

## **Oligoryzomys fornesi (Massoia, 1973), Mammalia, Rodentia, Sigmodontinae: Distribution extension**

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**ABSTRACT:** We report the easternmost record for the Fornes' Colilargo, *Oligoryzomys fornesi* in the state of Minas Gerais, Brazil extending more than 500 km to the southeast the geographic range of the species. The studied specimens were found in owl pellets collected in caves. This is the first record of *O. fornesi* in the municipalities of Lagoa Santa, Sete Lagoas and Cordisburgo, a karst transition zone between the Atlantic Forest and Cerrado biomes.

**Key-words:** Geographic distribution, owl pellets, karst area, Minas Gerais

**RESUMO:** *Oligoryzomys fornesi* (Massoia, 1973), Mammalia, Rodentia, Sigmodontinae: **Extensão da distribuição.** Relatamos o registro mais oriental para o rato-do-mato *Oligoryzomys fornesi* no estado de Minas Gerais, Brasil ampliando a distribuição da espécie em mais de 500 km para o sudoeste. Os espécimes foram amostrados por pelotas de coruja coletadas em cavernas. Este é o primeiro registro de *O. fornesi* nos municípios de Lagoa Santa, Sete Lagoas e Cordisburgo, uma área cárstica de transição entre a Mata Atlântica e o Cerrado.

**Palavras-chaves:** Distribuição geográfica, pelotas de coruja, área cárstica, Minas Gerais

*Oligoryzomys* Bangs, 1900 comprises a group of small sigmodontinae mice distributed from Central America to southern South America (Musser & Carleton, 2005). In Brazil, nine species of *Oligoryzomys* have been reported: *O. chacoensis* (Myers & Carleton, 1981), *O. flavescens* (Waterhouse, 1837),

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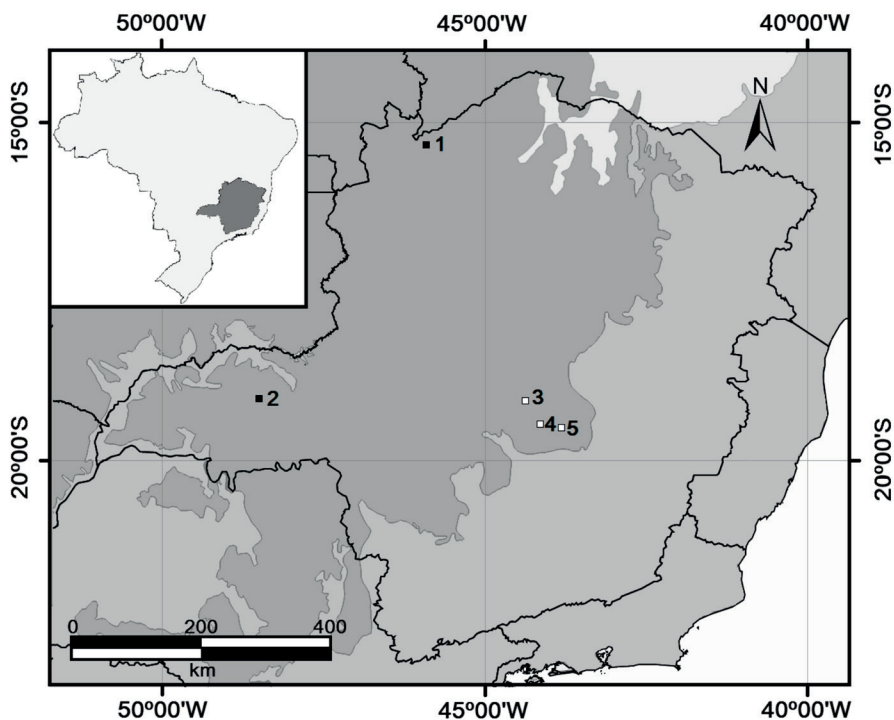
*O. fornesi* (Massoia, 1973), *O. fulvescens* (Saussure, 1860), *O. microtis* (J. A. Allen, 1916), *O. moojeni* Weksler & Bonvicino, 2005, *O. nigripes* (Olfers, 1818), *O. rupestris* Weksler & Bonvicino, 2005 and *O. stramineus* Bonvicino & Weksler, 1998 (Paglia *et al.*, 2012). Recently another species, *Oligoryzomys utiaritensis* J. A. Allen, 1916, was recognized for the country (Agrellos *et al.*, 2012). These mice can be found in forested and open formations in the Amazon Forest, Atlantic Forest, Cerrado, Caatinga and Pantanal biomes (Bonvicino *et al.*, 2008).

