

## ***Aphelenchoides microstylus* n. sp. and *Seinura onondagensis* n. sp. (Nemata: Aphelenchina) from New York**

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**Abstract:** *Aphelenchoides microstylus* n. sp. and *Seinura onondagensis* n. sp., a nematode predator, are described from dead Scots pine (*Pinus sylvestris* L.) in Onondaga County, New York. Females of *A. microstylus* are 370 to 485  $\mu\text{m}$  long. The body is slender and tapers posteriorly to an amucronate, pointed terminus. The head is continuous with the body, and lips bear a stylet guide. Diagnostic characters of females are three incisures in the lateral field, a short stylet (6–7.5  $\mu\text{m}$ ) with small basal knobs, a single row of oocytes, and a long postuterine sac (25–50  $\mu\text{m}$ ). Males are characterized by small spicules (10–11  $\mu\text{m}$ ); two pairs of post-anal, subventral papillae; and a single row of spermatocytes. A bursa and gubernaculum are absent. *Seinura onondagensis* females are characterized by a body of moderate length (475–595  $\mu\text{m}$ ), finely annulated cuticle, and a slightly set-off head. Diagnostic characters are four incisures in the lateral field, long stylet without basal knobs (17–22  $\mu\text{m}$ ), single row of oocytes, and presence of a postuterine sac (14–38  $\mu\text{m}$ ). Males are unknown. The monospecific genus *Indaphelenchus* is proposed as a synonym of *Seinura*, and *S. siddiqii* n. comb. is proposed for the only species, *I. siddiqii*.

**Key words:** Aphelenchina, *Aphelenchoides microstylus*, bark beetle, *Indaphelenchus siddiqii*, nematode, new combination, new species, New York, *Pinus sylvestris*, predator, Scots pine, *Seinura onondagensis*, synonym, taxonomy.

Fewer than 10% of described *Aphelenchoides* or *Seinura* species are associated with insects. Fuchs (1931), Massey (1971, 1974), and Rühm (1957) have provided the only descriptions of these species in association with insects. These nematodes have been described in association with coniferous beetles of the families Scolytidae and Curculionidae.

In 1990, an undescribed *Aphelenchoides* sp. and *Seinura* sp. were isolated from Scots pine in Onondaga County, New York, in association with bark beetles. Recently, slides of the same undescribed *Seinura* sp. were discovered in the U.S. Department of Agriculture (USDA) Forest Service RMRS Collection. In 1965, Massey collected these specimens from Durham, North Carolina, in association with the beetle *Hylobius pales* Herbst. Massey never described this species or des-

ignated a specific epithet for it and, to date, it remains undescribed.

This paper describes the two new species herein known as *Aphelenchoides microstylus* n. sp. and *Seinura onondagensis* n. sp. Morphological measurements of Massey's material are provided, and the designation *S. onondagensis* is proposed for this material.

### MATERIALS AND METHODS

During summer 1990 specimens of *Aphelenchoides microstylus* n. sp. and *Seinura onondagensis* n. sp. were isolated from dead Scots pine logs in Onondaga County, New York. Nematodes were recovered by soaking the wood in water overnight. After identification, nematodes were heat-killed and fixed in glycerin-formaldehyde. Permanent mounts were made in glycerin after processing the nematodes slowly to glycerin by Hooper's method (1970). Specimens of *S. onondagensis* from Durham, North Carolina, were obtained from the USDA Forest Service RMRS Collection, Lincoln, Nebraska.

Drawings of *A. microstylus* and *S. onondagensis* were created with a Nikon Optiphot light microscope fitted with a drawing attachment. Measurements of specimens from New York and the USDA Forest Service were taken from permanent, glycerin mounts. All

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measurements are in micrometers ( $\mu\text{m}$ ) unless otherwise specified.

