

**TWO NEW SPECIES OF THE GENUS
HALAPHANOLAIMUS DE MAN, 1876 (NEMATODA: LEPTOLAIMIDAE)
FROM CANGIO MANGROVE FOREST, VIETNAM**

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SUMMARY

New brackish water nematode species *Halaphanolaimus cangionensis* sp.nov, and *Halaphanolaimus rivalis* sp.nov collected from Cangio mangrove forest, Hochiminh city of Vietnam are described. *Halaphanolaimus cangionensis* sp.nov is characterized by the absence of somatic and cervical setae, comparatively slender tail, presence of caudal apophysis of the gubernaculum and comparatively short spicules. New species *Halaphanolaimus cangionensis* sp.nov resembles to *Halaphanolaimus harpaga* Boucher, Bovee, 1972 and *Halaphanolaimus luridus* (Timm, 1963) but differs from *H. harpaga* by the absence of somatic and cervical setae, more anterior position of vulva, another structure of gubernaculums and other arrangement of precloacal supplements. The new species differs from *H. luridus* by the more slender tail, longer stoma, another structure of gubernaculums and shorter spicules. *Halaphanolaimus rivalis* sp.nov is characterized by the presence of somatic and cervical setae, long spicules and pre-equatorial vulva. New species *Halaphanolaimus rivalis* sp.nov, resembles to *Halaphanolaimus luridus* (Timm, 1963) and *L. lorenzei* Boucher, Bovee, 1972 but *H. rivalis* sp.n. differs from *H. luridus* by the presence of somatic and cervical setae, more wide labial region, longer stoma, shorter spicules. *H. rivalis* sp.n. differs from *H. lorenzei* by the thicker body, longer stoma and longer spicules. Key to six valid species of the genus *Halaphanolaimus* are given.

Key words: Nematoda, *Halaphanolaimus*, new species, Cangio mangrove, Vietnam.

Fauna of free-living brackish water and marine nematodes of Vietnam is studied recently. At present, this investigating field on nematode biodiversity is strongly improved, in connection with creating of the new database for the biomonitoring assessment of water quality in watershed and wetland ecosystems of whole Vietnam. This work is a part of the Vietnam National Project for study of biodiversity and free-living nematode fauna of the Cangio mangrove forest, belongs to the Hochiminh city of Vietnam during 2000-2005 years. Cangio mangrove forest located in the South of Hochiminh city, Vietnam with latitude: 10°22'14''-10°40'09'' and longitude: 106°46'12''-107°00'59''. The nematode samples

were collected at the March and April 2002-2004. In this paper, two new species of the Leptolaimidae, *Halaphanolaimus cangionensis* sp.nov, *Halaphanolaimus rivalis* sp.nov are described.

I. MATERIAL AND METHODS

Samples are done from a boat using a Ponar grab. In each station one grab is collected with three replicated for nematodes analysis, all samples are fixed in hot formalin 10%. The nematodes are extracted by LUDOX - TM 50 solution with centrifugation method and gradually transferred to anhydrous glycerin and finally mounted into permanent slides.

Abbreviation used in the text:

L. total body length (μm); a. body length divided by maximum body width; b. body length divided by pharyngeal length; c. body

length divided by tail length; c'. tail length measured in cloacal body diameters; V. relation of distance from anterior body end to vulva for body length at per cent.

II. DESCRIPTION

1. *Halaphanolaimus cangionensis* sp.nov (fig.1)

