

Occurrence of *Lipoptena mazama* and *Lipoptena guimaraesi* (Diptera: Hippoboscidae) on gray brocket deer (*Mazama gouazoubira*) in southern Brazil

Ocorrência de *Lipoptena mazama* e *Lipoptena guimaraesi* (Diptera: Hippoboscidae) em veado-catingueiro (*Mazama gouazoubira*) no sul do Brasil

Mariana Faccini Pinheiro¹; Raquel Muhlbeier Bonato¹; Priscila Ikeda²; Rodrigo Antonio Martins de Souza³, Adriano de Oliveira Torres Carrasco¹; Meire Christina Seki^{1*} 

¹Laboratório de Doenças Infecciosas e Parasitárias, Departamento de Medicina Veterinária, Universidade Estadual do Centro-Oeste – UNICENTRO, Guarapuava, PR, Brasil

²Laboratório de Imunoparasitologia, Departamento de Patologia, Reprodução e Saúde Única, Faculdade de Ciências Agrárias e Veterinárias – FCAV, Universidade Estadual Paulista Júlio de Mesquita Filho – UNESP, Jaboticabal, SP, Brasil

³Serviço de Atendimento a Animais Selvagens, Departamento de Medicina Veterinária, Universidade Estadual do Centro-Oeste – UNICENTRO, Guarapuava, PR, Brasil

How to cite: Pinheiro MF, Bonato RM, Ikeda P, Souza RAM, Carrasco AOT, Seki MC. Occurrence of *Lipoptena mazama* and *Lipoptena guimaraesi* (Diptera: Hippoboscidae) on gray brocket deer (*Mazama gouazoubira*) in southern Brazil. *Braz J Vet Parasitol* 2021; 30(4): e008621. <https://doi.org/10.1590/S1984-29612021081>.

Abstract

The genus *Lipoptena* includes hematophagous insects of the family Hippoboscidae that parasitize different deer species. The present study aims to identify 19 flies that parasitize deer of the genus *Mazama* in the State of Paraná, Brazil. We analyzed 18 flies (*Lipoptena mazamae*) and 1 *Lipoptena guimaraesi*. This study expands the host list for *L. guimaraesi*, previously restricted to a single deer species (*Ozotoceros bezoarticus*).

Keywords: Hippoboscidae, wildlife parasite, Diptera, cervid.

Resumo

O gênero *Lipoptena* engloba insetos hematófagos da família Hippoboscidae que parasitam diferentes espécies de cervídeos. O presente estudo tem por objetivo relatar a identificação de 19 moscas encontradas parasitando cervídeos do gênero *Mazama*, no Estado do Paraná, Brasil. Dentre os espécimes analisados, 18 pertenciam à espécie *Lipoptena mazamae* e um à espécie *Lipoptena guimaraesi*. O presente artigo expande a lista de hospedeiros de *L. guimaraesi*, antes restrita a uma única espécie de cervídeo (*Ozotoceros bezoarticus*).

Palavras-chave: Hippoboscidae, parasito de animal silvestre, Diptera, cervídeo.

The family Hippoboscidae (order Diptera) comprises 21 genera and 200 species as described in 18 orders of birds and 5 orders of mammals (Reeves & Lloyd, 2019), among which are the species of the genus *Lipoptena*. They are monoxene parasites popularly known as “neotropical deer ked” since they lose their wings once on the host. Females are larviparous, and their life cycle is divided into larvae, pupae, and adults (Härkönen et al., 2010).

Parasitism by these flies is associated with intense blood spoliation of the host, causing anemia and weight loss. At high parasitic loads, it can even culminate on the death of the host. Moreover, severe infestations can lead to secondary bacterial infections due to scarification of the attachment site at the host animal, usually in the cervical or posterior regions (Hodžić et al., 2012; Lazăr et al., 2017).

In humans, the bite of this ectoparasite is extremely painful and causes severe dermatitis with the occurrence of hemorrhagic papules usually distributed on the scalp, neck, and upper back of the infested person (Härkönen et al.,

Received May 26, 2021. Accepted September 16, 2021.

