

Two Unrecorded Species, *Globodera hypolysi* and *Sarisodera hydrophila* (Nematoda: Heteroderidae) from Korea

씨스트線蟲科 (Nematoda: Heteroderidae)의 韓國 2未記錄種 *Globodera hypolysi*와 *Sarisodera hydrophila*의 기재

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Abstract – Two unrecorded species of Heteroderinae, *Globodera hypolysi* Ogawa, Ohshima and Ichinohe, 1983 and *Sarisodera hydrophila* Wouts and Sher, 1971 from Korea were firstly reported. The Korean specimens well correspond with the original description of *Globodera hypolysi* except stylet length of the juveniles, slightly shorter (21~24 vs. 24~25 μm) and shorter distance from the anus to the fenestra in cyst (22~50 vs. 25~80 μm). The measurements of Korean specimen of *Sarisodera hydrophila* are slightly short compared with the type species; Female body length 367.2~597.6 μm vs 359~688 μm ; Stylet length 37~44 μm vs 38~46 μm ; Male body length 662~1198 μm vs 579~1405 μm ; stylet length 37~43.8 μm vs 38~46 μm . Juvnile body length 460~536 μm vs 466~558 μm . stylet length 32~38 μm vs 39~43 μm .

Key Words – Systematics, Heteroderidae, *Globodera hypolysi*, *Sarisodera hydrophila*, Korea

초 록 – 씨스트선충과의 한국 2 미기록속 및 종, *Globodera hypolysi*, *Sarisodera hydrophila*를 팔공산에서 채집하였다. 한국산 *G. hypolysi*는 원 기재와 비슷하나 유충의 구침 길이가 약간 짧고 (21~24 vs. 24~25 μm); 씨스트 향문에서 창까지 거리가 약간 짧았다 (23~54 vs. 25~80 μm). 한국산 *S. hydrophila*는 모든 측정치가 원 기재에 비하여 약간 짧았다; 암컷 체장 (367.2~597.6 μm vs 359~688 μm); 구침장 (37~44 μm vs 38~46 μm); 수컷 체장 (662~1198 μm vs 579~1,405 μm); 구침장 (37~43.8 μm vs 38~46 μm). 제2령유충: 체장 (460~536 μm vs 466~558 μm); 구침장이 짧았다 (32~38 μm vs 39~43 μm).

검색어 – 분류, 씨스트선충과, 썩씨스트선충, 팔공오리선충, 한국

During the systematic study of Heteroderidae from Korea, *Globodera hypolysi* (Ogawa *et al.*, 1983) and *Sarisodera hydrophila* (Wouts and Sher, 1971) were newly collected from Korea. *Sarisodera hydrophila* has been found secondly since its original description. In this paper, morphological characteristics of the species were described and illustrated in detail.

Materials and Methods

The nematodes were collected from soil around mugwort (*Artemisia princeps* Pamp) and *Fraxinus rhynchophylla* Hance at Palgong-san, Taegu. The nematodes were fixed in 70°C F:G 4-1 fixative and dehydrated by a Seinhorst's rapid glycerin method. Measurements were

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made with a drawing tube attachment. Photographs was taken by using Nomarski differential interference attachment.

Description

Globodera hypolysi Ogawa, Ohshima & Ichinohe, 1983 **썩씨스트선충 (신칭)** (Figs. 1-3)

Measurements:

Female: (n = 34). L = 382.3 $\mu\text{m} \pm 30.9$ (326.4~438.4);

W = 305.3 $\mu\text{m} \pm 38.3$ (220.8~380.8); L/W = 1.3 ± 0.1 (1.1~1.5); Neck length = 77.1 $\mu\text{m} \pm 17.3$ (41.6~112.0); Stylet = 25.5 $\mu\text{m} \pm 2.2$ (18.0~28.5).