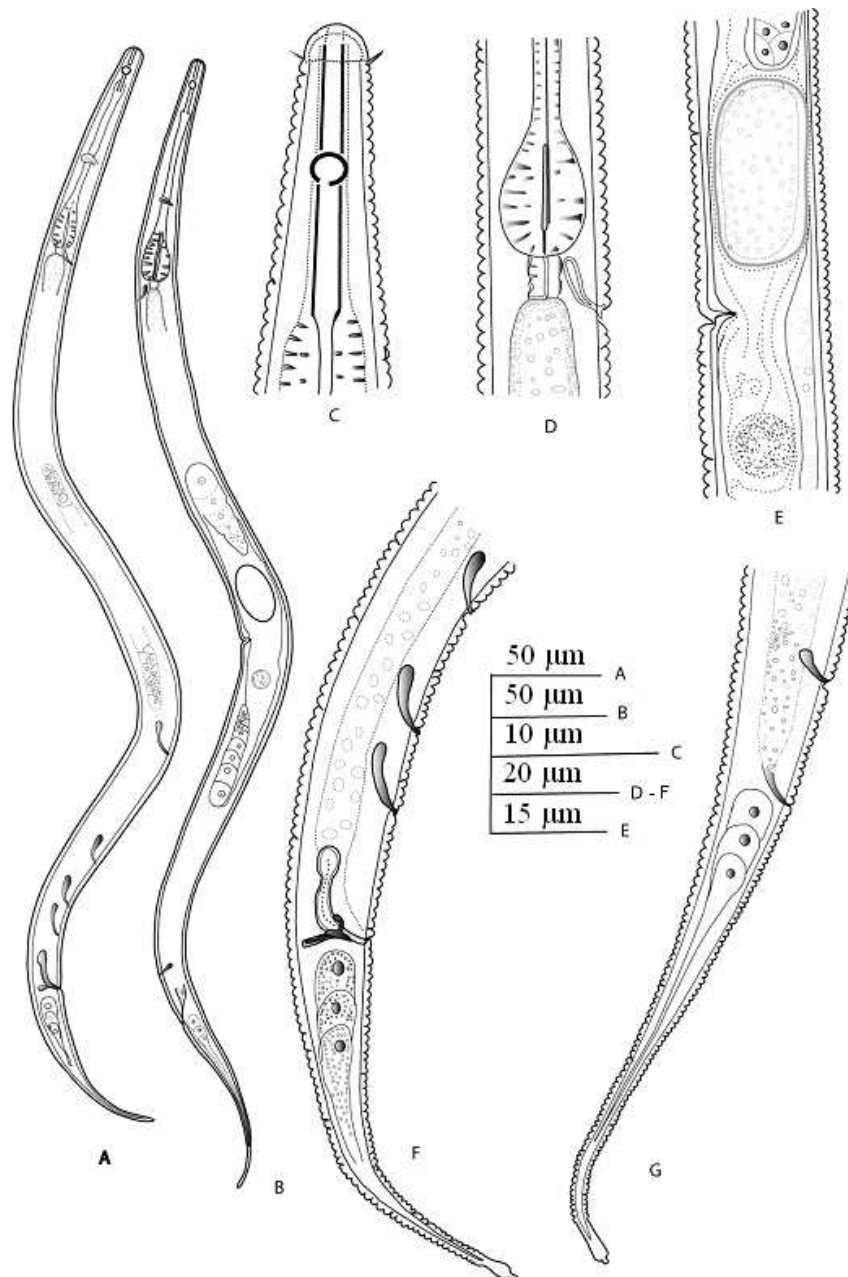


Fig.1. *Halaphanolaimus cangionensis* sp.nov

A. Entire male; B. Entire female; C. Head region; D. Cardial region of male;
E. Vulva region; F. Posterior end of male; G. Posterior end of female.

Measurements: Table 1.

