

# Helminth Parasites of the Leaf-toed Gecko *Asaccus elisae* (Werner, 1895) from Şanlıurfa, Turkey

Hikmet Sami Yildirimhan<sup>1</sup>, Nurhan Sümer<sup>1</sup> & Charles R. Bursey<sup>2</sup>

<sup>1</sup>Department of Biology, Science and Literature Faculty, Uludag University, 16059 Bursa, Turkey;  
E-mails: yhikmet@uludag.edu.tr; n.sumer@hotmail.com

<sup>2</sup>Department of Biology, Pennsylvania State University, Shenango Campus, Sharon, Pennsylvania 16146, USA;  
E-mail: cxb13@psu.edu

**Abstract:** Forty-nine specimens of the leaf-toed gecko *Asaccus elisae* (Werner, 1895) collected in Şanlıurfa Province, Turkey, were examined for helminth parasites. One species of Digenea, *Plagiorchis molini*, one species of Cestoda, *Diplopylidium noelleri* (larvae), six species of Nematoda, adults of *Atractis dactyluris*, *Spauligodon azerbaijanicus*, *Spauligodon tarentolae*, *Spauligodon eremiasi*, *Spauligodon* sp., larvae assigned to Acuariidae gen. sp. and one species of Acanthocephala, *Centrorhynchus aluconis*, were found. *Asaccus elisae* represents a new host record for each of the parasite species. *Atractis dactyluris*, *Diplopylidium noelleri*, *Plagiorchis molini*, *Spauligodon azerbaijanicus*, *S. tarentolae*, *S. eremiasi*, *Spauligodon* sp., acuariid larvae and *Centrorhynchus aluconis* are reported from Turkey for the first time.

**Key words:** Digenea, Cestoda, Nematoda, Acanthocephala, leaf-toed gecko.

## Introduction

The leaf-toed gecko *Asaccus elisae* (Werner, 1895) (Phyllodactylidae) is known from Iran, Iraq, Syria and southern Turkey at altitude up to 650 m (BARAN & ATATUR 1998). To the best of our knowledge, there is only one report of helminth parasites from *A. elisae*, i.e. AL-BARWARI & SAEED (2007) reported the presence of larvae of *Diplopylidium noelleri* and *Thelandros* sp. from this host species from Iraq. The purpose of this paper is to update the helminth list for *A. elisae*.

## Materials and Methods

Forty-nine specimens of the leaf-toed gecko *Asaccus elisae* (20 males, 29 females, mean snout-vent length = 42 ± 4 mm, range 35-48 mm), were collected by hand in 2000-2010 at Birecik (37°03'N, 37°58'E, altitude 415 m) and Harran (36°52'N, 39°01'E, altitude 360 m), Şanlıurfa Province, Turkey. Lizards were euthanized with an overdose of sodium pentobarbital. The body cavity was opened and the digestive tract was removed. The oesophagus, stomach, small and large intestine and lungs were opened and separately examined for helminths using a dissecting microscope. Nematodes were killed in hot saline solution, fixed in

70% ethanol and mounted in glycerol. Digeneans and cestodes were fixed in 70% ethanol, stained with iron acetocarmine (GEORGIEV et al. 1986), cleared in clove oil and mounted in Entellan. Helminth identification was based on keys of YAMAGUTI (1961), SHARPILO (1976) and SCHMIDT (1986). Helminth voucher specimens were deposited in the helminth collection of the Uludag University Museum of Zoology, Bursa, Turkey. Lizard specimens were deposited in the Department of Biology, Uludag University, Bursa, Turkey.

## Results

### *Plagiorchis molini* Lent & Freitas, 1940

**Prevalence and intensity:** 1 of 49 (2%), 2. **Temporal distribution:** 23 June 2010, one host with two parasites. **Site of infection:** small intestine. **Other Turkish records:** none.

**Other reported hosts:** *Lacerta muralis* (CAPUSE 1971, ROCA VELASCO & NAVARRO GOMEZ 1983, SHARPILO et al. 2001); *Lacerta schreiberi* (ROCA & FERRAGUT 1989); *Lacerta vivipara* (LEWIN 1992, SANCHIS et al. 2000); *Algyroides marchi* (LAFUENTE & ROCA 1994).

**Geographic range:** Romania (CAPUSE 1971, SHARPILO et al. 2001) Spain (ROCA VELASCO & NAVARRO GOMEZ 1983, ROCA & FERRAGUT 1989; LAFUENTE & ROCA 1994, SANCHIS et al. 2000); Poland (LEWIN 1992); Turkey (present study).

**Remarks:** *A. elisae* is a new host record for *P. molini*. Turkey is a new geographical record for this parasite species.

#### ***Diplopylidium noelleri* (Skrjabin, 1924), larvae**

**Prevalence, mean intensity and range:** 3 of 49 (6%), 1.7 ± 0, 1–2. **Temporal distribution:** 23 June 2010, three hosts with two, one and one parasites, respectively. **Site of infection:** intestine. **Other Turkish records:** none.

