Description of *Radopholoides triversus* n. sp. from Japan with a Reference to the Classification of the Family Pratylenchidae (Nematoda: Tylenchida)

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*Radopholoides triversus* n. sp. was detected from the rhizosphere of *Lespedeza cyrtobotrya* in Kumamoto Prefecture, Japan. This species is distinguished from others by having three, rather than four, incisures in the lateral field and by the absence of a spine on the tail terminus. *Radopholoides* is placed in the subfamily Radopholinae of the family Pratylenchidae. Subfamilies Hoplotylinae and Acontylinae are synonymous with Radopholinae, and subfamily Hirschmanniellinae is treated as a junior synonym of Pratylenchidae. The key to subfamilies and genera of Pratylenchidae is given.

The genus *Radopholoides* de Guiran, 1967 was established in the subfamily Pratylenchinae (s. 1.) based on *R. litoralis* de Guiran, 1967 from Madagascar, and now includes two other species from Australia and U.S.S.R. (Colbran, 1970; Nesterov and Kozhokaru, 1980). A species of this genus was also reported from Japan (Gotoh, 1972), and obviously the same nematode was obtained by the author from soil around the root of *Lespedeza cyrtobotrya* Miq. in the Kyushu National Agricultural Experiment Station, Nishigoshi, Kumamoto, Japan. This species is distinguished from others of this genus, and is described under the name of *Radopholoides triversus* n. sp. So far, this genus has been placed in the subfamily Pratylenchinae (de Guiran, 1967; Golden, 1971; Andrassy, 1976; Wouts, 1979), in Radopholinae of Pratylenchidae (Siddiqi, 1971), or in Radopholidae (Fotedar and Handoo, 1979). The systematic position of *Radopholoides* and allied genera including classification of Pratylenchidae is discussed and a revision is proposed in this paper. Nematode specimens in this study were fixed by TAF fixative, and mounted in glycerine after slow dehydration.

*Radopholoides triversus* n. sp.

**Descriptions. Female.** Paratypes: *n* = 25, *L* = 277–559 μm (422 ± 60; mean ± standard deviation), *a* = 19.3–29.3 (23.7 ± 2.9), *b* = 4.4–6.7 (5.8 ± 0.6), *b’* = 2.1–3.6 (2.9 ± 0.3), *c* = 10.7–14.6 (13.2 ± 1.0), *c’* = 1.9–3.2 (2.7 ± 0.3), *l’* = 67.5–72.6 (69.3 ± 1.6), stylet = 14.3–19.5 μm (16.9 ± 1.2), proglottid = 7.2–9.9 μm (8.5 ± 0.7), E. P. = 13.3–21.6% (17.0 ± 1.6). Holotype: *L* = 434 μm, *a* = 24.8, *b* = 5.9, *b’* = 3.4, *c* = 13.3,
$c' = 2.6$, $V = 68.8$, stylet $= 17.5 \mu m$, prorhabdion $= 8.8 \mu m$, E. P. $= 14.3\%$. Body cylindrical, gradually tapering to lip region and bluntly pointed tail end. Lip region subspherical, slightly flattened at tip, continuous from the body contour, usually having three annules though in rare cases two or four. Labial framework strongly sclerotized, arch-shaped. Stylet stout; knobs round and anterior surface flattened, 1.9–2.8 $\mu m$ (2.4±0.2) high, and 3.5–4.8 $\mu m$ (4.2±0.4) across. Dorsal esophageal gland orifice 2.5–4.0 $\mu m$ (3.4±0.4) behind stylet base. The distance from anterior end to esophageal-intestinal valve 56.2–89.1 $\mu m$ (73.1±8.2) and to middle of median blub 40.4–56.8 $\mu m$ (48.9±4.9). Median bulb oval, well developed. Esophageal gland overlapping intestine dorsally. Glandular esophageal basal lobe massive, ending 113.7–206.5 $\mu m$ (144.3±22.5) from lip. Excretory pore 59.7–84.3 $\mu m$ (71.5±7.0) from anterior end, opposite esophageal-intestinal valve. Hemizonid prior to excretory pore, two-body.
annule-long. Himizonion one-annule long, 8.7–24.6 μm (16.8 ± 4.5, n = 21) posterior to hemizonid. Lateral field 4.0–5.7 μm (4.8 ± 0.6, n = 14) wide with three incisures, inner occasionally indistinct. Tail 23.1–41.4 μm (32.1 ± 4.0) long, with 17–26 (21 ± 2.1) annules. Tail terminus bluntly pointed, usually without annulations. Hyaline part of tail 3.5–7.5 μm (6.1 ± 1.2) in length. Phasmids 19.1–28.6 μm (23.1 ± 2.4) from tail end. Reproductive system well developed. Ovary outstretched. Spermatheca round with rod-like sperm. Post uterine vulval branch 8.9–42.9 μm (33.5 ± 6.4) in length, 1.2–3.0 times (2.0 ± 0.4) body width at vulva, occasionally with vestigial ovary.