In Brazil, *Oligoryzomys fornesi* primarily inhabits open formations in the Cerrado (Federal District, Minas Gerais, Goiás, Bahia) and Caatinga domains (Pernambuco), but it can also be found in forest formations in these biomes (Weksler & Bonvicino, 2005; Pereira & Geise, 2009). This species have also been reported in eastern Paraguay and northern Argentina, where the type locality is situated, in Formosa Province (Weksler & Bonvicino, 2005; Teta & Pereira, 2009; Teta & Pardiñas, 2010). The aim of this study is to report a record that extend the current geographic distribution of *O. fornesi* more than 500 km to the southeast, being the most eastern locality known for the species in the state of Minas Gerais and in Brazil.

Between 2010 and 2012 we collected owl pellets of *Tyto furcata* (Aves, Tytonidae) from three caves in a karst area in the state of Minas Gerais, Brazil. Samples of pellets were collected in three different areas: Sumidouro State Park (19°33'30" S, 43°57'03" W), Lagoa Santa; Mata Grande Cave (19°30'02" S, 44°15'59" W), Sete Lagoas; Peter Lund Natural Monument (19°07'17" S, 44°28'24" W), Cordisburgo (Fig. 1). According to the Köppen classification, the climate in the region is the type Aw tropical humid, characterized by hot, rainy summers and dry winters (IEF, 2008; Travassos, 2010). The annual average temperature is 22°C in Cordisburgo and 21,4°C in the Lagoa Santa region (IEF, 2008; Travassos, 2010). The annual average precipitation varies between 1250 mm to 1500 mm in Cordisburgo (Travassos, 2010) and in Lagoa Santa the annual pluviometric average is 1206.80 mm (IEF, 2008; Travassos, 2010). The area is inserted in the Cerrado biome, with some peculiarities related to the presence of enclaves similar to Caatinga vegetation, with Deciduous Seasonal Forest ("dry forest") in the areas of limestone outcrops (Piló, 1998). Currently the sampled area is disturbed, often the vegetation is restricted to cerrado in regeneration or in transition and "dry forest" in the limestone outcrops (Berbert-Born, 2002) along with pastures, crops and eucalyptus plantations (IEF, 2008; Travassos, 2010). Fieldwork was carried out with IEF (Instituto Estadual de Florestas) and SISBIO (Sistema de Autorização e Informação em Biodiversidade) permits (Permit # 13045-1). The pellets were disaggregated and accumulated in the cave floor. The skulls and mandibles were recovered by hand and identified to

the lowest taxonomic level based on specific literature (Bonvicino & Weksler, 1998; Paresque, 2010; Weksler & Bonvicino, 2005; Weksler & Percequillo, 2011) and the reference material at the Mastozoology Collection at the João Moojen Zoology Museum (MZUFV, Universidade Federal de Viçosa, Brasil). Some of the specimens examined were identified as *O. fornesi*. Posteriorly were tumbled in batches according to locality (with the other specimens from the pellets) and deposited in this collection, under the reference numbers: MZUFV 3814(Lagoa Santa); MZUFV 3843 (Sete Lagoas); MZUFV 3856 (Cordisburgo).

