

Gastrointestinal helminths of the lizard *Chalcides ocellatus* from Benghazi, Libya

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Abstract

Chalcides ocellatus, a scincid lizard, sampled during October 1998 to December 1999 from Benina (farmland) and Al-Kueffia (a rocky area) in Benghazi, Libya, was found to harbour three intestinal nematodes, *Pharyngodon mamillatus*, *Thelandros alatus* and *Parapharyngodon micipsae*, and an intestinal cestode, *Oochoristica tuberculata*. *Thelandros alatus*, *P. micipsae* and *O. tuberculata* were recorded for the first time in *C. ocellatus*. *Parapharyngodon micipsae* was detected in *C. ocellatus* from Benina and *O. tuberculata* from lizards in Al-Kueffia. The majority (87.6%) of *C. ocellatus* were infected with helminth parasites and the levels of infection were higher in males than in females but this difference was not significant. *Pharyngodon mamillatus* recorded the highest number of nematode parasites in *C. ocellatus*, although there was no relationship between the number of nematode parasites recovered and host density. In lizards infected with the cestode *O. tuberculata*, males had shorter snout–vent lengths than females. From a total of 153 *C. ocellatus*, 120 (78.4%) showed single and 14 (9.2%) showed mixed parasitic infections. Mixed infections between different species of nematodes were not observed.

Introduction

Chalcides ocellatus (Forsk., 1775) is a common scincid lizard found throughout the year in Benghazi (32°10'N, 20°06'E) and its neighbourhood in Libya. These lizards are found in open landscapes with moderate or little vegetation, and are common in farms, stonepiles and ruins. They remain under cover most of the time and retire into refuges when necessary.

Schleich (1987) reported that *C. ocellatus* is widespread in northern Libya from the Sirte-basin in the west to Tobruk (Libyan–Egyptian border) in the east. *Chalcides ocellatus* has also been reported to be widely distributed over northern Africa, Somalia, southern Greece, Italy, Ethiopia and near-east India (Schleich *et al.*, 1996). The present study concentrated on the gastrointestinal helminths of *C. ocellatus* from two sites in Benghazi during the period October, 1998 to December 1999. The objectives of the study were: (i) to identify the helminth parasites found in the gastrointestinal region of

C. ocellatus; (ii) to establish the prevalence and intensity of helminth infections relative to body size; and (iii) to determine the prevalence of single or mixed helminth infections.

Materials and methods

Sampling sites

Chalcides ocellatus was sampled from two sites from Benghazi, namely Benina and Al-Kueffia. Benina is located in the south-east of Benghazi some 18 km from the city centre and the site chosen was a farm which depends upon ground water for irrigation. The farm has many crops, plants and grasses, and the favourable microclimatic conditions prevailing in the farm contribute to the survival of these lizards throughout the year. The farm is subjected to frequent-pesticide sprayings to control insects and other pests. Al-Kueffia is located north-east of Benghazi, some 10 km from the city centre. It is a virgin rocky area facing the Mediterranean sea with few plants and animals. However, insects, snails and birds are present throughout the year except during the

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summer. The site is not subjected to pesticide sprayings or other man-made alterations.

Parasitological procedures

Random sampling of *C. ocellatus* was carried out in Benina and Al-Kueffia once a month during October 1998 to December 1999. Lizards were caught with bare hands and placed separately in a glass jar. At least a minimum of five adult lizards were collected monthly. Following euthanization with ether, the body weight, total body length and snout–vent length (SVL) of each lizard were measured. A total of 153 lizards (86 from Benina and 67 from Al-Kueffia) were examined for intestinal helminths during October 1998 to December 1999. Amongst the lizards from Benina, 47 were males and 39 females and from Al-Kueffia 25 were males and 42 females.

The body cavity of each lizard was opened by a longitudinal incision from the vent to the throat and the sex of each lizard was determined. The alimentary canal and its offshoots were examined in warm 0.7% saline solution for the presence of helminths, which were removed, counted and preserved in a mixture of 70% alcohol and 5% glycerine (nematodes) or in 80% alcohol with drops of acetic acid (cestodes). Nematodes and cestodes were identified using taxonomic keys (Yamaguti, 1958, 1959, 1961; Skrjabin *et al.*, 1960) and later re-confirmed by Drs Stephen R. Goldberg and Charles R. Bursley from the Department of Biology, University of Whittier, California, USA. Statistical analyses including z-tests, t-tests and correlation co-efficients (Grimm, 1993) were undertaken to determine the relevance and significance of the data.