**Other reported hosts:** *Tarentola boettgeri* (ROCA et al. 1987, 1999); *T. delalandii* (ROCA et al. 1987, 1999); *T. gomerensis* (ROCA et al. 1999); *Asaccus elisae* (AL-BARWARI & SAEED 2007).

**Geographic range:** Europe, Africa, Asia, India and China (KHALIL et al. 1994).

**Remarks:** Adults of *D. noelleri* are intestinal parasites of carnivores; larval stages occur in amphibians and reptiles. This is the second report of *Asaccus elisae* as host for larvae of *D. noelleri*.

#### ***Atractis dactyluris* (Rudolphi, 1819)**

**Prevalence and intensity:** 1 of 49 (2%), 10. **Temporal distribution:** 13 September 2000, one host with ten parasites. **Site of infection:** intestine. **Other Turkish records:** none.

**Other reported hosts:** the species of *Atractis* are typically found in tortoises. Currently, the only European species is *A. dactyluris*, which is associated with members of the genus *Testudo* (BAKER 1987).

**Other reports:** see GALLEGO BERENQUER (1947).

**Remarks:** It is of interest to note that *Atractis waltoni* was described from a European toad, *Bufo variabilis* (currently *Bufoles variabilis*) by GALLEGO BERENQUER (1947); however, the species was considered a *species inquirenda* by BAKER (1987). Our specimens are more similar to *A. d. baltazardi* (Petter, 1966). The measurements of *Atractis dactyluris* from *Asaccus elisae* compared with those from *Testudo graeca zarudnyi* from Iran (PETTER 1966) are as follows: muscular oesophagus 410 vs 420; glandular oesophagus 280 vs 260, short spicule 115 vs 140, long spicule 375 vs 370, gubernaculum 110 vs 110. *Asaccus elisae* represents a new host record for the genus *Atractis*. Turkey is a new geographical record for this parasite species.

#### ***Spauligodon azerbaijanicus* Sharpilo, 1974**

**Prevalence, mean intensity and range:** 10 of 49 (20%), 13.8 ± 11, 5, 1–38. **Temporal distribution:** 13 September 2000, one host with ten parasites; 21 June 2010, three hosts with one, one and 11 parasites, respectively; 22 June 2010, five hosts with 9, 7, 24, 14 and 23, respectively; 23 June 2010, one host with 38. **Site of infection:** intestine. **Other Turkish records:** none.

**Another host and locality:** *Lacerta chlorogaster*, Azerbaidzhan (SHARPILO 1974).

**Geographic range:** Azerbaidzhan (SHARPILO 1974); Turkey (present study).

**Remarks:** *A. elisae* is a new host record for *S. azerbaijanicus*. Turkey is a new geographical record for this species.

#### ***Spauligodon cf. tarentolae* (Spaul, 1926)**

**Prevalence, mean intensity and range:** 5 of 49 (10%), 35.8 ± 17.4, 12–60. **Temporal distribution:** 13 September 2000, two hosts with 12 and 30 parasites, respectively; 22 June 2010, one host with 37 parasites; 23 June 2010, two hosts with 60 and 40 parasites. **Site of infection:** intestine. **Other Turkish records:** none.

**Another host and locality:** *Tarentola delalandii*, Canary Islands (SPAUL 1926).

**Geographic range:** Canary Islands (SPAUL 1926); Turkey (present study).

**Remarks:** *A. elisae* is a new host record for *S. cf. tarentolae*. Turkey is a new geographical record. Further examination of these specimens is necessary. Although they are very similar to *S. tarentolae*, the distribution pattern suggests they might be a distinct species.

#### ***Spauligodon eremiasi* Markov & Bogdanov, 1961**

**Prevalence, mean intensity and range:** 5 of 49 (10%), 16.6 ± 11.2, 5–32. **Temporal distribution:** 13 September 2000, two hosts with seven and five parasites, respectively; 22 June 2010, one host with ten parasites; 23 June 2010, two hosts with 32 and 23 parasites, respectively. **Site of infection:** Intestine. **Other Turkish records:** none.

**Type host and type locality:** *Eremias velox*, Central Asia (MARKOV & BOGDANOV 1961). **Other reports:** *Eremias araguta*, *Eremias nikolskii*, *Eremias pelskii*, *Eremias regeli*, *Eremias istrauchi*, *Eremias velox* (MARKOV & BOGDANOV 1961).

**Geographic range:** Central Asia (MARKOV & BOGDANOV 1961); Turkey (present study).

**Remarks:** *A. elisae* is a new host record for *S. eremiasi*. Turkey is a new geographical record for this parasite species.