As the studied material is originated by owls pellets, in most cases the bones are disarticulated and fragmented. Is common to find skulls and mandibles



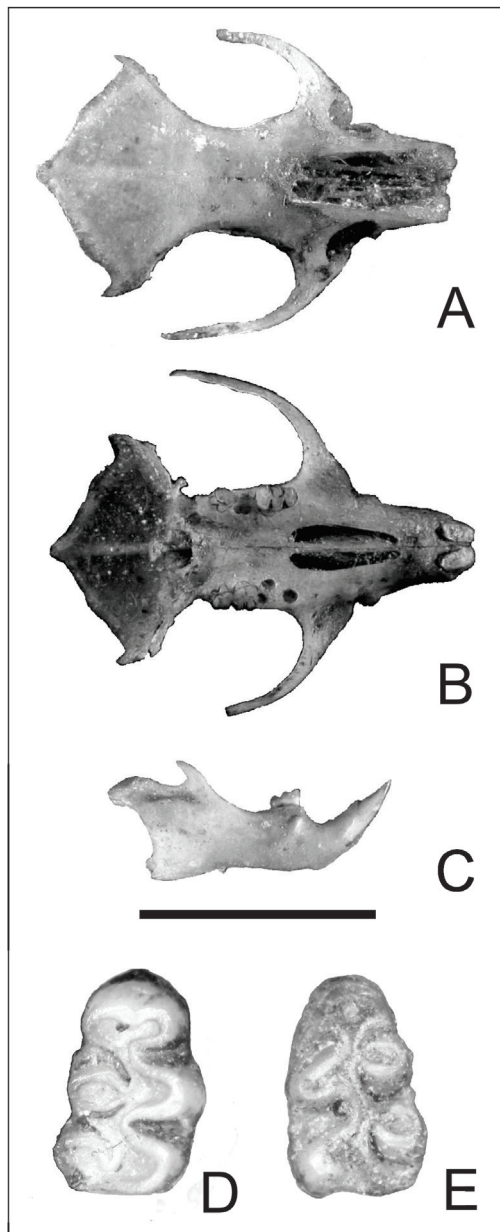
**Figure 1.** Collecting localities (white squares) and previous records (black squares) of *Oligoryzomys fornesi*. Localities 1 and 2 are in the Cerrado biome (dark gray) and localities 3 to 5 are in the transition zone between Cerrado/Atlantic Rainforest biome (light gray) (IEF, 2014). Localities in the state of Minas Gerais: 1) Grande Sertão Veredas National Park, Formoso (Paresque, 2010); 2) Panga Ecological Station, Uberlândia (Bruna *et al.*, 2010); 3) Peter Lund Natural Monument, Cordisburgo; 4) Mata Grande Cave, Sete Lagoas; 5) Sumidouro State Park, Lagoa Santa.

broken, beyond just maxilla bones with molars. Mandibles, maxillas (left and right of both) and one fragmented skull of *Oligoryzomys fornesi* were found in the owl pellets sampled. For the taxon, was calculated the number of identified specimens (NISP), being the sum of all fragments (mandibles, maxillae, skull) of the taxon. Of the total 499 (NISP) of cranial and mandibular remains of *Oligoryzomys*, 49 specimens (NISP), were assigned to *O. fornesi* (Fig. 2) based on the following combinations of traits: 1) skull with a strong anterior constriction of the interorbital area and divergent posteriorly; 2) short incisive foramen not reaching M1; 3) reduction of mesoloph/mesolophid in the molars; 4) mandibular with a slightly dilated capsular process (Weksler & Bonvicino, 2005; Paresque, 2010). The reduced mesoloph and mesolophid in the molars was an important feature to differentiate *O. fornesi* from others *Oligoryzomys* species that can occur in the studied area. The mesoloph/mesolophid can be reduced in most specimens of *O. fornesi* (see Paresque, 2010). See the Table 1 for comparison of the diagnostic cranial characters used to identify *O. fornesi* and among other *Oligoryzomys* species which can be simpatric in the region.

This is the first record of *Oligoryzomys fornesi* in the central karst of Minas Gerais, a transition zone between the Cerrado and Atlantic Forest. Few records of *O. fornesi* in the state are available in the literature, all in areas of Cerrado: Grande Sertão Veredas National Park (15°23'S, 45°54'W), in the municipality of Formoso, about 700 km northwest of Lagoa Santa (Paresque, 2010) and Panga Ecological Station (19°10'S, 48°23'W) (Bruna *et al.*, 2010), in Uberlândia, approximately 570 km west of Lagoa Santa (Fig. 1). In these studies the external characteristics were used for identification of specimens, but Paresque (2010) also examined the cranial features and karyotype.

