

## NEW RECORD OF *LYCALOPEX VETULUS* (CARNIVORA, CANIDAE) IN NORTHEASTERN BRAZIL

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Currently, the genus *Lycalopex* (Burmeister, 1854) (Carnivora, Canidae) is composed of six species, two of which - *L. gymnocercus* and *L. vetulus* - occur in Brazil (Wilson and Reeder 2005). The hoary fox *L. vetulus* (Lund, 1842) is the smallest and the only endemic canid of Brazil, even though there is a record from Huanchaca, Bolívia (Anderson 1997), that was nevertheless questioned (Dalponte and Courtenay 2004, Dalponte 2009). The type locality of *L. vetulus* is “Rio das Velhas’s Floddal”, county of Lagoa Santa, Minas Gerais State, Brazil (Dalponte 2009). The species is considered of “Least Concern” by International Union for Conservation of Nature (Dalponte and Courtenay 2008) but “Vulnerable” in Brazil (Lemos *et al.* 2013).

*Lycalopex vetulus* is essentially nocturnal (Jácomo *et al.* 2004, Courtenay *et al.* 2006, Rocha *et al.* 2008, Dalponte 2009), a solitary forager (Courtenay *et al.* 2006, Lemos and Facure 2011) and primarily an insectivore-omnivore, feeding mainly on termites (genera *Syntermes* and *Cornitermes*), beetles, and grasshoppers (Dalponte 1997, Ferreira-Silva and Lima 2006, Lemos *et al.* 2011). The species does not show apparent sexual dimorphism in size (Courtenay *et al.* 2006) and it is morphologically similar to the sympatric crab-eating fox *Cerdocyon thous* (Linnaeus, 1766) (Carnivora, Canidae) (Dalponte 2009). As pointed out by Cabrera (1931), one of the main diagnosis features of the species is related to the length of fourth premolar (P4), which is “hardly greater than length of the first molar (M1)”, and to the length of M1, which is about the length of the second molar (M2) added to the third molar (M3).

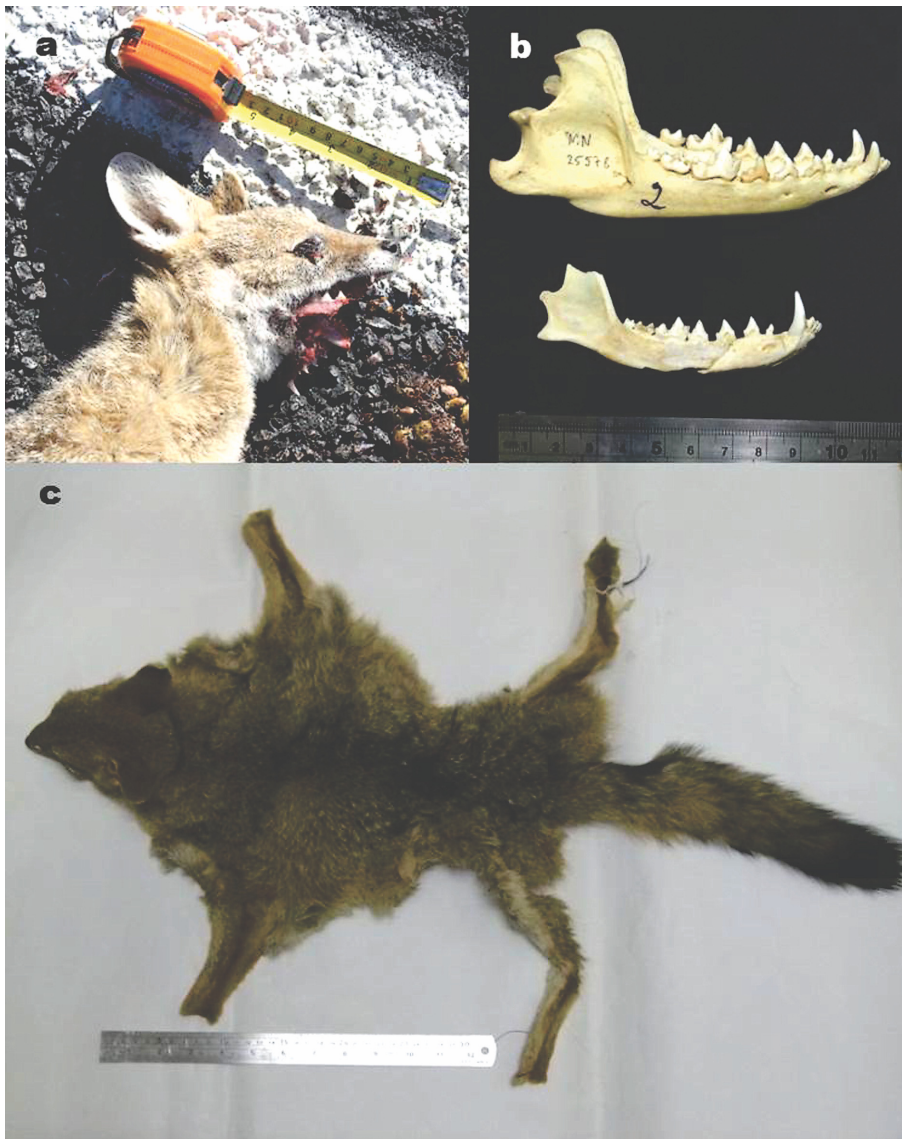
The hoary fox occurs mostly in the central part of Brazil, mainly in the savannah-like Cerrado biome (Dalponte 2009), but the exact limits of its distribution

