

# First Report on the Copro-parasitology of Striped Hyena, African Golden Wolf and Red Fox in Chrea National Park, (Algeria)



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**Abstract** This work is carried out in the Chrea National Park, located 50 km southwest of Algiers, classified as a biosphere reserve in 2002 as part of the UNESCO program. The coprological study is carried out by the analysis of the excrements (48 samples) of the red fox, the African golden wolf and, for the first time in Algeria, the striped hyena. The excreta collection was done in several stations (Oued el Marja, Tiberkent, Bni-selmen, Tamesguida). The faecal samples were collected between February and the end of May 2018. The faeces are brought back to the laboratory, measured, weighed, and decorticated for prey identification and parasitological analysis. Parasitological diagnosis revealed the presence of helminth eggs and oocysts of coccidia or even protozoan cysts in the samples. Overall, 7 genera of parasitic species were identified infesting both red fox and the African golden wolf faeces while only 5 were recovered from the faeces of the striped hyena. The results showed that the nematodes (*Ankylostoma* spp., *Toxocara Canis*, *Strongylus* spp.) were the most commonly found parasites in these mammals. The diet composition of the three species was mainly composed of micromammals, invertebrates, birds, and plants.

**Keywords** Mammals · Copro-parasitology · Chrea · Wildlife · Endoparasites · Algeria

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1357

## 1 Introduction

Predators or scavenger carnivores occupy a very important trophic position in the biocenosis by participating in the regulation of the animal populations and the maintenance of ecosystem balance. This ecological and economic importance has guided many studies on mammals in North Africa [1, 2].

Wild mammals represent an important reservoir of many endoparasites. Indeed, more than 75% of human diseases are of wildlife-related zoonotic origin [3]. Therefore, our study aimed at the copro-parasitological study of three wild mammals in the Chrea National Park, namely the red fox (*Vulpes vulpes*), the African golden wolf (*Canis Anthus*) and for the first time in Algeria the striped hyena (*Hyaena hyaena*).

The objective of this investigation is to highlight the prevalence of intestinal parasites, which are excreted in the faeces of these animals.

## 2 Methods

This study took place in the Chrea National Park, located 50 km southwest of Algiers, extends in a scarf over 26,587 ha along with the central parts of the Atlas Tellien range.

The coprological study was done by analyzing the excrement of three carnivorous mammals, namely, the red fox, the African golden wolf, and, for the first time in Algeria, the Striped Hyena. The collection of dung took place in several stations from different altitudes. The dung was harvested between February and the end of May 2018. In total, 48 faecal samples were collected over the entire territory. The faeces were then labeled and returned to the laboratory. The samples were measured, weighed, and decorticated for prey identification and parasitological analysis.

## 3 Results

### 3.1 Results of the Copro-parasitological Analysis

The coprological study and the parasitological diagnosis made possible to reveal and quantify the presence of helminth eggs, oocysts of coccidia, and protozoan in the excreta of three wild mammals. Our analysis shows that striped Hyena faeces were infested by 5 genera of parasitic species and 7 species for both red Fox and the African golden wolf. The results showed that the nematodes (e.g., *Ankylostoma* spp., *Toxocara Canis*, *Strongylus* spp.) were the most commonly found endoparasites in all tested mammals (Table 1).

In striped hyena, the most dominant parasites were the embryonated eggs of *Ankylostoma* spp. (84%). In the red Fox, the most common parasites were *Toxocara*

