

Review of cestodes (Platyhelminthes: Cestoda) recorded from birds and mammals in Sarnena Sredna Gora Mountains and adjacent territories

MARGARITA MARINOVA

Trakia University, Faculty of Agriculture, Student Campus, 6000 Stara Zagora, Bulgaria; e-mail: mmarinova_@abv.bg

Abstract. A review of cestodes (Platyhelminthes: Cestoda) recorded from birds and mammals in Sarnena Sredna Gora Mountains is presented. A total of 55 species were reported: 29 from birds, 26 from mammals as two of them have been identified at the generic level only. They belong to 36 genera and 9 families of the order Cyclophyllidea. As definitive hosts, 66 vertebrate species have been reported: 46 avian and 20 mammalian species. In addition, 5 of the mammalian species were recorded as intermediate hosts also. Data about synonyms used in Bulgarian helminthological literature, hosts recorded in this area, and geographical distribution are given about each species. A host-parasite list is presented. The cestode species from birds and mammals recorded in the Sarnena Sredna Gora Mts. represent respectively 12.7% from the species recorded from birds and 30.6% from the species recorded from mammals in Bulgaria.

Key words: Cestoda, birds, mammals, review, Sarnena Sredna Gora Mts., Bulgaria.

Introduction

The species composition of the helminth parasites, in particular cestodes (Platyhelminthes: Cestoda) of vertebrate animals has been a subject of extensive studies in Bulgaria during the last 60 years. An updated overview of the cestode fauna of Bulgaria summarizing the available faunistic data on cestodes in this country was presented by Nikolov *et al.* (2010). A total of 336 species were reported: 31 species from fishes, 6 species from amphibians and reptiles, 215 species from birds and 84 species from mammals (Nikolov *et al.* 2010). Subsequently, Binkienė *et al.* (2015), Marinova *et al.* (2015) and Marinova (2016), add another 14 new cestode species for the fauna of Bulgaria, respectively 1 from mammals and 13 from birds.

The review of the literature on cestodes of birds and mammals in Bulgaria indicates that till now, investigations of the cestode fauna of particular geographic regions in the country are relatively few. Such are the helminthological studies in: Stara Planina Mountains, Vrachanska Planina Mountains, Pirin Mountains, Strandja Mountains, the Rhodopes Mountains, Vitosha Mountains, the Black Sea coast, Thracian Region, Silistra Region, the regions of Petrich and Gotse Delchev, (Genov 1984; Korniyushin *et al.* 1984; Marinova 2019).

Until now, the cestodes from birds and mammals of Sarnena Sredna Gora Mts have not been in the scope of any specialized study. Scattered data about the distribution of cestode species in the study area or some adjacent territories can be found in a number of publications, such as: from birds (Vasilev 1970, 1973; Kamburov & Vasilev 1972; Petrova 1977, 1978; Georgiev & Genov 1985, 1987; Georgiev *et al.* 1995; Vasileva *et al.* 2004) and mammals (Yanchev 1963, 1965; Todorov 1963; Georgieva & Kamenov 1993; Georgieva *et al.*

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1997a, b, 1999; Todorov & Boeva 1999; Chakarova 2004; Kirkova *et al.* 2011; Chakarova *et al.* 2015; Giannelli *et al.* 2017; Iliev *et al.* 2017a, b).

In addition, summarized data has been presented in review publications on the cestodes from the fauna of Bulgaria. These are: the monograph on the helminth parasites of insectivores and rodents in Bulgaria (Genov 1984), the PhD thesis of the cestodes of the family Dilepididae from passeriform birds in Bulgaria (Georgiev 1991), the checklist of cestodes of waterfowl (Marinova *et al.* 2013) and the PhD thesis of the cestodes of the family Hymenolepididae from birds of the families Anatidae and Rallidae in this country (Marinova 2016).

The aim of the present review is to summarise the information about cestode parasites of birds and mammals, which have been recorded in Sarnena Sredna Gora Mts. until 2020.

Material and Methods

The present review includes the cestode species from birds and mammals recorded from Sarnena Sredna Gora Mts until 2020. In addition, with some conditionality, the list also includes 4 species reported for the Plovdiv and Sliven Regions only, for which in the literature are not indicated specific localities and need further confirmation.

The species list is arranged according to the classification adopted by the database of Fauna Europaea (<http://www.faunaeur.org>). Synonyms used in the Bulgarian helminthological literature only are included. In addition, data of general distribution of the reported species were presented. The nomenclature of the hosts follows Fauna Europaea (Roselaar 2004) (birds), (Bogdanowicz & Zagorodniuk 2004) (mammals). The intermediate hosts in which the metacestode of the relevant species is identified are marked by asterisk (*).

Results

List of cestode species from birds and mammals in the Sarnena Sredna Gora Mountains

Phylum Platyhelminthes

Class Cestoda van Beneden, 1848

Order Cyclophyllidea van Beneden in Braun, 1900

Family Anoplocephalidae Cholodkowsky, 1902

Genus *Andrya* Railliet, 1893

(1) *Andrya rhopalocephala* (Riehm, 1881) Railliet, 1893

Report: Yanchev (1963).

Host: *Lepus europaeus* Pallas.

Locality: Dalboki, Kolena, Khrishtene (Stara Zagora Region).

General distribution: Palearctic (Spasskii 1951; Schmidt 1986).

Genus *Moniezia* Blanchard, 1891

(2) *Moniezia* sp.

