

PARASITES ENCOUNTERED IN CAPTIVITY BIRDS: CASE OF INFESTED BLUE PEACOCK - *Pavo cristatus* Linnaeus, 1758 (AVES: PHASIANIDAE) IN DIFFERENT LOCALITIES FROM ALGERIA

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Abstract. For our study, sampling of the Blue Poppy droppings of *Pavo cristatus* in captivity, February and March 2016 from two zoos (El Hamma Test Garden and the Ben Aknoun) of 24 individuals were collected. The flotation technique allowed us to identify the parasites found in our samples. Our results revealed the presence of a 50% rate of the genus *Capillaria* and a rate of 50% of the genus *Ascaridia* at the Reghaia marsh. In the Ben Aknoun National Park, we recorded a total of 179 individuals of hosted parasites, including *Eimeria* sp. (AR% = 7.26%) and *Capillaria* sp. (5.03%) are the dominant in the Blue Peacock droppings. Finally 77 parasite specimens from 24 samples of this bird's droppings were recorded at the El Hamma test garden with a relative abundance recorded for *Capillaria* sp. (AR% = 7.79%), *Eimeria* sp. (AR% = 6.49%), and *Amidostomum* sp. (AR% = 5.19%). The ectoparasites encountered in both *Pavo cristatus* are *Amyrsidea minuta* and *Colpocephalum tausi* in the Ben Aknoun National Park.

Keywords: *Pavo cristatus* in zoos, ecto- and endoparasites, relative abundance, dominant species.

Rezumat. Paraziți întâlniți la păsările din captivitate: studiu de caz păunul albastru - *Pavo cristatus* Linnaeus, 1758 (Aves: Phasianidae) în diferite grădini zoologice din Algeria. Pentru studiul nostru au fost prelevate probe din excrementele a 24 indivizi de păun albastru (*Pavo cristatus*) în februarie și martie 2016 din diferite grădini zoologice (El Hamma Test Garden și Ben Aknoun). Prin tehnica flotației au fost separați paraziții din probe. Identificarea lor a relevat prezența a 50% din genul *Capillaria* sp. și de 50% din genul *Ascaridia*. Din fecalele păunilor din grădinile zoologice au fost în total identificați 179 de paraziți – 77 fiind din El Hamma. Abundența relativă (AR) este pentru *Eimeria* sp. = 7,26%, iar pentru *Capillaria* sp. = 5,03%, aceste două genuri fiind dominante. Separat, pentru El Hamma, AR a genului *Capillaria* = 7,79%, pentru *Eimeria* = 6,49% și pentru *Amidostomum* = 5,19%. Ectoparaziții întâlniți la *Pavo cristatus* din Ben Aknoun sunt *Amyrsidea minuta* și *Colpocephalum tausi*.

Cuvinte cheie: *Pavo cristatus* în grădinile zoologice, ecto- și endoparaziți, abundența relativă, specii dominante.

INTRODUCTION

Parasitoses are diseases of particular importance in animal health. The status of animals in zoos remains quite singular, which differentiates them, particularly in terms of parasites, from the species mentioned above. Nevertheless, they can not be likened to pets because they live in an often closed environment, sometimes coexist with others within their enclosure and evolve in a large animal density of varied nature. Nevertheless, parasites remain a notable issue in birds in animal parks. Unfortunately, the scientific data concerning the parasites of animal park birds remain few. The purpose of this study is therefore to identify the main parasites found on wild birds in captivity. Of a very wide distribution, we are based precisely on the Blue Peacock as an example of the Phasianidae, to make our study. The diseases and health of peacocks are about the same as those of domestic poultry, especially those of turkeys. The Peacocks are Phasianids and can therefore be affected by the same diseases as other Pheasants. For enthusiasts, getting closer to an avian pathologist is a good option to get the necessary information on the health of the Peacock. Since many of the bird diseases can cross the species line, mixing peacocks with other birds or domestic poultry will increase their risk of becoming infected with endemic diseases.

