

## Systematic Study of Korean Stunt Nematodes\*

### 韓國產 萎縮線蟲類의 分類學的 研究

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**ABSTRACT** A taxonomical revision of the Korean species of family Belonolaimidae has been undertaken. Twenty three species belonging to four different genera under two subfamily were reported from Korea hiteroto. Among them *Tylenchorhynchus martini* to *T. annulatus*. *Merlinius acuminatus*, *M. brevidens*, *M. joctus*, *M. lenorus*, *M. nothus* and *M. koreanus* to genus *Geocenamus*. *M. clavicaudatus*, *M. macrurus*, *M. socialis* to genus *Amplimerlinius* and *Quinsulcius capitatus* to *Tylenchorhynchus capitatus* were synonymized respectively. The keys of the each genera were proposed for identification. Distribution, host plants and photograpgs were included.

**KEY WORDS** Stunt nematode, Belonolaimidae, taxonomy, Korea

**초 록** 지금까지 韓國產 Belonolaimidae科는 2亞科 4屬 23種이 발표되었다. 이중에 *Tylenchorhynchus martini*는 *T. annulatus*로 정리 되었고, *Merlinius acuminatus*, *M. brevidens*, *M. joctus*, *M. lenorus*, *M. nothus*, *M. koreanus*는 *Geocenamus*속으로 변경되었으며, *M. clavicaudatus*, *M. macrurus*, *M. socialis*는 *Amplimerlinius* 속으로 변경되었다. *Quinsulcius capitatus*는 *Tylenchorhynchus capitatus*로 정리되었다. 各 屬別 檢索表를 作成하였으며, 種을 同定하는데 容易하도록 寫眞을 첨부하였고, 採集地 및 寄主植物을 記錄했다.

**검 색 어** 萎縮線蟲, Belonolaimidae, 分類, 韓國

The Belonolaimidae are widely distributed group of plant parasitic nematodes. About 275 species were reported hiteroto. Among them *Amplimerlinius clavicaudatus*, *Geocenamus boghiae*, *G. koreanus*, *G. myungsugae*, *G. sobaekensis*, *Triversus kangwonensis* and *T. yugaensis* were firstly reported from Korea. Sice, Allen(1955) presented the first revision of the genus *Tylenchorhynchus*. A revisional work of the korean species of family has been need in morden taxon.

### MATERIALS AND METHODS

Total six hundred soil samples were collected from 180 different host plants all over the country. Nematodes extracted from soil by sieving-Baerman funnel method and centrifugal sugar flotation mehtod. Nematodes were fixed with 80 °C heated FG: 4-1 fixative and transferred to anhydrous glycerin by Seinhorst's rapid glycerin method. Photographs were taken with Olympus

\* This paper was supported by 91 fundamental research fund, Korea Science and Engineering Foundation

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Nomarski differential interference contrast attachment.

### Systematics

Order: *Tylenchida* Thorne, 1949

Suborder: *Tylenchina* Thorne, 1949

Superfamily: *Tylenchoidea* Orley, 1880

I. Family: *Belonolaimidae* Whitehead, 1960

= *Telotylenchidae* Siddiqi, 1960

= *Tylenchorhynchidae* Eliava, 1974

### DIAGNOSIS

Tylenchoidea. Medium to large sized nematodes, with tail cylindroid to conoid, more than twice as long as wide but never elongate fili-form (typically  $c' = 2-5$ ). Phasmid always on posterior half of tail, never enlarged into scutella. Deirids present or absent. Face view as seen with SEM either ancestral (first lip annulus six-sectored) or with lateral sectors regressed and face view evolving towards either a grossly quadrangular shape or a four leaf clover shape. Females typically with two genital branches (except *Trophurus*). Columned uterus with three rows of cells. Males with peloderan caudal alae, rarely lobed or stopping just short of the tail tip. Spicules with or without pronounced velum.

Belonolaimidae are migratory ectoparasites of plant roots. A few species are endoparasitic.

I. 1. Subfamily: *Telotylenchinae* Siddiqi, 1960

= *Tylenchorhynchinae* Eliava, 1964

= *Trophurinae* Paramonov, 1967

= *Tetylenchinae* Siddiqi, 1970

= *Mertiniinae* Siddiqi, 1971

= *Meiodorinae* Siddiqi, 1971

### DIAGNOSIS

Belonolaimidae. Cephalic framework with

weak to medium sclerotization. Stylet 15 to 40  $\mu\text{m}$  long, with cone about as long as shaft. Corpus not enlarged and metacorpal valve of medium development. Labial region continuous or with slight indentation, never bulbous. SEM face view with six lip sectors or with lateral lip sectors regressed. Labial disc lemon shaped or variously fused with lip sectors. Disc and lip sectors sometimes fused together. Sensillae openings often visible on the sub-median lip sectors.

I. 1. 1. Genus: *Tylenchorhynchus* Cobb, 1913

= *Bitylenchus* Filip'ev, 1934

= *Telotylenchus* Siddiqi, 1960

= *Quinisulcius* Siddiqi, 1971

= *Dolichorhynchus* Mulk & Jairajpuri, 1974

= *Trilineellus* Lewis & Golden, 1981

= *Divittus* Jairajpuri, 1984

= *Morasinema* Javed, 1984

= *Tessellus* Jairajpuri & Hunt, 1984

= *Neodolichorhynchus* Jairajpuri & Hunt, 1984

### DIAGNOSIS

Telotylenchinae. Body medium sized. Lateral field with two, three, four, or five lines, sometimes aerolated. Longitudinal ridges sometimes present on body. Tail conoid to subcylindroid, about three times as long as wide ( $c' = 2-4$ ), sometimes with thicker cuticle in the distal portion. SEM face view typically with labial disc fused with first lip annulus, and with lateral sectors regressed. The remaining sub-median sectors give a distinctive quadrangular appearance to the face view. Papillae often present on submedian sectors. Head continuous to slightly offset. Stylet 15-30  $\mu\text{m}$  long, thin to slender, with cone about as long as shaft, sometimes needle-like. Deirids often absent. Male with cau-

dal alae rarely lobed. Spicules with well developed velum.

**Key to Female of *Tylenchorhynchus*  
(Korean species)**

1. Cuticle without longitudinal striae .....2  
Cuticle with 24 longitudinal striae, Stylet 21-23  $\mu\text{m}$  long. Tail conid terminus subhemispherical, smooth ..... *T. claytoni*
2. Labial region offset .....3  
Labial region continuous .....5
3. Tail subhemispherical, terminus annulated, subcylindrical. Tail with 46-48 annuli, Stylet 18-19  $\mu\text{m}$  long.  $C' = 3.2$  ..... *T. dubius*  
Tail terminus smooth .....4
4. Tail conoid terminus bluntly pointed smooth, tail with 32-33 annuli.  
Labial annule 8. Stylet 16-18  $\mu\text{m}$  long.  $C' = 3.0$  ..... *T. capitatus*  
Tail subcylindrical hemispherical, smooth with 22-27 annuli, labial annule 3. Stylet 19  $\mu\text{m}$  long.  $C' = 3.7$  ..... *T. annulatus*
5. Tail shape clavate, terminus annulated. Stylet 18-20  $\mu\text{m}$  long.  $C' = 3.7$  *T. clavicaudatus*  
Tail shape not clavate, terminus smooth ...6
6. Tail shape cylindrical, terminus hemispherical. Stylet 20  $\mu\text{m}$  long.  $C' = 3.6$  .....  
..... *T. crassicaudatus*  
Tail shape conical, terminus bluntly pointed. Stylet 17-18  $\mu\text{m}$  long.  $C' = 2.4-2.5$  .....  
..... *T. mashhoodi*

*Tylenchorhynchus annulatus* (Cassidy, 1930)  
Golden, 1971  
= *Tylenchorhynchus martini* Fielding, 1956

**Host plants and localities:**

*Brassica campestris* subsp. *napus* var. *pekinensis* MAKINO (Chollabuk-do: Iri-shi,

Kyönggi-do: Seoul, P'yöungt'aek-gun, Kimp'o-gun, Asan-gun, Kyöngsangbuk-do: Yöngch'ön-shi)\*

*Hordeum vulgare* L. (Chollabuk-do: Iri-shi, Kyönggi-do: Seoul, P'yöungt'aek-gun, Kimp'o-gun, Asan-gun, Kyöngsangbuk-do: Yöngch'ön-shi)

*Oryza sativa* L. (Chollabuk-do: Iri-shi, Kyönggi-do: Seoul, P'yöungt'aek-gun, Kimp'o-gun, Asan-gun, Kyöngsangbuk-do: Yöngch'ön-shi)

\* Source: Park, 1963

*Tylenchorhynchus capitatus* Allen, 1955 (Fig. 1. A-D)

= *Quinisulcius capitatus* (Allen, 1955)  
Siddiqi, 1971

= *T. acti* Hopper, 1959

= *T. nilgiriensis* Seshadri, Muthukrisnan & Shunmugan, 1967

= *T. himalayae* Mahajan, 1974

= *Q. himalay* Mahajan, 1974

**Host plant and Localities:**

*Capsicum annum* L. (Kyöngsangnam-do: Miryang-up Sammun-dong)\*

\*Source: Choi, 1984

*Tylenchorhynchus clavicaudatus* Seinhorst, 1963 (Fig. 2. A-E)

= *Bitylenchus clavicaudatus* (Seinhorst, 1963) Siddiqi, 1986

**Host plants and Localities:**

*Oryza sativa* L. (Kyönggi-do: Ich'ön-gun Pubal-myön. Yangju-gun, Hoech'ön-üp, Wondang-üp, Pyökche-üp. Kanghwa-gun Sönwon-myön, purün-myön, Kanghwa-ü p. Hwasöng-gun Yanggam-myön, P'yöngt'aek-gun ch'öngbuk-myön, Kangwon-do:

Hoengsǒng-gun Hoegsǒng-ŭp)\*

\*Source: Choi, 1989

*Tylenchorhynchus claytoni* Steiner, 1937 (Fig. 1. E-I)

