A Key and Diagnostic Compendium to the Species of the Genus *Hoplolaimus* Daday, 1905 (Nematoda: Hoplolaimidae)

ZAFAR A. HANDOO AND A. MORGAN GOLDEN

Abstract: An identification key to 29 valid species of *Hoplolaimus* is given. A compendium of the most important diagnostic characters for use in identification of species is included as a practical alternative and supplement to the key. Diagnosis of *Hoplolaimus* is emended and lists of species of the genus, their synonyms, species inquirendae, nomina nuda, and species transferred to other genera are given. *Hoplolaimus sheri, H. chambus, H. casparus, and H. capensis* are recognized as valid species.

Key words: Compendium, diagnostic, Hoplolaimidae, *Hoplolaimus*, identification, key, lance nematode, morphology, Nematoda, taxonomy.

The genus *Hoplolaimus* was established on the basis of a single female by Daday in 1905 when he described *H. tylenchiformis* from a mud hole on Banco Island in the Paraguay river at Asuncion, Paraguay (1). Sher (11) provided the first comprehensive work on the genus, giving historical, morphological, and systematic sections and also a key to eight valid species. Golden (4) included *Hoplolaimus* under the subfamily Hoplolaiminae Filipjev, 1934 along with *Aorolaimus* Sher, 1963, *Scutelonema* Andrassy, 1958, and *Peltamigratus* Sher, 1963. Krall (6) reviewed all the previous work done on the family Hoplolaimidae Filippiev, 1934 and provided details on the morphology and development, phylogenetic relationship, and host–parasite relationship of the species. He accepted three subfamilies within Hoplolaimidae: Hoplolaiminae Filipiev, 1934 with four genera; Rotylenchinae Golden, 1971 with three genera; and Rotylenchoidinae Whitehead, 1958 with two genera. He also gave a key to 18 species of *Hoplolaimus*. Fortunier (3) more recently presented a diagnosis and systematic relationship of the family Hoplolaimidae. Only two subfamilies were included within Hoplolaimidae: Hoplolaiminae with eight valid genera, including *Hoplolaimus*, and Rotylenchinae with three genera.

The purpose of this study is to examine in detail representative specimens and published data on *Hoplolaimus* species, to determine the interrelationship of the species, to define the valid and most significant differentiating characters, and to prepare a new key and compendium to facilitate identification of the species.

Materials and Methods

Paratype specimens of 10 species (*H. aegypti, H. aorolaimoides, H. californicus, H. clarissimus, H. columbus, H. coneaudajuven-cus, H. indicus, H. magnistylus, H. sheri*, and *H. stephanus*) and nontype specimens of five other species (*H. galeatus, H. pararobustus, H. seinhorsti, H. seshadrii*, and *H. tylenchiformis*) were examined from the USDA Nematode Collection at Beltsville, Maryland. Specimens of each species, which ranged in numbers from 1 to over 50, were mounted in glycerine and accompanied by pertinent records. Examinations were made with a compound light microscope, usually at highest magnification, and morphometric data were obtained with an eyepiece micrometer. In evaluation of the species, our own data and the original descriptions of most species, as well as any subsequent redescription or other relevant data, were utilized. All measurements are
in micrometers (μm) unless otherwise stated.

**SYSTEMATICS**

*Genus Hoplolaimus* Daday, 1905  
*Syn. Nemonchus* Cobb, 1913  
*Hoplolaimoides* Shakil, 1973  
*Basirolaimus* Shamsi, 1979  
(Diagnostic data on females and male spicules in Table 2.)

*Emended diagnosis:* Hoplolaiminae. Female. Large sized nematodes (1–2 mm).

Lip region high, offset, with prominent transverse and longitudinal striae (except *H. cephalus*); cephalic framework massive, basal annule divided into squares. Stylet massive, 31–61 μm, with compact tulip-shaped basal knobs bearing anterior tooth-like projections (except *H. aorolaimoides* with poorly developed anterior projections). Dorsal esophageal gland opening near base of spear knobs (25% or less of spear length). Excretory pore posterior to hemizonid in species with four lines in lateral field (except *H. sacchari*), anterior to...

