



Noteworthy coastal records of the maned wolf, *Chrysocyon brachyurus* (Illiger, 1815), in Southeastern Brazil

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Abstract: The presence of maned wolves in the Brazilian Atlantic forest has been interpreted as recent dispersal to coastal areas. We report seven records of *Chrysocyon brachyurus* in the northern littoral of Rio de Janeiro state, representing its first confirmed occurrence in coastal lowlands and most coastal range documented by voucher-specimens. Road-kills were concentrated along a short length of BR 101-North highway, indicating a priority area to implement mitigating actions. An alternative hypothesis to recent dispersal is that local population of maned wolves might be ancient due to natural occurrence of open physiognomies in the area.

Key-Words: Dispersal; Geographic distribution; Threatened-species; Road-kill; Voucher-specimen.

Resumo: Registros costeiros do lobo-guará, *Chrysocyon brachyurus* (Illiger, 1815), no Sudeste do Brasil. A presença do lobo-guará na Mata Atlântica tem sido interpretada como dispersão recente da espécie. Aqui relatamos sete registros no litoral norte do estado do Rio de Janeiro, representando a primeira ocorrência confirmada de *Chrysocyon brachyurus* nas planícies costeiras e o registro mais costeiro com espécimes-testemunho. Os atropelamentos concentraram-se em um curto trecho da rodovia BR 101 Norte, indicando uma área prioritária para ações de mitigação. Uma alternativa para a hipótese de dispersão recente, é que a população local de lobo-guará pode ser mais antiga devido à ocorrência natural de fisionomias abertas na região.

Palavras-Chave: Dispersão; Distribuição geográfica; Espécies ameaçadas; Atropelamento; Espécime-testemunho.

Most tropical ecosystems across the world have been partially or completely substituted by human-made habitats, imposing different ecological conditions to biotas formerly adapted to their original environments (Haddad *et al.*, 2015). One consequence of such landscape-level changes is the modification of species distribution patterns, in which the disruption of natural geographic barriers by human activities might promote dispersal of species to new habitats (Tscharrntke *et al.*, 2012). While this process has been well studied in arthropod and plant communities in agroecosystems (Thies & Tscharrntke, 1999; Blitzer *et al.*, 2012), recent changes on species distributions are still poorly documented for Neotropical mammals, even for large-sized and conspicuous species such as the maned wolf. The maned wolf, *Chrysocyon brachyurus* (Illiger, 1815), the largest extant canid in the Americas (Dietz, 1984), is today considered near threatened at global scale (Cunha de Paula & DeMarteo, 2015) and vulnerable in Brazil (Brasil, 2014), where it presents 90% of its current distribution range (Cunha

de Paula *et al.*, 2008). Among its major threats, habitat loss, overkilling of its preys and road-kills are responsible for reductions of up to one third of original population sizes in some localities and only a small fraction of its distribution (39%) is thought to be stable through long term (Cunha de Paula *et al.*, 2013; Torres *et al.*, 2013). Maned wolves are solitary and secretive, have crepuscular-nocturnal habits, an omnivorous diet and large home ranges (Dietz, 1984). Adult individuals measure 95 to 115 cm of body length, weight 20 to 33 kg, and exhibit a yellowish-brown dorsal pelage sharply contrasting with the distally black and notably long limbs (Cheida *et al.*, 2006), a peculiar set of external characters that makes this large carnivore easily recognizable. Despite that, data on its distribution has accumulated only recently due to difficulties in observing this shy carnivore in field studies and to the scarcity of museum-vouchered records (Queirolo *et al.*, 2011; Torres *et al.*, 2013).

Chrysocyon brachyurus was originally distributed across open formations of interior South America, such



Table 1: Records of maned wolves *Chrysocyon brachyurus* in the Northern littoral of Rio de Janeiro state, Brazil, based on road-killed and live specimens observed between 2013 and 2015.

