UNIVERSIDADE FEDERAL DO RIO GRANDE DO SUL

FACULDADE DE VETERINÁRIA

PROGRAMA DE PÓS-GRADUAÇÃO EM CIÊNCIAS VETERINÁRIAS

DIAGNÓSTICO DE DOENÇAS EM AVES SILVESTRES E ORNAMENTAIS

LUIZ GUSTAVO SCHNEIDER DE OLIVEIRA

Porto Alegre

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Orientador: Prof. Dr. David Driemeier

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DIAGNÓSTICO DE DOENÇAS EM AVES SILVESTRES E ORNAMENTAIS

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APROVADO POR:

_____
Prof. Dr. David Driemeier
Orientador e presidente da comissão

_____
Prof[a]. Francielli Cordeiro Zimermann
Membro da comissão

_____
Dr. Helton Fernandes dos Santos
Memrbo da comissão

_____
Dr. Cláudio Estêvão Farias da Cruz
Membro da comissão

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RESUMO

Doenças relacionadas ao manejo estão entre as principais causas de perdas na criação de aves silvestres ou ornamentais em cativeiro. Apesar da urgência em dominar a conservação de espécies em cativeiro, pouco se sabe sobre os fatores limitantes a esses projetos. O objetivo desse trabalho é descrever a ocorrência de enfermidades em aves silvestres em cativeiro, por meio da análise anatomopatológica, microbiológica, molecular, imuno-histoquímica, apresentando os fatores predisponentes observados. Os três artigos apresentados nesse trabalho abordam as causas de perdas em criatórios ou em iniciativas independentes de reabilitação de aves silvestres. O primeiro trabalho discute a casuística de perdas em um plantel de uma diversidade de aves silvestres, incluindo passeriformes, galiformes e musofagiformes. Foram registradas 28 mortes em cinco anos de estudo, em que se constatou que as categorias de maior risco foram as aves jovens e as recém introduzidas, com 40% e 28% das mortes, respectivamente. Além disso, se observou que, quanto à causa, 21% das mortes foram secundárias a infestações parasitárias, e que, excetuando-se três casos de mortes decorrentes de doenças da senescência, todas as demais puderam ser atribuídas a inadequações do manejo. O segundo trabalho relata a ocorrência de um surto de micoplasmose por *Mycoplasma gallisepticum* afetando 12 perdizes chukar, 12 pavões, 19 galinhas ornamentais e 46 exemplares de quarto espécies de faisões, dentre as quais, 36 aves morreram, em um grande aviário comercial. Em um outro evento no mesmo plantel, foi diagnosticada motalidade de 19 perdizes chukar em um grupo de 27, decorrente de histomoníase. Identificaram-se, em ambos os surtos, falhas na realização de quarentena, administração de anti-helmínticos, vacinação, assim como superlotação e higiene inadequada dos recintos. No último trabalho são apresentados casos de osteodistrofia de origem nutricional em cinco aves de rapina jovens, sendo um urubu-de-cabeça-preta, um carcará e três suindaras. Todas as aves foram abondonadas pelos pais e mantidas em cativeiro por criadores leigos, que lhes ofertaram exclusivamente carne desossada ou comida caseira. O diagnóstico dos casos apresentados foi baseado no histórico clínico, nos achados de necropsia e histopatologia, aliado a técnicas complementares. Tendo em vista os resultados obtidos, é possível concluir que o diagnóstico de doenças em aves silvestres em cativeiro e a manutenção de registros

sanitários dos planteis pode auxiliar na implementação de programas de conservação de aves silvestres bem estruturados e com grandes chances de sucesso.

PALAVRAS-CHAVE: Ornitopatologia, enfermidades de aves silvestres, sanidade de aves em cativeiro.

ABSTRACT

Management-related diseases are among the main causes of losses in wild or ornamental bird propagatig projects. Despite the urgency in dominate the conservation of species in captivity, still little is known about the limiting factors to these initiatives. The aim of this study is to describe the occurrence of diseases in wild birds in captivity through the anatomopathological, microbiological, molecular and immunohistochemical analysis, relating them to the predisposing factors. The three papers presented in this study address the causes of losses in aviaries or independent wild bird rehabilitation initiatives. The first study discusses the bird losses in a varied flock of wild birds, including passerines, galliformes and musofagiformes. Twenty-eight deaths were recorded in five years of study, where the highest risk categories were young and newly introduced birds, with 40% and 28% of deaths, respectively. In addition, it was observed that 21% of the deaths were secondary to parasitic infestations, and that, except for three cases of deaths due to senescence diseases, all the others were attributed to management inadequacies. The second study reports the occurrence of an outbreak of mycoplasmosis by *Mycoplasma gallisepticum* affecting 12 chukar partridges, 12 peacocks, 19 ornamental chickens and 46 specimens of four species of pheasants, of which 36 birds died in a large commercial aviary. In another event in the same establishment, the morality of 19 chukar partridges was diagnosed in a group of 27, due to histomoniasis. Failure to perform quarantine, administration of anthelmintics, vaccination, as well as overcrowding and inadequate hygiene of the enclosures were identified in both outbreaks. In the last study, five cases of nutritional osteodystrophy in birds of prey are reported in chicks of a black-headed vulture, a caracara and three barn owls. All the birds were abandoned by the parents and kept in captivity by lay creators, who fed them an all-meat diet or homemade food. The diagnosis of all cases presented in this study was based on the clinical history, on necropsy and hitopathology findings, allied to complementary techniques. Considering the results, we conclude that the diagnosis of diseases in wild birds in captivity and to mantain a sanitary record of the flocks can help in the implementation of well planned and successfull wild bird conservation programs.

KEYWORDS: Ornithopathology, diseases of wild birds, captive birds health.

SUMÁRIO

1. INTRODUÇÃO

Por meio de suas belas plumagens, seus cantos melodiosos e sua capacidade de voar, as aves nos inspiram admiração e encantamento desde tempos remotos. Entretanto, de acordo com dados da IUCN, 2015, aproximadamente 12% das espécies de aves estão ameaçadas de extinção, criando um desafio único na história da humanidade, na defesa desses animais carismáticos. Neste sentido, as alternativas de conservação conhecidas são baseadas em estratégias *in-situ*, que contemplam a preservação dos habitats naturais, e as estratégias *ex-situ*, que preveem a reprodução e a manutenção de estoques genéticos de populações em cativeiro. Apesar da inegável importância da criação de reservas naturais para a conservação de aves ameaçadas, essa é uma estratégia de difícil aplicação, devido a obstáculos econômicos impostos aos países com alta biodiversidade (Azevedo; Young; Rodrigues, 2011).

Exemplos emblemáticos de programas bem sucedidos de restabelecimento de populações de aves em risco iminente de extinção incluem os projetos de conservação e subsequente reintrodução do Condor-da-Califórnia (*Gymnogyps californianus*) e do Grou-americano (*Grus americana*) (McGowan; Taylor-Holzer; Leus, 2016). Podem ser somados a esses, múltiplos outros programas em andamento, com expectativa de crescimento contínuo, devido a uma mudança da opinião pública frente à ameaça de extinção de diversas espécies e ao conhecimento adquirido e difundido por diversos grupos de pesquisa em conservação animal (Seddon; Armstrong; Maloney, 2007).

Entre os maiores desafios associados à manutenção e propagação de espécies em cativeiro estão os problemas sanitários decorrentes de falhas de manejo. No caso da criação de aves silvestres em cativeiro, falhas de manejo podem ser atribuídos a múltiplos fatores, como o desconhecimento da biologia das espécies, incluindo suas necessidades fisiológicas e nutricionais, bem como as suas interações sociais e com o ambiente (Wolff, 1996; Dierenfeld, 1997, Cruz et al., 2011). Somado a isso, há ainda uma grande distância entre o conhecimento dos mecanismos de transmissão, patofisiologia, diagnóstico, tratamento e prevenção das doenças de aves domésticas quando comparado às doenças de aves silvestres (Wolff, 1996).

A mudança do cenário atual de profundo desconhecimento das técnicas de manejo e reprodução de aves silvestres em cativeiro parece residir na documentação e divulgação das observações realizadas em longo prazo. Da mesma forma, as enfermidades de maior ocorrência em aves em cativeiro podem ser reconhecidas por meio da manutenção de registros sanitários cuidadosos, associados ao diagnóstico *post-mortem* e demais exames laboratoriais, como realizado em um estudo em um criadouro de passeriformes no sul do Brasil em um período de dez anos (Cruz et al., 2011).

Em um outro estudo pôde-se concluir que práticas de manejo podem ter interferência direta sobre a ocorrência de doenças parasitárias em aves em cativeiro. Em um plantel de Codornizes-da-Califórnia (*Callipepla californica*), por exemplo, comprovou-se que é possível reduzir drasticamente a infestação das aves por *Eucoleus contortus* por meio da substituição de um piso de areia por um de grade sem contato com o solo, permitindo a interrupção do ciclo evolutivo do nematódeo (Cruz et al., 2016).