SYSTEMATICS

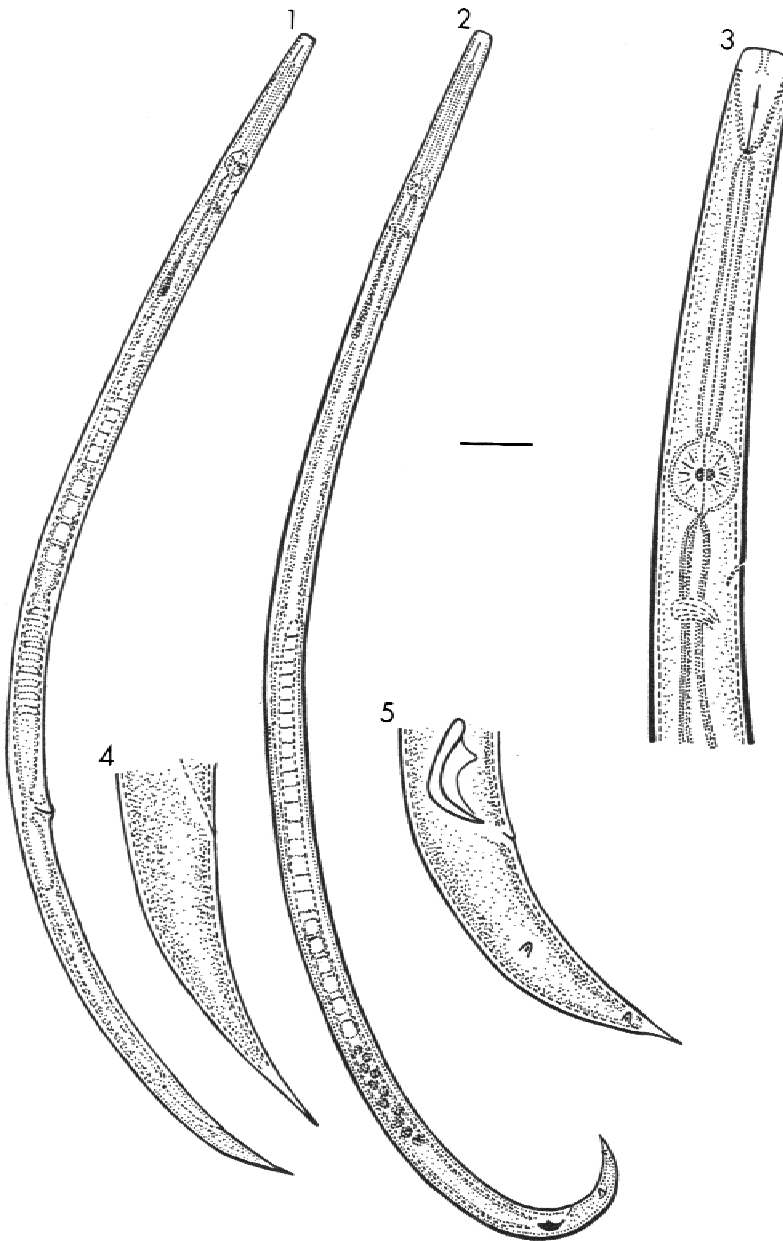
*Aphelenchoides microstylus* n. sp.  
(Figs. 1–5)

*Description*

*Holotype (female in glycerin)*: Length 480; stylet 6; ratios—a 27.4, b 9.6, c 12.8, c' 3.8, V 69.

*Females (n = 10)*: Length 370–485 (429; SD 31.5); stylet 6–7.5 (6.6; SD 0.7); ratios—a 25.4–48.5 (33.2; SD 6.2), b 7.8–14.9 (9.7; SD 1.8), c 12.2–16.2 (14.1; SD 1.1), c' 2.8–4.7 (3.8; SD 0.6), V 69–74 (70.5; SD 1.6).

Body slender, ventrally curved, tapering posteriorly to pointed, amucronate terminus. Cuticle with fine, transverse striae. Lateral field with three incisures. Head continuous with body, lips with stylet guide. Stylet



FIGS. 1–5. *Aphelenchoides microstylus* n. sp. 1) Full view of female. 2) Full view of male. 3) Head and neck of female. 4) Female tail. 5) Male tail. Scale = 25  $\mu\text{m}$  in Figs. 1, 2; 6  $\mu\text{m}$  in Fig. 3; 7  $\mu\text{m}$  in Figs. 4, 5.

short (6–7.5), with small basal knobs. Median bulb spherical, valves centrally situated. Esophageal gland lobes about four body widths long. Nerve ring one body width below base of median bulb. Excretory pore between median bulb and nerve ring, at times difficult to observe in fixed specimens. Ovary single, outstretched; oocytes in single row. Spermatheca with disk-shaped sperm. Postuterine sac 25 to 50 long. Vulva protuberant, flap absent. Vagina oblique.

