Short note

First report of *Steinernema affine* (Bovien, 1937) Wouts, Mráček, Gerdin & Bedding, 1982 from the Russian Federation

Darja S. Kalinkina[1] and Sergei E. Spiridonov[2]

[1]Institute of Biology, Karelian Research Centre of the Russian Academy of Sciences, Pushkinskaya Street 11, 185910, Petrozavodsk, Russia
[2]Centre of Parasitology, A.N. Severtsov Institute of Ecology and Evolution, Russian Academy of Sciences, Leninskii Prospect 33, 119071, Moscow, Russia
e-mail: dania_22@mail.ru

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Entomopathogenic nematodes (EPN) have been reported from different habitats on all continents except Antarctica (Hominick, 2002). Single or few findings of some EPN species prevent any generalisations about their geographical distribution. Some species of EPN were reported from different regions of the planet (*e.g.*, *Steinernema feltiae*), but the participation of human activity in the distribution of such EPN cannot be excluded. EPN isolation from soil continues and in some cases it is an absence of species, which are common in the neighbouring areas of the same continent that attracts attention. Thus, the species *Steinernema affine* (Bovien, 1937) Wouts, Mráček, Gerdin & Bedding, 1982 described from agricultural soil in Denmark was then reported throughout Europe and in British Columbia, Canada (Nguyen *et al.*, 2007). Surprisingly, this species was never reported on the territory of the Russian Federation, neither in the European part nor in the Asian part.

Soil samples of about 1 kg were collected in 2014 on the Solovetsky Islands archipelago (White Sea), Arkhangelsk Region, in the North of the European part of the Russian Federation. These samples were transferred to the laboratory and baited with *Galleria* caterpillars. The development of steinernematids was detected in one soil sample, collected on Bolshoy Solovetsky Island on the territory of the local Botanical Garden under introduced specimen of *Larix sibirica* (65º03´09.40″ N; 35º39´27.40″ E), which was planted in the 20th century. Migrating steinernematid juveniles were harvested from dead *Galleria* caterpillars. Adult nematodes of the second generation were also collected from sediment, fixed in formalin and mounted in glycerol. A mixture of juveniles and second generation adults was used to extract DNA with Promega columns (Wizard® SV Genomic DNA Purification System). The sequences of ITS rDNA and D2-D3 expansion segments of LSU rDNA were obtained with TW81-AB28 and D2A-D3B primers, as previously described (Ivanova *et al.*, 2013). BLAST analysis in NCBI GenBank demonstrated 100% correspondence of obtained sequences to those of *S. affine* isolates from Central and Western Europe: *i.e.*, no nucleotide differences were found between Solovetsky isolate and the deposited sequences of European *S. affine* isolates in 750 bp long ITS rDNA alignment and 650 bp long D2-D3 LSU rDNA alignments.

A comparison of morphometric features of second generation adults of *S. affine* from Solovetsky Islands with those of topotype culture revealed that when some parameters are overlapping with the lower mean value for Solovetsky isolate (Table 1), all remaining parameters are coinciding in both isolates. The structure of a lateral field of dauer (infective) juveniles corresponds to typical one for this species (Fig. 1A). The only morphological difference with West Europe isolates of *S. affine* is in the form of refractive inclusion in the tail tip of dauer juveniles. In Solovetsky isolate this inclusion is rod-like (Fig. 1B), or just absent (Fig. 1C) in approximately half of all studied juveniles ($n > 40$). In infective juveniles of European isolates the inclusion is usually drop-like.

The finding of *S. affine* adds a species to the list of steinernematids reported from the territory of the Russian Federation. Still, the transfer of this species to the Solovetsky Archipelago with human activity cannot be excluded, as various different plants were brought and planted on the island in the 19th and 20th centuries. As significant amount of soil is transported with seedlings the nematodes were possibly introduced from other areas where this species is a common component of soil biota.

Table 1. Comparative morphometrics of two isolates of *Steinernema affine*: topotype and Solovetsky ones. Data are in the form: mean (range)(all measurements are in μm)

Character	Measurements for *S. affine* re-isolated from the type locality (Nguyen *et al.*, 2007)	Measurements for *S. affine* isolated from the Bolshoy Solovetsky Island
Body length of second generation males (n = 10)	1300 (1200-1500)	1075 (796-1404)
Pharynx length of second generation males (n = 10)	155 (146-168)	149 (136-157)
Distance from anetrior end to the excretory pore in second generation males (n = 10)	93 (86-104)	78 (60-90)
Spicule length in second generation males (n = 10)	69 (62-72)	61 (52-72)
Gubernaculum length in second generation males (n = 10)	36 (30-42)	32 (27-36)
Body length of infective juveniles (n = 20)	712 (626-788)	700 (561-750)
Pharynx length of infective juveniles (n = 20)	126 (115-134)	133 (127-145)
Distance from anterior end to the excretory pore in infective juveniles (n = 20)	62 (51-69)	61 (60-63)

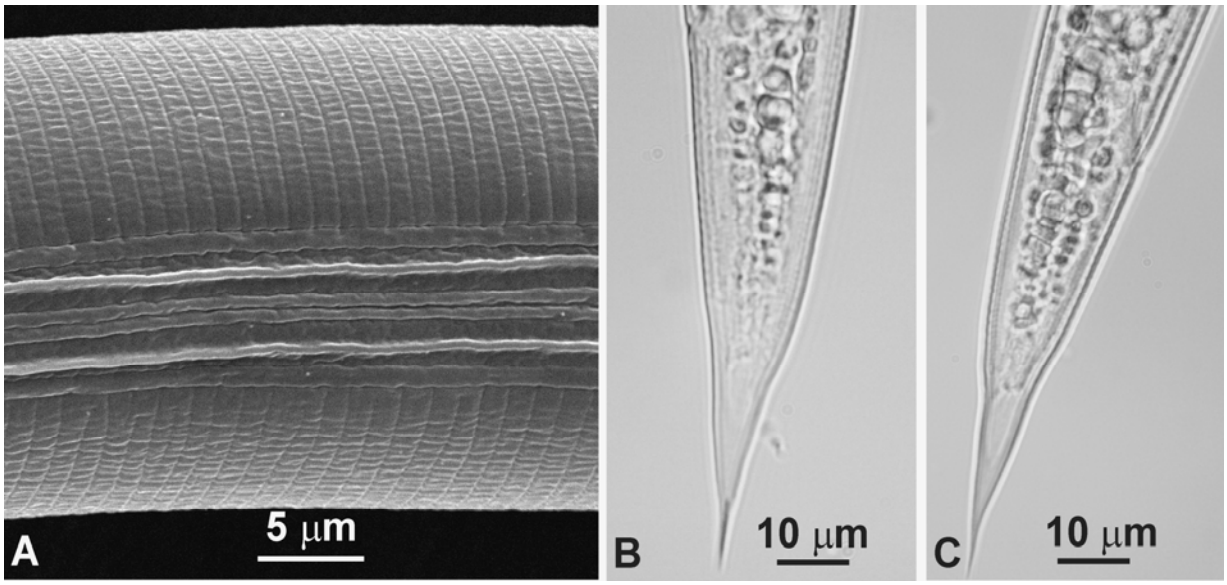

Fig. 1. Morphology of *Steinernema affine* infective juveniles (strain isolated on the Bolshoy Solovetsky Island, Solovetsky Archipelago, Arkhangelsk Region, Russian Federation). A: ridges of lateral field; B: tail terminus with rod-like refractive inclusion; C: tail terminus without refractive inclusion.

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