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Studies on gastrointestinal helminth of three Lacertid Lizard species, *Podarcis muralis, Podarcis siculus* and *Ophisops elegans* (Sauria: Lacertidae) from Bursa, North-Western Turkey

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Summary

A total of 80 specimens of three species of lacertid *Podarcis muralis* (39), *Podarcis siculus* (18) and *Ophisops elegans* (23) from Bursa were examined for helminths. One species of Digenea, *Plagiorchis elegans*, 1 species of Cestoda, *Mesocestoides* sp. (tetrathyridium); and 3 species of Nematoda, *Skrjabinodon medinae, Spauligodon saxicolae* and *Skrjabinelazia hoffmanni* were found. The helminths reported in this study are generalist helminths that infect a number of lizards.
Keywords: *Podarcis muralis; Podarcis siculus*; *Ophisops elegans*; Digenea; Cestoda; Nematoda

Introduction

Common Wall Lizard, *Podarcis muralis* (Laurenti, 1768) inhabits dry, sunny, rocky places, sometimes sparsely wooded areas; seen on garden walls and ruins. This species known from Middle and South Europe and Turkey; with a vertical distribution up to 2000 m. Istanbul Wall Lizard, *Podarcis siculus* (Rafinesque-Schmaltz, 1810) prefers rocky-stony places and rough stone walls, seen on garden walls or in cemeteries. Its range includes South Europe and North- west Turkey, also an isolated colony in Philadelphia (USA); with a vertical distribution up to 1800 m. A single subspecies *P. s. hieroglyphica* Berthold, 1842 lives in Turkey, in urban Istanbul and Bursa and some islands in the Sea of Marmara (Ugurtas *et al*. 2000). Snake – eyed Lizard, *Ophisops elegans* Menetries, 1832 is a ground-dwelling species usually inhabiting open and plains with sparse vegetation and rocky, soily substrates; prefers steppes. Its range extends from southern Balkan countries, Aegean and Mediterranean to SW Asia and Punjab in N. India; with a vertical distribution to 2000 m. (Baran & Atatur 1998).

To our knowledge, there are just two report of helminths in *Podarcis muralis;* Garcia-Adell and Roca (1988) reported 8 species of helminths from Spain including *Plagiorchis molini, Oochoristica* sp., *Mesocestoides* sp., *Skrjabinadon medinae, Spauligodon carbonelli, Skrjabinelazia pyrenaica, Skrjabinelazia* sp. and *Oswaldocruzia filiformis*. Kirin (2002a) reported 3 species of helminth from Bulgaria *Mesocestoides* spp., *Spauligodon extenuatus* and *Skrjabinelazia hoffmanni.*

There is just one report of helminth in *Podarcis siculus.* This study was conducted in Spain. Roca (1995) reported 6 species of helminths, *Paradistomum mutabile, Oochoristica gallica, Skrjabinadon medinae, Spauligodon cabrerae, Acuaria* sp. (larvae) and *Spirurida* gen sp.

In two reports related to *Ophisops elegans*, Goldberg and Bursey (2010) examined Iranian species and came across *Oochoristica tuberculata* and Nelli *et al*. (2014) encountered *Mesocestoides lineatus* in Armenian species. Nothing has been published on helminths of *P. muralis, P. siculus* and *O. elegans* from Bursa province, North-western Turkey. This study provides new helminth data for these lizard species from Bursa Province in Turkey.