MATERIALS AND METHODS

We harvested 50 fresh droppings from 10 Blue Peacocks (*Pavo cristatus*) from January to February 2016 from two different zoological parks Ben Aknoun (36 ° 45 '34.19 "N, 3 ° 0' 33.36" E) El Hamma (36 ° 44 '53 "N, 3 ° 04' 34" E) and only two at the Marais de Réghaia (36 ° 46 '17 "N, 3 ° 20' 38" E). These samples of fecal matter were identified and quantified. These samples were analyzed at E. N. S. V by the total flotation technique is the most widely used enrichment technique in veterinary medicine. Its purpose is to concentrate the parasitic elements from a very small quantity of excreta. It is based on the use of solutions whose density is higher than that of most parasite eggs ($d = 1.2$). The aim is to bring up the parasitic elements while letting the faecal debris flow (BUSSIERAS & CHERMETTE, 1991). Ectoparasites are collected from 6 Blue Peacocks in Ben Aknoun Park. For the exploitation of the coprological results we used a statistical analysis method of endoparasites are parasitological analysis such as host status, prevalence and mean intensity. These tests were performed using the Quantitative Parasitology V 3.0 software. (ROZSA et al., 2000).

RESULTS

- **Coprology of the Peacock droppings (*Pavo cristatus*)**

The identification of the parasites was based on morphological criteria of the eggs / oocysts, observed under a microscope. To go further and be more precise, it would have been necessary to use molecular methods leading to the

identification of parasites. For lack of means, this could not be achieved (Table 1, Figs. 1, 4). Table 1 shows the different parasitic species present in the Blue Pawn droppings listed in the three study stations cited above by means of the Flotation technique.

Table 1. Systematics of the parasites present in the droppings of the Peacocks in the 3 stations.

Branches	Classes	Orders	Families	Species
Protozoaires	Sporozoa	Eimeriida	Eimeriidae	<i>Eimeria</i> sp.
	Mastigophora	Diplomonadida	Giardiidae	<i>Giardia</i> sp.
		Retortamonadida	Retortamonadidae	<i>Chilomastix</i> sp.
Plathelminthes	Nematoda	Strongylida	Trichostrongylidae	<i>Cooperiasp.</i>
			Strongylidae	<i>Strongyloides</i> sp.
			Syngamidae	<i>Cyathostoma bronchialis</i>
			Amidostomatidae	<i>Amidostomum</i> sp.
		Ascaridida	Ascaridae	<i>Ascaridia</i> sp.
		Trichocephalida	Capillariidae	<i>Capillaria</i> sp.

The prevalence and intensity of endoparasites of the Blue Peacock in both stations only are noted in Table 2 below - Parasitology V 3.0.

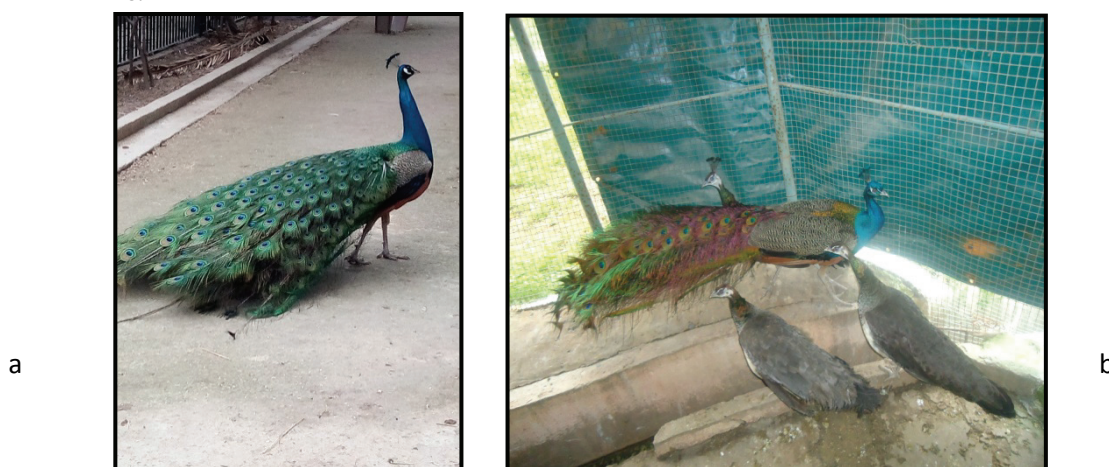


Figure 1. Blue Peacock a, Zoological Park of the Garden of Trial El Hamma; B, male and female Ben Aknoun National Park (Original photo).