**Male.** Paratypes: n = 10, L = 358–454 μm (415 ± 26), a = 24.0–32.9 (29.4 ± 3.1), b = 4.8–6.6 (5.9 ± 0.6), b' = 3.0–4.6 (4.1 ± 0.5), c = 10.8–13.9 (12.1 ± 0.9), c' = 2.6–3.7 (3.3 ± 0.4), stylet = 9.5–13.9 μm (11.5 ± 1.6), prohabdion = 5.7–8.2 μm (7.0 ± 0.7), spicules = 13.3–17.7 μm (15.8 ± 1.3), gubernaculum = 8.2–10.1 μm (9.7 ± 0.7), E. P. = 16.6–19.6% (18.0 ± 0.8). Distinct sexual dimorphism present. Body more slender than female. Lip region dome-like, distinctly set off, 6.9–8.2 μm (7.3 ± 0.3) wide, 3.2–4.4 μm (3.9 ± 0.5) high, with three to five, though usually four, annules. Stylet weak, basal part occasionally obscure; knobs round, 1.3–1.9 μm high, and 1.6–2.5 μm wide. Esophagus narrow, and median bulb indistinct. Basal lobe short, ending 88.4–125.1 μm (101.5 ± 12.4) from lip. Excretory pore 68.2–80.2 μm (74.6 ± 3.8) from anterior end. Hemizonid two-annule long, and located at prior to excretory pore; himizonion one-annule long, 9.5–20.9 μm (16.8 ± 3.4, n = 8) behind hemizonid. Lateral field 3.2–4.4 μm (3.6 ± 0.5, n = 9) wide with three incisures. Spicules arch-shaped; gubernaculum long with a small knob-like structure on basal part. Bursa well developed, enveloping tail. Phasmids on bursa, rod-like shaped, 15.8–27.8 μm (22.2 ± 3.2) from posterior end. Testis single, 76.4–113.7 μm (96.0 ± 11.8) long, outstretched. Sperms rod shaped. Tail end pointed.

**Type specimens.** Holotype: female; paratypes: 58 females, 16 males and 1 larva. All specimens are deposited in the Herbarium and Insect Museum of the National Institute of Agricultural Sciences in Yatabe, Ibaraki Prefecture.

**Type host and locality.** Specimens were collected from soil around root of Lespedeza cyrtobotrya Meq. in the Kyushu National Agricultural Experiment Station in Nishigoshi, Kumamoto Prefecture, Japan on May 23, 1980 and June 27, 1980 by N. Minagawa.

**Diagnosis.** Radopholoides trivarius n. sp. is distinguished from other species of this genus by having three incisured rather than the four of other species (de Guiran, 1967; Colbran, 1970), and/or without a spine on the tail terminus (Nesterov and Kozhokaru, 1980). Key to the species is as follows.

1. (2) Tail terminus with a spine; c = 4.5 .......................... R. serjabinii Nesterov and Kozhokaru, 1980
2. (1) Tail terminus without spine; c-value more than 9.
3. (4) Lateral incisures three .......................... R. trivarius n. sp.
4. (3) Lateral incisures four.
5. (6) Female stylet 14–17 μm; tail terminus annulated; male known .......................... R. litoralis de Guiran, 1967
6. (5) Female stylet 12–13 μm; tail terminus smooth; male unknown .......................... R. laevis Colbran, 1970
The classification of Hopololaimidae and its allied families based on gonad morphology has been widely accepted. Within this family, the genus *Radopholoides* was thought to belong to subfamily Pratylenchinae because of the female's single ovary (Golden, 1971; Wouts, 1979), although this character was not appropriate to classify this family. For example, in the subfamily Pratylenchinae, the morphology of the anterior body of the genus *Pratylenchus Filipjev*, 1936 and *Hirschmanniella Luc* and Goodey, 1963 have a close resemblance except for the female gonads which are monodelphic in the former and didelphic in the latter. Similarly, *Radopholus Thorne*, 1949 and *Radopholoides de Guiran*, 1967 can be differentiated by their female reproductive organs, but there are some common characteristics, such as dorsally extending esophageal basal lobes, distinct sexual dimorphism of the anterior body, rod-like sperm and long gubernaculum, which suggest phylogenetically close relationships between the two genera belonging to the same subfamily Radopholinae. Although Andrassy (1976) defined Hopololaimidae as “Phasmids of males flattened, not lying on bursal flaps, . . .,” he placed Radopholinae, the male of which has rod-like phasmids lying on bursal flaps, in this family. Radopholinae is considered to be a subfamily belonging not to family Hopololaimidae but to family Pratylenchidae. The principal characteristics classifying subfamilies of Pratylenchidae are not their female gonad morphology, but the esophagus lobes as pointed out by Siddiqi (1971) and Sher (1973). Seinhorst (1971) showed the similar notion of his study on the structure of esophagus of this group.