Em outras condições, as decisões quanto ao manejo parecem ser controversas, mas os registros podem auxiliar nas tomadas de decisão. Assim, por exemplo, a manutenção de gatos em criadouros de aves, mostra-se um risco potencial para a ocorrência de toxoplasmose em aves, como foi reportado em uma Codorniz-da-Califórnia do mesmo criadouro. A decisão de manter os gatos, entretanto, ainda demonstra ter resultados significativamente mais positivos nessas criações, pois os ratos são considerados uma das principais causas de perdas de aves (Casagrande et al., 2015)

As investigações do mesmo grupo também demonstraram que anseriformes silvestres em cativeiro também estão expostos a riscos ambientais. Um surto de botulismo C foi associado à produção da toxina botulínica no ambiente anaeróbico do lodo nas margens do lago artificial em que as aves eram mantidas. Outros fatores de risco detectados foram as temperaturas elevadas do final do verão e a permanência das carcaças de aves nos recintos, o que possibilita o consumo de larvas necrófagas com altos níveis de toxinas pelas demais aves (Raymundo et al. 2012).

2. OBJETIVOS

2.1 Objetivo geral

Realizar o diagnóstico patológico, associado a técnicas complementares, de enfermidades em aves silvestres em cativeiro, apontando os fatores predisponentes decorrentes do manejo em criadouros e em reabilitação de aves.

2.2 Objetivos específicos

- Descrever os principais problemas sanitários em um criadouro de aves silvestres exóticas em um período de cinco anos e apontar as práticas de manejo associadas à sua ocorrência;
- Demonstrar a ocorrência de surtos de micoplasmose e de histomoníase em galiformes ornamentais;
- Relatar casos de osteodistrofia em diferentes espécies de aves de rapina jovens criadas em cativeiro.

3. ARTIGO 1

Neste item é apresentado o artigo "**Causes of bird losses recorded in a captive-bred wild Bird flock between 2011 and 2015**" aceito para publicação na revista Ciência Rural.

Causes of bird losses recorded in a captive-bred wild bird flock between 2011 and 2015

Luiz Gustavo de Oliveira[1] Gustavo Lipinski[II] Marina Paula Lorenzett[I] Verônica Rolim[I] Sandra Marques[III] David Driemeier[I] Cláudio Estêvão Farias da Cruz[2*]

RESUMO

Este estudo discute as causas de morte de aves registradas em um pequeno criadouro de umas poucas espécies de aves silvestres exóticas. As mortes de 28 aves foram examinadas em um período de cinco anos. Cerca de 40% dos casos ocorreram na primeira semana de vida de filhotes das duas espécies mais numerosas no plantel e essas perdas foram consequentes à desnutrição por falhas no manejo nutricional. Outros 28% de casos ocorreram em aves, recentemente introduzidas, ou em fase de adaptação, no criadouro. Ainda que as aves do plantel sejam frequentemente dosificadas com anti-helmínticos, 21% das mortes no plantel foram secundárias a doenças parasitárias; a maioria afetou aves recentemente adquiridas. Exceto por três mortes que foram associadas com desordens atribuídas à idade avançada, todas as demais foram associadas com inadequações no manejo das aves. Esses resultados sugerem que, em sistemas dessa natureza, as aves recém-nascidas e as recém-introduzidas são categorias críticas que demandam concentração de esforços para o atendimento sistemático de suas necessidades. Tais dados podem ser aplicáveis em

[I]Setor de Patologia Veterinária, Universidade Federal do Rio Grande do Sul (UFRGS), Porto Alegre, RS, Brasil.
[II*]Centro de Estudos em Manejo de Aves Silvestres CEMAS-UFRGS, 95.540-000, Porto Alegre, RS, Brasil. E-mail: claudio.cruz@ufrgs.br Autor para correspondência.
[III]Laboratório de Helmintologia-UFRGS, Porto Alegre, RS, Brasil.

iniciativas de conservação de outras espécies e podem justificar, ainda que parcialmente, a manutenção desses animais, em cativeiro.

Palavras-chave: causas de morte de aves, ***Leiothrix lutea***, ***Callipepla californica***, ***Tauraco livingstonii***, faisões ***Polyplectron*** **sp.**

ABSTRACT

This study discusses the causes of bird deaths recorded in an small aviary dedicated to the breeding of a few exotic, wild bird species. Findings from 28 birds were examined over a period of five years. About 40% of the deaths occurred in the first two weeks after hatching in the two most numerous species in the flock and such losses were mainly a result of starvation caused by inadequate nutritional management. Additionally, 28% of the cases affected recently introduced birds. Despite frequent treatment with anthelmintics; a total of 21% of the deaths in the flock could be attributed to parasitic diseases, most of them in recently acquired birds. Only three of the deaths could be associated with advanced age, all of the further cases were also attributable to management fails. Our results indicate that propagation of these species requires an improvement of the management of the newly hatched and newcomer birds to considerably enhance the flock's performance. Such information may be useful in conservation initiatives and may justify, at least in part, captivity of these animals.

Key words: wild bird management, causes of bird death, ***Leiothrix lutea***, ***Callipepla californica***, ***Tauraco livingstonii***, ***Polyplectron*** **sp.** pheasants.

INTRODUCTION

Captive propagation and the subsequent reintroduction of threatened species may also be a tool for bird conservation (HEINRICH, 2009; COLLAR et al., 2012). The environmental and nutritional requirements of species kept in captivity are the major aspects to be addressed in such projects (KARSTEN, 2007). While important questions regarding management limitations in captive breeding programs have been raised (SNYDER et al., 1996; HEMMINGS et al., 2012), little specific and detailed information from bird breeding centers is available (CORK et al., 1999; CRUZ et al., 2011; PEREIRA et al., 2013), albeit this may be useful for planning such conservation initiatives. In this sense, analysis of the financial costs involved (FA et al., 2011; CRUZ et al., 2016) is essential for decision making or planning captive breeding efforts. This paper reports the bird losses recorded in a five-year period from a small southern Brazilian aviary, where a few captive-bred exotic wild bird species are kept.

MATERIAL AND METHODS

Information on management data and history from diseased bird was provided by the owner of the aviary, where data have been systematically recorded. All dead birds, even those in which an obvious cause of death could be recognized by the owner, were submitted for necropsy. Samples from several organs and tissues were collected, fixed in buffered formalin, and processed following standard procedures for histopathology. Hematoxylin and eosin were used for staining. Additional diagnostic tests, including microbiological and toxicological assays, were performed as needed.

During the experimental period, about 40 birds were kept in the aviaries; most of them in planted outside aviaries during the breeding season (September to January)

and in aerial wire mesh floored enclosures during the rest of the year. The complete area of the aerial enclosures is covered by a roof, as well as both corners of the outside aviaries. Consumption of food items by most of the species kept in the aviaries has been reported in a previous study (CRUZ et al., 2016). Pekin robins (***Leiothrix lutea***) are fed commercial softbill ration, fruits (mostly apple and papaya), boiled egg meal, live insects (bought, bred, collected, and trapped), and invertebrates (collected). Livingstone's turacos (***Tauraco livingstonii***) are fed fruits, vegetables, boiled egg meal, and a few live mealworms (***Tenebrio molitor***). California quail (***Callipepla californica***) are fed seed mixture, commercial quail ration, vegetables (mostly lettuce), boiled egg meal, and a few live mealworms and termites. In addition to the diet fed to quail, peacock pheasants (***Polyplectron emphanum*** and ***Polyplectron bicalcaratum***) also received a mix of chopped and crystallized fruits, broken maize seeds, giant mealworms (***Zophobas morio***), and collected ***Scolopendra* sp.**, spiders, caterpillars, etc. In this aviary, reproduction has been kept to a minimum only for maintaining the flock, whose number remained stable throughout the experimental period. All the tasks in the aviary are performed by the aviary's owner.

RESULTS AND DISCUSSION

Bird losses recorded in the period are presented in Table 1. Most losses affected newly hatched Pekin robin and California quail chicks, which also were the most numerous bird species in the flock. Most of these chicks showed a lack of feed in their digestive tracts and probably died due to starvation, associated with difficulties in the learning process of feed intake (artificially incubated quail chicks). In a previous study, the supply of insects in the breeding of Pekin robin nestlings has been associated with a relative lack of insects for the parents for feeding their

nestlings (CRUZ et al., 2011). A total of 10% of the quail chicks hatched annually died within the first week after hatching, most of them were kept in a heated enclosure with a nanny quail (***Coturnix japonica*** or ***Coturnix chinensis***) (Figure 1), which may stimulate food uptake in chicks. Only one quail chick that was kept with its parents has died in a similar condition. While allowing the hen to incubate their eggs may diminish egg-laying rates, the viability of the chicks raised with the parents tends to be higher in comparison with that of the former method (CORDER, 2011). In the study period, a total of 11 Pekin Robins and 25 California quails were successfully raised.

The loss of four newly acquired California quails due to complications associated with severe ***Eucoleus contortus*** infection has been described previously (CRUZ et al., 2015), including the measures applied for controlling the parasitosis. A systemic and fatal case of toxoplasmosis affecting a recently introduced California quail has also been reported (CASAGRANDE et al., 2015). A three-year-old Pekin robin died after suffering from a gizzard inflammation and obstruction by ***Acuaria spiralis*** worms (Figure 2). At this age, this bird had been dosed three times with a fipronil/methoprene combination (2 and 1 mg) and three times with pour on selamectin (2 mg). The last dose was performed 40 days before its death. The bird died 48 hours after appearing ill. The arthropods woodlice ***Porcellio*** sp. and ***Armadillidium*** sp. have been shown to serve as intermediate hosts for ***Acuaria spiralis*** (= ***Dispharynx spiralis***) (CRAM, 1931). The presence of the parasite in some bird species has sporadically been reported (BOLETTE, 1998; BARTMANN & AMATO, 2009). Many live insects and arthropods have been offered to these Pekin robins. While the owner has never offered woodlice to the birds, these arthropods are sporadically present in the grounds of the outside enclosures and it is possible that the

bird had hunted and ingested an infected woodlouse. In addition, the possibility that other arthropods could serve as intermediate hosts cannot be excluded. All the remaining Pekin robins were captured, dosed with oral levamisol (2 mg), and had two consecutive negative fecal samples in parasitological tests, before being released back in the outside aviary, which had its bedding material (gravel) exchanged and limed. Bedding exchange and liming were performed twice annually in the planted outdoor enclosures.