Cyst: (n = 73). L = 452.2 $\mu\text{m} \pm 55.2$ (338.4~590.4); W = 377.8 $\mu\text{m} \pm 84.0$ (216.0~576.0); L/W = 1.2 ± 0.2 (0.9~1.6); (n = 44). Fenestral length = 21.7 $\mu\text{m} \pm 2.9$ (16.2~28.8); Fenestral width = 18.6 $\mu\text{m} \pm 3.0$ (10.8~25.2); Distance from anus to nearest edge of fenestra = 35 $\mu\text{m} \pm 8.9$ (23.3~54); Granek's ratio = 2.0 ± 0.6 (0.7~3.1).

Male: (n = 23). L = 893.3 $\mu\text{m} \pm 83.8$ (838.8~1087.2); W = 24 $\mu\text{m} \pm 1.9$ (22.6~27.0); a = 37.6 ± 3.9 (35.8~43.8); b =

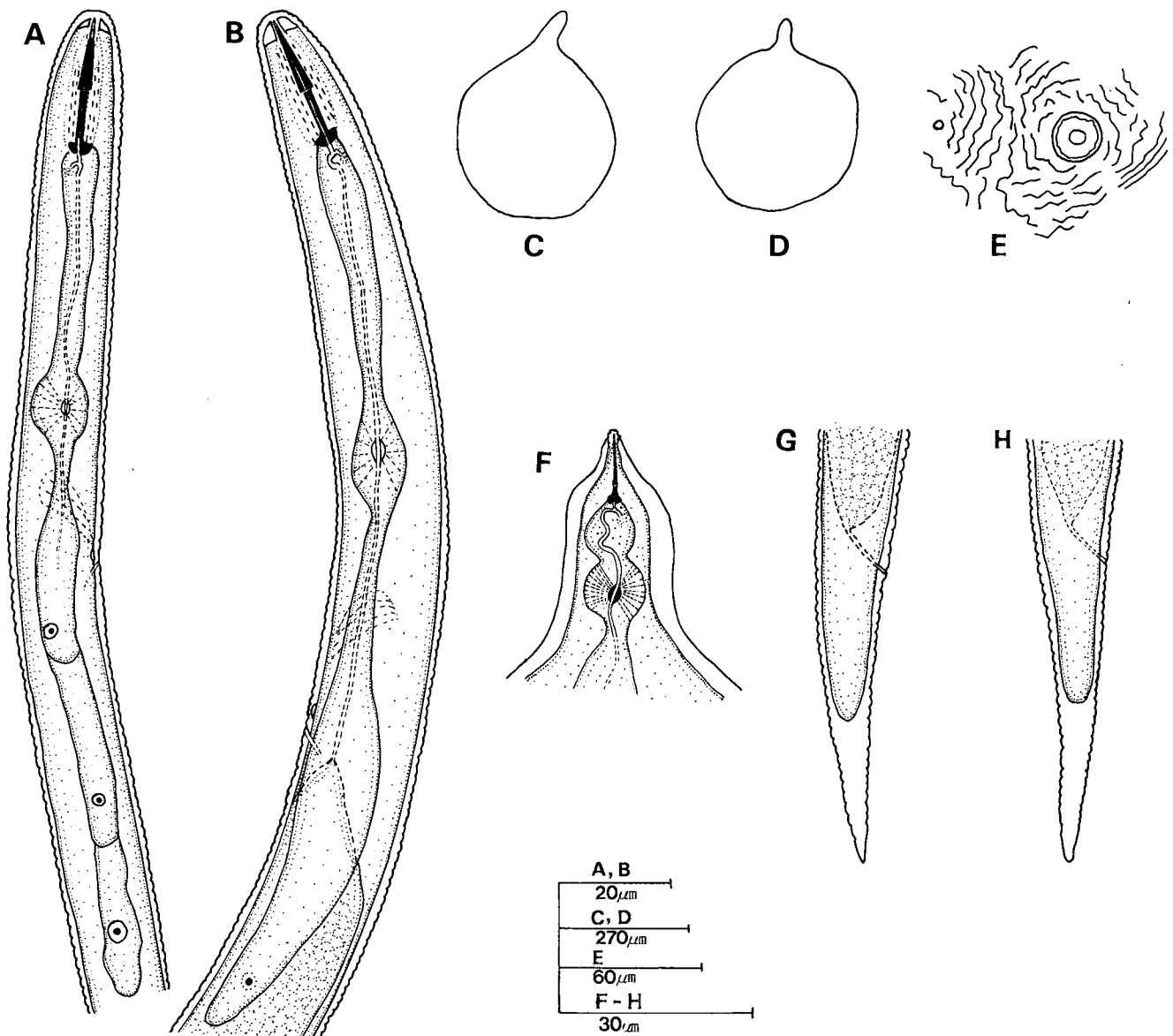


Fig. 1. *Globodera hypolysi*: A. anterior part of juvenile; B. anterior part of male; C, D. shape of cyst; E. perineal pattern of cyst; F. anterior part of female; G, H. tail of juvenile.