#### ***Spauligodon* sp.**

**Prevalence, mean intensity and range:** 28 of 49 (57%), 13.1 ± 8.9, 1–31. **Temporal distribution:** 22 June 2010, 14 hosts with 4, 10, 2, 1, 7, 4, 29, 15, 22, 24, 7, 22, 10 and 3, respectively; 23 June 2010, 14 hosts with 31, 23, 19, 11, 24, 19, 19, 13, 2, 17, 1, 7, 13 and 9, respectively. **Site of infection:** intestine. **Other Turkish records:** none.

**Remarks:** These specimens represent an undescribed species of *Spauligodon*. AL-BARWARI & SAEED (2007) reported the occurrence of *Thelandros* sp. in *A. elisae* collected in Iraq. Both are assigned to the family Oxyuridae and should be examined in detail.

#### **Acuariid larvae**

**Prevalence and mean intensity:** 12 of 49 (24%), 1.0 ± 0. **Temporal distribution:** 22 June 2010, 12 hosts, each with one parasite individual. **Site of infection:** cysts in liver. **Other Turkish records:** none.

**Other reports:** *Lacerta lepida* (ROCA et al. 1986, ROCA & LLUCH 1988); *Podarcis hispanica* (ROCA et al. 1986, ROCA & LLUCH 1988); *Hyla meridionalis* (GALEANO et al. 1990); *Podarcis pityusensis* (ROCA & HORNERO 1991, 1992); *Podarcis lilfordi* (HORNERO & ROCA 1992, 1994); *Lacerta agilis* (SHARPILO et al. 2001); *Lacerta viridis* (KIRIN 2002).

**Geographic range:** Spain (ROCA et al. 1986); Ukraine (SHARPILO et al. 2001); Bulgaria (KIRIN 2002).

**Remarks:** Species of the Acuariidae are mainly parasites of the upper alimentary tract of birds, although several species occur in mammals (ANDERSON 2000). Acuariid nematodes require an arthropod intermediate hosts; lizards may serve as paratenic hosts (ANDERSON 2000). *Asaccus elisae* represents a new host record. To the best of our knowledge, this is the first report of larval acuariid nematodes in lizards of Turkey.

#### ***Centrorhynchus aluconis* (Müller, 1780)**

**Prevalence and mean intensity:** 3 of 49 (6%), 2. **Temporal distribution:** 22 June 2010, one host with two parasites; 23 June 2010, two hosts with three and one parasites. **Site of infection:** intestine. **Other Turkish records:** none.

**Other reports:** *Bufo melanostictus* (SUBRAMANIAN 1927); *Rana tigrina* (SUBRAMANIAN 1927); *Rhabdophis ceylonensis* (SUBRAMANIAN 1927); *Natrix natrix* (LEWIN 1992); *Strix aluco* (DIMITROVA & GIBSON 2005).

**Geographic range:** Europe, Asia, Poland, Russia, Ukraine (PETROCHENKO 1958).

**Remarks:** Adults are parasites of owls and hawks; sexually immature parasites have been reported in cats; paratenic hosts are frogs, lizards and snakes (PETROCHENKO 1958). *Asaccus elisae* represents a new host record for *C. aluconis*. Turkey is a new geographical record.

**Table 1A.** Helminth parasites reported from Turkish lizards. References: 1. SCHAD et al. (1960); 2. TINAR (1982); 3. TINAR (1983); 4. SAYGI & OLGUN (1993); 5. YILDIRIMHAN et al. (2006); 6. GURELLI et al. (2007); 7. YILDIRIMHAN et al. (2008); 8. YILDIRIMHAN et al. (2009); 9. DÜŞEN et al. (2010); 10. YILDIRIMHAN et al. (2011); 11. DÜŞEN et al. (2013); 12. İNCEDOĞAN et al. (2014); 13. BIRLIK et al. (2015); 14. ROCA et al. (2015); 15. BIRLIK et al. (2016); 16. ROCA et al. (2016); 17. ROCA et al. (2016); 18. Present study.