Report: Halatcheva *et al.* (2001).

Host: *Capra aegagrus hircus* (L.).

Locality: Stara Zagora Region.

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Genus *Mosgovoyia* Spasskii, 1951

(3) *Mosgovoyia pectinata* (Goeze, 1782) Spasskii, 1951

Report: Yanchev (1963).

Host: *Lepus europaeus*.

Locality: Dalboki, Kolena, Khristene (Stara Zagora Region).

General distribution: Holarctic (Spasskii 1951).

Genus *Paranoplocephala* Lühe, 1910

(4) *Paranoplocephala montana* (Kirshenblat, 1941) Tenora, Murai & Vaucher, 1984

Synonym: *Andrya montana* Kirschenblatt, 1941.

Report: Yanchev (1965).

Host: *Microtus arvalis* (Pallas).

Locality: Stara Zagora Region.

General distribution: Georgia, Armenia (Spasskii 1951).

(5) *Paranoplocephala omphalodes* (Hermann, 1783) Lühe, 1910

Report: Yanchev (1965).

Host: *Microtus arvalis*.

Locality: Starozagorski Bani (Stara Zagora Region).

General distribution: Holarctic (Spasskii 1951; Genov 1984; Schmidt 1986).

Family Catenotaeniidae Spasskii, 1950

Genus *Catenotaenia* Janicki, 1904

(6) *Catenotaenia pusilla* (Goeze, 1782) Janicki, 1904

Report: Yanchev (1965).

Host: *Mus musculus* L.

Locality: Stara Zagora Region.

General distribution: Holarctic (Genov 1984; Schmidt 1986).

Genus *Skrjabinotaenia* Akhumian, 1946

(7) *Skrjabinotaenia lobata* (Baer, 1925) Spasskii, 1951

Report: Genov (1984).

Hosts: *Apodemus agrarius* (Pallas), *Apodemus flavicollis* (Melchior), *Apodemus sylvaticus* (L.).

Locality: Sredna Gora Mts.

General distribution: Palearctic (Genov 1984; Schmidt 1986).

Family Davaineidae Fuhrmann, 1907

Genus *Raillietina* Fuhrmann, 1920

(8) *Raillietina frontina* (Dujardin, 1845) Fuhrmann, 1920

Synonym: *Raillietina* (R.) *frontina* Dujardin, 1845.

Report: Petrova (1978).

Hosts: *Sturnus vulgaris* L., *Passer hispaniolensis* (Temminck), *Picus viridis* L., *Picus canus* Gmelin, *Dendrocopos syriacus* (Hemprich & Ehrenberg) (= *Dryobates syriacus*).

Locality: Stara Zagora.

General distribution: Palearctic, Neotropical and Afrotropic Regions (Yamaguti 1959; Schmidt 1986; Korniyushin 1989; Movsesyan 2003).

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(9) *Raillietina tetragona* (Molin, 1858) Fuhrmann, 1920

Report: Vasilev (1970).

Host: *Numida meleagris* L.

Locality: Stara Zagora Region.

General distribution: Cosmopolitan (Schmidt 1986; Movsesyan 2003).

Genus *Skrjabinia* Fuhrmann, 1920

(10) *Skrjabinia caucasica* Petrochenko & Kireev, 1966

Synonym: *Raillietina* (*Skrjabinia*) *caucasica* Petrochenko & Kireev, 1966

Report: Vasilev (1970).

Host: *Numida meleagris*.

Locality: Stara Zagora Region.

General distribution: Palearctic (Schmidt 1986; Movsesyan 2003).

(11) *Skrjabinia cesticillus* (Molin, 1858) Fuhrmann, 1920

Synonym: *Raillietina cesticillus* (Molin, 1858) [1].

Reports: [1] Stoimenov (1961); [2] Vasilev (1970).

Hosts: *Coturnix coturnix* L. [1]; *Numida meleagris* [2].

Locality: Sliven Region [1]; Stara Zagora Region [2].

General distribution: Cosmopolitan (Schmidt 1986; Movsesyan 2003).

(12) *Skrjabinia circumvallata* (Krabbe, 1869) Baer, 1925

Synonym: *Raillietina* (*Skrjabinia*) *circumvallata* (Krabbe, 1869) Fuhrmann, 1920.

Report: Stoimenov (1961)

Host: *Coturnix coturnix*.

Locality: Sliven Region.

General distribution: Palearctic, Indomalaya (Schmidt 1986; Movsesyan 2003).

Family Dilepididae Fuhrmann, 1907

Genus *Angularella* Strand, 1928

(13) *Angularella parachelidonariae* (Jaron, 1967) Spasskaya & Spasskii, 1971

Report: Georgiev (1991).

Host: *Emberiza hortulana* L. (?)

Locality: Starozagorski bani (Stara Zagora Region).

General distribution: Palearctic (Georgiev 1991).

Remarks: Petrova (1978) recorded the species „*Icterotaenia passerina* (Fuhrmann, 1907)“ from *Emberiza hortulana* from Starozagorski bani. These specimens have been re-examined and further recognized by Georgiev (1991) as belonging to another species, i. e. *Angularella parachelidonariae*. In addition, the author considered *A. parachelidonariae* as a specific parasite of the swallows (Hirundinidae) and regarded the finding the species in *Emberiza hortulana* as doubtful or erroneous.

Genus *Choanotaenia* Railliet, 1896

(14) *Choanotaenia infundibulum* (Bloch, 1779) Railliet, 1896.

