

COMUNICACIONES

## *Parasites of pigeons (Columba livia) in urban areas of Lages, Southern Brazil*

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### ABSTRACT

The prevalence of ectoparasites and endoparasites was studied in 58 free-living pigeons (*Columba livia*) in urban areas of Lages, in the state of Santa Catarina, Brazil. The pigeons were visually inspected and fecal and blood samples were collected to determine the presence of ectoparasites. The serological diagnosis was established through the use of blood smears stained with Quick Panoptic and Giemsa methods. The fecal samples were analyzed using Sheather's method. The Quick Panoptic and Giemsa methods detected 67.24% (39/58) and 46.55% (27/58) of *Haemoproteus* sp, respectively. The prevalence rate amounted to 57% of 116 smears analyzed ( $P$  value=0.0387; odds ratio = 2.357 with a 95% confidence interval). The prevalence of gastrointestinal parasites was 74.14% (43/58). Protozoa (100% for *Eimeria* sp.) were detected in 86.05% of the cases and nematodes (*Ascaridia* sp. and *Capillaria* sp.) in 32.56%, whereas 20.93% of the pigeons were infected by multiple parasites. The fly *Pseudolynchia canariensis* was found beneath the feathers of all pigeons. This is the first report of parasites in *C. livia* in the state of Santa Catarina.

**Key words:** pigeons, *Columba livia*, Hippoboscidae, helminths, protozoa.

### INTRODUCTION

Pigeons of the order Columbiformes are ubiquitous birds and can be found in virtually every town and city around the globe. *Columba livia* is a species that descends from wild rock pigeons, which live in Mediterranean Europe. There has been a sharp increase in the number of these birds in Brazilian cities, drawing the attention of authorities to health and building defacement issues<sup>1</sup>.

Those who watch these birds can barely imagine how detrimental their disorderly reproduction may be and how many risks they

pose to human health. They constitute a major source of infection and transmission of diseases. They are often a cause for repulsion and nuisance due to the accumulation of fecal droppings and to the disruptive noise associated with their presence. Humans are infected by inhaling fecal dust from cages or from sites that have been contaminated with dry feces, urine and other droppings. This usually occurs among breeders, veterinary doctors, industrial workers, and cleaning workers<sup>2</sup>.

Several health problems can affect pigeons, but parasite infections play a major role. The prevalence of *C. livia* parasites was studied on

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the Canary Islands, where *Pseudolynchia* (*P.*) *canariensis* was observed in 36%, *Haemoproteus* (*H.*) *columbae* in 82%, coccidial oocysts in 50% and *Ascaridia columbae* in 40% of the pigeons.<sup>3</sup> In Costa Rica, *Haemoproteus* sp was detected in 4.8% of birds<sup>4</sup>; in Queensland, Australia, a total of 3,059 birds were examined and *Haemoproteus* sp was found in 31.4% of them<sup>5</sup>.

Endemic free-ranging Galapagos doves (*Zenaida galapagoensis*) and rock pigeons (*C. livia*) were surveyed in several islands of the Galapagos archipelago to establish the sample prevalence of blood parasites. *Haemoproteus* sp, the only blood parasite identified, was found in 89% of the Galapagos doves sampled, but not in the rock doves.<sup>6</sup> In Bulgaria, the total prevalence of the genus *Haemoproteus* amounted to 18.5%<sup>7</sup>. In Alaska, a study for the detection of blood parasites in birds during the breeding season revealed that the prevalence of *Haemoproteus* ranged from 5 to 18%<sup>8</sup>.

The prevalence of blood parasites was investigated in Japanese wild birds (from 1988 to 2001) and 5.1% were infected with *Haemoproteus* sp<sup>9</sup>. A total of 315 birds from Villavicencio and San Miguel, Colombia, were tested for the presence of hematozoa; of these, 50 birds (15.9%) harbored blood parasites of the genus *Haemoproteus*.<sup>10</sup> *Haemoproteus* was the most prevalent parasite among *C. livia* in Uganda (76.5%)<sup>11</sup>, in South Africa (80%)<sup>12</sup> and in the USA (22.8%)<sup>13</sup>.

In the state of Minas Gerais, in southeastern Brazil, a research study with free-living pigeons (*C. livia domestica*) showed that all pigeons were infested with *P. canariensis* - a blood-feeding louse fly - and with *H. columbae* and *Eimeria* sp. oocysts. *A. columbae* was detected in 4.91% of the pigeons and 3.27% presented with mixed infections caused by *A. columbae* and *Raillietina* spp<sup>14</sup>. The prevalence and intensity of blood parasites in three species of wild doves were studied in the western region of the state of São Paulo, Brazil. *H. columbae* was found in the blood of all dove species<sup>15,16</sup>.

