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THREE NEW AND FOUR KNOWN SPECIES OF THE GENUS *APORCELAIMELLUS* HEYNS, 1965 (NEMATODA: DORYLAIMIDA) FROM WEST BENGAL, INDIA

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INTRODUCTION

The genus *Aporcelaimellus* was erected by Heyns, 1965 belonging to the family Aporcelaimidae Heyns, 1965 under the order Dorylaimida. Tjepkema *et. al.,* (1971) provided a general review of the genus. Determination keys to the species were given by Baqri and Jairajpuri (1968) and Thorne (1974) respectively. Baqri & Khera (1975) transferred 12 species from *Eudorylaimus* Andrassy, 1959 to *Aporcelaimellus*. Andrassy (2002) synonymised 17 species and transferred 24 species of *Aporcelaimellus* to other genera and provided a key to the species. Gantait *et al.,* (2008) compiled the genus and also provided the species key including 49 valid species under the genus. Three new viz. *Aporcelaimellus istvani* n. sp., *A. tiasiae* n. sp., *A. wasimi* n. sp. and four known species viz. *A. amazonicus* Andrassy, 2004; *A. budauniensis* Khatoon and Sharma, 2000; *A. obtusicaudatus* (Bastian, 1865) Altherr, 1968; *A. subhasi* Gantait *et. al.,* 2006 of the genus are being described and illustrated herein. *A. budauniensis* is being reported first time from West Bengal; *A. amazonicus* and *A. obtusicaudatus* are being reported first time from India.

MATERIALS AND METHODS

Specimens were collected from rhizospheric soil of different cucurbitaceous plants from different localities of the district North 24-Paganas, West Bengal, India. Nematodes were extracted from soil by Cobb's sieving technique (Cobb, 1918) and decanting method followed by Modified Baermann's funnel technique (Christie and Perry, 1951); processed by Seinhorst's slow dehydration method (Seinhorst, 1959); mounted on slides in anhydrous glycerin and sealed. Specimens were identified following the taxonomic key, made by Jairajpuri and Ahmad (1992). Measurements were taken with the help of an ocular micrometer using Olympus research microscope with drawing-tube attachment, model no. BX 41. Dimensions were presented in accordance with De Man's formula (De Man, 1884). Positions of the oesophageal gland nuclei were presented according to Andrássy's formula (Andrássy, 1998). Diagrams were drawn with the help of a camera lucida.

De Man's Formula

- L = body length
- a = body length / maximum body width
- b = body length / oesophageal length
- b' = body length / distance from head end to posterior end of oesophageal glands
- c = body length / tail length
- c' = tail length / body width at anus

V = distance from head end to vulva x 100 / body length

V' = distance from head end to vulva x 100 / distance from head end to anus

G_1 = anterior genital branch x 100 / body length

G_2 = posterior genital branch x 100 / body length

Andrássy's formula

Glandularium = distance between dorsal oesophageal gland and oesophago-intestinal junction which contains two pairs of oesophageal gland nuclei

D = distance between head end and dorsal oesophageal gland x 100 / oesophageal length

AS_1 = distance between dorsal oesophageal gland and first anterior sub-ventral oesophageal gland x 100 / glandularium

AS_2 = distance between dorsal oesophageal gland and second anterior sub-ventral oesophageal gland x 100 / glandularium

PS_1 = distance between dorsal oesophageal gland and first posterior sub ventral oesophageal gland x 100 / glandularium

PS_2 = distance between dorsal oesophageal gland and second posterior sub ventral oesophageal gland x 100 / glandularium

SYSTEMATIC ACCOUNTS

Order DORYLAIMIDA Pearse, 1942
Suborder Dorylaimina, Pearse, 1936
Superfamily Dorylaimoidea De Man, 1876
Family Aporcelaimidae Heyns, 1965
Subfamily Aporcelaiminae Heyns, 1965
Genus *Aporcelaimellus* Heyns, 1965

Aporcelaimellus istvani n. sp.
(Table-1; Figs. 1 & 2)

Material examined: 6 females.

Measurements: Shown in Table 1.

Description: Female: Body ventrally curved upon fixation. Body plump, tapering slightly towards the tail but more strongly in the anterior part of neck towards the lip region which is only one-fourth or less the maximum body width. Cuticle with two thin transparent outer layers followed by a slight broader layer, which is then followed by a thick main layer with transverse striations. Total cuticle width is 7-9 µm at mid body and 10-12 µm at tail. Dorsal and ventral body pores distinct. Two to four dorsal pores in the anterior part of the neck and numerous ventral pores over the entire body are present. Lateral chords about one-third of total body width at mid body. Lips separated with prominent papillae, labial region separated from the adjoining body by deep constriction. Amphids stirrup-shaped with its aperture 11-12µm wide or about half of the corresponding body width. Odontostyle 1.3-1.4 lip region width long, its aperture is more than half of its length. Odontophore rod-like 2.6-2.7 of the odontostyle length. Guiding ring single, non sclerotised, plicated and located at 0.8-0.9 lip region width from anterior end. Nerve ring encircling the anterior slender part of oesophagus at 22-24% of the oesophageal length from anterior end. Oesophageal expansion gradual, expanded part occupying about 60-61% of the total oesophageal length. Cardia conoid about one-forth to one fifth as long as corresponding body width. Genital system amphidelphic with both the branches equally developed. Ovary reflexed with oocytes arranged in a single row except near the tip. Oviduct joins the ovary subterminally. Vulva longitudinal. Vagina extending about 30-32% of the corresponding body width and with 5-6 muscle bands. Vulva vaginal junction with moderate sclerotisation. Prerectum 2.5-2.6 and rectum about 0.8 anal body width long. Tail conoid with convex dorsal contour and a small subdigitate projection at the tail tip, 0.6-0.7 anal body width long with a pair of caudal pores on each side.

Male: Not found

Type habitat and locality: Specimens were collected by the first author on 26.6.2007 from the

Table-1: Measurements of *Aporcelaimellus istvani* n. sp. (all measurements are in µm except L in mm).

Morphometric characters	Holotype female (n = 5)	Paratype females	Mean ± SD
L	3.435	3.506 – 3.603	3.492 ± 0.12
a	24.89	24.49 – 25.28	24.94 ± 0.41
b	4.16	4.02 – 4.21	4.13 ± 0.10
c	70.1	73.82 – 75.84	74.83 ± 1.01
c'	0.61	0.61 – 0.63	0.62 ± 0.01
V	50.22	49.96 – 50.31	50.12 ± 0.18
G_1	20.01	19.45 – 21.25	20.44 ± 0.91
G_2	18.85	19.23 – 21.25	20.46 ± 1.08
Height of lip	10	8.75 – 10	9.58 ± 0.72
Lip width	25	-	25 ± 0
Amphid position	15	13.75 – 15	14.17 ± 0.72
Guiding ring	22.5	21.25 – 22.5	21.67 ± 0.72
Nerve ring	195	187.5 – 202.5	197.5 ± 8.66
Stylet length	32.5	32.5 - 35	33.33 ± 1.44
Stylet aperture	20	20 – 21.25	20.42± 0.72
Odontophore	65	65 - 67.5	65.83 ± 1.44
Oesophageal length	852.5	837.5 – 855	844.17 ± 9.46
Expanded oesophagus	518.5	502.5 – 517.5	510.83 ± 7.63
DO	367.5	367.5 – 391.25	382.08 ± 12.76
AS_1 from DO	187.5	187.5 - 202.5	195 ± 7.5
AS_2 from DO	207.5	207.5 – 215	211.67 ± 3.82
PS_1 from DO	372	367.5 – 382.5	376.67 ± 8.04
PS_2 from DO	402.5	395 - 412.5	404.17 ± 8.78
Cardia	27.5	27.5 – 30	28.33 ± 1.44
Maximum width	138	137.5 – 142.5	140 ± 2.5
Anterior end to vulva	1725	1682.5 – 1812.5	1750.5 ± 65.21
Vaginal length	42.5	42.5 – 45	33.33 ± 1.44
Vaginal width	21.5	21.5 – 28.75	17.92 ± 0.73
Pars distalis	1.25	1.25 – 2.75	2.58 ± 0.14
Pras refringes	3.75	-	3.75 ± 0
Pars proximalis	17.5	17.5 – 29.75	18.25 ± 1.29
Anterior gonad	745	655 – 745	714.17 ± 51.26
Uterus	147.5	120 – 147.5	136.67 ± 14.65
Oviduct	280	255 -280	269.5 ± 12.97
Ovary	347.5	255 – 347.5	308 ± 47.71
Posterior gonad	752.5	647.5 – 752.5	715 ± 58.57
Uterus	152.5	122.5 – 152.5	140.83 ± 16.47
Oviduct	277.5	237.5 – 277.5	252.17 ± 22.03
Ovary	363.5	247.5 – 363.5	322 ± 64.66
Rectum	61.5	58.75 – 62.5	61.25 ± 2.17
Prerectum	192.5	185 – 192.5	188.33 ± 3.82
Tail length	49	45 – 47.5	46.67 ± 1.44

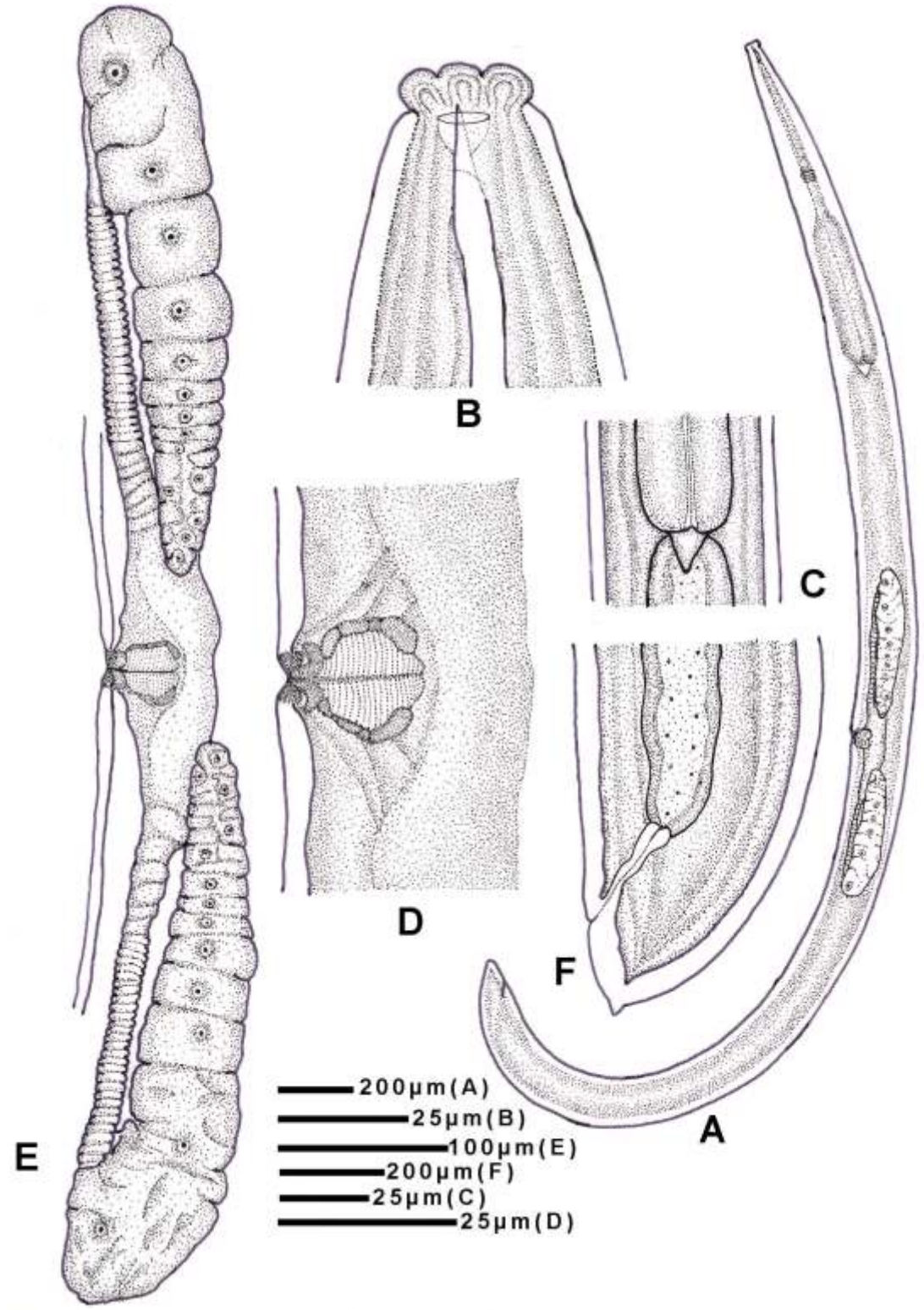

Fig. 1: Camera lucida drawings of *Aporcelaimellus istvani* n. sp.; A. Entire female; B. Lip region and Odontostyle of female; C. Cardia of female; D. Vulval region; E. Gonads; F. Tail region of female.