Two aged Pekin robins (12 and 18 y-o) died due to wasting associated with blindness secondary to cataracts (Figure 3A). A previous failure in an attempt to treat the disorder (CRUZ et al., 2011) has discouraged us to try again. Contrary to the evidence recorded in free-living Pekin robins (MALE et al., 1998), the captive birds have lived much longer (CRUZ et al., 2011) and therefore, may present age-related disorders such as cataracts and wasting (WILLIAMS, 1994). A nine-y-o Pekin robin was found dead one morning after a severe nightly storm. While Pekin robins usually choose good cover branches as night roosting places, this bird may have been scared by thunder and flown to unprotected areas, becoming wet and dying of hypothermia. While both corners of the enclosure had water proof covers, as recommended to minimize such losses (KARSTEN, 2007), this bird was completely wet. As an aggravating factor, the bird had a large ventral abdominal hernia (which had been developing since he was three years; since then, it has been increasing from the size of a pea to the size of an olive), possibly providing additional surface for heat loss, since it was prominent over the feather cover (Figure 3B).

Fatal egg-binding affected two first-time-laying California quail females. The birds were 10 months old and still kept with young males in the same aerial enclosure. During non-breeding seasons, California quails are usually kept together

for maintaining high stocking bird density in the enclosure. In this manner, there is no territory to defend and such territorial birds can be cared for more easily. Young hens, calcium and/or vitamin D deficiency, obesity, stress, and cold weather, among others factors, have been listed in the disorder's etiology (KARSTEN, 2007). Birds were in good body condition and have been regularly supplemented with crushed eggshell. However, probably young age, lack of sunlight, and stress associated with overcrowding have acted as determinant factors in such cases. One of them was found dead and the other was placed in a heated cage, where it died 1/2 hour later. Several authors recommend placing the affected bird in a heated environment as a therapeutic measure for this condition (VINCE, 1996; KARSTEN, 2007). Additional six hens (quails and pheasants) have been affected by this condition (mostly at the beginning of the breeding seasons) in the aviary within the study period and could be successfully treated through immediate intervention: injecting mineral oil into the cloaca (1 ml/100 g bw) and gently pressing and pushing the egg out after restraining the bird with a towel.

Rats used to be the top predators in these aviaries (CRUZ et al., 2011); however, rigorous rat control has completely prevented such cases. Although controversial, we have reported that cats may help in controlling rodents in the aviary grounds (CASAGRANDE et al., 2015). A recently acquired 90-d-o Livingstone's turaco had its head and viscera eaten by a young skunk that entered the cage through the slot (4 x 2 cm) of the sliding door latch. A 6-y-o female Pekin robin was dead one morning after ingesting an assassin bug (***Ricolla* sp.**, Reduviidae) the previous afternoon. Usually, assorted insects (Figure 4) collected by sweeping a net on the top of plants are offered to these birds. Immediately after taking the bug, the bird

presented torticollis, and dyspnea. The sting from this insect has been associated with severe pain and inflammation (WATKINS, 2012). Attempts to capture the bird failed, since it was not interested in additional insect in the trap and a net capture was not tried to avoid disturbing the birds in the evening. Laryngeal swelling and diffuse pulmonary edema were associated with inflammatory infiltrates, findings which are consistent with anaphylaxis. A 2-y-o female Pekin Robin died 1 hour after it was found at the bottom of the aviary presenting extreme distress, blood stained feathers, and severe head lesions. This had happened during day time and the most probable cause was aggression by its sister, probably due to a dispute following the attention from a male Pekin robin kept in the contiguous enclosure. Diffuse pallor was evident at necropsy.

A newly acquired 11-mo-o grey peacock pheasant (***Polyplectron bicalcaratum***) died after presenting apathy and complete lack of food ingestion over a period of 18 days. The bird showed apparent interest in food items, but only was observed drinking water and did not even take insects. Periods of improving and worsening were noticed after forced feeding. The bird was kept in a heated environment. At necropsy, a 1.5 cm diameter rock was found within the ileum; in the previous segment, a dilated gut was evident (Figure 5). Microscopically, a focally extensive necrotic and hemorrhagic area affected the ileal mucosa and was associated with fibrin deposition, inflammatory infiltrates, and basophilic bacterial myriads. Sand boxes are usually placed in the Galliformes' enclosures for bathing (Figure 5, inset). Often, rocks are mixed with the sand, from where probably the bird ingested that one which caused its death. New arrivals may become stressed, confused and

consume such strange bodies (VINCE, 1996). Sifting the sand to be used for newcomers has been established in the aviaries as a preventive measure.

An 8-y-o male Palawan peacock (***Polyplectron emphanum***) died after showing anorexia and severe weakness that lasted for three weeks, a period in which it was force-fed every two days. The bird had been kept in these aviaries for four months and the owner reported that it never appeared to be completely healthy. While showing an excessive appetite and promptly taking numerous and assorted insects and invertebrates, the bird often remained lethargic for long periods. Its mate had laid and incubated four eggs in that breeding season, but not even one egg was fertile. Moderate multifocal infiltrate and diffuse congestion were observed in numerous organs; in the lungs, there were extent multifocal areas with severe infiltrates with heterophils and macrophages, associated with coccoid and bacillary bacterial myriads, cellular debris, and blackened granular material filling the parabronchial lumen. Death was probably secondary to septicemia due to aspiration pneumonia caused by reflux linked to force-feeding (TULLY & HARRISON, 1994).

CONCLUSIONS

While all the management is performed by the aviary's owner, who has tentatively adopted adequate management practices, the results presented here indicate that in such programs, newly hatched and newcomer birds should be managed at higher levels of care. In this sense, housing the California quail in a wire mesh-floored outside the breeding season and allowing the quail couples to incubate their eggs and raising their chicks in properly installed enclosures (sand floored, sunny, and planted aviaries) have improved the health of the quail colony (CRUZ et

al., 2015). In addition, plenty and diverse live food items are essential for achieving high Pekin robins' nestling survival rates (CRUZ et al., 2011 and 2016). The aforementioned practices could have prevented most losses described here. Many of the further losses were associated with unique situations, based on which the owner has improved the preventive practices applied in the aviary. Although the information presented here is based on a specific case, it includes data on species with diverse behaviors and habits; therefore, it may be extrapolated for other, but similar species.

ETHICS COMMITTEE

This study is included in the project 26308 - Management of wild bird flocks, which has been approved by the UFRGS' Ethics Committee in 2015.

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Table 1 – Bird losses recorded in a softbill breeding aviary in Southern Brazil, 2011-2015.

Affected birds	**n**	**Probable cause of death**
1-we-o *Callipepla* chicks	09	Starvation
1-we-o *Leiothrix* chicks	03	Starvation
Callipepla californica[#]	04	Secondary to *Eucoleus contortus* parasitism
Callipepla californica[#]	01	Fatal acute toxoplasmosis
Leiothrix lutea	01	Gizzard obstruction, *Acuaria spiralis*
Leiothrix lutea	02	Multiple weakness, aged birds
Leiothrix lutea	01	Hypothermia, aged bird
Callipepla californica	02	Egg-binding
Tauraco Livingstonii[#]	01	Predation
Leiothrix lutea	01	Anaphylaxis, Hemiptera sting
Leiothrix lutea	01	Conspecific traumatism
Polyplectron bicalcaratum[#]	01	Intestinal obstruction
Polyplectron emphanum[#]	01	Aspiration pneumonia

newly acquired

Figure 1. – A heated enclosure with 1- to 5-d-o California quail chicks. A nanny male ***Coturnix chinensis*** stimulates the chicks to take food items and provides shelter under his wings at night.

Figure 2. – A dead 3-y-o female Pekin robin (***Leiothrix lutea***) with a dilated gizzard evident through the abdominal wall. Inset: numerous nematodes (arrows) ***Acuaria spiralis*** agglomerated near the pylorus.

Figure 3. – A 12-y-o Pekin robin (***Leiothrix lutea*****)** affected by cataracts (A) and a 9-y-o Pekin robin presenting a large and ventral abdominal hernia (B).

Figure 4. – Assorted insects collected by sweep net. Note an assassin bug (***Ricolla* sp.**, Reduviidae) (arrow) among other insects, mostly grasshoppers and leafhoppers. Inset: detailed aspect of an assassin bug.

Figure 5. – Aspect of the intestines from a grey peacock pheasant (***Polyplectron bicalcaratum***) presenting a dilated segment anterior to an intestinal obstruction by a rock. Inset: sand box in a temporary enclosure in which a newcomer couple of grey peacock pheasants (***Polyplectron bicalcaratum***) were being adapted.

