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ARTIGO

# Occurrence and interaction of wild birds at poultry houses in southern Brazil

**Angelo Luís Scherer[1,2]; Janete de Fátima Martins Scherer[1,3]; Maria Virginia Petry[1,4] and Martin Sander[1,5]**

[1] Programa de Pós-Graduação em Biologia: Diversidade e Manejo de Vida Silvestre. Laboratório de Ornitologia e Animais Marinhos. Universidade do Vale do Rio dos Sinos. Avendia Unisinos, 950, 93022-000, São Leopoldo, RS, Brasil.
[2] E-mail: alscherer@pop.com.br
[3] E-mail: netscherer@yahoo.com.br
[4] Author for correspondence. E-mail: vpetry@unisinos.br
[5] E-mail: sander@unisinos.br

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**RESUMO: Ocorrência e interação entre aves silvestres e domésticas em granjas no sul do Brasil.** A interação de aves silvestres com aves domésticas é considerada fator para a ocorrência de diferentes enfermidades na produção industrial, comercial ou doméstica de aves. Entre fevereiro a outubro de 2006 foram realizados sete períodos de observação da ocorrência e interação de aves silvestres em dois aviários de criação de frangos de corte no município de Bom Princípio, Rio Grande do Sul, Brasil. Foram registradas 15 espécies de aves silvestres dentro dos aviários e 24 espécies no entorno. Em média, 76 e 67 aves silvestres por visita estavam presentes nos aviários "A" e "B" respectivamente, sendo *Columbina talpacoti* e *Sicalis flaveola* as com maior abundância em ambos. Observou-se que existe diferença significativa na abundância de aves silvestres nos aviários durante os diferentes estágios de desenvolvimento das aves de corte. A maior abundância ocorreu no período de manutenção e preparo da cama, seguido do período dos primeiros dias após a chegada dos pintos aos aviários. Os locais com maior freqüência de ocorrência de aves silvestres dentro dos aviários foram: o chão do aviário o telhado, o depósito de ração e comedouros. Desta forma, aves silvestres que visitam aviários e interagem com outras espécies podem ser aves de ligação na dispersão de diferentes tipos de vírus.

**PALAVRAS-CHAVE:** avicultura, aves de ligação, aves silvestres.

**ABSTRACT:** Interaction between wild and domestic birds is considered a factor in the occurrence of various diseases during the industrial, commercial or domestic production of birds. Between February and October 2006, seven surveys were carried out to determine the occurrence and interaction of wild birds at two poultry houses in Rio Grande do Sul, Brazil. A total of 15 wild bird species were recorded in the poultry houses, and 24 in the surrounding environment. On average, 76 and 67 wild birds were present in poultry houses "A" and "B" respectively. The Ruddy Ground-Dove (*Columbina talpacoti*) and Saffron Finch (*Sicalis flaveola*) were the most abundant at both sites. There was a significant difference in wild bird abundance during different poultry development stages. The greatest abundance occurred during the maintenance and preparation of poultry litter, followed by the initial days following the supply of new chicks. The floor, roof, feeders and feed storage rooms had the greatest frequency of occurrence of wild birds. Wild birds that visit poultry houses and interact with other bird species may be agents in the dispersion of viruses.

**KEY WORDS:** aviculture, link birds, wild birds.

The constant reduction in natural environments has favored the colonization of human environments (Sander and Voss 1982, Sick 1984, Marreis and Sander 2006), in which wild species interact with domestic and commercial species, thereby increasing the possibility of the emergence of zoonoses. Animal migration facilitates the dissemination of disease (Petry *et al.,* 2006), such that the occurrence of emergent diseases in the northern hemisphere can be transported by migratory birds along latitudinal and longitudinal routes to the southern hemisphere (Hyman *et al.,* 1986). In different regions of the world, the avian influenza virus has been isolated in wild and domesticated birds (Panigrahy 1997), indicating an asymptomatic presence (Petry *et al.,* 2006) and the possibility of its dispersion among different species of vertebrates. Waterfowl and other wild species are the main source of dissemination of the different subtypes of the avian influenza virus (Friend and Franson 1999) and are responsible for the periodic circulation of new forms of the virus, with different degrees of pathogenicity among bird species (Webster *et al.,* 1992; Alexander 2000, Perkins and Swayne, 2003, Webster *et al.,* 2006).