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Materials and Methods

A total of 80 lacertid lizards representing three species (*Podarcis muralis*, *Podarcis siculus* and *Ophisops elegans*) were examined for helminths. Thirty nine specimens of *P. muralis* (21 males, 18 females) were collected by hand in May 1997 – August 1998 from two different locations of Bursa Province, in Turkey. Number of lizards were n=17 at Sogukpınar, n=22 at Baraklı village. Sixteen specimens of *P. siculus* (6 males, 10 females) were collected by hand in May 1997 – July 1998 from two different locations of Bursa Province, in Turkey. Number of lizards were n=5 at İznik, n=11 at Fethiye village. Twenty one specimens of *O. elegans* (15 males, 4 females and 2 juvenils) were collected by hand in December 1996 – October 1998 from two different locations of Bursa Province, in Turkey. Number of lizards were n=6 at Karacabey, n=15 at Baraklı village. Lizards were humanely killed with sodium pentobarbital. The body cavity was opened and the digestive tract was removed. The esophagus, stomach, small and large intestines and lungs were opened and separately examined for helminths under a dissecting microscope. Helminths from each host were placed in individuals of ethanol for storage. For study, helminths were cleared in a drop of undiluted glycerol on a glass slide. Nematodes were identified from these temporary preparations. Digenea and Cestodes were fixed in 70 % ethanol, stained with iron-carmine, dehydrated, cleared and mounted in Entellan (Georgiev *et al*., 1986). Helminth identifications were based on the reference keys of Yamaguti (1961) and Schmidt (1986). Helminth voucher specimens were deposited in the helminth collection of Uludag University Museum of Zoology, Bursa, Turkey. Lizard specimens were deposited in the Department of Biology, Uludag University, Bursa, Turkey.

Ethical Approval and/or Informed Consent

All applicable national and institutional guidelines for the care and use of animals were followed.