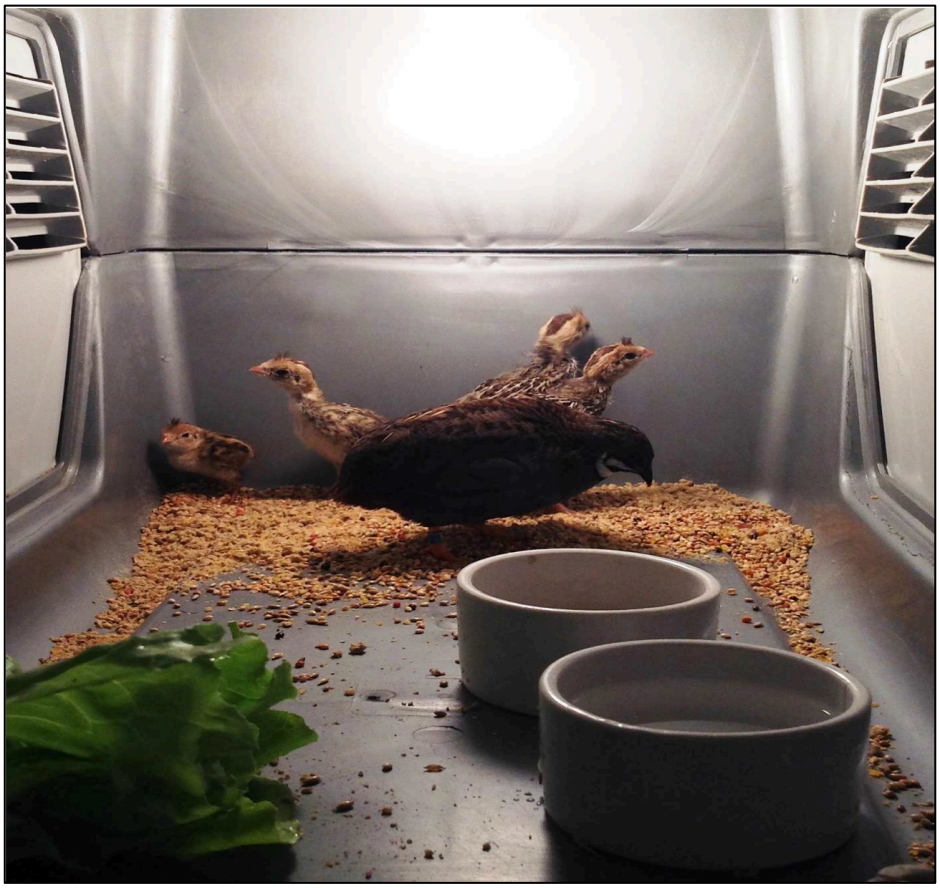

Figure 1.

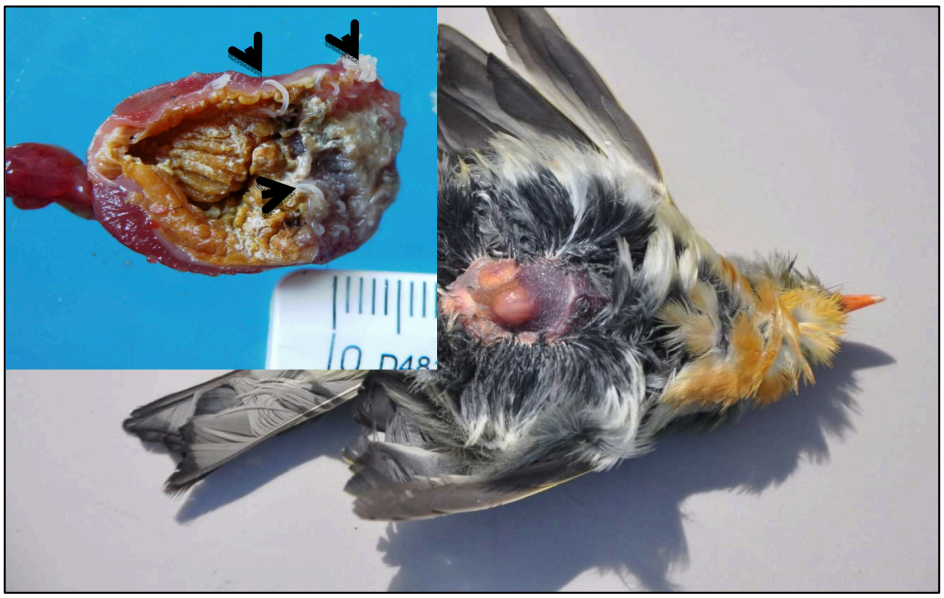

Figure 2.

Figure 3.

Figure 4.

Figure 5.

4. ARTIGO 2

Neste item é apresentado o artigo "**Outbreaks of mycoplasmosis and histomoniasis in a Southern Brazilian flock of ornamental birds**" submetido para publicação na revista Acta Scientia Veterinaria.

Outbreaks of Mycoplasmosis and Histomoniasis in a Southern Brazilian Flock of Ornamental Birds

Luiz Gustavo Schneider de Oliveira[1], Fabiana Marques Boabaid[1], Marina Paula Lorenzett[1], Veronica Rolim[1], Helton Fernandes dos Santos[2], David Driemeier[1] & Cláudio Estêvão Farias Cruz[3]

[1] Setor de Patologia Veterinária (SPV), Universidade Federal do Rio Grande do Sul (UFRGS), Porto Alegre, RS, Brasil.
[2] Laboratório de Virologia, Instituto de Ciências Básicas da Saúde (ICBS), UFRGS, Porto Alegre, RS, Brasil.
[3] Centro de Estudos em Manejo de Aves Silvestres (CEMAS/UFRGS), Porto Alegre, RS, Brasil. CORRESPONDENCE: C. Cruz [claudio.cruz@ufrgs.br – Tel.: +55 (51) 33086107]. Faculdade de Veterinária, UFRGS. Av. Bento Gonçalves, nº 9090. Bairro Agronomia, CEP. 91540-000. Porto Alegre, RS, Brasil.

ABSTRACT

***Background*:** Infectious diseases have expanded their host and geographic ranges, increasing impacts on both human and animal health. *Mycoplasma gallisepticum* usually causes avian chronic respiratory conditions and *Histomonas meleagridis* infects the cecum and the liver of poultry. Although these diseases have been reported in several bird species, information associated with their prevalence and impact in local flocks of ornamental birds is scarce. This communication describes severe outbreaks of mycoplasmosis and histomoniasis that affected a southern Brazilian commercial flock of ornamental birds.

***Case*:** The outbreaks occurred in an ornamental bird flock that contained 2,340 birds from 39 different species, distributed mostly in the orders Galliformes, Anseriformes, and Psittaciformes. *Mycoplasma gallisepticum* affected 12 chukar partridges, 12 Indian peacocks, 19 ornamental chickens and 46 individuals of four species of pheasant. The disease cases were distributed between April and July 2015. A total of 36 birds died due to the disease' complications and most surviving birds suffered from severe ocular sequels, which determined their subsequent culling, despite attempts of different treatment protocols. The main signs included coughing, sneezing, infraorbital swelling, wasting, and death which were mostly associated with caseous sinusitis. Affected birds had positive samples when stained with anti-*Mycoplasma gallisepticum* immunohistochemistry and tested by *Mycoplasma gallisepticum*-Polymerase Chain Reaction. The application of two doses of a

Mycoplasma gallisepticum vaccine in early 2016 to all the Galliformes in the flock reduced the annual prevalence to four clinical cases. Histomoniasis affected and killed 19 out of 27 chukar partridges that were being kept with ring-necked pheasants in the same enclosure. The disease occurred between September and December 2016 and a high prevalence of *Heterakis gallinarum* was detected in the flock. The main findings included apathy and death linked to hepatic and cecal necrosis. Admixed in the necrotic areas, there were numerous round to oval, eosinophilic, protozoal trophozoites of 15–20 μm in diameter, occasionally containing a 3–5 μm centrally located basophilic nucleus (histomonads) surrounded by a clear halo. Anthelmintic dosing, exchanging and liming the bedding material of the enclosures, and keeping the remaining partridges in an aerial aviary with a wire mesh floor prevented additional cases of histomoniasis.

***Discussion*:** In Brazil, as in other countries, the sanitary management practices applied in commercial chicken production reached high levels of technification. However, this is not the case in ornamental bird breeding systems, which may still suffer the impacts of diseases that are practically extinct in industrial chicken flocks. For both diseases, diagnosis was based on typical clinical signs and detection of the pathogens in association with characteristic pathological findings. The occurrence of mycoplasmosis and histomoniasis was associated with improper management practices at the farm; the main risk factors observed were a high turnover of birds, the absence of quarantine, the absence of basic health care, overcrowding and poor hygiene. The prevention of further cases of both diseases was mostly established with the application of basic sanitary measures, including vaccination and anthelmintic dosing, for mycoplasmosis and histomoniasis respectively. This report alerts bird keepers and avian veterinarians of the importance of establishing proper sanitary management in local ornamental bird flocks. Because some of the ornamental bird species that have been commercially propagated worldwide may be included in the list of threatened species, the findings described here also show that simple health care may promote the fight against extinctions.

Keywords: avian diseases, ornamental birds, sanitary management, chukar partridge, pheasants, control.

Descritores: doenças de aves, aves ornamentais, manejo sanitário, perdiz Chukar, faisões, controle.