Report: Stoimenov (1961).

Host: *Coturnix coturnix*.

Locality: Sliven Region.

General distribution: Cosmopolitan (Spasskaya & Spasskii 1977; Schmidt 1986).

Genus *Cinclotaenia* Macy, 1973

(15) *Cinclotaenia tarnogradskii* (Dinnik, 1927) Georgiev & Genov, 1985

Synonym: *Pseudanomotaenia trigonocephala* (Krabbe, 1869) of Petrova (1978) in part [1, 3].

Reports: [1] Petrova (1978); [2] Georgiev & Genov (1985); [3] Georgiev (1991).

Host: *Cinclus cinclus* (L.) [1, 2, 3].

Locality: Stara Zagora.

General distribution: Palearctic (Spasskaya & Spasskii 1977; Schmidt 1986; Georgiev 1991).

Remarks: Petrova (1978) recorded the species „*Pseudanomotaenia trigonocephala* (Krabbe, 1869)“ from *Cinclus cinclus* and *Luscinia megarhynchos* from various localities in Trakia Region. These specimens have been re-examined and further Georgiev (1991) recognised the specimens from *Cinclus cinclus* from Stara Zagora as belonging to another species, i.e. *Cinclotaenia tarnogradskii*.

Genus *Dilepis* Weinland, 1858

(16) *Dilepis undula* (Schrank, 1788) Weinland, 1858

Report: Stoimenov (1963).

Host: *Corvus cornix*.

Locality: Sliven Region.

General distribution: Holarctic, Indomalaya (Spasskaya & Spasskii 1977; Schmidt 1986; Georgiev 1991).

Genus *Hirundinicola* Birova-Volosinovicova, 1969

(17) *Hirundinicola chelidonariae* (Spasskaya, 1957) Birova-Volosinovicova, 1969.

Report: Georgiev (1991).

Host: *Delichon urbica* (L.).

Locality: Starozagorski bani (Stara Zagora Region).

General distribution: Palearctic and Afrotropic (Georgiev 1991).

Genus *Monopylidium* Fuhrmann, 1899

(18) *Monopylidium cf. passerinum* Fuhrmann, 1907 (I)

Synonym: *Icterotaenia passerina* (Fuhrmann, 1907) of Petrova (1978) in part [1, 2].

Reports: [1] Petrova (1978); [2] Georgiev (1991).

Host: *Passer domesticus* (L.) [1, 2].

Locality: Stara Zagora [1, 2].

Remarks: Petrova (1978) recorded the species „*Icterotaenia passerina* (Fuhrmann, 1907)“ from passeriform birds, from various localities in Bulgaria. These specimens have been re-examined and further Georgiev (1991) recognised the specimens from *Passer domesticus* from Stara Zagora as belonging to another species, i.e. *Monopylidium cf. passerinum* (I).

(19) *Monopylidium cf. passerinum* Fuhrmann, 1907 (II)

Synonym: *Icterotaenia passerina* of Petrova (1978) in part [1, 2].

Reports: [1] Petrova (1978); [2] Georgiev (1991).

Host: *Sylvia communis* Latham [1, 2].

Locality: Stara Zagora.

Remarks: Petrova (1978) recorded the species „*Icterotaenia passerina* (Fuhrmann, 1907)“ from *Sylvia communis* from Stara Zagora. Subsequently, these specimens are re-examined and reidentified as *Monopylidium cf. passerinum* (II) by Georgiev (1991).

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Genus *Sobolevitaenia* Spasskaya & Makarenko, 1965

(20) *Sobolevitaenia unicolorata* (Fuhrmann, 1908) Spasskaya & Spasskii, 1977

Report: Georgiev (1991).

Hosts: *Turdus merula* L., *Turdus pilaris* L., *Sturnus vulgaris*.

Locality: Stara Zagora.

General distribution: Palearctic (Spasskaya & Spasskii 1977; Schmidt 1986; Georgiev 1991).

Family Dipylidiidae Stiles, 1896

Genus *Dipylidium* Leuckart, 1863

(21) *Dipylidium caninum* (Linnaeus, 1758) Leuckart, 1863

Reports: [1] Georgieva & Kamenov (1993); [2] Georgieva *et al.* (1997a); [3] Georgieva *et al.* (1997b); [4] Georgieva, Ivanov & Prelezov (1999); [5] Kirkova *et al.* (2011); [6] Iliev *et al.* (2017b); [7] Giannelli *et al.* (2017).

Hosts: *Vulpes vulpes* (L.) [1, 2, 3, 5]; *Canis aureus* (L.) [1, 2, 5]; *Canis lupus* (L.) [2]; *Canis familiaris* (L.) [4, 6]; *Felis catus* (L.) [6, 7].

Locality: Stara Zagora Region [1, 4]; Sredna Gora Mts [2, 3]; Sredna Gora Mts (the State Forestry in Stara Zagora) [5]; Stara Zagora [6, 7].

General distribution: Cosmopolitan (Schmidt 1986).

Family Hymenolepididae Ariola, 1899

Genus *Aploparaksis* Clerc, 1903

(22) *Aploparaksis furcigera* (Rudolphi, 1819) Fuhrmann, 1926

Report: Marinova (2016).

Host: *Anas platyrhynchos* L.

Locality: Yagoda (Stara Zagora Region).

General distribution: Holarctic and Australian (New Zealand) (Spasskaya 1966; Schmidt 1986; McKenna 2010).

