

ARTIGO ORIGINAL

## Mites Macronyssidae parasites of *Passer domesticus* (Linnaeus, 1758) (Passeriformes: Passeridae) in the Southern of Brazil

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### RESUMO

**Ácaros Macronyssidae parasitos de *Passer domesticus* (Linnaeus, 1758) (Passeriformes: Passeridae) no extremo sul do Brasil.**

O objetivo deste estudo foi relatar as espécies de ácaros hematófagos parasitos de *Passer domesticus* (Linnaeus, 1758) e analisar os índices de infestação em relação ao gênero, massa corporal e comprimento total dos hospedeiros. Para isso, cada um dos 100 pardais capturados na área urbana de Pelotas, Rio Grande do Sul, Brasil, foi sexado, pesado e medido. A coleta dos ácaros foi realizada após aplicação de um talco repelente de ectoparasitos sobre o corpo das aves. *Pellonyssus reedi* ocorreu em 29 pardais com intensidade média de 8,37 ácaros/hospedeiro e *Ornithonyssus bursa* ocorreu em duas aves, somente um hospedeiro macho apresentou co-infestação. A prevalência e intensidade média de infestação por *P. reedi* entre hospedeiros machos e fêmeas adultos não apresentou diferença significativa, também não houve correlação entre a abundância dessa espécie, massa corporal e comprimento total dos pardais. Relata-se a ocorrência de *P. reedi* e *O. bursa* parasitando *P. domesticus* no extremo sul do Brasil.

**Palavras-chave:** Ácaros hematófagos, Índices parasitológicos, *Ornithonyssus*, Pardais, *Pellonyssus*

### ABSTRACT

The aim of this study was to report the species of haematophagous parasitic mites of *Passer domesticus* (Linnaeus, 1758) and analyze the infestation rates regarding to gender, body mass, and total length of the hosts. To do so, each of the 100 house sparrows captured in the urban area of Pelotas, Rio Grande do Sul, Brazil, was identified by gender, weighed, and measured. The mite collection was carried out after applying an ectoparasite-repelling talc in the body of the birds. *Pellonyssus reedi* was found in 29 house sparrows with mean intensity of 8.37 mites/host and *Ornithonyssus bursa* was found in two birds, only one male host showing co-infestation. The prevalence and mean intensity of *P. reedi* between male and female adults did not show significant difference, nor was there any correlation among species abundance, body mass, and total length of the house sparrows. We report the occurrence of *P. reedi* and *O. bursa* parasitizing *P. domesticus* in the southern of Brazil.

**Keywords:** Haematophagous mites, House sparrows, *Ornithonyssus*, Parasitological indices, *Pellonyssus*

## INTRODUCTION

The birds are hosts of many symbiotic animals and some of the most diverse are the mites (Arachnida: Acariformes and Parasitiformes) (Knee & Galloway, 2017). There are approximately 3,000 species of mites described, distributed in 40 families (Proctor & Owens, 2000). Among these are haematophagous mites Macronyssidae (Acari: Mesostigmata), which parasitize domestic and wild birds worldwide, being found on the body and/or nest of their hosts (Stoehr et al., 2000; Berggren, 2005).

The Macronyssidae often parasitize chickens, doves and house sparrows (Flechtmann, 1985), as well as wild birds (Gjelstrup & Møller, 1986; Aramburú et al., 2002; Sinkoc & Brum, 2004; Mascarenhas et al., 2007; 2009; Lareschi et al., 2017). In great infestations, they can affect the development, due to considerable blood loss, and reduced poultry posture, resulting in death and, thus, economic loss (Knee & Proctor, 2007; Silva et al., 2018).

The house sparrow, *Passer domesticus* (Linnaeus, 1758) (Passeriformes: Passeridae), is a non-migratory bird, terrestrial, which can adapt itself easily to agricultural, urban and suburban environments, taking advantage of human action, occupying constructed areas which can serve as shelter and nesting (Major et al., 2004). These species come from Eurasia and the north of Africa, and has intentionally been introduced in America (Global Invasive Species Database, 2018). It was inserted in Brazil in 1906 for biological control of insects and, currently, are scattered across all Brazilian territory (Sick, 1997).

Due to the presence of synanthropic bird's nests near the residences, Macronyssidae mite (such as *Ornithonyssus* spp.) may occasionally bite humans and cause pruritic dermatitis (Knee & Proctor, 2007; Oliveira et al., 2012). This study aimed to investigate the occurrence of Macronyssidae mites related to *P. domesticus* and analyze the infestation rates regarding to gender, as well as the effects of mites in the body mass and total length of hosts native to urban areas, in the state of Rio Grande do Sul, southern of Brazil.