According to (Table 2, Fig. 5) a total of 24 samples of Ben Aknoun Blue Peacock droppings have been identified. Only 14 droppings are infested with *Eimeria* sp. (Egg) with a rate of 58.30%. Followed by 6 droppings infested by *Capillaria* sp. With a rate of 25%. Then 5 droppings are infested with *Amidostomum* sp. with a rate of 20.80%. A prevalence of 16.70% on 4 droppings infesting the two species of parasites *Chilomastix* sp. and *Strongyloides* sp. And for the other species have a prevalence ranging from 4.20% to 8.30% on 1 and 2 droppings. It is observed that 58.30% are infested by *Eimeria* sp. belongs to the class of the dominant species, then *Capillaria* sp. And *Amidostomum* sp with a rate ranging from 20.80% to 25%. These species belong to the class of satellite species. And for the other species belong to the class of rare species. The mean intensity increases gradually between 1 and 6.43 (very low) for *Giardia* sp., *Chilomastix* sp., *Strongyloides* sp., *Amidostomum* sp. and weak for the value 8.67 for *Capillaria* sp. (Fig. 2). Similarly, 6 specimens of El Hamma Blue Peacock droppings are infested with two parasites *Amidostomum* sp. and *Capillaria* sp. With a prevalence of 25%, whereas on 8 droppings are infested with *Eimeria* sp. (Egg) with 33.33% (Table 3). It also appears that the three satellite species are *Eimeria* sp. *Capillaria* sp. et *Amidostomum* sp. (Table 2). The average intensity is weakly marked for the *Eimeria* sp species of 3.5 and a low value of 3.5 for the two species *Amidostomum* sp. and *Capillaria* sp. (Fig. 3).

Table 2. Endoparasites found in Blue Peacock droppings in both stations with host status, prevalence and intensity.

Stations	Host	Species	Host Condition		Prevalence	Intensity	
			Total	Infested		Medium	Median
Ben Aknoun	Paon bleu	<i>Amidostomum</i> sp.	24	5	20,80%	2,6	2
		<i>Capillaria</i> sp.	24	6	25%	8,67	8,5
		<i>Chilomastix</i> sp.	24	4	16,70%	2	2
		<i>Cooperia</i> sp.	24	1	4,20%	2	2
		<i>Cyathostoma branchialis</i>	24	2	8,30%	1,5	1,5
		<i>Eimeria</i> sp.	24	14	58,30%	6,43	5,5
		<i>Giardia</i> sp.	24	1	4,20%	1	1
		<i>Strongyloides</i> sp.	24	4	16,70%	2,5	2
Jardin d'essai d'El Hamma	Paon bleu	<i>Amidostomum</i> sp.	24	6	25%	3,5	3,5
		<i>Capillaria</i> sp.	24	6	25%	3,5	3,5
		<i>Eimeria</i> sp.	24	8	33,30%	3,38	4,5