*Allotype (male in glycerin)*: Length 510; stylet 6; spicules 11; ratios—a 34, b 9.3, c 18.5, c' 2.2.

*Males (n = 10)*: Length 350–480 (402; SD 44.4); stylet 6–7.5 (6.6; SD 0.7); spicules 10–11 (10.2; SD 0.4); ratios—a 29.3–38.4 (34; SD 3.4), b 8–10.5 (9.3; SD 0.9), c 14.5–21.1 (18.1; SD 2), c' 2–3 (2.4; SD 0.3).

Body J-shaped, at times ventrally curved. Cuticle, head, excretory pore, median bulb, and stylet same as female. Tail conoid to pointed, amucronate terminus. Testis 165 to 275 long, spermatocytes in single row. Spicules arcuate, 10 to 11 long; apex and rostrum prominent. Two pairs of post-anal, subventral papillae present: first pair just anterior to tail tip, second pair one body width posterior to cloaca. Bursa and gubernaculum absent.

#### *Type host and locality*

From the xylem of dead Scots pine (*Pinus sylvestris* L.), Syracuse University Campus, Onondaga County, New York.

#### *Bionomics*

Bark beetle associate.

#### *Type specimens*

*Holotype (female)*: Collected 23 June 1990 by T. R. Kaisa in Onondaga County, New York. Slide no. T-535t, deposited in the U.S. Department of Agriculture Nematode Collection (USDANC), Beltsville, Maryland. *Allotype (male)*: Same data as holotype. Slide no. T-536t deposited in USDANC, Beltsville, Maryland. *Paratypes (females and males)*: Same data as holotype. Two females on slide no. T-4787p and three males on slide no. T-4788p deposited in USDANC, Beltsville, Maryland; three females and one male in

Nematology Department, Rothamsted Experimental Station, Harpenden, Herts., England; and two females and one male in State University of New York College of Environmental Science and Forestry, Program in Environmental and Forest Biology, Department of Entomology, Syracuse, New York.

#### *Diagnosis*

The female of *Aphelenchoides microstylus* n. sp. is 370 to 485  $\mu\text{m}$  long. The body is slender and ventrally curved posteriorly to a pointed, amucronate tail. The cuticle is finely annulated and bears three incisures in the lateral field. The stylet is short (6–7.5  $\mu\text{m}$ ), with small basal knobs. The intestine terminates in a rectum and anus. Oocytes are arranged in a single row, and a long postuterine sac is present (25–50  $\mu\text{m}$ ). The vulva is protuberant, and a flap is absent. The male is 350 to 510  $\mu\text{m}$  long. The body is slender and tapers posteriorly to an amucronate tail, which bears two pairs of post-anal, subventral papillae. Spicules are 10 to 11  $\mu\text{m}$  long with a prominent apex and rostrum. A bursa and gubernaculum are absent.

#### *Relationships*

*Aphelenchoides microstylus* n. sp. has a simple, amucronate tail and belongs to the Group 1 category of *Aphelenchoides* species as described by Shahina (1996). All species in this group except *A. helicus* Heyns, 1964 are differentiated from *A. microstylus* by a set-off head. *Aphelenchoides helicus* differs in having a longer female body (480–500  $\mu\text{m}$  vs. 370–485  $\mu\text{m}$ ), stouter female body (24–31 vs. 25.4–48.5), and a longer stylet (10  $\mu\text{m}$  vs. 6–7.5  $\mu\text{m}$ ).

Other characters that differentiate the rest of the Group 1 species from *A. microstylus* are listed in Table 1.