Host family	Agamidae		Anguidae	Blanidae	Gekkonidae		Scincidae
Host species	<i>Paralaudakia caucasia</i>	<i>Stellagama stellio</i>	<i>Anguis fragilis</i>	<i>Blanus strauchi</i>	<i>Asaccus elisae</i>	<i>Hemidactylus turcicus</i>	<i>Chalcides ocellatus</i>
Digenea							
<i>Brachylaemus</i> sp., metacercariae	-	-	-	-	-	-	12
<i>Plagiorchis molini</i>	-	-	-	-	18	-	-
Cestoda							
<i>Oochoristica tuberculata</i>	5	-	-	-	-	-	12
<i>Diplopylidium noelleri</i> , larvae	-	-	-	-	18	-	-
<i>Joyeuxiella pasqualei</i> , larvae	-	-	-	-	-	3	-
Nematoda							
<i>Aplectana</i> sp.	-	-	-	9	-	-	-
<i>Atractis dactyluris</i>	-	-	-	-	18	-	-
<i>Acuaridae</i> gen. sp., larvae	-	-	-	-	18	-	-
<i>Ascaridoidea</i> gen sp. (larva)	-	5	-	-	-	-	-
<i>Cosmocerca ornata</i>	-	-	9	-	-	-	-
<i>Entomelas entomelas</i>	-	-	1, 9	-	-	-	-
<i>Foleyella candezei</i>	5	5	-	-	-	-	-
<i>Moaciria icosiensis</i>	-	-	-	-	-	-	12
<i>Oswaldocruzia filiformis</i>	-	-	1, 9	-	-	-	-
<i>Oxysomatium brevicaudatum</i>	-	-	1, 9	-	-	-	-
<i>Parapharyngodon bulbosus</i>	-	-	-	-	-	-	12
<i>Parapharyngodon kasauli</i>	-	5	-	-	-	-	-
<i>Parapharyngodon micipsae</i>	-	-	-	8	-	-	-
<i>Parapharyngodon tyche</i>	5	5	-	-	-	-	-
<i>Pharyngodon inermicauda</i>	-	-	-	-	-	-	12
<i>Pharyngodon mamillatus</i>	-	-	-	-	-	-	12
<i>Pharyngodon spinicauda</i>	-	-	-	9	-	-	-
<i>Rhabdias bufonis</i>	-	-	9	-	-	-	-
<i>Skrjabinodon aegyptiacus</i>	-	-	-	-	-	-	12
<i>Spauligodon azerbajdzanicus</i>	-	-	-	-	18	-	-
<i>Spauligodon eremiasi</i>	-	-	-	-	18	-	-
<i>Spauligodon laevicauda</i>	-	-	-	-	-	2, 3, 6, 7	-
<i>Spauligodon</i> cf. <i>tarentolae</i>	-	-	-	-	18	-	-
<i>Spauligodon</i> sp.	-	-	-	-	18	-	-
<i>Spinicauda sonsinoi</i>	-	-	-	-	-	-	12
<i>Strongyluris calotis</i>	-	5	-	-	-	-	-
<i>Thelandros baylisi</i>	5	-	-	-	-	-	-
<i>Thelandros taylori</i>	-	5	-	-	-	-	-
<i>Thelastomoides</i> sp. (accidental)	-	-	-	8	-	-	-
<i>Acanthocephala</i>							
<i>Centrorhynchus aluconis</i>	-	-	-	-	18	-	-
<i>Macracanthorhynchus catulinus</i>	-	-	-	-	-	7	-

**Table 1B.** Helminth parasites reported from Turkish lizards. References: 1. SCHAD et al. (1960); 2. TINAR (1982); 3. TINAR (1983); 4. SAYGI & OLGUN (1993); 5. YILDIRIMHAN et al. (2006); 6. GÜRELLI et al. (2007); 7. YILDIRIMHAN et al. (2008); 8. YILDIRIMHAN et al. (2009); 9. DÜŞEN et al. (2010); 10. YILDIRIMHAN et al. (2011); 11. DÜŞEN et al. (2013); 12. İNCEDOĞAN et al. (2014); 13. BIRLIK et al. (2015); 14. ROCA et al. (2015); 15. BIRLIK et al. (2016); 16. ROCA et al. (2016); 17. ROCA et al. (2016); 18. Present study.

Host family	Lacertidae										
	Anatololacerta danfordi	Eremias pleskei	Eremias strauchi	Eremias suphani	Lacerta trilineata	Lacerta viridis	Parvilacerta parvataurica	Podarcis taurica	Phoenicolacerta laevis	Apathya capadocica	
Digenea											
<i>Brachylaemus</i> sp., metacercariae	-	-	-	-	10	-	-	-	15	-	-
<i>Plagiorchis elegans</i>	-	-	-	-	10	-	-	-	-	-	-
<i>Pleurogenoides medians</i>	-	-	-	-	10	-	-	-	-	-	-
<i>Prosthodendrium chilosomum</i>	-	-	-	-	-	-	-	-	15	-	-
<i>Sonsinoitrema tacapense</i>	-	-	-	-	-	-	-	-	15	-	-
Cestoda											
<i>Mesocestoides</i> sp., tetrathyridia	6	-	-	-	-	-	-	-	15	13	-
<i>Oochoristica tuberculata</i>	-	-	-	11	-	-	-	-	15	13	-
Nematoda											
<i>Abbreviata abbreviata</i>	-	-	-	-	10	-	-	-	-	-	-
<i>Ascarops strongylina</i> , larvae	-	-	-	-	10	-	-	-	-	-	-
<i>Ascarididae</i> gen sp., larvae	-	-	-	-	-	-	-	-	15	-	-
<i>Falcaustra armenica</i>	-	-	-	-	10	-	-	-	-	-	-
<i>Oswaldocruzia filiformis</i>	-	-	-	-	10	1	-	-	-	-	-
<i>Physaloptera</i> sp., larvae	-	-	-	11	-	1	-	-	-	-	-
<i>Skrjabinodon medinae</i>	-	-	-	-	10	-	-	-	15	13	-
<i>Skrjabinelazia hoffmanni</i>	-	-	-	-	10	-	-	-	-	-	-
<i>Skrjabinelazia taurica</i>	-	-	-	-	-	1	-	-	-	-	-
<i>Spatuligodon atlanticus</i>	-	-	-	-	-	-	-	-	-	-	13
<i>Spatuligodon</i> sp.	-	-	-	-	-	-	4	-	15	-	-
<i>Spatuligodon eremiasi</i>	-	-	11	11	-	-	-	-	-	-	-
<i>Spatuligodon saxicolae</i>	-	-	11	11	-	-	-	-	-	-	-
<i>Thubunaea</i> sp.	-	-	-	-	-	-	-	-	15	-	-
Acanthocephala											
<i>Centrorhynchus</i> sp.	-	-	-	-	-	-	-	-	-	-	13
<i>Unidentified cystacanths</i>	-	11	-	-	-	-	-	-	-	-	-