Results

Helminth parasites in C. ocellatus

The majority (87.6%) of *C. ocellatus* from both sites were infected with helminth parasites. Most of these helminths belonged to the phylum Nematoda, order Oxyurida, and included *Pharyngodon mamillatus* Linstow, 1897, *Thelandros alatus* Wedl, 1861, and *Parapharyngodon micipsae* Seurat, 1917. Only one species of cestode, *Ochhoristica tuberculata* Luhe, 1898 (order Eucestoda, family Linstowiidae) was found. Lizards examined from Benina harboured any one of the three species of nematodes (*P. mamillatus*, *T. alatus*, *P. micipsae*) and those from

Al-Kueffia harboured either *P. mamillatus* or *T. alatus* in their large intestines. The stomach and small intestine of *C. ocellatus* were not infected with these parasites. The cestode *O. tuberculata* was found in the large intestine of *C. ocellatus* sampled from Al-Kueffia.

The nematode parasites were found in 89.4% of male and 76.9% of female lizards from Benina, and in 92% of males and 88.1% of females from Al-Kueffia. The cestode *O. tuberculata* was found in the large intestine of 28% male and 21.4% female lizards from Al-Kueffia.

Overall, lizards from Al-Kueffia showed higher levels of helminth infections than those from Benina, although these differences were not significant, and neither were the differences between male and female infected *C. ocellatus* from Benina or Al-Kueffia.

Prevalence and mean intensity of helminth infections

The number of infected male and female *C. ocellatus* from Benina and Al-Kueffia, their snout–vent length (SVL), body weights, prevalence of helminth infections and ranges in parasite numbers are presented in tables 1 and 2.

Pharyngodon mamillatus was found in the large intestine of *C. ocellatus* in 51.1% of male and 53.8% of female lizards from Benina with respective mean intensities of 128 ± 113 and 153 ± 120 . In Al-Kueffia, 76% of males and 59.5% of females were infected with *P. mamillatus* with respective mean intensities of 147 ± 110 and 174 ± 114 . In addition, 27.7% of male (MI = 51 ± 50) and 18% of female (MI = 78 ± 52) lizards from Benina, and 16% of males (MI = 36 ± 28) and 28.6% of females (MI = 72 ± 54) from Al-Kueffia were infected with *T. alatus*. *Parapharyngodon micipsae* was found in *C. ocellatus* from Benina only with 10.6% of males (MI = 4 ± 3) and 5.1% of females (MI = 5 ± 3) being infected.

Relative to snout–vent length (SVL) and body weight, no significant differences were found between male and female infected *C. ocellatus* from Benina or Al-Kueffia. Also, there were no significant differences in the prevalence and mean intensity of nematode infections relative to host body weight or sex (tables 1 and 2). However, weak correlations were shown between the mean intensity of nematode infection and the snout–vent length ($r = 0.39$) and body weight ($r = 0.48$) in male and female *C. ocellatus*.

In the case of cestode infections, 28% of male lizards (MI = 4 ± 3) and 21.4% of female lizards (MI = 10 ± 4)

Table 1. The prevalence (%) and mean intensity of three nematode species, *Pharyngodon mamillatus*, *Thelandros alatus* and *Parapharyngodon micipsae* in male and female *Chalcides ocellatus* from Benina, October 1998 to December 1999, relative to snout–vent length (SVL) and body weight (BW).

Parameters	<i>P. mamillatus</i>		<i>T. alatus</i>		<i>P. micipsae</i>	
	Male	Female	Male	Female	Male	Female
Number of infected lizards	24	21	13	7	5	2
SVL (cm) (X ± SE)	12.1 ± 2.1	12.8 ± 2.2	11.9 ± 2.3	13.2 ± 1.9	10.8 ± 2.0	9.6 ± 0.1
BW (g) (X ± SE)	27.4 ± 2.9	33.9 ± 3.4	27.8 ± 4.3	35.4 ± 5.1	19.0 ± 6.1	12.3 ± 0.3
Prevalence of infection (%)	51.1	53.8	27.7	18.0	10.6	5.1
Range in parasite numbers (male and female combined)	4–492		3–146		1–9	

Table 2. The prevalence (%) and mean intensity of infection of the nematodes *Pharyngodon mamillatus* and *Thelandros alatus* and the cestode *Oochoristica tuberculata* in male and female *Chalcides ocellatus* from Al-Kueffia, October, 1998 to December, 1999, relative to snout-vent length (SVL) and body weight (BW).