#### *Remarks*

Three Group 1 species were not compared to *A. microstylus* because of uncertainty regarding their placement in this group or taxonomic status. *Aphelenchoides orientalis* Eroshenko, 1968 and *A. parasubtenuis* Shavrov, 1967 were described as mucronate and may belong to the Group 2 (mucro-

TABLE 1. Characters differentiating Group 1 *Aphelenchoides* spp. with set-off heads from *Aphelenchoides microstylus* n. sp.

<i>A. africanus</i> Dasonville & Heyns, 1984
Longer, knobless female stylet (11–13 $\mu\text{m}$ ); longer female tail (c 10–12); larger spicules (12–16 $\mu\text{m}$ ).
<i>A. capsuloplanus</i> (Haque, 1967) Andr�assy, 1976
Shorter female tail (c 17–19); larger spicules (15–17 $\mu\text{m}$ ).
<i>A. confusus</i> Thorne & Malek, 1968
Longer, knobless female stylet (12 $\mu\text{m}$ ); longer female body (600 $\mu\text{m}$ ); shorter female tail (c 18).
<i>A. helicisoma</i> Maslen, 1979
Curved female and male tails, longer female body (520–910 $\mu\text{m}$ ), longer female stylet (13–16 $\mu\text{m}$ ); larger spicules (22–27 $\mu\text{m}$ ).
<i>A. involutus</i> Minagawa, 1992
Longer, curved female tail (c 6–8); longer female stylet (14–16 $\mu\text{m}$ ); smaller V (61–63).
<i>A. jacobi</i> Husain & Khan, 1967
Longer, knobless female stylet (12–14 $\mu\text{m}$ ); smaller female b (3–5); larger spicules (13–15 $\mu\text{m}$ ).
<i>A. kuehni</i> Fischer, 1894 in Thorne, 1961
Longer female body (610–800 $\mu\text{m}$ ), longer female stylet (14 $\mu\text{m}$ ), larger spicules (18 $\mu\text{m}$ ).
<i>A. limberi</i> Steiner, 1936 in Filipjev and Schuurmans Stekhoven, 1941
Longer female body (550–640 $\mu\text{m}$ ), longer female stylet (11 $\mu\text{m}$ ), blunt female tail.
<i>A. longiurus</i> Das, 1960
Longer, knobless female stylet (14 $\mu\text{m}$ ); longer female tail (c 10).
<i>A. marinus</i> Timm & Franklin, 1969
Longer female body (570–860 $\mu\text{m}$ ), longer female tail (c 7–12), smaller V (61–68), larger spicules (24–25 $\mu\text{m}$ ).
<i>A. obtusicaudatus</i> Eroshenko, 1967
Longer female body (570–580 $\mu\text{m}$ ), shorter female tail (c 17–20).
<i>A. obtusus</i> Thorne & Malek, 1968
Stouter female body (a 26), smaller female b (6), blunt female tail.
<i>A. pitoykteini</i> Massey, 1974.
Longer female body (540–740 $\mu\text{m}$ ), shorter female tail (c 23–25), longer female stylet (12 $\mu\text{m}$ ), larger spicules (18.5 $\mu\text{m}$ ).
<i>A. polygraphi</i> Massey, 1974
Longer female body (1,180–1,300 $\mu\text{m}$ ), more slender female body (a 41–48), shorter female tail (c 18–22), longer female stylet (15–16 $\mu\text{m}$ ).
<i>A. spinosus</i> Paesler, 1957
Stouter female body (a 22–24), shorter female tail (c 16–17), larger V (76–77).
<i>A. taraii</i> Edward & Misra, 1969
Longer female stylet (13 $\mu\text{m}$ ), shorter female tail (c 16–19), larger V (78–80), two rows of oocytes present.

nate) category of *Aphelenchoides* species. The status of *A. zerauschanicus* Tulaganov, 1949 is

unresolved; Sanwal (1961), Baranovskaya (1981), and Ebsary (1991) regard it as species inquirenda whereas Hunt (1993) considers it a valid species.