Genus *Diorchis* Clerc, 1903

(23) *Diorchis elisae* (Skrjabin, 1914) Spasskii & Freze, 1961

Report: Vasilev (1973).

Host: *Anas platyrhynchos* L. *f. dom.*

Locality: Stara Zagora Region.

General distribution: Palearctic (Spasskaya 1966; Schmidt 1986).

(24) *Diorchis stefanskii* Czapliński, 1956

Report: Marinova (2017).

Hosts: *Anas penelope* L.

Locality: Zagore (Stara Zagora Region).

General distribution: Holarctic (Schmidt 1986; McLaughlin 1990; Tolkacheva 1991).

Genus *Fimbriaria* Frölich, 1802

(25) *Fimbriaria fasciolaris* (Pallas, 1781) Frölich, 1802

Reports: [1] Vasilev (1970); [2] Kamburov & Vasilev (1972).

Hosts: *Numida meleagris* [1]; *Anas platyrhynchos* [2]; *Anas crecca* L. [2]; *Anas strepera* L. [2]; *Anas acuta* L. [2]; *Anas penelope* [2]; *Anas querquedula* L. [2]; *Aythya nyroca* (Güldenstädt) [2]; *Netta rufina* (Pallas) [2].

Locality: Stara Zagora Region [1]; Stara Zagora [2].

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General distribution: Cosmopolitan (Spasskaya 1966; Schmidt 1986).

Genus *Hilmylepis* Skrjabin & Matevosyan, 1942

(26) *Hilmylepis prokopici* Genov, 1970

Synonym: *Hilmylepis* sp. of Yanchev (1965) [1, 2].

Reports: [1] Yanchev (1965); [2] Vasileva *et al.* (2004).

Hosts: *Crocidula leucodon* (Hermann) [1]; *Crocidura suaveolens* (Pallas) [1, 2].

Locality: Stara Zagora Region [1]; Stara Zagora [2].

General distribution: Europe: Bulgaria, Germany (Genov 1984; Schmidt 1986; Vasileva *et al.* 2004).

Remarks: *H. prokopici* was originally described from *Crocidura leucodon* and *C. suaveolens* in north-eastern Bulgaria (see Genov 1970). According to this description, specimens from *C. leucodon* and *C. suaveolens* in the Thracian Region, recorded by Yanchev (1965) as *Hilmylepis* sp., are recognized as belonging to *H. prokopici* (Genov 1970, cited after Vasileva *et al.* 2004).

Genus *Hymenolepis* Weinland, 1858

(27) *Hymenolepis diminuta* (Rudolphi, 1819) Weinland, 1858

Report: Iliev *et al.* (2017a).

Host: *Rattus rattus* (L.).

Locality: Stara Zagora.

General distribution: Cosmopolitan (Genov 1984; Schmidt 1986).

Genus *Microsomacanthus* Lopez-Neyra, 1942

(28) *Microsomacanthus abortiva* (von Linstow, 1904) Lopez-Neyra, 1942

Report: Kamburov & Vasilev (1972).

Hosts: *Anas platyrhynchos*, *Anas acuta*.

Locality: Stara Zagora Region.

General distribution: Holarctic (Spasskaya 1966; McLaughlin & Burt 1979; Schmidt 1986; Marinova *et al.* 2013) and Afrotropic (Alexander & McLaughlin 1997).

Genus *Molluscotaenia* Spasskii & Andreiko, 1971

(29) *Molluscotaenia crassiscolex* (von Linstow, 1890) Spasskii & Andreiko, 1971

Report: Genov (1984).

Hosts: *Sorex araneus* L., *Sorex minutus* L.

Locality: Thracian valley.

General distribution: Palearctic (Genov 1984).

Genus *Passerilepis* Spasskii & Spasskaya, 1954

(30) *Passerilepis crenata* (Goeze, 1782) Sultanov & Spasskaya, 1959

Synonym: *Variolepis crenata* (Goeze, 1782) [1].

Reports: [1] Stoimenov (1963); [2] Petrova (1978).

Hosts: *Corvus cornix* [1]; *Dendrocopos syriacus* (= *Dryobates syriacus*) [2]; *Turdus merula* [2]; *Sturnus vulgaris* [2]; *Pica pica* (L.) [2]; *Coturnix coturnix* [2].

Locality: Sliven Region [1]; Stara Zagora [2].

General distribution: Sub-cosmopolitan: Holarctic, Afrotropic, Indomalaya and Australian Regions (Yamaguti 1959; Spasskaya 1966; Schmidt 1986).

(31) *Passerilepis passeris* (Gmelin, 1790) Spasskii & Spasskaya, 1954

Report: Petrova (1978).

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Hosts: *Coracias garrulus* L., *Hirundo rustica* L., *Lanius collurio* L., *Muscicapa striata* (Pallas), *Oenanthe hispanica* (L.), *Passer domesticus*, *Passer montanus* (L.), *Parus major* L.

Locality: Stara Zagora.

General distribution: Palearctic, Indomalaya and Afrotropic (Spasskaya 1966; Schmidt 1986; Mariaux 1994).

(32) *Passerilepis stylosa* (Rudolphi, 1809) Spasskii & Spasskaya, 1954

Report: Petrova (1978).

Hosts: *Corvus monedula* L., *Garrulus glandarius* (L.), *Pica pica*.

Locality: Stara Zagora.

General distribution: Palearctic, Nearctic and Afrotropic (Spasskaya 1966; Schmidt 1986).