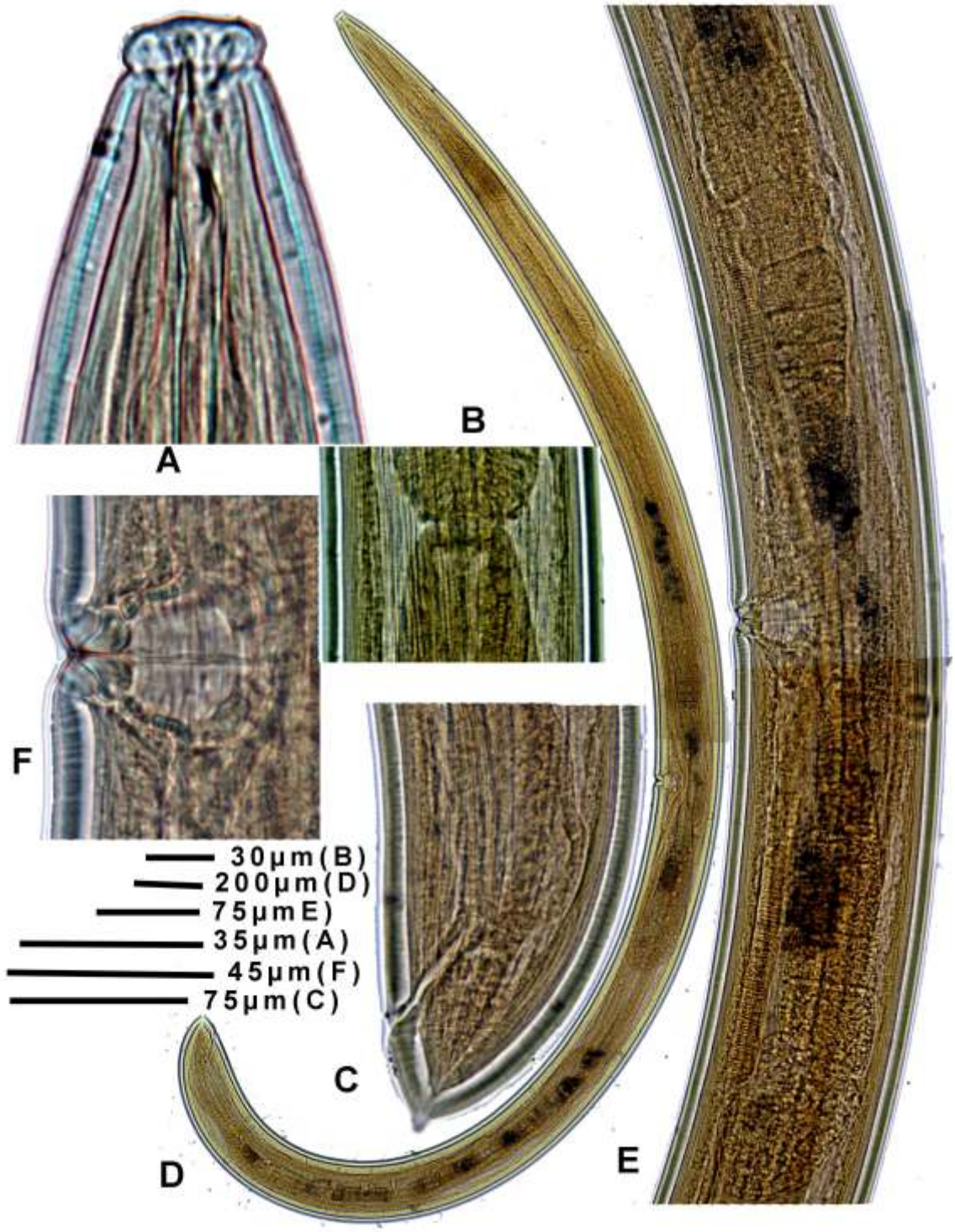

Fig. 2: Photomicrographs of *Aporcelaimellus istvani* n. sp; A. Lip region and Odontostyle of female; B. Cardia of female; C. Tail region of female; D. Entire female; E. Gonads; F. Vulval region.

rhizospheric soil of snake cucumber (*Cucumis utilissimus* L.) from the Village Madhyamgram, district North 24-Parganas, West Bengal, India.

Type materials: Specimens were deposited in the National Zoological Collections of the Zoological Survey of India, Kolkata, West Bengal, India under the Registration No.WN1348 (Holotype) and WN1349 (Paratypes) on glass slide.

Differential diagnosis and relationships: *The present species* is characterized by its large and robust size (L= 3.5-3.6 mm); separated and prominent labial papillae with lip region separated from the adjoining body by deep constriction; conoid cardia; longitudinal vulva with 5-6 muscle bands and presence of moderate sclerotisation in the vulva vagina junction; unspecialized uterus with equally developed gonads and hemispherical tail with a small centrally located subdigitate projection. Out of all the known valid species, the present species closely resembles the following species.

The species under discussion in its general morphology bears a close resemblance with *Aporcelaimellus macropunctatus* Heyns, 1995 regarding its body length, body width, lip width, length of odontophore, oesophageal length, shape of cardia, position of vulva, length of prerectum and tail shape. However, it differs from the latter in having a longer odontophore (*vs* 53-61µm), longitudinal vulva (*vs* transeverse), shorter rectum (*vs* 70-77 µm) and longer tail (*vs* 26.5-38 µm).

The present species also closely resembles *Aporcelaimellus insularis* (Andrassy, 2001) regarding its cardia and specialized mammilate tail but differs from it in having a larger and robust body (*vs* 1.2-1.5 mm), more wider lip region (*vs* 18-20 µm), longer odontostyle (*vs* 28-30 µm), longer oesophagus (*vs* 360-406 µm), longitudinal vulva (*vs* transverse) and larger vagina (*vs* 29-33 µm). Thus from the above discussion, it is obvious that the species under discussion differs from all other valid species of the genus as well as other new species created in this report and thus can be considered new to science.

Etymology: The new species has been named after the eminent nematologist, Prof. István Andrássy, Institutum Zoosystematicum Universitatis, Budapest of Hungary.

Aporcelaimellus tiasiae n. sp.
(Table-2; Figs. 3 & 4)

Materials examined: 7 females.

Measurements: Shown in Table 2.

Description: Female: Body ventrally curved upon fixation. Cuticle with transverse striations, 4-6 µm thick at mid body and 8-9 µm at tail. Dorsal and ventral body pores distinct. Three to four dorsal pores in the anterior part of the neck and numerous ventral pores over the entire body are present. Lateral chords about one-third of total body width at mid body. Lips partially amalgamated, papillae not prominent, labial region separated from the adjoining body by constriction. Amphids stirrup-shaped with its aperture 10-12µm wide or about half of the corresponding body width. Odontostyle 1.2-1.5 lip region width long, its aperture about half of its length. Odontophore rod-like and about two times the odontostyle length. Guiding ring single, non sclerotised, plicated and located at 0.7-1.3 lip region width from anterior end. Nerve ring encircling the anterior slender part of oesophagus at 27-28% of the oesophageal length from anterior end. Oesophageal expansion gradual, expanded part occupying about 52-56% of the total oesophageal length. Cardia rounded about one-third as long as corresponding body width. Presence of a thin cardiac disc at oesophagus-intestinal junction. Genital system amphidelphic with both sexual branches equally developed. Ovary reflexed with oocytes arranged in a single row especially near the tip. Oviduct joins the ovary subterminally. Vulva longitudinal. Vagina extending about 32-33% of the corresponding body width and with 5-6 muscle bands. Presence of *pars refringens vaginae* at vagina vulval junction. Prerectum 3.6-3.8 and rectum about one anal body

Table-2: Measurements of *Aporcelaimellus tiasiae* n. sp. (all measurements in µm except L in mm)

Morphometric characters	Holotype female	Paratype females (n = 6)	Mean ± SD
L	2.675	2.675 – 3.2	3.166 ± 0.03
a	31.4	31.4 – 37.12	35.68 ± 1.24
b	4.26	4.26 – 4.98	4.97 ± 0.02
c	41.96	40.5 – 50.32	48.35 ± 1.82
c'	1.41	1.32 – 1.41	1.34 ± 0.02
V	55.5	47.94 – 55.5	49.81 ± 2.05
G1	13.5	11.45 – 23.25	18.4 ± 6.17
G2	14.6	12.04 – 20.51	17.68 ± 4.88
Height of lip	7.5	6.75 – 7.5	7.08 ± 0.38
Lip width	19.6	15.5 – 20	17.67 ± 2.25
Amphid position	10	–	10 ± 0
Guiding ring	15.5	–	15.5 ± 0
Nerve ring	175	175 – 180	177.5 ± 3.53
Stylet length	22.7	22.5 – 23	22.75 ± 0.25
Stylet aperture	12.5	12.5 – 15	13.5 ± 1.25
Odontophore	40	40 – 42.5	40.83 ± 1.44
Oesophageal length	627.5	632.5 – 640	635.83 ± 3.82
Expanded oesophagus	361.75	355 – 362.5	358.33 ± 3.82
DO	297	290 – 305	296.83 ± 7.58
AS1 from DO	134.5	112.5 – 135	122.67 ± 11.41
AS2 from DO	149.75	145 – 152.5	149.17 ± 3.82
PS1 from DO	237.5	235 – 237.5	236.67 ± 1.44
PS2 from DO	268.5	255 – 275	265.83 ± 10.10
Cardia	22.5	22.5 – 30	24.33 ± 2.88
Maximum width	85	85 – 90	88.33 ± 2.88
Anterior end to vulva	1485	1485 – 1655	1600.83 ± 77.15
Vaginal length	27.5	27.5 – 30	29.17 ± 1.44
Vaginal width	20	17.5 – 20	19.17 ± 1.44
Pars distalis	2.5	-	2.5
Pras refringes	7.5	-	7.5
Pars proximalis	17.5	17.5 – 20	19.17 ± 1.44
Anterior gonad	361.5	361.5 – 731.5	546.5 ± 261.45
Uterus	45	45 – 145	95 ± 70.71
Oviduct	168.5	168.5 – 237.5	203 ± 48.79
Ovary	147.5	147.5 – 348.5	248 ± 142.13
Posterior gonad	390	380 – 645	512.5 ± 187.5
Uterus	52.5	52.5 – 145	65.41 ± 98.75
Oviduct	200	200 – 225	212.5 ± 17.67
Ovary	137.5	137.5 – 275	206.5 ± 97.22
Rectum	45	45– 50	48.5 ± 1.77
Prerectum	175	175 – 182.5	179.17 ± 3.82
Tail length	63.75	62.5 – 67.5	65 ± 2.5

