

Original papers

Endoparasites of pet reptiles based on coprosopic methods

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ABSTRACT. Due to the growing popularity of reptiles as a household animals and the development of numerous reptile farms, they have become a common sight in veterinary clinics. As parasitic infections represent a serious problem among pet reptiles obtained by captive breeding and from pet shops, the purpose of the present study was to determine the species composition of parasites present in reptiles bred privately or in Cracow Zoological Garden, and those obtained from pet shops. Fecal samples collected from 91 reptiles (30 turtles, 40 lizards, and 21 snakes) were examined using the quantitative McMaster method. Parasite eggs or protozoan oocysts were identified in 59.3% of samples. These included the eggs of the Pharyngodonidae, Ascarididae and Rhabditoidea (Nematoda), and Trematoda, as well as oocysts of *Isospora* and *Eimeria*. In addition, pseudoparasites belonging to the Mesostigmata, Demodecidae and Myobiidae were found.

Key words: pet reptiles, endoparasites, coproscopic methods, lizards, snakes, turtles

Introduction

One of the most popular groups of exotic animals found in the home is exotic reptiles. Some are purchased as surplus from private breeders or bought in specialist pet shops, while others have been sourced from the wild. Parasitic infections are common in reptiles, and they are common sight at veterinary practices. Studies on pet reptiles from Slovenia revealed parasitic infection levels of 81.8%, with eight different groups of endoparasites found in 498 of 563 tested turtles (88.5%), 19 groups of parasites (endo- and ectoparasites) in 252 of 331 tested lizards (76.1%) and 12 groups of endoparasites and two species of ectoparasites in 26 of 55 tested snakes (47.3%); the most common type of parasite was the nematode [1]. Elsewhere, the prevalence of endoparasites in tortoises from the Zoological Garden in Wrocław was found to be 81.2%, all of which belonging to the Pharyngodonidae family (Nematoda; Oxyurida) [2]. The lizard species *Laudakia caucasia* and *Laudakia stellio* of the Agamidae family from Turkey demonstrated parasite infection levels of 87% and 96%, respectively, with the most prevalent type of parasites in both being nematodes (particularly the

Oxyuridae and Ascarididae) [3].

Other than nematodes, one of the most common reptile parasites are the coccidia. Abdel-Wasae [4] found coccidia from the genus *Isospora* in 64.3% of examined chameleons *Chamaeleo calyptratus*, one of the most popular species of pet reptiles. Seven species of coccidia from the *Eimeria* genus were described in snakes (Colubridae) during the period 1998–2000 in Guatemala [5]. Many of the reptiles obtained from the wild come from Africa, and a large number of these are lizards of the *Varanus* genus. Captive varanidae are often fed rodents that may be infected with parasites such as Trematoda. The prevalence of Trematoda in the Ornate monitor (*Varanus ornatus*) from Nigeria was 33.3% [6]. In 2002, a new species of Trematoda, *Meristocotyle provitellari* (Digenea: Meristocotylidae), was found to infect *Varanus salvator* from the Guanxi region in China [7]. New species of parasites are constantly being described, and many of these can be passed to captive-bred pet reptiles from imported reptiles which have been caught in the wild.

The aim of the study was to estimate the level of gastrointestinal parasite infection in reptiles obtained by different types of breeding.

Materials and Methods

A total of 91 reptiles representing 30 species were examined for the presence of endoparasites. Twenty-seven were housed in the Zoological Garden in Cracow, 34 in pet shops, and 30 in private homes (Table 1). Fecal samples from 91 different reptiles (lizards n=40, snakes n=21, tortoises n=30) were collected from live animals and examined by flotation according to the standard procedure but with the samples being centrifuged at 1200 rpm for five minutes. For flotation, saturated NaCl solution with a specific gravity of 1.2 was used. Samples in McMaster egg counting chambers were observed under the light microscope with 40–400× magnification.

Results

The prevalence of endoparasites in examined reptiles was 59.3%. The highest prevalence was in pet shops (61.8%) and the lowest in private breeding (43.3%), with a prevalence of 51.9% found in the Zoological Garden (Table 2).

In total, coccidian oocysts were found in 15.4% of fecal samples, *Eimeria* sp. (Fig. 1) in 12.1% and *Isospora* sp. in 3.3% (Fig. 2). Coccidia were detected in reptiles from pet shops and private breeding, with very high intensity of infection: mean value 219 695 OPG (range 20–429600 OPG).

