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VERSITA

RESEARCH NOTE

First record of the nematode *Aviculariella alcedonis* (Yamaguti et Mitunaga, 1943) (Spirurida, Acuariidae) in Europe, with SEM observations and comments on its taxonomic position

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Abstract

Aviculariella alcedonis (Spirurida, Acuariidae) is recorded from *Alcedo atthis* (Coraciiformes, Alcedinidae) from Bulgaria (new geographical record). A description of female specimens based on light-microscopy and SEM studies is presented. On the basis of the observations of the cephalic end, the position of the genus is considered to be in the subfamily Acuariinae, not in the Seuratiinae where it was previously placed. The host range of *Aviculariella* spp. is recognised as restricted to birds of the family Alcedinidae. A new morphological peculiarity described in *A. alcedonis* is the presence of a pair of sublateral ribs at the anterior end of each pseudolabium.

Keywords

Aviculariella alcedonis, Acuariidae, morphology, taxonomy, Bulgaria

The nematode *Aviculariella alcedonis* (Yamaguti et Mitunaga, 1943) was described on the basis of male specimens collected from the common kingfisher, *Alcedo atthis* (L.) (Coraciiformes, Alcedinidae) in Taiwan (Skryabin *et al*. 1965). Subsequent records of this species from *A. atthis* were from Fukien (China) and Amurskaya Oblast' (Russian Far East) (Wang 1966, Baruš *et al*. 1978). Baruš *et al*. (1978) recognised *Aviculariella collaricephala* (Oshmarin, 1959) from the same host species in Primorye Region, Russia, as a junior synonym of *Aviculariella alcedonis*. Nematodes from the same host in Vietnam (Ryzhikov and Khokhlova in Skryabin *et al*. 1965) and Rimskiy-Korsakov Archipelago in Peter the Great Gulf, Sea of Japan, Russia (Alekseev and Smetanina 1968) were identified as *A. collaricephala*. According to these records, *Aviculariella alcedonis* is specific to the common kingfisher and its geographical range is restricted to East Asia.

In the course of a survey of acuariid nematodes from Bulgaria, we found specimens of *Aviculariella alcedonis* from the common kingfisher. The aim of the present note is to report for the first time a species of the genus *Aviculariella* Wehr, 1931 as part of the European fauna. We also provide the first SEM data on a species of this genus and use the material studied to expand morphological information on *A. alcedonis*.

Two female nematodes were found under the lining of the gizzard of *Alcedo atthis* on 14 May 2007 at Kalimok Biological Station of the Institute of Zoology, Bulgarian Academy of Sciences (44°01′N, 26°26′E), Silistra Region, NE Bulgaria. The nematodes were preserved in 70% ethanol. For light microscopy, the larger specimen was cleared and examined in a temporary mount in glycerol. The smaller specimen was used for SEM observations. It was transferred from 70% ethanol to 40% ethanol (10 min), rinsed in 0.1 M cacodylate buffer (twice for 10 min), post-fixed in 1% OsO_4 for 2 h, dehydrated in ethanol series and critical-point dried with CO_2 by BAL-TEC CPD 030; it was coated with gold-palladium in sputter coater Polaron SC7640 and studied by LEO VP 1540 microscope at 10 kV. The specimens are preserved in the Helminthological Collection of the Central Laboratory of General Ecology (CLGE), Bulgarian Academy of Sciences, collection nos. N001.034 and N001.033 (SEM stub).

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In the following description, the measurements are given in micrometres except where otherwise stated.

***Aviculariella alcedonis* (Yamaguti et Mitunaga, 1943) Wang, 1966** (Figs 1 and 2)

Syns: *Rusguniella alcedonis* Yamaguti et Mitunaga, 1943; *Alcedospirura collaricephala* Oshmarin, 1959; *Aviculariella collaricephala* (Oshmarin, 1959) Oshmarin, 1963.