= *Tessellus claytoni* (Steiner, 1937)  
Jairajpuri & Hunt, 1984

**Host plants and localities:**

*Abeliophyllum distichum* Nak. (Chǒllabuk-do: Wanju-gun Isǒ-myǒn Ŭnkyo-ri)

*Abies holophylla* Max (Kangwon-do: Ch'unch'ǒn-shi Sanong-dong)

*Abies koreana* Wilson (Kangwon-do: Ch'unch'ǒn-shi Sanong-dong, Kyǒngsangnam-do: Chinju-shi Kajwa-dong)

*Abies nephrolepis* Max. (Kyǒngsangnam-do: Chinju-shi Kajwa-dong)

*Acer buergerianum* Miq. (Ch'ungchǒngnam-do: Yǒn-gi-gun Kŭmnam-myǒn Yongpo-ri)

*Acer ginnala* Maxim (Kyǒnggi-do: Osan-shi Such'ǒng-dong, Woraksan)

*Acer mono* Max. (Kyǒngsangnam-do: Chinju-shi Kajwa-dong)

*Acer negundo* L. (Ch'ungchǒngbuk-do: Ch'ǒngju-shi Yongdam-dong)

*Acer palamtum* var. *palmtum* Rehd (Ch'ungchǒngnam-do: Yǒn-gi-gun Kŭmnam-myǒn Yongpo-ri)

*Acer palmtum* var. *amoenum* cv. *sanguineum* Nak. (Kangwon-do: Ch'unch'ǒn-shi Sanong-dong)

*Acer palmtum* Thumb (Kyǒngsangbuk-do: Kimchǒn-shi Pubok-dong)

*Acer saccharinum* L. (Ch'ungchǒngbuk-do: Ch'ǒngju-shi Yongdam-dong)

*Acer triflorum* Kom. (Kangwon-do: Ch'unch'ǒn-shi Sanong-dong)

*Ailanthus altissima* Swingle (Chǒllanam-

do: Naju-gun Sanpo-myǒn Sanche-ri)

*Alnus hirsuta* Rupr (Kyǒnggi-do: Osan-shi Such'ǒng-dong)

*Aphananthus aspera* Planchon (Chǒllabuk-do: Wanju-gun Isǒ-myǒn Ŭnkyo-ri)

*Asimina triloba* Dun. (Chǒllabuk-do: Wanju-gun Isǒ-myǒn Ŭnkyo-ri)

*Berchemia berchemiaefolia* Koidez. (Ch'ungchǒngbuk-do: Ch'ǒngju-shi Yongdam-dong)

*Betula costata* Trautv. (Kyǒngsangnam-do: Chinju-shi Kajwa-dong)

*Betula platyphylla* var. *japonica* Hara (Ch'ungchǒngnam-do: Yǒn-gi-gun Kŭmnam-myǒn Yongpo-ri, Kangwon-do: Ch'unch'ǒn-shi Sanong-dong)

*Buxus microphylla* var. *koreana* Nak. (Kangwon-do: Ch'unch'ǒn-shi Sanong-dong)

*Camellia japonica* L. (Kyǒngsangnam-do: Chinju-shi Kajwa-dong)

*Campsis grandiflora* K. Schum (Ch'ungchǒngbuk-do: Ch'ǒngju-shi Yongdam-dong)

*Caragana chamlagu* Lam. (Chǒllanam-do: Naju-gun Sanpo-myǒn Sanche-ri)

*Carpinus laxiflora* Blume (Ch'ungchǒngbuk-do: Ch'ǒngju-shi Yongdam-dong)

*Castanea crenata* Sieb et Zucc (Ch'ungchǒngnam-do: Yǒn-gi-gun, Kŭmnam-myǒn Yongpo-ri, Kyǒngsangbuk-do: Kyǒngju-shi Paeban-dong, Kyǒngsangnam-do: Chinju-shi Kajwa-dong.\* Kangwon-do: Ch'unch'ǒn-shi Sanong-dong)

*Catalpa bignonioides* Walt. (Kyǒngsangbuk-do: Kyǒngju-shi Paeban-dong)

*Cedrela sinensis* Juss. (Ch'ungchǒngnam-do: Yǒn-gi-gun Kŭnam-myǒn Yongpo-ri)

*Celtis sinensis* Person (Kyǒngsangbuk-do: Kyǒngju-shi Paeban-dong, Chǒllabuk-do: Wanju-gun Isǒ-myǒn ŭnkyo-ri)

- Cercidiphyllum japonicum* Sieb et Zucc (Kyönggi-do Osan-shi Such'öng-dong)
- Cerris chinensis* Bunge. (Kangwon-do: Ch'unch'ön-shi Sanong-dong)
- Chaenomeles sinensis* Koehne (Ch'ungchöngnam-do: Yönggi-gun Kūmnam-myöñ Yongpo-ri. Kyöngsangnam-do: Chinju-shi Kajwa-dong)
- Chamaecyparis pisifera* Endle. (Ch'ungchöngbuk-do: Ch'öngju-shi Yongdam-dong. Chöllanam-do: Naju-gun Sanpo-myöñ Sanche-ri)
- Chionanthus retusa* Lindley et Paxton (Kyöngsangbuk-do: Kyöngju-shi Paeban-dong. Chöllabuk-do: Wanju-gun Isö-myöñ Ünkyo-ri)
- Cornus affinalis* S. et Z. (Ch'ungchöngbuk-do: Ch'öngju-shi Yongdam-dong Kangwon-do: Ch'unch'ön-shi Sanong-dong)
- Cornus controversa* Hemsl (Kangwon-do: Ch'unch'ön-shi Sanong-dong)
- Cornus kousa* Buerg. (Ch'ungchöngbuk-do: Ch'öngju-shi Yongdam-dong Kangwon-do: Ch'unch'ön-shi Sanong-dong)
- Corus coreana* Wanger. (Chöllabuk-do: Wanju-gun Isö-myöñ Ünkyo-ri)
- Corylus sieboldiana* var. *mandsurica* Schn. (Ch'ungchöngnam-do: Yönggi-gun Kūmnam-myöñ Yongpo-ri)
- Eunymus oxyphyllus* Mig (Ch'ungchöngbuk-do: Ch'öngju-shi Yongdam-dong)
- Firmiana simplex* Wight (Kyöngsangnam-do: Masan-shi Usan-dong)\*
- Forsythia koreana* Nak. (Ch'ungchöngbuk-do: Ch'öngju-shi Yongdam-dong)
- Fragaria ananassa* Duchesne (Kyöngsangnam-do: Kimhae-üp Samjöng-dong. Kimhae-gun Karak-myöñ Taesa-ri)
- Fraxinus mandshuriana* Rupr. (Kangwon-do: Ch'unch'ön-shi Sanong-dong)
- Fraxinus rhynchophylla* Hance (Chöllabuk-do: Wanju-gun Isö-myöñ Ünkyo-ri)
- Fraxinus sieboldiana* Blume (Kyöngsangnam-do: Chinju-shi Kajwa-dong)
- Ginkgo biloba* L. (Kangwon-do: Ch'unch'ön-shi Sanong-dong, Pomunsa)
- Glycine soja* S. et Z. (Ch'ungch'öngbuk-do: Ch'öngwon-gun Munüi-myöñ P'umgok-ri. Okch'ön-gun Ch'öngsöng-myöñ, Changyöñ-ri. Yöngdong-gun Shimch'ön-myöñ Kodang-ri. Kyöngsangbuk-do: Sönsan-gun Sönsan-üp Kyodong. Söngju-gun chochön-myöñ Yongbong-dong. Sangju-gun Naktong-myöñ Sangch'on-dong. Yöngyang-gun Yöngyang-üp Kamch'ön-dong. Kyöngsang-gun Kyöngsang-üp Taep'yöng-dong)
- Hordeum vulgare* (Kyöngsangnam-do: Pusan-shi)\*
- Juglans mandshurica* Max. (Chöllabuk-do: Wanju-gun Isö-myöñ Ünkyo-ri)
- Juglans sinensis* Dode (Ch'ungchöngnam-do: Yönggi-gun Kūnam-myöñ Yongpo-ri. Kyöngsangbuk-do: Kyöngju-shi Paeban-dong. Kyöngsangnam-do: Chinju-shi. Ch'ungchöngbuk-do: Ch'öngju-shi Yongdam-dong. Chöllabuk-do: Wanju-gun Isö-myöñ Ünkyo-ri.)
- Juniperus chinensis* L. (Ch'ungchöngnam-do: Yönggi-gun Kūmnam-myöñ Yongpo-ri. Kyöngsangbuk-do: Yöngju-shi.)
- Koelreuteria paniculata* Laxm. (Kyöngsangnam-do: Chinju-shi Kajwa-dong)
- Larix gmelini* var. *principis-rupprechtii* Pilger (Kyönggi-do: Osan-shi Such'öng-dong)
- Lespedeza angustifoloides* T. Lee (Chöllanam-do: Naju-gun Sanpo-myöñ Sanche-ri)
- Lindera erythrocarpa* Makino (Kyöngsangbuk-do: Kyöngju-shi Paeban-dong)
- Liquidambar styraciflua* L. (Chöllabuk-do:

- Wanju-gun Isō-myōn Ŭnkyo-ri)
- Liriodendron tulipifera* L. (Ch'ungchōngnam-do: Yōngi-gun Kūmnam-myōn Yongpo-ri. Ch'ungchōngbuk-do: Ch'ōngju-shi Yongdam-dong)
- Liriope platyphylla* (Ch'ungch'ōngnam-do: Ch'ōngyang-gun Namyang-myōn Taebong-ri)
- Malus pumila* Mill (Kyōngsangbuk-do: Kunwi-gun Hyoryōng-myōn Sōng 1 dong, Uisōng-gun Tanch'on-myōn Sech'on 2 dong, Andong-gun Ilchik-myōn Unsan-dong, Mangho-dong, Yōngch'ōn-gun Hwabuk-myōn Kūmho 1 dong\* Puga-myōn Im'p'o 2 dong, Hwasan-myōn Maesan-dong, Kūmho-ūp Tōksōng-dong, Ch'ilgok-gun Tongmyōng-myōn Namwon-dong, Yangmok-myōn Poksōng 3 dong, Ch'ilgok-myōn Tongch'ōn-dong, Hwakchōng-dong. Kyōngsan-gun Hayang-ūp Kūmhak-dong\*, Tongsō 3 dong, Anshim-ūp Yulha-dong)
- Magnolia obovata* Thunb. (Kyōngsangnam-do: Chinju-shi Kajwa-dong)
- Mangolis kobus* Dc. (Ch'ungchōngnam-do: Yōngi-gun Kūmnam-myōn Yongpo-ri)
- Melia azedarach* var. *japonica* Makino (Kyōngsangnam-do: Chinju-shi Kajwa-dong, Kyōngsangbuk-do: Yōngch'ōn-gun Chayang-myōn Youngsan-dong)
- Metasequoia glyptostroboides* Hu et Cheng (Kangwon-do: Ch'unch'ōn-shi Sanong-dong)
- Nicotiana tabacum* L. (Kyōsangbuk-do: Chinbo-myōn, Yōngyang-gun, Yōngch'ōn-gun, Kyōngsangnam-do: Kōchang, Chinju-shi, Kyōngsangbuk-do: Sangju-gun, Andong-gun)
- Osmanthus heterophyllus* P. S. Green (Kyōngsangnam-do: Chinju-shi Kajwa-dong)
- Phyllostachys bambusoides* S. et Z. (Kyōngsangnam-do: Chinju-shi)
- Picea abies* (L.) Karst. (Ch'ungchōngnam-do: Yōngi-gun Kūmnam-myōn Yongpo-ri)
- Picer koraiensis* Nak. (Kyōnggi-do: Osan-shi Such'ōng-dong, Kyōngsangnam-do: Chinju-shi Kajwa-dong)
- Pinus densiflora* Sieb et Zucc (Chōllabuk-do: Wanju-gun Isō-myōn Ŭnkyo-ri. Ch'ungchōngnam-do: Donghaksa)
- Pinus koraiensis* Sieb et Zucc (Kyōngsangbuk-do: Kyōngju-shi paeban-dong)
- Pinus mugo* Turra (Kangwon-do: Ch'unch'ōn-shi Sanong-dong)
- Pinus rigida* Mill (Kyōngsangnam-do: Chinju-shi Kajwa-dong)
- Pinus rigitaeda* L. (Kyōngsangnam-do: Chinju-shi Kajwa-dong)
- Pinus thunbergii* Parl (Kyōngsangnam-do: Chinju-shi Kajwa-dong)
- Platanus orientalis* L. (Ch'ungchōngnam-do: Yōngi-gun Kūmnam-myōn Yongpo-ri, Kangwon-do: Ch'unch'ōn-shi Sanong-dong)
- Populus alba* L. (Kyōngsangnam-do: Kōchang-gun Chusang-myōn Top'yōng-ri\* Kyōngsangbuk-do: P'ohang-shi Chukdo-dong)
- Populus tomentiglandulosa* T. Loe (Chōllanam-do: Naju-gun Sanpo-myōn Sanche-ri)
- Prunus persica* Batsch (Kyōngsangnam-do: Chinju-shi Kajwa-dong)
- Prunus serrulata* var. *spontanea* Wilson (Chōllabuk-do: Chōngju-shi Naejangsa, Kyōngsangnam-do: Kimje-gun Paekku-myōn Panwol-ri)
- Prunus yedoensis* Matsum (Kyōngsangnam-do: Chinju-shi Kajwa-dong)
- Pterocarya stenoptera* Dc. (Kyōngsangbuk-

- do: Kyōngju-shi Paeban-dong)
- Quercus acuta* Thumb (Kyōngsangnam-do: Chinju-shi Kajwa-dong)
- Quercus glanca* Thumb Kyōngsangnam-do: Chinju-shi Kajwa-dong)
- Quercus variabilis* Bl. (Kyōnggi-do: Osan-shi Such'ōng-dong)
- Salix babylonica* L. (Ch'ungchōngbuk-do: Woraksan)
- Schizandra chinensis* Baillon (Kyōngsangbuk-do: Ponghwa-gun Pōpchon-myōn P'ungjōng-ri)
- Setaria italica* (L.) Beauv. (Kyōngsangbuk-do: Talsōng-gun)\*
- Sophora japonica* L. (Ch'ungchōngbuk-do: Ch'ōngju-shi Yongdam-dong. Chōllanam-do: Naju-gun Sanpo-myōn Sanche-ri. Chōllabuk-do: Wanju-gun Isō-myōn Ŭnkyo-ri)
- Sorbaria sorbifolia* var. *stellipila* Max. (Chōllanam-do: Naju-gun Sanpo-myōn Sanche-ri)
- Sorbus alnifolia* Koch (Kyōnggi-do: Osan-shi Such'ōng-dong)
- Sorbus commixta* Hedl. (Kangwon-do: Ch'unch'ōn-shi Sanong-dong)
- Styrax japonica* Sieb et Zucc (Kyōngsangbuk-do: Kyōngju-shi Paeban-dong)
- Styrax obassia* S. et Z. (Kangwon-do: Ch'unch'ōn-shi Sanong-dong)
- Symplocos chinensis* for. *pilosa* Ohwi (Kyōnggi-do: Osan-shi Such'ōng-dong)
- Taxus cuspidata* Sieb et Zucc (Kyōnggi-do: Osan-shi Such'ōng-dong. Kyōngsangbuk-do: Taegu-shi San-gyōk-dong)
- Thuja occidentalis* L. (Kyōnggi-do: Osan-shi Such'ōng-dong)
- Torreya nucifera* S. et Z. (Kyōngsangnam-do: Chinju-shi Kajwa-dong)
- Ulmus davidiana* var. *japonica* Nak. (Chōllabuk-do: Wanju-gun Isō-myōn Ŭnkyo-ri)
- Vitis amurensis* for. *glabrescens* Hara (Kangwon-do: Ch'unch'ōn-shi Sanong-dong)
- Zanthoxylum ailanthoides* S. et Z. (Kyōngsangnam-do: Chinju-shi Kajwa-dong)
- Zelkova serrata* (Ch'ungchōngnam-do: Yōnggi-gun Kūmnam-myōn Yongpo-ri. Kyōngsangbuk-do: Kyōngju-shi Paeban-dong, Yōngch'ōn-gun Chayang-myōn Yōngsang-dong. Kangwon-do: Ch'unch'ōn-shi Sanong-dong)
- Zizyphus jujuba* Mill (Chōllabuk-do: Wanju-gun Isō-myōn Ŭnkyo-ri Ch'ungchōngbuk-do: Ch'ōngju-shi Kaeshin-dong. Kangwon-do: Ch'unch'ōn-shi Sanong-dong)
- \*Source: Choi, 1972
- Tylenchorhynchus crassicaudatus* Williams, 1960  
= *Paratrophurus crassicaudatus* (Williams, 1960) Andrassy, 1973
- Host plants and Localities:  
*Glycine soja* S. et Z. (Kyōngsangnam-do: Samch'ōnp'-shi)  
*Panax ginseng* Meyer (Kyōnggi-do: Kanghwa-gun)\*  
\*Source: Choi & Geraert, 1975
- Tylenchorhynchus dubius* (Bütschli, 1873) Filip'ev, 1936 (Fig. 1. J-L)  
= *Bitylenchus dubius* (Bütschli, 1873) Siddiqi, 1986
- Host plants and Localities:  
*Acer ginnala* Maxim (Kyōngsangnam-do: Chirisan Paekmu-dong)  
*Allium sativum* for. *pekinensis* Makino (Ky

- ongsangnam-do: Kosong-gun)
- Alnus hirsuta* (Ch'ungchongbuk-do: Ch'ongju-shi Yongdam-dong)
- Angelica dahurica* (Ch'ungchongnam-do: Ch'ongyang-gun Taech'i-myon T'angjong-ri)
- Eucommia ulmoides* (Kyongsangnam-do: Sanch'ong-up Mogori, Sanch'ong-gun Saengbirayang-myon Kakye-ri)\*
- Fraxinus rhynchophylla* Hance (Kyongsangbuk-do: Kyongju-shi Paeban-dong)
- Glycine soja* S. et Z. (Ch'ungchongbuk-do: Boun-gun Maro-myon Immok-ri. Kyongsangnam-do: Kumnung-gun Nongso-myon Wolmyong-dong. Kyongsangbuk-do: P'ohang-shi)
- Horeum vulgare* var. *hexastichon* Aschers. (Kyongsangbuk-do: P'ohang-shi)
- Malus pumila* Mill (Kyongsangbuk-do: Kunwi-gun Hyoryong-myon Chunggudong. Andong-gun Namhu-myon Susang 1,2-dong)
- Paulownia coreana* (Chollanam-do: Changsong-gun Hwangnyong-myon Okchong-ri)
- Phellodendron amurense* Rupr. (Chollabuk-do: Wanju-gun Isdo-myon Unkyo-ri)
- Populus euramericana* (Kyongsangbuk-do: Kyongju-shi Paeban-dong)
- Prunus serrulata* var. *spontanea* Wilson (Kyongsangbuk-do: Pulguksa)
- Quercus acutissima* (Chollanam-do: Changsong-gun Hwangryong-myon Okchong-ri. Chollabuk-do: Wanju-gun Soyang-myon Hwangun-ri)
- Salix koreansis* (Chollabuk-do: Namwongun Taesa-myon Komsong-ri)
- Schizandra chinensis* (Kyongsangnam-do: Koshang-gun Puksang-myon Sojong-ri)
- Solanum tuberosum* L. (Ch'ungchongbuk-do: Chongju-shi)
- Taxus cuspidata* S. et Z. (Kyongsangbuk-do: Sobaeksan)
- \*Source: Choi & Geraert, 1975
- Tylenchorhynchus mashhoodi* Siddiqi & Basir, 1959
- Host plants and Localities:
- Panax ginseng* Meyer (Kyonggi-do: Kanghwa-gun Hajom-myon Changchong-ri. Ch'ungchongnam-do: Sosan-gun Sosan-up Sdklim-ri)\*
- \*Source: Choi, 1976
- Tylenchorhynchus nudus* Allen, 1955 (Fig. 2. F-K)
- Host plants and Localities:
- Acer negundo* L. (Ch'ungchongbuk-do: Ch'ongju-shi Yongdam-dong)
- Ailanthus altissima* (Kyongsangbuk-do: Kyongsan-gun Amnyang-myon)
- Albizia julibrissin* Duraz. (Kyonggi-do: Osan-shi Such'ong-dong)
- Angelica gigas* Nakai (Kyongsangbuk-do: Andong-gun Sohu-myon)
- Betula platyphylla* Sukatshev (Kyonggi-do: Osan-shi Such'ong-dong)
- Cercidiphyllum japonicum* Sieb et Zucc (Kyonggi-do: Osan-shi Such'ong-dong)
- Cirmus officinalis* sieb et Zucc (Kyonggi-do: Osan-shi Such'ong-dong. Kyongsangbuk-do: Uisong-gun sagok-myon)
- Diospyros kaki* Thunb (Kyongsangbuk-do: Taegu-shi. Uisong-gun. Kimch'on-shi Yangch'on-dong. Ch'ongdo-gun)\*
- Euphorbia pekinensis* Rupr. (Kyongsangbuk-do: Sosan-gun Togye-myon Tongсандong. Sangju-gun Naktong-myon Sangch'on-dong. Kyongsangnam-do: Sach'on-gun)\*