*Corresponding author: Meire Christina Seki. E-mail: mseki@unicentro.com



This is an Open Access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

2009). Moreover, several *Lipoptena* species have been associated with zoonotic bacterial agents such as *Bartonella* spp., *Actinectobacter* spp., *Anaplasma* spp., *Coxiella* spp., *Rickettsia* spp., and *Borrelia burgdorferi* in the American, European, and Asian continents (literature review by Bezerra-Santos & Otranto, 2020). Furthermore, the possible transmission of *Trypanosoma* spp. by *Lipoptena* spp. has been reported by Böse & Petersen (1991).

The occurrence of *Lipoptena* spp. is widely reported on neotropical deer and the most common species found in Brazil are *Lipoptena mazamae* (Rondani, 1878) and *Lipoptena guimaraesi* (Bequaert, 1957) (Souza et al., 2017), which have been reported in the states of Amazonas, Pará, Tocantins, Goiás, Mato Grosso, Mato Grosso do Sul, São Paulo, Paraná, Santa Catarina, and Rio Grande do Sul. To date, *L. guimaraesi* (Bequaert, 1957) has been exclusively found on deer of the species *Ozotoceros bezoarticus* (L., 1758) (pampas deer), while the hosts of *L. mazamae* include *Mazama gouazoubira* (Fischer, 1814) (gray brocket), *M. americana* (Erxleben, 1777) (red brocket), and *Odocoileus virginianus* (Zimmermann, 1780) (white-tailed deer) in addition to *O. bezoarticus* (Graciolli & Carvalho, 2003; Graciolli et al., 2011).

The species *M. gouazoubira* (gray brocket or brown brocket) is found in vast areas of the American continent, covering territories extending from northern Argentina to southern Mexico. Although it can be found in different Brazilian biomes, the southern Amazon is considered to be the northern limit of this species (Black-Décima et al., 2010).

The ecological niche of this species of deer is characterized by forest areas that are used as shelters and as a source of food by them. Although these animals are found both in areas surrounding dense forest and in sparse and undergrowth vegetation, they prefer transition regions between forested areas and fields (Vogliotti, 2003; Pinder & Leeuwenberg, 1997).

This species has diurnal and solitary habits, with a marked territorial behavior using urine feces and glandular odors as markers (Dellafiore & Maceira, 2001). Its diet is based on flowers, fruits (varying from fibrous to succulent depending on seasonal availability), sprouts, and leaves (Pinder & Leeuwenberg, 1997).

The populations of this species are in balance (Duarte, 1997), being considered threatened to extinction in the state of Rio de Janeiro and vulnerable in Rio Grande do Sul (Duarte, 1997). However, the current data is by itself insufficient, to determine how endangered the species is in the state of Paraná (Mikich & Bérnils, 2004).

The deer of the species *O. bezoarticus* (pampas deer) live in small and isolated populations distributed in Brazil, Bolivia, Paraguay, Uruguay, and Argentina (Duarte, 1997). This species is considered nearly threatened by the International Union for Conservation of Nature (IUCN). In Brazil, they are currently found in Goiás, Mato Grosso, Mato Grosso do Sul, Minas Gerais, southern Pará, Rio Grande do Sul, Paraná (Duarte, 1997) and Santa Catarina (Tortato & Althoff, 2011). *O. bezoarticus* is found in different habitats, preferentially occupying savannahs and pastures, but never in forests (Duarte, 1997).

This study aimed to report the occurrence of two species of neotropical deer keds, *L. mazamae* and *L. guimaraesi*, that parasitize the gray brocket deer (*M. gouazoubira*) in Guarapuava city, Paraná state, Brazil.

A total of 19 hippoboscids were collected from four gray brocket deer comprising three females (F1, F2, and F3) and one male (M1), which were received by the Wildlife Care Service of the Midwest State University (UNICENTRO) between 2014 and 2015. The specimens of hippoboscids were quantitatively 14 (F1), one (F2), two (F3), and two (M1). The deer were sent by the Environmental Police of the State of Paraná, which operates in the beforementioned city, Paraná, Brazil (25° 23 37" S, 51° 27 22" W).

The arthropods on the deer of *M. gouazoubira* species were identified by visual inspection and collected manually. Subsequently, they were placed in individual glass bottles containing 70° GL alcohol. Using a stereomicroscope, the individual specimens were morphologically identified based on the identification key for Hippoboscidae flies by Graciolli & Carvalho (2003) at the Infectious and Parasitic Diseases Laboratory of the UNICENTRO.