*Seinura onondagensis* n. sp.  
(Figs. 6–8)

*Description*

*Holotype (female in glycerin)*: Length 540; stylet 22; ratios—a 27, b 6.8, c 6.2, c' 8.8, V 69.

*Females (n = 16)*: Length 475–595 (535; SD 34); stylet 17–22 (18; SD 0.7); ratios—a 24–30 (28; SD 1.9), b 6–8 (7.6; SD 0.5), c 7–10 (7.3; SD 0.8), c' 6–9 (7.3; SD 1.3), V 68–73 (71; SD 1.8).

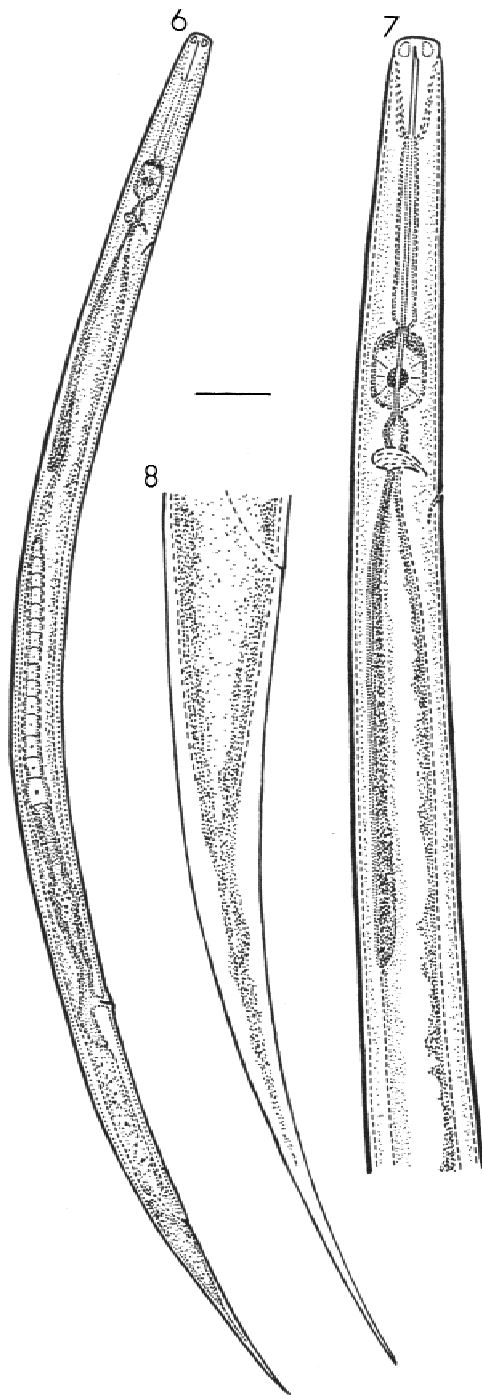
*Females (n = 3)*: Durham, North Carolina population (Slide no. 56-P in USDA Forest Service RMRS Collection). Length 530–650 (573; SD 55); stylet 18–20 (19; SD 0.8); ratios—a 27–31 (28.7; SD 1.7), b 7–8 (7.6; SD 0.4), c 6–7 (6.4; SD 0.2), c' 7–9 (8; SD 0.6), V 68–70 (69; SD 0.6).

Body 475 to 595 long, slightly curved ventrally, tapering posteriorly to filiform terminus. Cuticle with fine transverse striae. Lateral field with four incisures. Head rounded, slightly set off. Stylet 17 to 22 long, without knobs; tip slanted ventrally. Median bulb oblong, anterior one-fourth granular with buildup of secretions from esophageal glands; valves posteriorly situated. Excretory pore below nerve ring. Nerve ring about one-half body width below median bulb. Esophageal gland lobes five to six body widths long. Intestine terminating in rectum and anus. Ovary single, outstretched, at times reaching esophageal gland lobes. Oocytes arranged in single row. Spermatheca round or ovoid, sperm present. Postuterine sac 14 to 38 long. Vulva not protuberant, flap absent. Vagina oblique.

*Male*: Unknown.

*Type host and locality*

From the xylem of dead Scots pine (*Pinus sylvestris* L.), Syracuse University Campus, Onondaga County, New York.



