

Morphological Characteristics of *Hoplolaimus indicus* Sher, 1963 in Canada, a Parasite of Wild Rice

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Abstract: *Hoplolaimus indicus* Sher, 1963 was found for the first time in North America as a parasite of wild rice. Supplemental descriptive data, supported by illustrations, are given which extend the known range of variability in this species. The body, stylet, and tail lengths were often greater than those in published reports from India, the esophageal gland overlap was consistently shorter than body width in most specimens, and the excretory pore and vulva were more posterior. Longitudinal striae of the basal head annule ranged from 6 to 20, number of tail annules from 8 to 22, and the excretory pore extended at most 27 μm anterior or 22 μm posterior of the esophagointestinal valve. A taxonomic key is provided to facilitate the separation of the 13 species of *Hoplolaimus* having five or six esophageal gland nuclei. *Key words:* taxonomy, morphology. *Journal of Nematology* 15(3):366-369. 1983.

In late November 1980 a bisexual species of *Hoplolaimus* Daday, 1905 was extracted with *Hirschmanniella pisquidensis* Ebsary and Pharoah, 1982 from the roots of wild rice, *Zizania aquatica* var. *angustifolia*. The plants were growing in a meter of fresh, neutral or slightly alkaline water in Pisquid Pond, Prince Edward Island. Study of 27 females and 5 males convinced me that the species is conspecific with *H. indicus* Sher, 1963, which was previously known to occur only in India and Thailand. In India this species is a serious pest of a wide variety of fruit, vegetable, fiber, and cereal crops, including upland and lowland rice. The presence of *H. indicus* in Canada on wild rice establishes a new host and distribution record, and identifies a potential threat to wild rice. This paper amends the descriptive characters for *H. indicus* and extends the known range of variability.

Description of Canadian specimens of *Hoplolaimus indicus* Sher, 1963

Female ($n = 27$): L = 1,337 μm (1,090–1,629); a = 31 (25–37); b = 9.2 (8.1–10.6);

b' = 7.8 (5.7–9.0); c = 55 (33–81); c' = 0.8 (0.6–1.2). V = 55 (52–57); anterior ovary = 21% (13–31), posterior ovary = 21% (13–25). Anterior phasmid = 35% (33–45); posterior phasmid = 79% (76–88). Stylet length = 40 μm (33–47); M = 49 (46–55); O = 15 (13–18).

Body curved ventrally to varying degrees; width 44 μm (33–59). Transverse body annules 2 μm (1.4–2.4) wide, interrupted and open at lateral field, or delineated by irregular patterns of longitudinal of varying lengths (Fig. 1 G). Head set-off from body, hemispherical, with three or four transverse annules divided irregularly by longitudinal or oblique striae. Basal head annule of seven specimens having 6, 7, 10, 13, 14, 15, and 20 segments of variable size (Fig. 1 C). Head width 15 μm (13–18), height 7 μm (6–9).

Excretory pore 142 μm (111–174) posterior to head end, located 3–27 μm anterior to esophagointestinal valve in 17 specimens, at level of valve in 2 specimens, 5–22 μm posterior in 9 specimens. Hemizonid 1–8 body annules posterior to excretory pore. Esophagus 171 μm (132–214) long, 146 μm (117–179) to esophagointestinal valve. Isthmus 37 μm (27–43) long; basal esophageal glands 50 μm (31–64) long, extending 28 μm (8–49) posterior to esophagointestinal valve, with 59% (36–85) of the glands anterior to valve and 54% (26–80) posterior.