7.3 ± 0.8 (0.0~9.3); $b' = 4.6 \pm 0.4$ (4.0~5.3); Stylet = $27.4 \mu\text{m} \pm 1.1$ (26.3~29.9); Anterior end to excretory pore = $145.4 \mu\text{m} \pm 13.1$ (111.0~171.6); Anterior end to center of median bulb = $84.3 \mu\text{m} \pm 11.2$ (67.9~93.4); Spicules =

$27.6 \mu\text{m} \pm 2.6$ (23.4~32.9).

Juveniles 2nd stage: (n = 22). $L = 457.5 \mu\text{m} \pm 18.5$ (421.2~486.0); $a = 26.5 \pm 2.2$ (23.6~33.3); $b' = 2.5 \pm 0.4$ (2.1~3.8); $c = 9.4 \pm 1$ (7.0~11.8); $c' = 4.2 \pm 0.4$ (3.5~4.9);



Fig. 2. *Golboderia hypolysi*: A. female anterior region; B. male head; C. male median bulb region; D. SEM. photograph of cyst terminal cone; E. juvenile. head; F. juvenile tail.

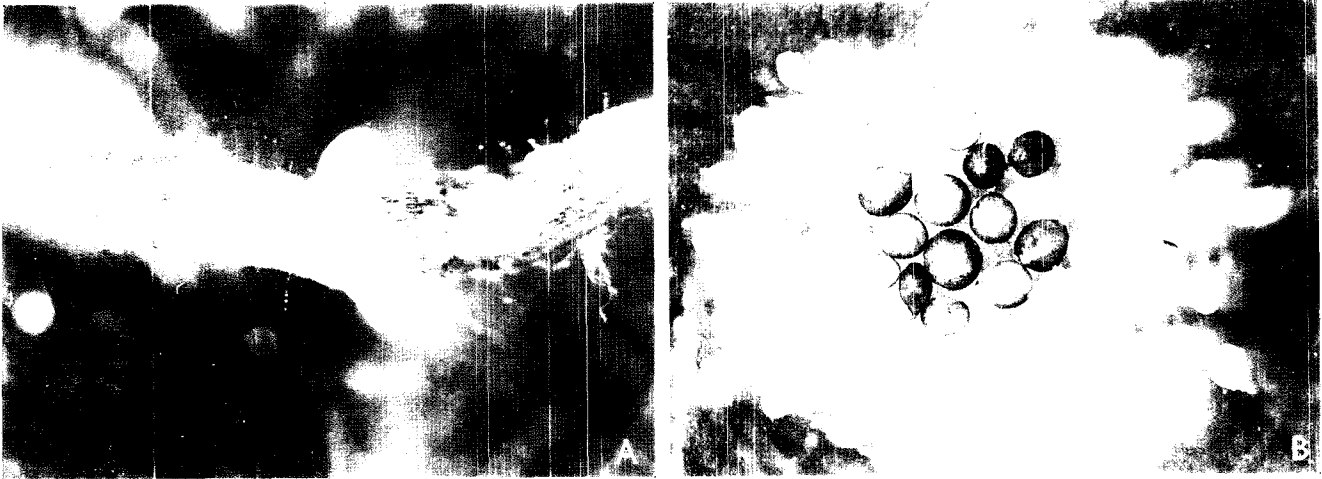


Fig. 3. *Golboderia hypolysi*: A. female penetrate in the root; B. females and cysts.