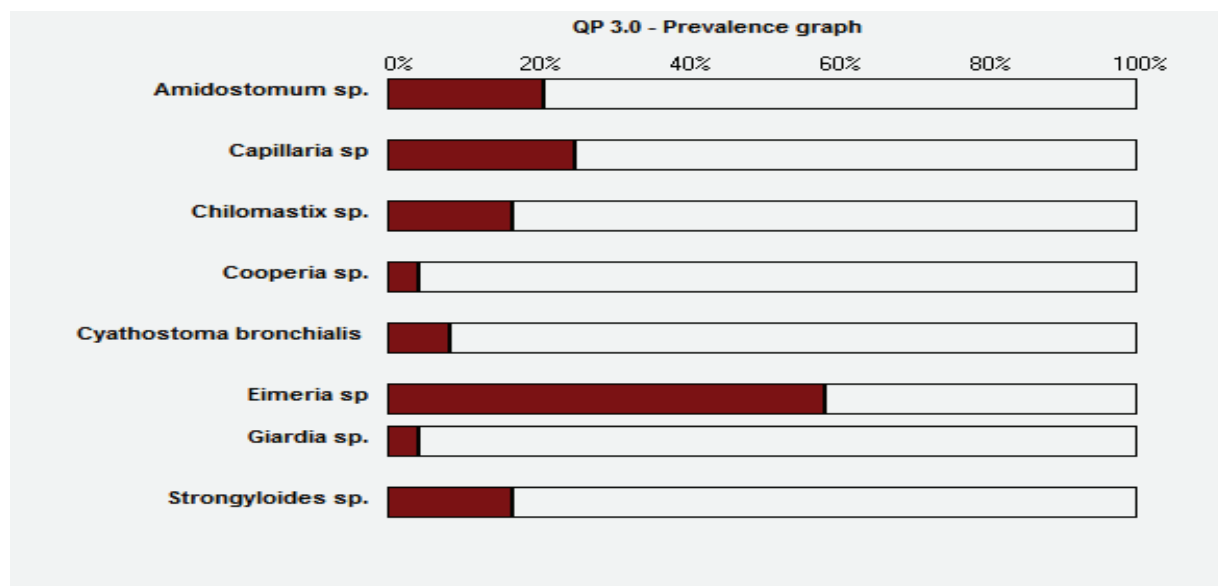


Figure 2. Graph of prevalences of endoparasites found in Ben Aknoun peacocks droppings with the software (Quantitative Parasitology V 3.0.).

• **Inventory of ectoparasites of animals in the zoo of Ben Aknoun.**

In Table 3, we have represented an inventory of ectoparasite species of the blue peacocks of the Zoological Park of Ben Aknoun.

Table 3. Inventory of bird ectoparasites in the Ben Aknoun Zoo in 2016.

Phylums	Classes	Ordres	Familles	Espèces	ni	AR %
Arthropodes	Insectes	Phtiraptera	Menoponidae	<i>Menopon sp.</i>	1	7,14
				<i>Menacantus sp.</i>	4	28,57
				<i>Colpocephalum tausi</i>	7	50,00
				<i>Amyrsidea minuta</i>	1	7,14
			Philopteridae	<i>Lipeureus caponis</i>	1	7,14
			Totale	5 espèces	14	100,00

Chez les Paons bleu du zoo de Ben Aknoun en 2016, nous avons identifié 2 genres et 3 espèces d'ectoparasites, appartenant à un seul phylum les arthropodes, une classe, un ordre et 2 familles.

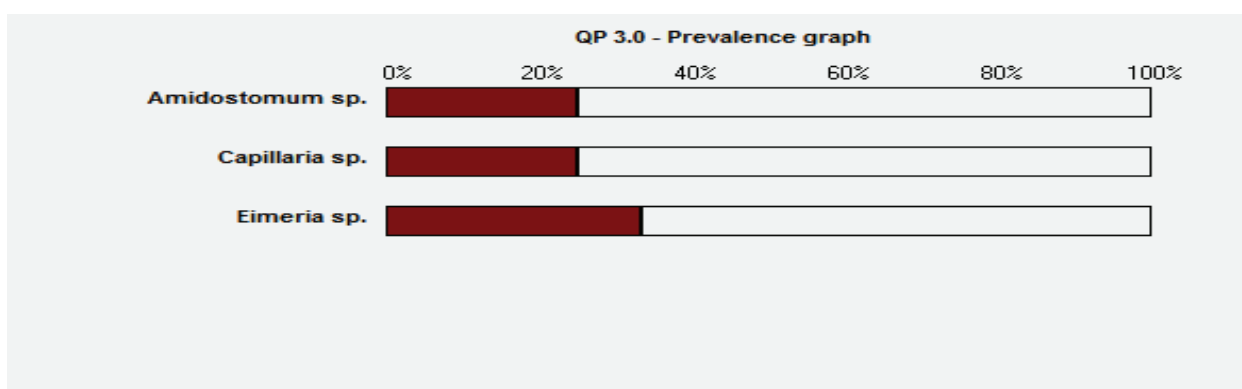


Figure 3. Graph of prevalences of endoparasites found in El Hamma peacock droppings with software (Quantitative Parasitology V 3.0.).