- Ipomoea batatas* Lam. (Kyöngsangnam-do: Samch'önpö-shi. Cheju-do: Sanpangsang)
- Maackia amurensis* Rupr. et Max. (Kyönggi-do: Osan-shi Such'öng-dong. Ch'ungchöngbuk-do: Ch'öngju-shi Yongdam-dong)
- Malus pumila* Mill (Kyöngsangbuk-do: Uisöng-gun Pian-myön Yongnam-dong\*, Pongyang-myön, Towon-dong. Yöngch'öng-gun Hwanam-myön Samch'ang-dong, Pukan-myön Imp'o-dong. Kyongsan-gun Kyongsan-üp Taejöng-dong, Taegu-shi Pangch'on-dong)\*
- Nicotiana tabacum* L. (Kyöngsangbuk-do: Uisöng-gun, Ponghwa-gun, Yöngdök-gun, Mungyöng-gun, Ponghwa-gun, Kimch'önsi)
- Oryza sativa* L. (Kyöngsangbuk-do: Kunwi-gun Kunwi-üp. Yöngdök-gun Chip'um-myön. Chöllanam-do: Kohüng-gun Namyang-myön: Ch'ungchöngnam-do: Tangjin-gun Songak-myön, Chöngmi-myön. Puyö-gun Naesan-myön. Ch'ungchöngbuk-do: Koesan-gun Toan-myön, Changyön-myön. Chungwon-gun Ch'ungju-shi. Poun-gun Naebuk-myön Kyönggi-do: P'yöngt'ae-gun Chungbuk-myön. Hwasöng-gun Yanggam-myön. Yongin-gun Yongin-üp. Kwangju-gun Ch'owol-myön. Yangju-gun Hoech'ön-üp, Changhüng-myön, Koyang-gun Pyökche-üp, Wondang-üp, Chido-üp. Kimp'o-gun Wolgot-myön Yanch'on, Kanghwa-gun Kanghwa-üp, Sönwon-myön, Pulün-myön. Cheju-do: Pukcheju-gun Aewol-üp)
- Picrasma quassioides* Benn (Ch'ungchöngbuk-do: Ch'öngju-shi Yongdam-dong)
- Prunus padus* L. (Kyönggi-do: Osan-shi Such'öng-dong)
- Rhamnus davurica* Pall. (Kyönggi-do: Osan-shi Such'öng-dong)
- Rhamnus yoshinoi* Makino (Chöllabuk-do: Wanju-gun Isö-myön Ünkyo-ri)
- Quercus rubra* L. (Ch'ungchöngbuk-do: Ch'öngju-shi Yongdam-dong)
- Quercus variabilis* Blume (Kyönggi-do: Osan-shi Such'öng-dong)
- Sesamum indicum* L. (Kyöngsangbuk-do: Ch'öngsong-gun)\*
- Setaria italica* (L.) Beauv. (Kyöngsangbuk-do: Yöngyang-gun)\*
- Solanum tuberosum* L. (Kyöngsangbuk-do: Taegu-shi Choya-dong)
- Stylax japonica* Sieb et Zucc (Kyönggi-do: Osan-shi Such'öng-dong)
- Triticum aestivum* L. (Kyöngsangbuk-do: Kimch'önsi)
- Ulmus parvifolia* var. *coreana* Uyeki (Kyönggi-do: Osan-shi Such'öng-dong)
- Zelkova serrata* Makino (Kyöngsangbuk-do: Yöngch'öng-gun Chayang-myön Yongsan-dong. Ch'ungchöngbuk-do: Ch'öngju-shi Yongdam-dong)

\*Source: Choi, 1972

1. 1. 2. Genus: *Triversus* Sher, 1974

= *Meiodorus* Siddiqi, 1974

= *Mulveyotus* Anderson & Ebsary, 1982

#### DIAGNOSIS

Telotylenchinae. Body about 1 mm long. Lip region low, flattened. SEM face view with labial disc and first labial annulus fused together; rounded amphid apertures often conspicuous. Stylet 11-25  $\mu$ m long, robust or with needle-like cone. Labial framework thin weakly sclerotized, with wide basal ring. Metacorporal bulb fusiform. Lateral field with four or three lines. Female tail conoid, pointed, medium to long ( $C' = 3-8$ ). Deirids absent. Male caudal alae sometimes trilobed.

Key to Female of *Triversus* (Korean species)

1. Body length 535-680  $\mu\text{m}$ , stylet 18-21.5  $\mu\text{m}$ . Tail slightly sloping in anterior two thirds, almost subcylindrical in posterior third ..... *T. kangwonensis*
2. Body length 780-935  $\mu\text{m}$ , stylet 17-19  $\mu\text{m}$ . conical in anterior three quarters and sbucylindrical towards the end ..... *T. yugaensis*

*Triversus kangwonensis* Choi & Geraert, 1990 (강원세죽위축선충 : 신칭) (Fig.3. G-L)

Host plant and Type Localities:

*Oryza sativa* L. (Kangwon-do: Kosong-gun S ðkch'o-shi, Myongju-gun Kangdong-myð n)\*

\*Source: Geraert, Choi & Choi 1990

*Triversus yugaensis* Choi & Geraert, 1990(유 가세죽위축선충 : 신칭) (Fig.3. A-F)

Host plant and Type Locality:

*Oryza sativa* L. (Kyongsangbuk-do: Talsong -gun Yuge-myðn)\*

\*Source: Geraert, Choi & Choi 1990

I. 1. 3. Genus: *Amplimerlinius* Siddiqi, 1976

DIAGNOSIS

Telotylenchinae. Body medium to large (1 to 2 mm). Labial region continuous with body contour. SEM face view similar to that of *Nagelus* except that it is more rounded. Lateral field with six lines over most of body. Deirids present, in the six line area of lateral field. Tail cylindrical with a broadly rounded terminus, with thickened cuticle at distal extremity. Labial framework and stylet robust. Oesophageal

glands sometimes overlapping the beginning of the intestine for a short distance. Male spicules without well developed velum, blunt ended. Gubernaculum not protruding from cloaca.

Key to Female of *Amplimerlinius* (Korean species)

1. Tail elongate, subcylindrical with clavate terminus annulated. Stylet 24-26  $\mu\text{m}$  long, labial annule 5-6 .....2 Tail cylindrical, hemispherical, terminus annulated. Stylet 30-35  $\mu\text{m}$  long, labial annule 8-10.....*A. macrurus*
2. C' = 2.0-2.8. Tail with 35-39 annuli ..... *A. socialis*  
C' = 3.2-4.0. Tail with 47-55 annuli ..... *A. clavicaudatus*

*Amplimerlinius clavicaudatus*(Choi & Geraert, 1975) Siddiqi, 1976

(Fig. 4. F-K)

= *Merlinius clavicaudatus* Choi & Geraert, 1975

Host plant and Localities:

*Oryza sativa* L. (Kangwon-do: Ch'ðrwon-gun Kalmal-ðp Munhye-ri)\*

\*Source: Choi & Geraert, 1975

*Amplimerlinus macrurus*(Goodey, 1932)

Siddiqi, 1976

= *Tylenchorhynchus macrurus* Goodey, 1932

= *Aphelenchus dubius* Steiner, 1914

Host plants and Localities:

*Citrullus vulgaris* Schrad. (Kyonggi-do: Suwon-shi, Seoul-shi)\*

*Fragaria ananassa* Duchesne (Kyonggi-do: Suwon-shi, Seoul-shi)

*Hordeum vulgare* L. (Kyōnggi-do: Suwon-shi, Seoul-shi)

\*Source: Park, 1963

*Amplimerlinius socialis* (Andrassy, 1962)

Siddiqi, 1976 (Fig. 4. A-E)

= *Tylenchorhynchus socialis* Andrassy, 1962

Host plants and Localities:

*Abies holophylla* Max (Kyōngsangnam-do: Haeinsa)\*

*Pinus koraiensis* S. et Z. (Kyōngsangnam-do: Chinju-shi Kangnam-dong, Haeinsa)

*Pinus rigida* Mill (Kangwon-do: Ch'ōrwongun Kalmal-ūp Munhye-ri)

\*Source: Choi & Geraert, 1975

I. 2. Subfamily: *Belonolaiminae* Whithead, 1960

DIAGNOSIS

Belonolaimidae. Cephalic framework often very weak, sometimes heavily sclerotized. Stylet slender, elongate, usually 60–150  $\mu\text{m}$  long, with cone longer than shaft ( $m=60-80$ ). In forms with elongate stylets, procorpus enlarged and separated from the median bulb by a constriction. Median bulb strong, muscular, with large valve. Labial region often offset, bulbous in lateral view, sometimes continuous with body contour. SEM face view generally with a well marked, round, labial disc and a first lip annulus with submedian sectors well marked and lateral sectors regressed, almost absent. Rarely, lateral sectors only slightly regressed. In one genus, *Morulaimus*, labial disc and lateral sectors are fused into a lemon-shaped structure. Female tail long, generally cylindroid to broadly rounded end, sometimes more conoid. Deirids

always absent.