Tail = $49.2 \mu\text{m} \pm 5.5$ (40.2~69.4); Hyaline = $24.8 \mu\text{m} \pm 4.5$ (19.0~41.6); Stylet = $24.4 \mu\text{m} \pm 3.1$ (21.2~35.8); Hyaline/Stylet = 1.0 ± 0.1 (0.8~1.2).

Female: Body pearly white, ovate to subspherical with protruding neck and rounded posteriorly. Head off set from neck with two annules. Stylet with well developed knobs sloping posteriorly. Excretory pore at base of oesophagus, 100~130 μm from anterior end. Median oesophageal bulb large, spherical, with well developed valve. Vulva slit 5~7 μm long.

Cyst: light to dark brown, ovate to sub-spherical with protruding neck. Fenestra 16~29 μm long and 11~25 μm width. Circumfenestra generally visible. The bullae like structure formed compact circles around the fenestra. Underbridge invisible. Anus located 23~54 μm from the edge of fenestra. Anal area encircled by cuticular rings. Cyst wall pattern tends to form wavy lines running latitudinally around body.

Male: Body slender, vermiform with short bluntly rounded tail. Body strongly twisted by fixation. Lateral field with 4 incisures. Head slightly off set, hemispherical, with 6~7 annules. Cephalic framework heavily sclerotized. Stylet well developed with rounded basal knobs. Spicules slightly acuate.

Juveniles 2nd stage: Body slightly curved ventrally when killed by heating. Head off set hemispherical, with 5~6 annules. Lateral field about quarter body width with four incisures. Cephalic framework heavily sclerotized. Stylet well-developed with anteriorly forwarded knobs. Hemizonid two annules long, situated anterior to excretory pore. Tail tapering to sharply pointed or rounded ter-

minus. Phasmid very small located 7~10 annuli or 11~16 μm behind anus

Discussion: *G. hypolysi* has been reported by Ogawa *et al.*, 1983. The Korean specimens well correspond with the original description, except stylet length of the juveniles, slightly shorter (21~24 vs. 24~25 μm) and shorter distance from the anus to the fenestra in cyst (23~54 vs. 25~80 μm)

Locality and habitat: Soil around the roots of mugwort (*Artemisia princeps* Pamp) at Palgong-san, Korea.

Sarisodera hydrophila Wouts & Sher, 1971,

팔공오리선충 (신칭) (Figs. 4-7)

Measurements:

Female: (n = 11). L = $500.7 \mu\text{m} \pm 65.1$ (367.2~597.6); W = $192.8 \mu\text{m} \pm 42.1$ (133.2~288.0); a = 2.7 ± 0.5 (1.8~3.6); Stylet = $44.9 \mu\text{m} \pm 5.3$ (31.4~49.6); Median bulb length = $24.8 \mu\text{m} \pm 3.7$ (17.5~32.9); Median bulb width = $20.1 \mu\text{m} \pm 3.5$ (15.3~27.0); Median bulb L/W = 1.2 ± 0.2 (1.0~1.6); Median valve length = $5.4 \mu\text{m} \pm 0.9$ (3.7~6.6); Median valve width = $4.3 \mu\text{m} \pm 0.7$ (2.9~5.1).

Male: (n = 18). L = $983.3 \mu\text{m} \pm 154.5$ (662.4~1198.8); a = 41.2 ± 4.5 (34.7~48.8); b = 6.8 ± 0.8 (4.9~8.0); b' = 4.5 ± 0.7 (3.1~5.9); Stylet = $39.8 \mu\text{m} \pm 1.7$ (37.2~43.8); Stylet knob length = $3.3 \mu\text{m} \pm 0.4$ (2.9~3.7); Stylet knob width = $6.6 \mu\text{m} \pm 0.5$ (5.8~7.3); Spicule = $40.0 \mu\text{m} \pm 3.5$ (34.3~46.0); Gubernaculum = $15.4 \mu\text{m} \pm 2.1$ (11.6~18.3); Anterior end to median valve = $97.2 \mu\text{m} \pm 9.9$ (81.0~114.0); Anterior to hemizonid = $141.7 \mu\text{m} \pm 19.4$ (97.8~172.3); Anterior end to excretory = $157.2 \mu\text{m} \pm 19$ (132.9~201).