All the insects collected were identified as belonging to the genus *Lipoptena* according to morphological characteristics such as: Basitarsus III with a similar length to the subsequent tarsomers, except the last one (Figure 1); the presence of ocelli and semicircular eye.

During the evaluation of each individual specimen collected, it was concluded that 18 of them belonged to the species *L. mazamae* which presented one or two fronto-orbital arrows (Figure 2A), tibia II with two apical arrows on the ventral surface (Figure 2B), the first four tarsomers of leg 2 with 2-1-1-1 posteroventral spinous arrows (Figure 2B), and the dorsal abdominal connective with sparse arrows, respectively (Figure 2C).

One specimen had three fronto-orbital setae (Figure 3A) and tibia II with three apical spiniform setae on the ventral surface. The median one was longer than the others; the first four tarsomers of leg 2 had 2-1-1-3 spinous setae on the posteroventral surface, respectively (Figure 3B), and the hairy abdominal connective on the dorsal surface. Such characteristics led to the identification of the specimen as *L. guimaraesi*.

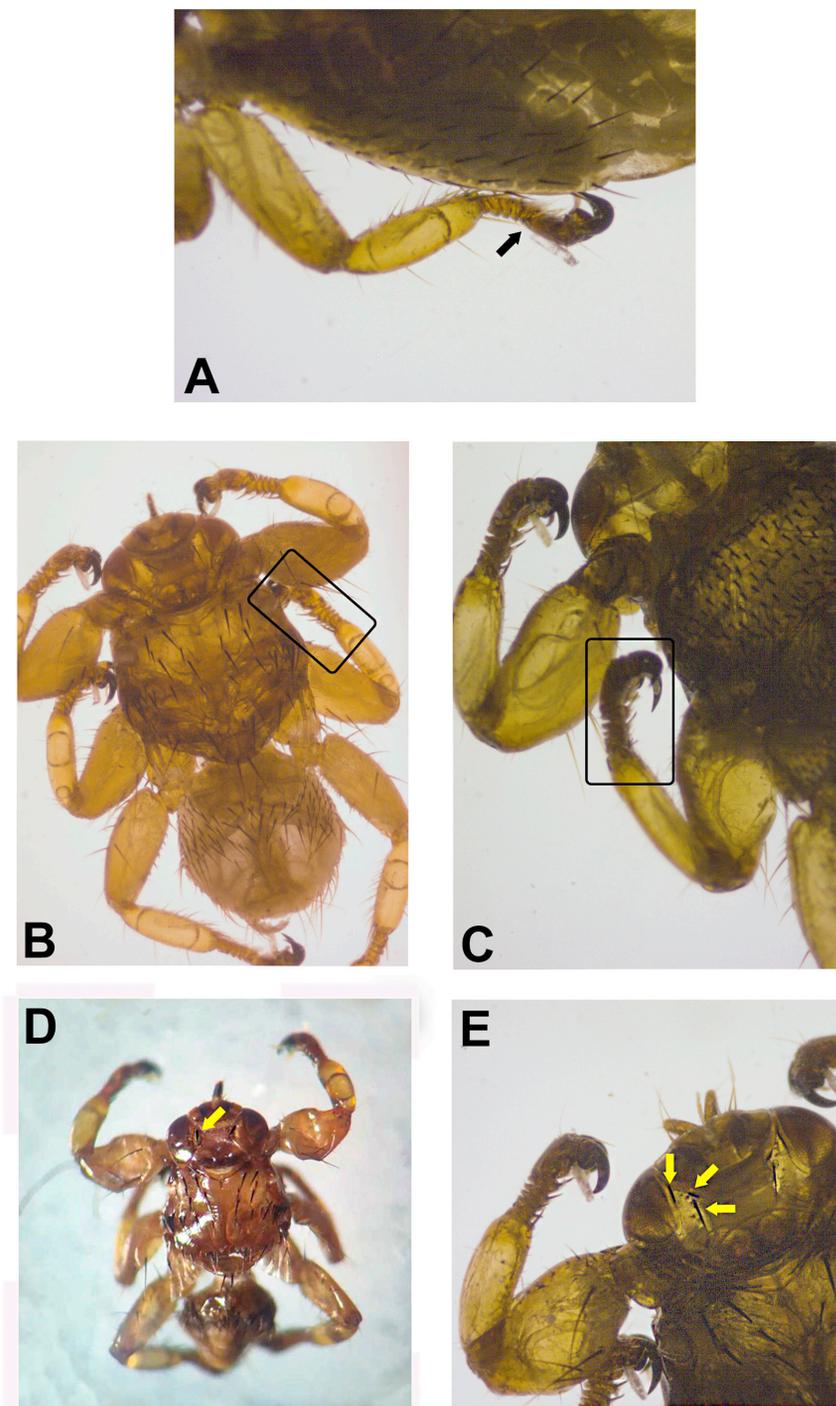


Figure 1. (A) Ventral view of a deer ked from the genus *Lipoptena*, showing the length of basitarsus III similar to subsequent tarsomeres, except for the last one (arrow); (B) Ventral view of a *Lipoptena mazamae*, the first four tarsomeres of leg 2 have 2-1-1-1 spiniform setae on the posteroventral