**Table 1.** *Hoplolaimus* species transferred to other genera with their present names and status.

<table>
<thead>
<tr>
<th>Species</th>
<th>Present name and status</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>H. annulifer</em> de Man, 1921</td>
<td>Criconema annuliferum (de Man, 1921) Micoletzky, 1925</td>
</tr>
<tr>
<td><em>H. aquatius</em> (Micoletzky, 1913) Menzel, 1917</td>
<td>Hemicycliophora aquatica (Micoletzky, 1913) Loos, 1948</td>
</tr>
<tr>
<td><em>H. brady</em> Steiner &amp; LeHew, 1933</td>
<td>Scutellonema brady (Steiner &amp; LeHew, 1933) Andrássy, 1958</td>
</tr>
<tr>
<td><em>H. quernei</em> (Certes, 1889) Menzel, 1917 (partially)</td>
<td>Criconema giardi (Certes, 1889) Micoletzky, 1925</td>
</tr>
<tr>
<td><em>H. quernei</em> nec Certes, 1889 from Schneider, 1923; from Stefanski, 1924</td>
<td>Ogma menzeli (Stefanski, 1924) Schuurmans Stekhoven &amp; Teunissen, 1938</td>
</tr>
<tr>
<td><em>H. quernei</em> (Certes, 1889) Menzel, 1917 (partially)</td>
<td>Ogma menzeli (Stefanski, 1924) Schuurmans Stekhoven &amp; Teunissen, 1938</td>
</tr>
<tr>
<td><em>H. informis</em> Micoletzky, 1922</td>
<td>Criconemella informis (Micoletzky, 1922) Luc &amp; Raski, 1981</td>
</tr>
<tr>
<td><em>H. menzeli</em> Stefanski, 1924</td>
<td>Ogma menzeli (Stefanski, 1914) Schuurmans Stekhoven &amp; Teunissen, 1938</td>
</tr>
<tr>
<td><em>H. murrayi</em> (Southern, 1914) Menzel, 1917</td>
<td>Ogma murrayi Southern, 1914</td>
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<tr>
<td><em>H. octangularis</em> (Cobb, 1914) Menzel, 1917</td>
<td>Ogma octangularis (Cobb, 1914) Schuurmans Stekhoven &amp; Teunissen, 1938</td>
</tr>
<tr>
<td><em>H. rusticus</em> var. <em>peruensis</em> Steiner, 1920</td>
<td>Criconemella peruensis (Steiner, 1920) Luc &amp; Raski, 1981</td>
</tr>
<tr>
<td><em>H. similis</em> (Cobb, 1918) Micoletzky, 1922</td>
<td>Criconemoides similis (Cobb, 1918) Chitwood, 1949 (Now species inquirenda)</td>
</tr>
<tr>
<td><em>H. sinensis</em> Rahm, 1937</td>
<td>Criconemoides sinensis (Rahm, 1937) Goodey, 1951 (Now species inquirenda)</td>
</tr>
<tr>
<td><em>H. squamosus</em> (Cobb, 1913) Menzel, 1917</td>
<td>Hemicriconemoides squamosus (Cobb, 1913) Siddiqi &amp; Goodey, 1963 (Now species inquirenda)</td>
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<tr>
<td><em>H. thienemanni</em> Schneider, 1925</td>
<td>Hemicycliophora thienemanni (Schneider, 1925) Loos, 1948</td>
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<tr>
<td><em>H. uniformis</em> Thorn, 1949</td>
<td>Rotylenchus robustus (de Man, 1876) Filipjev, 1936</td>
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<tr>
<td><em>H. zavadskii</em> Tulaganov, 1941</td>
<td>Criconemella zavadskii (Tulaganov, 1941) De Gis &amp; Loof, 1965</td>
</tr>
</tbody>
</table>
hemizonid in species with no or fewer than four incisures. Esophagus well developed; esophageal glands overlapping intestine dorsally and laterally, containing 3–6 nuclei. Epipygium present, distinct or indistinct, single or double. Vulva median; two outstretched genital branches. Tail short, terminus hemispherical to bluntly rounded, annulated. Phasmids large, scutellum-like, one prevulval, one postvulval (in H. abelmoschi adjacent to vulval area, one anterior and one posterior; in H. puertoricensis prevulval; and in H. californicus and H. tabacum postvulval). Lateral field with 0–4 incisures.