INTRODUCTION

The bacterium *Mycoplasma gallisepticum* causes chronic respiratory disease of poultry, especially in the presence of stress and/or other pathogens. Typical outbreaks are associated with coryza, sneezing, conjunctivitis and sinusitis, particularly in turkeys and game birds, which are often commercialized as ornamental bird species in Brazil. Mycoplasmas may be transmitted through infectious aerosols and contaminated feed and water [2,6]. Histomoniasis is caused by the protozoan parasite *Histomonas meleagridis* that infects the cecum and the liver of poultry. The disease affects turkeys to a greater extent than chickens or game birds. The parasite is most often transmitted in embryonated eggs of the nematode *Heterakis gallinarum*, which may be harbored by many birds. *H. gallinarum* larvae that are infected with *H. meleagridis* may also be carried by earthworms. Clinical signs of histomoniasis may include reduced appetite, drooping wings, ruffled feathers, diarrhea and sudden death. While vaccination and successful drug therapy have been reported to control mycoplasmosis, appropriate management practices are the most effective control measures [2,6]. Proper management has also been reported as a gold standard preventive practice for histomoniasis, especially general hygiene and housing species separately [4,8]. Although both conditions have been described in several exotic and wild species, there is little information available about the impact of the diseases on Brazilian flocks of ornamental birds. This communication describes severe outbreaks of mycoplasmosis and histomoniasis that affected a commercial flock of ornamental birds in southern Brazil.

CASE

The disease outbreaks occurred in an ornamental bird flock that has been established commercially for up to fifteen years and is located in the Glorinha municipality, Rio Grande do Sul, Brazil. The total flock included 2,340 birds, distributed mostly in the orders Galliformes, Anseriformes and Psittaciformes. The mycoplasmosis cases were observed in birds of both sexes and of 1–4 years old, between April and July 2015. Affected birds included 46 pheasants (18 golden *Chrysolophus pictus*, 15 silver

Lophura nycthemera, 8 green *Phasianus versicolor* and 5 ring-necked *Phasianus colchicus*), 12 Indian peafowl (*Pavo cristatus*), 12 chukar partridge (*Alectoris chukar*) and 19 ornamental chickens, mostly of the Appenzeller and Sebright breeds. The clinical signs included coughing, sneezing, respiratory rales, lacrimation, increased infraorbital volume (Figure 1), wasting and death. Eight dead birds were submitted for necropsy and tissue fragments were collected, processed by standard histological methods, and stained with hematoxylin-eosin. Selected sections were submitted to anti-*Mycoplasma gallisepticum* immunohistochemical (IHC) staining. In addition, samples of tracheal secretion from seven birds were submitted for *Mycoplasma gallisepticum*-Polymerase Chain Reaction (PCR).

The necropsies revealed that the increased infraorbital volume was filled with a translucent, mucous to caseous material (Figure 1D). An infiltrate of macrophages and cellular debris occupied the paranasal sinuses. The PCR confirmed the presence of *Mycoplasma gallisepticum* in four of the seven samples tested. The IHC staining showed positive staining in the air sacs in four cases. During the outbreak period, the farmer implemented some treatment protocols (for example, tylosin, gentamicin and tetracycline administered by oral and/or intramuscular routes, or surgical removal of the infraorbital caseous material), all of which produced low recovery rates. The condition produced a mortality rate of approximately 40%, but most surviving birds suffered from severe ocular sequels and consequently were culled due to commercial devaluation. In February – March 2016, just after the molt, two doses (of 1 drop each) of a *Mycoplasma gallisepticum* vaccine (Myco-Galli MG70®)[1], were provided ocularly 28 days apart to all the Galliformes in the flock. Later that year, during the usual period of the disease's annual occurrence (April-July), only four clinical cases (2 *Polyplectron bicalcaratum* and 2 *Lophura nycthemera*) were observed, and they were successfully treated at the beginning of the clinical course (the stage when the infraorbital edema was just becoming evident). A combination of 0.2 g tylosin (Tyladen®)[2] and 0.5 mg flumethasone (Flucortan®)[3] was splashed onto the birds' eyes using a syringe, twice daily for three days. The birds were released after their wet feathers had been dried with hair dryer.

In this same flock, but in the period September – December 2016, 19 out of 27 chukar partridges (*Alectoris chukar*) were affected and died suddenly. Due to the lack of an

available enclosure, a recently acquired group of partridges, comprising both sexes and ages of 1–2 years, was released into the enclosure in which the ring-necked pheasants were kept. The deaths started 30 days after releasing the birds, but signs of the disease were only noticed for three birds and included apathy, ruffled feathers and diarrhea. Most birds died suddenly. Eight dead birds with good body condition were submitted for necropsy and showed similar findings; the main changes were seen in the liver and cecum and consisted of well-delimited, focal to multifocal areas of hepatic necrosis (Figure 2). The ceca were largely filled with caseous contents and showed expanded and friable walls in addition to multifocal areas of adherences. In the lumen of the small intestine of all birds there were also large amounts of nematode parasites, which were identified as *Heterakis gallinarum* by a parasitological examination.

It was observed with a microscope that there were multifocal, well-delimited areas of massive lytic necrosis with a multifocal moderate infiltrate of macrophages, sometimes containing a granular brown pigment (hemosiderin) and lymphocytes, as well as multifocal areas of mild to moderate hemorrhage. Admixed in the necrotic areas, there were numerous round to oval, lightly eosinophilic, protozoal trophozoites of 15–20 μm in diameter, occasionally containing a 3–5 μm centrally located basophilic nucleus (histomonads), which were either extracellular or intrahistiocytic and surrounded by a clear halo. These structures were positive in Periodic Acid Schiff staining (Figure 3). The cecal walls were also markedly thickened, with multifocal, transmural, lytic necrosis areas with abundant infiltrates of macrophages and lymphocytes. The lumen was sometimes filled with large amounts of amorphous, eosinophilic material mixed with cellular debris and a large quantity of coccoid or coccobacillary structures (Figure 4), as well as numerous protozoal organisms in the necrotic areas, similar to those described in the liver. After dosing the whole flock with oral levamisole[4] (40 $mg.kg^{-1}$ PO), exchanging and liming the bedding material of the enclosures, and keeping the remaining partridges in an aerial aviary with a wire mesh floor, no additional cases were observed. The farmer reported about 50 losses associated with either of the two conditions each year for the last three years.

DISCUSSION

Definitive diagnosis of the two conditions was based on typical signs and lesions [2-8], in addition to complementary IHC [3] and PCR results for confirming mycoplasmosis. High rates of purchase and resale of birds in the absence of appropriate sanitary management (quarantine, routine anthelmintic administration and vaccination), overcrowding, and poor enclosure hygiene were identified as the main predisposing factors in these outbreaks. The difficulties and losses observed in mycoplasmosis cases, despite attempts of different treatment protocols, contrasted with the adequate results observed after disease vaccination. Similarly, the prevention of additional histomoniasis cases could be attributed to the hygienic and sanitary practices applied to the flock [4,11]. In addition to the management of bedding material (exchange and liming), further basic and simple practice such as anthelmintic dosing was effective for the disease control. As was the case in this outbreak, the acquisition of new animals has long been recognized as an important and frequent route for the introduction of new pathogenic agents into the flock [9,11]. The high susceptibility of chukar partridges to histomoniasis, especially when they are kept with resistant species such as ring-necked pheasants, was another risk factor involved in this outbreak [7]. This paper also highlights the valuable role of post-mortem examinations for disease vigilance and control [9,10,11]. However, local breeders of ornamental birds do not tend to adhere to this procedure, as well as many other measures routinely practiced in most animal production systems. Therefore, disseminating the information included here has additional justification. Moreover, since some of the species that are commercially propagated in Brazil, as in other countries, are listed as vulnerable or threatened species in their original environments [5], a higher level of care should be taken for disease prevention. There were records of similar losses to those reported here in at least two additional bird farms visited regularly by our team in 2016. Although it is known that mycoplasmosis and histomoniasis can affect free-range chickens in Brazil [1,3], this communication provides new evidence of the impact that these diseases may have on local flocks of ornamental birds, but also shows that some control measures may be easily performed.

MANUFACTURERS

[1]Biovet, São Paulo, Brazil.

[2]Ceva Saúde Animal Ltda., Paulínia, SP, Brazil.

[3]Zoetis, Campinas, SP, Brazil.

[4]Jansse-Cilag, São José dos Campos, SP, Brazil.

DECLARATION

The authors declare that they have no conflicts of interest. All authors approved the manuscript and its submission to the journal.

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Figure 1. A – Chukar partridge (*Alectoris chukar*) affected with pronounced infraorbital edema. B – Silver pheasant (*Lophura nycthemera*) with ocular and nasal discharges. C – Golden pheasant (*Chrysolophus pictus*) showing conjunctivitis, ocular discharge and increased infraorbital volume. D – Golden pheasant (*Chrysolophus pictus*; pictured in C); infraorbital area filled with caseous material. The three cases were confirmed to be infected with *Mycoplasma gallisepticum*.

Figure 2. Chukar partridges (*Alectoris chukar*) affected with well-delimited, circular to multifocal or coalescing areas of necrosis on the hepatic surface (arrows). There is also large area of cecal necrosis (arrowhead). Both lesions are associated with *Histomonas meleagridis* infection.

Figure 3. Chukar partridge liver with an extensive focal area of lytic necrosis, abundant histiocytic infiltrate and numerous round to oval, 15–20 μm, Periodic Acid Schiff (PAS)-positive, histomonad trophozoites (arrows), which are either extracellular or intracellular within macrophages and have a clear halo. [PAS staining; bar = 50 μm].

Figure 4. Chukar partridge. Cecum with an extensive focal area of lytic necrosis of the intestinal wall and abundant amorphous, eosinophilic cellular debris on the mucosal surface, covered by coccobacillary structures (bacterial colonies). [HE staining; bar = 500 μm].