are unclear (Lemos *et al.* 2013). The northern limit of its distribution is in the Maranhão and Piauí states (Costa and Courtenay 2003, Dalponte 2009, Lemos *et al.* 2013). Records in the Ceará state (Deane and Deane 1954, Deane 1956, Alencar 1959) were contested by Courtenay and co-workers (1996), who affirmed that the specimens sampled were most probably crab-eating foxes (*C. thous*), a wild canid sympatric with *L. vetulus* in the region. Neither the Ceará state nor the nearby Pernambuco and Paraíba states have official records of *L. vetulus* and their local museums do not have specimens deposited (Silva 2012).

In this study, we examined a roadkilled specimen of *Lycalopex vetulus* collected in the Ceará state, Brazil, which extends the species distribution range 330 Km to the northeast. The specimen was an adult male showing a complete dentition (3/3 1/1/ 4/ 4/ 2/3), with fur color and general dental and mandible measurements compatible with those of *L. vetulus* and distinct from the sympatric *C. thous* (Table 1, Figure 1a-c). The skull of the specimen was very fragmented, but we could obtain some basic dental measurements that allowed us to identify it as *L. vetulus*. The length of the first lower molar was the same as the length of the second and third lower molars together, which is a characteristic feature of *L. vetulus* (Cabrera 1931, Dalponte 2009). Moreover, the overall mandible and teeth were much smaller than those of *C. thous* (Fig. 2c), except for the canine height, which was very similar to that of *C. thous* and not shorter than this one, as previously suggested (de Paula-Couto 1950 *apud* Dalponte 2009). Fur color had some typical features of *L. vetulus*, such as chestnut ears and legs; upper parts of body pale gray (except head); anterior part of the neck white; and dark tail base and tail tip (Dalponte and Courtenay 2004, Dalponte 2009).

**Table 1.** Minimum and maximum (mm) morphological measurements of the specimen of *Lycalopex vetulus* MN77804 (Carnivora, Canidae) collected in Ceará state, Brazil. Data from the literature for *L. vetulus* and *Cerdocyon thous* are shown for comparison purposes.

MORPHOLOGICAL VARIABLES (mm)	MN77804 (SPECIMEN COLLECT IN THE PRESENT STUDY)	DESCRIPTION OF <i>LYCALOPEX VETULUS</i> (DALPONTE AND COURTENAY 2004, DALPONTE 2009)	DESCRIPTION OF <i>CERDOCYON THOUS</i> (CABRERA 1931, BERTA 1982, COURTENAY AND MAFFEI 2004, CHEIDA ET AL. 2011)
Head-body length	610	490-715	555-800
Tail length	280	250-380	220-410
Hind foot	128	120-135	125-147
Length of ear	65	60-76	55-86
Shoulder height	260	327-375	371-421
Mandible length	83.7	82-86	89.6-105.9
Length of P <sup>4</sup>	> M <sup>1</sup>	> M <sup>1</sup>	>> M <sup>1</sup>
Length of M <sub>1</sub>	9.85 (=M <sub>2</sub> +M <sub>3</sub> )	= M <sub>2</sub> +M <sub>3</sub>	> M <sub>2</sub> +M <sub>3</sub>
Weight (grams)	2500 (without viscera)	2500-4000	3700-11100