**Table 1C.** Helminth parasites reported from Turkish lizards. References: 1. SCHAD et al. (1960); 2. TINAR (1982); 3. TINAR (1983); 4. SAYGI & OLGUN (1993); 5. YILDIRIMHAN et al. (2006); 6. GÜRELLI et al. (2007); 7. YILDIRIMHAN et al. (2008); 8. YILDIRIMHAN et al. (2009); 9. DÜŞEN et al. (2010); 10. YILDIRIMHAN et al. (2011); 11. DÜŞEN et al. (2013); 12. İNCEDOĞAN et al. (2014); 13. BIRLIK et al. (2015); 14. ROCA et al. (2016); 15. BIRLIK et al. (2015); 16. ROCA et al. (2016); 17. ROCA et al. (2016); 18. Present study.

Host family	Lacertidae									
	<i>Darevskia uzzelli</i>	<i>Darevskia ben-dimahiensis</i>	<i>Darevskia sapphirina</i>	<i>Darevskia rudis</i>	<i>Darevskia clarkorum</i>	<i>Darevskia parvula</i>	<i>Darevskia raddei</i>	<i>Darevskia valentini</i>	<i>Darevskia armeniaca</i>	<i>Darevskia unisexualis</i>
<b>Cestoda</b>										
<i>Nematotaenia tarentolae</i>	-	-	-	16	-	17	-	17	-	-
<b>Nematoda</b>										
<i>Oswaldoernizia filiformis</i>	-	-	-	16	-	-	-	-	-	-
<i>Skryabinelazia hoffmanni</i>	-	-	-	16	-	-	-	-	-	-
<i>Spaulligodon saxicolae</i>	14	14	-	16	17	17	17	17	-	17
<i>Strongyloides darevskiyi</i>	-	-	-	16	-	-	-	-	-	17

## Discussion

Forty-four (90%) of 49 *Asaccus elisae* harboured 803 helminths representing nine species: 22 geckoes harboured one species; 20 geckoes harboured two species and three harboured three species. There were  $13.6 \pm 25.5$  SD helminth individuals per infected host and  $1.4 \pm 0.8$  helminth species per infected host.

To the best of our knowledge, only 26 (40%) of the 69 lizards reported to occur in Turkey (UETZ 2012) have been examined for helminths (Table 1): slow worm *Anguis fragilis* (SCHAD et al. 1960, DÜŞEN et al. 2010); European green lizard *Lacerta viridis* (SCHAD et al. 1960); Crimean wall lizard *Podarcis tauricus* (SCHAD et al. 1960); Turkish gecko *Hemidactylus turcicus* (TINAR 1982, 1983, YILDIRIMHAN et al. 2008); dwarf lizard *Parvilacerta parva* (SAYGI & OLGUN 1993); Caucasian agama *Paralaudakia caucasica* (YILDIRIMHAN et al. 2006); rougtail rock agama *Stellagama stellio* (YILDIRIMHAN et al. 2006); Danford's lizard *Anatololacerta danfordi* (GÜRELLI et al. 2007); Turkish worm lizard *Blanus strauchi* (YILDIRIMHAN et al. 2009, DÜŞEN et al. 2010); Balkan emerald lizard *Lacerta trilineata* (YILDIRIMHAN et al. 2011); Pleske's racerunner *Eremias pleskei*, Strauch's racerunner *Eremias strauchi*, and suphan racerunner *Eremias suphani* (DÜŞEN et al. 2013); ocellated skink *Chalcides ocellatus* (İNCEDOĞAN et al. 2014); Anatolian lizard *Apathya cappadocica* (BIRLIK et al. 2015); Uzzell's lizard *Darevskia uzzelli*, Bendimahi lizard *D. bendimahiensis*, and Van lizard *D. sapphirina* (ROCA et al. 2015); Lebanon lizard *Phoenicolacerta laevi* (BIRLIK et al. 2016); spiny-tailed lizard *Darevskia rudis* (ROCA et al. 2016), Clarks' lizard *Darevskia clarkorum*, Georgian lizard (red-bellied lizard) *D. parvula*, Radde's lizard *D. raddei*, Valentin's lizard *D. valentini*, Armenian lizard, *D. armeniaca*, unisexual lizard (white-bellied lizard) *D. unisexualis* (ROCA et al. 2016).