Male. When present, generally similar to females (except for reproductive structures) but slightly smaller. Tail short. Spicules well developed, arcuate with distal flanges, variable in size. Bursa extending to tail tip. Gubernaculum large, protrusible, with titillae and telamon.

**LIST OF VALID HOPLOLAIMUS SPECIES**

(Hoplolaimus species transferred to other genera with their present name and status in Table 1.)

Type species

1. *Hoplolaimus tylenchiformis* Daday, 1905
   syn. *Criconema tylenchiformis* (Daday) Micoletzky, 1917
   lapsus calami *H. paradoxus* Daday, 1905

Other species (with synonyms)

2. *Hoplolaimus abelmoschi* Tandon & Singh, 1973
   *B. aegypti* (Shafiee & Koura, 1969) Shamsi, 1979
   *H. aegypti* by Luc, 1981
   *B. aegypti* by Siddiqi, 1986
4. *H. aorolaimoides* Siddiqi, 1972
5. *H. californicus* Sher, 1963
   *Hoplolaimoides californicus* (Sher, 1963) Shakil, 1973
   *Hoplolaimus californicus* (Sher, 1963) Siddiqi, 1986
   *H. pararobustus* by Siddiqi, 1986
   *H. pararobustus* by Siddiqi, 1986
   *B. cephalus* (Mulk & Jairajpuri, 1976) Shamsi, 1979
   *B. cephalus* by Siddiqi, 1986
   *B. chambus* (Jairajpuri & Baqri, 1973) Shamsi, 1979
   *H. columbus* by Khan, 1978 in Siddiqi, 1986
    *B. citri* M. L. Khan & S. H. Khan, 1985
11. *H. clarissimus* Fortuner, 1973
    *B. clarissimus* (Fortuner, 1973) Shamsi, 1979
    *H. clarissimus* by Luc, 1981
    *B. clarissimus* by Siddiqi, 1986
12. *H. columbus* Sher, 1963
    *B. columbus* (Sher, 1963) Shamsi, 1979
    *H. columbus* by Luc, 1981
    *B. columbus* by Siddiqi, 1986
    *B. dimorphicus* (Mulk & Jairajpuri, 1976) Shamsi, 1979
    *H. dimorphicus* by Luc, 1981
    *B. dimorphicus* by Siddiqi, 1986
    *B. dubius* (Chaturvedi, Singh & Khera, 1979) Siddiqi, 1986
    *Nemonchus galeatus* Cobb, 1913
    *Hoplolaimus coronatus* Cobb, 1923
18. *H. indicus* Sher, 1963
    *B. indicus* (Sher, 1963) Shamsi, 1979
    *H. indicus* by Luc, 1981
H. arachidis (Maharaju & Das, 1982) Siddiqi, 1986
B. arachidis (Maharaju & Das, 1982) Siddiqi, 1986
B. indicus by Siddiqi, 1986