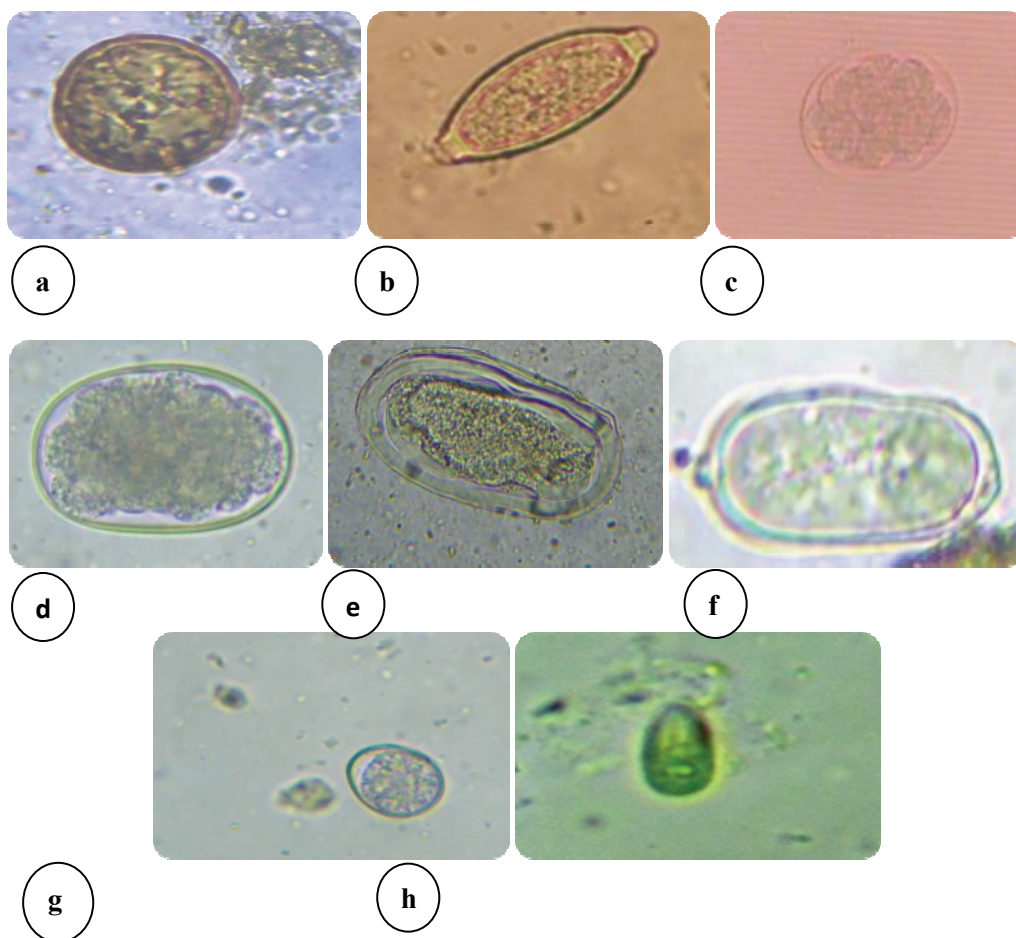


Figure 4. The different parasites found in the droppings of the Peacocks (Original Photo). a. Kyste *Giardia* sp., b. *Capillaria* sp.; c. *Cyathostoma branchialis*; d. *Amidostomum* sp.; e. *Strongyloides* sp.; f. *Cooperia* sp.; g. *Eimeria* sp.; h. *Chilomastix* sp.