Female: small, slender worms. Cuticle coarse annulated; annules 1.2-1.5 μm wide. Thickness of cuticle in vulva region about 1.0 μm . Lateral fields 1.3-1.5 wide, extend from middle of oesophagus length to one a third of tail length. Somatic setae absent. Labial region isolated from the rest of body. Labial papillae not visible. Four cephalic setae 1.5-2.0 μm long, disposed in the base of labial region. Amphidial fovea in form of the circle turn below, 1.8-2.0 μm in diameter, its anterior margin situated 7.0-8.0 μm from anterior body end. Stoma narrow and long tube-shaped, 14-18 μm long (3.5-4.5 labial region width). Oesophagus slender, muscular, basal bulb well developed, its length approximately equal to corresponding body width. Ventral gland, its canal and excretory

pore not observed. Cardia muscular, 6.5-8.5 μm long. One tubular supplement 8.0-8.5 μm long, situated ventrally at level of intestine beginning. This tubular supplement absent at two females. Rectum length shorter than anal body width. One tubular supplement situated ventrally at distance 20-21 μm (1.8-1.9 anal body width) from anus. Reproductive system didelphic, amphidelphic; ovaries antidromous. Vulva as a rule praequatorial. Vagina situated perpendicularly to longitudinal axis of the body; its length approximately equal to one a third of corresponding width. One or two eggs in uterus, 36-39 \times 15-17 μm . Tail slender, gradually narrowing. Papillae and setae at tail absent. Terminus of tail smooth, not annulated and slightly swollen. Caudal glands and spinneret well developed.

Table 1

Measurements of *Halaphanolaimus cangionensis* sp.nov (all measurements in μm , except ratio)

Characteristics	Holotype ♂	Paratypes			
		11 ♂♂		13 ♀♀	
		range	mean	range	mean
L	537	502-571	532	499-570	535
a	32	28-37	32	24-30	27
b	5.1	4.7-5.5	5.2	4.9-5.5	5.2
c	6.6	6.6-7.6	7.0	5.7-7.1	6.3
c'	5.8	5.0-6.3	5.5	6.8-8.1	7.4
V%	-	-	-	47.2-50.4	48.3
Oesophagus length	106	101-106	103	90-107	103
Posterior end of oesophagus to vulva	-	-	-	136-182	155
Vulva to anus	-	-	-	175-203	192
Posterior end of oesophagus to cloaca	350	322-388	353	-	-
Tail length	81	70-84	76	76-91	85
Labial region width	4.0	3.5-4.0	4.0	3.5-4.5	4.0
Stoma length	18	15-18	17	14-18	16
Cephalic setae length	2.0	1.5-2.0	1.75	1.5-2.0	1.8
Amphid fovea to body head	8.0	7.0-8.0	7.5	7.0-8.0	7.5
Spicules length (along arch)	17	16-18	17	-	-

Male: cuticle coarse annulated. Lateral fields extend from middle of oesophagus to one a third of tail length. Somatic setae absent. Labial region isolated from the rest of body.

Labial papillae not visible. Cephalic setae 1.5-2.0 μm long, situated in the base of labial region. Amphidial fovea in form of the circle, torn below, about 2.0 μm in diameter, its

anterior margin situated 7.0-8.0 μm from anterior body end. Stoma in form narrow tube, 15-18 μm long. Oesophagus slender, muscular with well developed basal bulb. Cardia muscular, 7.0-9.0 μm long. One tubular supplement situated at level of the intestine beginning. This tubular supplement absent at one male. Testes paired, opposed. Spicules paired, strongly curved, with well developed capituli. Gubernaculum with one dorsal apophysis and two narrow ventral apophyses. Precloacal ventromedian supplements in form cuticularized tubes, 11-13 μm long, 4 in number always. Supplements situated at different distance one after another. The longest distance being between fourth and third supplements. Distance between supplements (at brackets being the mean quantities). Cloaca to fourth, 18-22(20) μm ; fourth to third 11-17(15) μm ; third to second, 19-23(20) μm ; second to first, 43-76(55) μm . Common length of supplemental row being 93-126 μm . Papillae or setae at precloacal region between supplements absent. Tail slender, gradually narrowing. Caudal setae absent. Tail-tip slightly swollen and smooth, not annulated. Caudal glands and spinneret well developed.

Type locality and habitat: Thi Vai river, mangrove forest Cangio, Hochiminh city, Vietnam. Depth of waters 1.5-4.5 m, fine silt, salinity 16-25‰.

