

Entomology

Representatives of Nematodes of the Genus *Bursaphelenchus* (*Aphelenchida*, *Parasitophelenchidae*) in Georgia

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ABSTRACT. Species associated with insects are united in the genus *Bursaphelenchus*. There are pests of plants among them: *Bursaphelenchus cocophilus* damages coco palm, and *Bursaphelenchus xylophilus* conifer species, hence the great attention paid to the given genus of nematodes. In the process of study of nematodes associated with insects a great quantity of species of the genus *Bursaphelenchus* have been recorded in Georgia. In the list of nematodes of the order *Aphelenchida* 23 species are noted for Georgia. Of them 10 are described as new to science. However, the *Bursaphelenchus scalaris* Kakulia, 1989, described by Kakulia is missing in the list. A certain part, due to the absence of description in print, appeared to be *nomina nuda* or to be unknown to the authors. In the present paper attempts are made to fill the gap. © 2010 Bull. Georg. Natl. Acad. Sci.

Key words: *Aphelenchida*, obligate mycochilophage, pest of plants.

The genus *Bursaphelenchus* was founded by Fuchs in 1937. Species associated with insects are united in the genus. Among them there are dangerous pests of plants. These are *Bursaphelenchus cocophilus*, damaging coco palm and *Bursaphelenchus xylophilus*, damaging conifers, which accounts for the great attention paid to the given genus of nematodes. Most of the species are obligate mycochilophages. At present the genus *Bursaphelenchus* is one of the richest with the species of the genera of the order *Aphelenchida*. According to the data of Ryss, et al [1], it unites 78 species, and according to a later study [2] – 100 species. The main vectors of *Bursaphelenchus* are beetles from the families *Scolytidae*, *Cerambycidae*, *Curculinidae*, *Bupresididae*.

In the process of study of the nematodes associated with insects in Georgia a great number of species of the genus *Bursaphelenchus* was recorded. The list of the revealed species in Georgia and in Russia is the

most impressive for Eastern Europe [1]. In the list of nematodes of the order *Aphelenchida* [3] 23 species are noted for Georgia. Of them 10 are described as new for science. *Bursaphelenchus scalaris* Kakulia, 1989 described by Kakulia, was not included in the list. A number of species, described by Georgian authors, are mentioned in the brilliant study by Ryss et al [1], another part, being unpublished, appeared to be *nomina nuda* or was left unknown to the authors.

In the present list there are no plant pests, but the danger of the penetration into Georgia of *B. xylophilus* still exists. It can be quite dangerous for the forests of Georgia. Pests can penetrate into Georgia with plant material and by means of insect carriers. The above-mentioned ways of spreading in Georgia of *B. xylophilus* are unlikely; however the danger cannot be naturally excluded. Therefore, investigation towards identifying *Bursaphelenchus* in Georgia should be confirmed.

Ts. Devdariani, in her Dissertation Thesis (1975),

Table 1.

Representatives of the species *Bursaphelenchus* from the list of the nematodes pest of order *Aphelenchida* [3] (with supplements)