B. jalalabadiensis M. L. Khan & S. H. Khan, 1985

20. H. magnistylus Robbins, 1982
Tylenchorhynchus robustus Schuurmans Stekhoven, 1936
Tylenchorhynchus pararobustus Schuurmans Stekhoven & Teunissen, 1938
Rotylenchus pararobustus (Schuurmans Stekhoven & Teunissen) Filipjev & Schuurmans Stekhoven, 1941
Hoplolaimus proporicus Goodey, 1957
Gottholdsteineria pararobusta (Schuurmans Stekhoven & Teunissen) Andrássy, 1958
Hoplolaimus angustalatus Whitehead, 1959
Hoplolaimus kittenbergeri Andrássy, 1961
22. H. puertoricensis Ramírez, 1964
B. puertoricensis (Ramírez, 1964) Siddiqi, 1986
23. H. sacchari (Shamsi, 1979) Luc, 1981
B. sacchari Shamsi, 1979
B. sacchari by Siddiqi, 1986
24. H. seinhorsti Luc, 1958
B. seinhorsti (Luc, 1958) Shamsi, 1979
H. seinhorsti (Luc, 1958) Luc, 1981
B. seinhorsti by Siddiqi, 1986
25. H. seshadrii Mulk & Jairajpuri, 1976
B. seshadrii (Mulk & Jairajpuri, 1976) Shamsi, 1979
H. seshadrii by Luc, 1981
B. seshadrii by Siddiqi, 1986
26. H. sheri Suryawanshi, 1971
B. sheri (Suryawanshi, 1971) Siddiqi, 1986
H. seinhorsti by Siddiqi, 1986
27. H. singhi Das & Shivaswamy, 1977
B. singhi (Das & Shivaswamy, 1977) Siddiqi, 1986
28. H. stephanus Sher, 1963
29. H. tabacum Firoza, Nasira & Maqbool, 1990

Species inquirenda:
Hoplolaimus steineri Kannan, 1961 (by Krall, 1978)

Nomina nuda:
Hoplolaimus gadsdenensis Thames in Sher, 1963
Hoplolaimus neocoronatus Whitten in Sher, 1961

DISCUSSION
In our opinion, the few characters differentiating Hoplolaimus and Basirolaimus do not justify retaining the genus Basirolaimus. Instead, we consider these as useful supplemental diagnostic characters for differentiation of species within the Hoplolaimus group. We agree with Luc (7), Robbins (8), and Fortuner (2) in the synonymization of Basirolaimus with Hoplolaimus.

Shakil (9) proposed the genus Hoplolaimoides for Hoplolaimus californicus, which has both scutella posterior to the vulva. If Hoplolaimoides were accepted, a second new genus should be proposed for Hoplolaimus puertoricensis in which both scutella are anterior to the vulva (2); and further, a third new genus might be established for Hoplolaimus concaudajuvencus where larval heteromorphism is present, which is a useful character of possible phylogenetic relationship of Hoplolaimus to allied groups of nematodes. We agree with Siddiqi (12) in synonymizing Hoplolaimoides with Hoplolaimus.

The known range of variation for many Hoplolaimus species (no. or %) is limited to observations of specimens in single populations from the type locality. Further and more extensive morphological studies, including SEM, of specimens in a broader spectrum of habitats is needed to further clarify the relationships and identities of these species.