Genus *Retinometra* Spasskii, 1955

(33) *Retinometra serrata* (Fuhrmann, 1906) Spasskii, 1963

Report: Petrova (1978).

Host: *Streptopelia turtur* (L.)

Locality: Stara Zagora.

General distribution: Palearctic, Indomalaya and Afrotropic (Spasskaya 1966; Schmidt 1986).

Genus *Rodentolepis* Spasskii, 1954

(34) *Rodentolepis nana* (von Siebold, 1852) Spasskii, 1954

Synonym: *Hymenolepis nana* (von Siebold, 1852) Blanchard, 1891 [1, 2].

Reports: [1] Chakarova (2004); [2] Iliev *et al.* (2017a).

Hosts: *Homo sapiens* L. [1]; *Rattus rattus* [2].

Locality: Stara Zagora Region [1]; Stara Zagora [2].

General distribution: Cosmopolitan (Schmidt 1986).

(35) *Rodentolepis straminea* (Goeze, 1782) Spasskii, 1954

Synonym: *Hymenolepis straminea* (Goeze, 1782) Spasskii, 1954

Report: Yanchev (1965).

Hosts: *Apodemus sylvaticus*, *Mus musculus*.

Locality: Chirpan Region.

General distribution: Palearctic (Genov 1984; Schmidt 1986).

Genus *Sobolevicanthus* Spasskii & Spasskaya, 1954

(36) *Sobolevicanthus gracilis* (Zeder, 1803) Spasskii & Spasskaya, 1954

Report: [1] Kamburov & Vasilev (1972).

Hosts: *Anas acuta*, *Anas clypeata* L., *Anas crecca*, *Anas platyrhynchos*, *Anas querquedula*, *Aythya ferina* (L.).

Locality: Stara Zagora Region.

General distribution: Holarctic, Indomalaya (Spasskaya 1966; Schmidt 1986).

Genus *Staphylocystis* Villot, 1877

(37) *Staphylocystis furcata* (Stieda, 1862) Spasskii, 1950

Report: Yanchev (1965).

Hosts: *Crocidura leucodon*, *Crocidura suaveolens*.

Locality: Stara Zagora Region.

General distribution: Palearctic (Schmidt 1986).

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Genus *Tschertkovilepis* Spasskii & Spasskaya, 1954

(38) *Tschertkovilepis krabbei* (Kowalewski, 1895) Czaplinski & Jarecka, 1967.

Synonym: *Drepanidotaenia przewalskii* (Skrjabin, 1914) Lopez-Neyra, 1942.

Report: Kamburov & Vasilev (1972).

Hosts: *Anser anser* (L.), *Anser albifrons* (Scopoli), *Anser erythropus* (L.), *Anas platyrhynchos*, *Aythya nyroca*.

Locality: Stara Zagora Region.

General distribution: Holarctic (Czaplinski & Jarecka 1967; Schmidt 1986).

Remarks: The synonymy of *Drepanidotaenia przewalskii* and *Tschertkovilepis krabbei* has been proposed by Czaplinski & Jarecka (1967).

Family Mesocestoididae Perrier, 1897

Genus *Mesocestoides* Vaillant, 1863

(39) *Mesocestoides lineatus* (Goeze, 1782) Railliet, 1893

Reports: [1] Yanchev & Genov (1978); [2] Georgieva & Kamenov (1993); [3] Georgieva *et al.* (1997a); [4] Georgieva *et al.* (1997b); [5] Georgieva *et al.* (1999).

Hosts: *Felis silvestris* Schreber [1]; *Vulpes vulpes* [2, 3, 4]; *Canis aureus* [2, 3]; *Canis lupus* [2, 3]; *Canis familiaris* [5].

Locality: Plovdiv Region [1]; Stara Zagora Region [2, 5]; Sredna Gora Mts [3, 4].

General distribution: Almost Cosmopolitan (Schmidt 1986).

(40) *Mesocestoides litteratus* (Batsch, 1786) Vaillant, 1863

Report: Yanchev (1986).

Host: *Felis silvestris*.

Locality: Stara Zagora Region.

General distribution: Europe (Schmidt 1986).

(41) *Mesocestoides* sp.

Report: Kirkova *et al.* (2011).

Hosts: *Canis aureus*, *Felis silvestris*, *Vulpes vulpes*,

Locality: Sredna Gora Mts (the State Forestry in Stara Zagora).

Family Paruterinidae Fuhrmann, 1907

Genus *Biuterina* Fuhrmann, 1902

(42) *Biuterina fuhrmanni* Schmelz, 1941

Report: Georgiev *et al.* (2004).

Host: *Emberiza calandra* L. (= *Miliaria calandra*).

Locality: Starozagorski Bani (Stara Zagora Region).

General distribution: Palearctic (Georgiev *et al.* 2004).

Remarks: These specimens of Starozagorski Bani have been collected in 1961 by A. Paspaleva and mentioned by Petrova (1978) as „*Biuterina passerina* Fuhrmann, 1908“. Subsequently, they are re-examined and reidentified as „*Biuterina fuhrmanni*“ by Georgiev *et al.* (2004).

(43) *Biuterina triangula* (Krabbe, 1869) Fuhrmann, 1908

Report: Petrova (1978).

Hosts: *Acrocephalus arundinaceus* (L.), *Anthus trivialis* (L.), *Luscinia megarhynchos* C. L. Brehm, *Erithacus rubecula* (L.).