Juvenile 2nd stage: (n = 17). L = 490.3 $\mu\text{m} \pm 22.1$ (460.8~536.4); a = 25.4 ± 1.1 (23.5~27.2); b = 3.8 ± 0.3 (3.2~4.3); b' = 2.1 ± 0.3 (1.6~2.6); c = 8.9 ± 0.5 (8.2~9.9); c' = 3.9 ± 0.2 (3.4~4.3); Stylet = 34.6 $\mu\text{m} \pm 1.9$ (32.1~38.0); Head to median bulb = 80.2 $\mu\text{m} \pm 5.3$ (69.3~87.6); MB = 38.8 ± 3.2 (33.8~45.2); Oesophagus length = 205.4 $\mu\text{m} \pm 15.2$ (184~238); Lip width = 10.1 $\mu\text{m} \pm 1.3$ (7.3~11.6); Lip high = 5.4 $\mu\text{m} \pm 0.7$ (3.6~6.5); Anterior end to excretory pore = 114.1 $\mu\text{m} \pm 3.7$ (104~119); Tail length = 55.2 $\mu\text{m} \pm 2.9$ (49.6~59.1); Hyaline length = 18.7 $\mu\text{m} \pm$

2.5 (15.3~24.0) Body width = 18.9 $\mu\text{m} \pm 1.0$ (17.5~20.4); Anterior to hemizonid = 110.8 $\mu\text{m} \pm 3.9$ (100.7~115); Anus to phasmid = 7.4 $\mu\text{m} \pm 1.3$ (4.4~9.5); Stylet cone % = 48.2 ± 1.5 (45.6~51); DOG = 4.7 $\mu\text{m} \pm 1.0$ (3.6~5.8).

Female: Body swollen, longer than wide, duck-shape; posterior end conical-truncated with deep vulval cleft. Freshly collected specimens pearly white, becoming yellowish darker. No cyst stage. Head and neck region to root. Cuticle thick, with lace-like pattern. Lip region with distinct labial disc and prominently offset first lip annule.

