Mammalian Biology 87 (2017) 17–26

Contents lists available at ScienceDirect

Mammalian Biology

journal homepage: www.elsevier.com/locate/mambio

Original investigation

Weak premating isolation between two parapatric brocket deer species

Juan Carranza[a,b,c,*], Mar Roldán[a], Ellen de Fátima Carvalho Peroni[a], José Maurício Barbanti Duarte[a]

[a] Núcleo de Pesquisa e Conservação de Cervídeos (NUPECCE), Universidade Estadual Paulista (Unesp), Faculdade de Ciências Agrárias e Veterinárias, Jaboticabal, Brazil
[b] Ungulate Research Unit, Cátedra de Recursos Cinegéticos y Piscícolas (CRCP), Universidad de Córdoba, 14071 Córdoba, Spain
[c] Facultad de Medicina Veterinaria y Zootecnia, Universidad Agraria del Ecuador, Guayaquil, Ecuador

ARTICLE INFO

Article history:
Received 17 August 2016
Accepted 14 February 2017
Handled by Luca Corlatti
Available online 25 May 2017

Keywords:
Premating barriers
Mazama
Copulation
Mating
Courtship behaviour
Mate choice
No-choice experiments
Hybridization

ABSTRACT

Brocket deer *Mazama nemorivaga* and *M. gouazoubira* occur at the Amazon basin and southern areas, respectively, in parapatric distribution ranges. Both species can interbreed in captivity, although hybrids have serious fertility problems. Therefore, we expect natural selection to favour behavioural barriers against interspecific mating. We carried out no-choice tests with individuals of both species in captivity, along with white-tailed deer (*Odocoileous virginianus*) as outgroup. Behaviours were video recorded and analysed by using Generalized Mixed models, with interacting females and males as random subjects. Trials never led to copulation when the white-tailed-deer male was involved. Copulations within brocket deer species were more likely to occur when the individuals belonged to the same species (82.4%) but they also occurred quite frequently in interspecific interactions (35.7%). We identified some courtship behaviours, in males and females, which associated with a higher copulation probability or showed differences in frequency when performed to partners of the same or different species. In conclusion, our results reveal that the occurrence of facilitating behaviours and copulations were more common in intraspecific interactions, evidencing discrimination between species, but also that the precopulatory barrier was not strong between both brocket deer species.

Introduction

Biological species are maintained by reproductive isolation (Dobzhansky, 1937; Schluter, 1998; Futuyma, 2005; Birkhead and Brillard, 2007). Isolation may be effective due to allopatric distribution, although in many cases, either because of secondary contact or due to the type of speciation process, closely related species occur in sympatry or parapatry. In such circumstances, it becomes especially relevant to study the behavioural or physiological mechanisms that can limit gene flow between them (Dobzhansky, 1937; Mayr, 1963). Regardless the nature of the mechanisms that originate genetic differentiation, once the sister species have split, heterospecific breeding is usually costly for both of them. Mating and breeding may entail costs in terms of time, resources invested, predatory or disease risks incurred, as well as rearing and providing care to offspring. These costs may have none or little return when offspring are unviable or less successful, and hybrids from interspecific breeding are commonly infertile or have less fitness than offspring from intraspecific breeding (Liou and Price, 1994).

For mammalian females, the production of hybrids may entail high costs of gestation and lactation that compromise mothers' success in the current breeding season as well as for an important proportion of their lifetime reproductive success. These costs of heterospecific matings are expected to fuel selection favouring individual strategies to discriminate among mating partners and reject as mates those that would give rise to less successful offspring (Trivers, 1972; Andersson, 1994).

Sexual signals during courtship (Andersson, 1994; Johnstone, 1997), such as visual displays or sex pheromones, play a crucial role as premating barriers between closely related taxa (Bradbury and Vehrencamp, 1998; Ptacek, 2000). But rejection of potential mates may also entail costs. For example, males and females may lose time, energy and mating opportunities when suitable partners are wrongly avoided. Male harassment may also increase the costs

* Corresponding author at: Núcleo de Pesquisa e Conservação de Cervídeos (NUPECCE), Universidade Estadual Paulista (Unesp), Faculdade de Ciências Agrárias e Veterinárias, Jaboticabal, Brazil.
E-mail address: jcarranza@uco.es (J. Carranza).