Locality: Stara Zagora.

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General distribution: Palearctic (Matevosyan 1969; Schmidt 1986).

Genus *Dictyterina* Spasskii in Spasskaya & Spasskii, 1971

(44) *Dictyterina cholodkowskii* (Skrjabin, 1914) Spasskii in Spasskaya & Spasskii, 1971

Report: Georgiev *et al.* (1995).

Host: *Lanius collurio*.

Locality: Starozagorski Bani (Stara Zagora Region).

General distribution: Palearctic (Georgiev *et al.* 1995).

Remarks: This specimen from Starozagorski Bani has been collected in 1961 by A. Paspaleva and is not determined. Subsequently, is re-examined and identified as „*Dictyterina cholodkowskii*“ by Georgiev *et al.* (1995).

Genus *Lyruterina* Spasskaya & Spasskii, 1971

(45) *Lyruterina nigropunctata* (Crety, 1890) Spasskaya & Spasskii, 1971.

Synonym: *Rhabdometra nigropunctata* (Crety, 1890) Cholodkowsky, 1906 [1, 2].

Report: Stoimenov (1961).

Host: *Coturnix coturnix*.

Locality: Sliven Region.

General distribution: Palearctic (Schmidt 1986).

Genus *Neyraia* Joyeux & Timon-David, 1934

(46) *Neyraia intricata* (Krabbe, 1878) Joyeux & Timon-David, 1934

Report: Petrova (1977).

Host: *Upupa epops* L.

Locality: Pavel Banya (Stara Zagora Region).

General distribution: Palearctic, Afrotropic and Oriental Region (Mathevossian 1969; Schmidt 1986; Georgiev & Korniyushin 1994).

Family Taeniidae Ludwig, 1886

Genus *Echinococcus* Rudolphi, 1801

(47) *Echinococcus granulosus* (Batsch, 1786) Rudolphi, 1801

Reports: [1] Todorov (1963); [2] Soilev & Boeva (1982); [3] Georgieva & Kamenov (1993); [4] Georgieva *et al.* (1997a); [5] Georgieva *et al.* (1999); [6] Todorov & Boeva (1999); [7] Kirkova *et al.* (2011); [8] Chakarova *et al.* (2015).

Hosts: *Canis aureus* [3, 4, 7]; *Canis lupus* [3, 4]; *Canis familiaris* [5]; **Homo sapiens* [1, 2, 6, 8].

Locality: Stara Zagora Region [1, 2, 3, 5, 8]; Stara Zagora [6]; Sredna Gora Mts [4]; Sredna Gora Mts (the State Forestry in Stara Zagora) [7].

General distribution: Cosmopolitan (Schmidt 1986).

Remarks: * larvae.

Genus *Taenia* Linnaeus, 1758

(48) *Taenia hydatigena* Pallas, 1766

Reports: [1] Georgieva & Kamenov (1993); [2] Georgieva *et al.* (1997a); [3] Georgieva *et al.* (1997b); [4] Georgieva *et al.* (1999).

Hosts: *Vulpes vulpes* [1, 2, 3]; *Canis aureus* [1, 2]; *Canis lupus* [1, 2]; *Canis familiaris* [4].

Locality: Stara Zagora Region [1, 4]; Sredna Gora Mts [2, 3].

General distribution: Cosmopolitan (Schmidt 1986).

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(49) *Taenia multiceps* Leske, 1780

Reports: [1] Georgieva & Kamenov (1993); [2] Georgieva *et al.* (1997a); [3] Georgieva *et al.* (1997b).

Hosts: *Canis aureus* [1, 2]; *Canis lupus* [1, 2]; *Vulpes vulpes* [1, 2, 3].

Locality: Stara Zagora Region [1]; Sredna Gora Mts [2, 3].

General distribution: Cosmopolitan (Schmidt 1986).

(50) *Taenia ovis* (Cobbold, 1869) Ransom 1913

Reports: [1] Georgieva & Kamenov (1993); [2] Georgieva *et al.* (1997a).

Hosts: *Canis aureus* [1, 2]; *Canis lupus* [1, 2].

Locality: Stara Zagora Region [1]; Sredna Gora Mts [2].

General distribution: Cosmopolitan (Schmidt 1986).

(51) *Taenia pisiformis* (Bloch, 1780) Gmelin, 1790

Reports: [1] Yanchev (1963); [2] Yanchev (1965); [3] Georgieva & Kamenov (1993); [4] Georgieva *et al.* (1997a); [5] Georgieva *et al.* (1997b).

Hosts: **Lepus europaeus* [1, 2]; *Vulpes vulpes* [3, 4, 5]; *Canis aureus* [3, 4]; *Canis lupus* [3, 4].

Locality: Dalboki, Kolena, Khrishtene (Stara Zagora Region) [1], Stara Zagora Region [2, 3]; Sredna Gora Mts [4, 5].

General distribution: Cosmopolitan (Schmidt 1986).

Remarks: * larvae.

(52) *Taenia polyacantha* Leuckart, 1856

Reports: [1] Georgieva *et al.* (1997a); [2] Georgieva *et al.* (1997b); [3] Iliev *et al.* (2017a).

Hosts: *Vulpes vulpes* [1, 2]; **Rattus rattus* [3].

Locality: Sredna Gora Mts [1, 2]; Stara Zagora [3].

General distribution: Holarctic (Schmidt 1986).

Remarks: *larvae.