**HOPLOLAIMUS Species Key**

1. Lateral field with 4 incisures; excretory pore posterior to hemizonid (except H. sacchari) 2
2. Lateral field with 0–3 incisures;
excretory pore anterior to hemizonid .......................... 10
2. Esophageal glands with 3 nuclei .................................. 3
2. Esophageal glands with 6 (or 5) nuclei .......................... 9
3. Stylet 30–35 μm, basal knobs with poorly developed anterior projections .............. H. aorolaimoides
3. Stylet 38–61 μm, basal knobs with pronounced anterior projections ....... 4
4. Both scutella located below center of body ........................... H. californicus
4. Scutella anterior and posterior to vulva ............................... 5
5. Larvae heteromorphic; tails of J1 and J2 conically pointed with an acute terminus; female stylet knobs markedly tulip-shaped, heavily dentate anteriorly and tending to close upon stylet shaft ................ H. concaudajuvencus
5. Larvae not heteromorphic; tails of J1 and J2 rounded; female stylet knobs open tulip-shaped and not as dentate or closed anteriorly ...... 6
6. Stylet 56 (52–61) μm; intestine not overlapping rectum .... H. magnistylus
6. Stylet 42–52 μm; intestine overlapping rectum ........................................ 7
7. Lip region with 3 or 4 annules; female tail usually bluntly rounded .......... H. tylenchiformis
7. Lip region with 4 or more annules; tail usually rounded ....................... 8
8. Head annules 5; basal annule with 32–36 longitudinal striae; spicule 40–52 μm .......... H. galeatus
8. Head annules 4; basal annule with 24–28 longitudinal striae; spicule 30–38 μm .......... H. stephanus
9. Stylet 46–53 μm; basal annule of head with 18–31 longitudinal striations; hemizonid anterior to excretory pore; spicule 56–62 μm .......... H. clarissimus
9. Stylet 33–35 μm; basal annule of head with 8 longitudinal striations; hemizonid posterior to excretory pore; spicule 39–40 μm ........ H. sacchari
10. Esophageal glands with 3 nuclei ................................... 11
10. Esophageal glands with 6 (or 5) nuclei .................................. 16
11. Lateral field absent ............................................. 12
11. Lateral field with 1 or 2 incisures (except H. pararobustus sometimes shows 2 or 3 incomplete incisures) 13
12. Body length 1.2 mm; stylet 40 μm; tail short, c = 46 .......... H. casparus
12. Body length 1.4–2.1 mm; stylet 40 μm; tail long, c = 53–75 ... H. singhi
13. Lateral field with 1 incisure (except H. pararobustus sometimes shows 2 or 3 incomplete incisures) ............. 14
13. Lateral field with 2 incisures .......... 15
14. Stylet 34–37 μm, basal annule of head with 29–30 longitudinal striations; spicule 37–45 μm; gubernaculum 18–20 μm ........ H. impalensis
15. Scutella anterior and posterior to vulva; intestine not overlapping rectum; spicule 51–70 μm; gubernaculum 19–30 μm .......... H. capensis
15. Scutella adjacent to vulval area; intestine overlapping rectum; spicule 44–47 μm; gubernaculum 13–18 μm .......... H. abelmoschi
16. Lip region smooth, no annules ..................................... H. cephalus
16. Lip region annulated .................................................. 17
17. Scutella either pre- or postvulval ................................. 18
17. Scutella anterior and posterior to vulva ........................................ 19
18. Scutella prevulval .......... H. puertoricensis
18. Scutella postvulval ........... H. tabacum
19. Parthenogenetic; spermatheca absent or, if present, without sperm; males absent or rare .................... 20
19. Bisexual; spermatheca with sperm; males present .................................. 25
20. Epiptygma absent; lateral field narrow, aerolated, with 2 incisures .......... H. sheri
20. Epiptygma present; lateral field absent, with breaks only, or 1 incisure (often indistinct) ............... 21
21. Lateral field absent or with 1 in-
cisure, which is often indistinct; epiptygma single or double ........ 22
21. Lateral field with breaks only; epiptygma double .............. 24
22. Intestine not overlapping rectum; head annules 4; excretory pore usually at level of isthmus; epiptygma single ............... H. seinhorsti
22. Intestine completely or partially overlapping rectum; head annules 3; excretory pore posterior to isthmus; epiptygma double ............... 23
23. Head setoff, not bilobed, basal annule with 10-15 longitudinal striae; female tail with 16-22 annules ........ H. columbus
23. Head continuous, bilobed, basal annule with 20-22 longitudinal striae; female tail with 14-18 annules ..................... H. seshadrii
24. Basal annule of lip region with 6 longitudinal striae; c = 58 (52-67); V = 55 (52-56); tail with 9-13 annules ....................... H. chambus
25. Stylet 45-50 µm; spicule 54-65 µm ...................................... H. aegypti
25. Stylet 31-45 µm; spicule 34-47 µm ................................ 26
26. Lateral field usually with 1 stria, sometimes 2-4 irregular discontinuous striae ........................................ 27
26. Lateral field absent ........................................... 28
27. Intestine overlapping rectum; o = 15 (13-18); epiptygma single or double .............................. H. indicus
27. Intestine not overlapping rectum; o = 9-11; epiptygma single ........ .............................................. H. dubius
28. Lip region with 2-3 annules, basal annule with 18-21 longitudinal lines; tail with 6-10 annules ........ H. dimorphicus
28. Lip region with 4 annules, basal annule with 10-12 longitudinal lines; tail with 12-15 annules ........ H. citri (Khan & Khan, 1985) n. comb.

