

# THE COMPARISON OF HELMINTH INFECTIONS IN PET SNAKES AMONG AMATEUR AND PROFESSIONAL SNAKE KEEPERS

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## Annotation

*The aim of this article is to find out the prevalence of snake helminthiasis among private amateur keepers and professional snake keepers. Untreated animals are vectors of infection, and when ingested, helminths damage the digestive system, weaken the immune system, impair the absorption of nutrients, and the toxins they release, poison the body. As there is still a lack of readily available information on the breeding and care of exotic animals, one of the most common diseases of pet snakes is compared – helminthiasis among professional and amateur snake keepers.*

**Keywords:** pet snakes, helminthic infections, coprological analysis, sedimentation method.

## Introduction

Reptiles have become increasingly common domestic pets. Keeping exotic snakes as pets is becoming more and more popular every year (Vergles Rataj et al., 2014) not only in foreign countries, but also in Lithuania. There are enough forums and websites for exotic snake lovers on the Internet, which are actively involved in various health and housing issues, looking for common solutions.

The growing popularity of exotic animals has a significant impact on the interest of veterinarians in the diseases, treatment and prevention of these animals. Although this process is moving forward, it must be acknowledged that it is slow enough. Information is still lacking not only for animal keepers but also for veterinarians. As the number of exotic snakes increases, so does the number of sick snakes, so snake keepers should have more knowledge about the most common diseases in their pets. Veterinarians and the media do not carry out educational activities that would benefit current and future snake keepers. More information would significantly reduce the incidence of not only helminthiasis but also other diseases in snakes.

The infestation with parasites plays an important role. Reptiles may carry diseases, which can be spread to other animals, other animal species and even to humans (Dovč et al., 2004).

**Relevance of the research.** Helminthoses of exotic snakes are dangerous not only to snakes but also to other animals and their keepers. Infection of snakes with helminths is relevant not only for pet owners who keep one or more snake, but also for professional keepers, such as nature centers, zoos. Analyzing snake helminthiasis and its incidence inevitably raises the question of what influences helminth infestation and what could be done to improve the current situation.

**Research object:** pet snakes helminthosis.

**Aim of the research:** to identify the species of parasites that infected clinically healthy pet snakes at professional and amateur snake keepers.

**Objectives of the research:**

1. To compare the helminthic infectious in pet snakes between professional (zoos, natural centers, etc.) and amateur snake keepers.
2. To identify the species of parasites that infected clinically healthy pet snakes.

**Research methods.** Data of monitoring, results of coprological research.

### Literature review

Exotic reptiles held by people in their homes are often infected with internal parasites (Ras-Norynska & Sokol, 2015) and some of them can infect humans (Vergles Rataj et al., 2011). A healthy reptile has a number of pathogens, all kept in check by a healthy immune system and the beneficial gut flora. When a reptile is highly stressed or under prolonged moderate to severe stress, the immune system falters. In cases of improper environmental temperatures, starvation, or prolonged dehydration, the beneficial gut flora die off and organisms benign in small numbers gain ascendancy and start causing problems (Vergles Rataj et al., 2011).

Pet shop animals were more likely to be infected with endoparasites, whereas ectoparasites were more prevalent in household animals. Cervone et al. (2016) study confirm that pathogenic and potentially zoonotic parasites are common among pet reptiles in Italy and highlight the role of veterinarians in educating the public regarding the need to control pet reptile parasitic diseases and prevent the introduction of exotic reptile parasitic species.

Insufficient control of animal origin and health status causes a risk for introduction of various diseases, including parasitoses. Parasitic infections are often chronic and in optimal habitat and maintenance conditions do not give clear clinical symptoms. In contrast, the stress of transport, inadequate microclimate in the terraria, concentration of animals or improper nutrition, can suppress the immune system and lead to clinical form of parasitic diseases. Especially relating to internal parasites, which in nature live in a cohabitation with their host (Vergles Rataj et al., 2011).

According to Jorge et al. (2013) single coproscopical examination is not fully reliable, because only about 36% of the reptilian faecal samples showed the presence of parasites that were then found in postmortem examination. Nevertheless, parasitological examination of faeces is non-invasive and easy to perform. It should be performed especially in all reptiles freshly introduced to the terrarium, during the quarantine period, even if the animals do not show any clinical symptoms (Ras-Norynska & Sokol, 2015).