Belonolaiminae differs from Telotylenchinae by its biology, with a tendency towards an elongation of the stylet to reach inside the roots. SEM face views, with well marked round labial disc are characteristic for most genera.

I. 2. 1. Genus: *Geocenamus* Thorne & Malek, 1968

= *Mertinius* Siddiqi, 1970

= *Scutylenchus* Jairajpuri, 1971

= *Hexadorus* Ivanova & Shagalina, 1983

= *Pathotylenchus* Eroshenko & Volkova, 1987

DIAGNOSIS

Small to medium sized 0.5 mm seldom over 1.5 mm. Lateral field with six incisures, although additional lines may be present. Longitudinal body striation present or absent. Derides present or absent, usually opposite excretory pore, in four-incisures zone of lateral field. Labial region continuous with body contour or offset to varying degree. Labial disc (SEM) rounded, hexagonal or slightly laterally elongated. Lateral sectors of labial region may be somewhat smaller than the dorsal and ventral sectors. Anterior head annuli divided into six sectors by longitudinal ridges (not observed in *G. varians*). Stylet thin to robust, length of known species varying from 9 to 132  $\mu\text{m}$ , cone seldom longer than 55–60% of total stylet length. Dorsal oesophageal gland orifice 1–3  $\mu\text{m}$  posterior to stylet knobs. Oesophagus offset from intestine. Female tail cylindrical to conical.  $c'$  usually 2–4, thickened terminal cuticle not pronounced. Male spicules without distinct velum. Gubernaculum not protrusible. Epiptygma and hypopygma present.

Key to Female of *Geocenamus*  
(Korean species)

1. Cephalic sclerotization heavy, stylet 33-37  $\mu$  m, tail not striated.....*G. adakensis*  
Cephalic sclerotization mostly weak .....2
2. Cuticle with longitudinal striae .....3  
Cuticle without longitudinal striae .....5
3. Labial region offset, tail conical, terminus smooth,  $c'=3.9$ . Stylet 18-20  $\mu$  m long, 24-28 longitudinal striae .....*G. lenorus*  
Labial region offset. Tail terminus annulated .....4
4. Labial region slightly offset. Stylet 23-25  $\mu$  m long.  $C'=3.4-3.8$ . Longitudinal striae 15-17. Tail subcylindrical, slightly tapering towards the rounded, terminus coarsely annulated .....*G. koreanus*  
Labial region offset with six radial grooves. Stylet 22-27  $\mu$  m long.  $c'=1.3-1.9$ . Longitudinal striae 24-25. Tail subcylindrical, rounded, terminus coarsely annulated .....*G. myungsugae*
5. Tail terminus annulated .....6  
Tail terminus not annulated.....7
6. Tail conical with 26-46 annuli, subhemispherical, Stylet 15-18  $\mu$  m long,  $L=461-698 \mu$  m,  $c'=3.0$  .....*G. nothus*  
Tail conical with 60-75 annuli, subcylindrical, rounded, Stylet 16-29  $\mu$  m,  $L=775-950 \mu$  m,  $c'=3.5-4.2$ , M.B.=48-54% ...*G. sobaekensis*
7. Female tail pointed, male bursa does not reach tail end .....8  
Female tail conical with 23-25 annuli, hyaline tail tip, male without bursa, stylet 48-54  $\mu$  m,  $c'=2.0-3.2$  .....*G. boghiae*  
Female tail rounded, terminus smooth with 42-49 annuli, Stylet 14-16  $\mu$  m, knobs rounded to posteriorly sloping .....*G. brevidens*
8. Female tail terminus sharply pointed with 42-79 annuli,  $c'=4.1-4.8$ , stylet 11-14  $\mu$  m .....  
.....*G. acuminatus*  
Female tail terminus subacute,  $c'=3.2-4.5$ , stylet 15-20  $\mu$  m, head with 6-7 annuli.....  
.....*G. joctus*

*Geocenamus acuminatus* (Minagawa, 1985)

Brzeski, 1991

(Fig. 5. A-F)

= *Merlinius acuminatus* Minagawa, 1985

Host plant and Localities:

*Oryza sativa* L. (All over the country)\*

\*Source: Geraert, Choi & Choi, 1990

*Geocenamus adakensis* (Bernard, 1984)

Brzeski, 1991

(낙우송위축선충 : 신칭)(Fig. 6. A-F)

= *Merlinius adakensis* Bernard, 1984

Host plant and Localities:

*Taxodium disticum* (Chöllabuk-do: Chinangun Pugwi-myön)\*

\*Source: Choi & Geraert, 1993

*Geocenamus boghiae* Choi & Geraert, 1993

(북히에위축선충 : 신칭)(Fig. 6. G-K)

Host plant and Type locality:

*Platycarya strobilacea* Sieb et Zucc (Chöllabuk-do: Naejangsa)\*

\*Source: Choi & Geraert, 1993

*Geocenamus brevidens* (Allen, 1955) Brzeski, 1991 (Fig. 5. G-K)

Host plant and Localities:

*Ipomea batatas* Lam (Cheju-do: Sanbangan)\*

\*Source: Choi, 1975

*Geocenamus joctus* (Thorne, 1949) Brzeski, 1991 (Fig. 7. A-F)

= *Tetylenchus joctus* Thorne, 1949

= *Merlinius joctus* (Thorne, 1949) Sher, 1974

Host plant and Localities:

*Capsicum annuum* L. (Kyöngsangbuk-do: Ch'ilgok-gun)\*

*Diospyros kaki* Thumb (Chöllabuk-do: Changsöng-gun Paegyangsa)

*Morus bombycis* Koidz. (Kyöngsangnam-do: Chirisan Paekmu-dong)

\*Source: Choi, 1972

*Geocenamus koreanus* (Choi & Geraert, 1971) Brzeski, 1991 (Fig. 7. G-M)

= *Merlinius koreanus* Choi & Geraert, 1971

= *Scutylechus koreanus* (Choi & Geraert, 1971) Siddiqi, 1971

Host plant and Type locality:

*Fraxinus rhynchophylla* Hance (Chungch'yöngnam-do: Sogrisan)

*Malus pumila* Mill (Kyöngsangbuk-do: Uisöng-gun Pongyang-myöng Punt'oe-dong, Sagok-myöng. Ch'ilgok-gun Tongmyöng-myöng Namwon-dong. Kyöngsan-gun Kyöngsan-üp Taep'yöng-dong, Ansim-üp Sukch'ön-dong. Yöngch'ön-gun Kümho-ü p. Kyöngsangnam-do: Köch'ang-gun)\*

*Pinus koraiensis* S. et Z. (Kyöngsangbuk-do: Kimch'ön-shi Yangch'ön-dong)

*Phellodendron amurense* Rupr. (Chöllabuk-do: Wanju-gun Isö-myöng Ünkyo-ri)

*Prunus salicina* var. *columnaris* Uyrki (Chöllabuk-do: Ch'öngju-shi Yongdam-dong)

*Prunus serrulata* var. *spontanea* (Chöllabuk-do: Changsöng-gun Paegyangsa)

*Spiraea prunifolia* var. *simpliciflora* Nak. (Chöllanam-do: Naju-gun Sanpo-myöng Sanche-ri)

*Zelkova serrata* Makino (Chöllabuk-do: Ch'öngju-shi Yongdam-dong. Kyöngsangbuk-do: Ch'öngdo-üp Söho-dong. Kyöngsangnam-do: Miryang-gun Sangnam-myöng Yelim-ri)

\*Source: Choi & Geraert, 1971

*Geocenamus lenorus* (Brown, 1956) Brzeski, 1991

= *Tylenchorhynchus lenorus* Brown, 1956

= *Merlinius lenorus* (Brown, 1956) Siddiqi, 1970

= *Scutylechus lenorus* (Brown, 1956) Siddiqi, 1979

Host plant and Localities:

*Avena sativa* L. (Kyönggi-do: Suwon-shi. Kimp'o-gun)\*

*Hordeum vulgare* var. *hexastichon* Ashers. (Kyönggi-do: Suwon-shi, Kimp'o-gun)

\*Source: Park, 1963

*Geocenamus myungsugae* Choi & Geraert, 1993

(명숙에 위축선충 : 신칭)(Fig. 8. A-E)

Host plant and Type locality:

*Salix babylonica* L. (Chungch'öngnam-do: Kongju-gun Janggiri)\*

Other localities:

*Taxus cuspidata* S. et Z. (Kangwon-do: Ch'unch'ön-shi sanong-dong)

\*Source: Choi & Geraert, 1993

*Geocenamus nothus* (Allen, 1955) Brzeski, 1991 (Fig. 8. F-I)

= *Tylenchorhynchus nothus* Allen, 1955

- = *Tylenchorhynchus undyferrus* Haque, 1967  
 = *M. noihus* (Allen, 1955) Siddiqi, 1970  
 = *M. undyferrus* (Haque, 1967) Siddiqi, 1970  
 = *M. paramonovi* Volkova, 1972  
 = *M. nizamii* Luqman & Khan, 1986  
 = *M. bulgaricus* Budurova, 1988

## Host plants and Localities:

- Acanthopanax sessiliflorum* Seem (Kyöngsangnam-do: Sach'ön-gun Chöngdong-myön Chuch'öng-ri)  
*Acer mandshuricum* Max. (Kyöngsangbuk-do: Sobaeksan)  
*Capsicum annuum* L. (Kyöngsangbuk-do: Yöngyang-gun. Chöllanam-do: Sunch'ön-shi)  
*Doispyros kaki* Thunb (Kyöngsangnam-do: Ch'angnyöng-gun Pugok-myön Pugok-ri)  
*Eucommia ulmoides* Oliver (Kyöngsangnam-do: Sanch'öng-gun Saengbirayang-myön Kakye-ri)  
*Glycine max* Merr (Kyöngsangnam-do: Yöngyang-gun)  
*Juglans mandshurica* Max. (Chungch'öngbuk-do: Ch'öngju-shi Yondam-dong)  
*Malus pumila* Mill (Kyöngsangbuk-do: Andong-gun Namhu-myön Susan-dong, Kangwon-do: Ch'unch'ön-shi)  
*Nicotiana tabacum* L. (Kyöngsangbuk-do: Yöngyang-gun)\*  
*Setaria italica* (L.) BEAUV. (Kyöngsangbuk-do: Yöngyang-gun. Cheju-do: Choch'ön-myön Choch'ön-ri)\*