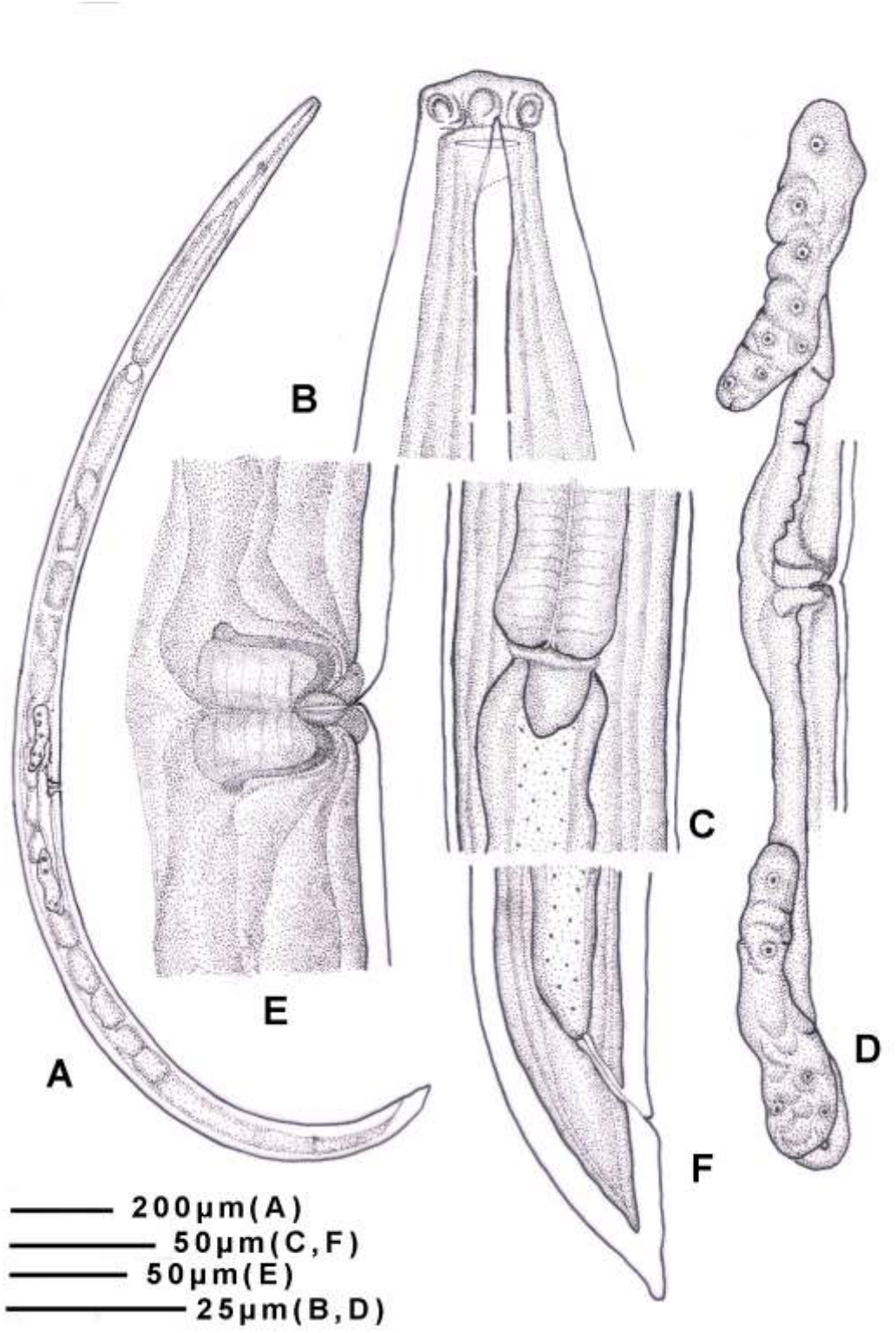

Fig. 3: Camera lucida drawings of *Aporcelaimellus tiasiae* n. sp. Female: A. Whole body; B. Lip region and Odontostyle; C. Cardia; D. Gonads; E. Vulval region; F. Tail region.

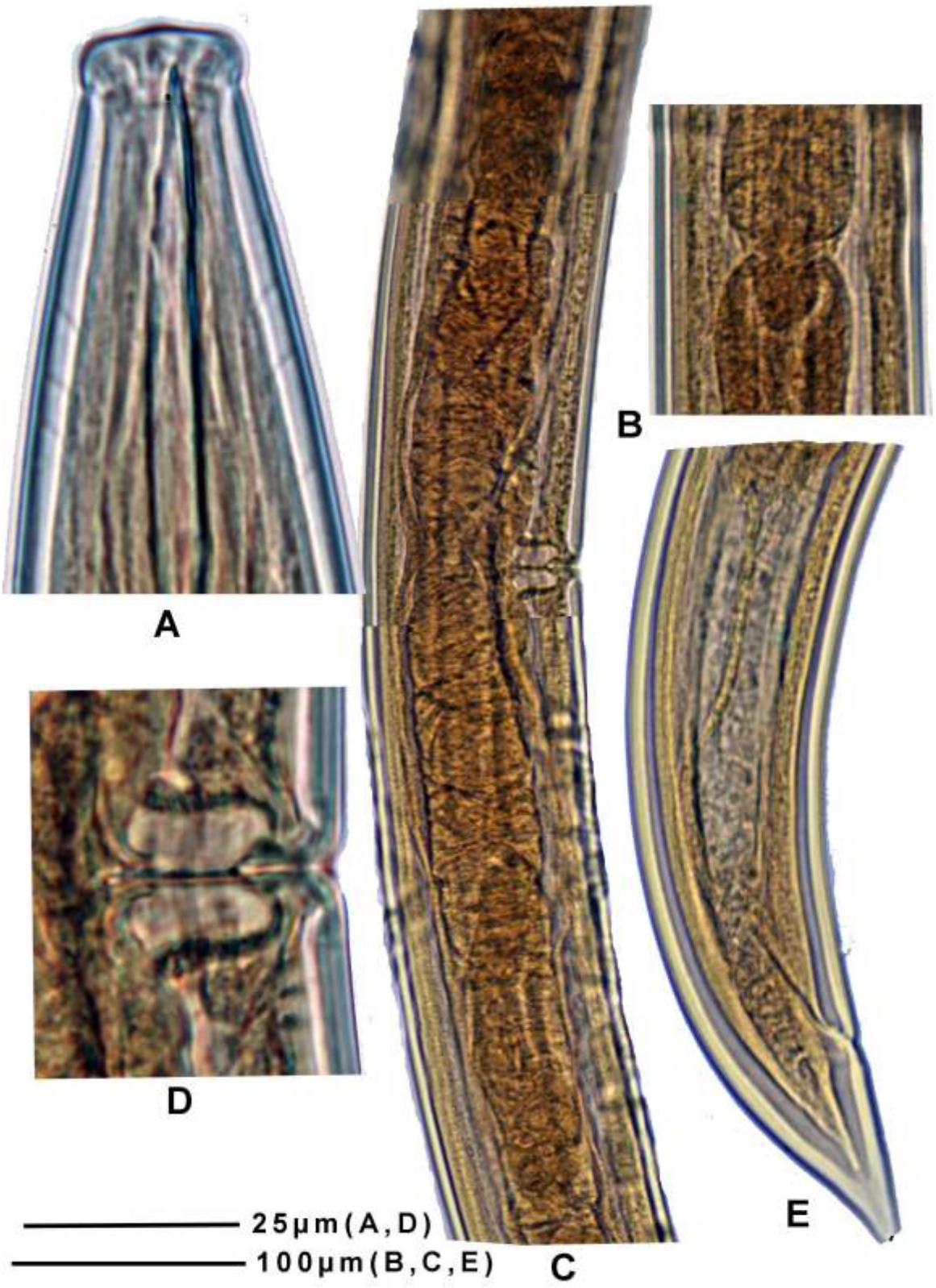

Fig. 4: Photomicrographs of *Aporcelaimellus tiasiae* n. sp. Female: A. Lip region and Odontostyle; B. Cardia; C. Gonads; D. Vulval region; E. Tail region.

width long. Tail conoid, 1.3-1.4 anal body width long with a pair of caudal pores on each side.

Male: Not found

Type habitat and locality: Specimens were collected by the first author on 04-3-2007 from the rhizospheric soil of bottle gourd (*Lageneria siceraria*) from the village Halisahar of the district North 24-Paganas, West Bengal, India.

Type materials: Holotype female along with six paratype females were mounted on slides and deposited in the National Zoological Collections (Registration No.WN1346, WN1347) of the Zoological Survey of India, Kolkata, West Bengal, India.

Differential diagnosis and relationships: The present species is large and robust in size (L= 2.67-3.2 mm) with partially amalgamated lips and non prominent papillae separated from the adjoining body by constriction. Rounded cardia with presence of cardiac disc in the oesophageal-intestinal junction. Longitudinal vagina with 5-6 muscle bands and presence of sclerotisation in the vulva vagina junction; unspecialized uterus with equally developed gonads and conoid tail. Out of all the known valid species, the present species closely resembles the following species.

The proposed species in its general morphology bears a close resemblance with *Aporcelaimellus macropunctatus* Heyns, 1995 in its body length, labial region, length of odontostyle, oesophageal length, position of vulva and length of prerectum. However, it differs from it in having a narrow lip region (*vs* 25-27.5 µm), shorter odontostyle (*vs* 26-30 µm) and odontophore (*vs* 53-61 µm), presence of cardiac disc at oesophagus-intestinal junction (*vs* absence), different cardia shape (vs conoid), different vulva (*vs* transeverse), shorter rectum (*vs* 70-77 µm), longer tail (*vs* 26.5-38 µm) and different tail shape (*vs* subdigitate).

The species under consideration also closely resembles Aporcelaimellus conicaudatus (Altherr,1953) Monteiro, 1970 regarding its body length, body width, lip width, rectum length and tail length but differs from it in having a longer odontostyle (*vs* 17-18 µm) and odontophore (*vs* 31-34 µm), shorter oesophagus (*vs* 760 µm), smaller cardia (*vs* 28 µm) with different cardia shape (*vs* elongate conoid), different vulval opening (*vs* transverse) with presence of sclerotisation at vulva vaginal junction, small prerectum (*vs* 195-210 µm) and tail shape (*vs* conoid with round terminus). Thus the differences are significant, substantial and sufficiently reasonable to consider the species as new to science.

Etymology: The authors suggest its name as *Aporcelaimellus tiasiae* n. sp. after Dr. Tiasi Jana, the eminent nematologist of India.

Aporcelaimellus wasimi n. sp.
(Table-3; Figs. 5 & 6)

Materials examined: 13 females.

Measurements: Shown in Table-3.

Description: Female: Body ventrally curved upon fixation. Cuticle with transverse striations, 5-7 µm thick at mid body and 8-10 µm at tail. Lateral chords about one-fourth to one-third of total body width at mid body. Lips distinct, well separated and pressed fairly close together, set off from the adjoining body by a deep constriction. Amphids stirrup-shaped with its aperture 9-11µm wide or about half of the corresponding body width. Odontostyle about one lip width long, its aperture about half of its length. Odontophore rod-like, 1.4-1.5 times the odontostyle length. Guiding ring single, plicated and located at 1.2-1.3 lip region width from anterior end. Nerve ring encircling the anterior slender part of oesophagus at 29-30% of the oesophageal length from anterior end. Oesophageal expansion gradual, expanded part occupying about 50-52% of the total oesophageal length. Cardia rounded about one-third to one-fourth as long as corresponding body width. Genital system amphidelphic with anterior gonad slightly longer than the posterior one. Ovary reflexed with oocytes arranged in a single row near the tip. Oviduct joins the ovary subterminally. Highly muscular uterus with

Table-3: Measurement of *Aporcelaimellus wasimi* n. sp. (all measurements in µm except L in mm).