In European countries, the prophylactic use of anthelmintics is common in small animals, while in the United States, coprological tests are performed before anthelmintics administration to make sure that treatment is appropriate. Frequent use of anthelmintics may lead to drug resistance, for example, the use of fenbendazole has already raised concerns regarding possible toxic effects, the development of resistance and radiomimetic effects in rabbits, birds, reptiles and farm animals (Machin, 2015).

However, by practicing good sanitation and personal hygiene, and keeping snakes, lizards, chameleons and turtles out of the food preparation areas, it is possible to minimize the risk. The presence of different endoparasites have an important role on the health status of reptiles and on the development of other diseases (Satour & Deweir, 2018).

### Methodology

The study was conducted in 2020-2021 among Lithuania snake keepers. Data of helminthiasis of exotic snakes were collected by interviewing exotic snake keepers and conducting coprological studies. Coprological samples of exotic snakes, collected from amateur and professional keepers were divided into three groups – snakes, grass-snakes, pythons. The infection of helminths in exotic snakes kept by professional keepers (zoos, natural centers) and private amateur growers was compared.

Coprological studies were performed in the College Laboratory. During the study period, 36 samples from private snake keepers and 25 samples from professional snake keepers (zoos, natural centers) were analyzed.

The feces used in the study were collected in sealed, disposable containers for the storage of feces. The collected snake feces were stored in a refrigerator at +3-5 °C until analysis. The coprological study was performed using the sedimentation method.

According to Wolf et al. (2014) for examination of reptile faeces two methods should be used – native smear and flotation. The aim of this study was not to identify protozoa and therefore the native smear test has not been applied. As sedimentation and flotation studies did not show significant differences in previous studies, the sedimentation method was chosen.

### Sedimentation techniques

Material: scales, microscope, methylene blue 1 percent, water, strainer (with 0,5 mm mesh), 2 glass flasks, conical cup, spatula.

Procedure: weigh 10 grams of fresh faeces and mix with 250 ml of water. Strain through a grid into a conical cup and leave to stand for 10 to 30 minutes until a large precipitate settles. Drain the water, re-add 250 ml of water to the precipitate and mix. After 10-30 minutes, the water is drained.

Add 100 ml of water to the precipitate and add 5 drops of 1% methylene blue solution. After 5 minutes the water is drained and the precipitate is examined under a microscope at 40 x.

### Results and Discussion

Reptiles tested in the study did not show any specific clinical symptoms for parasitic diseases, although more than 65 percent of the samples tested were positive. Infection with exotic snakes kept by private keepers-amateurs averaged almost 93 percent, professional growers (average of all three groups – snakes, grass-snakes and pythons) – 38 percent (Fig. 1).

Papini et al. (2011) states that approx. 57% of captive-bred reptiles are infected with parasites. According to A. M. Zajac & G. A. Conboy (2012), reptile parasite detection depends on the collection of the correct specimens, the number of specimens submitted, fixation, processing methods as well as diagnostic tests to be used, and the examination of personnel who are well trained in the identification of organisms. It should be noted, that these methods were developed for examination of humans and domestic animals (i.e. mostly mammals) parasites and that reptile faeces show some differences compared to other domestic animals, like the quantity available for examination (generally small) or the faecal composition (presence of urates, food artifacts or soil when samples are collected from terraria) (Wolf et al., 2014). Another recently established method (FLOTAC) has been shown to be a sensitive technique for diagnosis of parasitic infections in reptiles (Rinaldi et al., 2012) but requires a specially developed apparatus.

