

## New reports of helminthes in captive exotic psittacine birds in Chile

### Nuevos antecedentes de helmintos en aves psitácidas exóticas cautivas en Chile

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#### RESUMEN

A pesar de su importancia, la fauna helmíntica de aves psitácidas ha sido poco investigada en Chile. En el presente estudio se reporta la presencia de *Tetrameres* sp. en *Cyanoramphus novaezelandiae*, de *Schistorophus* sp. en *Platycercus flaveolus* y de *Dispharynx nasuta* en *P. flaveolus*, *Platycercus eximius*, *Platycercus elegans*, *Polytelis alexandrae*, y *C. novaezelandiae* en diferentes aviarios de la Región Metropolitana de Chile. Los primeros casos de *Ascaridia platyceri* en *P. eximius* y *C. novaezelandiae* son también descritos. *Ascaridia platyceri* y *D. nasuta* fueron implicados como la causa de enfermedades serias y fatales en estas aves psitácidas exóticas, mientras que *Schistorophus* sp. y *Tetrameres* sp. fueron clínicamente menos significativos.

*Key words:* helminthes, psittacine, birds, parasites.

*Palabras clave:* helmintos, psitácidas, aves, parásitos.

#### INTRODUCTION

Parakeets and parrots from Australia, Africa, Asia and the Pacific region are currently gaining in popularity as pets due to their bright plumage, small to medium size, and ease of breeding in captivity (Levine 2003). The importance of psittacine birds and the fact that they are easily domesticated (Pinto *et al* 1993) emphasize the need to identify their parasites and generate data on potential pathogens. Often, the only means of obtaining such data is mortality in captive birds (Matos and Morrissey 2005).

Among the species of clinically significant helminthes that occur in psittacine birds are liver flukes, and intestinal nematodes such as *Ascarops* sp., *Ascaridia* spp., and *Capillaria* spp. (Sood and Kalia 1975, Webster and Speckmann 1977, Greiner and Ritchie 1999). However, visceral or aberrant hepatic migration by larval ascarids has also been reported in parrots with severe ascariasis<sup>1</sup> (Reece *et al* 1992). Other nematode genera found in the proventriculus and ventriculus are *Tetrameres*, *Dispharynx*, *Spiroptera*, and *Procyrnea* (Clark 1978, Clark *et al* 1979,

Greiner and Ritchie 1999). Nematode parasites can also be seen on the surface of the eye (Anderson and Diaz-Ungria 1959, Greiner and Ritchie 1999), and in the subcutaneous region, air sacs, and body cavity (Greiner and Ritchie 1999).

Ascarids are the most common parasites found in birds that are maintained in enclosures with access to the ground, and infections are particularly common in budgerigars and cockatiels, while proventricular parasitism by *Dispharynx* spp. is a common finding in Australian parakeets (Levine 2003). The helminth fauna of psittacine birds has been poorly investigated in Chile, where the population of captive psittacine birds consists of 4 species of native psittacine birds and exotic parrots. There is only a single report on the presence of helminthes (*Ascaridia hermafrodita*) in two captive female specimens of the slender-billed parakeet (*Enicognathus leptorhynchus*), found dead at the National Zoo of Santiago, Chile (Gonzalez-Acuña *et al* 2007). The purpose of the study is to report new helminthes in exotic captive psittacine birds in Chile and supplement existing reports of endohelminthes from America.

#### MATERIAL AND METHODS

Helminthes were collected from 11 out of 30 (36.7%) captive psittacine birds which died between 2003 and 2008 in the Metropolitan Region of Chile. The following parrots species were investigated: 2 *Cyanoramphus novaezelandiae*, 1 *Platycercus flaveolus*, 7 *Platycercus*

Accepted: 02.06.2011.

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<sup>1</sup> Charles WB, KS Latimer, EW Howerth, GH Wilson. 1998. Aberrant hepatic ascarid migration in a blue fronted Amazon parrot (*Amazona aestiva*). <http://www.vet.uga.edu/vpp/ivcvm/1998/brockus/index.php>, accessed November 1, 2008.

*eximius*, 3 *Platycercus elegans*, 3 *Polytelis alexandrae*, 2 *Psittacula krameri*, 1 *Pionus menstruus*, 3 *Neophema bourkii*, 4 *Agapornis roseicollis*, 1 *Agapornis fischeri*, 3 *Agapornis personatus* (table 1). The parasites were collected from birds from four outdoor private collection sites: a 2 year old female Eastern rosella (*P. eximius*) and a male Yellow rosella (*P. flaveolus*) from aviary A with a population of 188 psittacine birds; a 3 year old male *P. eximius* from aviary B with more than 200 psittacine birds; a 3 year

**Table 1.** Total of species of exotic psittacine birds sampled from 4 private collections in the Metropolitan region, Chile, 2003-2008.