The most prevalent parasites were found to be the Pharyngodonidae (Oxyurida), with nematode eggs being found in 46.2% of fecal samples (Fig. 3). The Pharyngodonidae were also detected in lizards and snakes from pet shops and private breeding, and

Table 1. Species, number of individuals and origin of the examined reptiles

Reptiles n=91	Common name	Zoo n=27	Pet shop n=34	Private breeding n=30
Testudines				
<i>Testudo horsfieldii</i>	Horsfield's tortoise	19	1	2
<i>Testudo hermanni</i>	Hermann's tortoise	3		
<i>Testudo graeca</i>	Spur-thighed tortoise	5		
Lacertilia				
<i>Gerrhosaurus major</i>	Sudan plated lizard			4
<i>Tiliqua gigas</i>	Indonesian blue-tongued scink			2
<i>Tiliqua scincoides</i>	Australian blue-tongued scink		2	
<i>Varanus acanthurus</i>	Spiny-tailed monitor		1	
<i>Phelsuma madagascariensis</i>	Madagascar giant day gecko		1	
<i>Phelsuma dubia</i>	Zanzibar day gecko		1	
<i>Gecko gecko</i>	Tokay gecko		1	
<i>Correlophus ciliatus</i>	New Caledonian crested gecko		3	1
<i>Eublepharis macularius</i>	Leopard gecko		3	
<i>Physignathus cocincinus</i>	Chinese water dragon		1	
<i>Pogona vitticeps</i>	Bearded dragon		2	5
<i>Pogona henrylawsoni</i>	Rankin's dragon			1
<i>Chamaeleo calyptrotus</i>	Veiled chameleon		4	1
<i>Furcifer pardalis</i>	Panther chameleon			1
<i>Kinyongia fischeri</i>	Fisher's chameleon			1
<i>Basiliscus plumifrons</i>	Plumed basilisk		1	
<i>Iguana iguana</i>	Green iguana		2	
<i>Anolis equestris</i>	Knight anole		1	1
Serpentes				
<i>Morelia spilota cheynei</i>	Jungle carpet python		1	
<i>Morelia viridis</i>	Green tree python		1	
<i>Python regius</i>	Ball python		2	8
<i>Lampropeltis mexicana</i>	Mexican kingsnake			1
<i>Lampropeltis polyzona</i>	Pueblan milk snake		1	1
<i>Lampropeltis californiae</i>	California kingsnake			1
<i>Orthriophis taeniurus</i>	Beauty rat snake		1	
<i>Pantherophis guttatus</i>	Corn snake		3	
<i>Pituophis catenifer</i>	Pacific gopher snake		1	



Fig. 1. *Eimeria* sp. oocysts from *Chamaeleo calypturus*



Fig. 4. Rhabditoidea egg from *Chamaeleo calypturus*

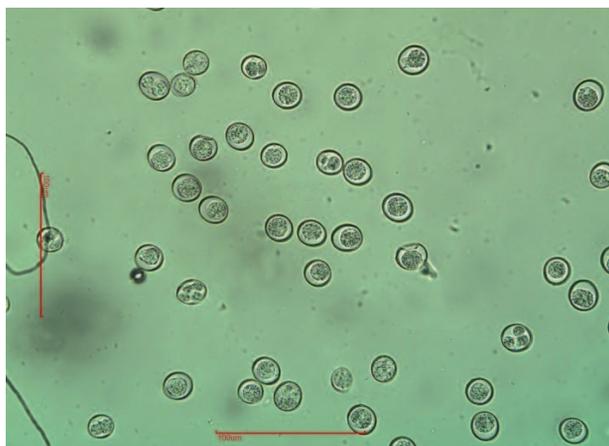


Fig. 2. *Isospora* sp. oocysts from *Phelsuma dubia*



Fig. 5. Trematoda egg from *Tiliqua gigas*



Fig. 3. Pharyngodonidae (Oxyurida) eggs from *Pogona vitticeps*



Fig. 6. Mesostigmata (Acari) egg from *Eublepharis macularius*

tortoises from the Zoological Garden. Rhabditoidea eggs were found in 7.7% of samples (Fig. 4). Larvae were present in the fecal samples from one specimen of *Python regius*, obtained from a pet shop.

Only one of the 91 examined specimens, an *Iguana iguana*, was infected by the Ascarididae family. The intensity of infection was 20 EPG.

Trematoda eggs were detected in the faeces of two specimens of *Tiliqua gigas* from a private owner (Fig. 5). The intensity was found to be 90 EPG.

Pseudoparasites were also detected. Eggs of the Mesostigmata (Acari) (Fig. 6) were found in 12.1% samples. *Myobia musculi* was detected in a single *Lampropeltis polyzona*, and *Demodex* sp. in one



Fig. 7. *Myobia musculi* (Acari) from *Lampropeltis polyzona*

specimen of *Pituophis catenifer* (Fig. 7). All of the pseudoparasites were derived from the crickets and rodents eaten by the reptiles.

A small proportion of the reptiles demonstrated some symptoms characteristic of parasitic infection, including weight loss, diarrhea or anorexia. This was particularly true in specimens with a high intensity of coccidian infection.