Parameters	<i>P. mamillatus</i>		<i>T. alatus</i>		<i>O. tuberculata</i>	
	Male	Female	Male	Female	Male	Female
Number of infected lizards	19	25	4	12	7	9
SVL (cm) (X ± SE)	12.9 ± 1.4	13.5 ± 1.5	11.0 ± 1.7	12.3 ± 1.8	11.7 ± 1.6	13.3 ± 0.7*
BW (g) (X ± SE)	32.2 ± 2.4	33.8 ± 11.1	18.6 ± 5.1	26.8 ± 3.2	20.2 ± 4.6	38.2 ± 6.8**
Prevalence of infection (%)	76.0	59.5	16.0	28.6	28.0	21.4
Range in parasite numbers (male and female combined)	11–779		3–183		1–41	

* $P < 0.05$; ** $P < 0.10$.

were infected with *O. tuberculata*. A significant difference in the snout-vent length (male: smaller; female: longer) ($P < 0.05$) and body weight ($P < 0.10$) existed between male and female *C. ocellatus* infected with *O. tuberculata* whereas differences in the prevalence and mean intensity of cestode infections relative to host body weight or sex were not significant (table 2).

Single or mixed helminth infections

Of 153 *C. ocellatus* examined from Benina and Al-Kueffia, 120 showed single (78.4%) and 14 showed mixed (9.2%) infections (table 3). Mixed infections between different species of nematodes were not observed.

In single infections, 23.2% and 7.5% of lizards examined from Benina and Al-Kueffia respectively were infected with *P. mamillatus*. The proportion of *C. ocellatus* infected with *T. alatus* was 16.4% from Benina and 17.9% from Al-Kueffia. The prevalence of *P. micipsae* in *C. ocellatus* from Benina was 8.1% compared with a 3% prevalence of *O. tuberculata* in lizards from Al-Kueffia.

Mixed infections between nematodes and cestodes were observed in *C. ocellatus* from Al-Kueffia, where 13.4% of lizards showed a combination of *P. mamillatus* + *O. tuberculata*, and 6% *T. alatus* + *O. tuberculata*.

Table 3. The proportion (%) of infected lizards, *Chalcides ocellatus*, from Benina ($n = 86$) and Al-Kueffia ($n = 67$) during October 1998 to December, 1999, harbouring single or mixed helminth infections.

Helminths	Proportion (%) of infected lizards	
	Benina	Al-Kueffia
Single infection		
<i>Pharyngodon mamillatus</i>	23.2	7.5
<i>Thelandros alatus</i>	16.4	17.9
<i>Parapharyngodon micipsae</i>	8.1	0.0
<i>Oochoristica tuberculata</i>	0.0	3.0
Mixed infection		
<i>P. mamillatus</i> + <i>O. tuberculata</i>	0.0	13.4
<i>T. alatus</i> + <i>O. tuberculata</i>	0.0	6.0

Discussion

The present study is a pioneering one in Libya on the helminth parasites of the lizard *C. ocellatus*. Of the three nematode and one cestode species identified from the gastrointestinal tracts of *C. ocellatus*, two nematodes *T. alatus* and *P. micipsae* and the cestode *O. tuberculata* are recorded for the first time in *C. ocellatus*. A high prevalence (87.6%) of helminth infections in *C. ocellatus* was observed and this could be attributed to the foraging behaviour of the lizard and favourable climatic conditions. Al-Shareef & Saber (1995) also reported high helminth infections in *C. ocellatus* from Egypt which were related to the foraging and feeding habits of the host.

Levels of helminth infections were higher in male compared with female *C. ocellatus* although these differences were not significant. This observation was in agreement with the findings of Golberg *et al.* (1993, 1996) and Al-Shareef & Saber (1995). Lewin (1992) reported that differences in the level of parasitic infections in the male and female sand lizard *Lacerta agilis* were attributed to differences in their behaviour at various stages in their life. The marked stationary behaviour of adult males made them more susceptible to infection when compared with adult females. The frequent sniffing of faeces of other lizards by males and touching them with the end of the tongue, a behaviour which the females do not show, facilitates ingestion of eggs into the alimentary tract of males. Similar behaviour was observed in male *C. ocellatus* in the wild.