LOCALITY	SPECIMEN	SEX	MASS (KG)	COORDINATES (DATUM: WGS 84)		DATE OF REGISTRATION
(1) km 138 of road BR 101-North, Carapebus	NPM 1404	Female	24	22°09'47"S	41°44'29"W	08.XI.2013
(2) km 153 of road BR 101-North, Macaé	Photographed/rescued	Male	—	22°15'13"S	41°49'46"W	14.X.2014
(3) km 154 of road BR 101-North, Macaé	NPM 1211	Female	24	22°13'52"S	41°47'15"W	30.V.2013
(4) km 155 of road BR 101-North, Macaé	NPM 1305	Male	30	22°15'35"S	41°50'32"W	18.XII.2014
(5) km 157 of road BR 101-North, Conceição de Macabú	NPM 1308	Female	35	22°16'09"S	41°51'55"W	09.V.2015
(6) Road RJ 168, Macaé	Photographed	—	—	22°19'46"S	41°58'02"W	19.III.2014
(7) Road RJ 162, Macaé	Photographed	—	—	22°17'05"S	41°58'16"W	31.III.2014

as the grasslands, scrublands and wet plains found in Cerrado and Pantanal, or in transitional areas of Caatinga and Southern grasslands (Rodden *et al.*, 2004; Cheida *et al.*, 2006; Pinto & Duarte, 2013). However, human induced modifications of these habitats might be facilitating the dispersal of *C. brachyurus* to coastal areas where formerly continuous forests have been converted to mosaics of pastures and forest fragments. This tendency is evidenced by a cumulating number of records in Atlantic forest areas in the Brazilian states of Bahia, Espírito Santo (Moreira *et al.*, 2008), São Paulo (Queirolo *et al.*, 2011), Paraná (Torres *et al.*, 2013) and Rio de Janeiro (Aximoff *et al.*, 2015). Despite the trend of expansion to more coastal areas, there are very few vouchered records of *C. brachyurus* in the Brazilian littoral, especially in the Rio de Janeiro state, where most records of maned wolves are still restricted to montane or hinterland areas bordering the state of Minas Gerais (Torres *et al.*, 2013). In this study we report the noteworthy occurrence of *C. brachyurus* in the northern littoral of Rio de Janeiro state based on direct observations and on voucher-specimens obtained from road-kills along three roads.

Since 2009, we have been receiving information on road-killed specimens of medium and large-size wild mammals from a network of governmental and non-governmental institutions monitoring the fauna impacts of BR 101/North RJ, a major highway in northern Rio de Janeiro state, and of RJ 162 and RJ 168, two smaller roads mostly situated within Macaé municipality. All road-killed specimens of maned wolf received by us at Nucleus in Ecology and Socio-Environmental Development in Macaé (NUPEM/UFRJ) had their external body measurements, sex, age and reproductive condition recorded, and their stomach contents examined. These specimens are deposited as vouchers (skin, skeleton, tissues) at the mammal collection of NUPEM/UFRJ (NPM). In addition to voucher-specimens, georeferenced photographic records made by us during sporadic car travels across RJ 162 and RJ 168 roads were also considered as evidence of occurrence of *C. brachyurus*. Voucher-specimens of maned wolf deposited in the mammal collection of National Museum (MN), Federal University of Rio de Janeiro, were also examined by us to evaluate previous records of the species in the state of Rio de Janeiro in addition to literature reports.

We obtained seven records of *C. brachyurus* in the northern littoral of Rio de Janeiro state, between 2013

and 2015 (Table 1), representing the first confirmed occurrence of the species in this region and its most coastal range documented by voucher-specimens (Figures 1 and 2). The coastal-most specimen was a road-killed female recorded only 12 km from the sea and 10 km from the Restinga de Jurubatiba National Park, the nearest coastal reserve. All individuals were adults. Among the accidentally struck specimens, four were road-killed and only one was rescued alive and sent to the Veterinary Hospital of Estácio de Sá University, at Rio de Janeiro. All seven records occurred in areas dominated by pastures and grasslands with reduced forest cover, during both dry and wet seasons from May 2013 to May 2015. One of the two free-ranging animals photographed (Figure 2b) showed signs of myiasis infestation in one ear. Since the other six roadkilled specimens recorded did not show this lesion, at least one individual might be still alive in the area. Two road-killed specimens showed gunshot injuries in the head and shoulders that were already healed, evidencing past conflicts with humans and highlighting punitive reprisals on live animals still occupying the area. The analysis of stomach contents of the four road-killed specimens revealed a diet constituted by small birds, one species of rodent (*Cavia fulgida* – Rodentia: Caviidae) and fruits, with no traces of domestic animals. The fruit seeds belong to an unidentified species of Myrtaceae and none of them represented *Solanum lycocarpum* (Solanaceae), a plant regularly consumed by maned wolves in the Cerrado of Central Brazil (Rodrigues *et al.*, 2007). Massara *et al.* (2012) suggested that the diets of individuals ranging outside protected areas of Cerrado are less diverse than inside natural reserves, possibly due to differences in resource diversity and availability, which might also explain the simplified set of contents recovered from road-killed specimens.