LITERATURE CITED
### Table 2. Diagnostic data on species of *Hoplolaimus* females and male spicules.

<table>
<thead>
<tr>
<th>Species</th>
<th>Length (mm)</th>
<th>Lateral incisures†</th>
<th>Esophageal gland nuclei</th>
<th>Stylet length (µm)</th>
<th>Labial annules</th>
<th>Longitudinal striae on basal lip annule</th>
<th>Excretory pore in relation to hemizonid</th>
<th>Intestinal post-rectal sac</th>
<th>Phasmids in relation to vulva</th>
<th>Tail annules</th>
<th>Males (µm)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>H. abelnoschi</em></td>
<td>1.63</td>
<td>2</td>
<td>3</td>
<td>43.3 (42-47)</td>
<td>5</td>
<td>25-28</td>
<td>Anterior</td>
<td>Present</td>
<td>Both adjacent, one anterior &amp; one posterior</td>
<td>9-15</td>
<td>Present</td>
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<tr>
<td>Tandon &amp; Singh, 1973</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>46 (44-47)</td>
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<tr>
<td><em>H. aegypti</em></td>
<td>1.3-1.9</td>
<td>1</td>
<td>5</td>
<td>45-50</td>
<td>4</td>
<td>13-22</td>
<td>Anterior</td>
<td>Present</td>
<td>One anterior &amp; one posterior</td>
<td>17-27</td>
<td>Present</td>
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<td>Shafiee &amp; Koura, 1969</td>
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<td></td>
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<td></td>
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<td></td>
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<td>54-65</td>
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<tr>
<td><em>H. aorolaimoides</em></td>
<td>0.85</td>
<td>4</td>
<td>5</td>
<td>32.8 (31-35)</td>
<td>4-5</td>
<td>6-13</td>
<td>Posterior</td>
<td>Present</td>
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<td>10</td>
<td>Present</td>
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<td>Siddiqi, 1972</td>
<td>(0.80-0.92)</td>
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<td>(31-37)</td>
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<td>3</td>
<td>46-53</td>
<td>6</td>
<td>36</td>
<td>Posterior</td>
<td>Present</td>
<td>Both posterior</td>
<td>14</td>
<td>Present</td>
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<td>45-55</td>
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<tr>
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<td>5-6</td>
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<td>Present</td>
<td>One anterior &amp; one posterior</td>
<td>9-16</td>
<td>Present</td>
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<td>51.4-69.8</td>
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<td>1.2</td>
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<td>3</td>
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<td>Absent</td>
<td>One anterior &amp; one posterior</td>
<td>12</td>
<td>Present</td>
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<td>0</td>
<td>6</td>
<td>34</td>
<td>0</td>
<td>0</td>
<td>Anterior</td>
<td>Absent</td>
<td>One anterior &amp; one posterior</td>
<td>6</td>
<td>Present</td>
</tr>
<tr>
<td>Mulk &amp; Jairajpuri, 1976</td>
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<td></td>
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<td></td>
<td>33-38</td>
</tr>
<tr>
<td><em>H. chambus</em></td>
<td>1.4</td>
<td>With breaks</td>
<td>6</td>
<td>43 (41-45)</td>
<td>3</td>
<td>6</td>
<td>Anterior</td>
<td>Present</td>
<td>One anterior &amp; one posterior</td>
<td>9-13</td>
<td>Unknown</td>
</tr>
<tr>
<td>Jairajpuri &amp; Baqr, 1973</td>
<td>(1.24-1.62)</td>
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<td><em>H. citri</em> (Khan, M. L. &amp; S. H. Khan) n. comb.</td>