Results

***Podarcis muralis* (Laurenti, 1768) Common Wall Lizard**
There were 5 species of helminths in these lizards.
***Plagiorchis elegans* (Rudolphi, 1802) Braun, 1902**
(Syn. *Fasciola elegans* Rudolphi, 1802; *Fasciola cirratus* Rudolphi, 1802; *Distoma colubri natricis* Rudolphi, 1809; *Distoma elegans* (Rudolphi, 1802) Rudolphi,1809; *Distoma colubri tessellati* Rudolphi, 1819; *Distoma lacertae* Rudolphi, 1819; *Distomum (Brachylaimus) elegans* (Rudolphi, 1802) Dujardin 1845; *Distomum erraticum* Linstow 1894; *Plagiorchis cirratus* (Rudolphi, 1802) Lühe, 1899; *Plagiorchis mentulatus* (Rudolphi 1819) Stossich, 1904; *Plagiorchis asperus* Stossich, 1904; *Plagiorchis notabilis* Nicoll, 1909; *Plagiorchis marii* Skrajabin, 1920; *Plagiorchis blumbergi* Massino 1927; *Plagiorchis brauni* Massino 1927; *Plagiorchis loossi* Massino 1927; *Plagiorchis massino* Petrov and Tichonoff , 1927; *Plagiorchis multiglandularis* Semenow, 1927; *Plagiorchis skrajabini* Massino 1927; *Plagiorchis uhlworni* Massino, 1927; *Plagiorchis potanini* Skrjabin, 1928; *Plagiorchis eutamiatis* Schulz, 1932; *Plagiorchis casarci* Mehra, 1937; *Plagiorchis ferrigunum* Mehra, 1937; *Plagiorchis eutamiatis* Zibethicus Vassiliev 1939; *Plagiorchis extremus* Strom, 1940; *Plagiorchis strictus* Strom, 1940; *Plagiorchis fuji* Ogata, 1941; *Plagiorchis ptschelkini* Sobolev, 1946; *Plagiorchis petrovi* Fediushin, 1949; *Plagiorchis oscineus* Sudarikov, 1950; *Plagiorchis castoris* Orloff et Moskalev, 1953; *Plagiorchis blatnensis* Chalupsky, 1954; *Plagirochis raabei* Furmaga, 1956; *Plagirochis stefanski* Furmaga, 1956, *Plagiorchis muris* sensu Prokopic and Genov, 1974; *Plagiorchis proximus* sensu Prokopic and Genov, 1974; *Plagiorchis cuculi* Schaldybin, Anikin, Budkin et Suslova, 1977)
Prevalence and mean intensity: 11/39 (28 %), 3 ± 2.38, 1 – 8.
Temporal distribution: 19 July 1998, 7 host with 2, 8, 1, 6, 4, 1, 1 respectively; 20 July 1998, 4 host with 2, 1, 3, 5 respectively.
Site of infection: Small intestine.
Type host and type locality: House sparrow, *Passer domesticus*, Germany (Rudolphi, 1802). ***Additional Turkish records:*** None.
Other reported hosts: **Amphibia:** yellowbelly toad, *Bombina variegata*, (Prokopic & Krivanec, 1975); pool frog, *Pelophylas lessonae*, (reported as Rana esculenta, Prokopic & Krivanec, 1975); common frog, *Rana temporaria*, (Capuse, 1971); **Reptilia:** sand lizard, *Lacerta agilis*, (Shevechenko & Barabashova, 1958; Moravec, 1963; Capuse, 1971; Lewin, 1992a; Shimalov *et al*., 2000; Sharpilo *et al*., 2001; Borkovcova & Kopriva, 2004); European green lizard, *Lacerta viridis*, (Capuse, 1971); viviparous lizard, *Zootoca vivipara*, (reported as *Lacerta vivipara*, Lewin, 1992b; Shimalov *et al*., 2000); European grass snake, *Natrix natrix* (Capuse, 1971); **Aves:** northern goshawk, *Accipiter gentilis*, (Sitko, 1998); Eurasian sparrowhawk, *Accipiter nisus*, (Sitko, 1998); spotted sandpiper, *Actitis macularius*, (Didyk *et al*., 2007); Balkal tean, *Anas formosa*, (Bykhovskaya-Pavlovskaya, 1962); mallard, *Anas platyrhynchos*, (Styczynska-Jurewicz, 1962); little stint, *Calidris minuta*, (Bykhovskaya-Pavlovskaya, 1962); twite, *Carduelis flavirostris*, (Massino, 1929); ruddy shelduck, *Casarca ferruginea*, (Mehra, 1937); black tern, Chlidonias nigra, (Massino, 1929); western marsh harrier, *Circus aeruginosus*, (Bykhovskaya Pavlovskaya, 1953; Krasnolobova, 1987); northern harrier, *Circus cyaneus*, (Krasnolobova, 1987); pallid harrier, *Circus macrourus*, (Bykhovskaya-Pavlovskaya, 1953; Krasnolobova, 1987); common quail, *Coturnix coturnix*, (Bykhovskaya-Pavlovskaya , 1953); common raven, *Corvus corax*, (Massino, 1927); carrion crow, *Corvus corone*, (Mühling, 1896); rook, *Corvus frugilegus*, (Braun, 1902); Eurasian jackdaw, *Corvus monedula*, (Massino, 1927); corncrake, *Crex crex*, (Macko, 1969); common cuckoo, *Cucullus canorus*, (Dubinia & Kulakova, 1960); common house-martin, *Delichon urbica*, (Odening, 1961); great spotted woodpecker, *Dendrocopos major*, (Styczynska-Jurewicz, 1962); merlin, *Falco columbarius*, (Massino, 1927; Krasnolobova, 1987); peregrine falcon, *Falco*