Female: Body 27.2 mm long, with maximum width 177, width 56 at anus and 131 at vulva; tail 138 long. Anterior end with 2 triangular pseudolabia, each bearing a single amphid, a pair of papillae and a pair of sublateral ribs (Figs 1A, 2A-D). Cordons arise dorsally and ventrally between pseudolabia, 61 long and 7 wide; anastomosing laterally. Each cordon consists of a single inner row of delicate cuticular plates and a longitudinal cuticular ridge along outer rims of plates; cuticular plates and longitudinal ridge delimiting longitudinal canal. Circular cuticular fold situated posterior to cordons (Fig. 2B, D). Deirids small, spine-like (Fig. 2A, E), situated at 278 from anterior end. Excretory pore at 304 from anterior end. Lateral alae extending from level posterior to deirids to 4.5 mm from anterior end (Fig. 2A). Buccal cavity 216 long and 11 wide. Muscular oesophagus 489 long and 27 wide. Glandular oesophagus 2,397 long and 45 wide. Nerve ring at 223 from anterior end. Cuticle thickness 9–11; distance between cuticular striations 7–9. Vulva at 373 from posterior end (Fig. 1B, C). *Vagina vera* short, posteriorly directed, separated from *vagina uterina* by cuticular folds. *Vagina uterina* longer, with well-developed circular musculature in walls. Uterus monodelphic. Eggs (unfertilized) oval, 61–66 × 30–34 (av. 63 × 32, n = 10). Phasmids subterminal (Fig. 2F).

The morphology of the studied specimens from Bulgaria corresponds to the previous descriptions of *Aviculariella alcedonis* (= *Alcedospirura collaricephala*) (Yamaguti and Mitunaga 1943 cited after Skryabin *et al*. 1965, Oshmarin 1959, Skryabin *et al*. 1965, Alekseev and Smetanina 1968). The specimen measured here is slightly larger than those from previous studies (Table I). However, the size and morphology of the cordons, the length of the muscular and glandular oesophagus and the distance from the vulva to the posterior end correspond with the known range of variation of this species (except data by Wang 1966 relative to the length of the muscular oesophagus). Therefore, we agree with Baruš *et al*. (1978) in considering *Alcedospirura collaricephala* as a junior synonym of *Aviculariella alcedonis* and believe that our material, though consisting of female specimens only, is conspecific with the nematodes from *Alcedo atthis* from East Asia reported under these two names.