<td>0.84-1.27</td>
<td>0</td>
<td>6</td>
<td>35-37</td>
<td>4</td>
<td>10-12</td>
<td>Anterior</td>
<td>Absent</td>
<td>One anterior &amp; one posterior</td>
<td>12-15</td>
<td>Present</td>
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<td><em>H. clarissimus</em></td>
<td>1.60</td>
<td>4</td>
<td>6</td>
<td>46-52.5 (46-52.7)</td>
<td>4</td>
<td>18-31</td>
<td>Posterior</td>
<td>Present</td>
<td>One anterior &amp; one posterior</td>
<td>20-26</td>
<td>Present</td>
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<tr>
<td>Fortuner, 1973</td>
<td>(1.58-1.83)</td>
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<td></td>
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<td></td>
<td></td>
<td>58.5 (55.5-61.5)</td>
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<td><em>H. columbus</em></td>
<td>1.26-1.80</td>
<td>1</td>
<td>6</td>
<td>40-48</td>
<td>3</td>
<td>10-15</td>
<td>Anterior</td>
<td>Present</td>
<td>One anterior &amp; one posterior</td>
<td>16-22</td>
<td>Rarely present</td>
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<tr>
<td>Sher, 1963</td>
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<td>36.6-52.5</td>
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<td><em>H. concaudajuvenescens</em></td>
<td>1.12-2.04</td>
<td>4</td>
<td>3</td>
<td>54.9</td>
<td>5-6</td>
<td>36</td>
<td>Posterior</td>
<td>Absent</td>
<td>One anterior &amp; one posterior</td>
<td>10</td>
<td>Present</td>
</tr>
<tr>
<td>Golden &amp; Minton, 1970</td>
<td></td>
<td></td>
<td></td>
<td>(50.4-56.6)</td>
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<td>(45-56)</td>
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<tr>
<td>Species</td>
<td>Length (mm)</td>
<td>Lateral incisures</td>
<td>Esophageal gland nuclei</td>
<td>Stylet length (μm)</td>
<td>Labial annules</td>
<td>Longitudinal striae on basal lip annule</td>
<td>Excretory pore in relation to hemizonid</td>
<td>Intestinal post-rectal sac</td>
<td>Phasmids in relation to vulva</td>
<td>Tail annules</td>
<td>Males</td>
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<tr>
<td><em>H. dimorphicus</em> Mulk &amp; Jairajpuri, 1976</td>
<td>1.15–1.64</td>
<td>0?</td>
<td>6</td>
<td>34–36</td>
<td>2–3</td>
<td>18–21 Anterior Absent</td>
<td>One anterior &amp; one posterior</td>
<td></td>
<td>6–10 Present</td>
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<tr>
<td><em>H. dubius</em> Chaturvedi, Singh &amp; Khera, 1979</td>
<td>1.05–1.27</td>
<td>1 (or 2–4 irregular)</td>
<td>6</td>
<td>31–42</td>
<td>3</td>
<td>14 Anterior Absent</td>
<td>One anterior &amp; one posterior</td>
<td></td>
<td>10–15 Present</td>
<td></td>
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<tr>
<td><em>H. imphalensis</em> Khan, M. L. &amp; S. H. Khan, 1985</td>
<td>0.95–1.35</td>
<td>1</td>
<td>3</td>
<td>34–37</td>
<td>3–4</td>
<td>29–30 Anterior Present</td>
<td>One anterior &amp; one posterior</td>
<td></td>
<td>12–14 Present</td>
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<td><em>H. indicus</em> Sher, 1963</td>
<td>0.95–1.63 (or 2–3 incomplete)</td>
<td>6</td>
<td>33–47</td>
<td>3–4</td>
<td>6–20 Anterior Present</td>
<td>One anterior &amp; one posterior</td>
<td></td>
<td>14 Present (8–22)</td>
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<td>34–42</td>
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<tr>
<td><em>H. magnistylus</em> Robbins, 1982</td>
<td>1.58 (1.36–1.97)</td>
<td>4</td>
<td>3</td>
<td>55.7 (52–61)</td>
<td>5</td>
<td>28 Posterior Absent</td>
<td>One anterior &amp; one posterior</td>
<td></td>
<td>12–17 Present</td>