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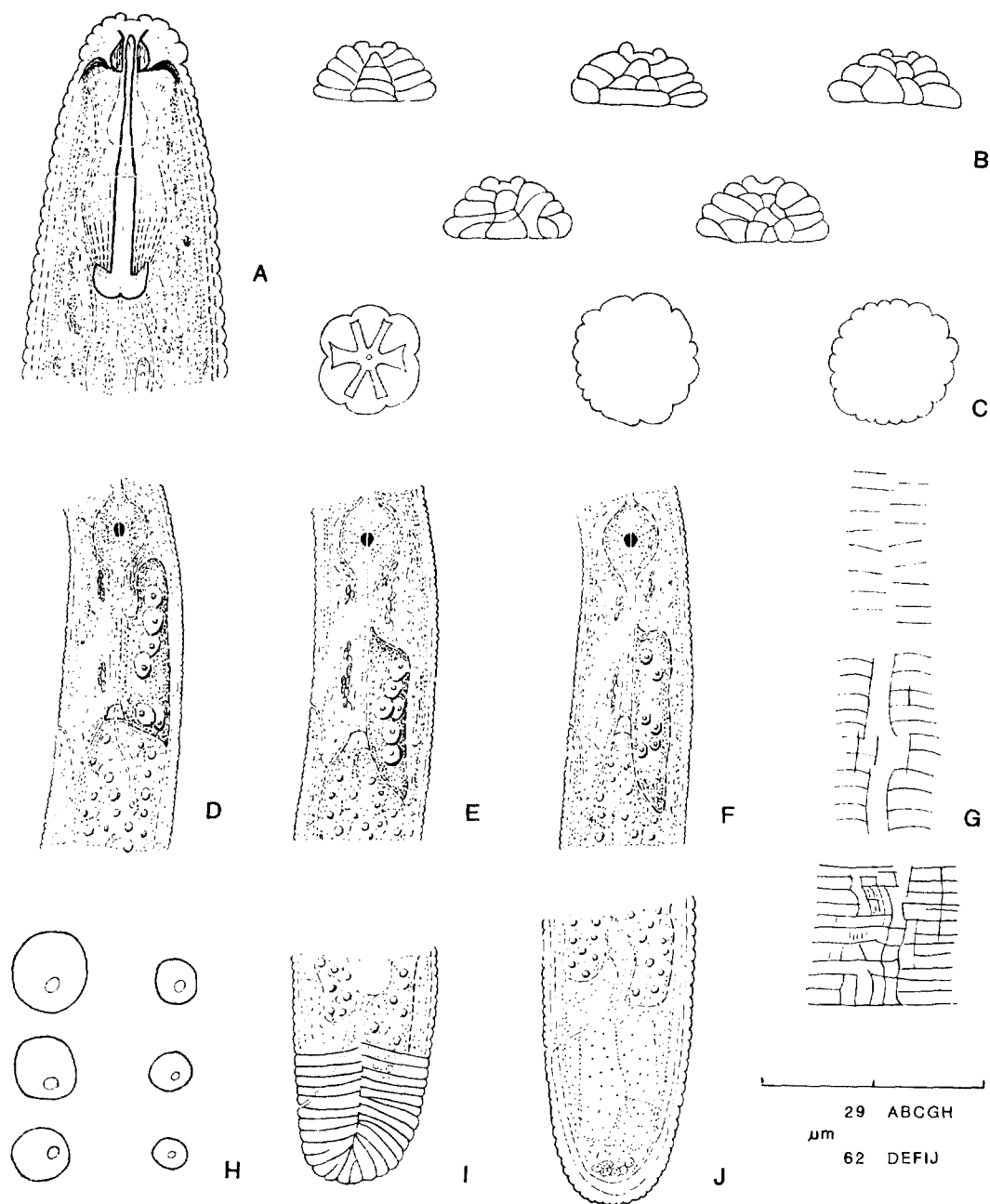


Fig. 1. Morphological variation in females of *Hoplolaimus indicus* Sher, 1963 from Canada. A) Anterior end of adult. B) Variation in segmentation of head annules in lateral view. C) Variation in number and spacing of longitudinal striae of basal head annule. D-F) Esophageal glands showing the typical short overlap of the intestine and variable arrangement of gland nuclei. G) Variable surface features of lateral field. H) Range in size of esophageal gland nuclei. I, J) Female tail. Note wide range in tail length and number of annules.

Esophageal gland nuclei six, distinct in all specimens, with diameter 4–10 μm (Fig. 1 H), of nearly constant size within a specimen.

Females young with germ cells in early

stages of gametogenesis. Vulval epiptygma double in all specimens, usually folding into vulval atrium. Spermatheca with sperm in six specimens, empty or indistinct in others. Intestine densely globular, turgid, over-

lapping rectum to varying degrees but never extending into tail, without overlap in one female. Rectum 25 μm (22–31) long, at least 65% of anal body width. Tail 29 μm (16–45) long, longer than anal body width in four females, with terminus broadly rounded; cuticle markedly thickened, in two distinct layers. Tail annules on ventral surface, to midterminus, 14 (8–22).

Male (n = 5): L = 1,041 μm (965–1,133); a = 33 (31–34); b = 10.1 (8.6–11.4); b' = 7.3 (6.3–8.7); c = 37 (33–40); c' = 1.4 (1.3–1.5). Anterior phasmid 36% (32–39), posterior phasmid 82% (79–83). Stylet length = 34 μm (32–35); M = 50 (48–52); O = 14 (12–16). Spicule length 37 μm (34–41), gubernaculum = 20 μm (19–21).

Male similar to female in general morphological characteristics but with proportionately smaller dimensions.