**Table 1** The parasite species found in the excrement of the three mammals

Phylum	Species	Aspect	Striped hyena	Red fox	African g. wolf
Nematodes	<i>Ankylostoma</i> sp.	Larva	1	8	52
	<i>Ankylostoma</i> sp.	Embryo egg	365	5	210
	<i>Ankylostoma</i> sp.	Egg not embryo	37	2	210
	<i>Strongylus</i> sp.	Larva	33	0	2
	<i>Strongylus</i> sp.	Eggs not spore	0	10	0
	<i>Toxocara canis</i>	Egg	0	30	0
	<i>Toxocara</i> sp.	Spore eggs	0	4	0
	<i>Trichuris vulpis</i>	Egg	0	0	11
Protozoa	<i>Eimeria</i> sp.	Eggs not spore	0	0	21
	<i>Isospora</i> sp.	Eggs not spore	0	0	61
	<i>Cryptosporidium</i> sp.	Spore	30	36	30
2	11	Total	466	95	597

*canis* with 32%. While in the African golden wolf, *Ankylostoma* sp. eggs 54% were most prevalent.

### 3.2 Results of the Diet Analysis

The composition of the prey species was the highest in the African golden wolf (6 species), followed by hyena (5 species) and the foxes (2 species). Hyena samples showed the presence of small vertebrates (*Gallus* spp. and *Atelerix algirus*), while wolves had parts of other mammals and insects such as *Oryctes* spp. and *Anotylus* spp. (Table 2).

## 4 Discussion

The analysis of the 48 faecal samples allowed us to identify 11 species of parasites. The reason behind the dominant presence of nematodes and protozoa in all these wild animals may be related to the climatic conditions of the study area because most of the samples were collected near the water points. Le Bihan [4] has explained

**Table 2** Prey species and plant species found in the excrements of the three mammals

Species	Striped hyena				
Class	Order	Family	Species	Ni	Fi (%)
Insecta	Diptera	Calliphoridae	<i>Chrysomyia</i> sp.	10	27.78
		Muscidae	<i>Musca</i> sp.	03	08.83
Aves	Galliformes	Gallinacea	<i>Gallus</i> sp.	12	33.33
Mammalia	Erinaceomorpha	Erinaceidae	<i>Atelerix algirus</i>	01	02.78
Pinopsida	Pinales	Pinacea	<i>Pinus</i> sp.	10	27.78
Species	Red fox				
Insecta	Coleoptera	Staphylinidae	<i>Anotylus</i> sp.	01	00.36
Magnolipsida	Fabales	Fabacea	<i>Ceratonia</i> sp.	274	99.64
Species	African golden wolf				
Insecta	Coleoptera	Scarabaeidae	<i>Oryctes</i> sp.	01	04.17
		Aphodiidae	<i>Aphodius</i> sp.	11	45.83
		Hymenoptera	Formicidae	<i>Lasius</i> sp.	02
Plantae ind	Plantae ind	Plantae ind	Plantae sp. ind	03	12.50
Magnolipsida	Fagales	Fagaceae	<i>Quercus</i> sp.	03	12.50
Pinopsida	Pinales	Pinaceae	<i>Cedrus</i> sp.	04	16.67

that protozoa live exclusively in water or at least in the humid earth. The dominance of nematodes is related to the corporal aspect of the parasite [5].

The trophic spectrum of the hyena is versatile and broad consisting of vertebrates, insects, plants, and human wastes. This variability has been reported by Kruuk [6] and Wagner [7], which emphasizes the generalist nature and trophic opportunism of this carnivore. The red fox consumes more plants, including fruit (99.64%) than insects (0.36%). This is consistent with the findings of several researchers [8, 9], who describe the fox as omnivorous, opportunistic, and generalist. Few studies on the diet of the African golden wolf were carried out in Algeria [10]. It adopts a heterogeneous diet and eats mainly mammals. When conditions are difficult, their diet varies according to the resources available on the site [11, 12].

## 5 Conclusions

In this study, we were able to provide for the first time a coprological data and diet composition of the newly described African golden wolf, the red fox, and the striped hyena from Chrea national park. The coprological study revealed the presence of nematodes (*Ankylostoma* spp., *Toxocara Canis*), and protozoa (*Cryptosporidium* spp. *Isopora* spp.). The results of diet composition show the generalist character of the striped hyena as well as the opportunistic resource used by African golden wolf and the red fox.

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