peregrinus, (Krasnolobova, 1987); Eurasian hobby, *Falco subbuteo,* (Bykhovskaya-Pavlovskaya, 1953; Styczynska-Jurewicz, 1962; Krasnolobova, 1987; Ferrer *et al*., 2004); Eurasian kestrel, *Falco tinnunculus*, (Sitko, 1998); red-footed falcon, *Falco vespertinus,* (Styczynska-Jurewicz, 1962; Krasnolobova, 1987); common chaffinch, *Fringilla coelebs*, (Bykhovskaya-Pavlovskaya , 1962); common snipe, *Gallinago gallinago*, (Massino, 1927); chicken, *Gallus gallus domesticus*, (Odening, 1959); Eurasian jay, *Garrulus glandarius*, (Bykhovskaya-Pavlovskaya, 1953); collared pratincole, *Glareola pratincola*, (Braun, 1902; Bykhovskaya-Pavlovskaya, 1962); barn swallow, *Hirundo rustica*, (Odening, 1961); red-backed shrike, *Lanius collurio*, (Massino, 1927); herring gull, *Larus argentatus*, (BykhovskayaPavlovskaya, 1962); great black-headed gull, *Larus ichthyaetus*, (Mhaisen *et al*., 1990); common blackheaded gull, *Larus ridibundus*, (BykhovskayaPavlovskaya, 1962); Hudsonian godwit, *Limosa haemastica* (Kinsella *et al*., 2007); black-tailed godwit, *Limosa limosa*, (Bykhovskaya-Pavlovskaya, 1962); Eurasian black grouse, *Lyrurus tetrix*, (BykhovskayaPavlovskaya, 1962); Eurasian swift , *Micropus apus*, (Odening, 1961); black kite *Milvus migrans*, (Krasnolobova, 1987); white wagtail, *Motacilla alba*, (Bykhovskaya-Pavlovskaya, 1962); yellow wagtail, *Motacilla flava*, (Bykhovskaya-Pavlovskaya, 1962); spotted flycatcher, *Muscicapa striata*, (Styczynska Jurewicz, 1962); Eurasian curlew, *Numenius arquata*, (Bykhovskaya-Pavlovskaya, 1962); slender-billed curlew, *Numenius tenuirostris*, (BykhovskayaPavlovskaya, 1962); tufted duck, *Nyroca fuligula*, (Styczynska-Jurewicz, 1962); Eurasian golden oriole, *Oriolus oriolus*, (Bykhovskaya-Pavlovskaya, 1962); Eurasia scops owl, *Otus scops*, (Braun, 1902); osprey, *Pandion haliaetus*, (Krasnolobova, 1987); bearded reeding, *Panurus biarmicus* (BykhovskayaPavlovskaya, 1962); great tit, *Parus major*, (Braun, 1902; Bykhovskaya-Pavlovskaya, 1962); house sparrow, *Passer domesticus*, (Braun, 1902); Eurasian sparrow, *Passer montanus*, (BykhovskayaPavlovskaya, 1962); coal tit, *Periparus ater*, (Massino, 1929); honey buzzard, *Pernis apivorus*, (Ferrer *et al*., 2004); ruff , *Philomachus pugnax*, (Bykhovskaya-Pavlovskaya, 1962); black-billed magpie, *Pica pica*, (Braun, 1902); glossy ibis, *Plegadis falcinellus*, (Bykhovskaya-Pavlovskaya, 1962); dunnock, *Prunella modularis*, (Styczynska-Jurewicz, 1962); Eurasian nuthatch, *Sitta europaea*, (StyczynskaJurewicz, 1962); common tern, *Sterna hirundo*, (Bykhovskaya-Pavlovskaya, 1962); common starling, *Sturnus vulgaris*, (Bykhovskaya-Pavlovskaya, 1953); barred warbler, *Sylvia nisoria*, (BykhovskayaPavlovskaya, 1962); hazel grouse, *Tetrastes bonasia*, (Bykhovskaya-Pavlovskaya, 1962); wood sandpiper, *Tringa glareola*, (Bykhovskaya-Pavlovskaya, 1962); fieldfare, *Turdus pilaris* (Bykhovskaya-Pavlovskaya, 1962); hoopoe, *Upupa epops*, (BykhovskayaPavlovskaya, 1962); **Mammalia:** arctic fox, *Alopex lagopus*, (Malczewski, 1961; Rausch *et al*., 1983); striped field mouse, *Apodemus agrarius*, (Furmaga, 1956; Zarnowski, 1960; Shimalov, 2002); yellownecked mouse, *Apodemus flavicollis*, (Matskasi, 1971); wood mouse, *Apodemus sylvaticus*, (Furmaga, 1956); dog, *Canis familiaris*, (Petrov & Tichonoff , 1927; Desrochers & Curtis, 1987); bank vole, *Clethrionomys glareolus*, (Matskasi, 1971; Tenora *et al*., 1983; Mazeika *et al*., 2003); cat, *Felis domesticus*, (Petrov & Tichonoff , 1927); harvest mouse, *Micromys minutus*, (Matskasi, 1971); common vole, *Microtus arvalis*, (Chalupsky, 1954); house mouse, *Mus musculus*, (Odening, 1959); water shrew, *Neomys fodiens*, (Panov & Karpenko, 2004); muskrat, *Ondatra ziabethicus*, (Sey, 1965; Matskasi, 1971); common shrew, *Sorex araneus*, (Matskasi, 1971).