FIGS. 6–8. *Seinura onondagensis* n. sp. 6) Full view of female. 7) Head and neck of female. 8) Female tail. Scale = 30  $\mu\text{m}$  in Fig. 6; 15  $\mu\text{m}$  in Fig. 7; 8  $\mu\text{m}$  in Fig. 8.

#### Bionomics

Nematode predator, bark beetle associate. This species was observed feeding on an *Aphelenchoides* sp. and a *Rhabditis* sp.

#### Type specimens

*Holotype (female)*: Collected 14 July 1990 by T. R. Kaisa in Onondaga County, New York. Slide no. T-534t, deposited in the U.S. Department of Agriculture Nematode Collection (USDANC), Beltsville, Maryland. *Paratypes (females)*: Same data as holotype. Six females on slide no. T-4774p deposited in USDANC, Beltsville, Maryland; seven females in Nematology Department, Rothamsted Experimental Station, Harpenden, Herts., England; and six females in State University of New York College of Environmental Science and Forestry, Program in Environmental and Forest Biology, Department of Entomology, Syracuse, New York.

#### Diagnosis

The female of *Seinura onondagensis* n. sp. averages 535  $\mu\text{m}$  in length with a body that tapers posteriorly to a filiform, amucronate terminus. The cuticle is finely annulated, and there are four incisures in the lateral field. The stylet is 17 to 22  $\mu\text{m}$  long, and without knobs. The intestine terminates in a rectum and anus. Oocytes are arranged in a single row, sperm are present in the spermatheca, and a postuterine sac is present.

#### Relationships

The lack of stylet knobs, presence of a postuterine sac, and presence of a single row of oocytes differentiate *S. onondagensis* n. sp. from 82% of *Seinura* species that are not described solely from males. Table 2 lists these species and characters that differentiate them from the new taxon.

The shorter female body (475–595  $\mu\text{m}$  vs. 620–820  $\mu\text{m}$ ) and shorter female tail (c 7–10 vs. c 4–7) differentiate *S. onondagensis* from *S. elmiraensis* (van der Linde, 1938) J. B. Goodey, 1960; *S. filicaudata* (Christie, 1939) J. B. Goodey, 1960; *S. longicaudata* (Cobb, 1893) J. B. Goodey, 1960; and *S. mali* Fuchs, 1931.

The shorter female body (390–400  $\mu\text{m}$ ), smaller V (60–62 vs. 68–73), shorter stylet (12–13  $\mu\text{m}$  vs. 17–22  $\mu\text{m}$ ), and distinctly set-off head differentiate *S. nodosa* Andr ssy, 1966 from the new species. The same characters also differentiate *S. hechlerae* Chatur-

TABLE 2. *Seinura* spp. that differ from *Seinura onondagensis* n. sp. in the absence of a postuterine sac, presence of stylet knobs, or presence of multiple rows of oocytes.