Type material: holotype male on slide number 48/II and paratypes 3 ♂♂ and 4 ♀♀ on slide 48b/II deposited at the nematode collection of the Institute of Inland Waters Biology, Borok, Russia. Paratypes 7 ♂♂ and 8 ♀♀ on slide 48c/II deposited at the nematode collection of the Institute of Ecology and biological Resources, Vietnamese Academy of Science and Technology, Hanoi, Vietnam

Differential diagnosis: the new species resembles to *Halaphanolaimus harpaga* Boucher, Bovee, 1972 and *Halaphanolaimus luridus* (Timm, 1963) but differs from *H. harpaga* by the absence of somatic and cervical setae, more anterior position of vulva (in *H. harpaga*, $V = 51-53\%$ in new species $V = 47.2-50.4\%$), another structure of gubernaculum and other arrangement of precloacal supplements (Boucher, Bovee, 1972). The new species differs

from *H. luridus* by the more slender tail (in *H. luridus*, $c' = 4.0-4.5$ vs $c' = 5.0-8.1$ in the new species), longer stoma (in *H. luridus*, stoma 8 μm vs 14-18 μm in new species), another structure of gubernaculum and shorter spicules (in *H. luridus*, spicules 35 μm vs 16-18 μm in new species) (Timm, 1963).

Etymology: the species is referred to its type locality: Cangio mangrove forest of Vietnam.

2. *Halaphanolaimus rivalis* sp.nov (Fig.2)

Measurements: Table 2.

Female: Small, slender worms. Cuticle coarse annulated, annules 1.5 μm wide. Thickness of cuticle 1.0-1.5 μm , lateral fields about 1.5 μm wide, extend from middle of oesophagus length to one a third of tail length. Somatic setae situated at cervical region and at the tail. Labial region isolated from the rest of body. Labial papillae not visible. Four cephalic setae about 3.0-3.5 μm long (50% of labial region width) disposed in the base of labial region. Amphidial fovea in form of the torn below circle, 3.0 μm in diameter, its anterior margin situated 6.5-7.5 μm from anterior body end. Cervical setae short, 2 μm long. Stoma in form of the narrow and long tube, 21-22 μm long (3.3-3.5 lip region width). Oesophagus slender, muscular, its basal bulb well developed, pear-shaped, its length approximately equal to corresponding body width. Ventral glands cell, its canal and excretory pore not observed. Cardia muscular, 7-9 μm long. One tubular supplement, 11 μm long, situated ventrally at level of intestine beginning. Rectum length slightly shorter than anal body diameter. Anal opening hardly observed. One tubular supplement situated ventrally, at distance 31-35 μm from anus (3.0-3.5 anal body width). Reproductive system didelphic, amphidelphic, with an ovaries antiodromous. Vulva pre-equatorial. Vagina situated perpendicularly to longitudinal axis of the body, its length approximately an equal to one a third of corresponding body width. Tail slender, gradually narrowing. Tail tip smooth, not annulated and slightly swollen, with 3-4 short setae 2 μm long situated at the tail. Caudal glands and spinneret well developed.