Additional studies will be required before the component community of helminths infecting Turkish lizards can be characterized. Currently, we can say that Turkish lizards are infected mostly by generalist helminths, i.e. helminth species that infect more than one host species.

## References

- AL-BARWARI S. E. & SAEED I. 2007. On the helminth fauna of some Iraqi reptiles. *Turkish Journal of Parasitology* 31: 330-336.
- ANDERSON R. C. 2000. *Nematode Parasites of Vertebrates: Their Development and Transmission*, 2<sup>nd</sup> ed. CAB International, Wallingford, Oxon, U.K. 650 p.
- BAKER M. R. 1987. *Synopsis of the Nematoda Parasitic in Amphibians and Reptiles*. Memorial University of Newfoundland, Occasional Papers in Biology, St. John's Newfoundland, Canada, pp. 1-325.
- BARAN İ. & ATATUR M. 1998. *Turkish Herpetofauna*. The Republic of Turkey, Ministry of Environmental Publications, Ankara. 214 p.
- BIRLIK S., YILDIRIMHAN H. S., SÜMER N., KUMLUTAŞ Y., İLGAZ C., GÜÇLÜ O. & DURMUŞ H. S. 2015. The helminth fauna of *Apathya cappadocica* (Werner, 1902) (Anatolian Lizard) from Turkey. *Helminthologia* 52: 310-315.