## MATERIAL AND METHODS

A total of 100 specimens of *P. domesticus* [90 adults (52 males, 38 females), nine juveniles (seven males, two females) and one undetermined nestling] were captured using mist-nets (30 mm mesh) at 13 sites (public squares, gardens of private properties and empty lots) of the urban area of Pelotas municipality, Rio Grande do Sul, Brazil, between March 2016 and February 2018. The capturing, transporting and euthanizing of the birds were licensed by the Instituto Chico Mendes de Conservação da

Biodiversidade (ICMBio nº 51118-3) and approved by the Comissão de Ética em Experimentação Animal at Universidade Federal de Pelotas (CEEA/UFPeI nº 4915).

After being transported in appropriate cages to the UFPel's Parasitology Laboratory, each specimen was weighed and measured, and the data assessed were: body mass, total length of the body, wings, and beak, gender and age (adult and/or juvenile). Then, using a technique called "dust-ruffing" by Walther and Clayton (1970), lice-killing talc commercially known as Piolhaves (ProvetS® Simões) (chemical compound: permethrin and sulfur) was individually applied in the bodies of the passerines, according to the manufacturer's instructions, which indicate that a thin layer of talc must be put on the body of the birds in order to repel ectoparasites, facilitating their collection. Afterward, the collected parasites were retained in 70% alcohol in containers labeled according to the host number.

The Macronyssidae mites were clarified in Amann Lactophenol, mounted on Hoyer's medium between slide and coverslip, according to Krantz (1978), photographed using an Olympus BX 41 microscope with attached camera, and the images were prepared using Adobe Photoshop CS5. Identification was based on morphologic characters according to Till (1963), Radovsky and Estébanes-González (2001) and Guimarães et al. (2001), and the parasitological parameters of prevalence (P%), mean abundance (MA) and mean infestation intensity (MII) were calculated according to Bush et al. (1997).

The infestations of the mites between male and female adult hosts were compared by prevalence using the Chi-square test ( $\chi^2$ ) and by mean infestation intensity by the t-test via "Bootstrap" ( $BC_a$   $p < 0.05$ ) in the program Quantitative Parasitology 3.0 (Rózsa et al., 2000). In order to verify the presence of correlations between the abundance of the mites and body mass, as well as total length of the hosts, a Regression Analysis (RA) was performed in accordance with the model  $y = a + bx$ , as well as the determination coefficient ( $r^2$ ), whose range is  $\geq 0$  or  $\leq 1$ , and Pearson's correlation coefficient ( $r$ ), whose range is  $\geq -1$  or  $\leq 1$  (Mukaka, 2012). For this analysis, a nestling host was disregarded. Both the regression analysis, the Chi-square test and the t-test were performed for mites, which presented prevalence greater or equal to 10% (Bush et al., 1990).

Vouchers were deposited in Coleção de Artrópodes do Laboratório de Parasitologia de Animais Silvestres – CALAPASIL/UFPeI (nº 548 – 557) at the Departamento de Microbiologia e Parasitologia, Instituto de Biologia, Universidade Federal de Pelotas, Pelotas, Rio Grande do Sul, Brazil.

## RESULTS

Among the 100 hosts examined, 31 (15 males and 14 females, one male juvenile and one undetermined nestling) were parasitized by 249 mites of the family Macronyssidae (Table 1). *Pellonyssus reedi*

(Zump & Patterson, 1952) has occurred in 29% of the hosts (14 females house sparrows were infested by 190 mites of this specie, 14 males house sparrows were infested by 50 mites, and the undetermined juvenile contained three mites). On the other hand, *Ornithonyssus bursa* (Berlese, 1888) was found only in two (n = 2) male adult hosts, totaling six mites. Only one male adult host presented co-infestation by these two mite species, where infestation intensity was three mites/host for *P. reedi* and two mites/host for *O. bursa*.