Geographic range: Northern hemisphere.

Remarks: All species of *Plagiorchis* use aquatic snails as first intermediate hosts and insects as second intermediate hosts (Roberts & Janovy, 2000). Given the broad host-range any insectivore might be expected to harbor *Plagiorchis elegans. P. muralis* represents the second host record for *P. elegans*.

***Mesocestoides* sp. (tetrathyridium);**

Prevalence and range: 1 of 39 (3 %), 32.

***Temporal distribution*:** 2 June 1997, 1 host with 32.

***Site of infection*:** Body cavity.

Additional Turkish records: *Apathya cappadocica* (Birlik *et al*., 2015); *Anatololacerta danfordi* (Gürelli *et al*. 2007); *Darevskia rudis* (Birlik *et al*., 2018a); *Darevskia valentini* (Birlik *et al*., 2018b); *Lacerta trilineata* (Yıldırımhan *et al*., 2011); *Phoenicolacerta laevis* (Birlik *et al*. 2016).

Other reported reptilian hosts: The genus *Mesocestoides* is cosmopolitian and tetrathyridia can be found in all classes of vertebrates. We have listed known accidental or paratenic hosts reported from the Palearctic biogeographic region: Slow worm, *Anguis fragilis* (Lewin, 1990); Mongolian racerunner, *Eremias argus* (Dugarov *et al*., 2018); Sand lizard, *Lacerta agilis* (Nelli *et al*., 2014; Lewin, 1992a; Sharpilo *et al*., 2001); Redbelly rock agama, *Paralaudakia erythrogaster* (reported as *Agama erythrogaster*, Radchenko, 1973); Eastern giant emerald lizard, *Lacerta media* (Nelli *et al*., 2014); Iberian emerald lizard, *Lacerta schreiberi* (Roca & Ferragut, 1989); *Lacerta viridis* (Biserkov & Kostadinova, 1998); Snake-eyed lizard, *Ophisops elegans* (Nelli *et al*., 2014); Secret toadhead agama, *Phrynocephalus mystaceus* (Ikromov & Cho, 2004); Bocage's wall lizard, *Podarcis bocagei* (Roca *et al*., 1989); Iberian wall lizard, *Podarcis hispanica* (Roca *et al*., 1989); Common wall lizard, *Podarcis muralis* (Kirin, 2002a); Ibiza wall lizard, *Podarcis pityusensis* (Roca & Hornero, 1991; Roca & Hornero, 1994); Spanish psammodromus, *Psammodromus hispanicus* (Roca *et al*., 1986a; Roca & Lluch, 1988); Tenerife wall gecko, *Tarentola delalandii* (Roca *et al*., 1987); Smooth snake, *Coronella austriaca* (Biserkov, 1996); Western whip snake, *Hierophis viridiflvus* (Santoro *et al*., 2013); Aesculapean snake, *Zamenis longissimus,* (reported as *Elaphe longissima,* Biserkov, 1996); Halys pit viper, *Gloydius halys* (reported as *Ancystrodon halys,* Bogdanov *et al*., 1969); European grass snake, *Natrix natrix* (Lewin, 1992b); nose-horned viper, *Vipera ammodytes* (Biserkov, 1995).