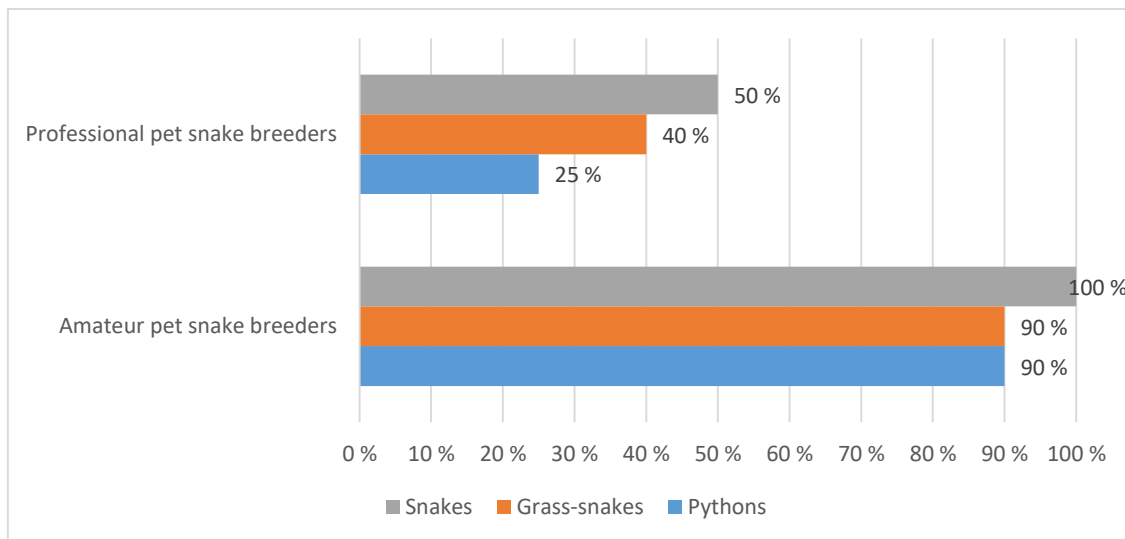


Fig. 1. Infection of pet snakes with helminths at private and professional snake keepers

Despite the fact that professional snake keepers give anthelmintics to exotic snakes once every six months, the infection rate is 38 percent (average of all three groups – snakes, grass-snakes and pythons). Helminths were found in 40 percent grass-snakes, 50 percent snakes and 25 percent pythons. This relatively high level of infection may be due to the fact that the anthelmintics were administered to these snakes only once and no re-dehelmentation was performed after two weeks. According to B. Ballard & R. Cheek (2003), if a large infestation of parasites is found, an animal such as python should be treated at least three times every two weeks. However, if the dose of the drug is strong enough and the invasion is not very high, a single dose of the drug may be sufficient. The eggs may come from the eaten rodents and are treated as pseudoparasites. It is recommended to repeat the faecal examination after a few days to rule out infection of the snake (Ras-Norynska & Sokol, 2015). Also, the litter which is used might be one of the reasons why there is a relatively large invasion of helminths with professional snake keepers, despite anthelmintics given every 6 months. Here, outdoor gravel is most commonly used as litter for snakes, and despite being heated, some helminth eggs may remain in it.

A survey of private snake keepers-amateurs revealed that only 7 percent private snake keepers have given anthelmintic drugs and only 6 percent they are given regularly every six months. This is also reflected in the research, as even 93 percent exotic snakes kept by private snake keepers are infected with helminths.