Figure 1.

Figure 2.

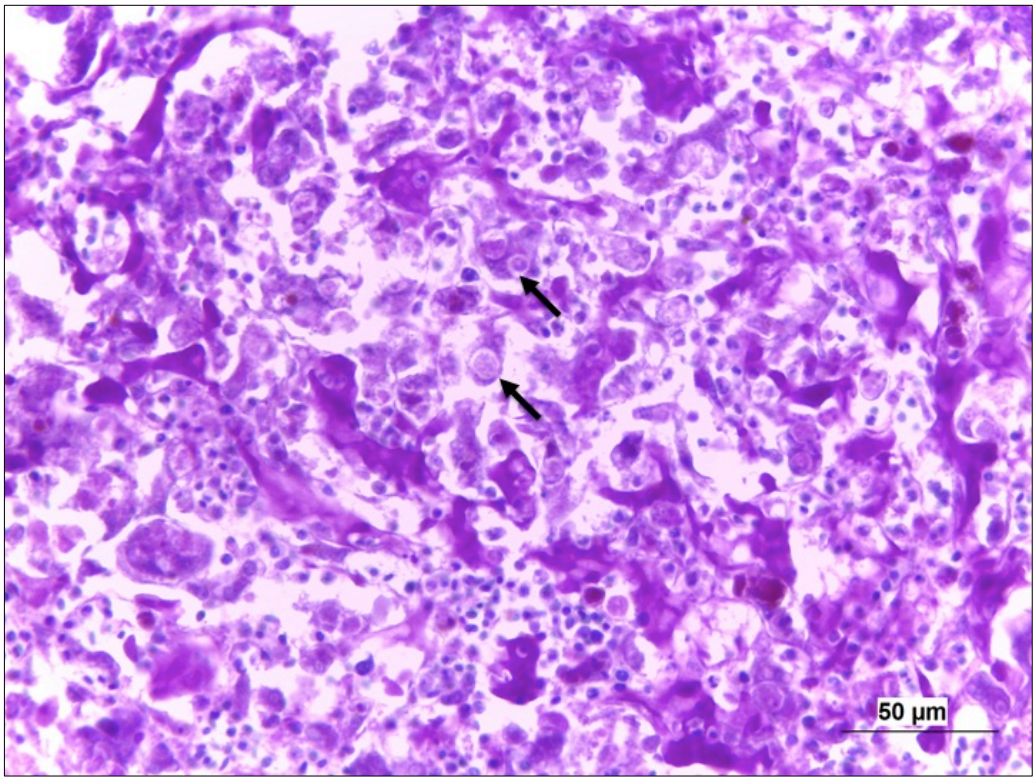

Figure 3.

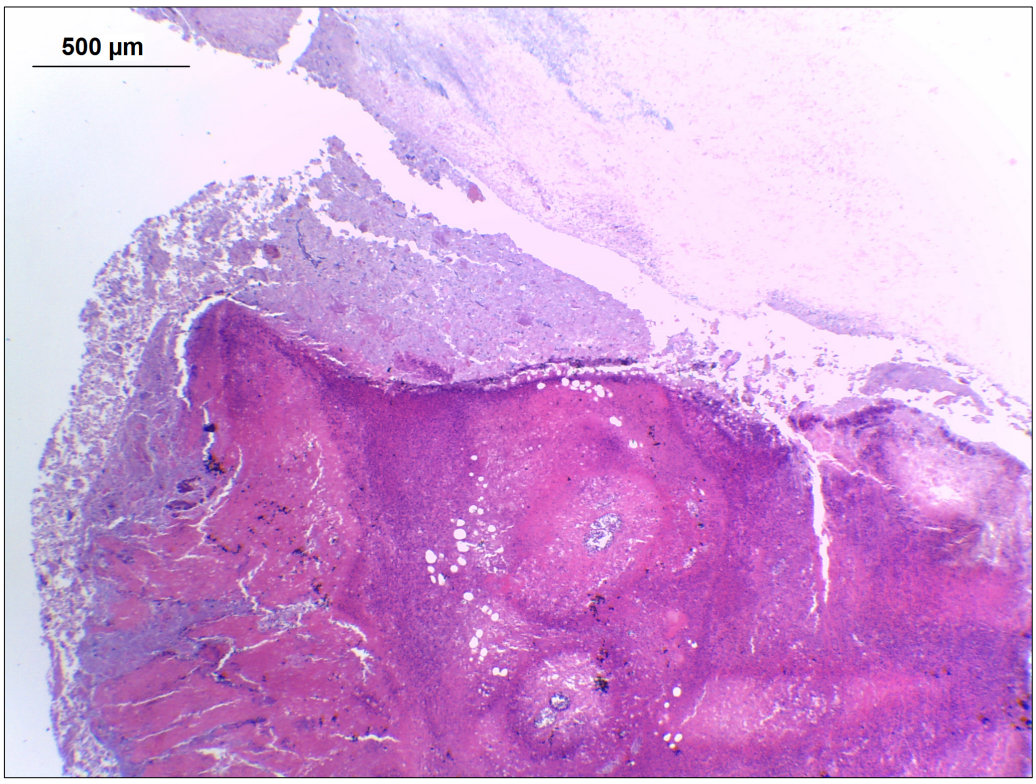

Figure 4.

5. ARTIGO 3

Neste item é apresentado o artigo **"Osteodistrofia nutricional em aves de rapina"** a ser submetido para publicação na revista Pesquisa Veterinária Brasileira.

OSTEODISTROFIA NUTRICIONAL EM AVES DE RAPINA[1]

Luiz G. S. de Oliveira[2]; Fabiana M. Boabaid[2]; Marina P. Lorenzett[2]; Saulo P. Pavarini[2]; Luciana Sonne[2]; Cláudio E. F. da Cruz[3] & David Driemeier[2]

ABSTRACT.– Oliveira, L.G.S., Boabaid, F.M., Lorenzett, M.P., Pavarini, S.P., Sonne, L., Cruz, C.E.F. & Driemeier, D. **[Nutritional osteodystrophy in birds of prey.]** Osteodistrofia nutricional em aves de rapina. *Pesquisa Veterinária Brasileira 00(0):00-00*. Departamento de Patologia Clínica Veterinária, Faculdade de Veterinária, Universidade Federal do Rio Grande do Sul (UFRGS), Av. Bento Gonçalves, 9090, Porto Alegre, RS, 95320-000, Brasil. E-mail: davetpat@ufrgs.br.

Nutritional osteodystrophy or nutritional secondary hyperparathyroidism is a metabolic disease of the bones characterized by increased bone resorption and replacement by fibrous connective tissue, resulting from a diet with excess phosphorus or deficiency of calcium or vitamin D. Five raptor chicks, including a caracara, a vulture and three owls were brought to clinical attendance and were hospitalized in the Hospital of Veterinary Clinics – UFRGS, due to poor development, prostration and locomotor disorders associated with deformed bones and multiple fractures, evidenced by radiographic examination. In addition, diarrhea was observed in the three owls, and dyspnea in the vulture. All birds were free-living juveniles, which were abandoned by their parents and subsequently rescued and fed by lay breeders, who inadvertently provided boneless meat or homemade food. During the clinical care, the birds were supplemented with oral and / or parenteral calcium and give support treatment. Due to poor prognosis, the birds were euthanized and submitted to necropsy. Macroscopic examination revealed poor body condition, skeletal deformities, soft bones with multiple fractures, and increased parathyroid glands. At the histopathological examination, the bones of all birds had scarce mineralized matrix, surrounded by numerous osteoclasts and replaced by fibrous connective tissue, and the parathyroids presented hyperplasia and hypertrophy. Based on the clinical and pathological data and on the history of unbalanced calcium food

supply, the diagnosis of secondary osteodystrophy of nutritional origin was made. The results obtained reinforce the need of adequate feeding for these species in captivity.

INDEX TERMS: Wildlife diseases, raptor medicine, avian pathology.

[1] Recebido em ....
Aceito para publicação em .....
[2] Setor de Patologia Veterinária, Faculdade de Veterinária, Universidade Federal do Rio Grande do Sul (UFRGS), Av. Bento Gonçalves, 9090, Porto Alegre, RS, 95320-000, Brasil.
[3] Centro de Estudos em Manejo de Aves Silvestres (CEMAS/UFRGS), Porto Alegre, RS, Brasil. CORRESPONDENCE: C. Cruz [claudio.cruz@ufrgs.br – Tel.: +55 (51) 33086107]. Faculdade de Veterinária, UFRGS. Av. Bento Gonçalves, nº 9090. Bairro Agronomia, CEP. 91540-000. Porto Alegre, RS, Brasil.
*Autor para correspondência: davetpat@ufrgs.br

RESUMO.– A osteodistrofia nutricional ou hiperparatiroidismo secundário nutricional é uma doença metabólica óssea caracterizada pelo aumento da reabsorção óssea e substituição por tecido conjuntivo fibroso, decorrente de uma dieta com excesso de fósforo ou deficiência de cálcio ou vitamina D. Cinco aves de rapina jovens, incluindo um carcará, um urubu e três corujas, foram atendidas e internadas no Hospital de Clínicas Veterinárias da UFRGS por apresentarem mau desenvolvimento, prostração e distúrbios locomotores associados a ossos deformados e múltiplas fraturas, evidenciadas por exames radiográficos. Além disso, foram constatados diarreia nas três corujas, e dispneia no urubu. Todas as aves eram jovens de vida livre abandonadas pelos pais, que foram resgatadas e alimentadas por criadores leigos, que inadvertidamente forneciam-lhes carne desossada ou comida caseira. Durante a internação hospitalar as aves receberam suplementação com cálcio por via oral e/ou parenteral, e tratamento sintomático. Devido ao mau prognóstico, as aves foram submetidas a eutanásia e encaminhadas para necropsia. À necropsia se observou mau estado corporal, deformidades esqueléticas, ossos facilmente dobráveis e com múltiplas fraturas, além de paratireoides aumentadas de tamanho. Ao exame histopatológico, os ossos de todas as aves apresentavam escassa matriz mineralizada,

circundada por numerosos osteoclastos e substituída por tecido conjuntivo fibroso, e as paratireoides apresentavam hiperplasia e hipertrofia. Baseado nos dados clínicos e patológicos e no histórico de fornecimento de alimento desbalanceado em cálcio, realizou-se o diagnóstico de osteodistrofia secundária de origem nutricional. Os resultados obtidos reforçam a necessidade de uma alimentação adequada para estas espécies em cativeiro.