Geographic range: Cosmopolitan (McAllister *et al*., 1991).

Remarks: The life cycle of *Mesocestoides* spp. is thought to require 3 hosts, i.e. a vertebrate definite host, a vertebrate second

intermediate host, and a purported arthropod first intermediate host (Rausch, 1994). Tetrathyrida are frequently found in the body cavities of amphibians, reptiles, birds and mammals (Padgett & Boyce, 2004). *P. muralis* represents the eighth host record for the genus *Mesocestoides* in Turkey.

***Skrjabinelazia hoffmanni* Li, 1934**

Prevalence, mean intensity and range: 4 of 39 (10 %) 3 ± 3.5, 1 – 8

Temporal distribution: 2 June 1997, 2 host with 8, 1 respectively; 19 July 1998, 1 host with 1; 20 July 1998, 1 host with 1.

Site of infection: Small intestine.

Type host and type locality: Mongolia racerunner, *Eremias argus*, China (Li, 1934).

Additional Turkish records: *Darevskia rudis* (Roca *et al*., 2015a; Birlik *et al*., 2018a); *Darevskia valentini* (Birlik *et al*., 2018b); *Lacerta trilineata* (Yıldırımhan *et al*., 2011).

Other reports: Comb-toed gecko, *Crossobamon eversmanni* (Andrusko & Markov, 1956; Sharpilo, 1976); Azarbaijan lizard, *Darevskia raddei* (Host reported as *Lacerta raddei*, Khomustenko & Ataev, 1979); *Darevskia saxicola* (Host reported as *Lacerta saxicola*, Sharpilo 1976); *Eremias argus* (Li, 1934; Dugarov *et al*., 2018); Kirghiz racerunner, *Eremias nikolskii* (Sharpilo, 1976); *Lacerta agilis* (Sharpilo, 1976; Sharpilo *et al*., 2001); *Lacerta viridis* (Biserkov & Kostadinova, 1998); *Podarcis bocagei* (Galdon *et al*., 2006; Roca *et al*., 1990); Carbonell's wall lizard, *Podarcis carbonelli* (Galdon *et al*., 2006); *Podarcis hispanica* (Roca *et al*., 1990); Lilford's wall lizard, *Podarcis lilfordi* (Hornero & Roca, 1992a: Roca & Hornero, 1994); *Podarcis muralis* (Kirin, 2002a; Roca *et al*., 1990); Canary wall gecko, *Tarentola angustimentalis* (Roca *et al*., 1999); *Teratoscincus scincus* (Sharpilo, 1976).

Geographic range: Azerbaijan (Khomustenko & Ataev, 1979); Bulgaria (Biserkov & Kostadinova, 1998); Central Asia (Andrusko & Markov, 1956); China (Li, 1934); Portugal (Galdon *et al*., 2006); Russia (Dugarov *et al*.,2018); Spain (Roca *et al*., 1990); Turkey (Yıldırımhan *et al*., 2011); Ukraine (Sharpilo *et al*., 2001).

Remarks: The life history of *S. hoffmanni* apparently has not been studied. However the cogener *S. galliardi* is claimed by Chabaud *et al*. (1988) to produce two types of egg, one thin-shelled and containing third-stage larva, probably autoinfective and a seond, red, thicker shelled with third-stage larvae which probably pass out of the host. *P. muralis* represents the fourth reptilian host record for *Skrjabinelazia hoffmanni* in Turkey.

***Skrjabinodon medinae* (García-Calvente, 1948) Specian and Ubelaker, 1974**

(Syn. *Pharyngodon medinae* García-Calvente 1948; *Parathelandros medinae* [García-Calvente, 1948] Read and Amrein, 1953).

Prevalence, mean intensity and range: 6 of 39 (15 %) 3.5 ± 2.88, 1 – 8

Temporal distribution: 19 July 1998, 5 host with 7, 1, 3, 8, 6 respectively.