Total de especies muestreadas de aves psitácidas exóticas procedentes de 4 colecciones privadas de la Región Metropolitana, Chile, 2003-2008.

Species	Total
<i>Cyanoramphus novaezelandiae</i>	2
<i>Platycercus flaveolus</i>	1
<i>Platycercus eximius</i>	7
<i>Platycercus elegans</i>	3
<i>Polytelis alexandrae</i>	3
<i>Psittacula krameri</i>	2
<i>Pionus menstruus</i>	1
<i>Neophema bourkii</i>	3
<i>Agapornis roseicollis</i>	4
<i>Agapornis fischeri</i>	1
<i>Agapornis personatus</i>	3

old female red-fronted parakeet (*C. novaezelandiae*) from aviary C with a population of 50 psittacine birds; and 2 *P. eximius*, 3 Crimson rosellas (*P. elegans*) and 2 Princess parrots (*P. alexandrae*) from aviary D with a population of 61 psittacine birds. Samples of nematodes recovered from these birds were deposited in the Parasitological collection of the Laboratory of Parasitology, Faculty of Veterinary Sciences, University of Chile, and in the helminthological collection of the University of Concepción, Chile. The number of samples obtained (parasites), according to each host species were: 4 from *P. eximius*, 2 from *P. flaveolus*, 3 from *C. novaezelandiae*, 3 from *P. elegans*, and 2 from *P. alexandrae* (table 2). Some nematodes were preserved in 10% buffered formalin or 70% ethyl alcohol (Bolette 1998) and cleared in temporary mounts of creosote or lactophenol for identification as it was used by Gonzalez-Acuña *et al* 2007. Nematodes were identified to genus using the CIH Keys to the Nematodes (Chabaud 1975) and species identified through morphometric analysis. The key of Kajerova *et al* 2004a was followed for *Ascaridia* spp.

## RESULTS AND DISCUSSION

Four genera of nematodes, *Ascaridia* (Ascaridoidea), *Dispharynx* (Acuaridae), *Tetrameres* (Tetrameridae), and an unidentified *Schistorophus* sp. (Schistorophidae) were found in psittacine hosts of three genera: *Platycercus*, *Polytelis*, and *Cyanoramphus* in Chile. *Ascaridia platyceri* was found in the small intestine of 2 out of 7 *P. eximius* and 1 out of 2 *C. novaezelandiae*. *Dispharynx nasuta* was found

**Table 2.** Helminth parasites in exotic captive psittacine birds from 4 private collections in the Metropolitan region, Chile, 2003-2008. Parásitos helmintos en aves psitácidas exóticas en cautiverio procedentes de 4 colecciones privadas de la Región Metropolitana, Chile, 2003-2008.

Host species	Parasite species	Avian weight (g)	Normal weight <sup>b,c</sup> (g)	Parasite load approximate	Year	Site of infection	Aviary
<i>Cyanoramphus novaezelandiae</i> (4 <sup>d</sup> )	<i>Ascaridia platyceri</i> ,	60	50-113	2	2004	Intestine	C
	<i>Dispharynx nasuta</i>			<10		Proventriculus	
	<i>Tetrameres</i> sp.			ND		Proventriculus	
<i>Platycercus elegans</i> (5 <sup>d</sup> )	<i>Dispharynx nasuta</i>	99	115-170	>10	2007	Proventriculus	D
<i>Platycercus elegans</i> (7 <sup>d</sup> )	<i>Dispharynx nasuta</i>	100	115-170	>10	2008	Proventriculus	D
<i>Platycercus elegans</i> (8 <sup>d</sup> )	<i>Dispharynx nasuta</i>	103	115-170	>10	2008	Proventriculus	D
<i>Platycercus eximius</i> (1 <sup>d</sup> )	<i>Ascaridia platyceri</i>	90	95-120	100	2003	Intestine	A
<i>Platycercus eximius</i> (2 <sup>d</sup> )	<i>Ascaridia platyceri</i>	88	95-120	>50	2003	Intestine	B
<i>Platycercus eximius</i> (10 <sup>d</sup> )	<i>Dispharynx nasuta</i>	70	95-120	>10	2008	Proventriculus	D
<i>Platycercus eximius</i> (11 <sup>d</sup> )	<i>Dispharynx nasuta</i>	70	95-120	>10	2008	Proventriculus	D
				>10		Proventriculus	
<i>Platycercus flaveolus</i> (3 <sup>d</sup> )	<i>Dispharynx nasuta</i>	ND <sup>a</sup>	115-170	>10	2003	Proventriculus	A
				ND		Proventriculus	
<i>Polytelis alexandrae</i> (6 <sup>d</sup> )	<i>Dispharynx nasuta</i>	105	90-120	>10	2008	Proventriculus	D
<i>Polytelis alexandrae</i> (9 <sup>d</sup> )	<i>Dispharynx nasuta</i>	110g	90-120	>10	2008	Proventriculus	D