Contact among poultry and wild birds is responsible for the occurrence of outbreaks of influenza in industrial, commercial and domestic poultry farming (Alexander 2000). Different forms of avian influenza have been detected in eighty species of wild birds, which can become asymptomatic. They disseminate viruses either through

direct contact with other birds or through secretions, feces, feed, water and broken egg shells, as well as contaminated equipment, vehicles and clothing (Kida *et al.,* 1980, Ito *et al.,* 1995, Martins 2001).

In Brazil, studies carried out by Aranku *et al.* (1971, 1976) detected influenza virus in both resident and migratory birds, as well as domestic fowl. The virus has been detected in wild ducks (*Dendrocygna viaduta*) and in the cages of exotic birds (Salcedo 1980), as well as in samples collected in 1997/1998 of resident and migratory birds (Kawamoto *et al.,* 2005). Serological studies carried out in different states of Brazil have recorded the presence of different subtypes of avian influenza virus (Ministério da Saúde 2004), and indicate a focal point of Newcastle disease in chickens raised in a subsistence regimen in the municipality of Vale Real in the state of Rio Grande do Sul (Ministério da Agricultura, Pecuária e Abastecimento 2006).

There are no studies in Brazil that indicate what species of wild birds visit poultry houses or when they appear with greater abundance. Such data are of considerable importance to the establishment of management and conservation actions directed at wild birds as well as control actions in the production of poultry. The aim of the present study was to identify the wild birds that visit two poultry houses in a commercial and domestic poultry production zone in the state of Rio Grande do Sul, Brazil, as well as to track their interactions and determine which species are found in the areas surrounding the poultry houses.

## MATERIALS AND METHODS

### Study Area

The study was carried out at two poultry houses located 150 meters from the RS 122 roadway, km 33 (29°25'53"S; 051°21'11"W), in the municipality of Bom Princípio, Rio Grande do Sul, Brazil. The poultry houses are located in a developed area in the portion of the state known as the Central Depression, at 37 m above sea level, on the slope of the Central Plateau. The two houses are at a distance of 20 m apart and 100 m from the closest secondary forest. Trees are found in the immediate surroundings at a distance of 1 to 3 m, including the Japanese Raisin Tree (*Hovenia dulcis*), Persian Lilac (*Melia azedarach*), Peking Willow (*Salix babylonica*), Humboldt Willow (*Salix humboldtiana*), Japanese Plum (*Eriobotrya japonica*), Guava (*Psidium guajava*), Black Mulberry (*Morus nigra*) and Orange (*Citrus sinensis*), which offer shade to the poultry houses in summer. Poultry House A has a capacity for 10,600 chickens. It consists of a metal structure, asbestos tiles, sides enclosed with chicken wire with a two-inch hexagonal mesh, and automated feed and water dispensers. Poultry House B has a capacity for 5,400 chickens, is constructed in brick and mortar, with ceramic roofing tiles, a brick feed dispenser in its interior, manually-filled feed troughs and an automatic water dispensing system. Both are also equipped with a water atomization refrigeration system and fans.

### Methodology

The study was carried out between February and October 2006, with a total of seven observations. Two field observations were performed per season, except in spring, when only one observation was performed due to maintenance on the poultry houses, which interrupted the study. Two observation points were determined for the surveys, with 15 minutes of observation at each point in each poultry house. These observation points were located at the extremities of each poultry house on opposite sides in order to view all the wild birds passing through the chicken wire, and also to allow a view of both the internal area of the poultry house and the surrounding area. The observations were carried out in the early hours after dawn. The watcher remained on the point marked next to the poultry house with binoculars (10 × 50) and observed the wild birds, as well as which previously defined sites were most visited: a) floor of poultry house, b) feed troughs, c) feed storehouse, d) roof and e) chicken wire. Birds perched on the roof and chicken wire were considered visitors, as their excretions or secretions could be deposited in these locations. Birds observed on the trees near the poultry houses or on the ground were recorded as occurring around the poultry houses. The birds were classified according to status of occurrence in the state of Rio Grande do Sul based on Bencke (2001) and according to geographic distribution based on Ridgely and Tudor (1989), Sick (1997) and InfoNatura (2005).

