.

### **Final remarks**

The abundance of *Cerdocyon thous* in the Sete Passagens State Park was low, despite being a generalist species. In the presented study, although the low number of traps, we expected the crab-eating fox to be more abundant in the study area, accounting for the time the cameras remained operating (over 12 months) a time span considered enough for the collecting of data on mammals. Although a common species in human-modified environments, the apparent rarity of the species in the study area may be the result of human activities. Animals that attract interest from human beings, even in protected environments, may suffer with the border's effect. In this case, the species can be victim of persecution within the Protected Area buffer zone, even if being watched over. It was not intended here to analyze possible stressors on the animals or the environment, but we suggest that human activities in the park surroundings should be investigated in order to check whether they are responsible for the low local population of crab-eating foxes.

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