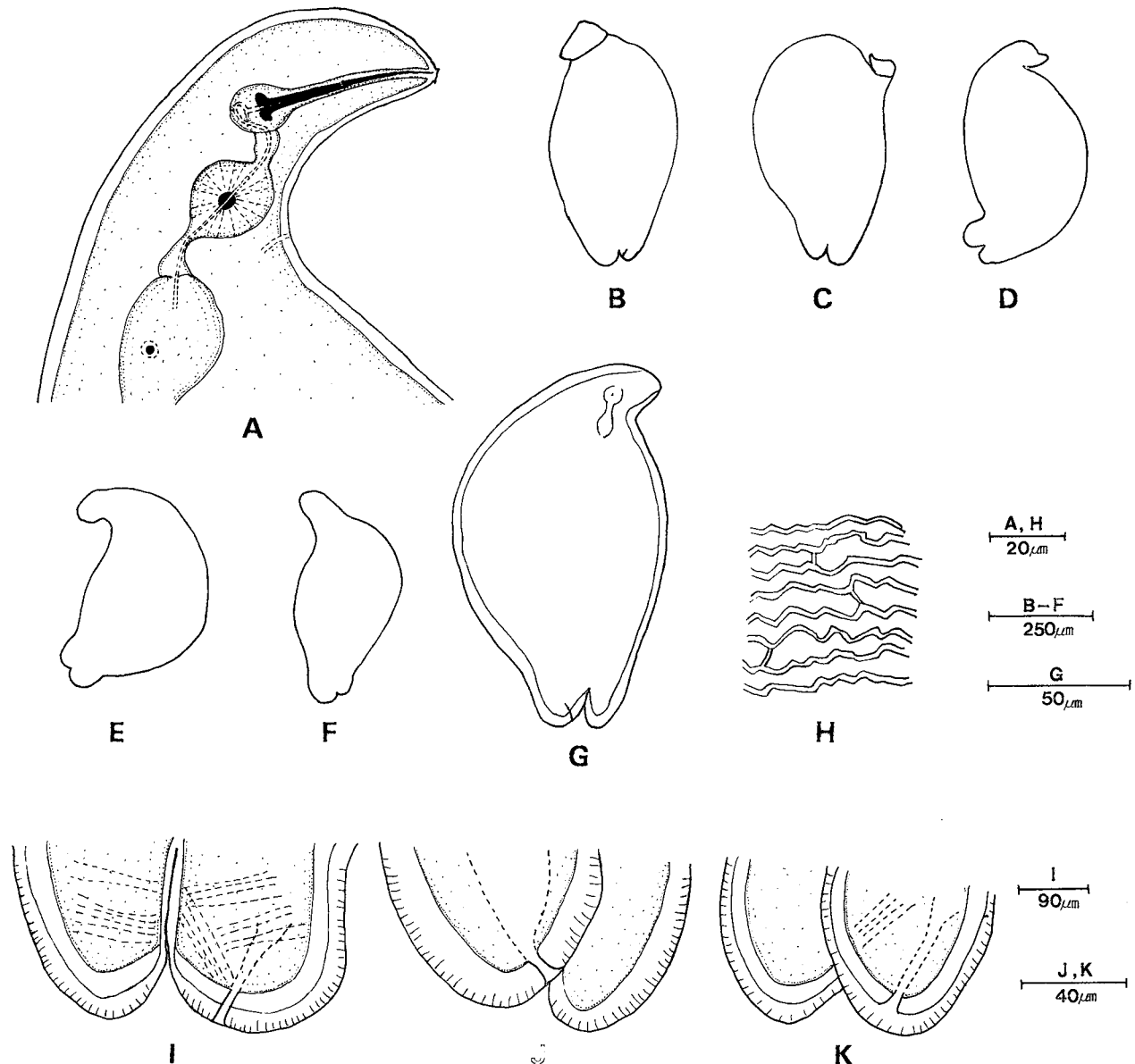


Fig. 4. *Sarisodera hydrophila*: A. female anterior region; B-G. general shape of female; H. cuticle pattern at mid body; I-K. vulva cone:

Stylet distinctly visible. Median bulb oval, valve distinct. Vulva terminal, with prominent hypertrophied lips, separated by a deep depression. Anus in the inner side of the posterior lip. Eggs retained in body.

Male: Body twisted. Stylet 37.2~43.8 μm long. Out margin of stylet knobs anteriorly forwarded. Lateral field with four incisures. Spicule 34.3~46.0 μm long, straight,

pointed at distal. No tail, no phasmids.

Juveniles 2nd stage: Stylet 32.1~38.0 μm long. Lateral field with four incisures. Oesophageal gland long ventral overlap. Tail conical, pointed, with terminal half hyaline. Phasmids with lens-like structure.

Discussion: Korean specimen slightly short in measurements compared with original description of *S. hy-*