Hippoboscidae flies are ubiquitous and a vector for *Haemoproteus* sp among pigeons and doves of the order Columbiformes, whereas *P. canariensis* is the vector of *H. columbae* among *Columba livia* pigeons, both in the case of natural and experimental infections<sup>11,17</sup>. They can be found in all biogeographical regions and usually

infect birds and some mammalian orders. Currently, there are 30 species in Brazil, classified into 10 genera; however, there is a paucity of information on their distribution and on their hosts in all Brazilian regions<sup>14-17</sup>. Gastrointestinal parasites are underinvestigated in birds. A report on captive wild birds, including those of the Columbidae family, carried out at a scientific rearing station and in a park in the city of Recife, northeastern Brazil, showed that 29.9% of the birds tested positive for helminths and/or protozoa; also showing that *Capillaria* sp was the most prevalent parasite, in addition to confirming the presence of *Ascaridia* sp and coccidial oocysts (8.3%)<sup>18</sup>.

The aim of this study was to determine the presence of ectoparasites and endoparasites in free-living *C. livia* that congregate around the public squares of Lages.

## MATERIAL AND METHODS

The pigeons included in this study were surveyed on the streets and squares of Lages, state of Santa Catarina, southern Brazil. They were captured with a fine mesh net after authorization by the Municipal Department of Environmental Protection and by the State Military Police Department of Santa Catarina. The study was approved by the Research Ethics Committee of Universidade do Planalto Catarinense (UNIPLAC). The pigeons were tagged with a leg ring to avoid multiple sampling.

A total of 58 male and female, different-aged pigeons were captured with a fine mesh net at different times between April and August 2004. Blood samples were initially collected from the pigeons. Thereafter, the pigeons were caged and taken to the Animal Facility of UNIPLAC, where they received water *ad libitum* until their stools could be sampled. After that, the pigeons were visually inspected for the detection, collection and identification of ectoparasites, and set loose immediately after that. Ectoparasites were identified using a stereo microscope and taxonomic keys<sup>17</sup>.

The blood samples were collected using an insulin syringe inserted through a brachial vein catheter. Each sample provided two blood smears, fixed with methanol and stained with Quick Panoptic and Giemsa dyes<sup>19</sup>. The slides were analyzed under light microscopy using an oil

immersion objective.

The fecal matter was analyzed by Sheather's method, whereby protozoa and helminths were detected and identified, with decantation of the supernatant extract on the glass slide after the centrifugation flotation technique<sup>20</sup>.

Fisher's exact test (Graphpad Software, version 2.04) was used to compare the two diagnostic methods. An alpha error of less than 5% ( $p < 0.05$ ) was considered statistically significant.

## RESULTS

The fly *Pseudolynchia canariensis* was found beneath the feathers of all pigeons (Figure 1).

*Haemoproteus* sp, a protozoan transmitted by biting dipterans of the Hippoboscidae family, was the major parasite detected. The serological diagnosis through the use of staining methods revealed that 67.24% (39/58) of the samples yielded positive results when stained with the Quick Panoptic dye. Among the 58 slides stained with Giemsa, 46.55% (27/58) demonstrated the presence of *Haemoproteus* sp (Figure 2).

The positive and negative results for 116 blood smears are shown in Table 1.

The statistical analysis demonstrated that a two-sided P value of 0.0387 was considered to be significant, with an odds ratio of 2.357 and a 95% confidence interval. This difference showed that the Quick Panoptic method was more sensitive in detecting parasites in blood smears of *Columba livia*.

The overall prevalence of gastrointestinal parasites amounted to 74.14% (43/58), with 86.05% (37/43) for protozoa, with the detection of *Eimeria* sp oocysts in all positive samples. Of these samples, 27.9% (12/43) were infected by multiple parasites, showing associations between *Eimeria* sp. and *Ascaridia* sp and *Ascaridia* sp

and *Capillaria* sp, whereas these three parasites were detected in 11.62% (5) of the samples. The prevalence of nematodes was 32.56% (14/43), and parasites of the genus *Ascaridia* (13/14) (92.85%) prevailed over those of the genus *Capillaria* (3/14) (21.42%) (Figure 3). The highest infection rate was that of *Eimeria* oocysts.

## DISCUSSION

The result for *P. canariensis* is the same observed for pigeons of the same species in the state of Minas Gerais, southeastern Brazil.<sup>14</sup> The study conducted in São Paulo, also in southeastern Brazil, with three pigeon species, showed smaller prevalence rates of 58.4%, 36.5% and 33.6%, respectively<sup>16</sup>. On the Canary Islands, the prevalence of the fly *P. canariensis* amounted to 36%<sup>3</sup>.