\*Source: Choi, 1972

*Geocenamus sobaekensis* Choi & Geraert, 1992  
 (소백위축선충 : 신칭)(Fig. 8. J-M)

## Host plant and Type locality:

- Acer mandshuricum* Max. (Kyöngsangbuk-do: Sobaeksan)\*

\*Source: Choi & Geraert, 1993

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(Received August 28, 1992)

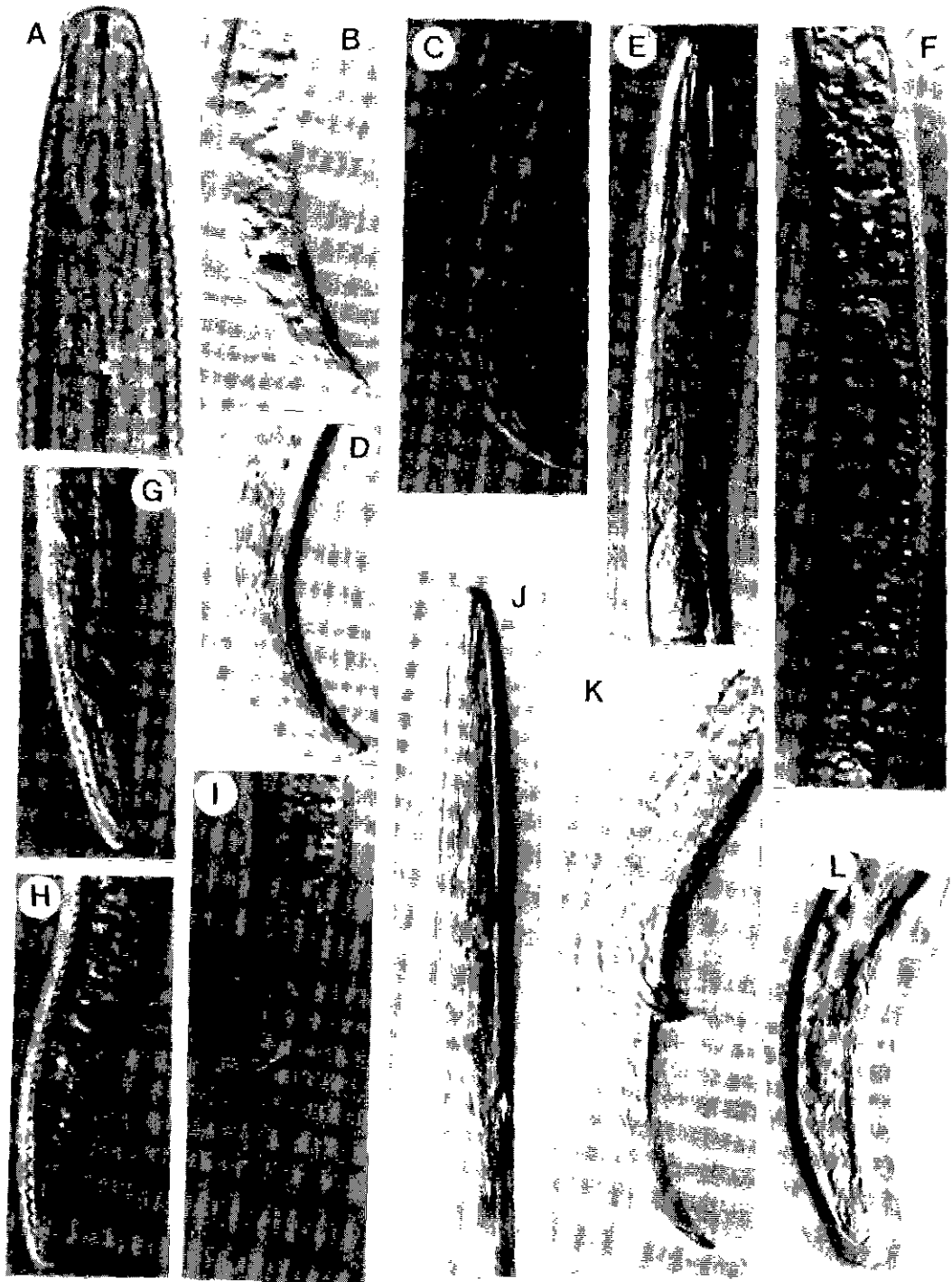


Fig. 1. A-D; *Tylenchorhynchus capitatus*: A; female head. B, D; female tail. C; male tail. E-I; *Tylenchorhynchus claytoni*: E; female anterior part. F; female reproductive system. G, H; female tail. I; male tail. J-L; *Tylenchorhynchus dubius*. J; female anterior part. K; male tail. L; female tail.



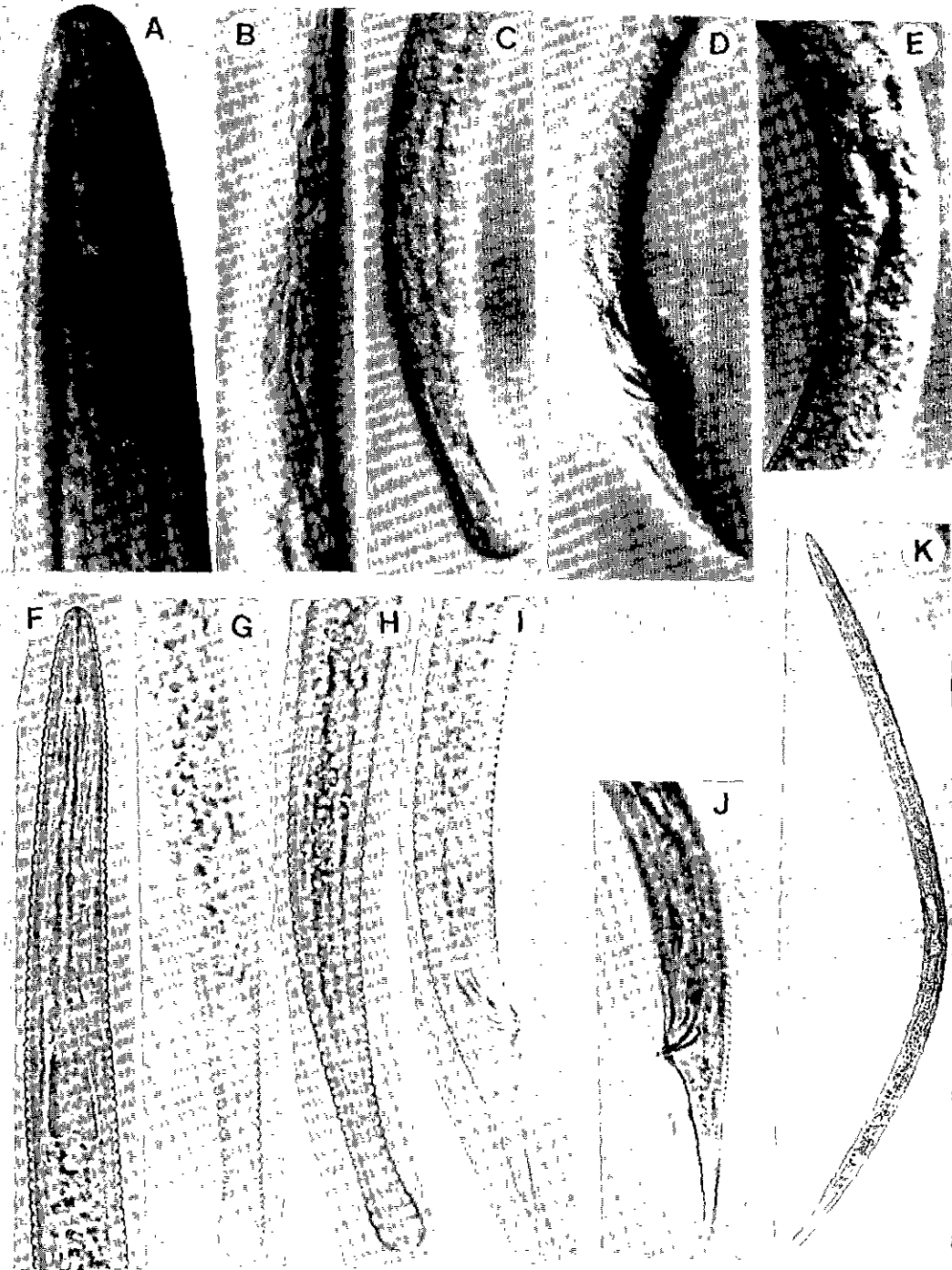


Fig. 2. A-E; *Tylenchorhynchus clavicaudatus*. A; female head. B; oesophageal region. C; female tail. D; male tail. E; vulva. F-K; *Tylenchorhynchus nudus*: F; female anterior part. G-H; female tail. I, J; male tail. K; entire female.