Morphometric characters	Holotype female	Paratype females (n=12)	Mean ± SD
L	2.44	2.427 – 2.645	2.541 ± 0.11
a	52.19	49.79 – 52.9	50.89 ± 1.74
b	4.84	4.76 – 4.92	4.83 ± 0.08
c	49.53	44.14 – 46	45.12 ± 0.93
c'	1.69	1.69 – 1.76	1.73 ± 0.04
V	56.24	56.23 – 58.41	57.38 ± 1.09
G1	24	20.32 – 24	22.27 ± 1.85
G2	18.44	18.43 – 22.87	20.26 ± 2.32
Height of lip	6.25	–	6.25 ± 0
Lip width	17.5	15 – 17.5	15.25 ± 0.35
Amphid position	6.25	6.25 – 6.5	6.38 ± 0.18
Guiding ring	11.75	11.75 – 12.5	12.13 ± 0.53
Nerve ring	157.5	152.5 – 157.5	155 ± 2.5
Stylet length	19.5	16.25 – 19.5	16.83 ± 0.63
Stylet aperture	10	–	10 ± 0
Odontophore	27.5	25 – 27.5	26.67 ± 1.44
Oesophageal length	510	510 – 537.5	525 ± 13.92
Expanded oesophagus	275	275 – 282.5	279.17 ± 3.82
DO	255	255 – 262.5	259.17 ± 3.82
AS1 from DO	105	87.5 – 105	95.83 ± 8.79
AS2 from DO	125	100 – 125	113.33 ± 12.58
PS1 from DO	205	200 – 205	201.67 ± 2.89
PS2 from DO	230	215 – 230	223.33 ± 7.63
Cardia	12.5	12.5 – 15	13.75 ± 1.77
Maximum width	48.75	48.75 – 50	49.25 ± 0.66
Anterior end to vulva	1365	1365.5 – 1545	1436.67 ± 95.43
Vaginal length	16	15 – 17.5	16.25 ± 1.77
Vaginal width	10	10 – 12.5	11.25 ± 1.77
Pars distalis	7.5	-	7.5
Pars proximalis	8.5	7.5 – 10	8.75 ± 1.77
Anterior gonad	582.5	537.5 – 582.5	558.33 ± 22.68
Uterus	75	75 – 187.5	113.33 ± 64.24
Oviduct	245	187.5 – 245	219.17 ± 29.19
Ovary	262.5	162.5 – 265.5	203.5 ± 52.37
Posterior gonad	447.5	447.5 – 605	535.83 ± 80.48
Uterus	70	70 – 75	72.5 ± 2.5
Oviduct	232.5	232.5 – 275	252.5 ± 21.36
Ovary	145	145 – 255	200 ± 55
Rectum	32.5	30 – 32.5	31.67 ± 1.77
Prerectum	150	150 – 155	152.5 ± 3.53
Tail length	54.5	55 – 57.5	56.67 ± 1.44

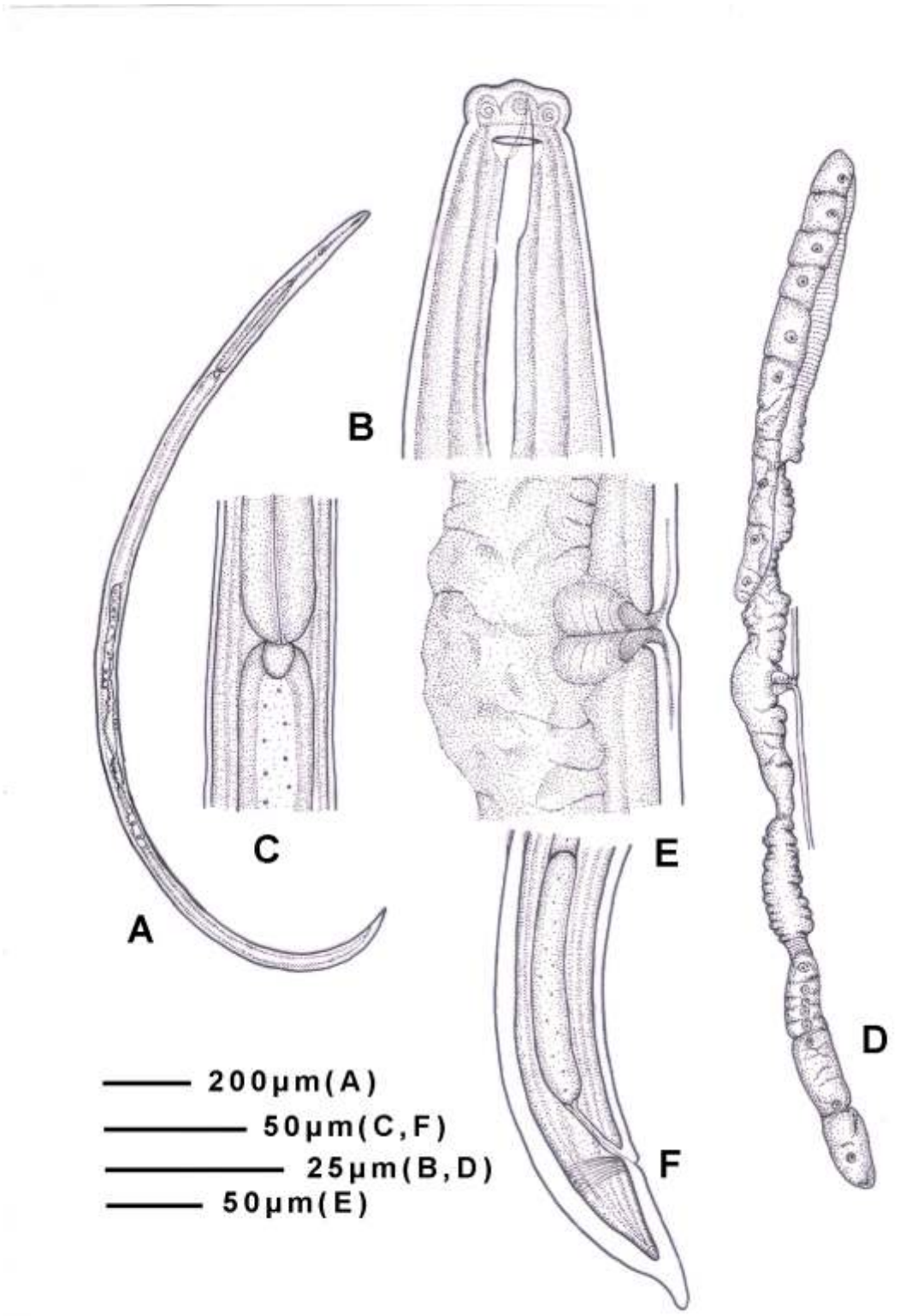

Fig. 5: Camera lucida drawings of *Aporcelaimellus wasimi* n. sp. Female: A. Whole body; B. Lip region and Odontostyle; C. Cardia; D. Gonads; E. Vulval region; F. Tail region.

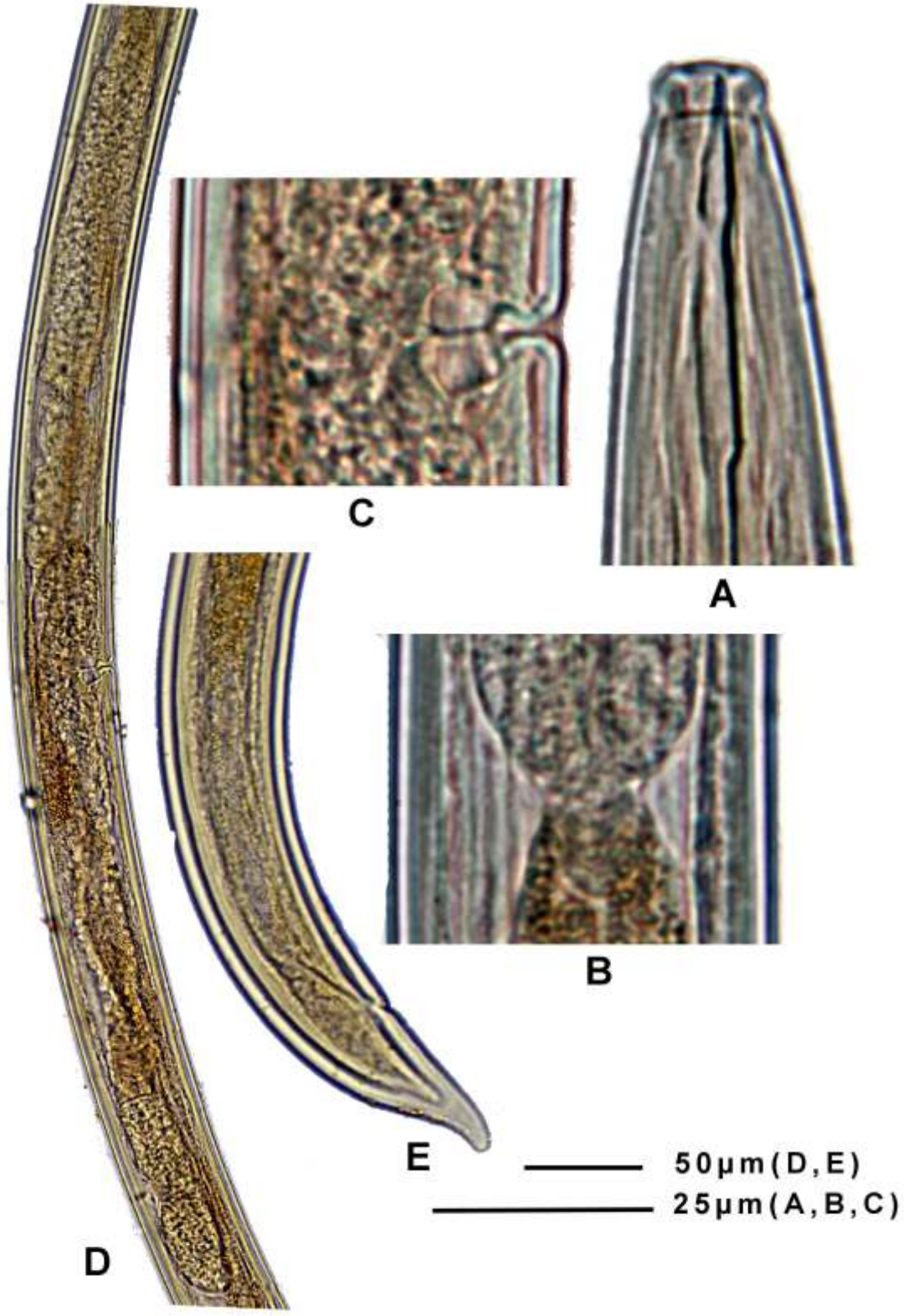

Fig. 6: Photomicrographs of *Aporcelaimellus wasimi* n. sp. Female: A. Lip region and Odontostyle; B. Cardia; C. Vulval region; E. Gonads; E. Tail region.

presence of distinct *pars dialatata* and sphincter at oviduct-uterus junction. Vulva transverse. Vagina extending about 30-35% of the corresponding body width. Absence of *pars refringens vaginae* at vagina vulval junction. Prerectum 4.5-4.6 and rectum about one anal body width long. Tail conoid with the tip slightly dorsally bent, 1.4-1.5 anal body widths long with a pair of caudal pores on each side.

Male: Not found

Type habitat and locality: Specimens were collected by the first author on 25-5-2006 from the rhizospheric soil of Cucumber (*Cucumis sativus*) from the village Habra of district North 24-Paganas, West Bengal, India.

Type specimens: Holotype female along with twelve paratype females are mounted on slides and are deposited in the National Zoological Collections (Registration No.WN1350, WN1351, WN1357) of the Zoological Survey of India, Kolkata, West Bengal, India.

Differential diagnosis and relationships: The proposed species is characterized by its large and slender body (L= 2.43-2.65 mm) with separated lips offset from the adjoining body by deep constriction; rounded cardia; transverse vagina with absence of sclerotisation in the vulva vagina junction, presence of spincter muscles and *pars dialatata* in the uterus-oviduct junction; short and conoid tail with the tip slightly dorsally bent. Out of all the known valid species, the present species closely resembles the following species.

The present species in its general morphology bears a close resemblance with *Aporcelaimellus obscurus* Thorne and Swanger, 1939 Heyns, 1965 regarding its body length, oesophageal length, position of vulva and tail length. However, it differs from it in having a narrow lip region (*vs* 20.3 µm), shorter odontostyle length (*vs* 23.8 µm), absence of cardiac disc at oesophagus-intestinal junction (*vs* presence), different cardia shape (*vs* conoid), longer prerectum (*vs* 102 µm) and different tail shape (*vs* convex-conoid).