A short length of BR 101/North RJ (between kilometers 154 and 157) concentrated most road-kills, where three specimens were collected (Figure 2a). The continuous monitoring of this putative road-kill hotspot by BR 101-North administrators is crucial to implement mitigating actions directed to *C. brachyurus*, especially if accidents become more frequent. It is important to note that collisions with large animals, such as maned wolves, are a great risk to the safety of road users and demand increasing costs in medical care and road maintenance (Huijser *et al.*, 2009, 2013).

Previous published records of *C. brachyurus* in Rio de Janeiro state comprised localities in montane areas,

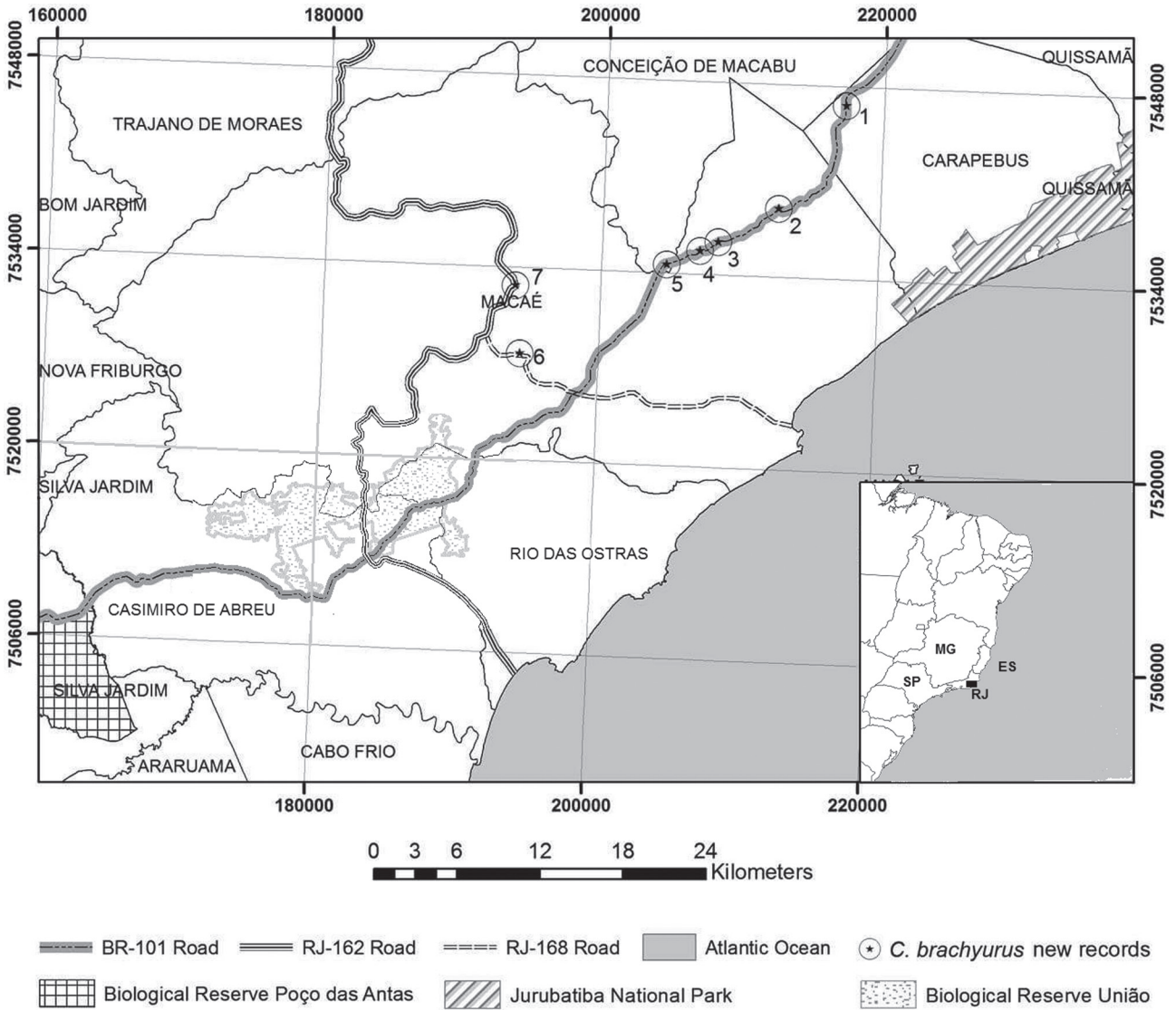


Figure 1: Records of maned wolf *Chrysocyon brachyurus* in Northern littoral of Rio de Janeiro state, Southeastern Brazil. Numbered localities are referenced in Table 1. Identified Brazilian states in the inset are Espírito Santo (ES), Minas Gerais (MG), Rio de Janeiro (RJ) and São Paulo (SP).



Figure 2: Specimens of maned wolf *Chrysocyon brachyurus* recorded in Northern littoral of Rio de Janeiro state, Brazil: (a) Road-kill at km 155 of road BR 101/North (NPM 1305); (b) live specimen photographed at the margins of road RJ 162.



such as the Itatiaia and Serra dos Orgãos National parks (Aximoff *et al.*, 2015), and in disturbed Atlantic forest areas bordering Minas Gerais state (Silva *et al.*, 2008). The examination of voucher-specimens deposited at MN further confirmed maned wolf occurrences in hinterland municipalities of Rio de Janeiro state (Piraí: MN62553; Comendador Levy Gasparian: MN62552; Três Rios: MN79386, 79396), but with no additional coastal lowland records. Therefore, both literature and museum records indicated a paucity of records in coastal lowlands of Rio de Janeiro state. Brito *et al.* (2004) and Queirolo *et al.* (2011) are the sole exceptions, reporting *C. brachyurus* in two lowland localities in Rio de Janeiro state, the Poço das Antas Biological Reserve and an unnamed coastal locality, respectively. However, these records were based on questionnaires, interviews and other anecdotal evidence unconfirmed by direct observations or voucher-specimens. The record of the maned wolf within Poço das Antas Biological Reserve, for instance, was based on a verbal account made by a former employee from Golden Lion Tamarin Association, who allegedly saw one specimen in 1993 with no further photographed or vouchered records of it (personal communication by Poço das Antas Biological Reserve administration on November, 2016). Additional records in these localities are likely, since they are not far from the localities reported in the present study. Nevertheless, until now our report provides the first confirmed records of the *C. brachyurus* in the Rio de Janeiro littoral, extending the range of the species to Brazilian coastal lowlands.