x№	Nematode Species	Host	Location	Author	Notes
1	<i>Bursaphelenchus crenati</i> (Rühm, 1956);	<i>Hylesinus crenatus</i> Fabr (<i>Ipidae</i>)	Borjomi, Eastern Georgia	Devdariani Ts., Kakulia G., Kurashvili B.	
2	<i>Bursaphelenchus eggersi</i> (Rühm, 1956);	<i>Hylurgops palliates</i> Gyll. (<i>Ipidae</i>)	Borjomi, Bakuriani, Khashuri dist., Eastern Georgia	Kakulia G., Kurashvili B., Devdariani Ts.	
3	<i>Bursaphelenchus eidenmani</i> (Rühm, 1956);	<i>Ips typographus</i> L. (<i>Ipidae</i>)	Borjomi, Bakuriani, Gagra dist. Eastern, Weastern Georgia	Kakulia G., Kurashvili B., Devdariani Ts.	
4	<i>Bursaphelenchus eremus</i> (Rühm, 1956);	<i>Scolytus intricatus</i> Ratz. (<i>Ipidae</i>)	Borjomi, Bakuriani, Eastern Georgia	Devdariani Ts.	
5	<i>Bursaphelenchus ernoporus</i> Devdariani, 1975;	<i>Ernoporus fagi</i> F. (<i>Ipidae</i>)	Borjomi, v. Martkopi, Eastern Georgia.	Devdariani Ts.	
6	<i>Bursaphelenchus erosus</i> Kurashvili, Kakulia, Devdariani, 1980;	<i>Orthotomicus erosus</i> Wall (<i>Ipidae</i>)	Borjomi, Bakuriani, Eastern Georgia.	Kurashvili B., Kakulia G., Devdariani Ts.	
7	<i>Bursaphelenchus eucarpus</i> (Rühm, 1956);	<i>Scolitus mali</i> Bechst. (<i>Ipidae</i>)	Borjomi, Bakuriani, Eastern Georgia	Devdariani Ts.	
8	<i>Bursaphelenchus frandulentus</i> (Rühm, 1956)	<i>Cerambyx cerdo acuminatus</i> Motsch. (<i>Cerambycidae</i>)	Borjomi, Bakuriani, Eastern Georgia	Devdariani Ts., Kakulia G., Kurashvili B.	
9	<i>Bursaphelenchus georgicus</i> Devdariani, Kakulia, Khavtasi, 1980;	<i>Rhopalopus macropus</i> Pens. (<i>Cerambycidae</i>)	Borjomi, Bakuriani, Eastern Georgia	Devdariani Ts., Kakulia G., Khavtasi D.	
10	<i>Bursaphelenchus hylesini</i> Devdariani, 1975;	<i>Hylesinus fraxini</i> Panz (<i>Ipidae</i>)	Borjomi, Bakuriani, Eastern Georgia	Devdariani Ts.	<i>Nomen nudum</i>
11	<i>Bursaphelenchus idius</i> (Rühm, 1956);	<i>Pityogenes chalcographus micans</i> Kug (<i>Ipidae</i>)	Borjomi, Bakuriani, Eastern Georgia	Kakulia G.	
12	<i>Bursaphelenchus incurvus</i> (Rühm, 1956);	<i>Dendroctonus micans</i> Kug (<i>Ipidae</i>)	Borjomi, Bakuriani, Eastern Georgia	Kakulia G.	
13	<i>Bursaphelenchus piniperdae</i> (Fuchs, 1937)	<i>Blasophagus piniperda</i> L. (<i>Ipidae</i>)	Borjomi, Bakuriani, Eastern Georgia	Kurashvili B., Kakulia G., Devdariani Ts.	
14	<i>Bursaphelenchus populneus</i> Devdariani, 1973;	<i>Saperda populnea</i> L. (<i>Cerambycidae</i>)	Gori dist. Eastern Georgia	Kakulia G., Devdariani Ts., Maglakelidze L. 1980	<i>Nomen nudum</i> , Hunt, 1993
15	<i>Bursaphelenchus ratzeburgii</i> (Rühm, 1956);	<i>Scolytus ratzeburgi</i> Jans (<i>Ipidae</i>)	Borjomi, Bakuriani, Eastern Georgia	Devdariani Ts.	
16	* <i>Bursaphelenchus scalaris</i> Kakulia, 1989;	<i>Saperda scalaris</i> L. (<i>Ipidae</i>)	Borjomi, Eastern Georgia	Kakulia G.	was not in the list

17	<i>Bursaphelenchus sexdentati</i> (Rühm, 1956);	<i>Ips sexdentatus</i> Boern (<i>Ipidae</i>)	Borjomi, Bakuriani, Eastern Georgia	Kakulia G.	
18	<i>Bursaphelenchus steineri</i> (Rühm, 1956)	<i>Cossus cossus</i> L. (<i>Cossodae</i>)	Borjomi, Bakuriani, Gagra dist., Eastern Georgia	Devdariani Ts., Kurashvili B., Kakulia G.	
19	<i>Bursaphelenchus sutoricus</i> Devdariani, 1974;	<i>Monochamus sutor</i> L. (<i>Cerambycidae</i>)	Borjomi dist., Akhaldaba, Eastern Georgia	Devdariani Ts., Kurashvili B., Kakulia G.	
20	<i>Bursaphelenchus tbilisiensis</i> Devdariani, 1971;	<i>Saperda carcharias</i> L. (<i>Cerambycidae</i>)	Tbilisi, Eastern Georgia	Kakulia G., Devdariani Ts., Maglakelidze, 1980	<i>Nomen nudum</i> , Hunt, 1993
21	<i>Bursaphelenchus teratospicularis</i> Kakulia et Devdariani, 1965	<i>Ortotomicus proximus</i> Eich. and <i>Taprorychus bicolor</i> Herbst (<i>Ipidae</i>)	Borjomi, Bakuriani, Eastern Georgia	Kakulia G., Devdariani Ts.	
22	<i>Bursaphelenchus typographi</i> (Kakulia, 1967)	<i>Ips typographus</i> L. (<i>Ipidae</i>)	Borjomi, Eastern Georgia	Kakulia G.	
23	<i>Bursaphelenchus xerocaraterus</i> (Rühm, 1956);	<i>Scolytus scolytus</i> F. (<i>Ipidae</i>)	Borjomi, Bakuriani, Eastern Georgia	Kakulia G., Devdariani Ts.	
24	<i>Bursaphelenchus wekuae</i> Kurashvili, Kakulia, Devdariani, 1980;	<i>Trypodendr signatum</i> F. (<i>Ipidae</i>)	Borjomi, Bakuriani, Eastern Georgia	Kurashvili B., Kakulia G., Devdariani Ts.	
25	** <i>Bursaphelenchus</i> sp.	<i>Monochamus sutor</i> L. (<i>Cerambycidae</i>)	Tskneti, near Tbilisi, Eastern Georgia	Mikaia N.	was not in the list