The species under discussion also closely resembles *Aporcelaimellus futaii Khan and Araki, 2002* regarding its body length, oesophageal length and length of prerectum but differs from it in having a slender body (*vs* 88-96 µm), narrow lip region (*vs* 21-27 µm), shorter odontostyle (*vs* 22-26 µm) and odontophore (*vs* 40-48 µm) length, more anteriorly located guiding ring (*vs* 14-16 µm), smaller cardia (*vs* 28-37 µm), shorter rectum (*vs* 55-69 µm), longer tail (*vs* 35-41 µm) and tail shape (*vs* conoid). Thus the present species does not fit well with the existing valid species and the newly described ones of the genera and can be considered new to science.

Etymology: The authors suggest its name as *Aporcelaimellus wasimi* after the eminent nematologist, Prof. Wasim Ahmad, Department of Zoology, Aligarh Muslim University, U.P, India.

Aporcelaimellus amazonicus Andrassy, 2004
(Table-4; Figs. 7 & 8)

Materials examined: 8 females.

Measurements: Shown in Table-4.

Description: Female: Body ventrally curved upon fixation. Body moderate and plump. Cuticle with transverse striations, 4-5 µm thick at mid body and 6-8µm at tail. Lateral chords about one-third to one-fourth of total body width at mid body. Lips practically amalgamated and set off from the adjoining body by deep constriction. Amphids stirrup-shaped with its aperture 8-9 µm wide or about half of the corresponding body width. Odontostyle rod-like, its length about 1.3 lip width long, its aperture about one-third of its length. Odontophore rod-like, 1.4-1.5 times the odontostyle length. Guiding ring single, plicated, sclerotised and located at 0.7-0.8 lip region width from anterior end. Nerve ring encircling the anterior slender part of oesophagus at 34-35% of the oesophageal length from anterior end. Oesophageal expansion gradual, expanded part occupying about 45-46% of the total oesophageal length. Cardia rounded, its length about one-third as long as corresponding body width. Presence of

Table-4: Measurements of *Aporcelaimellus amazonicus* Andrassy, 2004 (all measurements in µm except L in mm).

Morphometric characters	Females (n=8)	Mean ± SD
L	1.550 – 1.707	1.631 ± 0.08
a	20.05 – 20.69	20.38 ± 0.44
b	4.34 – 4.51	4.02 ± 0.38
c	34.44 – 35.02	34.71 ± 0.29
c'	1.09 – 1.15	1.12 ± 0.03
v	50 – 50.22	50.08 ± 0.18
G1	32.09 – 40.72	35.93 ± 4.39
G2	30.45 – 31.55	30.96 ± 0.55
Height of lip	5 – 7.5	6.25 ± 1.25
Lip width	15 – 17.5	15.83 ± 1.44
Amphid position	-	7.5 ± 0
Guiding ring	-	10 ± 0
Nerve ring	122.25 – 137.5	130.75 ± 7.77
Stylet length	20 – 22.5	21.67 ± 1.67
Stylet aperture	7.5 – 7.75	7.58 ± 0.14
Odontophore	28.75 - 32.5	30.25 ± 1.98
Oesophageal length	357.5 – 392.5	375 ± 17.5
Expanded oesophagus	162.5 – 177.5	171.67 ± 14.22
DO	215 – 225	220.83 ± 5.20
AS1 from DO	45 – 55	49.17 ± 5.20
AS2 from DO	55 – 70	62.5 ± 7.5
PS1 from DO	105 – 112.5	108.75 ± 5.33
PS2 from DO	112.5 – 127.5	119.17 ± 7.64
Cardia	25 – 27.5	26.67 ± 1.44
Max. width	77.25 – 82.5	80.33 ± 2.74
Anterior end to vulva	775 – 857.5	755.83 ± 88.36
Vaginal length	20 – 22.5	20.83 ± 1.44
Vaginal width	–	12.5 ± 0
Pars distalis	–	1.25 ± 0
Pras refringes	5 – 7.5	5.83 ± 1.44
Pars proximalis	12.5 – 13.75	12.92 ± 0.72
Anterior Gonad	497.5 – 695	572.5 ± 106.97
Uterus	75 – 90	82.5 ± 7.5
Oviduct	265.5 – 412.5	330 ± 75.13
Ovary	157 – 192.5	172.33 ± 18.24
Posterior gonad	462.5 – 520	489.17 ± 28.98
Uterus	72.5 – 162.5	107.5 ± 48.22
Oviduct	227.5 – 245	235 ± 9.01
Ovary	145 – 195	165.83 ± 26.02
Rectum	30 – 32.5	31.67 ± 1.44
Prerectum	65 – 68.75	67.08 ± 1.91
Tail length	45 - 48.75	47.08 ± 1.91

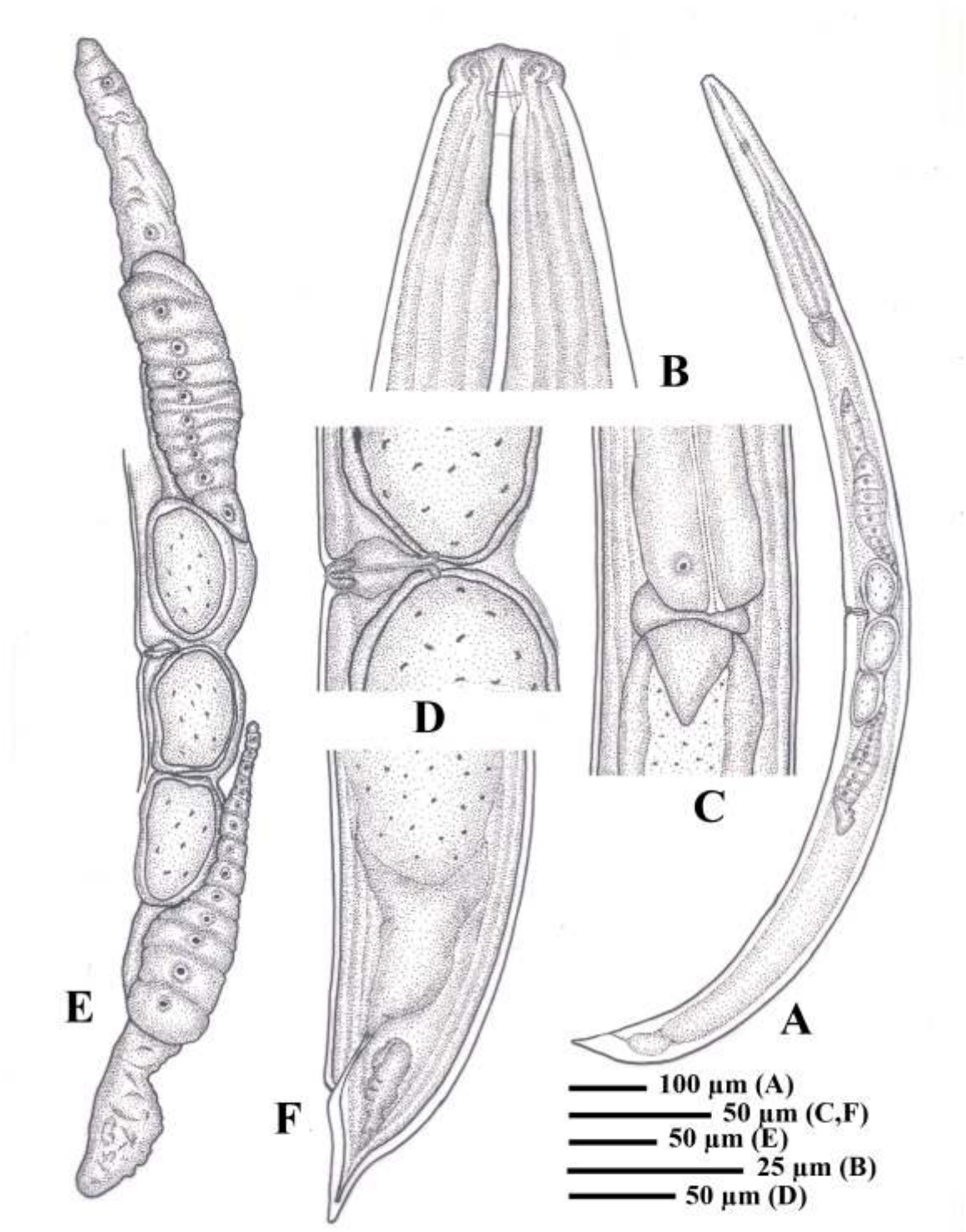

Fig. 7: Camera lucida drawings of *Aporcelaimellus amazonicus.* Female: A. Whole body; B. Lip region and Odontostyle; C. Cardia; D. Vulval region; E. Gonads; F. Tail region.

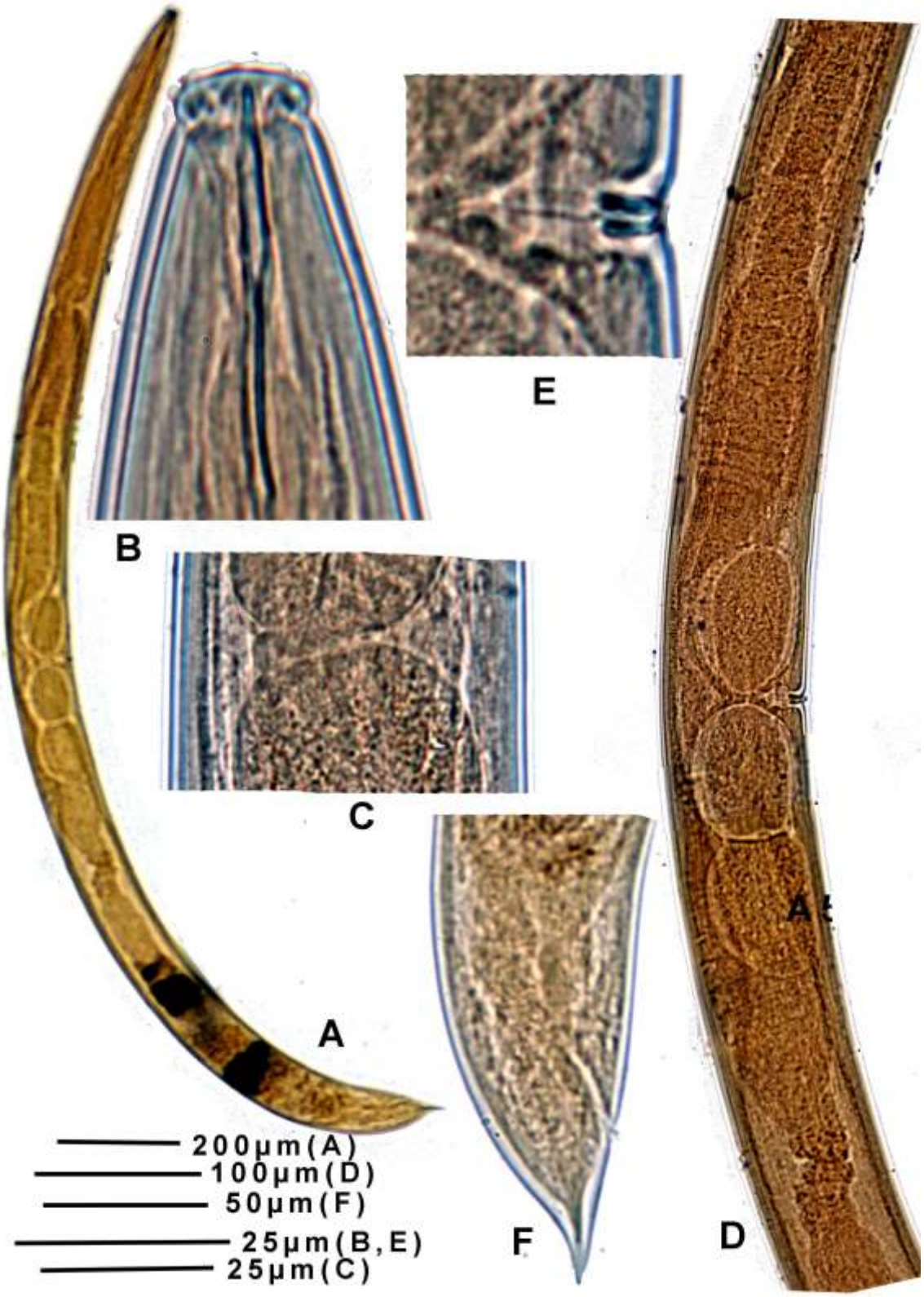

Fig. 8: Photomicrographs of *Aporcelaimellus amazonicus*. Female: A. Whole body; B. Lip region and Odontostyle; C. Cardia; D. Gonads; E. Vulval region; F. Tail region

cardiac disc at oesophageal-intestinal junction. Genital system amphidelphic with both the sexual branches equally developed. Ovary reflexed with oocytes arranged in a single row. Oviduct joins the ovary subterminally. Vulva transverse. Vagina extends about 26-27% of the corresponding body width. Presence of rod-shaped sclerotised *pars refringens vaginae* at vagina vulval junction. Prerectum 1.4-1.5 and rectum less than one anal body width long. Tail convex conoid with the tip pointed with a pair of caudal pores on each side.