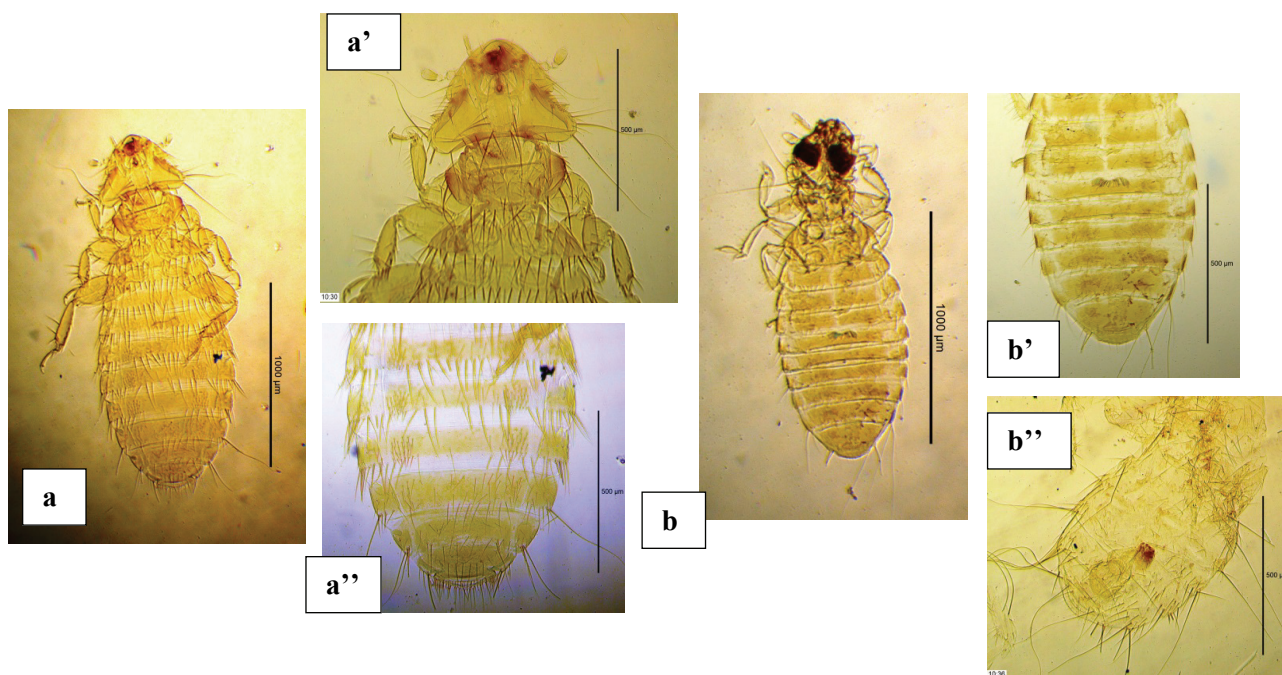


Figure 5. Ectoparasites of the blue peacock (Original Photo).a. *Amyrsidea minuta* female; a'. *Amyrsidea minuta*; a'' abdomen *Amyrsidea minuta*; b. *Colpocephalum tausi* female; b'. *Colpocephalum tausi* female abdomen; b''. *Colpocephalum tausi* male.

DISCUSSIONS AND CONCLUSION

50 droppings were collected from 10 peacocks (*Pavo cristatus*) from January to February 2016, from two different zoo parks (Ben Aknoun and El Hamma). These feces have been identified and quantified. We carried out another study of two blue peacocks in captivity in the Reghaia marsh which revealed the presence of 50% of the genus *Capillaria* and 50% of the genus *Ascaridia*. In Algeria, there are no studies on the intestinal parasites of the Blue Peacock, so we will refer to previous work carried out in other countries in order to compare it with the parasitic diversity of this captive bird in Algeria. In our study, the coprological examination of droppings revealed a 49% rate of the genus *Eimeria* sp between January and February, which is higher than that found by (QAMAR et al., 2013) conducted in Pakistan. Reported a rate of 18% in January and 22% in February (MUSAEV et al., 1991) found an *Eimeria* sp infestation rate of 53.3% in Azerbaijan, but noted that this rate decreased in February 26.6% due to climatic conditions.

The identification of the species in our case was not possible. However, several species of Blue Peacock species have been reported. In Romania (TITILINCU et al., 2009) reported 90 species with a presence of three species of *Eimeria* with different rates: *E. pavonis* with 16.7%, *E. pavonina* with 48.3% and *E. patnaiki* with 32.3% and a total of 64.4%. In Saudi Arabia, (ALYOUSIF et al., 1999) isolated four species of *Eimeria* (*E. pavonina*, *E. pavonis*, *E. mayinai*, *E. pellesdy*) from a peacock with diarrhea. In our study, the high infestation of the peacock by the genus *Eimeria* is revealed in Ben Aknoun station, this difference in infestation may be due to management conditions in the two localities.