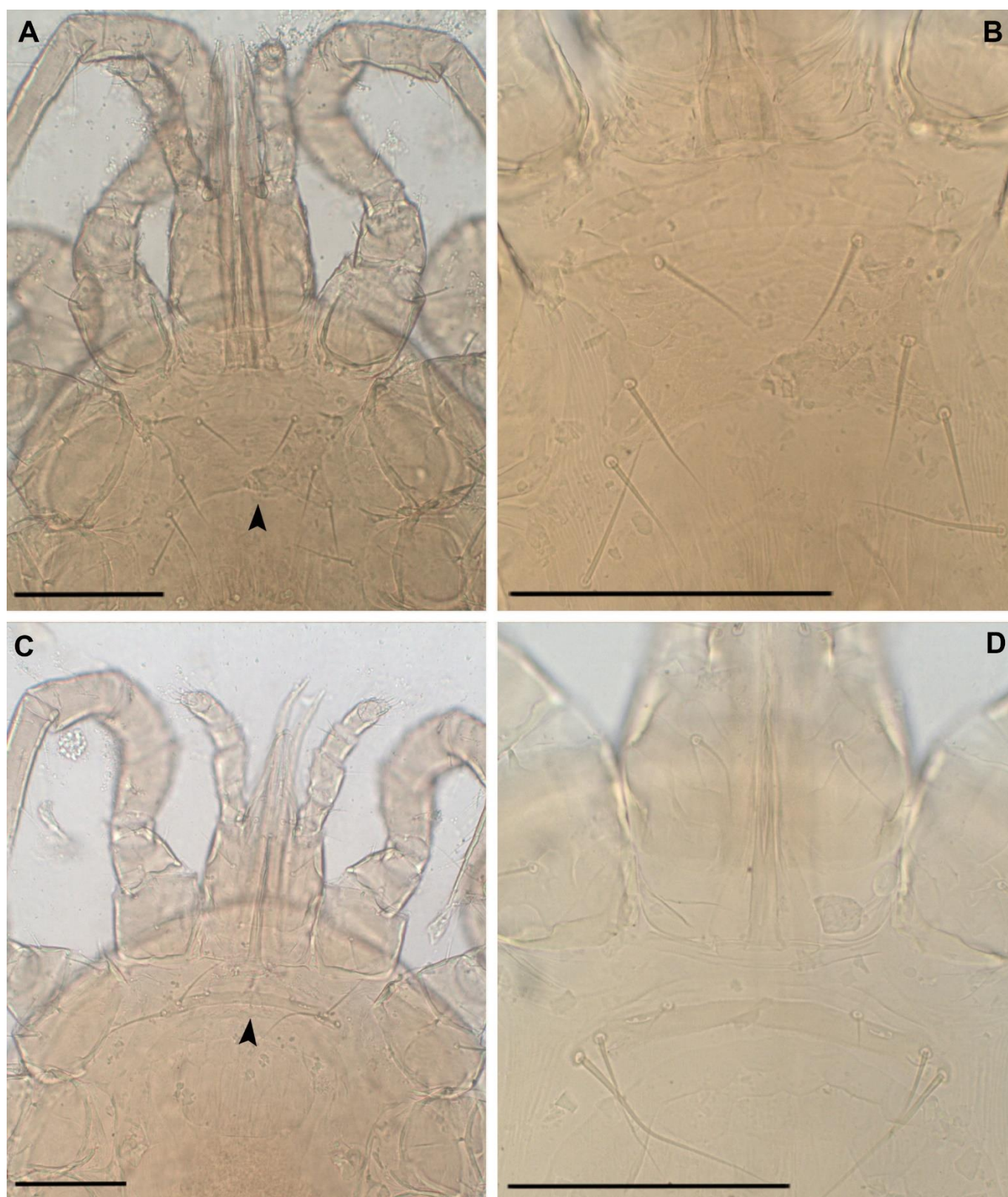
Some of the main morphological characteristics observed in the identification of mites were: for *P. reedi*, sternal shield with a reticulate pattern, with the presence of three pairs of setae; opisthonotal shield with three pairs of posterior marginal setae; peritreme ending over between coxae II and III; with anterior spur on coxa II well developed (Till, 1963; Radovsky & Estébanes-González, 2001); and for *O. bursa*, sternal shield gradually narrowing backward, with the presence of three pairs of smaller setae, never of the width of the shield and always on the plate (Guimarães et al., 2001; Denmark & Cromroy, 2003) (Figure 1).

**Table 1.** Prevalence (P%), mean intensity of infestation (MII  $\pm$  SD), mean abundance (MA  $\pm$  SD) and infestation intensity range (R) of mites Macronyssidae parasites of *Passer domesticus* (Linnaeus, 1758) (Passeriformes: Passeridae) (n = 100) from the urban area of Pelotas, Rio Grande do Sul, Brazil.