**Figure 1.** (a) Roadkilled specimen of *Lycalopex vetulus* (Carnivora, Canidae) on the CE-060 highway, Ceará state, Brazil; (b) Specimen mandible (lower picture) in comparison with that of a *Cerdocyon thous* (upper picture; MN25578); (c) Prepared skin in the “Coleção de Mamíferos do Museu Nacional / Universidade Federal do Rio de Janeiro”.

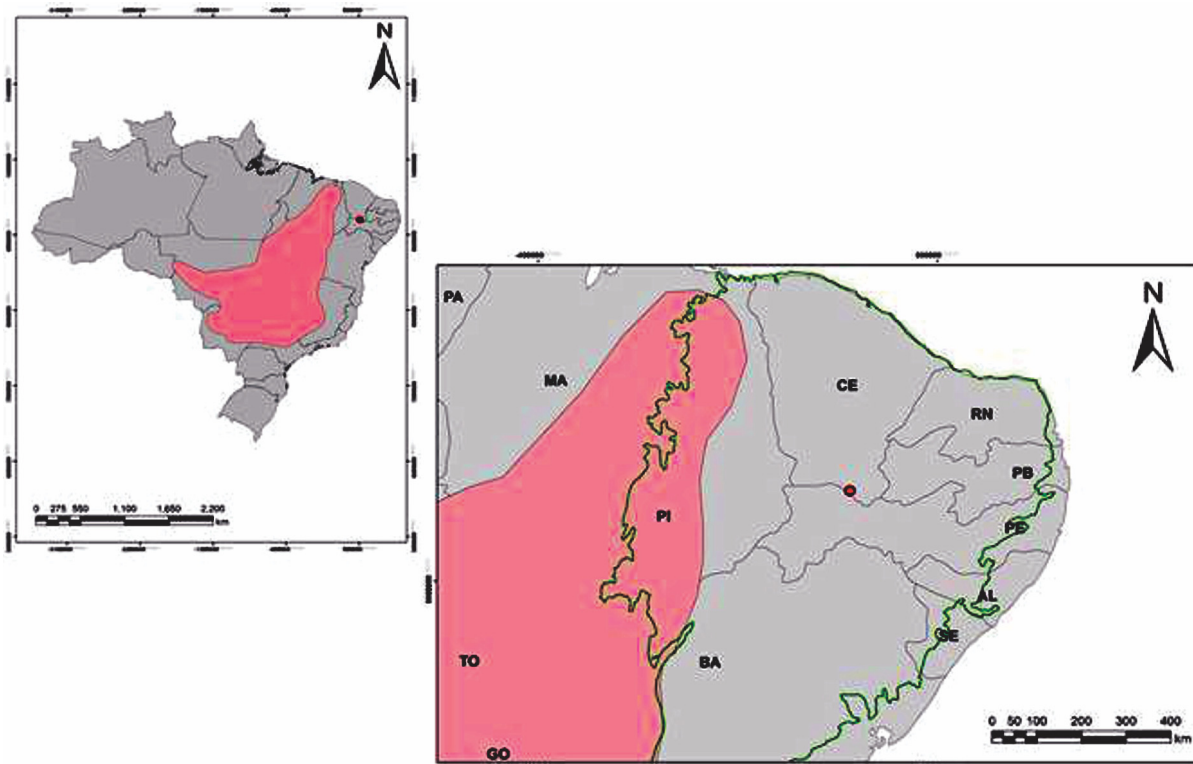
The record was obtained 330 kilometres northeast of the most recent distribution range (Lemos *et al.* 2013) and 500 Km southeast of the record of Costa and Courtenay (2003) in the north of the Piauí state (Figure 2). Therefore, the new record extends the species distribution toward the east. In addition, this is the first confirmed record of *L. vetulus* in the Ceará state.