surface, respectively (rectangle); (C) Ventral view of *Lipoptena guimaraesi*, showing the first four tarsomeres of leg 2 with 2-1-1-3 spiniform setae on the posteroventral surface, respectively (rectangle); (D) Dorsal view of a *Lipoptena mazamae* with showing one fronto-orbital setae on the left antimere of the head (arrow); (E) Dorsal view of *Lipoptena guimaraesi*, showing the three fronto-orbital setae on the left antimere of the head (arrow).

Therefore, most specimens were identified as *L. mazamae*, which have been previously reported to parasitize several deer species, including species from the genus *Mazama*, which occurs in the Paraná state (Gracioli & Carvalho, 2003). However, this is the first record of *L. guimaraesi* on a *Mazama* deer, since this specie of ectoparasite was recorded only on *O. bezoarticus* from Brazil and Uruguay (Bequaert, 1954; Gracioli & Carvalho, 2003; Gracioli et al., 2011).

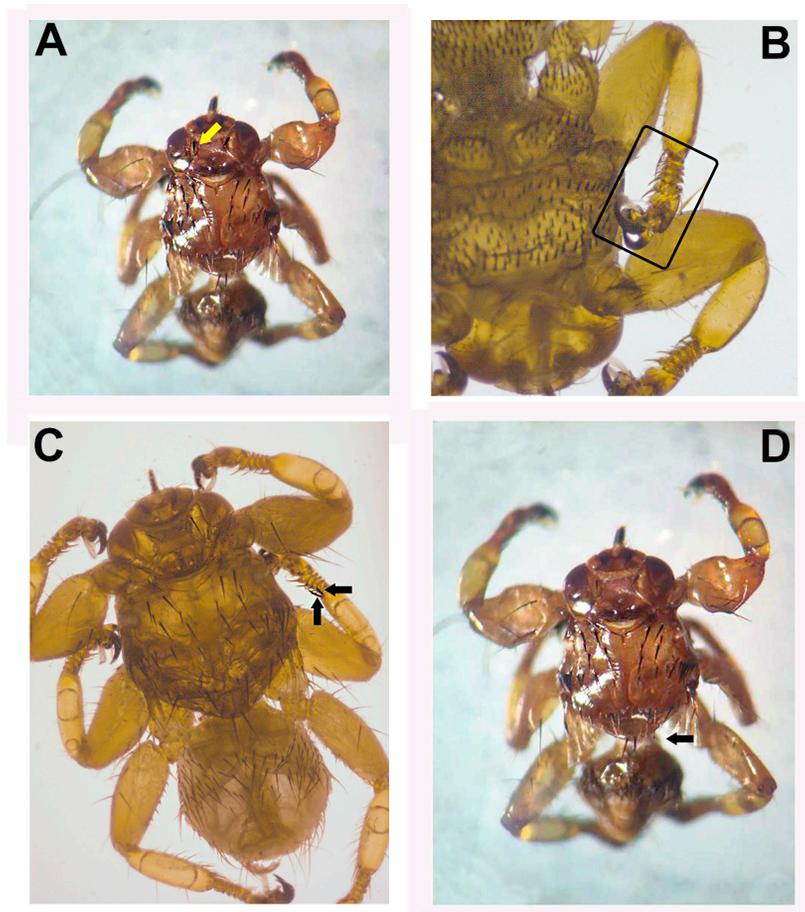


Figure 2. Morphological characteristics of *Lipoptena mazamae*: (A) dorsal view with showing fronto-orbital setae on the left antimere of the head (arrow); (B) ventral view of the right antimere, the first four tarsomeres of leg 2 have 2-1-1-1 spiniform setae on the posteroventral surface, respectively (rectangle); (C) ventral view of the right antimere, two apical setae are observed on the ventral surface of the Tibia II (arrows); (D) dorsal view showing sparse setae on abdominal connective (arrow).