Statistical analyses were processed on the Systat 12 software program. Student's t-test was used to compare the richness and abundance of wild birds between Poultry Houses A and B. Analysis of variance (ANOVA) was used to compare the abundance of wild birds at the poultry houses in different poultry developmental stages (Krebs 1999). Frequency of occurrence was calculated based on Vielliard and Silva (1990), considering the number of recorded visits by the species either in or around the poultry houses, divided by the total number of observations. This index was expressed in percentage form.

## RESULTS

Fifteen species of wild birds were found visiting the poultry houses and another 24 species were found in the surrounding trees (Table 1). There was no significant

**TABLE 1:** Frequency of occurrence (FO) of spontaneous wild birds that entered the aviaries or were found in the surrounding area from February to October 2006 in Bom Princípio, RS, Brazil. Status of occurrence (SO) according to Bencke, 2001: Resident (R), Migratory (M). Geographic distribution according to Ridgely and Tudor (1989), Sick (1997) and InfoNatura (2005).

| Wild Birds | Within FO (%) | Around FO (%) | SO | Geographic Distribution* |
|---|---|---|---|---|
| *Bubulcus ibis* | 0 | 2.7 | R | NA, CA, SA |
| *Aramides saracura* | 0.2 | 0.3 | R | BR, PY, AR |
| *Vanellus chilensis* | 0.5 | 0 | R | SA, PA |
| *Columbina talpacoti* | 48.7 | 28.9 | R | SA, CA |
| *Columbina picui* | 1.9 | 1.1 | R | BR, AR, BO, CH, CO, PE, PY, UR |
| *Crotophaga ani* | 0 | 2.7 | R | SA, CA |
| *Guira guira* | 0 | 3.3 | R | NA, BR, AR, BO, PY, UR |
| *Ramphastos dicolorus* | 0 | 0.5 | R | BR, AR, PY |
| *Thamnophilus caerulescens* | 0 | 0.5 | R | BR, AR, BO, PE, PY, UR |
| *Furnarius rufus* | 1.4 | 4.9 | R | BR, AR, PY, UR, BO |
| *Elaenia mesoleuca* | 0 | 0.3 | M | BR, AR, PY |
| *Legatus leucophaius* | 0 | 0.5 | M | SA, CA |
| *Pitangus sulphuratus* | 0 | 1.4 | R | USA, ME, CA, SA |
| *Myiodynastes maculatus* | 0 | 0.8 | M | ME, CA, SA |
| *Empidonomus varius* | 0 | 0.6 | M | SA |
| *Tyrannus melancholicus* | 0 | 1.4 | M | USA, ME, CA, SA |
| *Tyrannus savana* | 0 | 2.2 | M | CN, USA, ME, CA, SA |
| *Pachyramphus polychopterus* | 0 | 0.3 | M | SA, CA |
| *Progne tapera* | 0 | 0.5 | M | SA, PA, CR |
| *Troglodytes musculus* | 1.8 | 2.5 | R | NA, CA, SA |
| *Turdus subalaris* | 0 | 0.5 | M | BR, AR, PY |
| *Turdus rufiventris* | 2.7 | 1.6 | R | BR, AR, PY, UR, BO |
| *Turdus amaurochalinus* | 0.4 | 0.8 | R | BR, AR, PA, UR, BO, PE, CH |
| *Mimus saturninus* | 1.2 | 0.8 | R | BR, AR, PY, UR, BO, SU |
| *Coereba flaveola* | 0 | 0.8 | R | NA, CA, SA |
| *Thraupis sayaca* | 0 | 1.4 | R | BR, AR, PY, UR, BO, PE |
| *Thraupis bonariensis* | 0 | 0.5 | R | BR, AR, BO, CH, EC, PE, PY, UR |
| *Tachyphonus coronatus* | 0 | 0.3 | R | BR, AR, PY |
| *Zonotrichia capensis* | 1.8 | 2.2 | R | NA, CA, SA |
| *Sicalis flaveola* | 35.4 | 28.0 | R | SA |
| *Volatinia jacarina* | 0 | 0.3 | R | ME, CA, SA |
| *Sporophila caerulescens* | 0 | 0.3 | R | BR, AR, BO, CO, PE, PY, UR |
| *Coryphospingus cucullatus* | 2.3 | 1.1 | R | BR, AR, BO, EC, GU, PE, PY, SU, UR |
| *Saltator similis* | 0.1 | 0.3 | R | BR, AR, BO, PY, UR |
| *Euphonia chlorotica* | 0 | 1.9 | R | SA |
| *Cacicus chrysopterus* | 0 | 1.4 | R | BR, AR, BO, PY, UR |
| *Molothrus bonariensis* | 1.1 | 1.6 | R | SA, PA, CR, JA, CU, HA |
| *Carduelis magellanica* | 0 | 0.8 | M | SA |
| *Passer domesticus* | 0.6 | 0 | R | NA, CA, SA |