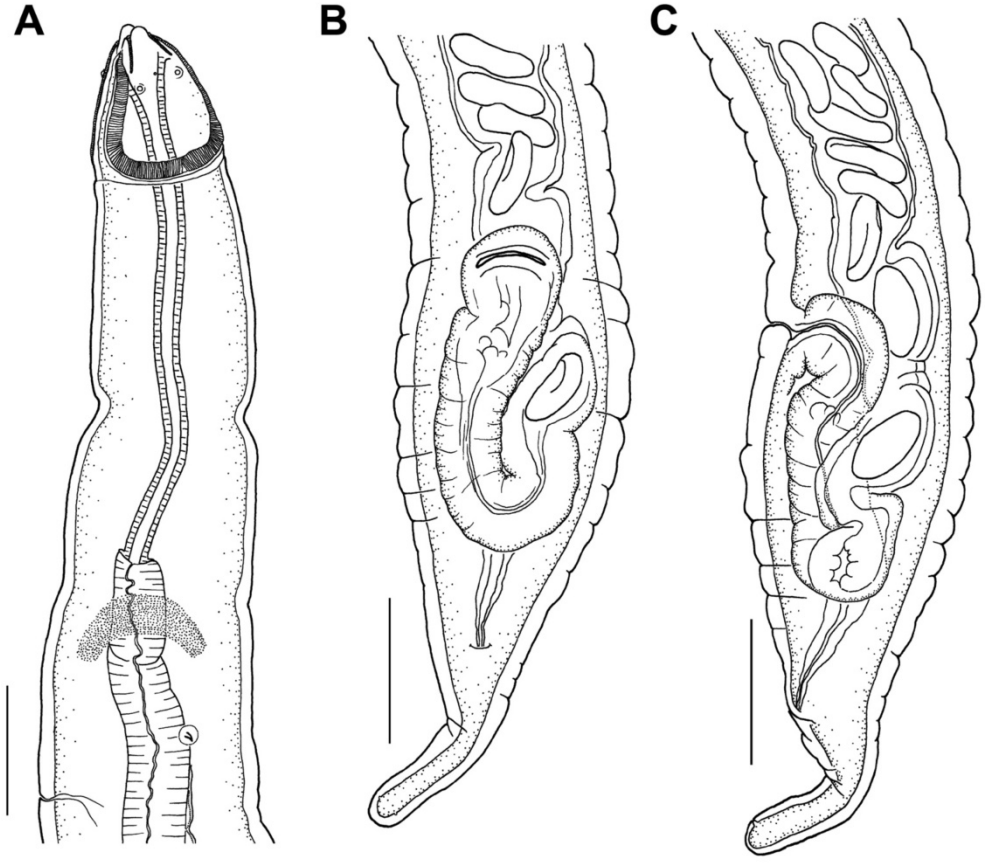

Fig. 1. *Aviculariella alcedonis*, female. **A.** Anterior end, lateral view. **B.** Posterior end, ventral view. **C.** Posterior end, lateral view. Scale bars = 50 μm (A); 100 μm (B, C)

Currently, the genus *Aviculariella* includes 6 species (Anderson *et al*. 1980, Nandi *et al*. 1985). Most of them are parasitic in kingfishers of the subfamilies Cerylinae and Daceloninae (systematics of the family Alcedinidae according to Howard and Moore 1980). The only species of *Aviculariella* from birds of the subfamily Alcedininae are *A. alcedonis* and *A. petterae* Bain et Chabaud, 1965. The latter species has been described from "*Corythornis vingtsioides* (Eydoux et Gervais) Passériformes-Turdidés" in Madagascar (Bain and Chabaud 1965). However, *Corythornis vingtsioides* (Eydoux et Gervais) belongs to the Alcedinidae and is often placed in the genus *Alcedo* L. or sometimes recognised as a member of the related genus *Corythornis* Kaup (see Marks and Willard 2005, Moyle *et al*. 2007). Therefore, the range of definitive hosts of