In addition to *O. fornesi*, 15 other rodent species were found in the owl pellets collected in the three localities, including *Oligoryzomys nigripes* (NISP = 334) (Table 2). *O. fornesi* can be sympatric with *O. nigripes*, *O. flavescens* and *O. stramineus* in Brazil (Bonvicino & Weksler, 1998; Weksler & Bonvicino, 2005; Pereira & Geise, 2009; Bruna *et al.*, 2010). Despite being sympatric in some regions of Cerrado, these species are usually found in different habitats. *O. fornesi* is generally found in open vegetation formations in the Cerrado, unlike *O. nigripes* (Weksler & Bonvicino, 2005). Among the species of the genus *Oligoryzomys*, *O. nigripes* is the most generalist in its habitat preferences, occurring in primary and secondary vegetation formations, especially in forested areas such as gallery forests in the Cerrado, Montane and Sub-Montane Forest in the Atlantic Forest (Weksler & Bonvicino, 2005).

Despite several studies on the taxonomy, morphology, cytogenetics, and molecular phylogeny (*e.g.* Weksler & Bonvicino, 2005; Paresque *et al.*, 2007; Trott *et al.*, 2007; Palma *et al.*, 2010; Paresque, 2010; Machado *et al.*, 2011;



**Figure 2.** Remains of *Oligoryzomys fornesi* found in the karst central area of Minas Gerais, Brazil. From top to bottom: anterior fragment of skull in dorsal (A) and ventral view (B), mandible in labial view (C) and upper and lower molars (D, E). D – Superior molar 1,50 mm in length. E – Inferior molar 1,46 mm in length. Specimens voucher: MZUFV 3856, Cordisburgo. Scale bar = 10 mm.

**Table 1.** Cranial and molar comparison among sympatric *Oligoryzomys* species of Minas Gerais. Adapted from Weksler & Bonvicino (2005) and Paresque (2010).

Species	Interorbital region	Incisive foramina	Mandible	Mesoloph and mesolophid
<i>Oligoryzomys fornesi</i>	Convergent anteriorly, giving a triangular appearance; supraorbital margins with sharp edges	Lenticular shape; usually reaches the first molar; vomer appears dilated along all their extension	Capsular process of lower incisor alveolus slightly dilated, not exceeding the mandibular notch line	Frequently present, but may be reduced
<i>Oligoryzomys flavescens</i>	Hourglass-shaped and rounded, may presents a slight posterior divergence; supraorbital margins tenuous and little curvy	Teardrop shape; often surpass the anterior edge of the first molar; vomer appears dilated only on 2/3 previous	Capsular process of lower incisor alveolus poorly developed; masseteric crest unclear	Frequently present
<i>Oligoryzomys nigripes</i>	Hourglass-shaped with a long constriction, following the molar rows; supraorbital margins rounded	Lenticular shape; may reach the anterior edge of the first molar; dilation of the vomer varies widely, usually appears 2/3 dilated	Capsular process of lower incisor alveolus slightly dilated, not exceeding the mandibular notch line	Frequently present
<i>Oligoryzomys stramineus</i>	Convergent anteriorly; supraorbital margins slightly sharp	Lenticular shape; may reach the anterior edge of the first molar; dilation of the vomer varies widely, usually appears 2/3 dilated	Capsular process of lower incisor alveolus slightly dilated, not exceeding the mandibular notch line	Frequently present

**Table 2.** NISP (number of identified specimens) of *Oligoryzomys* collected in owl pellets from the Sumidouro State Park, Lagoa Santa; Mata Grande Cave, Sete Lagoas; Peter Lund Natural Monument, Cordisburgo.

	Lagoa Santa	Sete Lagoas	Cordisburgo
<i>Oligoryzomys nigripes</i>	54	219	61
<i>Oligoryzomys fornesi</i>	6	33	10
<i>Oligoryzomys</i> sp.	7	92	17
<b>Total</b>	67	344	88

Weksler & Percequillo, 2011), *Oligoryzomys* is a complex genus with many morphological similarities between species. This makes the identification of the species difficult, especially because many are sympatric in different localities. In some cases, the use of molecular and cytogenetic data is essential for the identification of *Oligoryzomys* species.