- BIRLIK S., YILDIRIMHAN H. S., SÜMER N., KUMLUTAŞ Y., ILGAZ C., DURMUŞ S. H., GÜÇLÜ O. & CANDAN K. 2016. Helminth fauna of Lebanon lizard, *Phoenicolacerta laevis* (Gray, 1838), (Squamata: Lacertidae) from Southern Turkey. *Helminthologia* 53 (3): 262-269.
- CAPUSE I. 1971. Contributions à l'étude des trematodes parasites chez les reptiles du Roumanie. Travaux du Museum d'histoire Naturelle "Grigore Antipa" 11: 33-40.
- DIMITROVA Z. M. & GIBSON D. I. 2005. Some species of *Centrorhynchus* Luhe, 1911 (Acanthocephala: Centrorhynchidae) from the collection of the Natural History Museum, London. *Systematic Parasitology* 62: 117-134.
- DÜŞEN S., UĞURTAŞ İ. H. & AYDOĞDU A. 2010. Nematode parasites of the two limbless lizards: Turkish worm lizard, *Blanus strauchi* (Bedriaga, 1884) (Squamata: Amphisbaenidae), and slow worm, *Anguis fragilis* Linnaeus 1758 (Squamata: Anguillidae), from Turkey. *Helminthologia* 47: 158-163.
- DÜŞEN S., KUMLUTAŞ Y., ILGAZ C., YAKA H. & KARADAYI F. 2013. Helminth parasites of the three racerunner lizards: *Eremias pleskei* Nikolsky, 1905 (Pleske's racerunner-Transcaucasian racerunner), *Eremias strauchi* Kessler, 1878 (Strauch's racerunner) and *Eremias suphani* Başoglu and Hellmich, 1968 (Suphan racerunner) collected from Eastern part of Turkey. *Helminthologia* 50: 108-111.
- GALEANO M., NAVARRO P. & LLUCH J. 1990. Helminthofauna de *Hyla* spp. (Amphibia, Hylidae) en algunas localidades españolas. *Miscellanea Zoologica* 14: 1-6.
- GALLEGO-BERENGUER J. G. 1947. Revision de la familia Atractidae Travassos, 1920, con descripción de dos nuevas especies. *Revista Iberica de Parasitología* 7: 1-90.
- GEORGIEV B. B., BISERKOV V. Y. & GENOV T. 1986. *In toto* staining method for cestodes with iron acetocarmine. *Helminthologia* 23: 279-281.
- GURELLI G., GÖÇMEN B., CETİN-DOĞAN T. & ALPAGUT-KESKİN N. 2007. First record of *Mesocoeloides* spp. Vaillant, 1863. Tetrathyridia (cestoidea: cyclophyllidae) in Anaoian lizard, *Anatololacerta danfordi* (gunther, 1876) in Turkey. *North-Western Journal of Zoology* 3: 96-106.
- HORNERO M. J. & ROCA V. 1992. Redescription of *Skrjabinodon medinae* (García-Calvente, 1948) (Nematoda: Pharyngodonidae) from the cloaca of *Podarcis pityusensis* (Bosca, 1883) (Sauria: Lacertidae) of the Balearic Islands (Spain). *Systematic Parasitology* 23: 31-35.
- İNCEOĞAN S., YILDIRIMHAN H. S. & BURSEY C. R. 2014. Helminth parasites of the ocellated skink, *Chalcides ocellatus* (Foskal, 1775) (Scincidae) from Turkey. *Comparative Parasitology* 81: 260-269.
- KHALIL L. F., JONES A. & BRAY R. A. 1994. Keys to the cestode parasites of vertebrates. CAB international, Wallingford, Oxon, UK.
- KIRIN D. 2002. New data on the helminth fauna of *Lacerta viridis* Laurenti, 1768, and *Podarcis muralis* (Laurenti, 1768) (Reptilia: Lacertidae) in Bulgaria. *Acta Zoologica Bulgarica* 54: 43-48.
- LA FUENTE M. & ROCA V. 1994. Helminthofauna de *Algyroides marchi* Valverde, 1958 (Sauria, Lacertidae) en las Sierras de Alcaraz y Cazorla. *Miscellanea Zoologica* 17: 268-271.
- LEWIN J. 1992. Parasites of *Lacerta vivipara* Jacquin, 1787 in Poland. *Acta Parasitologica* 37: 79-82.
- MARKOV G. S. & BOGDANOV O. P. 1961. Parasites of desert lizards in Central Asia. *Uchenye Zapiski Stalinradsk Gosudarstve Pedagogicheskii Instytut*. 13: 101-123. [in Russian]
- PETROCHENKO V. I. 1958. Acanthocephala of domestic and wild animals. *Izdatel'stvo Akademii Nauk SSSR, Moskva*. Israel Program for Scientific Translation, Jerusalem, 1971.
- PETTER A. J. 1966. Équilibre des espèces dans les populations de nématodes parasitico du colon des tortues terrestres. *Memoires du Muséum National d'Histoire Naturelle, Série A., Zoologie Tome 39, fasc 1*, 252 p.
- ROCA V. & NAVARRO GOMEZ P. 1983. *Plagiorchis molini* (Digenea: Plagiorchidae) parasite to the rock lizard *Podarcis muralis* (Reptilia: Lacertidae). *Revista Iberica de Parasitología* 43: 325-332.
- ROCA V., LLUCH J. & NAVARRO P. 1986. Contribucion al conocimiento de la helmintofauna de los herpetos ibericos. Parasitos de Lacertidae: *Lacerta lepida* Daudin, 1802, *Podarcis hispanica* Steindachner, 1870. *Revista Iberica de Parasitología* 46: 129-136.
- ROCA V., GARCIA-ADELL G., LOPEZ E. & ZAPATERO-RAMOS L. M. 1987. Algunas formas adultas y larvarias de platelmintos de reptiles de las Islas Canarias. *Revista Iberica de Parasitología* 37: 263-270.
- ROCA V. & LLUCH J. 1988. L'helmintofaune des lacertidae (Reptilia) de la zone thermomediterraneenne de l'est de l'Espagne. *Aspects ecologiques*. *Vie et Milieu* 38: 201-205.
- ROCA V. & FERRAGUT M. V. 1989. Helminthofauna del lagarto verdinegro, *Lacerta schreiberi* Bedriaga, 1878 (Reptilia: Lacertidae) del Sistema Central (España). *Revista Iberica de Parasitología* 49: 291-300.