The results of the present study demonstrated higher rates of blood parasites than the other few studies carried out in Brazil in two regions of the state of São Paulo for *H. columbae*,



**Figure 1.** Hippoboscidae fly detected in *Columba livia* pigeons in Lages, state of Santa Catarina, Brazil.

**Table 1.** Diagnosis of *Haemoproteus* sp in *Columba livia* pigeons using the Quick Panoptic and Giemsa staining methods

<i>Haemoproteus</i> sp	Quick Panoptic	Giemsa	Total
Positive	39 (34%)	27 (23%)	66 (57%)
Negative	19 (16%)	31 (27%)	50 (43%)
Total	58 (50%)	58 (50%)	116 (100%)

p (<0.05%)

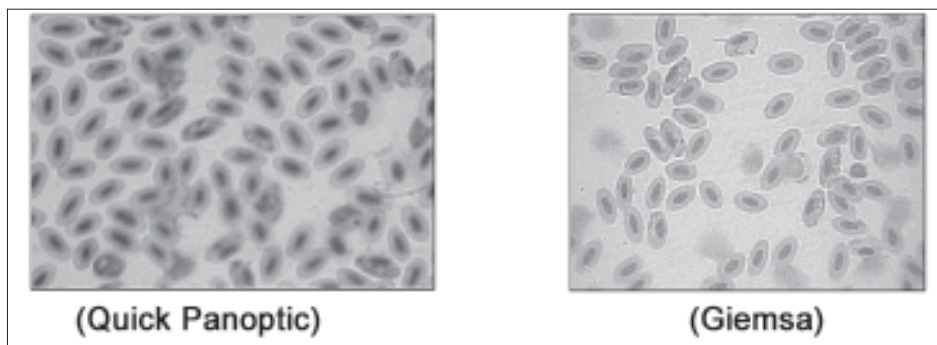


Figure 2. Blood smears of *Columba livia* pigeons infected by *Haemoproteus* sp and submitted to the Quick Panoptic and Giemsa staining methods (100 X).



Figure 3. *Eimeria* oocyst (a), *Ascaridia* egg (b) and *Capillaria* sp. (c). (40 X).

however, with a smaller rate than was observed in Minas Gerais (100% for *H. columbae*). The investigation into the prevalence of blood parasites in pigeons and other birds in Costa Rica<sup>4</sup>, Alaska,<sup>8</sup> and Japan<sup>9</sup> revealed rates lower than 10%; in the United States<sup>13</sup>, Colombia<sup>10</sup>, Bulgaria<sup>7</sup> and in Queensland<sup>5</sup>, Australia, the prevalence rates ranged from 20 to 32% for *Haemoproteus* sp. Similar or higher prevalence rates for *Haemoproteus* sp than those observed in this study were found in Uganda<sup>11</sup> (76.5%), in South Africa<sup>12</sup> (80%), on the Canary Islands<sup>3</sup> (82%), and on the Galapagos archipelago<sup>6</sup> (89%). The prevalence of gastrointestinal nematodes in *Columba livia* pigeons was higher than that obtained for Minas Gerais, in southeastern Brazil<sup>14</sup>; another study showed coccidial oocysts, but no prevalence data, unlike another study with pigeons from the public squares of Lages, where 100% of fecal samples revealed the presence of oocysts, in addition to a prevalence rate higher than 30% for nematode eggs, besides the predominance of *Ascaridia* sp<sup>3,14,18</sup>. Neither of the referenced studies revealed the presence

of ectoparasites or endoparasites that could be zoonotic to humans, nor did the present study.

This is the first report on ectoparasites and endoparasites in *Columba livia* in public squares of Lages, in the state of Santa Catarina, Brazil.

#### RESUMO

A prevalência de ecto e endoparasitos de 58 pombos (*Columba livia*) de vida livre foi estudada em áreas urbanas de Lages, estado de Santa Catarina, Brasil. Os pombos foram submetidos ao exame visual para a coleta e identificação de ectoparasitos, coletas de fezes e sangue. O diagnóstico hemoparasitológico foi através de esfregaços sangüíneos corados pelas técnicas de Panótico Rápido e Giemsa. As fezes foram processadas pelo método de Sheather. Entre os hemoparasitos destacou-se o *Haemoproteus* sp., com 67,24% (39/58) para a técnica de Panótico Rápido e 46,55% (27/58) para a técnica de Giemsa. Dos 116 esfregaços analisados, a prevalência foi de 57% (P = 0,0387; Odds Ratio = 2,357 e Intervalo de Confiança de 95%). A



prevalência de parasitos gastrintestinais foi de 74,14% (43/58) com 86,05% para protozoários (100% para *Eimeria* sp.), 32,56% para nematódeos (*Ascaridia* sp. e *Capillaria* sp.) e 20,93% multiparasitados. A presença da mosca *Pseudolynchia canarienses* foi observada entre as penas de todas as aves. Este é o primeiro registro destes parasitos em *C. livia* no estado de Santa Catarina.

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