<i>Seinura</i> species	Characters		
	Postuterine sac absent	Multiple rows of oocytes present	Stylet knobs present
<i>S. arguta</i> Kazachenko, 1980		x	
<i>S. arizonensis</i> Massey, 1974		x	
<i>S. aurangabadensis</i> Surywanshi, 1971		x	
<i>S. celeris</i> Hechler & Taylor, 1965		x	
<i>S. chertkovi</i> Dmitrenko, 1966			x
<i>S. citri</i> (Andrássy, 1957) J. B. Goodey, 1960		x	
<i>S. clavata</i> Bajaj & Bhatti, 1982		x	
<i>S. demani</i> (T. Goodey, 1927) J. B. Goodey, 1960	x		x
<i>S. diversa</i> (Paesler, 1957) J. B. Goodey, 1960	x	x	
<i>S. fuchusi</i> Edward & Misra, 1969			x
<i>S. indica</i> Surywanshi, 1971		x	
<i>S. kherai</i> Singh, 1977	x	x	
<i>S. linfordi</i> (Christie, 1939) J. B. Goodey, 1960			x
<i>S. nagini</i> Husain & Khan, 1965			x
<i>S. oahuensis</i> (Christie, 1939) J. B. Goodey, 1960			x
<i>S. obscura</i> Grewal, Siddiqi & Atkey, 1991		x	
<i>S. oliveirae</i> (Christie, 1939) J. B. Goodey, 1960	x	x	x
<i>S. oostenbrinki</i> Husain & Khan, 1967		x	
<i>S. oxura</i> (Paesler, 1957) J. B. Goodey, 1960	x	x	
<i>S. paraoxyura</i> Mavlyanov, 1976 in Baranovskaya, 1981	x	x	
<i>S. paratenuicaudata</i> Geraert, 1962		x	
<i>S. propora</i> Siddiqi, Husain & Khan, 1967	x	x	
<i>S. prospera</i> Kazachenko, 1980		x	
<i>S. steineri</i> Hechler & Taylor, 1965		x	
<i>S. sutura</i> Massey, 1971		x	
<i>S. tandoni</i> Singh, 1977	x	x	
<i>S. tenuicaudata</i> (de Man, 1895) J. B. Goodey, 1960 in Hechler, 1963		x	
<i>S. tritica</i> Bajaj & Bhatti, 1982		x	
<i>S. variobulbosa</i> Haque, 1966			x
<i>S. winchesi</i> (T. Goodey, 1927) J. B. Goodey, 1960	x	x	

vedi, Singh & Khera, 1979 from the new species. *Seinura hechlerae* is 320 to 470 µm long, with a more anteriorly situated vulva (V 60–66) and a stylet that is 14 to 15 µm long.

*Seinura oswegoensis* (van der Linde, 1938) J. B. Goodey, 1960 resembles the new species in the female body length of 480–546 µm. It differs in having a more posteriorly situated vulva (V 75–76 vs. 68–73); a shorter, stouter tail ( $c'$  3.7 vs.  $c'$  6–9); and a distinctly set-off head.

*Seinura onondagensis* and *S. paynei* Grewal, Siddiqi & Atkey, 1991 are similar in stylet length, but *S. paynei* differs in the set-off head, longer female body (640–840 µm), longer postuterine sac (45–85 µm vs. 14–38 µm), and shorter female tail (39–50 µm vs. 55–90 µm).

#### Remarks

Specimens of *Seinura* sp. from Durham, North Carolina (Massey's collection), are morphologically and morphometrically similar to type specimens from New York. For these reasons, the specimens are designated as *S. onondagensis*.

*Seinura siddiqii* (Bajaj, Bishnoi & Dabur, 1994) n. comb. syn. *Indaphelenchus siddiqii* Bajaj, Bishnoi & Dabur, 1994

#### Diagnosis

The female of *S. siddiqii* is characterized by a short body (346–410 µm), set-off head, three incisures in the lateral field, and a filiform tail. The stylet is 12–13 µm long and without basal knobs. The esophageal gland

lobes are short, about two body widths long (as measured from the drawing). Both rectum and anus are distinct. Oocytes are arranged in two to three rows in the growth zone, and a long postuterine sac (34–56  $\mu\text{m}$ ) is present.

The male of *S. siddiqii* is 333–363  $\mu\text{m}$  long. The body tapers posteriorly to a spicate tail, which bears two pairs of post-anal papillae. Spicules are 13 to 15  $\mu\text{m}$  long with a prominent apex and rostrum. Spermatocytes are arranged in two rows. A bursa and gubernaculum are absent.

#### Relationships

The short male and female bodies (333–363  $\mu\text{m}$  and 346–410  $\mu\text{m}$ , respectively) differentiate *S. siddiqii* from all other species except *S. nagini* Husain & Khan, 1965; *S. nodosa* Andr ssy, 1966; and *S. hechlerae* Chaturvedi, Singh & Khera, 1979. *Seinura nagini* is similar to *S. siddiqii* in female body length (320–400  $\mu\text{m}$ ), stylet length (12–15  $\mu\text{m}$ ), c (6–8), and V (60–64). *Seinura nagini* females differ from *S. siddiqii* females in having stylet knobs, a stylet guide, fewer rows of oocytes (two vs. two to three), smaller b ratio (3–4 vs. 6–9), and number of incisures (four vs. three). *Seinura nagini* males differ in the smaller b ratio (4 vs. 6–10), number of caudal papillae (three pairs vs. two), and longer spicules (18  $\mu\text{m}$  vs. 13–15  $\mu\text{m}$ ). Spermatocytes are arranged in a single row in *S. nagini* vs. two rows in *S. siddiqii*.