<sup>a</sup> ND: Not determined.

<sup>b</sup> <http://www.parrots.org/>

<sup>c</sup> [http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?axon\\_id=758](http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?axon_id=758).

<sup>d</sup> animal number.

in the proventriculus of only one examined *P. flaveolus* specimen, 3 out of 3 *P. elegans*, 2 out of 7 *P. eximius*, 2 out of 3 *P. alexandrae* and 1 out of 2 *C. novaezelandiae*. *Tetrameres* sp. occurred in the proventriculus of 1 out of 2 *C. novaezelandiae*. A few specimens of a species belonging to the subfamily Schistophophinae (Spirurida) were found in the proventriculus of 1 *P. flaveolus*. Percentage of birds and henhouse infected with parasites are listed in table 3.

Hosts: animal number (a.n.1.) a 2 year female *P. eximius* from aviary A with about 100 nematodes *Ascaridia platyceri*, congestion of the intestinal mucous and poor body condition 2/5, (90 g). (a.n.2.) A 3 year old male *P. eximius* from aviary B with heavy intestinal parasitism by *Ascaridia platyceri* and poor body condition 2/5, (88 g). (a.n.3.) A male *P. flaveolus* from aviary A was found to have thickening of the proventricular mucosa, ulcers, inflammation and nodules with nematodes in the proventriculus (*D. nasuta*, *Schistorophus* sp.). However, these lesions were attributed to the action of severe infestations of *D. nasuta*. (a.n.4.) A 3 year old female *C. novaezelandiae* from aviary C, with a body condition of 3/5, 60 g, and a history of acute mortality. This bird developed uric acid deposits in visceral organs such as the pericardium and kidneys. In this case, the *causa mortis* was visceral gout and the etiology was not defined. Examination of the digestive tract revealed the presence of two ascarids (*Ascaridia platyceri*) in the small intestine. This bird also had slight thickening of the proventricular mucosa and presence of few filiform and white worms in the proventriculus identified as *Tetrameres* sp and *D. nasuta*.

During December 2007 and May 2008, 7 deaths (11.5 % mortality rate) were observed in a population of 61 psittacine birds of different species (20 *Platycercus* sp., 2 *Polytelis alexandrae*, 16 *Amazona aestiva*, 5 *Pionus menstruus*, 7 *Psephotus haematonotus*, 1 *Psittacus erithacus*, 2 *Eclectus roratus*, 1 *Cyanoramphus auriceps*, and 7 *Ara* sp.). Intensities of infection of *D. nasuta* exceeded 10 worms per bird in: (a.n.5.) a female 4 year old *P. elegans* in poor body condition (2/5) weighed 99 g. Its necropsy revealed abundant ingesta content in esophagus, crop and proventriculus, melena and anemia. Its proventricular mucosa was ulcerated and swollen with nodules. Nematode eggs were not found in fecal flotations from birds in contiguous cages. (a.n.6.) A female *P. alexandrae* with a body condition of 3/5, weighing 105 g, with severe proventricular lesions.

(a.n.7.) A male 3 year old *P. elegans* with a body condition of 2/5 (100 g). (a.n.8.) A male 3 year old *P. elegans* in poor body condition of 2/5, (103 g), with presence of congestion in the proventriculus, and granulomatous injuries with great necrotic component associated with presence of fungi microorganisms in lung compatible with aspergillosis, (a.n.9.) a male 6 month old *P. alexandrae* with a body condition of 3/5 (110 g), (a.n.10.) an adult female *P. eximius* in poor body condition of 2/5 (70g), and finally (a.n.11.) an adult male *P. eximius* with a body condition of 2/5 (70 g). The common gross finding in necropsies of the 5 *Platycercus* and 2 *Polytelis* sp. found dead in aviary D were a great enlargement of the proventriculus, with the lumen of this organ filled with a thick, white and slimy mucous and digested blood. Histological changes in these species including adult *D. nasuta* attached to the mucosa and epithelial cells of the proventriculus, ulcerations, hemorrhage, necrotic foci, inflammation, and congestion in proventriculus and in some cases destruction of the glandular tissue and muscular layers. Microscopic findings also revealed the presence of a perforant ulcer in the proventricular mucosa in one *P. alexandrae*. Table 2 summarizes all the individuals infected with helminthes.