http://dx.doi.org/10.1016/j.mambio.2017.02.009
1616-5047/

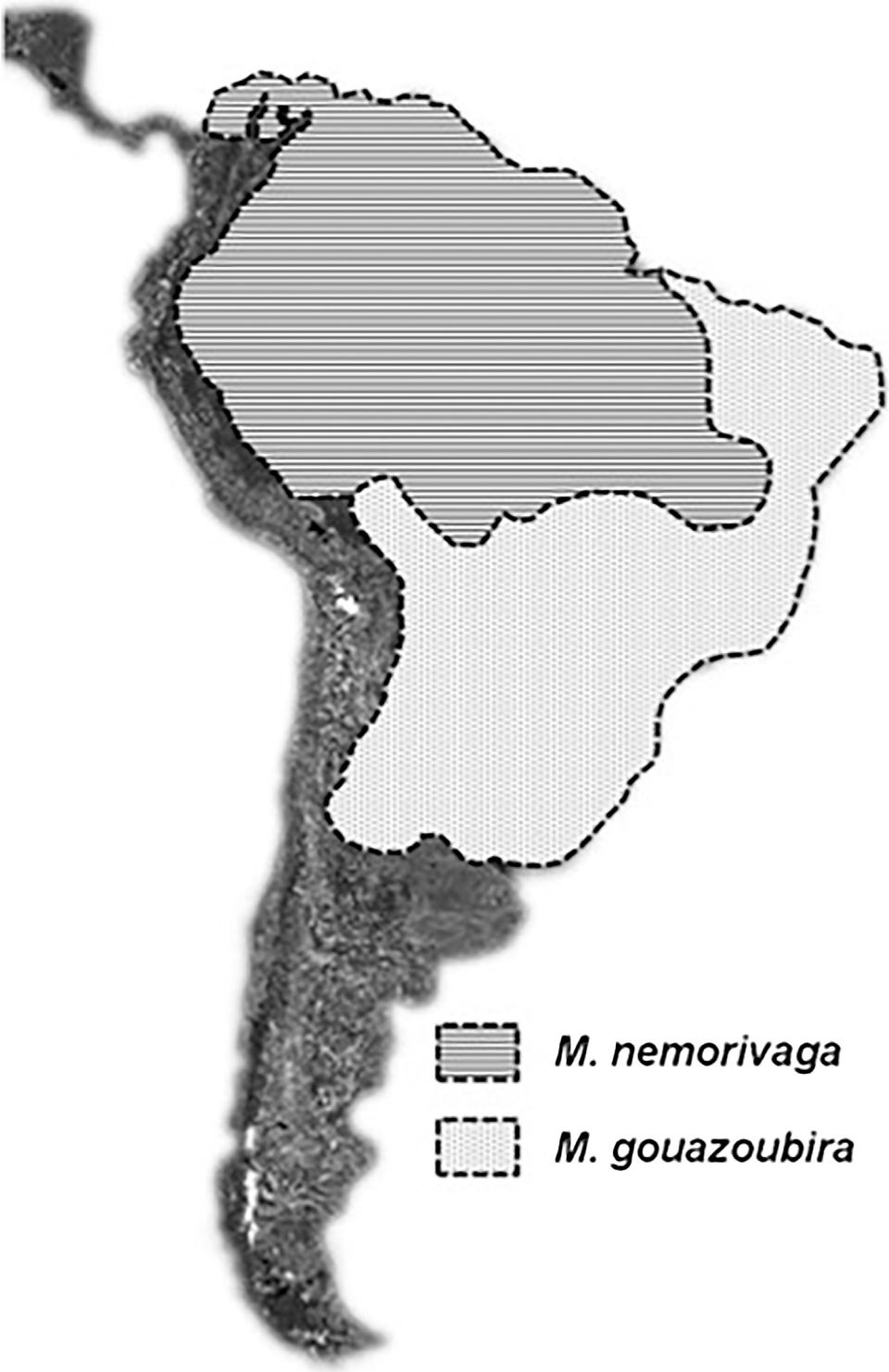

Fig. 1. Map showing the current accepted distribution ranges of both study species in South America (after Black-Decima et al., 2010; Rossi et al., 2010).

of mate rejection, so that females may be forced to accept copulations to save time, energy and risk of injuries from the males. However, acceptation by females may not be favoured by selection if leading to the allocation of significant maternal resources into unviable or low successful offspring. But also, the presence of effective barriers either at postcopulatory-prezygotic phase or at an early postzygotic stage when little investment has been allocated to the new embryo by the female, are expected to reduce the strength of selection for precopulatory barriers, i.e. favour female acquiescence against male coercion (Parker and Birkhead, 2013). Likewise, pre- and post-copulatory traits tend to be negatively related in ungulates (Ferrandiz-Rovira et al., 2014).

Mazama nemorivaga and *Mazama guazoubira* are two cervid species that inhabit, respectively, the tropical rainforest in the Amazonian basin and drier forested habitats southwards from the Amazon to eastern and southern Brazil, Uruguay and northern Argentina (Fig. 1). Although a thoughtful sampling is lacking, it is assumed that their ranges do not have much overlapping but