- ROCA V. & HORNERO M. J. 1991. Helminthofauna de *Podarcis pityusensis* (Bosca, 1883) (Sauria: Lacertidae). *Revista Espanola de Herpetologia* 5: 77-87.
- ROCA V. & HORNERO M. J. 1992. A contribution to the knowledge of helminth communities of insular lizards. pp. 393-398 in Z. Korsos and I. Kiss (eds). *Proceedings of the 6th Ordinary General Meeting of the Societas Europaea Herpetologica*, Hungarian Natural History Museum, Budapest.
- ROCA V. & HORNERO M. J. 1994. Helminth infracommunities of *Podarcis pityusensis* and *Podarcis lilfordi* (Sauria: Lacertidae) from the Balearic islands (western Mediterranean basin). *Canadian Journal of Zoology* 72: 658-664.
- ROCA V., MARTIN J. E. & CARBONELL E. 1999. Helminths parasitising endemic geckoes from Canary Islands. *Miscellanea Zoologica* 22: 101-108.
- ROCA V., JORGE F., ILGAZ C., KUMLUTAŞ Y., DURMUŞ S. H. & CARRETERO M. A. 2015. Are the helminth communities from unisexual and bisexual lizards different? Evidence from gastrointestinal parasites of *Darevskia* spp. in Turkey. *Acta Zoologica Academiae Scientiarum Hungaricae* 61: 279-288.
- ROCA V., JORGE F., ILGAZ C., KUMLUTAŞ Y., DURMUŞ S. H. & CARRETERO M. A. 2016. The intestinal helminth community of the spiny-tailed lizard *Darevskia rudis* (Squamata, Lacertidae) from northern Turkey. *Journal of Helminthology* 90: 144-151.
- ROCA V., JORGE F., ILGAZ C., KUMLUTAŞ Y., DURMUŞ S. H. & CARRETERO M. A. 2016. Intestinal parasites of unisexual and bisexual lizards *Darevskia* spp. (Lacertidae) from Northeastern Anatolia. *Helminthologia* 53: 298-303.
- SANCHIS V., ROIG J. M., CARRETERO M. A., ROCA V. & LLORENTE G. A. 2000. Host-parasite relationships of *Zootoca vivipara* (Sauria: Lacertidae) in the Pyrenees (North Spain). *Folia Parasitologica* 47: 118-122.
- SAYGI G. & OLGUN K. 1993. Sivas'ta Cüce Kertenkelelerde (*Lacerta parva*) bulduğumuz Nematod: *Spauligodon cinsi*. *Turkish Journal of Parasitology* 17: 40-45.
- SCHAD G. A., KUNTZ R. E. & WELLS W. H. 1960. Nematode parasites from Turkish vertebrates. An annotated list. *Canadian Journal of Zoology* 38: 949-963.
- SCHMIDT G. D. 1986. *Handbook of tapeworm Identification*. CRC Press Inc., Boca Raton, Florida, USA. 675 pp.
- SHARPILO V. P. 1974. *Spauligodon azerbaijanicus* n. sp. (Nematoda Pharyngodonidae) a parasite of *Lacerta choloragasten*. *Vestnik Zoologii* 3: 82-83.
- SHARPILO V. P. 1976. Parasitic worms of reptiles from the fauna of USSR. *Kiev: Naukova Dumka*.
- SHARPILO V. P., BISERKOV V. A., KOSTADINOVA J., BEHNKE M. & KUZMIN Y. I. 2001. Helminths of the sand lizard, *Lacerta agilis* (Reptilia, Lacertidae), in the Palaearctic: faunal diversity and spatial patterns of variation in the composition and structure of component communities. *Parasitology* 123: 389-400.
- SPAUL E. A. 1926. On a new species of the nematode genus *Pharyngodon*. *The Annals and Magazine of Natural History* 17: 585-591.
- SUBRAMANIAN K. 1927. Notes on the larvae *Centrorhynchus aluconis* (Muller, 1780) (Acanthocephala) found in Rangoon toads. *Journal of the Burma Research Society* 16: 211-212.
- TINAR R. 1982. Güney Anadolu Bölgesi *Hemidactylus turcicus* türü kertenkelelerinde *Pharyngodon laevicauda* Seuret, 1914, Bulguluse. *Uludag Üniversitesi Veteriner Fakültesi Dergisi* 29: 64-174.
- TINAR R. 1983. Güney Anadolu Bölgesinden yakalanan *Hemidactylus turcicus* türü kertenkelelerinde Helmintholojik araştırma. *Uludag Üniversitesi Veteriner Fakültesi Dergisi* 2: 1-7.
- UETZ P. 2012. The Reptile Database. <http://www.Reptile-database.org>. Accessed 2016 July 19
- YAMAGUTI S. 1961. *Systema Helminthum: Vol. III. The Nematodes of Vertebrates. Part I*. Interscience Publishers Inc., New York. 679 pp.
- YILDIRIMHAN H. S., GOLDBERG S. R. & BURSEY C. R. 2006. Helminth parasites of the Caucasian agama, *Laudakia caucasia*, and the rough tail rock agama, *Laudakia stellio* (Squamata: Agamidae) from Turkey. *Comparative Parasitology* 73: 257-262.
- YILDIRIMHAN H. S., SÜMER N. & YILMAZ N. 2008. Hatay'dan Toplanan *Hemidactylus turcicus* (Linnaeus, 1758) (Geniş Parmaklı Keler)'in Helminth Faunası. *Acta Parasitologica Turcica* 32: 393-395.
- YILDIRIMHAN H. S., YILMAZ N. & İNCEOĞAN S. 2009. Helminth Fauna of the Anatolian Worm Lizard, *Blanus strauchi* (Bedriaga, 1884) from Hatay. *Turkish Journal of Parasitology* 33: 327-329.
- YILDIRIMHAN H. S., BURSEY C. R. & ALTUNEL F. N. 2011. Helminth parasites of the Balkan green lizard *Lacerta trilineata* Bedriaga 1886 from Bursa, Turkey. *Turkish Journal of Zoology* 35: 519-535.

Received: 10.01.2017

Accepted: 13.04.2017