Records of Cerrado mammals in coastal Atlantic forest could be explained by the cross-habitat “spillover” hypothesis, which postulates that dispersal of a species from one biome to another is facilitated by human mediated landscape modifications (Thies & Tschardtke, 1999; Tschardtke *et al.*, 2012). Indeed, the elimination of Cerrado formations coupled with severe deforestation of Atlantic forest lowlands might have formed new habitats suitable to open-specialist species. In this context, *C. brachyurus* would represent an invasive species in the northern coast of Rio de Janeiro state dispersing from the vanishing open habitats in the interior. If this is the case, maned wolves would merit less conservation priority at regional scale relative to other endangered taxa autochthonous to Atlantic forest. Population genetic studies of Brazilian populations based on mitochondrial DNA markers apparently favor this recent dispersal hypothesis, inferring a modern demographic expansion from a single population without pronounced geographic structuring (Cunha de Paula *et al.*, 2013; González *et al.*, 2015), despite the lack of coastal samples in these studies. On the other hand, the natural occurrence of open physiognomies in the northern coast of Rio de Janeiro, such as natural grassland relicts and coastal shrublands, for the last 7,000 years (Luz *et al.*, 2011) favors an alternative hypothesis of *C. brachyurus* as a native and anciently established species in this region. Not surprisingly, projections of potential distribution of maned wolves depict the northern littoral of Rio de Janeiro as a historically stable and suitable habitat for the species,

despite the lack of historical records (Torres *et al.*, 2013). Answering whether maned wolves are recent or ancient arrivers in northern coast of Rio de Janeiro state will depend on further studies of peripheral populations, but the records documented in the present study highlight *C. brachyurus* a member of the local lowland mammalian community, threatened by road-killing, human reprisals, and targeted for road mitigation measures in the region.

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