Male: Not found.

Habitat and locality: Specimens were collected by the first author on 17.05.2007 from the rhizospheric soil of bottle gourd (*Lageneria siceraria*) from the village Kaugachi of district North 24-Paganas, West Bengal, India.

Remarks: The species *A. amazonicus* was described by Andrassy (2004) from Amazonia forest, the greatest rain forests of Brazil. This species is characerised by its sharply pointed tail showing concave contour on dorsal side of tail. The presently described species completely corresponds with the previous description but slightly differs from it in having a shorter odontostyle (*vs* 24-26 µm), greater body width (*vs* a=21-23), posteriorly located vulva (*vs* 44-45%) and shorter prerectum (*vs* 45-50 µm). This species is reported for the first time from India.

Aporcelaimellus budauniensis
Khatoon and Sharma, 2000
(Table-5; Figs. 9 & 10)

Materials examined: 6 females.

Measurements: Shown in Table -5.

Description: Female: Body ventrally curved upon fixation. Cuticle with transverse striations, 4-5 µm thick at mid body and 6-8 µm at tail. Lateral chords about one-fourth to one-third of total body width at mid body. Lips practically amalgamated and set off from the adjoining body by deep constriction. Amphids stirrup-shaped with its aperture, 8-9µm wide or about half of the corresponding body width. Odontostyle slightly arcuate, its length about one lip width long, its aperture more than half of its length. Odontophore rod-like, 1.7-1.9 times the odontostyle length. Guiding ring single, plicated, sclerotised and located at 0.7-0.8 lip region width from anterior end. Nerve ring encircling the anterior slender part of oesophagus at 35-36% of the oesophageal length from anterior end. Oesophageal expansion gradual, expanded part occupying about 42-43% of the total oesophageal length. Cardia tongue shaped, its length about one-third as long as corresponding body width. Genital system amphidelphic with both the sexual branches equally developed. Ovary reflexed with oocytes arranged in a single row. Oviduct joins the ovary subterminally. Vulva transverse. Vagina extends about 44-48% of the corresponding body width. Presence of moderate sclerotisation at vagina vulva junction. Prerectum and rectum about one anal diameter long. Tail conoid, 1.1-1.2 anal body widths long with a pair of caudal pores on each side.

Male: Not found.

Habitat and locality: Specimens were collected by the first author on 12.09.2008 from the rhizospheric soil of spiny bitter gourd (*Momordica cochinchinensis*) from the village Amdanga of district North 24-Paganas, West Bengal, India.

Remarks: The species *A. budauniensis* was described by Khatoon and Sharma (2000) from Uttar Pradesh, India. The presently described species fits well with the previous description but slightly differs from it in having a shorter odontostyle (*vs* 28-35 µm), anteriorly located nerve ring (*vs* 146-150 µm), shorter prerectum (*vs* 70-72 µm) and rectum (*vs* 50 µm), may be due to intraspecific variations. This species is reported for the first time from West Bengal.

Table-5: Measurements of *Aporcelaimellus budauniensis* Khatoon and Sharma, 2000 (all measurements in µm except L in mm).

Morphometric characters	Females (n=6)	Mean ± SD
L	1.250 – 1.375	1.319 ± 0.02
a	20.69 – 24.4	22.53 ± 1.85
b	3.6 – 4.35	4.02 ± 0.38
c	41.67 – 44.06	42.74 ± 1.21
c'	1.09 – 1.15	1.12 ± 0.03
V	50.22 – 55.8	52.84 ± 2.81
G1	17.8 – 40.72	28.67 ± 11.50
G2	16.4 – 30.45	23.95 ± 7.08
Height of lip	5 – 6.25	5.42 ± 0.72
Lip width	16.25 – 17.5	16.67 ± 0.72
Amphid position	-	6.25 ± 0
Guiding ring	-	12.5 ± 0
Nerve ring	120 – 127.5	123.33 ± 3.82
Stylet length	15 – 17.5	15.83 ± 1.44
Stylet aperture	8.5 – 10	9.17 ± 1.15
Odontophore	28.75 - 30	29.17 ± 0.72
Oesophageal length	345 – 358.5	353.67 ± 7.52
Expanded oesophagus	147.5 – 155	151.67 ± 3.82
DO	215– 222.5	219.17 ± 4.23
AS1 from DO	45 – 47.5	49.17 ± 5.20
AS2 from DO	55 – 61.75	58.42 ± 3.26
PS1 from DO	95 – 102.5	98.75 ± 3.75
PS2 from DO	105 – 112.5	108.33 ± 3.82
Cardia	15 - 20	16.67 ± 2.87
Maximum width	51.25 – 52.5	51.67 ± 0.72
Anterior end to vulva	697.5 – 857.5	755.83 ± 88.36
Vaginal length	22.5 – 25	23.33 ± 1.44
Vaginal width	–	12.5 ± 0
Pars distalis	2.5 – 2.75	2.58 ± 0.14
Pras refringes	5 – 7.5	5.83 ± 1.44
Pars proximalis	12.5 – 17.25	14.08 ± 2.74
Anterior gonad	222.5 – 695	420.83 ± 145.21
Uterus	25 – 90	48.33 ± 36.17
Oviduct	125 – 412.5	255 ± 145.71
Ovary	72.5 – 192.5	117.5 ± 65.38
Posterior gonad	205 – 520	356.66 ± 137.82
Uterus	27.5 – 162.5	77.23 ± 52.07
Oviduct	122.5 – 227.5	170.83 ± 52.93
Ovary	55 – 195	112.5 ± 43.27
Rectum	30 – 32.5	31.67 ± 1.44
Prerectum	30 – 38.75	34.58 ± 4.39
Tail length	41.67 - 44.06	42.74 ± 1.21

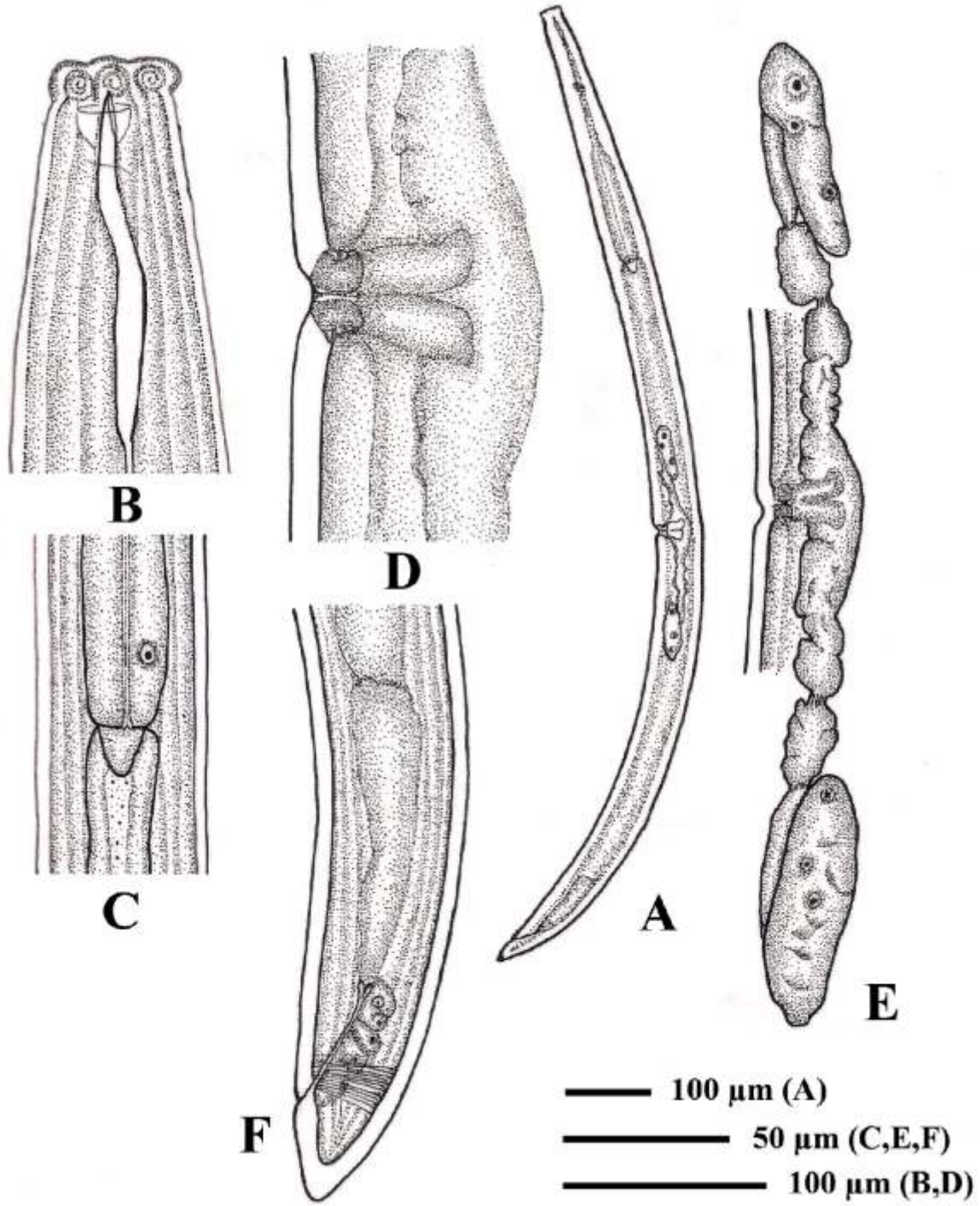

Fig. 9: Camera lucida drawings of *Aporcelaimellus budauniensis*. Female: A. Whole body; B. Lip region and Odontostyle; C. Cardia; D. Vulval region; E. Gonads; F. Tail region.