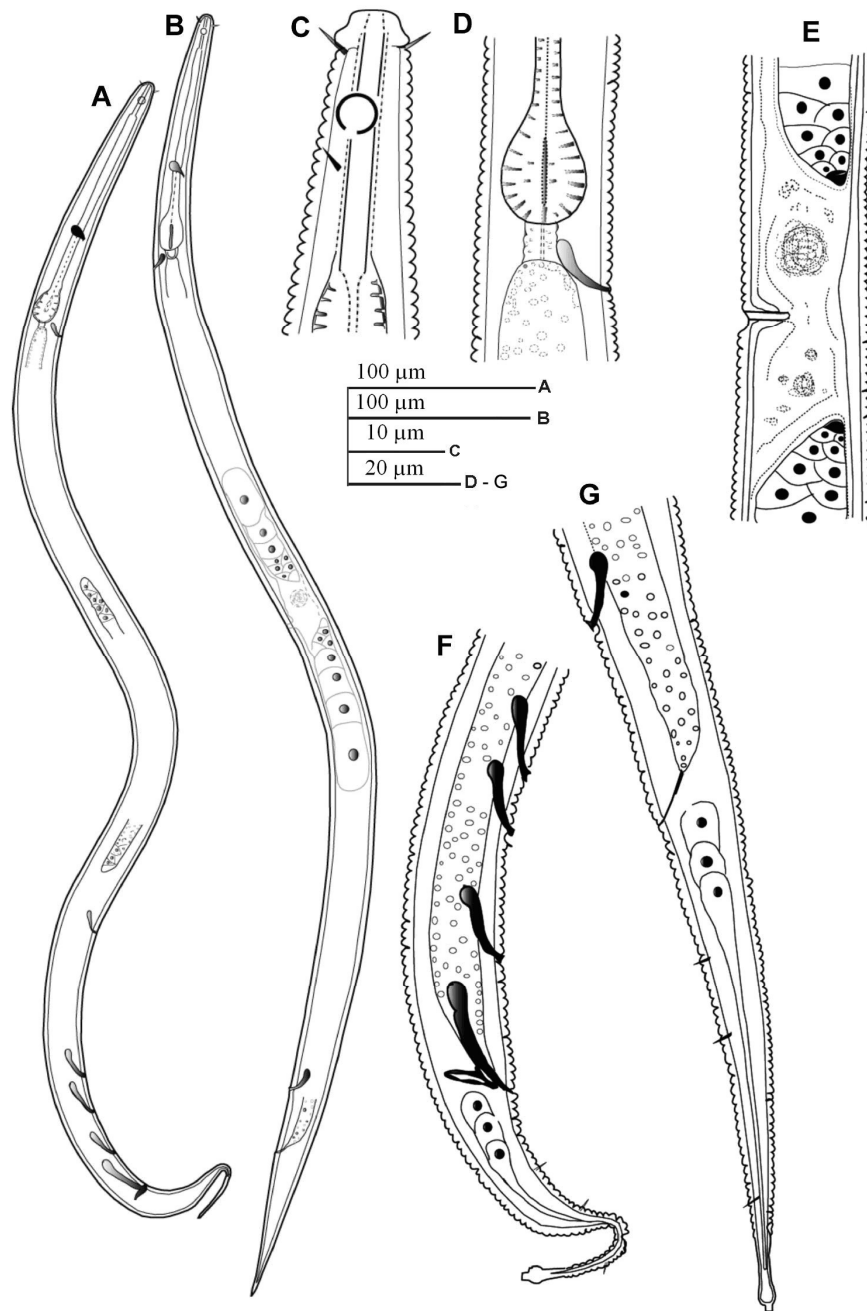


Fig. 2. *Halaphanolaimus rivalis* sp.nov

A. Entire male; B. Entire female; C. Head region; D. Oesophagus bulb;
E. Vulva region; F. Spicule structure with precloacal supplements; G. Tail of female.

Male: similar to females in general morphology. Cuticle coarse annulated. Lateral fields extend from middle of oesophagus to one a third of tail length. Labial region isolated from the rest of body. Labial papillae not visible. Cephalic setae 3.0-3.5 μm long. Cervical setae 2

μm long. Amphidial fovea in form of the circle, torn below, 3.0 μm in diameter, its anterior margin situated 7.0-8.0 μm from anterior body end. Stoma in form narrow tube, 19-21 μm long. Oesophagus slender, muscular, its basal bulb well developed. Cardia muscular, 7-9 μm long.