Macronyssidae	P (%)	MII $\pm$ SD	MA $\pm$ SD	R
<i>Pellonyssus reedi</i>	29	8.37 $\pm$ 13.48	2.43 $\pm$ 8.12	1 – 50
<i>Ornithonyssus bursa</i>	2	3 $\pm$ 1.41	0.06 $\pm$ 0.44	2 – 6

SD = Standard deviation

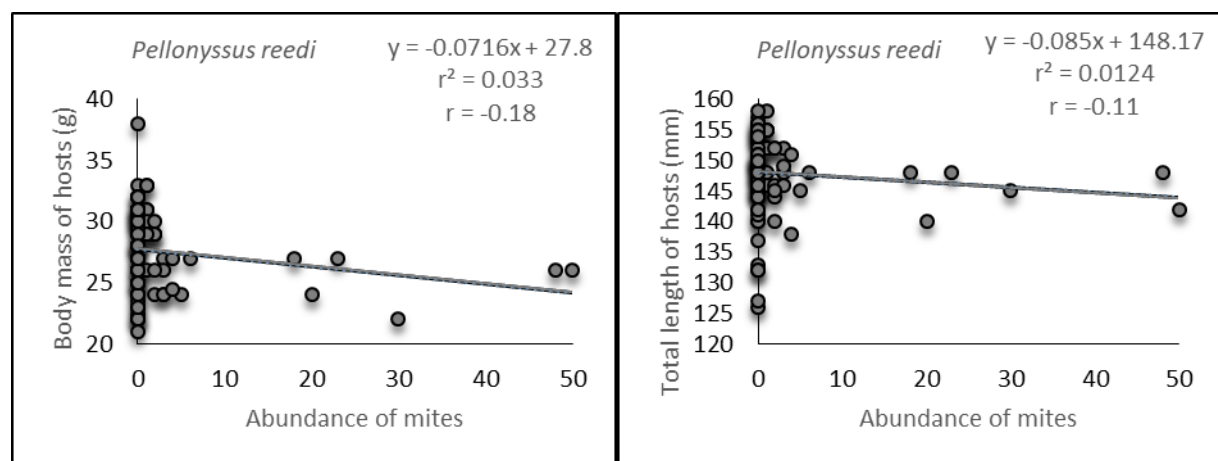




**Figure 1.** Mites Macronyssidae parasites of *Passer domesticus* (Linnaeus, 1758) (Passeriformes: Passeridae) from the urban area of Pelotas, Rio Grande do Sul, Brazil. (A) Ventral view of the *Ornithonyssus bursa* (Berlese, 1888) female (arrow show the sternal shield, bar = 120  $\mu$ m); (B) Detail of the sternal shield of the *O. bursa* female (bar = 120  $\mu$ m); (C) Ventral view of the *Pellonyssus reedi* (Zump & Patterson, 1952) female (arrow show the sternal shield, bar = 100  $\mu$ m); (D) Detail of the sternal shield of the *P. reedi* female (bar = 100  $\mu$ m).

The prevalence (P%) and mean infestation intensity (MII) by *P. reedi* in adult male hosts (P% = 25%; MII = 3.54 mites/host) female (P% = 36.8%; MII = 13.57 mites/host), did not show significant difference

( $p > 0.05$ ). The correlations among *P. reedi* abundance, body mass (grams) and total length (millimeters) of hosts had low magnitude, with no identifiable functional correlations among the variables, since Pearson's ( $r$ ) correlation coefficient showed negative values close to zero (Figure 2).



**Figure 2.** Regression Analysis (RA) of the body mass (grams) and to the total length of hosts (millimeters) in relation to the abundance of *Pellonyssus reedi* (Zumt & Patternam, 1952) in *Passer domesticus* (Linnaeus, 1758) (Passeriformes: Passeridae) ( $n = 100$ ) in urban area of Pelotas, Rio Grande do Sul, Brazil.

## DISCUSSION

*Pellonyssus reedi* was described by Zumt and Patternam (1952) as *Steatonyssus reedi*. Shortly after, the species was taxonomically replaced by Clark and Yunker (1956) by the name *Pellonyssus passerii* and later synonymized as *P. reedi* by Till (1963). According to Rosa and Flechtmann (1981), there are records of this mite associated with several species of birds, including *P. domesticus*, in Africa and North America, with the first occurrence in South American house sparrow nests registered by those same authors.

In the southern of Brazil, *P. reedi* was quoted parasitizing artificial nests of *Troglodytes musculus* Naumann, 1823 (Passeriformes: Troglodytidae) (Sinkoc & Brum, 2004) and *Sicalis flaveola* (Linnaeus, 1766) (Passeriformes: Thraupidae) (Mascarenhas et al., 2007), on the contrary from the present study, the specimen was collected manually, directly from the host's body.