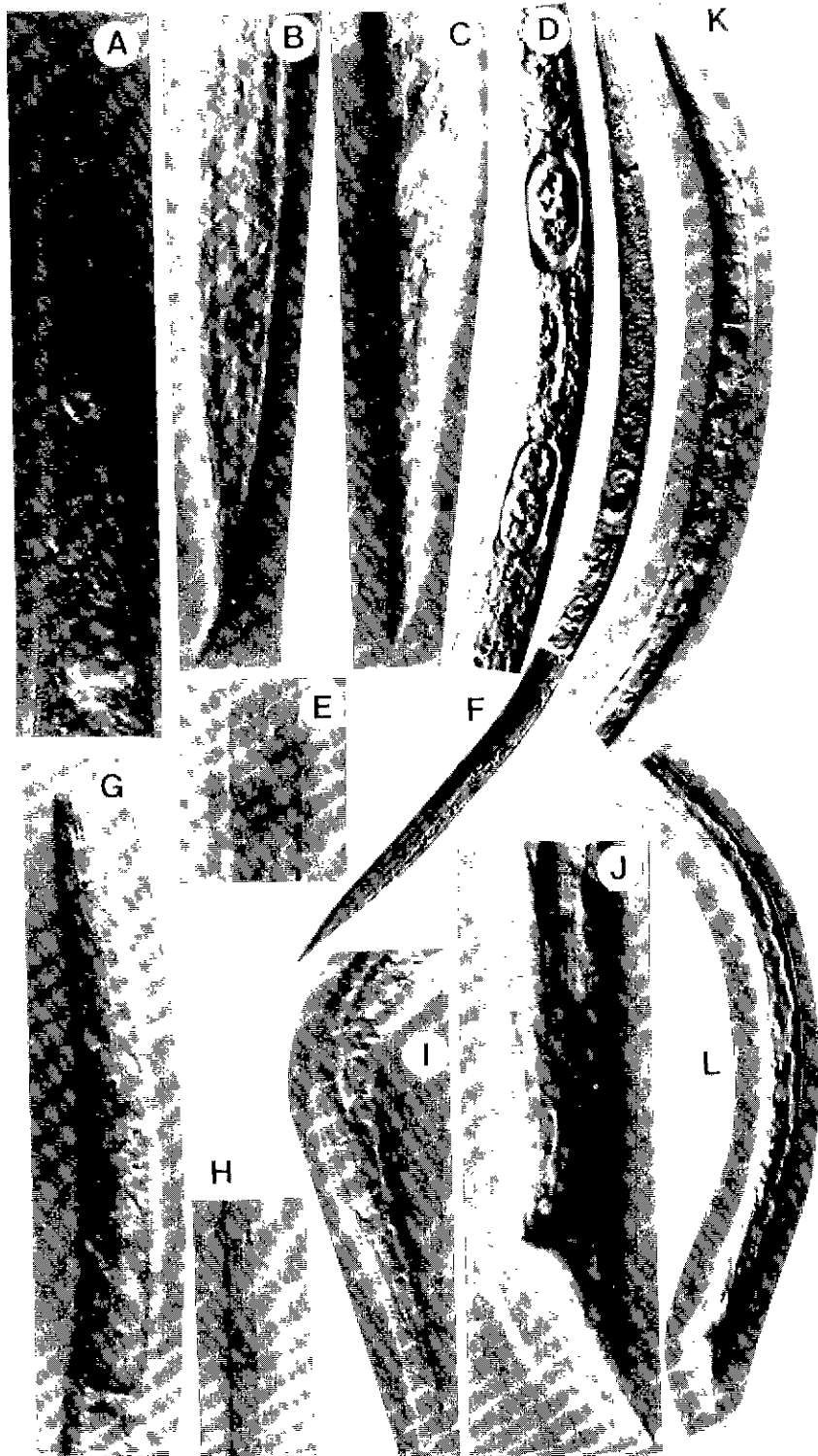


Fig. 3. A-F: *Triversus yugaensis*: A; female anterior part. B. C; female tail. D; female reproductive system. E; Lateral field. F: entire female. G-L: *Triversus knagweonensis*: G; female anterior part. H; lateral field. I; female tail. J; male tail. K; male anterior part. L; male posterior part.

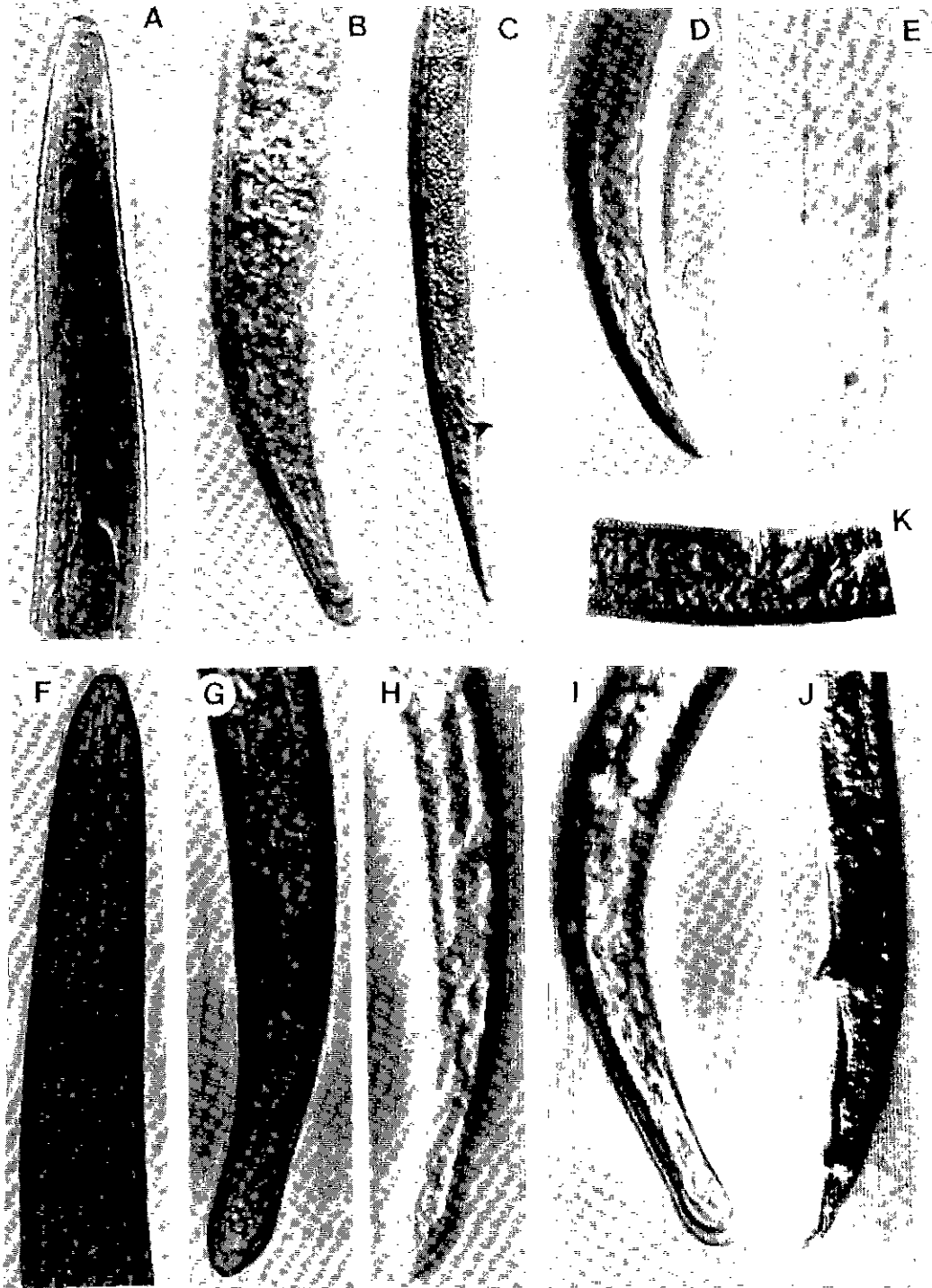


Fig. 4. A-E: *Amplimerlinius socialis*: A; female anterior part. B, D; female tail. C; male tail. E; lateral field. F-K: *Amplimerlinius clavicaudatus*: F; female anterior part. G-I; female tail. J; male tail. K; vulva.

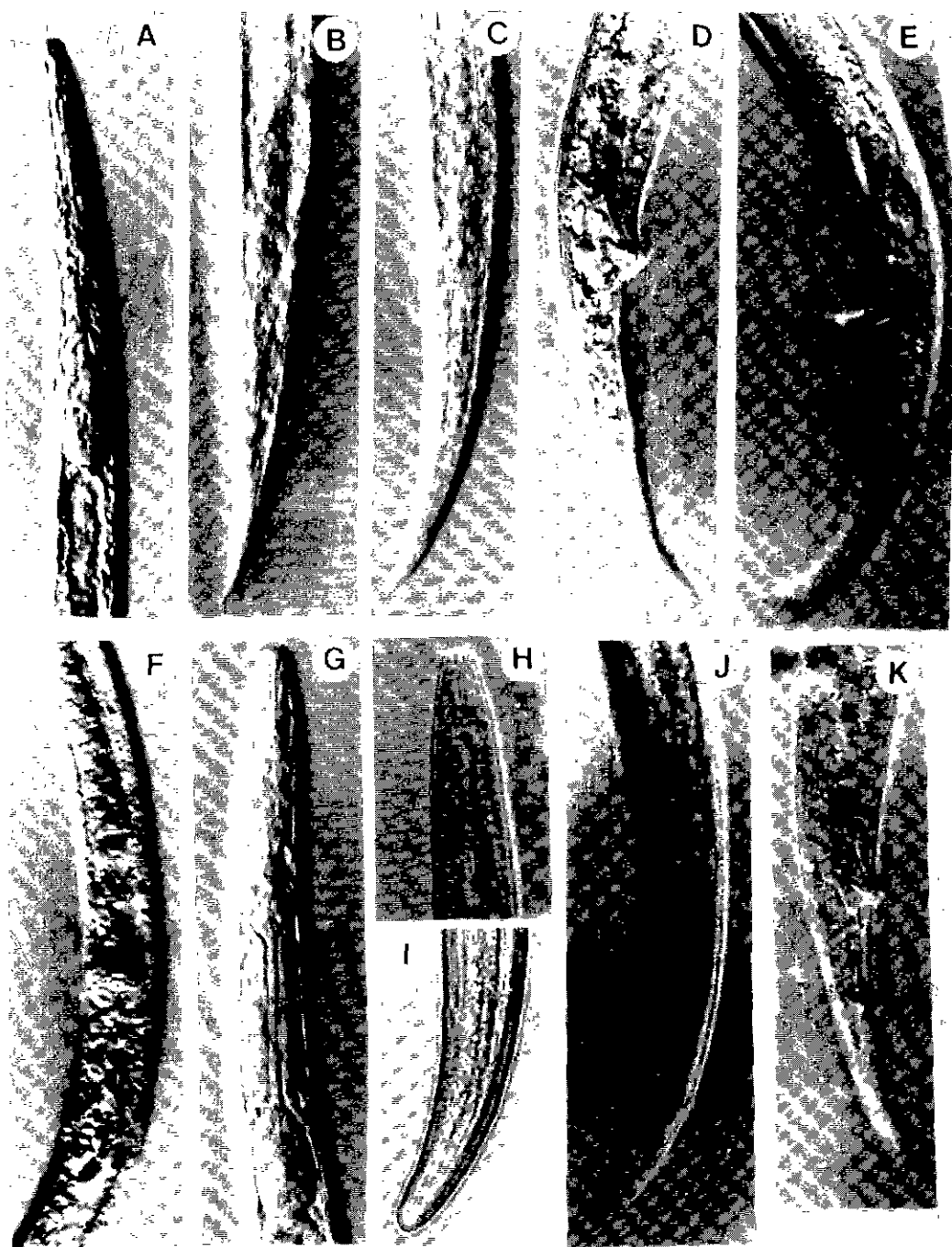


Fig. 5. A-F: *Geocnamus acuminatus*: A; female anterior part. B, C; female tail. D, E; male tail. F; female reproductive system. G-K: *Geocnamus brevidens*: G; female anterior part. H; head. I, J; female tail. K; male tail.