*Oligoryzomys fornesi* might have already been collected in other regions of Cerrado in eastern Minas Gerais, between Uberlandia and Lagoa Santa, and further north between Formoso and Lagoa Santa, but assigned as another species of *Oligoryzomys* or *O. nigripes*, the most common species of the genus. Minas Gerais is a large state and many areas of Cerrado have not yet been surveyed, which also explains the lack of information about the geographic distribution of this species in the state.

Recently studies with *Oligoryzomys* molecular phylogeny suggest a taxonomic revision for populations assigned to *O. fornesi* in Brazil (González-Ittig *et al.*, 2010; González-Ittig *et al.*, 2014). These authors point out the distinctiveness of specimens from Brazil and the ones from the type locality (Nainck in Formosa, Argentina), since they are recovered in different clades, with Brazilian *O. fornesi* grouped into a basal group (González-Ittig *et al.*, 2010; González-Ittig *et al.*, 2014). More extensive studies are needed to clarify the taxonomic status of *Oligoryzomys* populations from central Brazil, including the recent proposition to refer to *O. matogrossae* the records previously assigned to *O. fornesi* from Cerrado and Caatinga (see Weksler & Bonvicino, 2015).

It should be pointed out that some species of this genus are important hantavirus reservoirs, such as *Oligoryzomys nigripes* and *O. fornesi*. They have been identified as reservoirs by serological and molecular methods in different Brazilian regions (Lemos *et al.*, 2004; Suzuki *et al.*, 2004; Oliveira *et al.*, 2013; Guterres *et al.*, 2014). The hantavirus, subject of studies worldwide, is among the most important zoonotic pathogens of humans and the role in hantaviruses cycles reinforce the importance of rodent inventories in poorly sampled regions and taxonomic studies on this genus. The karst area of Lagoa Santa can be considered poorly sampled actually because no small mammals survey was done since Lund and Winge's work in 1887. Some works were made in nearby regions such as the Parque Nacional Serra do Cipó (Leal *et al.*, 2008), Parque Nacional das Sempre-Vivas (Camara *et al.*, 2007) and Conceição do Mato Dentro (Ávila Pires, 1960)

Our findings also show the importance and effectiveness of owl pellets to inventory small mammal assemblages in poorly known regions. The analysis of barn owl pellets is a valuable, quick, and cost-effective tool for surveying small mammals and it should be extensively used in Brazil.

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## Literature Cited

- Agrellos R.; Bonvicino, C. R.; Rosa, E. S. T.; Marques, A. A. R.; D'andrea, P. S. & Weksler, M. 2012. The taxonomic status of the Castelo dos Sonhos Hantavirus reservoir, *Oligoryzomys utiaritensis* Allen 1916 (Rodentia, Cricetidae, Sigmodontinae). *Zootaxa*, 3220:1–28.
- Avila-Pires, F. D. de. 1960. Roedores colecionados na região de Lagoa Santa, Minas Gerais, Brasil. *Arquivos do Museu Nacional*, 50:25-46.
- Bonvicino, C. R.; Oliveira, J. A. & D'Andrea, P. S. 2008. Guia dos roedores do Brasil, com chaves para gêneros baseadas em caracteres externos. Rio de Janeiro: Centro Pan- Americano de Febre Aftosa - OPAS/OMS. 120 p.
- Bonvicino, C. R. & Weksler, M. 1998. A new species of *Oligoryzomys* (Rodentia, Sigmodontinae) from Northeastern and Central Brazil. *Zeitschrift für Säugetierkunde*, Jena, 63:90-103.
- Berbert-Born, M. 2002. Carste de Lagoa Santa, MG: Berço da paleontologia e da espeleologia brasileira. In: C. Schobbenhaus; D. A. Campos; E. T. Queiroz; M. Winge; M. L. Berbert-Born (ed); *Sítios Geológicos e Paleontológicos do Brasil*. 1ªed., Brasília: DNPM/CPRM - Comissão Brasileira de Sítios Geológicos e Paleobiológicos (SIGEP), 1:415-430.
- Bruna, E. M.; Guimarães, J. F.; Lopes, C. T.; Duarte, P.; Cláudia, A.; Gomes, L.; Belentani, S. C.; Pacheco, R.; Facure, K. G.; Lemos, F. G. & Vasconcelos, H. L. 2010. Mammalia, Estação Ecológica do Panga, a Cerrado protected area in Minas Gerais state, Brazil. *Check List*, 6(4):668-675.
- Câmara, E. M.; Costa, C. G.; Lira, F.; Paula, A.; Duarte, G.; Leal, K. P. & Diniz, F. F. 2007. Comunidade de mamíferos do Parque Nacional das Sempre Vivas, Minas Gerais Mammals communities of Parque