*Ascaridia* spp. and *D. nasuta* caused serious and fatal diseases in the exotic psittacine birds studied. Ascarids are common parasites found in birds that are maintained in aviaries with access to the ground (Greiner and Ritchie 1999). Infections are often asymptomatic, although weight loss and diarrhea may be seen (Wilson *et al* 1999). Species that infect psittacine birds include *A. columbae* (Mines and Green 1983), *A. galli* (shared with gallinaceous birds) and *A. platyceri*, with records thus far only from the order Psittaciformes. Other psittaciform-specific *Ascaridia* species are *A. sergiomeirai*, *A. ornata*, *A. nicobarensis* and *A. hermafrodita* (Kajeroova *et al* 2004<sup>a</sup>). *A. hermafrodita* has been reported as one of the most common nematode species to infect psittacine hosts (Pinto *et al* 1993). In Brazil, it occurs in several psittacine birds (Serra-Freire and Bianchin 1978, Barros *et al* 2002). Other *Ascaridia* species have reported (Mines 1979). *A. platyceri* was described in Germany (Australian zoogeographical region) in captive parrot species as *Platycercus* spp., *Cyanoramphus auriceps*, *Neopsephotus bourkii*, *Nymphicus hollandicus*, *Polytelis authopeplus* and *Psephotus haematonotus*. The same parasite was also detected in *Agapornis taranta*

**Table 3.** Percentage of birds and henhouse infected with parasites reported in this study. Metropolitan region, Chile. Porcentaje de aves y aviarios infectados con parásitos en el presente estudio. Región Metropolitana, Chile.

Parasite genus	<i>Platycercus</i>	<i>Polytelis</i>	<i>Cyanoramphus</i>	Henhouse
<i>Dispharynx</i>	54.5% (6/11)	66.7% (2/3)	50% (1/2)	75% (3/4)
<i>Tetrameres</i>	–	–	50% (1/2)	25% (1/4)
<i>Shitorophus</i>	9.0% (1/11)	–	–	25% (1/4)
<i>Ascaridia</i>	18.2% (2/11)	–	50% (1/2)	75% (3/4)

from the African region and in *Enicognathus ferrugineus* in the Neotropical region, Germany (Hartwich and Tscherner 1979). Ten species of Australian psittacines have been reported as hosts of this nematode (Mines 1979). In Canada, *A. platyceri* was found in *Melopsittacus undulatus* and *Nymphicus hollandicus* (Webster 1982) and in New Zealand, in *Cyanoramphus* spp. (Nixton and Weeks 1985) and *Agapornis personatus* (Weeks 1981). In the Czech Republic, new hosts among Australian parrots kept in captivity were *Alisterus scapularis*, *Barnardius zonarius*, *Cacatua* sp. In addition it was found in *Agapornis* originating from the Afrotropical zoogeographical region, in *Psittacula kramerii* from the Afrotropical and Oriental region, as well as in *Amazona leucocephala* and *Aratinga jandaya* from the Neotropical region (Kajerova et al 2004<sup>a</sup>).

The two new cases reported here of *A. platyceri* in *P. eximius* are similar to the case report of *Ascaridia* in a macaw from Brazil infected with nematodes (Barros et al 2002). There are other cases where *Ascaridia* spp. has also been associated with fatal disease in farm and exotic birds kept in captivity (Schock and Cooper 1978, Melendez and Lindqis 1979, Charles et al 1998, Greiner and Ritchie 1999).

*Dispharynx nasuta* has been described in numerous avian orders (Charles et al 1998, Zhang et al 2004). The dispharynxiasis cases in Yellow, Crimson, and Eastern rosella, and Princess parrot were similar to the case described in a *P. alexandrae*, where large numbers of *D. nasuta* were firmly attached to the proventricular mucosa, and these proventricular worms may have been sufficient to have caused nutritional compromise, debilitation and subsequent death of this host (Bolette 1998). This parasite has been reported in association with thickening of the proventricular mucosa in Psittaciformes and the proliferative mucosa may prevent the passage of ingesta, resulting in weight loss and chronic vomiting (Greiner and Ritchie 1999). When 10 or more adult worms were present, a proliferation with necrosis and sloughing of mucosal surfaces and multiple proventricular ulcerations were seen in these Australian parakeets.