*Ornithonyssus bursa* (Berlese, 1888) is a common parasite in domestic and wild birds. The species is distributed in temperate, tropical, and subtropical regions of the world (Mašán et al., 2014). This mite may cause irritation, severe dermatitis and anemia on the birds (Lareschi et al., 2017). In Europe, numerous colonies have been reported to occur in nestlings of *Hirundo rustica* Linnaeus, 1758 (Passeriformes: Hirundinidae) (Gjelstrup & Møller, 1986). In Argentina, it has been quoted parasitizing nests of *Myiopsitta*

*monachus* (Boddaert, 1783) (Psittaciformes: Psittacidae) (Aramburú et al., 2002) and *Sturnus vulgaris* (Linnaeus, 1758) (Passeriformes: Sturnidae), an invasive bird in the region (Lareschi et al., 2017). In the southern of Brazil, *O. bursa* was reported in *Megascops choliba* (Vieillot, 1817) (Strigiformes: Strigidae) and *Pitangus sulphuratus* (Linnaeus, 1766) (Passeriformes: Tyrannidae) (Mascarenhas et al., 2009) in nestlings; and *Columbina picui* (Temminck, 1813) (Columbiformes: Columbidae) (Coimbra et al., 2012) adults.

The infestation by *P. reedi* in *P. domesticus* showed lower values than the ones recorded in Hungary, where 12,213 specimens were removed from 188 house sparrows in nestlings spread across 46 nests (Szabó et al., 2008). In *P. domesticus*' nests, studies carried out in Brazil and in Europe describe differences in infestations, where in São Paulo, 42 mites were found in three (03) out of 20 nests (Rosa & Flechtmann, 1981); and in Slovakia, 2,598 specimens were detected in only one (01) nest (Mašán et al., 2014).

In the present study, the number of mites did not influence the weight and size of the birds. Similarly, Szabó et al. (2002) observed no significant effects of infestations of these mites in the body mass and general size of the in nestlings. However, conflicting results were reported by Weddle (2000) and Stoehr et al. (2000). Weddle (2000) notes a negative correlation between the parasitizing load and the body mass of all 127 house sparrow in nestlings among 37 evaluated nests, that is, nestlings with higher infestations had lower total body masses than less infested nestlings; while Stoehr et al. (2000) observed that high levels of parasitism by *P. reedi* in *Carpodacus mexicanus* (Statius Muller, 1776) (Passeriformes: Fringillidae) in Alabama, USA, were associated with lower hematocrit and body mass values of this host. Such results may be related to the permanent presence of the offsprings in the nests during parental care, once these mites are considered nidicolous, with high demographic density in bird nests (Berggren, 2005).

In this sense, the low infestation rates by Macronyssidae mites in *P. domesticus*, as well as the lack of positive correlation among *P. reedi* abundance, body mass and total length of birds may be related to sexual maturity of the hosts examined in the present study which were adults (n = 90) and possibly were not nesting when captured. Although the species reproduces all yearlong (Long, 1981), it is important to highlight that only females incubate eggs (Romero et al., 2008). In the present study, although there was no significant difference in *P. reedi* infestations between males and females, we observed that prevalence values and mean infestation intensity were higher in females.

The mites associated with birds and their nests require attention, especially in regards to synanthropic birds, which build their nests near human residences, because when young birds leave their nests, the mites seek other sources of food (Oliveira et al., 2012). There are records of dermatitis caused by *O. bursa* in various regions of the world, such as the United States (Fox, 1957), India (Lodha, 1969), Argentina (Semenas & Rocha, 1998) and Italy (Castelli et al., 2015). In Brazil, there are reports of cases of *O. bursa* parasitism in humans, causing dermatitis with intense pruritus (Ribeiro et al., 1992; Oliveira et al., 2012;

Mentz et al., 2015; Bassini-Silva et al., 2019). In reports recorded in Rio Grande do Sul, the mites were associated to domestic bird nests (Ribeiro et al., 1992); of *Myiodynastes maculatus* (Stadius Muller, 1776) (Passeriformes: Tyrannidae) in air from the air conditioner of an apartment in Santa Maria (Oliveira et al., 2012); and an abandoned *Furnarius rufus* nest (Gmelin, 1788) (Passeriformes: Furnariidae) built outside an apartment in a residential county of Porto Alegre (Mentz et al., 2015). There are no records of *P. reedi* causing cutaneous infections in humans, although its haematophagous habits and intense infestations in birds may serve as warnings for public health and poultry farming.

### CONCLUSION

This work reports on *Passer domesticus* acting as hosts for *Pellonyssus reedi* and *Ornithonyssus bursa* in Rio Grande do Sul, Brazil, and its respective infestation rates in house sparrows from urban areas. Moreover, it is noted that *P. reedi* infestations are similar between male and female hosts, and these mite's abundance does not influence the total length and body mass of birds.

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