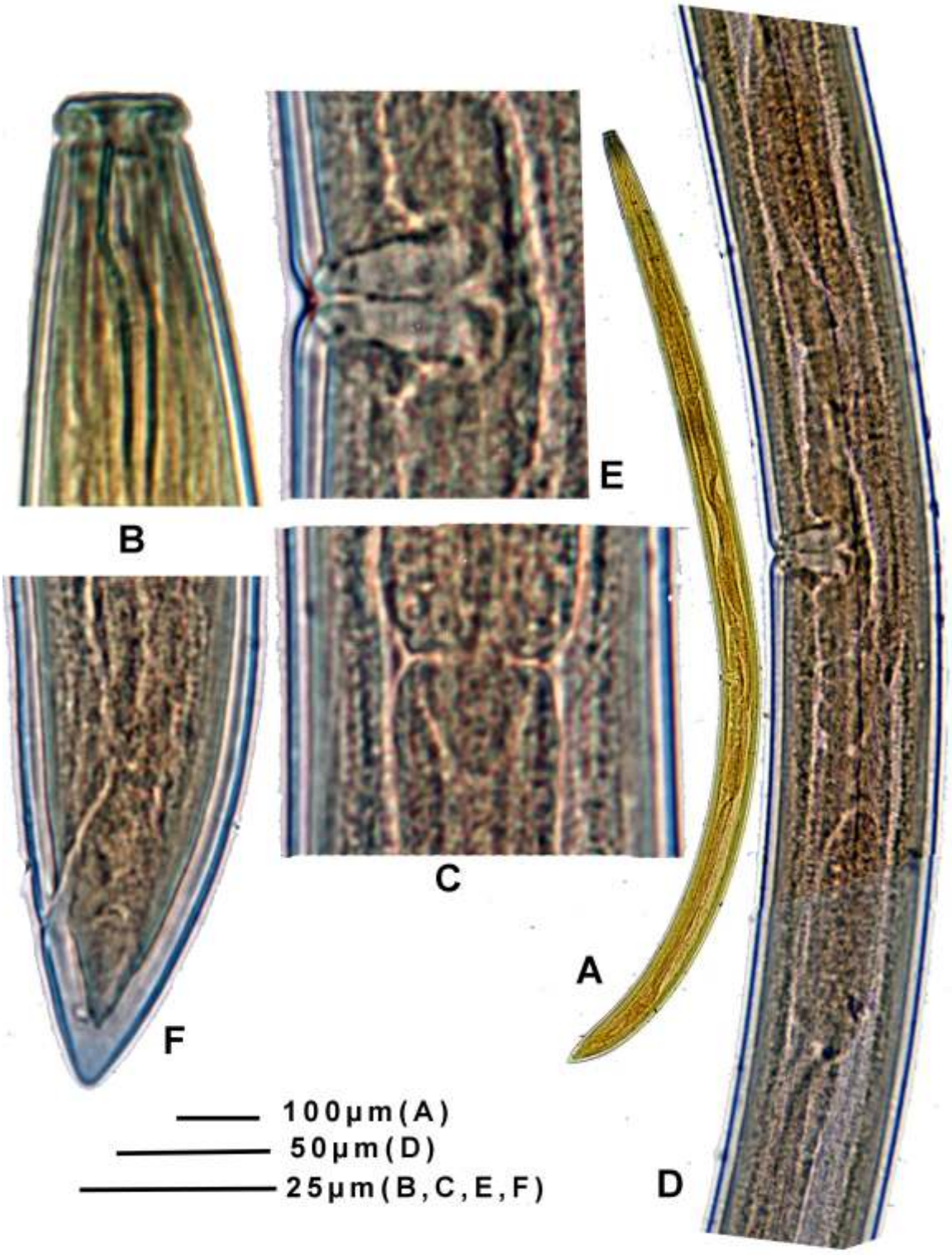

Fig. 10: Photomicrographs of *Aporcelaimellus budauniensis*. Female: A. Whole body; B. Lip region and Odontostyle; C. Cardia; D. Gonads; E. Vulval region; F. Tail region.

Aporcelaimellus obtusicaudatus
(Bastian, 1865) Altherr, 1968
(Table-6; Figs. 11 & 12)

Materials examined: 22 females.

Measurements: Shown in Table-6.

Description: Female: Body ventrally curved upon fixation. Cuticle with transverse striations, 5-7 µm thick at mid body and 8-10 µm at tail. Lateral chords about one-third to one-fourth of total body width at mid body. Lips partially amalgamated and pressed fairly close together, set off from the adjoining body by deep constriction. Amphids stirrup-shaped with its aperture 8-10 µm wide or about half of the corresponding body width. Odontostyle about one lip width long, its aperture about half of its length. Odontophore rod-like, 2-2.7 times the odontostyle length. Guiding ring single, plicated and located at 0.5-0.6 lip region width from anterior end. Nerve ring encircling the anterior slender part of oesophagus at 29-32% of the oesophageal length from anterior end. Oesophageal expansion gradual, expanded part occupying about 49-55% of the total oesophageal length. Cardia conoid, about one-third as long as corresponding body width. Genital system amphidelphic with both branches of ovary equally developed. Ovary reflexed with oocytes arranged in a single row. Oviduct joins the ovary subterminally. Vulva transverse. Vagina extends about 36-38% of the corresponding body width. Presence of large and sclerotised *pars refringens vaginae* at vagina vulva junction. Prerectum 3.0-5.6 and rectum about one anal body width long. Tail shape rounded or conoid, about one anal body widths long with a pair of caudal pores on each side.

Male: Not found.

Habitat and locality: Specimens were collected by the first author on 25.03.2006 from the rhizospheric soil of pumpkin (*Cucurbita pepo L.*) from the village Hridaypur of district North 24-Paganas, West Bengal, India.

Remarks: The species *A. obtusicaudatus* was originally described by Bastian (1865) under the genus *Dorylaimus*. Later after many alterations it was finally transferred to the genus *Aporcelaimellus* and is now designated as its type species. De Ley *et al.* (1993) and Andrassy (2002) provided a good redescription of the species. It is distributed over the world and belongs to most frequent species of soil nematodes. This species has been reported from Africa (Jacob, 1984), Costa Rica (Esquivel, 2003), Sevilla (Pena Santiag *et al.*, 2005) and Pakistan (Shahina *et al.*, 2006). This species completely fits with the previous description but slightly differs from it regarding its body length (*vs* 2.2-3.0mm), odontostyle length (*vs* 22-24 µm) and vaginal length (*vs* 48-52%), due to intraspecific variations. This is the first report from India.

Aporcelaimellus subhasi Gantait
Bhattacharya & Chatterjee , 2006
(Table-7; Figs. 13 & 14)

Materials examined: 25 females.

Measurements: Shown in Table-7.

Habitat and locality: Specimens were collected by the first author on 25.04.2006 from the rhizospheric soil of pumpkin (*Cucurbita pepo L.)* from the village Hridaypur of district North 24-Paganas, West Bengal, India.

Description: Female: Body ventrally curved upon fixation. Cuticle with transverse striations, 4-5 µm thick at mid body and 6-8 µm at tail. Lateral chords about one-third to one-fourth of total body width at mid body. Lips practically amalgamated and set off from the adjoining body by deep constriction. Amphids stirrup-shaped with its aperture 7-8 µm wide or about half of the corresponding body width. Odontostyle rod-like, its length about 1.2-1.6 lip width long, its aperture about half of its length. Odontophore rod-like, 1.6-1.7 times the odontostyle length. Guiding ring single, plicated, sclerotised and located at 0.6-0.8 lip region width from anterior end. Nerve ring encircling the anterior slender part of oesophagus at 32-46% of the oesophageal length from anterior end. Oesophageal expansion gradual, expanded part occupying about 51-64% of the total oesophageal length. Cardia conoid with abruptly

Table-6: Measurements of *Aporcelaimellus obtusicaudatus* (Bastian, 1865) Altherr, 1968 (all measurements in µm except L in mm).

Morphometric characters	Females (n=22)	Mean ± SD
L	1.817 – 2.372	1.914 ± 0.66
a	27.92 – 33.92	30.07 ± 1.67
b	3.85 – 4.33	4.11 ± 0.17
c	62.5 – 83.2	68.68 ± 6.49
c'	0.52 – 1.7	0.99 ± 0.41
v	51.43 – 59.12	53.85 ± 2.79
G1	11.28 – 18.2	14.49 ± 2.14
G2	10.62 – 19.4	16 ± 3.47
Height of lip	5.5 – 7.5	6.53 ± 0.71
Lip width	17.5 – 18.75	17.75 ± 0.50
Amphid position	-	7.5 ± 0
Guiding ring	8.75 – 11.25	10.57 ± 1.12
Nerve ring	150 – 167.5	161.38 ± 7.27
Stylet length	17.5 – 22.5	18.75± 1.59
Stylet aperture	8.75 – 12.5	10.84 ± 1.13
Odontophore	35- 50	42.16 ± 4.55
Oesophageal length	470 – 575	520.68 ± 34.37
Expanded oesophagus	232.5 – 315	277.73 ± 25.73
DO	262.5 – 312.5	285.56 ± 19.23
AS1 from DO	67.5 – 100	84.29 ± 11.96
AS2 from DO	75 – 112.5	92.18 ± 12.84
PS1 from DO	162.5 – 220	181.5 ± 15.81
PS2 from DO	169.5 – 232.5	192.5 ± 19.96
Cardia	24.25 – 27.5	25.83 ± 1.37
Maximum width	62.5 – 85	72.05 ± 7.48
Anterior end to vulva	1057.5 – 1280	1132.4 ± 72.12
Vaginal length	22.5 – 30	26.25 ± 2.20
Vaginal width	17.5 – 25	21.81 ± 3.37
Pars distalis	2.5 – 3.75	2.96 ± 0.62
Pras refringes	6.25 – 7.5	7.31 ± 0.42
Pars proximalis	12.5 – 16.75	14.53 ± 1.75
Anterior gonad	205 – 395.5	309 ± 56.64
Uterus	61.5 – 132.5	85 ± 27.51
Oviduct	75 – 132.5	111.8 ± 19.95
Ovary	67.5 – 137.5	111.5 ± 26.87
Posterior gonad	242.5 – 483.75	357.38 ± 74.93
Uterus	62.5 – 215	109.17 ± 53.14
Oviduct	85 - 170	126.75 ± 22.14
Ovary	62.5 – 187.5	126.87± 35.50
Rectum	37.5 – 47.5	40.55 ± 4.28
Prerectum	132.5 – 167.5	147.5 ± 14.21
Tail length	25 – 47.5	32.5 ± 6.71

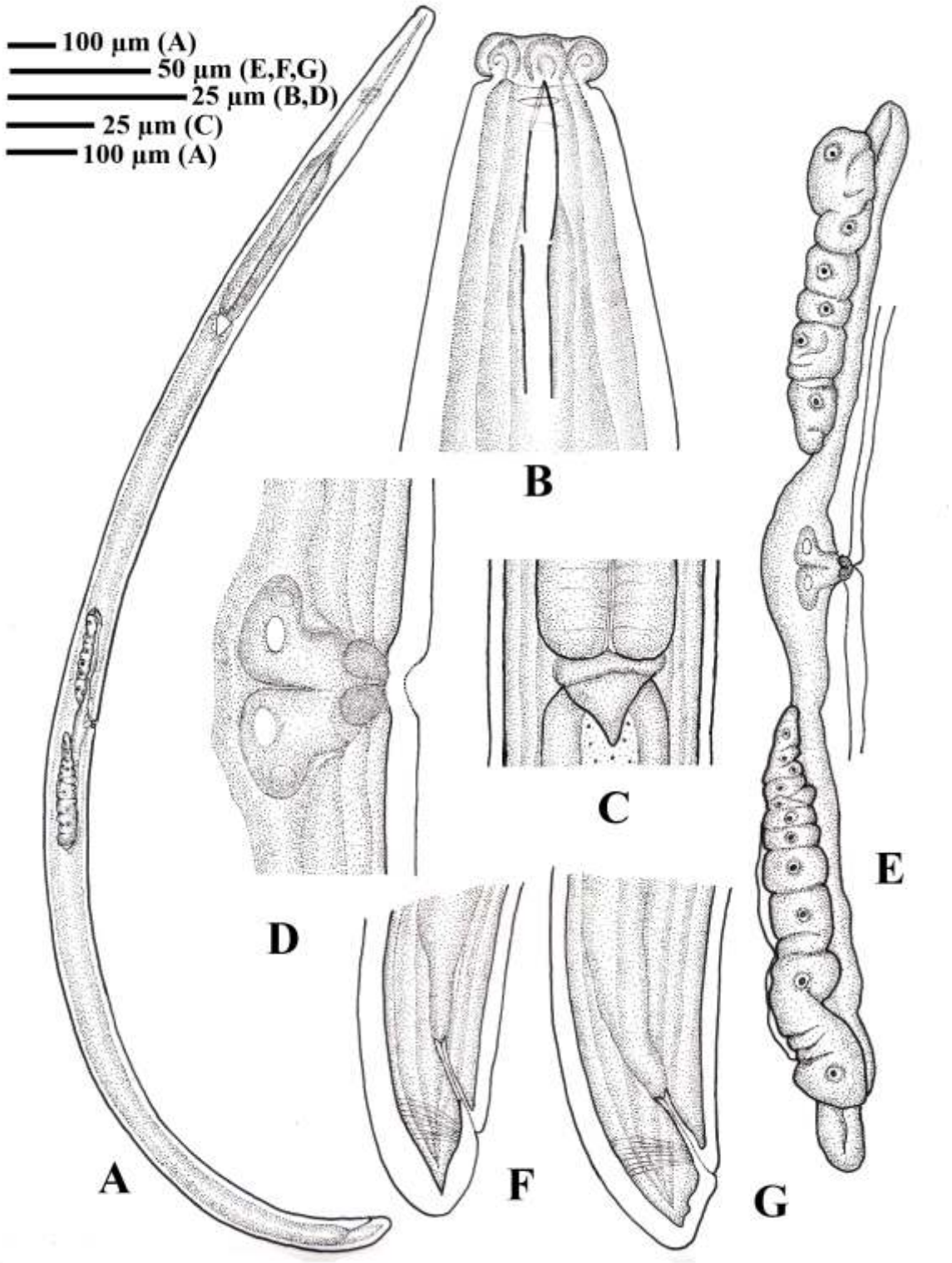

Fig. 11: Camera Lucida drawings of *Aporcelaimellus obtusicaudatus*. Female: A. Whole body; B. Lip region and Odontostyle; C. Cardia; D. Vulval region; E. Gonads.; F, G. Tail region.