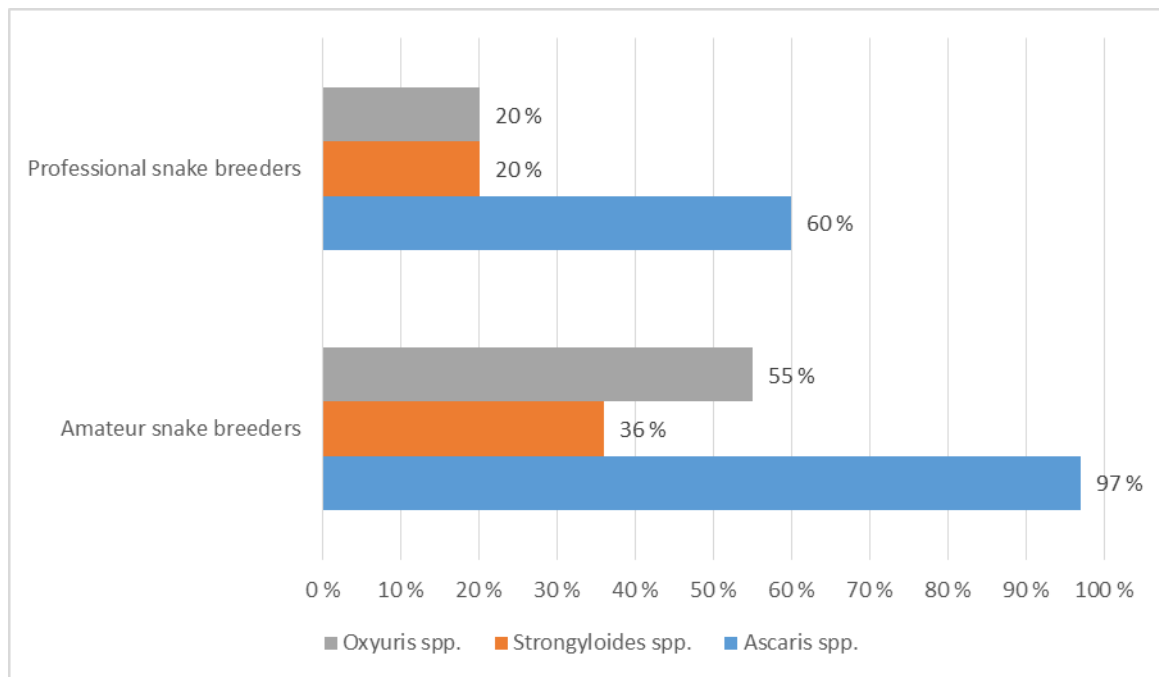


Fig. 2. Helminth species in snakes kept by amateur and professional keepers

Coprological studies of exotic snakes revealed 3 species of nematodes. *Ascaris spp.*, *Oxyuris spp.* and *Strongyloides spp.* was mostly detected in both groups of snakes (professional and amateur) with 60 percent and 97 percent, to a lesser extent *Oxyuris spp.*, 20 percent and 55 percent respectively and the least *Strongyloides spp.*, 20 percent and 36 percent respectively. However, only one species of helminth eggs or larvae (*Ascaris spp.* or *Strongyloides spp.* or *Oxyuris spp.*) was found in the faecal sample of one animal in professional keepers, and either only *Ascaris spp.* or two species of nematodes were found in one snake faecal sample of private keepers (*Ascaris spp.* and *Strongyloides spp.* or *Ascaris spp.* and *Oxyuris spp.*).

According to A. Vergles Rataj et al. (2014) data, in many of reptiles two or more different species of parasites were found. In two cases four different parasitic species were identified: in Ball Python *Strongyloid* eggs, *Ascaridae*, *Capillaria spp.* and *Pentastomida (Porocephalus crotali)*, and in Spotted Desert Racer *Strongyloid* eggs, *Acanthocephala*, *Cyclospora spp.* and eggs and adults of *Porocephalus crotali*. By W. Beck & N. Pantchev (2012), *Ascarid* nematoda is one of the most important pathogens for snakes and infestation can be fatal. By A. Vergles Rataj et al. (2014), the most frequent parasites found in snakes were *Strongyloid* nematoda. *Ascarid* eggs, *Oxyurid* eggs, *Strongyloides spp.*, *Capillaria spp.*, *Trematoda*, *Acanthocephala*, *Trichomonadidae*, *Cryptosporidium spp.*, *Cyclospora spp.* and *Nyctotherus spp.* were also detected. Similar parasite invasions are described in the literature (Mader, 1996; Klingerberg, 1993).

According to Rapševičiūtė (2021), coprological examinations should be performed in both clinically healthy reptiles and reptiles with clinical signs of disease. The most accurate results are obtained using two coprological test methods – native smear and flotation.

*Ascaridia spp.* and *Strongylus spp.* infections result in nonspecific gastrointestinal signs such as haemorrhagic ulcers and maldigestion, that may lead to general debility. Parasitic diseases combined with stress and poor husbandry conditions (e.g. malnutrition or low temperature in the terrarium) may even lead to death of the reptile (Ras-Norynska & Sokol, 2015).

### Conclusions

- According to professional snake keepers, the total infectivity of snakes reaches 38 percent. Helminths were found in 40 percent grass-snakes, 50 percent snakes and 25 percent pythons.
- Only 7 percent private snake keepers have given anthelmintic drugs to their pets and only 6 percent respondents give anthelmintics regularly. This is also reflected in research, as even 93 percent exotic snakes kept by private snake keepers are infected with helminths.
- *Ascaris spp.* was mostly detected in both professional and amateur snake keepers, with 60 percent and 97 percent, a bit less extent *Oxyuris spp.*, respectively 20 percent and 55

percent and at least *Strongyloides spp.*, respectively 20 percent and 36 percent. However, only one species of helminth egg or larvae was found in the faecal sample of one animal by professional keepers and of private keepers was found only ascarids or two species of nematodes (*Ascaris spp.* and *Strongyloides spp.* or *Ascaris spp.* and *Oxyuris spp.*) were found in one faecal sample of private keepers.

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