- Nacional das Sempre Vivas, Minas Gerais. In: Congresso Brasileiro de Unidades de Conservação. Anais Eletrônicos: Foz do Iguaçu, Rede Nacional Pró-Unidades de Conservação: Fundação o Boticário de Proteção à Natureza.
- González-Ittig, R. E.; Salazar-Bravo, J.; Barquez, R. M. & Gardenal, C. N. 2010. Phylogenetic relationships among species of the genus *Oligoryzomys* (Rodentia, Cricetidae) from Central and South America. *Zoologica Scripta*, 39: 511–526.
- González-Ittig, R. E.; Rivera, P. C.; Levis, S. C.; Calderón, G. E. & Gardenal, C. N. 2014. The molecular phylogenetics of the genus *Oligoryzomys* (Rodentia: Cricetidae) clarifies rodent host–hantavirus associations. *Zoological Journal of the Linnean Society*, 171:457–474.
- Guterres, A.; de Oliveira, R. C.; Fernandes, J.; Strecht, L.; Casado, F.; Gomes de Oliveira, F. C.; D’Andrea, P. S.; Bonvicino, C. R.; Schrago, C. G. & Sampaio de Lemos, E. R. 2014. Characterization of Jujuitiba Virus in *Oligoryzomys fonesi* from Brazilian Cerrado. *Viruses*, 6:1473-1482.
- IEF – Instituto Estadual De Floresta. 2008. Parque Estadual do Sumidouro. Plano de Manejo. Relatório técnico não publicado. IEF/Gheosfera Consultoria Ambiental.
- Leal, K. P.; Batista, I. R.; Santiago, F. L.; Costa, C. G. & Câmara, E. M. 2008. Mamíferos registrados em três unidades de conservação na Serra do Espinhaço: Parque Nacional da Serra do Cipó, Parque Nacional das Sempre Vivas e Parque Estadual da Serra do Rola-moça. *Sinapse Ambiental*, 5:40-50.
- Lemos, E. R. S.; D’Andrea, P. S.; Bonvicino, C. R.; Famadas, K. M.; Padula, P.; Cavalcanti, A. A. & Schatzmayr, H. G. 2004. Evidence of Hantavirus in wild rodents captured in an endemic area for Brazilian spotted fever in the State of São Paulo. *Pesquisa Veterinária Brasileira*, 24(2):71-73.
- Machado, L. F.; Paresque, R. & Christoff, A. U. 2011. Anatomia comparada e morfometria de *Oligoryzomys nigripes* e *O. flavescens* (Rodentia, Sigmodontinae) no Rio Grande do Sul, Brasil. *Papéis Avulsos Zoologia*, 51(3):29-47.
- Musser, G. G. & Carleton, M. D. 2005. Superfamily Muroidea, p. 894–1531. In: Wilson, D. E. & Reeder, D. M. (Eds.). *Mammal Species of the World*, Baltimore: The John Hopkins University Press. 2000 p.
- Oliveira, S. V.; Escobar, L. E.; Peterson, A. T. & Gurgel-Gonçalves, R. 2013. Potential geographic distribution of hantavirus reservoirs in Brazil. *PLoS ONE*, 8(12): e85137.
- Paglia, A.; Fonseca, G. A.; Rylands, A. B.; Hermann, G.; Aguiar, L. M. S.;