There were no significant differences in the snout-vent length and body weight between male and female nematode-infected *C. ocellatus*. On the other hand, weak positive correlations, though not significant, were evident between the mean intensity of nematode infections and snout-vent length and body weight of host lizards (males and females combined). Al-Shareef & Saber (1995) found no correlation between the intensity of nematode infections with condition factors such as body weight and snout-vent length of lizards in Egypt.

Among the three species of nematode parasites recovered from *C. ocellatus*, *P. mamillatus* was more frequently found than *T. alatus* and *P. micipsae*. Moravec *et al.* (1987) reported that *P. mamillatus* is mainly found in scincid lizards and this was later confirmed by Ashour *et al.* (1992) and Al-Shareef & Saber (1995) in Egyptian *C. ocellatus*. *Pharyngodon mamillatus* has also been reported

from a variety of reptiles, namely *Eumeces algeriensis*, *Eumeces schneideri*, *Hemidactylus turcicus* and *Plestiodon aldrovandi* (Skrjabin *et al.*, 1960; Myers *et al.*, 1962; Al-Shareef & Saber, 1995; Saber *et al.*, 1995). *Thelandros alatus* and *P. micipsae*, which were recorded for the first time in *C. ocellatus* in the present study, have been reported in other species of reptiles. *Thelandros alatus* was previously recorded in other reptiles from north Africa including *Uromastix spinipes* and *Uromastix hardwicki* from Egypt (Skrjabin *et al.*, 1960; Yamaguti, 1961), and *Uromastix acanthinurus* from Morocco (Adamson & Petter, 1983). *Parapharyngodon micipsae* is a common parasite found in *Chalcides micipsae* and *Scincus officinalis* (Skrjabin *et al.*, 1960). *Parapharyngodon bulbosus*, a related species of *P. micipsae* was recorded from *C. ocellatus* by Ashour *et al.* (1994).

There existed a significant difference in the snout-vent length of male (shorter) and female (longer) *C. ocellatus* infected with the cestode *O. tuberculata*. This cestode was previously recorded in other lizards by Schmidt (1970) and Smith (1973). Yamaguti (1959) observed *O. tuberculata* in several lizards, namely *Lacerta* sp., *Agama* sp., *Uromastix* sp. and *Acanthodactylus* sp. *Oochoristica fibrata*, a closely related species of *O. tuberculata* was recorded from *C. ocellatus* by Al-Shareef & Saber (1995).

The absence of *O. tuberculata* in *C. ocellatus* from Benina may be due to the effect of intensive pesticide sprayings in the sampling site, the restricted availability of food resources or other edaphic factors. Reports on the life-cycle of *Oochoristica* sp. suggest that insects act as intermediate hosts (Kennedy *et al.*, 1982). Conn (1985) reported the beetles *Tribolium confusum* and *Tribolium molitor* as intermediate hosts of *O. tuberculata*. In the present study, species of *Tribolium* were observed in large numbers in the sampling site of Al-Kueffia, but not in Benina, and some remains of the body parts of these beetles were found in the intestine of these lizards, suggesting the likelihood of these beetles acting as intermediate hosts for *O. tuberculata*.

Single nematode species infection in *C. ocellatus* was observed as the general pattern in the present study. This was likely to be due to competition for food and space between different species of nematode populations occupying the intestine. Al-Shareef & Saber (1995) also reported single nematode species infections in the majority of *C. ocellatus* examined in Egypt. Among the mixed infections, a higher percentage of *C. ocellatus* recorded the combination of the nematode *P. mamillatus* with the cestode *O. tuberculata* in the intestine.

In conclusion, the present study on the helminths of the scincid lizard *C. ocellatus* from Benghazi, Libya, established new records for the nematodes *T. alatus* and *P. micipsae* and the cestode *O. tuberculata*. Three specimens of a trematode parasite *Harmotrema* sp. were also found in the large intestine of a *C. ocellatus* sampled from Al-Kueffia. It will be interesting to conduct further studies on the prevalence and intensity of parasite infections in Libya to further our understanding of the community ecology of helminths in lizards and other reptiles, especially those in desert areas. Man-made alterations in the habitat of these lizards such as pesticide-spraying and single crop plantations can lead to the

disappearance of intermediate hosts of cestode parasites such as *O. tuberculata* and this was evident from the total absence of this cestode in Benina.

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