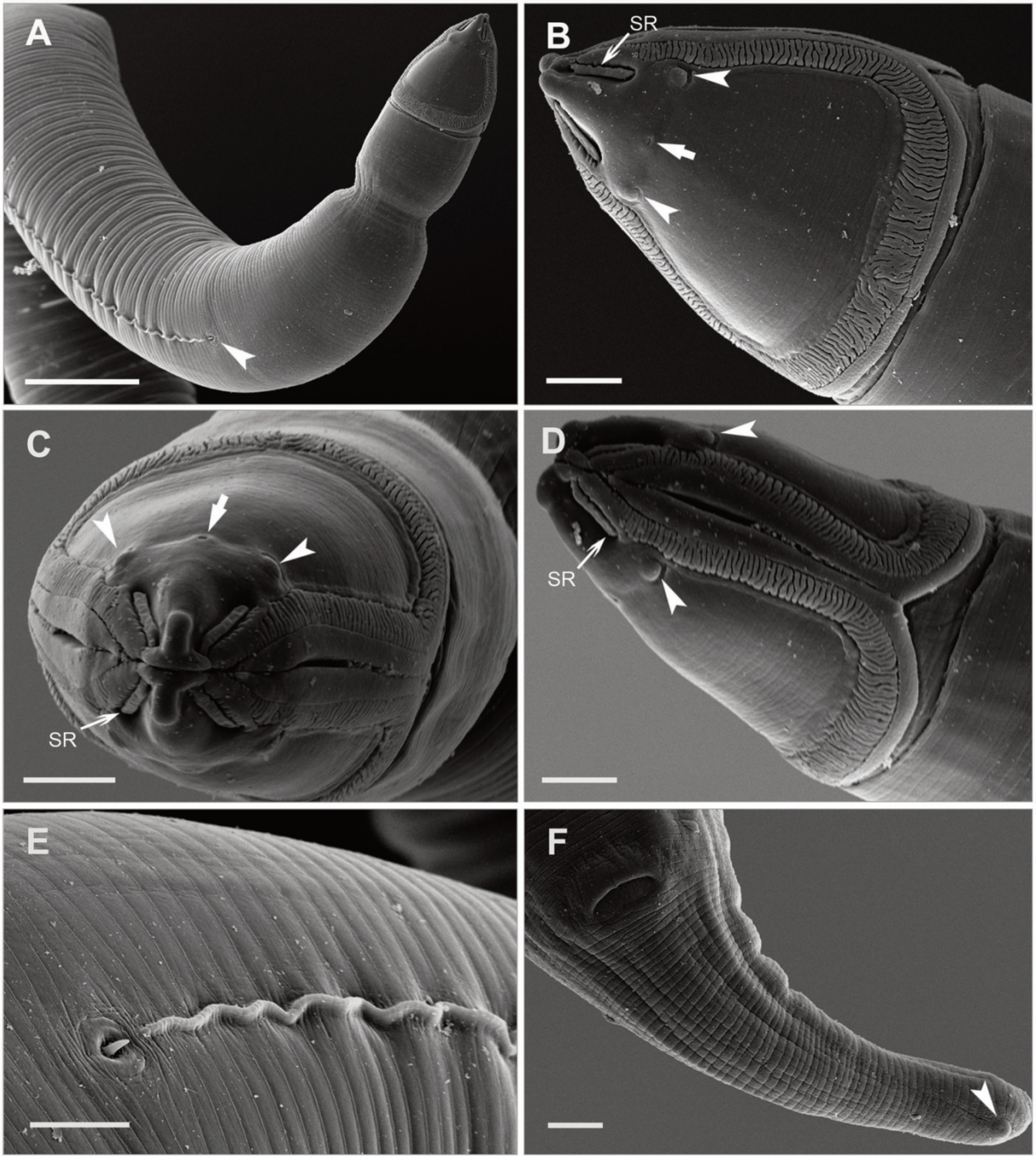

Fig. 2. *Aviculariella alcedonis*, female, SEM. **A.** Anterior end, note deirid (arrowhead). **B.** Pseudolabia, lateral view; note cephalic papillae (arrowheads), amphid (arrow) and sublateral ribs (SR). **C.** Anterior end, apical view; note cephalic papillae (arrowheads), amphid (arrow) and sublateral ribs (SR). **D.** Pseudolabia, dorsal view; note cephalic papillae (arrowheads), amphid (arrow) and sublateral ribs (SR). **E.** Deirid and lateral ala. **F.** Posterior end, note phasmid (arrowhead). Scale bars = 50 μm (A); 10 μm (B-F)