* Geographic distribution: North America (NA), Central America (CA), South America (SA), Argentina (AR), Brazil (BR), Bolivia (BO), Canada (CN), Costa Rica (CR), Chile (CH), Colombia (CO), Cuba (CU), Ecuador (EC), United States (USA), Guyana (GU), Haiti (HA), Jamaica (JA), Paraguay (PY), Panama (PA), Peru (PE), Uruguay (UR), Mexico (ME), Suriname (SU).

difference ($P > 0.05$) in the richness of spontaneous wild birds between Poultry House A (n = 14) and Poultry House B (n = 11).

An average of 76 wild birds were recorded per visit within Poultry House A and 67 per visit within Poultry House B, with no significant difference in the abundance of visiting birds between the two houses ($P > 0.05$). The species with the greatest abundance on a single visit at both poultry houses were *Columbina talpacoti* (maximum/visit = 160) and *Sicalis flaveola* (maximum/visit = 135), when the houses were in maintenance to exchange the batches of chickens. Two *Aramides saracura* individuals were recorded in the interior of Poultry House B during the maintenance period to prepare the litter before receiving the new lot of chicks, when the doors remained open. The colonizing species *Bubulcus ibis* was seen in the surrounding area next to cattle.

Comparing wild birds at the poultry houses during the different poultry development stages, there was a significantly greater abundance ($H = 13.113$; gl = 6.0;

P < 0.05) during the periods of maintenance and repair of the litter to receive a new batch of chicks, as well as in the first few days following the arrival of the chicks.

*Columbina talpacoti* and *Sicalis flaveola* accounted for 84.1% of dominance in the frequency of occurrence within the poultry houses (Table 1). The sites with the greatest frequency of occurrence of wild birds were the floor of Poultry Houses A and B (67% and 51%, respectively), followed by the roof (14%) and feed troughs (10%) at Poultry House A, and the feed storage house (21%) and feed troughs (13%) at Poultry House B. The 14% frequency of occurrence on the roof of Poultry House A was related to the occurrence of *Vanellus chilensis* and *C. talpacoti,* which used this site for perching. In the first days following the arrival of new chicks, wild birds were seen feeding on the floor, but tended to diminish at this site with the increase in frequency of chickens at the feed troughs due to the greater demand for feed and the occupation of empty spaces in the poultry house. During the period of maintenance and litter preparation, 94% of the wild birds fed on the floor, whereas 6% fed at the feed troughs, which remained suspended. Following any disturbance, the first species to return to the poultry houses was *T. rufiventris,* followed by *C. talpacoti* and *S. flaveola.*

## DISCUSSION

Analyzing the richness of visiting wild birds at the poultry houses (n = 15), the species were of small sizes and managed to pass through the two-inch mesh of the chicken wire. Those with the greatest frequency of occurrence were *Columbina talpacoti* and *Sicalis flaveola* (Table 1). The expansion of these species is favored by human activities (Rosário 1996), as poultry houses offer a large amount of food and thereby contribute toward the growth of their populations. According to Alexander (2000), wild birds generally exhibit low degrees of virulence for domestic birds and contact with them is a determinant of transmission. The majority of these small birds can easily be stopped from entering the poultry houses if recommendations of the epidemiological surveillance agencies were followed, including the use of chicken wire with smaller mesh and completely closed poultry houses that impede access to wild birds. *Aramides saracura* was the only larger species recorded within Poultry House B, when the doors were left open. This species is regularly spotted in wet areas near this poultry house and its occurrence within it was likely accidental.