*Seinura nodosa* is similar to *S. siddiqii* in female body length (390–400  $\mu\text{m}$ ), stylet length (12–13  $\mu\text{m}$ ), and in the ratios a (23–24) and b (7). *Seinura nodosa* females differ in having a clavate tail terminus, a more anteriorly placed vulva (V 60–62 vs. 62–68), and a shorter postuterine sac (one vs. two to four body widths long).

*Seinura hechlerae* females are similar to *S. siddiqii* females in body length (320–470  $\mu\text{m}$ ), V (60–66), knobless stylet, and a long postuterine sac (three body widths long). *Seinura hechlerae* females differ in having a single row of oocytes vs. two to three in *S.*

*siddiqii*, and having a conical tail vs. filiform in *S. siddiqii*.

#### Remarks

*Indaphelenchus siddiqii* Bajaj, Bishnoi & Dabur, 1994 was described as the only species in this new genus. The genus is remarkably similar to *Seinura* as indicated by the diagnosis: female tail filiform, female and male bodies short ( $\leq 410$   $\mu\text{m}$ ), postuterine sac long, embryonated eggs absent in uterus, esophageal gland lobes short, male tail spicate, and spicules with a prominent apex and rostrum. Consequently, *Indaphelenchus* (Bajaj et al., 1994) is synonymized with *Seinura*, and *S. siddiqii* n. comb. is proposed for *I. siddiqii*.

#### LITERATURE CITED

- Bajaj, H. K., S. P. Bishnoi, and K. R. Dabur. 1994. Description of *Indaphelenchus siddiqii* gen. n., sp. n. (Nematoda: Aphelenchida) from India. *Indian Journal of Nematology* 24:211–213.
- Baranovskaya, I. A. 1981. Plant and soil nematodes (Aphelenchoididae and Seinuridae). Moscow: Nauka.
- Ebsary, B. A. 1991. Catalog of the Order Tylenchida (Nematoda). Ottawa, Canada: Agriculture Canada.
- Fuchs, G. 1931. *Seinura* gen. nov. *Zoologischer Anzeiger* 94:226–228.
- Hooper, D. J. 1970. Handling, fixing, staining, and mounting nematodes. Pp. 39–54 in J. F. Southey, ed. *Laboratory methods for work with plant and soil nematodes*, 5th ed. London: Her Majesty's Stationery Office.
- Hunt, D. J. 1993. Aphelenchida, Longidoridae, Trichodoridae: Their systematics and bionomics. Wallingford, UK: CAB International.
- Massey, C. L. 1971. Nematode associates of several species of *Pissodes* (Coleoptera: Curculionidae) in the United States. *Annals of the Entomological Society of America* 64:162–169.
- Massey, C. L. 1974. Biology and taxonomy of nematode parasites and associates of bark beetles in the United States. *Agricultural Handbook* no. 446. USDA Forest Service, Washington, DC: US Government Printing Office.
- R hm, W. 1957. *Aphelenchoides sinodendroni* n. sp. und *Ektaphelenchus zwolferi* n. sp., zwei neue, mit *Sinodendron cylindricum* L. vergesellschaftete Nematodenarten. *Zoologischer Anzeiger* 158:72–82.
- Sanwal, K. C. 1961. A key to the species of the nematode genus *Aphelenchoides* Fischer, 1894. *Canadian Journal of Zoology* 39:143–148.
- Shahina, F. 1996. A diagnostic compendium of the genus *Aphelenchoides* Fischer, 1894 (Nematoda: Aphelenchida) with some new records of the group from Pakistan. *Pakistan Journal of Nematology* 14:1–32.