Table I. Metrical data of *Aviculariella alcedonis* and *A. petterae*

	***Aviculariella alcedonis* (= *Aviculariella collaricephala*)**						***A. petterae***
Source	Yamaguti and Mitunaga (1943, cited after Skryabin *et al.* 1965)	Oshmarin (1959)	Ryzhikov and Khokhlova in Skryabin *et al.* (1965)	Wang (1966)	Alekseev and Smetanina (1968)	Present study	Bain and Chabaud (1965)
Locality	Taiwan	Russian Far East	Vietnam	China	Russian Far East	Bulgaria	Madagascar
Male	–	–	–	–	**n = 1**	–	**n = 1**
Body length (mm)	10.0	7.2–8.0	8.3–8.8	8.0–8.8	7.5	–	10.0
Maximum body width	95–100	85–86	110–144	87–105	80	–	80
Cordons, length	50–54	40–45	50–53	42	40	–	45
Buccal cavity, length	186–200	138–175	106–150	160	153	–	160
Muscular oesophagus, length	465–540	410–520	500–530	1,200–1,280	605	–	460
Glandular oesophagus, length	2,600–2,800	2,080–2,200	2,080–2,400	1,760–1,920	1,130	–	2,400
Left spicule, length	280–390	372–375	360–380	380–386	380	–	380
Right spicule, length	100–114	95–108	100–102	115	102	–	125
Female	–	–	–	–	–	**n = 1**	**n = 1**
Body length (mm)	–	19.0–24.5	18.6–23.0	16.5	–	27.2	19.0
Tail, length	–	118–130	132–182	98–105	–	138	140
Maximum body width	–	145–170	144–160	123	–	177	120
Cordons, length	–	62	56–66	–	–	61	45
Buccal cavity, length	–	170–177	132–198	192	–	216	183
Muscular oesophagus, length	–	580–670	448–590	1,120	–	489	555
Glandular oesophagus, length	–	2,360–2,420	2,240–2,900	2,080	–	2,397	3,200
Distance between vulva and posterior end	–	305	340–400	438	–	373	445
Eggs	–	75–78 × 39–42	73–79 × 42–45	64–70 × 28–32	–	–	70–75 × 32–35

Aviculariella spp. includes only birds of the family Alcedinidae.

The morphological characters of *A. petterae* (see Bain and Chabaud 1965) are similar to those of *A. alcedonis*, including metrical data (Table I). Further studies are needed in order to confirm the taxonomic independence of the two species.

The subfamily affiliation of the genus *Aviculariella* is controversial. Chitwood and Wehr (1934), Skryabin *et al*. (1965) and Baruš *et al*. (1978) placed it in the subfamily Acuariinae, characterised by cephalic ornamentation consisting of cordons so that they extend also to the cervical region. Chabaud and Petter (1959) and Chabaud (1975) consider it as a member of the subfamily Seuratiinae, which is defined by "cordons extending mainly transversely from near point of origin, so they expand only on the cephalic region, where they form a collarette" (Chabaud 1975). Chitwood and Wehr (1934) described the collarette of *Seuratia* Skryabin, 1916 and related genera as "serrated on its distal margin and forms a sort of collar around the anterior end of the body at the base of pseudolabia". As seen from our observations (Fig. 2B, D), the area restricted by the cordons of *A. alcedonis* does not correspond to the definition of a collarette: its posterior margin is not serrated and it extends in the posterior direction much beyond the base of the pseudolabia. Furthermore, the SEM studies have revealed that each cordon of *A. alcedonis* consists of an inner single row of delicate cuticular plates and an outer longitudinal cuticular ridge delimiting the longitudinal canal of the cordon (Fig. 2B, D). This cordon structure is similar to that previously described in species of the genera *Syncuaria* Gil'bert, 1927, *Decorataria* Sobolev, 1949 and *Desportesius* Chabaud et Campana, 1949 (see Mutafchiev and Georgiev 2008a, b, 2009). On this basis, we agree with Skryabin *et al*. (1965) that *Aviculariella* is closely related to the genera *Syncuaria*, *Decorataria*, *Chevreuxia* Seurat, 1918 and *Skrjabinocara* Kurashvili, 1940. In addition, all these genera (except *Chevreuxia*) are characterised by a vulva situated at the posterior end of the body and a monodelphic uterus. For these reasons, we follow Chitwood and Wehr (1934), Skryabin *et al*. (1965) and Baruš *et al*. (1978) in recognising *Aviculariella* as a member of the subfamily Acuariinae.

None of the previous descriptions of *A. alcedonis* (including those referring to it as *A. collaricephala*) mentioned the presence of a pair of sublateral ribs at the anterior end of each pseudolabium. However, such ribs were clearly illustrated by Ryzhikov and Khokhlova (in Skryabin *et al*. 1965) in their fig. 106b showing the cephalic end of *A. collaricephala*. Our SEM study revealed the presence of these cuticular structures (Fig. 2B-D); their origin as a part of the cordon apparatus or a part of the pseudolabia remains unclear.

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