There was a great frequency of visits from wild birds with the habit of eating on the floor of the poultry houses, as feed troughs and feed storage houses are important sites for obtaining food, even in periods of maintenance and preparation of the litter. These sites were visited for the obtainment of leftover feed in all periods of the study, which can become infected, passing the virus on to future batches of chickens (Martins 2001).

During the maintenance and preparation of the poultry houses prior to receiving a new batch of chicks, only the moist parts of the litter were removed and a new layer of saw dust was put down. Through the study, only partial changes of the litter occurred and complete replacement only occurred in each poultry house after raising five or six batches of chickens. Such procedure allows diseases to be transmitted to different batches of poultry raised under different climatic conditions during the year, as feces can transfer infection to susceptible batches (Alexander 2000). The litter removed in either the partial or complete replacement is used as fertilizer in agriculture, where contaminants from the poultry houses can be disseminated to the native avifauna that come into contact with this material if the proper sanitary recommendations are not fulfilled (Ministério da Agricultura, Pecuária e Abastecimento 2002).

Secondary forests near the poultry houses and the sparse availability of trees in the fields lead to wild birds perching on the poultry houses. Moreover, the wet areas surrounding the poultry houses serve as feeding sites and allow the interaction of different species of wild, aquatic birds. Thus, some species of wild birds are adapting well to the human environment, using it for feeding and reproduction and preferring to build their nests on buildings, posts and other areas constructed by humans (Marreis and Sander 2006).

The fruit trees used for shade around the poultry houses are a food source for frugivorous birds, such as *Turdus rufiventris, Turdus amaurochalinus, Turdus subalaris, Saltator similis, Thraupis sayaca, Thraupis bonariensis, Euphonia chlorotica* and *Ramphastos dicolorus.* These trees also serve as sites for perching, resting and interspecies and intra-species interactions of diverse resident and migratory species, which approach and enter the poultry houses and enable the transmission of zoonoses (Petry *et al.,* 2006). *Bubulcus ibis,* seen a few meters from the poultry houses, also merits attention. In Hong Kong, Webster *et al.* (2006) confirmed the presence of the H5N1 virus in egrets, revealing this species as a potential vector. This exotic species reproduces in mixed colonies together with other native egrets and curlews (Threskiornithidae) in the Central Depression of Rio Grande do Sul (Petry and Hoffmann 2002, Petry and Fonseca 2005). Thus, wild species seen in and around poultry houses may serve as a link between other wild avifauna (especially aquatic birds) and poultry.

Throughout the present study, the migratory species *Elanoides forficatus,* visitor from the northern hemisphere, and *Mimus triurus,* visitor from the southern hemisphere, were seen in the proximity of the poultry houses. Kawamoto *et al.* (2005) report the presence of the influenza A virus in *Elaenia mesoleuca, Vireo olivaceus, Sporophila*

*lineola, Sporophila caerulescens, Columbina talpacoti* and *Paroaria dominicana* caught in São Paulo, Brazil. The first two species migrate between the northern and southern hemispheres and there are records of their occurrence in forested areas near the poultry houses studied. *S. lineola* and *S. caerulescens* have also been recorded in fields near the poultry houses and *C. talpacoti* was the species of greatest frequency of occurrence within the poultry houses. Thus, wild birds can inadvertently transmit infection by sharing the environment in which poultry is raised and are listed as possible vectors of avian influenza for the poultry industry (Alexander 1982, Martins 2001).

The predominant poultry system in Brazil employs the most up-to-date technology. Scientific knowledge on production and management with biosafety and the use of properly equipped poultry houses could contribute toward the eradication of avian influenza in the country (Martins 2001). Cases such as Newcastle disease detected in poultry raised in subsistence farming in Vale Real, Rio Grande do Sul and the presence of wild birds in poultry houses are evidence of the possible transmission of zoonoses. One of the most valuable strategies for slowing down viral transmission is virological and epidemiological surveillance, with early detection of cases, the blocking of transmission and timely intervention (Shortridge *et al.,* 2000, Donalísio 2005, Ho and Parker 2006). Besides the adoption of preventive measures, knowing which species visit poultry houses and the sites used for feeding and perching is of summary importance to the adequate control and management of poultry farms, as well as to the quality of Brazilian aviculture and the conservation of wild birds.

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