Although *Hoplotylus* s’Jacob, 1959 and *Acontylus Meagher*, 1968 are now included in subfamily Hoplotylinae Khan, 1969 and in Acontylinae Foteder and Handoo, 1979 of family Hopololaimidae, respectively (Khan, 1969; Siddiqi, 1971; Foteder and Handoo, 1979), the morphological characters of both genera are analogous to those of Radopholinae in the round lip region, dorsally overlapping esophageal gland lobes, and highly degenerate male adults (s’Jacob, 1959, 1979; Meagher, 1968; Bernard and Niblack, 1982). These two genera also belong to subfamily Radopholinae, and here such subfamilies as Hoplotylinae, Acontylinae, and family Radopholiidae are synonymous with subfamily Radopholinae Allen and Sher, 1967. An amended definition of this subfamily is provided below.

**Subfamily Radopholinae Allen and Sher, 1967**

=Hoplotylinae Khan, 1969 n. syn.

=Acontylinae Foteder and Handoo, 1979 n. syn.

=Radopholidae (Allen and Sher, 1967) Khan and Nanjapa, 1972

**Definition** (Amended). Family Pratylenchidae. Female. Lip region high and subspherical. Esophageal gland well developed, overlapping intestine dorsally or laterally. Median bulb massive. Stylet stout; knobs strong, rounded, anterior surface flattened or pointed. Ovary one or two. Vulva in posterior part or middle of body. Male. Sexual dimorphism present; male adult degenerate to various degrees. Lip region set off from body, usually rounded or dome-like. Esophagus and stylet weakly developed. Spicules arch-shaped; gubernaculum rather long, occasionally with appendix in the basal part and projecting from cloaca. Reproductive system simple, outstretched. Sperms rod-shaped or round. Bursa subterminal. Phasmids usually on bursa, rod-like.
Radopholoides trivorus n. sp. and Pratylenchidae

Remarks: Differential diagnoses of subfamilies and genera of Pratylenchidae are given in the following key.

Key to subfamilies and genera of Pratylenchidae.
1  (2) Adult female saccate, gall forming ........................................ Subfamily Nacobbinae CHITWOOD and CHITWOOD, 1955
Genus Nacobbus THORNE and ALLEN, 1944
2  (1) Adult female vermiform, not gall-forming.
3  (8) Esophageal basal lobes extending ventrally and ventro-laterally over intestine...............Subfamily Pratylenchinae THORNE, 1949
(=Hirschmanniellinae FOTEDAR and HANDOO, 1979 n. syn.)
4  (5) Ovary one; tail terminus smooth or annulated ........................................ Genus Pratylenchus FILIPJEV, 1936
5  (4) Ovary two.
6  (7) Tail elongate-conoid, with a terminal mucronate or peg; bursa in male sub-terminal ............Genus Hirschmanniella LUC and GOODEY, 1963
7  (6) Tail short, cylindrical, without terminal mucro or peg; bursa in male terminal .....................Genus Zygotylenchus SIDDIGI, 1963
8  (3) Esophageal basal lobes extending dorsally and dorso-laterally over intestine ......................................Subfamily Radopholinae ALLEN and SHER, 1967
9  (12) Female phasmids in posterior or middle portion of tail; male not highly degenerate.
10 (11) Ovary one; deirids absent .............Genus Apratylenchoides SHER, 1973
11 (10) Ovary two; deirids present .............Genus Pratylenchoides WINSLOW, 1958
12  (9) Female phasmids in anterior portion of tail; male highly degenerate.
13 (14) Female tail terminus pointed; male gubernaculum small, not projecting from cloaca ...........Genus Hoplotyulus s'JACOB, 1959
14 (13) Female tail terminus bluntly pointed or annulated; male gubernaculum long and modified, projecting from cloaca.
15 (16) Ovary two ........................ Genus Radopholus THORNE, 1949
16 (15) Ovary one.
17 (18) Mature female swollen, tail short (c=23.5-30.5); dorsal esophageal gland orifice more than a half stylet length behind stylet base; sperms round .....................................................Genus Acontyulus MEAGHER, 1968
18 (17) Mature female not swollen, tail long (c=9-14.6); dorsal esophageal gland orifice near the stylet base; sperms rod-shape .............................Genus Radopholoides de GUIRAN, 1967

REFERENCES

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