* was not in the list; ** *Bursaphelenchus*, found by Mikaia N.

described 4 new species of nematodes of bark beetles (*Ipidae*) and capricorns (*Cerambycidae*) of deciduous woody species of Eastern Georgia: *B. populneus*, *B. tbilisiensis*, *B. ernoporus*, *B. hylesini* [4]. All of them were described and pictured, except one, *B. hylesini*. The description of the above species did not appear in print. Two species *B. populneus* and *B. tbilisiensis* were mentioned in the work by Kakulia, Devdariani, Maglakelidze [5], but due to the absence of description, Hunt [6] referred those species to *nomina nuda* (citation by Ryss et al., 2005). Below we give the description of three species and *B. scalari* Kakulia, 1989 [7], except *B. hylesini*.

1. *Bursaphelenchus populneus* Kakulia, Devdariani, Maglakelidze, 1980

Measurements:

Females: n=7; L=420-654 mkm; D=10-16 mkm; OS=46-58 mkm; CD=30-50 mkm; a=40.87-52.00; b=10.00-12.11; c=19.33-16.40; V%=67.00-78.93.

Males: n=10; L=400-550 mkm; D=30 mkm; OS=50 mkm; CD=10-14 mkm; sp=14 mkm; St=12 mkm; a=39.28-48.00; b=9.60-10.06; ñ=16.00-18.97.

The body is covered with cuticle of slightly expressed annulate structure. Tubera (three pairs) are high and clearly distinguished against the contours of the body. Stilet's length is 12 mkm, basal thickness is not of a large size. Procorpus is cylindrical, bulbus – oval. Chewing plates are located lower than the centre of bulbus. Rectum and holes are well developed.

Female: Vulva is situated in the second half of the body. Vagina is slanted and connected with postvulvar sac. The distance between vulva and anus is 120-14 mkm. Terminus of the tail is sharpened. Gonad is unpaired, 180 mkm in length. Scaly appendage is at the end.

Male: The body compared to female is small and wider. Spicules are partially accrete, wide and falciform, ventrally sharpened. The head of the spicule is dorsally distinguished from the spicule. The tail is short and ventrally bent. There is one pair of preanal and a pair of postanal papillae. Gland papilla is adonally located.

At the end of the narrowing of the tail there is bursa. Body's diameter in the area of anus equals 1/3 of the length of the tail. Host: capricorn (*Saperda populnea* L.). The habitat of beetles: Poplar saplings. Gori district (Eastern Georgia).

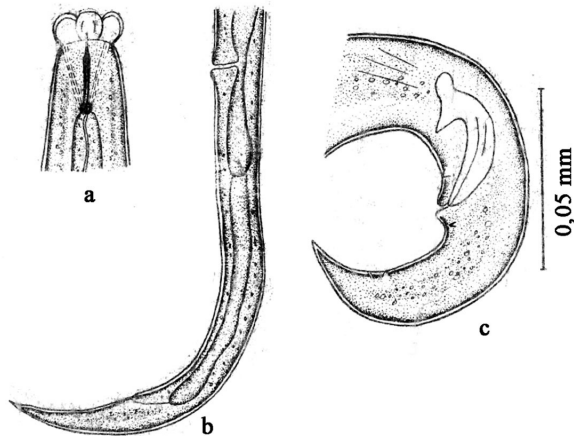


Fig.1. *Bursaphelenchus populneus* after Devdariani. a – Head end of nematode; b – Female tail end; c – Male tail end.

2. *Bursaphelenchus tbilisensis* Kakulia, Devdariani, Maglakelidze, 1980

Measurements:

Females: n=8; L=450 mkm; D=12 mkm; OS= 60 mkm; CD=30 mkm; a=37.60; b=7.50; c= 15.00; V%=71.11.