*Lycalopex vetulus* specimens were supposedly captured in Pernambuco and Paraíba states for parasitological studies (Gennari *et al.* 2004, Bernardi *et al.* 2005, Labruna *et al.* 2005, Azevedo *et al.* 2009, Silva *et al.* 2009, Dantas-Torres *et al.* 2010), but there are no specimens deposited in the local museums and previous misidentifications of *C. thous* for *L. vetulus* have occurred (see Courtenay *et al.* 1996). The specimens previously captured in the Atlantic Forest of the Paraíba state (Gennari *et al.* 2004, Dantas-Torres *et al.* 2010) are most probably *C. thous*, and records from the interior part of the state (Labruna *et al.* 2005, Azevedo *et al.* 2009, Silva *et al.* 2009), where the Caatinga vegetation is typical, might be of *C. thous* as well.

The hoary fox is typically found in open-grasslands of the Cerrado biome. It has been observed that it can also occur in the Caatinga biome of Piauí (Costa and Courtenay 2003) and Ceará states. However, the vegetational types of those localities are

not typical. The record of Costa and Courtenay (2003) from north of Piauí, for instance, was obtained in a palm grove of babaçu (*Orbygnia martiana*) with a cerrado *sensu lato* vegetation. Likewise, the record obtained in the present study was in an area of transitional vegetation in which one could find both savannah-like (“cerrado”) areas and seasonal forest (Costa *et al.* 2004, IBGE 2004, Costa and Araújo 2007). It is not clear whether the species can actually have populations in the driest and most typical areas of the Caatinga biome (that is, the “savana estépica”) or whether it has populations only in Cerrado-like vegetation within the Caatinga biome.

The distributional range of *L. vetulus* is still poorly known not only in the northeast of Brazil but also in other regions. There are visual records and personal communications that have never been confirmed by specimen collection. For instance, visual records obtained in the Pantanal biome (Coutinho *et al.* 1997 *apud* Rodrigues *et al.* 2002) could not be confirmed and records in the Paraná state in the south of Brazil have also been questioned (Dalponte 2009, Lemos *et al.* 2013). However, there is one museum record confirming the occurrence of the species in the Atlantic forest of the Mato Grosso do Sul state (Cáceres *et al.* 2008).



**Figure 2.** Distribution range of *Lycalopex vetulus* in pink (modified from Lemos *et al.* 2013). The red point is the new species record in Ceará state, Brazil. The green line is the limit for the Caatinga biome.

In this study, we found that the canine height of *L. vetulus* was very similar to that of *C. thous* we used for comparison. This is not surprising, as tooth height may vary with both animal age and diet (e.g. Olifiers *et al.* 2010). Therefore, even though canine height has been cited before as one of the features differentiating *L. vetulus* from *C. thous* (de Paula-Couto 1950 *apud* Dalponte 2009), we believe this characteristic should not be used as a diagnosis feature to differentiate these species.

If a specimen is captured or killed for scientific purposes, it is good practice to obtain as much information as possible from it. Particularly, information allowing proper species identification is essential, regardless of the objectives of the study. If the study involves capturing and releasing the animals, then diagnostic morphological and cranial measurements and/or tissue samples for molecular analyses should be collected to avoid misidentifications. We strongly suggest that specimens collected should be deposited in scientific collections to allow proper identification and to increase the species database, especially if the species and/or the study area where it was collected are not well-known. Roadkilled animals should also be collected and deposited, even if the skull condition is not ideal.

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## MATERIAL AND METHODS

The study area is located in the surroundings of Chapada do Araripe National Forest, along the CE-060 highway, in the Municipality of Jardim, Ceará state, Brazil (Figure 2). Following the Köppen classification, the climate of Jardim is “tropical savannah climate” (type Aw’), with mean annual temperature between 18 and 34°C and mean annual precipitation of 1.033 mm (Mendonça *et al.* 2009). The location is inserted in the Caatinga biome, but the predominant vegetation in the region is typical of Cerrado (Costa *et al.* 2004, Costa and Araújo 2007).

A roadkilled specimen of *L. vetulus* was found on the CE-060 highway on April 03<sup>rd</sup>, 2011, at about 6 km northwest from the Municipality of Jardim (*Datum* WGS84, 7°31’36.3”S, 39°19’9.7”W; Figure 1a). The specimen was prepared and deposited at the Museu Nacional, Universidade Federal do Rio de Janeiro, Brazil (number MN77804). We sexed, weighted, and obtained cranial and postcranial measures (Table 1) that were compared with information from the literature.

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