Site of infection: Large intestine.

Type host and type locality: *Lacerta muralis*, Spain (García-Calvente, 1948)

Additional Turkish records: *Apathya cappadocica* (Birlik *et al*., 2015); *Darevskia rudis,* Birlik *et al*., 2018a); *Darevskia valentini* (Birlik *et al*., 2018b); *Iranolacerta brandtii* (Birlik *et al*., 2017); *Lacerta trilineata* (Yıldırımhan *et al*., 2011), *Phoenicolacerta laevis* (Birlik *et al*., 2016).

Other reports: *Lacerta schreiberi* (Roca & Ferragut, 1989); *Podarcis bocagei* (Roca *et al*., 1989); *Podarcis hispanica* (Roca *et al*., 1986b; Roca & Lluch, 1988; Roca *et al*., 1989; Hornero & Roca, 1992a); Lilford's wall lizard, *Podarcis lilfordi* (Hornero & Roca, 1992b; Roca & Hornero, 1994); *Podarcis muralis* (Dollfus *et al*., 1961; Garcia-Calvente, 1948; Hornero & Roca, 1992a); *Podarcis pityusensis* (Roca & Hornero, 1991; Hornero & Roca, 1992a; Roca & Hornero, 1994); *Zootoca vivipara* (Host reported as *Lacerta vivipara*, Dollfus *et al*., 1961).

Geographic range: France (Dollfus *et al*., 1961); Spain (Roca & Hornero, 1994); Turkey (Yıldırımhan *et al*., 2011).

Remarks: *P. muralis* represents the seventh host record for the species *Skrjabinodon medinae* in Turkey.

***Spauligodon saxicolae* Sharpilo, 1961**

Prevalence, mean intensity and range: 2 of 39 (5 %) 18 ± 24, 1 – 35

Temporal distribution: 19 July 1998, 2 host with 1, 35 respectively.

Site of infection: Large intestine.

Type host and type locality: Scaly lizard, *Lacerta saxicola* (Sharpilo, 1962) Ukraine.

Additional Turkish records: *Darevskia bendimahiensis* (Roca *et al*., 2015a); *Darevskia clarkorum* (Roca *et al*., 2016)*; Darevskia parvula* (Roca *et al*., 2016); *Darevskia radde* (Roca *et al*., 2016)*; Darevskia rudis* (Roca *et al*., 2016; Murvanidze *et al*., 2008); *Darevskia sapphirina* (Roca *et al*., 2015b); *Darevskia unisexualis* (Roca *et al*., 2016); *Darevskia uzzelli* (Roca *et al*., 2015b); *Darevskia valentini* (Roca *et al*., 2016); *Eremias strauchi* (Düşen *et al*., 2013); *Eremias suphani* (Düşen *et al*., 2013); *Mesalina brevirostris* (Düşen *et al*., 2016).

Other reports: *Eremias velox* (Ikromov & Cho, 2004); *Darevskia caucasica* (Uhlírová, 2005); *Lacerta strigata* (Murvanidze *et al*., 2008); *Daraevskia saxicola* (Goldin, 1975; Murvanidze *et al*., 2008); *Darevskia rudis* (Murvanidze *et al*., 2008); *Podarcis vaucheri* (Carretero *et al*. (2011); *Coluber jugularis* (Murvanidze *et al*., 2008).

Geographic range: Algeria (Carretero *et al*.,2011); Azerbaijan (Uhlirova, 2005); Crimea (Goldin, 1975); Georgia (Murvanidze *et al*., 2008); Turkey (Dusen *et al*. 2013).

Remarks: *P. muralis* represents the 12th reptilian host record for *Spauligodon saxicolae* in Turkey.

***Podarcis siculus* (Rafinesque-Schmaltz, 1810) Istanbul Wall Lizard**

One helminth species was found in the host.