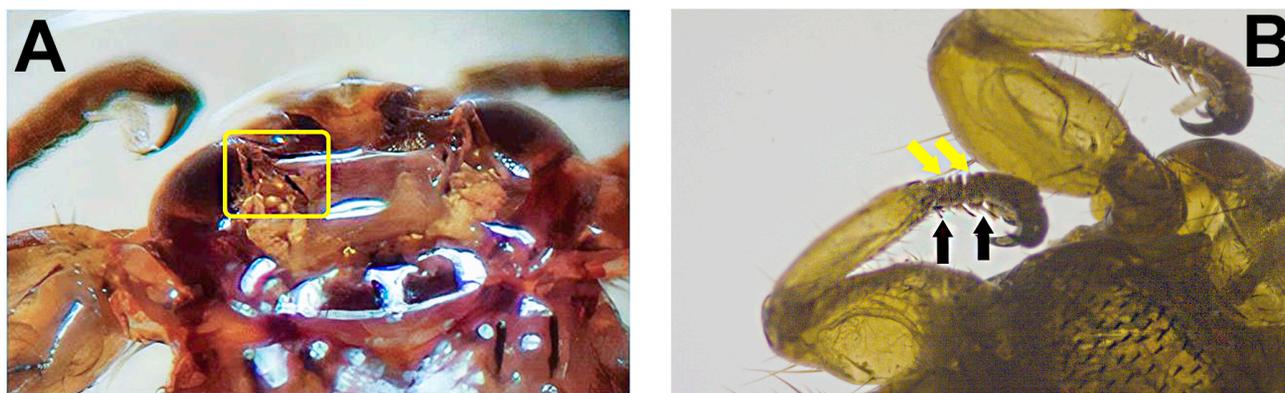


Figure 3. Morphological characteristics of *Lipoptena guimaraesi*: (A) dorsal view showing showing the three fronto-orbital setae on the left antimere of the head (rectangle); (B) ventral view showing the first four tarsomeres of leg 2 with 2-1-2-3 setae on the posteroventral surface, respectively (arrow).

It is important to emphasize that parasitism by this arthropod causes direct damage to the host, and there is an increasing concern on its potential as a vector of pathogenic and zoonotic agents due to its hematophagy (Böse & Petersen, 1991; Bezerra-Santos & Otranto, 2020). Souza et al. (2017) detected the occurrence of *Bartonella* spp. in *L. mazamae* collected from deer in the state of Rio Grande do Sul which is the only report of this agent among arthropods of the genus *Lipoptena* in Brazil. However, little is known about its vector competence and its role in public health.

To the best of our knowledge, this is the first report of *L. guimaraesi* on the *Mazama* deer in Brazil.

These findings have significant importance due to the scarce information in Brazil about these parasites. Hence, more studies are needed to better understand the geographic distribution of these parasitic arthropods of deer in Brazil, as well as their potential importance to public health.