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<tr>
<td><em>H. pararobustus</em> (Sch. Stekh. &amp; Teunissen, 1938) Sher, 1963</td>
<td>0.95–1.60 (2–3)</td>
<td>3</td>
<td>38–49</td>
<td>4–5</td>
<td>18–25 Anterior Present</td>
<td>One anterior &amp; one posterior</td>
<td></td>
<td>7–15 Present</td>
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<td>40–57</td>
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<td><em>H. puertoricensis</em> Ramírez, 1964</td>
<td>1.3–1.7</td>
<td>0?</td>
<td>5</td>
<td>41–45</td>
<td>3</td>
<td>6–9 Anterior Absent</td>
<td>Both anterior</td>
<td></td>
<td>19 Unknown</td>
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<td>Species</td>
<td>Length</td>
<td>Segments</td>
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<td>Anterior</td>
<td>Posterior</td>
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<td>H. seinhorstii</td>
<td>1.06–1.56</td>
<td>1</td>
<td>6</td>
<td>40–49</td>
<td>4</td>
<td>8–12</td>
<td>Absent</td>
<td>One anterior &amp; one posterior</td>
<td>10–15</td>
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<td>Luc, 1958</td>
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<td>H. sehadii</td>
<td>1.45–1.77</td>
<td>0?</td>
<td>6</td>
<td>42–43</td>
<td>3</td>
<td>20–22</td>
<td>Anterior</td>
<td>Present</td>
<td>One anterior &amp; one posterior</td>
<td>14–18</td>
<td>Unknown</td>
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<td>Mulik &amp; Jairajpuri, 1976</td>
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<td>H. sherii</td>
<td>1.16–1.48</td>
<td>2</td>
<td>6</td>
<td>40–45</td>
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<td>Anterior</td>
<td>Absent</td>
<td>One anterior &amp; one posterior</td>
<td>12</td>
<td>Unknown</td>
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<td>Suryawan-shi, 1971</td>
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<td>H. singhii Das &amp; Shivaswamy, 1977</td>
<td>1.43–2.07</td>
<td>0</td>
<td>3</td>
<td>43–56</td>
<td>4</td>
<td>Unknown</td>
<td>Anterior?</td>
<td>Absent</td>
<td>One anterior &amp; one posterior</td>
<td>7</td>
<td>Present</td>
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<td>H. stephanus</td>
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<td>24–28</td>
<td>Posterior</td>
<td>Present</td>
<td>One anterior &amp; one posterior</td>
<td>12</td>
<td>Present</td>
</tr>
<tr>
<td>Sher, 1963</td>
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<td>H. tabacum</td>
<td>1.3</td>
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<td>6</td>
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<td>3–4</td>
<td>Unknown</td>
<td>Anterior</td>
<td>Present</td>
<td>Both posterior</td>
<td>12–15</td>
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<td>Firoza, Nasira &amp; Maqbool, 1990</td>
<td>(1.3–1.4)</td>
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<td>H. tylenchiiformis</td>
<td>0.86–1.39</td>
<td>4</td>
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<td>42–51</td>
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<td>20–24</td>
<td>Posterior</td>
<td>Present</td>
<td>One anterior &amp; one posterior</td>
<td>8–14</td>
<td>Present</td>
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<td>Daday, 1905</td>
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† Species with four incisures in the lateral field have excretory pore located below hemizonid (except H. sacchari). Species with 0–3 incisures, or with breaks only in the lateral field have excretory pore located above the hemizonid.

‡ Larval heteromorphism present: J1 and J2 conically pointed with an acute terminus.