***Spauligodon saxicolae* Sharpilo, 1961**

Prevalence, mean intensity and range: 12 of 16 (75 %), 33 ± 29.5, 4 – 115.

Temporal distribution: 5 May 1997, 2 host with 20, 30 respectively; 25 May 1998, 7 host with 30, 25, 32, 40, 6, 7, 43, 15 respectively; 24 June 1998, 2 host with 4, 60 respectively.

Site of infection: Large intestine.

Remarks: See remarks above under *Podarcis muralis*.

***Ophisops elegans* Menetries, 1832 Snake – eyed Lizard**

No helminths were found in the host.

Discussion

Sixteen (41 %) of 39 *Podarcis muralis* harbored 143 helminths representing 5 species: 10 lizards harbored 1 species, 5 harbored 2 species and 1 harbored 4 species. There were 8.7 ± 9.1 SD (range 1 – 32) helminth individuals per host lizard and 3.5 ± 0.5 SD helminth species per host lizard.

Twelve (67 %) of 16 *P. siculus* harbored 397 helminths representing 1 species: 12 lizards harbored 1 species. There were 33 ± 25.5 SD (range 6 – 115) helminth individuals per host and 24.8 ± 0.5 SD helminth species per host.

There are not helminths in the lizard of the *Ophisops elegans* species.

Of the 147 Turkish reptile species (Uetz, 2019) helminth lists are available for 24 species: *Acanthocadtylus harranensis* Baran, Kumlutas, Llanza, Sindaco, Avci and Crucitti, 2005; *Acanthodactylus schreiberi* Boulenger, 1878; *Anatololacerta danfordi* (Gunther, 1876); *Apathya cappadocica* (Werner, 1902); *Darevskia armeniaca* (Mehely, 1909); *Darevskia bendimahiensis* (Schmidtler, Eiselt and Darevsky, 1994); *Darevskia clarkorum* (Darevsky and Vedmederja, 1977); *Darevskia parvula* (Lantz and Cyren, 1913); *Darevskia raddei* (Boettger, 1892); *Darevskia rudis* (Bedriaga, 1886); *Darevskia sapphirina* (Schmidtler, Eiselt and Darevsky, 1994); *Darevskia unisexualis* (Darevsky, 1966); *Darevskia uzzellis* (Darevsky and Danielyan, 1977); *Darevskia valentini* (Boettger, 1892); *Eremias pleskei* Nikolsky, 1905; *Eremias strauchi* Kesslser, 1878; *Eremias suphani* Basoglu and Hellmich, 1986; *Iranolacerta brandtii* (De Filippi, 1863); *Lacerta trilineata* Bedriaga, 1886; *Lacerta viridis* (Laurenti, 1768); *Mesalina brevirostris* Blanford, 1874; *Parvilacerta parva* (Boulenger, 1887); *Phoenicolacerta laevis* (Gray, 18838); *Podarcis tauricus* (Pallas, 1814).

This report is the first report the helminth fauna list for *P. muralis* and *P. siculus* in Turkey (Table 1). However, additional studies will be required before the component community of helminths infecting Turkish lizards can be determined. For the 24 species listed above, there are on average 3.4 ± 3.3 SD (range 1 – 11) helminth species per lizard species. Currently, we can say that Turkish lizards are infected by generalist Nematodes, i.e. Nematode species that infect more than one host species. And also Turkish lizard is infected by some Digenea and Cestoda species.

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Table 1. Helminths in lizards from Bursa-Turkey.

	P. muralis	*P. siculus*	*O. elegans*
DIGENEA			
Plagiorchis elegans	+	-	-
CESTODA			
Mesocestoides sp. (tetrathyridium)	+	-	-
NEMATODA			
Skrjabinodon medinae	+	-	-
Spauligodon saxicolae	+	+	-
Skrjabinelazia hoffmanni	+	-	-

certidae) from Southern Turkey. *Helminthologia*, 53(3): 262 – 269. DOI: 10.1515/helmin-2016-0016

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