TERMOS DE INDEXAÇÃO: Doenças de animais selvagens, medicina de rapinantes, patologia aviária.

INTRODUÇÃO

Osteodistrofia é um termo utilizado para designar alterações ósseas do desenvolvimento, que incluem a osteodistrofia fibrosa, também chamada doença óssea metabólica e hiperparatireodismo secundário nutricional. A condição é registrada em equinos, caprinos, suínos (Bandarra et al. 2009, Craig et al. 2016), antílopes (Boulay et al. 1972, Grandi et al. 2011), caninos (Kawaguchi et al. 1993), felinos domésticos (Tomsa et al. 1999), grandes felídeos (Krook & Whalen 2010, Asi et al. 2014), primatas neotropicais (Fowler 1986), lagartos, iguanas, crocodilianos, quelônios (Anderson & Capen 1976, Fowler 1986) e anfíbios (Bruce & Parkes 1950). Em aves a condição é descrita em diferentes grupos taxonômicos, como psitacídeos (Arnold et al. 1973), corvídeos (Tangredi et al. 1999), ardeídeos (Phalen et al. 2005), entre outros. Em as aves de rapina, a enfermidade é reconhecida há séculos por praticantes de falcoaria, estando associada a dietas compostas exclusivamente por carne, sobretudo quando fornecida a indivíduos jovens (Cooper 2002, Carciofi 2007). Este tipo de dieta contém níveis de cálcio relativamente baixos, frente a níveis de fósforo altos (Capen 2007). É sabido que dietas compostas de músculo cardíaco ou esquelético apresentam uma relação de cálcio para fósforo de cerca de 1:20, enquanto dietas compostas de fígado podem apresentar uma relação de aproximadamente 1:50. Por outro lado, como regra geral, a relação ideal entre cálcio e fósforo na dieta é de 1:1, e mesmo relações de 1:2 já podem desencadear anormalidades ósseas (Craig et al.

2016). Os sinais clínicos em rapinantes incluem ossos macios e flexíveis, fraturas espontâneas e distúrbios locomotores, além de sinais neurológicos em estágios avançados (Cooper 2002). As aves aqui descritas são parte de um grupo heterogêneo com adaptações para a atividade predatória. O urubu-de-cabeça-preta é uma espécie de abutre do Novo Mundo, da família Cathartidae, relacionada, de acordo com literatura clássica às cegonhas (ordem Ciconiiformes) (Sick 1997), ou, segundo estudos mais recentes, mais próximo aos demais rapinantes diurnos (Accipitriformes) (Hackett et al. 2008). Os catartídeos possuem hábitos essencialmente necrófagos com atividade predatória oportunista, semelhante aos abutres do Velho Mundo. Os rapinantes diurnos são classificados nas ordens Accipitriformes, que inclui gaviões e águias, e Falconiformes, que compreende falcões e carcarás. Esses últimos são falconídeos neotropicais com características primitivas e hábitos alimentares generalistas. Os carcarás são considerados onívoros, por consumirem presas vivas, incluindo anfíbios, répteis, mamíferos, artrópodes, assim como carcaças de animais mortos e vegetais. As suindaras, por sua vez, são corujas pertencentes à família Tytonidae, da ordem Strigiformes. Predadoras noturnas com parentesco ainda pouco conhecido, as suindaras alimentam-se principalmente de roedores e invertebrados e, raramente, de aves e outros pequenos vertebrados (Sick 1997). A osteodistrofia em aves de rapina deve ser diferenciada de outras desordens ósseas metabólicas, que incluem a osteoporose, ocasionada por desnutrição proteica, o raquitismo, decorrente da carência de vitamina D em filhotes e da osteomalácia, resultante da deficiência de fósforo ou vitamina D em adultos (Carciofi 2007). O objetivo deste trabalho é descrever os aspectos clínicos e patológicos da osteodistrofia secundária nutricional em diferentes espécies de aves de rapina jovens alimentadas artificialmente.

MATERIAL E MÉTODOS

Cinco aves de rapina foram atendidas no Hospital de Clínicas Veterinárias (HCV) da UFRGS e, devido ao mau prognóstico, foram submetidas à eutanásia e encaminhadas ao Setor de Patologia Veterinária da UFRGS. Durante o exame de necropsia todas as alterações macroscópicas foram registras e fragmentos de glândulas paratireoides, tireoides, pulmões, coração, rins e diferentes porções do trato gastrintestinal foram

colhidas e fixadas em solução de formalina 10%, incluídas em blocos de parafina e coradas por hematoxilina e eosina (H&E). Adicionalmente, fragmentos de ossos (fêmur) colhidos à necropsia foram submetidos a descalcificação por ácido nítrico, processadas da mesma forma que os demais tecidos e corados por H&E e coloração de tricrômio de Masson (TM).

RESULTADOS

Foram atendidos no HCV, um carcará (*Caracara plancus*), um urubu-de-cabeça-preta (*Coragyps atratus*) e três suindaras (*Tyto furcata*) jovens, com queixa de problemas locomotores. Tanto o carcará quanto o urubu-de-cabeça-preta haviam sido criados em cativeiro por criadores leigos que forneciam-lhes exclusivamente carne desossada e comida caseira, respectivamente. As suindaras foram encontradas à beira de uma estrada e foram alimentadas com carne desossada, gluconato de cálcio e Glicopan® antes de serem encaminhadas ao HCV. Todas as aves estavam prostradas e com evidente debilidade locomotora, associado a deformidades ósseas severas, visíveis ao exame externo e por meio de estudo radiográfico (Fig. 1), além de ossos macios e facilmente dobráveis, com múltiplas fraturas. Adicionalmente, as três suindaras apresentaram diarreia e o urubu apresentou dispneia. O urubu foi tratado com gluconato de cálcio a 10% (100 mg/kg) por via intramuscular, além de suplemento vitamínico e tratamento sintomático. As suindaras foram suplementadas com fosfato tricálcico e tiveram os membros imobilizados com talas após a internação. Entretanto, devido ao agravamento do quadro clínico, as aves foram submetidas à eutanásia. Ao exame externo se observou mau estado corporal, deformidades ósseas apendiculares, com múltiplas fraturas não consolidadas e calos ósseos além de fezes aderidas à plumagem peri-cloacal. À palpação, os ossos apresentavam consistência macia e maleável, de maneira especial os ossos das maxilas e mandíbulas (Fig. 2). Ao exame interno se observou aumento moderado a acentuado das paratireoides em todas as aves examinadas. Histologicamente a matriz óssea apresentava mineralização marcadamente reduzida e numerosos osteoclastos na periferia das trabéculas. Observou-se ainda, acentuada proliferação de fibroblastos e matriz conjuntiva na região intertrabecular, evidenciada pela coloração de TM. Também haviam áreas

multifocais com perda da continuidade da arquitetura óssea, com deposição de material eosinofílico amorfo e debris celulares (fraturas), por vezes com proliferação periférica de tecido conjuntivo fibroso e formação de matriz cartilaginosa (calo ósseo). As paratireoides estavam hiperplásicas e hipertróficas, com vacuolização citoplasmática das células principais em graus variados em todos os casos. Demais órgãos não apresentaram alterações histológicas significativas.