Another parasite found in our study is a *plathelminth* worm of the genus *Capillaria*, with a rate of 29% which is lower than that observed by (TITILINCU et al., 2009). (35.3%), but SAKAMOTO & YAMASHTA (1970) reported its presence in peacocks with diarrhea and in those with loss of appetite. It is noted that many Galliformes can host this species, PINTO et al., (2008) in Brazil reported that a representative of the order Galliformes: Turkey harbors this species with a rate of 82.5%. However, *Capillaria anatis* in the latter is not pathogenic. However, they also reported the presence of *Capillaria phasiania* in the Pheasant. *Strongyloides* have had parasites reported in our study, but their rates are very low (4%) when compared to TITILINCU et al., (2009) which is 51% knowing that these results are obtained by the same method (flotation).

The identification of the species has not been carried out. But (TITILINCU et al., 2009) reported the presence of the species *Strongyloides pavonis* in the Blue Peacock (*Pavo cristatus*). This kind was also found in Galliformes species in a recent study of the quail of wheat in Algeria carried out by ZOUBIRI & IDRIS-BAY (2015) with a prevalence of 28%, and in another study that of WETZEL & RIECKEN (1966). On the game bird that harbors the genus *Strongyloid*. Another representative of protozoa of the genus *Chilomastix* with a low rate of 3%, no study reported its presence in the Blue Peacock. Nevertheless, two studies have been carried out on representatives of the Galliformes, the first one on ZOUBIRI & IDRIS-BAY (2015) on the Quail of the wheat, which harbors this protozoan at a very high rate compared with that observed in our study (65, 77%). And the second one of on the chicken which signals its presence but without any pathogenic effect. In addition, three other parasitic platyhelminths and a protozoan of the genus *Giardia* were found in the peacock during our experiment, but no study reported their presence in *Pavo cristatus*. The first plathelminth is that of the genus *Amidostomum* recorded with a prevalence of 36% in the El Hamma station and 7% in Ben Aknoun, this difference is significant so that the El Hamma Blue Peacock are very infested by these parasites. The genus *Cooperia* and genus *Cyathostoma branchialis* as well as the protozoan *Giardia* was only found in the peacocks of Ben Aknoun with low rates of 1%, 2%, and 1% respectively in faecal samples. Except that (GARAPIN, 2014) in France declares that in captive birds the genus *Cyathostoma* sp. Can cause high mortality and affects a number of different species. This parasitic variation and variation between the two stations studied during our experiment on the Blue Peacock (*Pavo cristatus*). Concerning the ectoparasites taken from the 6 Blue Peacocks of Ben Aknoun shows that our results are similar to those found by (SEGUY, 1944), that he described the Blue Peacock as the host of *Menopon phaeostomum*, *Goniodes parviceps*, *Goniodes pavonis*, *Goniocotes rectungulatus* and *Lipeurus pavo*. On the other hand (LAKSHMINARAYANA, 1979) cites for the Blue Peacock 09 lice *Goniocotes mayuri*, *Goniocotes parviceps*, *Goniocotes rectangulatus*, *Goniocotes yngarejsuf*, *Goniodes meinertzhageni*, *Goniodes pavonis*, *Amysidea minuta*; *Amysidea phaestoma* and *Colpocephalum tausi*. According to (PRICE et al., 1997) the Blue Peacock is a host for *Goniocotes rectangulatus* and *Goniocotes parviceps* (cosmopolitan species) and *Goniocotes mayuri* a subspecies of the Indian subcontinent. Our work has revealed a great diversity of parasites in the Blue Peacocks of animal parks in Algeria. The majority of these parasites are direct-cycle parasites. Indeed, these parasites can more easily infest their host even if it is not in its natural environment, since they do not require intermediate hosts. Considering the disparities between parks, the numbers of the different orders and the number of samples sent, it is difficult to identify general trends regarding parasitism in these parks. The overall prevalence of positive colposcopy remains moderate.

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