References

- Bequaert JC. The Hippoboscidae or louse-flies (Diptera) of mammals and birds. Part II. Taxonomy, evolution and revision of American genera and species. *Entomol Am* 1954; 34: 1-232.
- Bezerra-Santos MA, Otranto D. Keds, the enigmatic flies and their role as vectors of pathogens. *Acta Trop* 2020; 209: 105521. <http://dx.doi.org/10.1016/j.actatropica.2020.105521>. PMID:32447028.
- Black-Décima P, Rossi RV, Vogliotti A, Cartes JL, Maffei L, Duarte JMB, et al. Brown brocket deer *Mazama gouazoubira* (Fischer 1824). In: Duarte JMB, Gonzalez S. *Neotropical cervidology, biology and medicine of latin american deer*. Jaboticabal: FUNEP/IUCN; 2010. p. 190-201.
- Böse R, Petersen K. *Lipoptena cervi* (Diptera), a potential vector of *Megatrypanum* trypanosomes of deer (Cervidae). *Parasitol Res* 1991; 77(8): 723-725. <http://dx.doi.org/10.1007/BF00928691>. PMID:1805220.
- Dellafiore CM, Maceira N. *Los ciervos autóctonos de la Argentina y La acción del hombre*. Buenos Aires: Grupo Abierto Comunicaciones; 2001.
- Duarte JMB. *Biologia e conservação de cervídeos sul-americanos: blastocerus, ozotoceros e mazama*. Jaboticabal: FUNEP; 1997.
- Gracioli G, Carvalho CJ. Hippoboscidae (Diptera, Hippoboscoidea) no estado do Paraná, Brasil: chaves de identificação, hospedeiros e distribuição geográfica. *Rev Bras Zool* 2003; 20(4): 667-674. <http://dx.doi.org/10.1590/S0101-81752003000400019>.
- Gracioli G, Zucco CA, Caçado PHD, Mourão G. Parasitism rates of *Lipoptena guimaraesi* and a new record of *Lipoptena mazamae* on *Ozotoceros bezoarticus* from the Central Pantanal wetlands in Brazil. *Rev Bras Parasitol Vet* 2011; 20(2): 178-180. <http://dx.doi.org/10.1590/S1984-29612011000200017>. PMID:21722497.
- Härkönen L, Härkönen S, Kaitala A, Kaunisto S, Kortet R, Laaksonen S, et al. Predicting range expansion of an ectoparasite – the effect of spring and summer temperatures on deer ked *Lipoptena cervi* (Diptera: Hippoboscidae) performance along a latitudinal gradient. *Ecography* 2010; 33(5): 906-912. <http://dx.doi.org/10.1111/j.1600-0587.2009.05890.x>.
- Härkönen S, Laine M, Vornamen M, Reunala T. Deer ked (*Lipoptena cervi*) dermatitis in humans – an increasing nuisance in Finland. *Alces* 2009; 45: 73-79.
- Hodžić A, Omeragić J, Alić A, Jažić A, Zuko A. *Lipoptena cervi* (Diptera: Hippoboscidae) in roe deer (*Capreolus capreolus*). *Veterinaria* 2012; 61(1-2): 17-21.
- Lazăr M, Iacob OC, Solcan C, Pașca SA, Lazăr R, Boișteanu PC. The first report of massive infestation with *Lipoptena Cervi* (Diptera: Hippoboscidae) in Roe Deer (*Capreolus Capreolus*) in Iasi county, N-E of Romania. *Arq Bras Med Vet Zootec* 2017; 69(2): 293-298. <http://dx.doi.org/10.1590/1678-4162-8612>.
- Mikich SB, Bérnils RS. *Livro Vermelho da fauna ameaçada no Estado do Paraná*. Curitiba: Instituto Ambiental do Paraná; 2004.
- Pinder L, Leeuwenberg F. Veado-Catingueiro (*Mazama gouazoubira*, Fisher 1814). In: Duarte JMB. *Biologia e conservação de cervídeos sul-americanos: blastocerus, ozotoceros e mazama*. Jaboticabal: FUNEP; 1997. p. 60-68.
- Reeves WK, Lloyd JE. Louse flies, keds, and bat flies (Hippoboscoidea). In: Mullen GR, Durden L, editors. *A medical and veterinary entomology*. 3rd ed. Amsterdã: Elsevier Inc.; 2019. p. 421-438.
- Souza U, Dall'Agnol B, Michel T, Webster A, Klafke G, Martins JR, et al. Detection of *Bartonella* sp. in deer louse flies (*Lipoptena mazamae*) on gray brocket deer (*Mazama gouazoubira*) in the neotropics. *J Zoo Wildl Med* 2017; 48(2): 532-535. <http://dx.doi.org/10.1638/2016-0058R3.1>. PMID:28749268.
- Tortato FR, Althoff SL. Mammalia, Myrmecophagidae, *Myrmecophaga tridactyla* (Linnaeus, 1758) and Cervidae, *Ozotoceros bezoarticus* (Linnaeus, 1758): contribution to the knowledge of the historical distribution in Santa Catarina, southern Brazil. *Check List* 2011; 7(2): 146-148. <http://dx.doi.org/10.15560/7.2.146>.
- Vogliotti A. *História natural de Mazama bororo (Artiodactyla; Cervidae) através da etnozoologia, monitoramento fotográfico e rádio-telemetria* [dissertação]. São Paulo: Escola Superior de Agricultura "Luiz de Queiroz", Universidade de São Paulo; 2003.