DISCUSSÃO

As doenças ósseas metabólicas compreendem diversas condições que resultam da deficiência prolongada de cálcio ou vitamina D, ou uma proporção inadequada de cálcio para fósforo na dieta de diferentes grupos de animais (Fowler 1986). A causa do distúrbio nas aves de rapina é, na maior parte das vezes, o hiperparatireoidismo nutricional, decorrente de uma carência relativa de cálcio na dieta (Cooper 1975, Phalen et al. 2005, Carciofi 2007). Visto que a relação ideal de cálcio para fósforo na alimentação dessas aves é da ordem de 1,5:1 (Cooper 1975), uma dieta composta exclusivamente por carne desossada, que possui uma relação de aproximadamente 1:20 a 1:30 (Cooper 1975, Craig et al. 2016), pode causar desequilíbrio na homeostasia do cálcio, semelhante ao que é visto em casos de hiperparatireoidismo nutricional em grandes felídeos em cativeiro (Krook & Whalen, 2010, Asi et al. 2014). Além de seu papel estrutural na composição do osso, o cálcio é determinante no metabolismo neuromuscular e, portanto sua regulação plasmática constante é vital (Carciofi 2007). Níveis elevados de fósforo na dieta diminuem a disponibilidade de cálcio plasmático ionizado e estimulam a secreção de paratormônio (PTH). O PTH se liga a receptores em osteoblastos, que, por sua vez, estimulam a retirada de cálcio ósseo pelos osteoclastos (Capen 2007, Thompson 2007). O resultado é a mineralização óssea deficiente e, em estágios avançados, sinais neuromusculares decorrentes da hipocalcemia (Cooper 1975 Cooper 2002). Nos casos descritos não foram constatados quaisquer sinais neurológicos ou musculares, possivelmente devido à realização da eutanásia antes que os níveis plasmáticos caíssem abaixo dos valores limítrofes. O sinal clínico de diarreia, constatado nas três corujas, é citado como possível manifestação da enfermidade em aves adultas (Wallach & Flieg 1970, Cooper 2002). Baseado na apresentação clínica e patológica, associada ao histórico de

fornecimento de alimento deficiente em cálcio, conclui-se que o hiperparatireoidismo secundário nutricional é a causa da osteodistrofia nas cinco aves, semelhante ao que foi descrito em outras aves de rapina em cativeiro (Toyoda et al. 2010). Apesar de rara em vida livre, a osteodistrofia é descrita em ninhegos de abutres do Velho-Mundo (*Gyps africanus* e *Gyps coprotheres*) em algumas regiões da África (Richardson et al.1986, Abrey 1993). O fato foi relacionado ao desaparecimento de hienas-malhadas (*Crocuta crocuta*), que, quando presentes, maceram os ossos de grandes mamíferos em fragmentos que podem ser ingeridos pelos jovens abutres (Richardson et al. 1986). Na América do Norte também foram registrados casos de osteodistrofia em ninhegos de garças-vaqueiras (*Bubulcus ibis*) em áreas com baixa disponibilidade de pequenos vertebrados, e com isso, a substituição por insetos ortópteros ocasionou a ingestão de níveis insuficientes de cálcio para o crescimento (Phalen et al. 2005). Em cativeiro a doença pode ocorrer em aves alimentadas pelos próprios pais, quando estes selecionam o alimento e fornecem carne sem ossos aos filhotes, o que também pode acarretar em outras deficiências nutricionais. Espécies de rapinantes pequenos que se alimentam predominantemente de artrópodes também estão sob risco quando são suplementados apenas com carne, pois ao contrário do que alguns criadores acreditam, o exoesqueleto desses invertebrados não contém níveis apreciáveis de cálcio (Cooper 2002). O fornecimento de pintos de um dia de idade, utilizados com frequência na alimentação de aves de rapina, também não é satisfatório para aves em crescimento, pois os ossos imaturos dos pintos apresentam apenas valores marginais de cálcio (Cooper 1975). Além disso, é importante ressaltar que há diferentes exigências nutricionais relacionadas com os hábitos alimentares de cada espécie, de forma que os secretários (*Sagittarius serpentarius*), aves africanas essencialmente ofiófagas na natureza, podem sofrer deficiência de cálcio em cativeiro, mesmo quando alimentadas com dieta padrão para rapinantes, visto que as serpentes possuem de altos níveis de fosfato de cálcio (Cooper 2002). Como visto nos casos aqui apresentados, o tratamento da doença óssea metabólica é, via de regra, pouco efetivo. Dessa forma, demonstra-se a necessidade de ampliar a investigação e a difusão de conhecimentos a respeito das necessidades nutricionais na prevenção de condições como a osteodistrofia em aves de rapina.

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Fig. 1. Osteodistrofia nutricional em aves de rapina. **A** - Suindara jovem, prostrada, com talas nas tíbias e tarso-metatarsos, mantida suspensa devido a múltiplas fraturas e fragilidade óssea dos membros. **B -** Exame radiográfico ventro-dorsal, urubu-de-cabeça-preta jovem, observe as deformidades dos ossos longos dos membros, bem como fraturas na porção média dos tarso-metatatarsos.

Fig. 2. Osteodistrofia nutricional em aves de rapina. **A** - Carcará jovem com plumagem do ventre impregnada de fezes e deformidades ósseas evidentes nos tarso-metatarsos. No detalhe a mandíbula da ave é torcida com facilidade. **B** - Urubu-de cabeça-preta jovem com deformidades dos ossos longos.

Fig. 3. Osteodistrofia nutricional em aves de rapina. **A** – Osso longo, suindara jovem, observe as trabéculas marcadamente adelgaçadas e a substituição disseminada do osso alveolar por tecido conjuntivo fibroso, HE. Obj. 10x B - Osso longo, suindara jovem, ao centro, uma trabécula óssea está circundada por numerosos osteoclastos e na periferia há intensa deposição de tecido conjuntivo fibroso, HE. Obj. 40x.

Figura 1.

Figura 2.

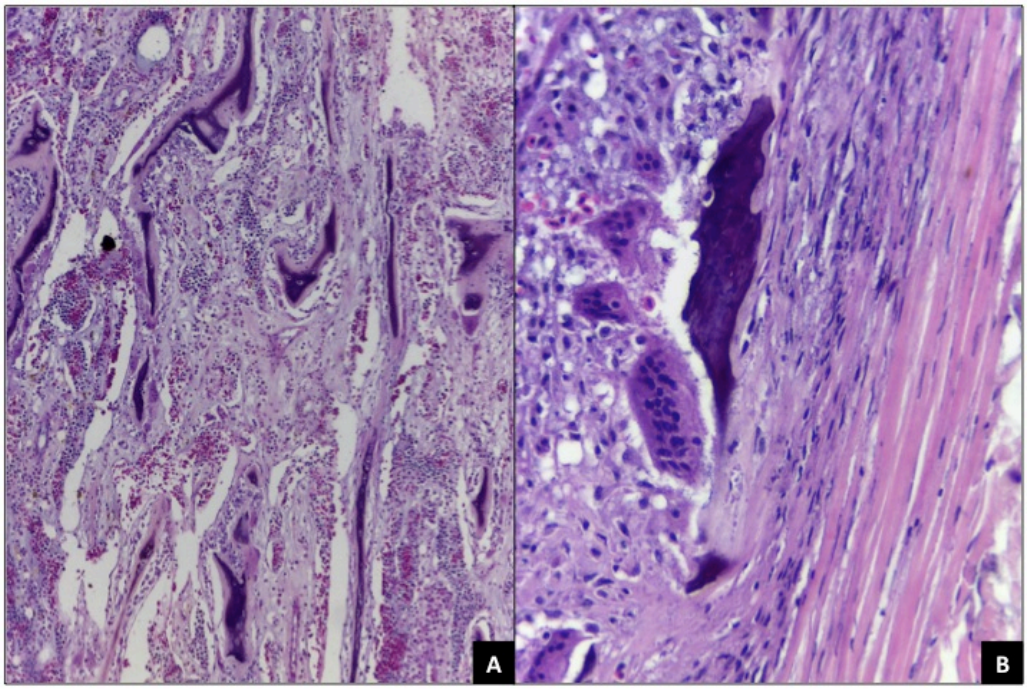

Figura 3.

6. CONSIDERAÇÕES FINAIS

Nesse trabalho foi possível constatar a importância do acompanhamento e registro dos dados relativos à sanidade de planteis de aves silvestres, bem como do manejo dos animais, realizando a correlação desses dados. Assim, por exemplo, em um trabalho abrangendo um período de cinco anos em um criadouro de aves silvestres, entre galiformes, passeriformes e musofagiformes, pôde-se constatar que 40% das mortes ocorreram em aves de até duas semanas de idade e que outros 28% concentraram-se em aves recentemente introduzidas. Tal resultado aponta para a adoção de cuidados intensivos voltados às categorias de risco nessas criações.

Observou-se a ocorrência de enfermidades infecciosas, como a histomoníase em galiformes ornamentais demonstrando a existência de uma relação da sua manifestação com práticas de manejo, como a manutenção de espécies de galiformes com diferentes suscetibilidades em viveiros comunitários com piso constituído por solo, que possibilita o acesso a minhocas, carreadoras das larvas de *Heterakis gallinarum*, transmissor do protozoário *Histomonas meleagridis*.

Da mesma forma, a micoplasmose demonstrou um grande impacto sobre criações de galiformes de diferentes espécies, devido a pouca atenção a períodos de quarentena, vazios sanitários e segregação de lotes. Subsequentemente constatou-se que a vacinação sistemática do plantel é capaz de controlar eficientemente a proliferação do agente entre as aves.

Por outro lado, doenças decorrentes da alimentação inadequada, como a osteodistrofia de origem nutricional puderam ser constatadas em ocasiões em que aves de rapina jovens foram resgatadas e criadas por criadores leigos após o abandono pelos pais. A condição resultou do fornecimento de uma dieta composta principalmente por carne destituída de ossos, o que resulta na carência relativa de cálcio ingerido e dessa forma ocasiona deposição deficiente do componente mineral nos ossos do filhote.

Embora conhecidas há muito tempo, essas enfermidades persistem como alguns dos principais limitantes da criação de aves silvestres em cativeiro, pois

muitas das medidas de manejo associadas com a sua ocorrência ainda são negligenciadas ou mesmo desconhecidas. O registro e divulgação de trabalhos demonstrando as enfermidades mais frequentes e quais os métodos de manejo associados à sua ocorrência podem fornecer subsídios para a criação eficiente de espécies de aves ameaçadas em cativeiro e, dessa forma, representar a possibilidade de salvar a espécie da extinção iminente.

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