Males: n=7; L=498 mkm; D=16 mkm; OS=60 mkm; CD=38 mkm; Sp=19 mkm; a=33.00; b=8.20; C=13. 10.

The body is covered with annulate cuticle. There are three pairs of tuberas. Stylet and oesophagus are typical of the given species.

Female: Vulva is situated in the second half of the body. Gonad is unpaired, vagina – slanting. Postvulvar sac is long (70-80 mkm). The distance between vulva and anus equals 110 mkm. Terminus of the tail is sharpened.

Male: Spicule is partially accrete, the head of the spicule is well distinguished. The tail is short slightly bent ventrally. There are three pairs of postanal and preanal papillae. The round form bursa is on the tail.

Anus body diameter is a bit less than the length of the tail. Nematodes are revealed in big aspen capricon (*Saperda calcharias* L.), in rotten wood and under beetle's elytra. The habitat of beetles: felled aspen; Tbilisi, Navtlughi Forestry.

3. *Bursaphelenchus ernoporus* Devdariani n.sp.

Measurements:

Females: n=7; L=780-820 mkm; D=12-14 mkm; OS= 74-80 mkm; CD= 44-46 mkm; St=12-14 mkm; a=39.50-41.13; b=10.54-11.00; c=17.72-21,18; V%=80.76-81.99.

Males: n=6; L=720-780 mkm; D=13-14 mkm; OS=56-62 mkm; CD=21-24 mkm;

Sp= 16-18 mkm; a=40.00-46.19; b=10.10- 12.75; \bar{n} =34. 28- 39.90.

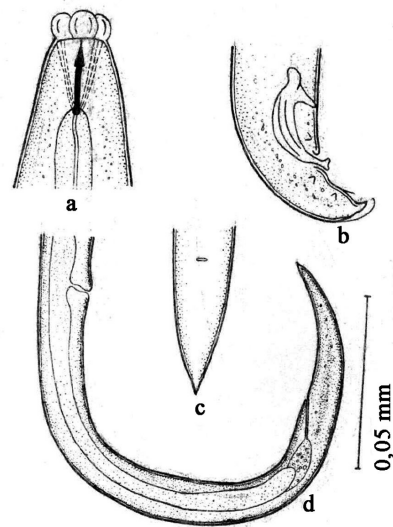


Fig. 2. *Bursaphelenchus tbilisensis* after Devdariani. a – Head end of nematode; b – Male tail end; c – Female tail end.

The body is covered with annulate cuticle. There are three pairs of high tuberas well distinguished from body contours. Stylet is small, 9 mkm, the right side is well marked and basal thickening of the stylet is differentiated from contours of the body. Procorpus is cylindrical, bulbus – oval. Chewing plates are located in the lower part of bulbus. Gland bulbus is pair, well distinguished from each other.

Females: Gonad is unpair (240 mkm), its bend is 80 mkm. Vulva is located in the second half of the body. Lips of vulva are slightly seen. Vagina is slanting. Postvulvar sac is short (28-40 mkm). Anal tubercula is not expressed. Diameter of the body (20 mkm) is a little bigger than hind intestine (18 mkm).

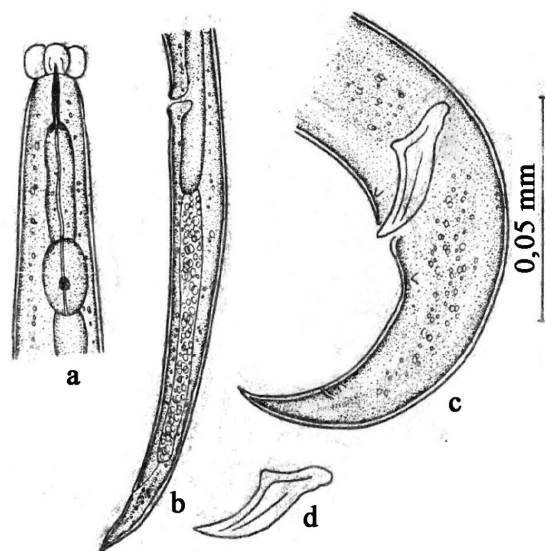


Fig. 3. *Bursaphelenchus ernoporus* after Devdariani. a – Head end of nematode b – Female tail end; c – Male tail end; d – Spicule

Males: Gonad is unpaired. There is a pair of partially accrete spicules of not large size (18 mkm). Distal part of spicule is sharpened. Proximal part of spicule is not distinguished. Ventral appendage is sharpened. The tail is bent, terminus is sharpened. There is a pair of preanal and one postanal papillae. Bursa is oval. Anal tuberculas are well distinguished. Host: *Ernoporos fugi* F. The place of settlement of beetles: tilled aspen, Eastern Georgia, village of Martkopi.