(53) *Taenia saginata* Goeze, 1782

Synonym: *Taeniarhynchys saginatus* (Goeze, 1782) Weinland, 1858.

Report: Chakarova (2004).

Host: *Homo sapiens*.

Locality: Stara Zagora Region.

General distribution: Cosmopolitan (Schmidt 1986).

(54) *Taenia taeniaeformis* (Batsch, 1786) Wolffhügel, 1911

Synonym: *Hydatigera taeniaeformis* (Batsch, 1786) Lamarck, 1816 [1].

Reports: [1] Yanchev (1965); [2] Georgieva *et al.* (1997a); [3] Georgieva *et al.* (1997b); [4] Kirkova *et al.* (2011); [5] Iliev *et al.* (2017a).

Hosts: **Apodemus sylvaticus* [1]; **Mus musculus* [1]; *Vulpes vulpes* [2, 3]; *Felis silvestris* [4]; *Martes foina* (Erxleben) [4]; **Rattus rattus* [5].

Locality: Stara Zagora Region [1]; Sredna Gora Mts [2, 3]; Sredna Gora Mts (the State Forestry in Stara Zagora) [4]; Stara Zagora [5].

General distribution: Cosmopolitan (Genov 1984; Schmidt 1986).

Remarks: *larvae; The synonymy of *Hydatigera taeniaeformis* and *Taenia taeniaeformis* has been proposed by Wolffhügel (1911).

(55) Taenia sp.

Reports: [1] Kirkova *et al.* (2011); [2] Iliev *et al.* (2017b); [3] Giannelli *et al.* (2017).

Hosts: *Vulpes vulpes* [1]; *Canis aureus* [1]; *Martes foina* [1]; *Canis familiaris* [2]; *Felis catus* [3].

Locality: Sredna Gora Mts (the State Forestry in Stara Zagora) [1]; Stara Zagora [2, 3].

Host-parasite checklist

Class Aves

Order Anseriformes

Family Anatidae

Anas platyrhynchos L. f. dom.

Diorchis elisae

Anas platyrhynchos L.

Aploparaksis furcigera

Fimbriaria fasciolaris

Microsomacanthus abortiva

Sobolevicanthus gracilis

Tschertkovilepis krabbei

Anas acuta L.

Fimbriaria fasciolaris

Microsomacanthus abortiva

Sobolevicanthus gracilis

Anas clypeata L.

Sobolevicanthus gracilis

Anas crecca L.

Fimbriaria fasciolaris

Sobolevicanthus gracilis

Anas strepera L.

Fimbriaria fasciolaris

Anas querquedula L.

Fimbriaria fasciolaris

Sobolevicanthus gracilis

Anas penelope L.

Diorchis stefanskii

Fimbriaria fasciolaris

Anser albifrons (Scopoli)

Tschertkovilepis krabbei

Anser anser (L.)

Tschertkovilepis krabbei

Anser erythropus (L.)

Tschertkovilepis krabbei

Aythya ferina (L.)

Sobolevicanthus gracilis

Aythya nyroca (Güldenstädt)

Fimbriaria fasciolaris

Tschertkovilepis krabbei

Netta rufina (Pallas)

Fimbriaria fasciolaris

Order Columbiformes

Family Columbidae

Streptopelia turtur (L.)

Retinometra serrata

Order Coraciiformes

Family Coraciidae

- Coracias garrulus* L.
Passerilepis passeris

Order Galliformes

Family Numididae

- Numida meleagris* (L.)
Fimbriaria fasciolaris
Raillietina tetragona
Skrjabinia caucasica
Skrjabinia cesticillus

Family Phasianidae

- Coturnix coturnix* (L.)
Choanotaenia infundibulum
Lyruterina nigropunctata
Passerilepis crenata
Skrjabinia cesticillus
Skrjabinia circumvallata

Order Passeriformes

Family Cinclidae

- Cinclus cinclus* (L.)
Cinclotaenia tarnogradskii

Family Corvidae

- Corvus cornix* L.
Dilepis undula
Passerilepis crenata
Corvus monedula L.
Passerilepis stylosa
Garrulus glandarius (L.)
Passerilepis stylosa
Pica pica (L.)
Passerilepis crenata
Passerilepis stylosa

Family Emberizidae

- Emberiza calandra* L.
Biuterina fuhrmanni
 (?) *Emberiza hortulana* L.
Angularella parachelidonariae

Family Hirundinidae

- Hirundo rustica* L.
Passerilepis passeris
Delichon urbica (L.)
Hirundinicola chelidonariae

Family Laniidae

- Lanius collurio* L.
Dictyterina cholodkowskii
Passerilepis passeris

Family Motacillidae

- Anthus trivialis* (L.)
Biuterina triangula

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Family Muscicapidae

Muscicapa striata (Pallas)

Passerilepis passeris

Family Paridae

Parus major L.

Passerilepis passeris

Family Passeridae

Passer domesticus (L.)

Monopylidium cf. passerinum (I)

Passerilepis passeris

Passer hispaniolensis (Temminck)

Raillietina frontina

Passer montanus (L.)

Passerilepis passeris

Family Saxicolidae

Erithacus rubecula (L.)

Biuterina triangula

Luscinia megarhynchos C. L. Brehm

Biuterina triangula

Oenanthe hispanica (L.)

Passerilepis passeris

Family Sturnidae

Sturnus vulgaris L.