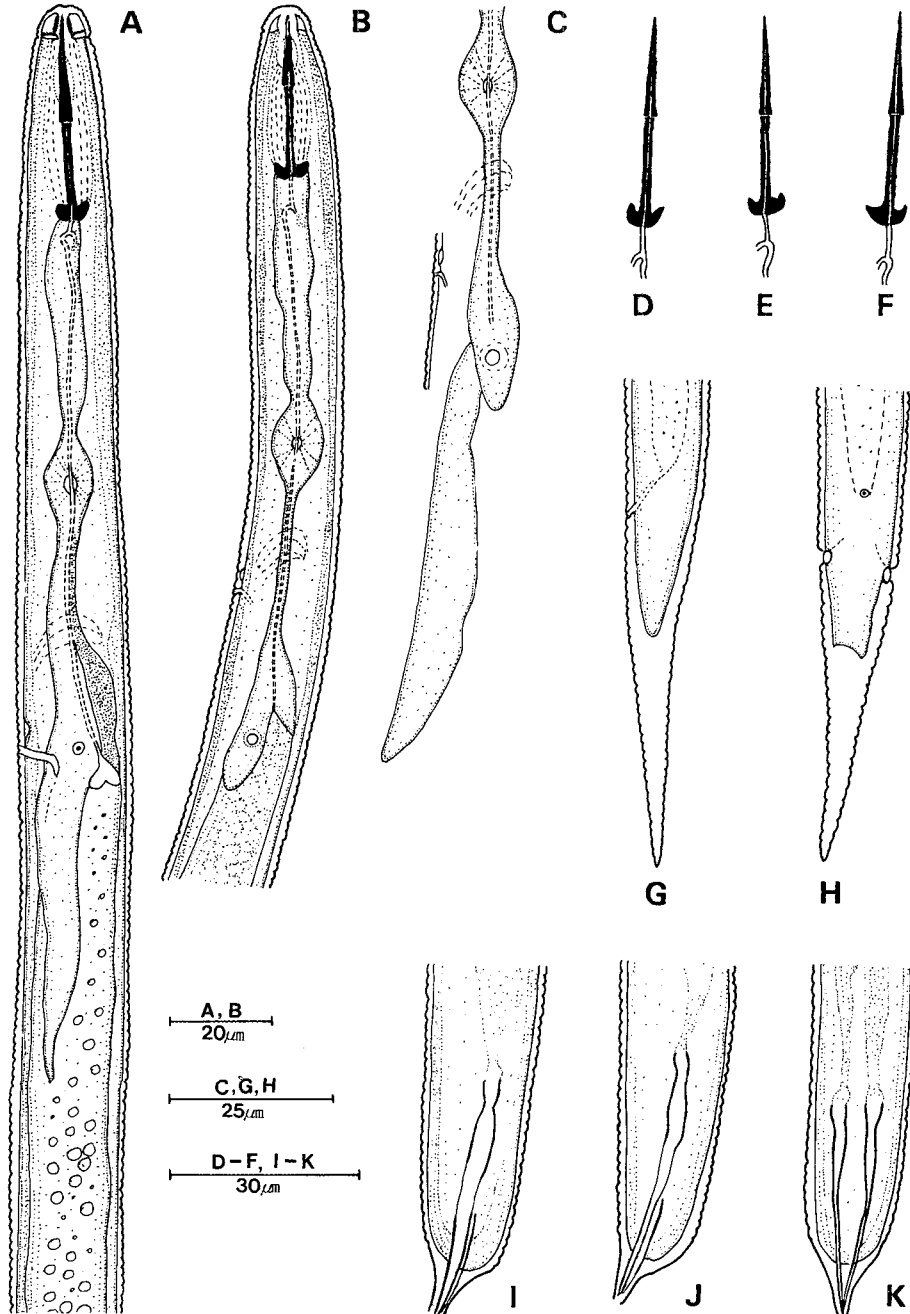


Fig. 5. *Sarisodera hydrophila*: A. male anterior region; B-H. juvenile: B. anterior region; C. oesophagus; D-F. stylet; G. posterior region, lateral view; H. posterior region, ventral view; I-K. male posterior region.

drophila Wouts and Sher, 1971; female body length slightly shorter (367.2~597.6 μm vs 359~688 μm); stylet slightly shorter (37~44 μm vs 38~46 μm); Male: body length slightly shorter (662~1,198 μm vs 579~1405 μm); stylet slightly shorter (37~43.8 μm vs 38~46 μm). Juven-

ile 2nd stage: body length slightly shorter (460~536 μm vs 466~558 μm). stylet slightly shorter (32~38 μm vs 39~43 μm .)

Locality and habitat: Soil around the roots of *Fraxinus rhynchophylla* Hance at Palgong-san, Taegu Korea.



Fig. 6. *Sarisodera hydrophila*: A. developing stage; B. young female; C-F. various shape of adult females; G. cuticle surface view; H. terminal cone, showing vulva sunken, anus on vulva lip.



Fig. 7. *Sarisodera hydrophila*: A. male anterior region; B-D. juvenile: B, C. oesophagus; D. tail; E-G. male posterior region (lateral view); H. male posterior region (ventral view).

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