Discussion

Based on the results of the coproscopic examination, endoparasite infection appears very common in pet reptiles, with 59.3% of them demonstrating signs of infection. Studies on pet reptiles from Slovenia revealed parasitic infection levels of 81.8%, but only 1.5% of them were infected by coccidia [1]. A similar result to the present study was obtained by Papini, who

identified coccidian oocysts in 12.3% of reptiles [8]. In the present study, lizards were much more likely to be hosts of coccidia than any other group of examined reptiles. A study of pet reptiles in Italy identified oocysts of *Eimeria* sp. and *Isospora* sp. only in lizards; snakes and tortoises were not infected [8]. *Eimeria* and *Isospora* are the most common protozoans found in reptiles, with oocysts of *Isospora taizii* having been found in 64.3% of *Chamaeleo calypttratus* from the Republic of Yemen [4] and *Eimeria* sp. (mostly *Eimeria tenella*) in 63% of *Agama agama* from Nigeria [9]. In addition, another type of protozoan, one of the *Choleoeimeria* genus, was found in a captive-bred *Python regius* [10].

The most common parasites of pet reptiles are nematodes, being found to infect over half of the examined animals in the present study, with the most commonly-observed group of nematodes being the oxyurids from the Pharyngodonidae family. The Pharyngodonidae are the only members of the Oxyuroidea superfamily which can infect reptiles [11]. Oxyurid infection was found in reptiles from pet shops, private owners and the Cracow Zoological Garden. According to Rataj et al. [1] the Pharyngodonidae are common parasites of lizards, snakes and tortoises, infecting 649 of 949 studied reptiles. Okulewicz et al. [12] report the presence of Pharyngodonidae in 37.5% of samples taken from lizards, and Papini found oxyurids in only 16% of tested fecal samples [8]. In the present study, the Pharyngodonidae were also found to be more likely to infect lizards than other tested reptiles, with a prevalence of 29.7%.

The Rhabditoidea were also found to be quite

Table 2. Prevalence of parasites in examined pet reptiles

	Testudines (n=30)	Lacertilia (n=40)	Serpentes (n=21)	Total	Prevalence (%)
Parasites					
<i>Isospora</i> sp.	0	3	0	3	3.3
<i>Eimeria</i> sp.	0	10	1	11	12.1
Pharyngodonidae	14	27	1	42	46.2
Ascarididae	0	1	0	1	1
Rhabditoidea	0	5	2	7	7.7
Trematoda	0	2	0	2	2.2
Pseudoparasites					
Mesostigmata	0	8	3	11	12.1
<i>Myobia musculi</i>	0	0	1	1	1
<i>Demodex</i> sp.	0	0	1	1	1

common. All genera in this superfamily have free-living and parthenogenetic parasitic cycles, and mostly affect the respiratory system. The *Rhabdias* genus has been detected in a number of popular lizard and snake families, such as the Agamidae, Chamaeleonidae, Gekkonidae, Boidae and Colubridae [13]. Previous studies have found them to have a prevalence of only 2.8%. Rataj et al. [1] report the presence of *Strongyloides* sp. (Rhabditoidea) eggs in 0.3% of tested lizards, 5.6% of snakes and 3.7% of tortoises.

In the present study, only one specimen of *Iguana iguana* from the pet shop was found to be infected by members of the Ascarididae. Okulewicz et al. [12] report the presence of Ascarididae eggs in one specimen of *Gonocephalus chamaeleontinus* obtained from wholesale suppliers, which had probably been caught from the wild, giving a prevalence of 0.6% within the tested sample. Ascarididae eggs were also identified in 2.5% of pet reptiles from Germany [13].

The last group of endoparasites detected in our study was the Trematoda. Unfortunately, this species was identified based solely on morphological features, and measurement of the eggs was impossible. Trematoda eggs were also found in fecal samples from an Indonesian blue-tongued scythe (*Tiliqua gigas*) obtained from a pet shop, and which had been caught from the wild. Trematoda are rather unusual parasites of pet reptiles: only 80 infections were found from 949 pet reptiles tested in Slovenia [1]. Pasmans et al. [13] detected Trematoda eggs in 0.6% of examined lizards and snakes.

The reptiles from pet shops examined in the present study were found to be rich in endoparasite species, and this could be attributed to the fact that some were caught from the wild and most had not been dewormed. As well as the helminth species typically found in reptiles, pseudoparasites like Mesostigmata groups, *Myobia musculi* and *Demodex* sp. were also detected; these had probably infected the reptiles from insects or rodents in their diet [14]. Similarly, Rinaldi et al. [15] detected various pseudoparasites including *Hymenolepis nana*, *Trichuris muris* and *Syphacia obvelata* in 39.2% of examined snakes, and mite eggs were found in 12% of examined lizards. Raś-Noryńska and Sokół [16] also found eggs of *Hymenolepis* sp. eggs in the feces of *Lampropeltis* sp.

In conclusion, endoparasites are common in pet reptiles caught from the wild and in those kept in pet

stores. To improve the welfare of these animals, the level of parasitic infections should be monitored and appropriate zoohygienic conditions should be maintained. Reptiles, like other domestic animals, should receive regular veterinary care and be periodically dewormed, because high parasitic invasions can contribute to losses in captive breeding. While the reptiles are being treated the reptiles should be kept on an aseptic substrate like paper towels or lignin, which should be replaced daily. It is also important to regularly inspect faeces in order to determine the effectiveness of treatment [17].

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Received 31 January 2018

Accepted 23 April 2018