Passerilepis crenata

Raillietina frontina

Sobolevitaenia unicoloronata

Family Sylviidae

Acrocephalus arundinaceus (L.)

Biuterina triangula

Sylvia communis Latham

Monopylidium cf. passerinum (II)

Family Turdidae

Turdus merula L.

Passerilepis crenata

Sobolevitaenia unicoloronata

Turdus pilaris L.

Sobolevitaenia unicoloronata

Order Piciformes

Family Picidae

Picus viridis L.,

Raillietina frontina

Picus canus Gmelin

Raillietina frontina

Dendrocopos syriacus (Hemprich & Ehrenberg)

Passerilepis crenata

Raillietina frontina

Order Upupiformes

Family Upupidae

Upupa epops L.

Neyraia intricata

Class Mammalia

Order Artiodactyla

Family Bovidae

Capra aegagrus hircus (L.)

Moniezia sp.

Order Carnivora

Family Canidae

Canis aureus (L.)

Dipylidium caninum

Echinococcus granulosus

Mesocestoides lineatus

Mesocestoides sp.

Taenia hydatigena

Taenia multiceps

Taenia ovis

Taenia pisiformis

Taenia sp.

Canis familiaris (L.)

Dipylidium caninum

Echinococcus granulosus

Mesocestoides lineatus

Taenia hydatigena

Taenia sp.

Canis lupus (L.)

Dipylidium caninum

Echinococcus granulosus

Mesocestoides lineatus

Taenia hydatigena

Taenia multiceps

Taenia ovis

Taenia pisiformis

Vulpes vulpes (L.)

Dipylidium caninum

Mesocestoides lineatus

Mesocestoides sp.

Taenia hydatigena

Taenia multiceps

Taenia pisiformis

Taenia polyacantha

Taenia taeniaeformis

Taenia sp.

Family Felidae

Felis catus (L.)

Dipylidium caninum

Taenia sp.

Felis silvestris Schreber

Mesocestoides lineatus

Mesocestoides litteratus

Mesocestoides sp.

Taenia taeniaeformis

Family Mustelidae

Martes foina (Erxleben)

Taenia taeniaeformis

Taenia sp.

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Order Insectivora

Family Soricidae

- Crocidura leucodon* (Hermann)
 - Hilmylepis prokopiči*
 - Staphylocystis furcata*
- Crocidura suaveolens* (Pallas)
 - Hilmylepis prokopiči*
 - Staphylocystis furcata*
- Sorex araneus* L.
 - Molluscotaenia crassiscolex*
- Sorex minutus* L.
 - Molluscotaenia crassiscolex*

Order Lagomorpha

Family Leporidae

- Lepus europaeus* Pallas
 - Andrya rhopalocephala*
 - Mosgovoyia pectinata*
 - **Taenia pisiformis*

Order Primates

Family Hominidae

- Homo sapiens* L.
 - **Echinococcus granulosus*
 - Rodentolepis nana*
 - Taenia saginata*

Order Rodentia

Family Muridae

- Apodemus agrarius* Pallas
 - Skrjabinotaenia lobata*
- Apodemus flavicollis* (Melchior)
 - Skrjabinotaenia lobata*
- Apodemus sylvaticus* (L.)
 - Skrjabinotaenia lobata*
 - Rodentolepis straminea*
 - **Taenia taeniaeformis*
- Microtus arvalis* (Pall.)
 - Paranoplocephala montana*
 - Paranoplocephala omphalodes*
- Mus musculus* L.
 - Catenotaenia pusilla*
 - Rodentolepis straminea*
 - **Taenia taeniaeformis*
- Rattus rattus* (L.)
 - Hymenolepis diminuta*
 - Rodentolepis nana*
 - **Taenia polyacantha*
 - **Taenia taeniaeformis*

Discussion

As seen from the above survey, 55 cestode species were recorded from the Sarnena Sredna Gora Mts. 29 of the cestode species are from avian hosts and 26 from mammals. The cestodes recorded belong to 36 genera, 9 families and 1 order. As definitive hosts, 66 vertebrate species have been recorded. These are 46 avian and 20 mammalian species. They belong to 28 orders and 13 families. In addition, 5 of the mammalian species were also recorded as intermediate hosts of 4 cestode species (*E. granulosus*, *T. pisiformis*, *T. polyacantha* and *T. taeniaeformis*).

According to Nikolov *et al.* (2010), Binkienė *et al.* (2015), Marinova *et al.* (2015) and Marinova (2016) a total 313 cestode species from birds and mammals were recorded for the fauna of Bulgaria: 228 from birds and 85 from mammals. The cestode species from birds and mammals of Sarnena Sredna Gora Mts. represent respectively 12.7% from the species recorded from birds and 30.6% from the species recorded from mammals. We expect that this number will increase after detailed future investigations. The prerequisite for this is the large number of cestodes of birds and mammals reported in Bulgaria (Nikolov *et al.* 2010; Binkienė *et al.* 2015; Marinova *et al.* 2015; Marinova 2016), as well as the species-rich vertebrate fauna of the study area.

The majority of the species recorded in Sarnena Sredna Gora Mountains (85.5%) are characterised by large geographical ranges (Palearctic, Holarctic, Holarctic-Afrotropical, Holarctic-Oriental, Holarctic-Australian, Palearctic-Oriental, Palearctic-Paleotropical, Palearctic-Afrotropical, sub-cosmopolitan and cosmopolitan) which is probably due to the biological features of their final hosts, their diversity, migrations and extensive areas.

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