- Chiarello, A. G.; Leite, Y. R. L.; Costa, L. P.; Siciliano, S.; Kierulff, M. C. M.; Mendes, S. L.; Tavares, V.; Mittermeier, R. A. & Patton, J. L. 2012. Annotated Checklist of Brazilian Mammals. 2. ed. Arlington, VA: Conservation International, 1:1-76.
- Palma, R. E.; Rodríguez-Serrano, E.; Rivera-Milla, E.; Hernandez, C. E.; Salazar-Bravo, J.; Carma, M. I.; Belmar-Lucero, S.; Gutierrez-Tapia, P.; Zeballos, H. & Yates, T. L. 2010. Phylogenetic relationships of the pygmy rice rats of the genus *Oligoryzomys* Bangs, 1900 (Rodentia: Sigmodontinae). *Zoological Journal of the Linnean Society*, 160:551-566.
- Paresque, R.; Silva, M. J. J.; Yonenaga-Yassuda, Y. & Fagundes, V. 2007. Karyological geographic variation of *Oligoryzomys nigripes* Olfers, 1818 (Rodentia, Cricetidae) from Brazil. *Genetics and Molecular Biology*, 30:43-53.
- Paresque, R. 2010. Diversificação das espécies do gênero *Oligoryzomys* Bangs 1900 (Rodentia, Cricetidae) na região neotropical. 2010. Tese de doutorado, Programa de Pós-graduação em Ciências, Universidade de São Paulo, São Paulo. 326f.
- Pereira, L. G. & Geise, L. 2009. Non-flying mammals of Chapada Diamantina (Bahia, Brazil). *Biota Neotropica*, 9(3):165-196.
- Piló, L. B. 1998. Morfologia cárstica e materiais constituintes: Dinâmica e evolução da Depressão Poligonal Macacos-Baú - Carste de Lagoa Santa, Minas Gerais. 1998. Tese de Doutorado, Departamento de Geografia da Faculdade de Filosofia, Letras e Ciências Humanas, Universidade de São Paulo, São Paulo. 269f.
- Suzuki, A.; Bisordi, I.; Levis, S.; Garcia, J.; Pereira, L. E.; Souza, R. P.; Sugahara, T. K. N.; Pini, N.; Enria, D. & Souza, L. T. M. 2004. Identifying rodent hantavirus reservoirs, Brazil. *Emerging Infectious Diseases*, 10 (12): 2127-2134.
- Teta, P. & Pardiñas, U. F. 2010. Mammalia, Didelphimorphia and Rodentia, central Santa Fe Province, Argentina. *Check List*, 6(4):552-554.
- Teta, P. & Pereira, J. A. 2009. Mammalia, Didelphimorphia, Chiroptera, and Rodentia, Parque Nacional Chaco and Capitán Solari, Chaco Province, Argentina. *Check List*, 5(1):144-150.
- Travassos, L. E. 2010. Considerações sobre o carste da região de Cordisburgo, Minas Gerais, Brasil. Belo Horizonte: Tradição Plana.
- Trott, A.; Callegari-Jacques, S.; Oliveira, L.; Langguth, A. & Mattevi, M. 2007. Genetic diversity and relatedness within and between species of the genus *Oligoryzomys* (Rodentia; Sigmodontinae). *Brazilian Journal Biology*, 67(1):153-160.

- Weksler, M. & Bonvicino, C. R. 2005. Taxonomy of pigmy rice rats genus *Oligoryzomys* Bangs, 1900 (Rodentia, Sigmodontinae) of the Brazilian cerrado, with the description of two new species. *Arquivos do Museu Nacional*, 1900(1):113-130.
- Weksler, M. & Bonvicino, C. R. 2015. Genus *Oligoryzomys* Bangs, 1900, p. 417-437. In: Patton, J.; Pardiñas, U. F. J. & D'Elía, G. (Eds.). *Mammals of South America, Volume 2 – Rodents*. The University of Chicago Press. 1384 p.
- Weksler, M. & Percequillo, A. R. 2011. Key to the genera of the tribe Oryzomyini (Rodentia: Cricetidae: Sigmodontinae). *Mastozoología Neotropical*, 18(2): 281-292.
- Winge, H. 1887. Jordfundne og nulevende Gnavere (Rodentia) fra Lagoa Santa, Minas Geraes, Brasilien. *E Mus. Lundii*, 178 + 18 pls.