DISCUSSION

Morphometrical characters for *H. indicus* given by Sher (5), Khan and Chawla (4), and Dasgupta et al. (2) agree well with those of the Canadian population, although Indian specimens tend to be smaller. Characters that are more variable in Canadian specimens compared with Indian specimens are (i) body length 1.1–1.6 mm (over 1.4 mm in 26% of specimens) versus 0.9–1.4 mm; (ii) stylet length 33–47 μm (over 40 μm in 44% of specimens) versus 33–43 μm ; (iii) position of excretory pore 111–174 μm from head end (over 140 μm in 63% of specimens) versus 115–130 μm ; (iv) position of vulva 52–67% (over 60% in 26% of specimens) versus 50–59%; and (5) tail length, c' = 0.6–1.2 (over 0.7 in 50% of specimens) versus 0.7. Variation observed in the lateral field, number of longitudinal striae on basal head annule, placement of phasmids in either right or left lateral field, variable position of the excretory pore, presence or absence (rare) of an intestinal overlap of the rectum, and number of tail annules are consistent with data for Indian populations (1).

The Canadian population of *H. indicus* is notable by the length of the esophageal gland overlap of the intestine. The gland overlap is exceptionally short for *Hoplolaimus* spp. (Fig. 1 D, E, F), being less than the corresponding body width in 75% of

all females examined. The gland overlap expressed as a ratio of neck width to gland overlap is 0.8 (0.2–1.6), with 40% of specimens ranging from 0.2–0.5 and 35% ranging from 0.6–0.9. The coefficient of gland overlap, the distance from the anterior part of the metacorporeal valve to the end of the gland lobe (3) is 36% (17–55) compared to 50% (28–67) in nine paratypes provided by A. M. Golden. Specimens from India had a coefficient of gland overlap of 24–76% (1). Because of the wide ranges in the coefficient of gland overlap, this measurement is of doubtful value in separating species of *Hoplolaimus*. Similarly, the long rectum in Canadian specimens (Fig. 1J), as compared to a short rectum (only a third of the anal body width) reported by Khan and Chawla (4), is not judged to be a valid, differential character. The rectum in paratypes of *H. indicus* examined, as well as that in six paratypes of *H. columbus* Sher, 1963, were as long as those in Canadian specimens, although illustrated as short by Sher (5).

The following taxonomic key is for those species of *Hoplolaimus* having six (? or five) esophageal gland nuclei. Some of the species are separable only by characters of weak or doubtful stability.

1. Lateral body incisures four, areolated 2
Lateral body incisures less than four, or absent 3
2. Stylet 46–53 μm long. Hemizonid anterior to excretory pore.
Spicules 56–62 μm long
..... *H. clarissimus* Fortuner, 1973
Stylet 34–53 μm long. Hemizonid posterior to excretory pore.
Spicules 39–40 μm long
..... *H. sacchari* (Shamsi, 1979) Luc, 1981
3. Head smooth, lacking annules
..... *H. cephalus* Mulk & Jairajpuri, 1976
Head annulated, basal annule with longitudinal striae 4
4. Head continuous, or slightly set-off
..... *H. seshadrii* Mulk & Jairajpuri, 1976
Head strongly set-off by deep constriction 5
5. Phasmids located anterior to vulva
..... *H. puertoricensis* Ramirez, 1964
One phasmid anterior, one posterior to vulva 6
6. Parthenogenetic; spermatheca absent or, if present, without sperms; males

- absent or rare 7
 Bisexual; spermatheca with sperms;
 males present 10
7. Basal head annule with about 20 longi-
 tudinal striae.
 Epiptygma absent
 *H. sheri* Suryawanshi, 1971
 Basal head annule with 15 or fewer
 longitudinal striae.
 Epiptygma present 8
8. Intestine not overlapping rectum
 *H. seinhorsti* Luc, 1958
 Intestine overlapping rectum 9
9. Basal annule of head with six longi-
 tudinal striae. Hemizonid 6-11 body
 annules posterior to excretory pore.
 Epiptygma usually single
 *H. chambus* Jairajpuri & Baqri, 1973
 Basal annule of head with 10-15 longi-
 tudinal striae. Hemizonid 2-5 annules
 posterior to excretory pore. Epiptygma
 usually double
 *H. columbus* Sher, 1963
10. Stylet 45-50 μm long. Spicules 55-65
 μm *H. aegypti* Shafiee & Koura, 1969
 Stylet less than 45 μm long. Spicules
 less than 50 μm 11
11. Intestine overlapping rectum
 *H. indicus* Sher, 1963
 Intestine not overlapping rectum 12
12. Lateral field absent. Basal head annule
 with at least 18 longitudinal striae
 *H. dimorphicus* Mulk & Jairajpuri, 1976
 Lateral field marked by irregular longi-
 tudinal striae. Basal head annule with
 fewer than 15 longitudinal striae
 *H. dubius* Chaturvedi, Singh,
 & Khera in Chaturvedi & Khera, 1979

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