One tubular supplement, 12-13 μm long, situated at intestine beginning. One setae, 3 μm long, disposed in front of the cloaca. Testes paired, opposed. Spicules paired, strongly curved, with well developed capituli. Gubernaculum with one caudal apophysis. Precloacal ventromedian supplements in form cuticularized tubes, 14-18 μm long 4 in number always. Supplements situated at different distance one after another. The longest distance being between first (the distantest from cloaca) and second supplement; the smallest distance

being between second and third supplements. Distance between supplements (at brackets being the mean quantities): cloaca to fourth, 25-28(27) μm ; fourth to third, 22-30(25) μm ; third to second, 13-17(14) μm ; second to first, 76-94(86) μm . Common length of supplement row being 149-158 μm . Papillae and setae at precloacal region between supplements absent. Tail slender, gradually narrowing. Tail armed 3-5 short setae, 2 μm long. Tail tip smooth, not annulated and slightly swollen. Caudal glands and spinneret well developed.

Table 2

Measurements of *Halaphanolaimus rivalis* sp.n. (all measurements in μm , except ratio)

Characteristics	Holotype ♂	Paratypes			
		7 ♂♂		3 ♀♀	
		range	mean	range	mean
L	724	686-754	717	696-748	719
a	30	30-37	33	30-36	33
b	5.3	5.3-5.8	5.5	5.3-6.1	5.7
c	9.9	7.8-9.9	8.8	7.8-9.0	8.2
c'	4.0	4.0-5.8	4.5	5.5-7.8	6.8
V%	-	-	-	45.7-49.3	47.9
Oesophagus length	136	122-137	130	122-132	127
Posterior end of oesophagus to vulva	-	-	-	207-224	217
Vulva to anus	-	-	-	263-308	284
Posterior end of oesophagus to cloaca	515	476-529	505	-	-
Tail length	73	70-92	82	7-98	91
Labial region width	6.0	5.5-6.0	6.0	5.5-6.0	6.0
Stoma length	21	19-21	20	20-21	20.5
Cephalic setae length	3.0	3.0-3.5	3.0	3.0-3.5	3.0
Amphid fovea to body head	7.5	7.0-8.0	7.5	6.5-7.5	7.0
Spicules length (along arch)	28	27-28	27.5	-	-

Type locality and habitat: Thi Vai river, mangrove forest Cangio, Hochiminh city, Vietnam. Depth of waters 1,5-4,5 m, fine silt, salinity 16-25‰.

Type material: holotype male on slide number 50/II and paratypes 1 ♂ and 2 ♀♀ on slide 50b/II deposited at the nematode collection of the Institute of Inland Waters Biology, Borok, Russia. Paratypes 5 ♂♂ and 1 ♀♀ on slide 50c/II deposited at the Nematode collection of the Institute of Ecology and Biological

Resources, Vietnamese Academy of Science and Technology, Hanoi, Vietnam

Differential diagnosis: the new species resembles to *Halaphanolaimus luridus* (Timm, 1963) and *L. lorenzeni* Boucher, Bovee, 1972, *H. rivalis* sp.n. differs from *H. luridus* by the presence of somatic and cervical setae, more wide labial region (in *H. luridus*, labial region 4.0-4.5 μm wide vs 5.5-6.0 μm wide in new species), longer stoma (in *H. luridus*, stoma 8 μm long vs 19 = 21 μm long in new species),

from the genus *Leptolaimus* to the genus *Halaphanolaimus*: *H. luridus* and *H. lorenzeni*. Thus, six valid species of the genus *Halaphanolaimus* are known at present (table 3).