4. *Bursaphelenchus scalari* Kakulia, 1989

Measurements:

Females: L=1.150 mkm; D=0.040 mkm; st=0.018 mkm; a=28.7; b=14.8; c=30.0; V%=74.5.

Males: L=0.845 mkm; D=0.023 mkm; st=0.018 mkm; a=36.7; b=11.0; c=14.5; sp=0.013.

Female: The body is covered with cuticle of slightly expressed annulate structure. Tubers are large and high, sharply defined from contours of the body and from each other. Stylet is dense, 18 mkm in length. Bulbus fibrillar, round. Nervous ring is slightly behind bulbus. Gonad is well marked. Lips of vulva are convex. Postvulvar sac is long and wide. The tail ends bluntly, with little mucro.

Male: Dense. Pair papillae are located preanally and postanally. Grand papilla is seen adonally. The tail ends with angular form pelodern bursa. Host: Patterned capricorn (*Saperda scalaris* L.). The habitat of beetles: alder-tree (*Alnus glutinosa* L.), Borjomi gorge, Eastern Georgia.

5. *Bursaphelenchus* sp. Mikaia

Measurements:

Females: L=0.22 mkm; D=0.040 mkm; st=18 mkm; a=52; b=154; c=34; V%=71%.

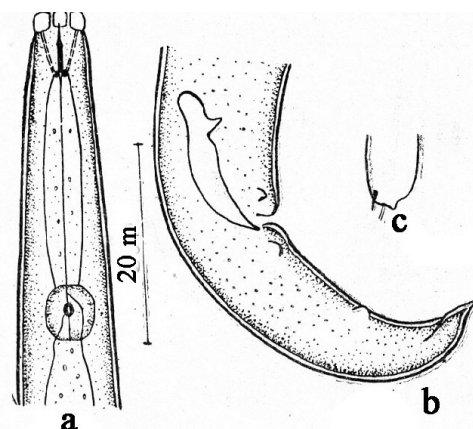


Fig. 4. *Bursaphelenchus scalari* Kakulia, 1989 (according to Kakulia). a – Head end of nematode; b – Male tail end; c – Bursa

Males: L=0.6 mm; D=0.023 mkm; st=15 mkm; sp=21 mkm; a=40; b=10.2; c=27.

Bursaphelenchus sp. is close to *Bursaphelenchus wekuae*, but it differs from it by different properties: 1. Spicule is larger; 2. Female's tail is shorter and the host is different. Host: Pine-tree black capricorn (*Monochamus galloprovincialis*). The habitat of beetles: pine-tree, Tskneti village near Tbilisi, Eastern Georgia.

As is seen from the above-mentioned material, most of the *bursaphelenchus* known in Georgia are found in Eastern Georgia. This is accounted for by the fact that special study of insect nematodes found in Western Georgia was carried out sporadically.

We can assume that the List of the revealed *bursaphelenchus* will grow when study of the insect nematodes in Western Georgia is constantly conducted.

ენტომოლოგია

გვარ *Bursaphelenchus*-ის (*Aphelenchida*, *Parasitophelenchidae*) წარმომადგენლები საქართველოში

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(წარმოდგენილია აკადემიის წევრის ი. ელიაშვილის მიერ)

Bursaphelenchus-ის გვარში გაერთიანებული არიან მწერებთან ასოცირებული სახეობები. მათ შორის არიან მცენარეთა საშიში მავნებლებიც: *Bursaphelenchus cocophilus* ქოქოსის პალმის მავნებელი და *Bursaphelenchus xylophilus* წიწვოვანი მცენარეების მავნებელი, რაც განსაზღვრავს დიდ ყურადღებას არსებული გვარის ნემატოდებისადმი. მწერებთან ასოცირებული ნემატოდების შესწავლისას საქართველოში რეგისტრირებულია *Bursaphelenchus*-ის გვარის დიდი რაოდენობა. საქართველოში რიგი *Aphelenchida*-ს ნემატოდების საშიში აღნიშნულია 23 სახეობა, მათ შორის 10 მეცნიერებისათვის ახალი სახეობა. ამ საშიში ვერ მოხვდა კაკულიას მიერ აღწერილი *Bursaphelenchus scalaris* Kakulia, 1989. სახეობის ნაწილი, რომელიც არ იქნა აღწერილი, აღმოჩნდა *nomina nuda*, ან საერთოდ უცნობია ავტორებისათვის. გაკეთებულია მცდელობა, რათა აღმოიფხვრას არსებული ხარვეზი.

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