Fig. 6. A-F: *Geocenamus adakensis*: A; female anterior part. B; head. C; lateral field. D. F; female tail. E; male tail. G-K; *Geocenamus boghiae*: G, H: male tail. I, J; female tail. K: female anterior part.

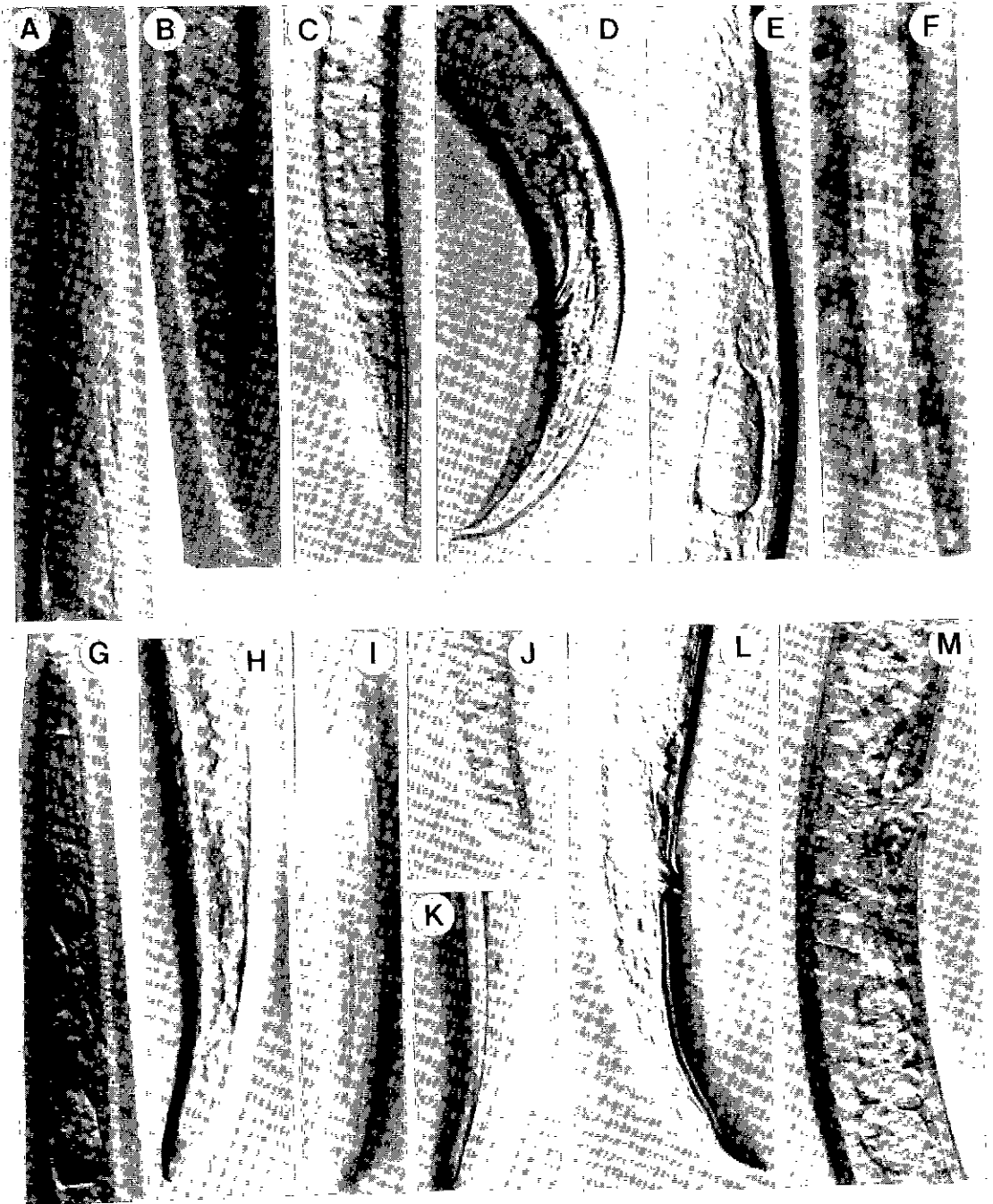


Fig. 7. A-F: *Geocenamus joctus*: A; female anterior part. B, C: female tail. D; male tail. E; oesophagus. F; lateral field. G-M: *Geocenamus koreanus*: G; female anterior part. H, J; female tail. I, K; female tail showing lateral field and phasmid. L; male tail. M; vulva and spermatheca with sperm.

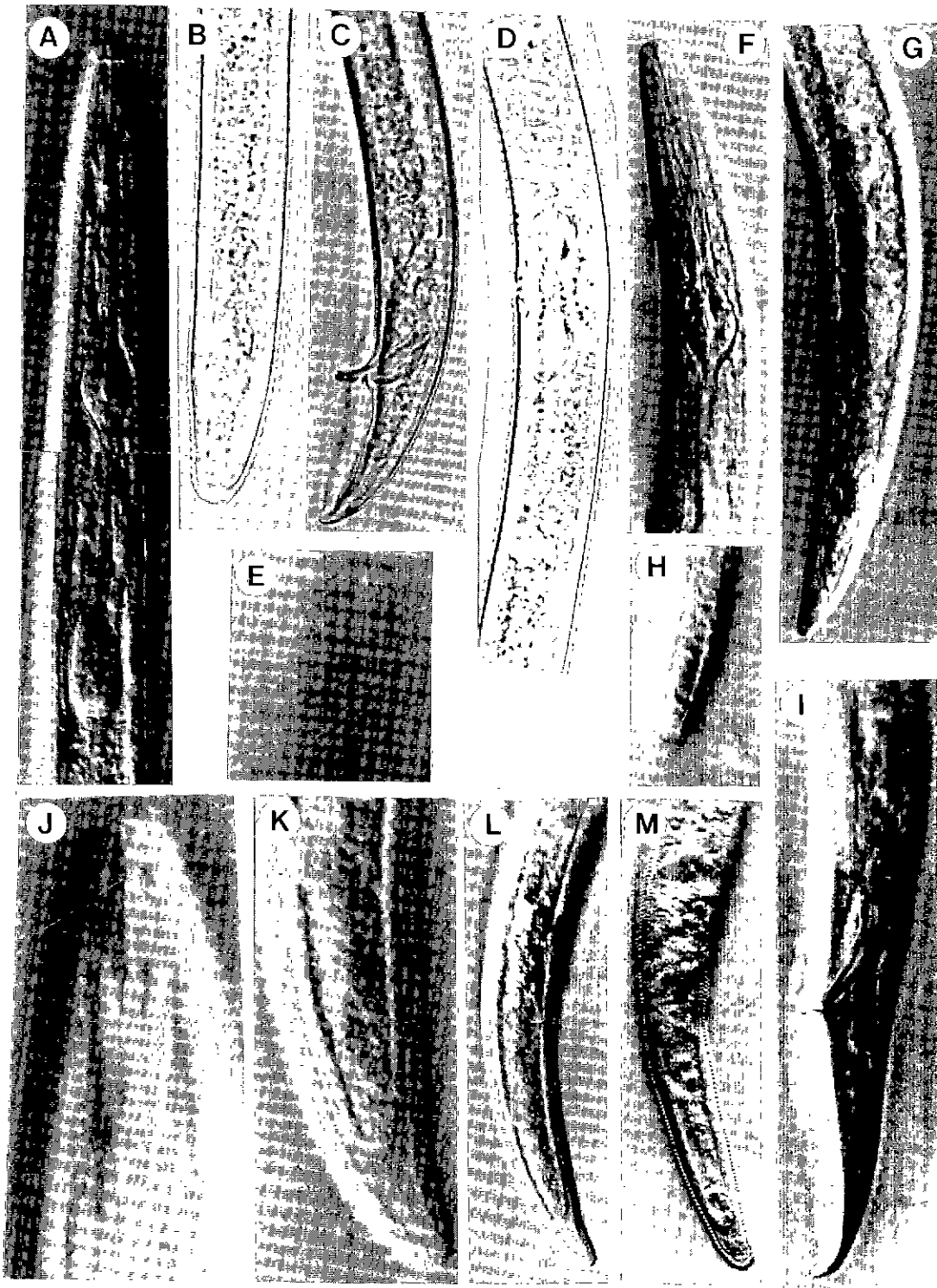


Fig. 8. A-E: *Geocnamus myungsugae*: A; female anterior part. B; female tail. C; male tail. D; female reproductive system. E; lateral field. F-I: *Geocnamus nothus*: F; female anterior part. G, H; female tail. I; male tail. J-M; *Geocnamus sobaekensis*: J; female head. K, L, M; female tail.