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HAI LOÀI TUYẾN TRÙNG MỚI THUỘC GIỐNG *HALAPHANOLAIMUS* DE MAN, 1876 (NEMATODA: LEPTOLAIMIDAE) Ở RỪNG NGẬP MẶN CẦN GIÒ, VIỆT NAM

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TÓM TẮT

Khu hệ Tuyến trùng nước lợ, Tuyến trùng biển và Tuyến trùng ở hệ sinh thái rừng ngập mặn Việt Nam chỉ mới được nghiên cứu trong mấy năm gần đây. Cho đến nay, trên toàn thế giới, 9 loài thuộc giống *Halaphanolaimus* Southern, 1914 đã được mô tả là các loài *H. pellucidus* Southern, 1914; *H. longisetosus* Allgen, 1928; *H. minutus* Stekhoven, 1942; *H. norvegicus* Allgen, 1945; *H. luridus* (Timm, 1963); *H. harpaga* Boucher, Bovee, 1972; *H. lorenzeni* Boucher, Bovee, 1972; *H. cangionensis* sp.nov; *H. rivalis* sp.nov Tuy nhiên hai loài *H. longisetosus* Allgen, 1928 và *H. norvegicus* Allgen, 1946 đã được Gerlach et Riemann, 1973 chuyển sang giống *Alaimella* Cobb, 1920, Loài *H. minutus* Stekhoven, 1942 được mô tả chỉ dựa vào 1 con cái và không có nhú sinh dục phụ hình ống tại vùng gần cổ, do vậy được chuyển sang loài chưa đủ cơ sở dữ liệu để mô tả (*species inquirenda*). Boucher, Bovee, 1972 mô tả loài tuyến trùng mới *H. harpaga* và tu chỉnh giống này với việc chuyển từ giống *Leptolaimus* sang giống *Halaphanolaimus* hai loài *H. luridus* và *H. lorenzen*. Như vậy cộng cả hai loài vừa mô tả tại Việt Nam, trong giống này hiện đã biết 6 loài.

Loài tuyến trùng mới *Halaphanolaimus cangionensis* sp.nov tương đối giống loài *Halaphanolaimus harpaga* Boucher, Bovee, 1972 và loài *Halaphanolaimus luridus* (Timm, 1963), tuy nhiên loài mới khác biệt so với loài *H. harpaga* bởi chúng không có các lông somatic và các lông cổ; vị trí lỗ sinh dục cũng nằm về nửa trước nhiều hơn (ở loài *H. harpaga*, $V = 51-53\%$ so với $V = 47,2-50,4\%$ ở loài mới). Ngoài ra, loài mới cũng có cấu tạo miếng đệm của gai sinh dục rất đặc trưng và cách sắp xếp của các nhú phụ sinh dục (Boucher, Bovee, 1972). Loài mới cũng khác biệt loài *H. luridus* bởi có cấu trúc đuôi dài hơn (ở *H. luridus*, $c' = 4,0-4,5$ so với $c' = 5,0-8,1$ ở loài mới), xoang miệng dài hơn (ở *H. luridus*, xoang miệng dài 8 μm so với 14-18 μm của loài mới) và có gai sinh dục ngắn hơn (ở *H. luridus*, gai sinh dục dài 35 μm so với 16-18 μm ở loài mới).

Loài Tuyến trùng mới *Halaphanolaimus rivalis* sp.n. tương đối giống loài *Halaphanolaimus luridus* (Timm, 1963) và loài *L. lorenzeni* Boucher, Bovee, 1972, tuy nhiên khác loài *H. luridus* ở chỗ loài mới có nhiều lông somatic, lông cổ, vùng môi rộng hơn (ở *H. luridus*, vùng môi rộng 4,0-4,5 μm so với 5,5-6,0 μm ở loài mới), loài mới có xoang miệng dài hơn (ở *H. luridus*, xoang miệng dài 8 μm so với 19-21 μm ở loài mới) và chiều dài gai sinh dục dài hơn (ở *H. luridus*, gai sinh dục dài 27-28 μm so với 35 μm ở loài mới).

Loài tuyến trùng mới *Halaphanolaimus rivalis* sp.n. khác biệt so với loài *H. lorenzeni* bởi cơ thể dầy, mập hơn (ở *H. lorenzeni*, $a = 40-45$ so với $a = 30-37$ μm ở loài mới), gai sinh dục dài hơn (ở loài *H. lorenzeni*, gai sinh dục dài 16 μm so với 27-28 μm ở loài mới).

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