*Tetrameres nestoris* in the ducts of the proventricular glands of a parrot causes destruction of secretory cells and thickening and some necrosis of the epithelium (Clark et al 1979). At least 280 worms were recovered from a single *Nestor meridionalis*, but no history was provided other than the bird was dead (Clark et al 1979, Greiner and Ritchie 1999). *Tetrameres americana* was reported from the blue and gold macaw (*Ara ararauna*) in the lumen of the proventriculus as well as fistulated nodules in the proventriculus wall, in Brazil (Silva et al 2005). In the Chilean *Cyanoramphus* case, the tetramerid nematode infestation was limited.

Members of the subfamily Schistorophinae have been frequently reported in wild birds (Neveu-Lemaire 1938, Courtney and Forrester 1974). To our knowledge

(Hinojosa and Gonzalez-Acuña 2005), this is the first time a *Schistorophus* species has been reported in Chile. Studies of parasitic species composition and prevalence and intensity of infections in budgerigars, cockatiels, rosellas and parrots have primarily been carried out on fecal samples. Nematodes of the family Ascarididae, Capillaridae and Heterakidae were recorded, with the highest intensity of infection of Ascarididae and Capillaridae found in *P. eximius* (Balicka-Ramisz et al 2007). These results obtained in the survey of Balicka-Ramisz and coworkers and in the present study show that introduction of parasitological prophylaxis programs are necessary, especially in the larger birds' farming.

Currently, there are few records of the species of nematodes reported in wild birds in Chile. *D. nasuta* has been found in California quail (*Callipepla californica*) (Gonzalez-Acuña et al 2000) and Rock pigeon (*Columba livia*) (Toro et al 1999) with a prevalence of 4% and 2% respectively; and *Tetrameres* spp. has been identified in *C. livia* in Santiago and Chillán (Toro et al 1999, Gonzalez-Acuña et al 2004). The infection of *D. nasuta* and *Tetrameres* spp. in captive psittacine birds could be explained by indirect contact with pigeons and the presence of parasitized isopods.

The occurrence of *A. platyceri* in captive psittacine birds in Chile and South America is rare because this is generally a parasite of parrots of the Australian region (Kajerova et al 2004<sup>b</sup>). This nematode species is also found in populations parasitizing both Australian and African parrots kept in captivity in Europe (Kajerova et al 2004<sup>a</sup>). It has also been reported in parrots of Neotropical and Afrotropical origin kept in Germany (Hartwich and Tscherner 1979) and in Czech Republic (Kajerova et al 2004<sup>b</sup>), but in these cases, psittacines of different zoogeographical origins were caged together. In Netherlands, psittacine birds also were infected with *A. platyceri* (Van den Brand et al 2007). In the Chilean case, it is probable that the parasite was introduced with the psittacine birds' importation from Europe.

However in all the cases described in this report, we cannot exclude the possibility that some psittacine birds came to the aviaries already parasitized.

All the species involved in the survey are exotic to Chile and some of them acquired helminthic infections. The fact that aviary birds from widely varying geographic regions are combined creates a potential opportunity for introducing diseases or rapid death into unnatural hosts (e.g. native populations). Sanitation and movements of flocks must be restricted between populations.

## SUMMARY

In spite of its importance, the helminthic fauna from psittacine birds has been poorly investigated in Chile. The occurrence of *Tetrameres* sp. is reported in *Cyanoramphus novaezelandiae*, a *Schistorophus* sp. in *Platycercus flaveolus*, and *Dispharynx nasuta* in *P. flaveolus*, *Platycercus eximius*, *Platycercus elegans*, *Polytelis alexandrae*, and *C. novaezelandiae*

located in different aviaries of the Metropolitan Region of Chile. The first cases of *Ascaridia platyceri* in *P. eximius* and *C. novaezelandiae* are also described. *Ascaridia platyceri* and *D. nasuta* were implicated as the cause of serious and fatal disease in these exotic psittacine birds while, other organisms such as the *Schistorophus* sp. and *Tetrameres* sp. were clinically less significant.

## ACKNOWLEDGEMENTS

The authors acknowledge the collaboration of Dr. Hector Hidalgo Olate and Dr. Federico Cifuentes (Department of Animal Pathology, College of Veterinary Sciences, University of Chile), in some avian necropsy cases.

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