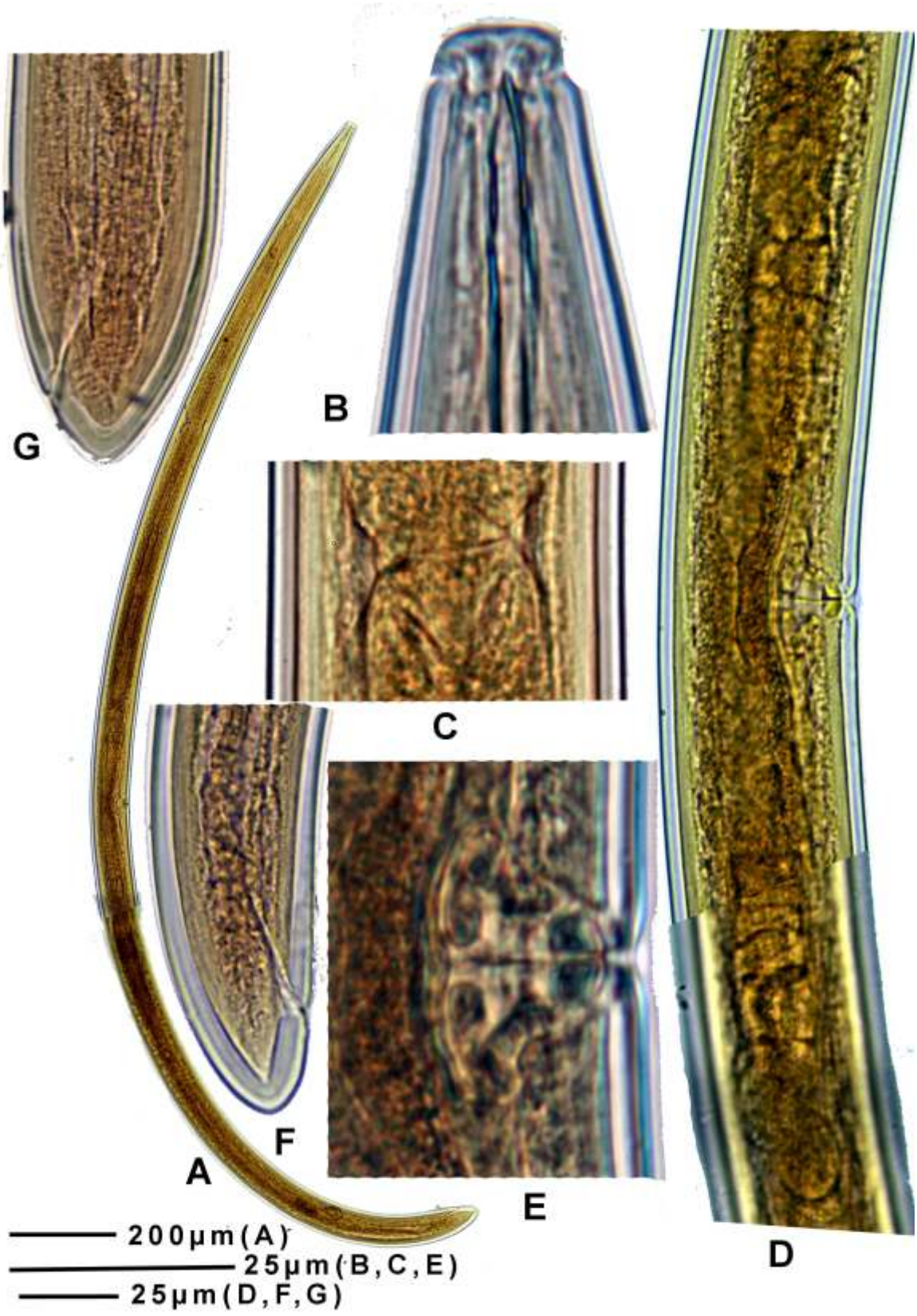

Fig. 12: Photomicrographs of *Aporcelaimellus obtusicaudatus*. Female: A. Whole body; B. Lip region and Odontostyle; C. Cardia; D. Gonads; E. Vulval region; F, G. Tail region.

Table-7: Measurement of *Aporcelaimellus subhasi* Gantait *et al.*, 2006 (all measurements in µm except L in mm).

Morphometric characters	Females (n=25)	Mean ± SD
L	1.377 – 1.880	1.586 ± 0.19
a	20.29 – 40.08	29.57 ± 5.47
b	3.71 – 5.35	4.29 ± 0.57
c	24.83 – 42.47	31.45 ± 5.40
c'	1.12 – 2.17	1.56 ± 0.45
V	41.66 – 54.54	49.46 ± 3.57
G1	11.55 – 24.2	18.14 ± 4.41
G2	13.13 – 26.08	18.37 ± 4.30
Height of lip	-	5
Lip width	15 – 16.25	15.58 ± 0.54
Amphid position	5 – 6.25	5.57 ± 1.35
Guiding ring	8.75 – 13.75	10.5 ± 0.86
Nerve ring	118 – 127.5	121.75 ± 5.07
Stylet length	17.5 – 25.5	21.19 ± 2.71
Stylet aperture	7.5 – 11.25	9.47 ± 1.22
Odontophore	30- 40	33.67 ± 3.72
Oesophageal length	257.5 – 399.5	373 ± 44.03
Expanded oesophagus	165 – 202.5	187.5 ± 14.08
DO	198.5 – 227.5	212.64 ± 13.20
AS1 from DO	50 – 93.5	67.96 ± 17.42
AS2 from DO	55 – 112.5	70.07 ± 20.45
PS1 from DO	117.5 – 172.5	142.14 ± 22.05
PS2 from DO	125 – 175	149.57± 19.58
Cardia	22.5 - 28	26 ± 2.09
Maximum width	45 – 83.36	59.48 ± 14.52
Anterior end to vulva	670 – 937.5	799.44 ± 93.08
Vaginal length	19.25 – 22.5	20.83 ± 1.45
Vaginal width	12.5 – 17.5	14.88 ± 2.18
Pars distalis	2.0 – 2.5	2.46 ± 0.22
Pras refringes	5 – 7.5	6.25 ± 1.09
Pars proximalis	10 – 12.5	11.16 ± 0.91
Anterior gonad	165 – 455	293.4 ± 100.92
Uterus	50 - 140	75.27 ± 31.92
Oviduct	60 – 125	97.38 ± 21.03
Ovary	50 - 190	120.61 ± 54.74
Posterior gonad	195 – 450	297.22 ± 100.98
Uterus	49 – 137.5	75.33 ± 32.07
Oviduct	71 - 140	99.36 ± 24.42
Ovary	62.5 – 200	122.5 ± 49.54
Rectum	27.5 – 40	34.5 ± 4.84
Prerectum	62.5 – 85.5	72.82 ± 7.98
Tail length	45 – 57.5	51.72 ± 3.85

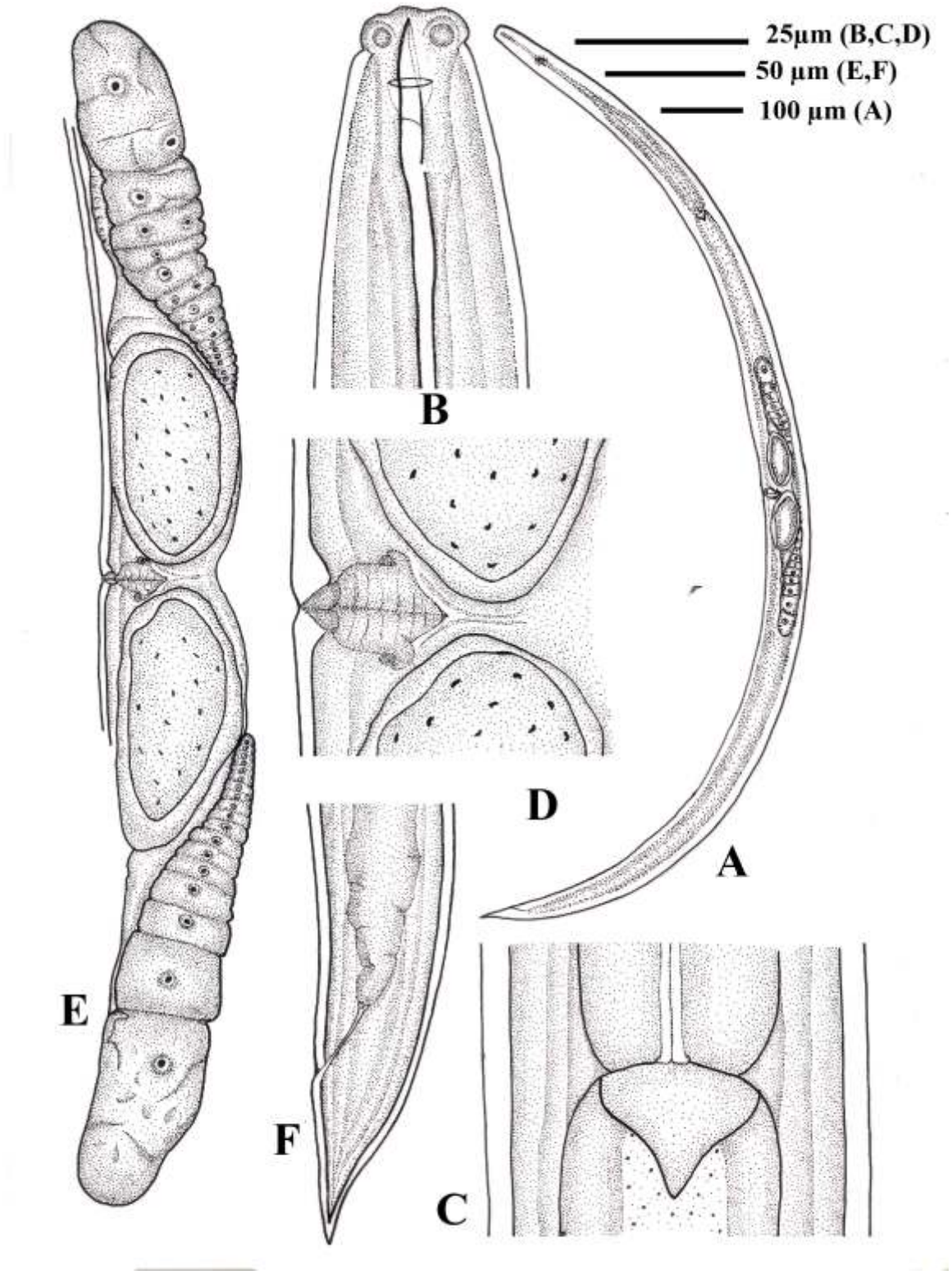

Fig. 13: Camera lucida drawings of *Aporcelaimellus subhasi*. Female: A. Whole body; B. Lip region and Odontostyle; C. Cardia; D. Vulval region; E. Gonads; F. Tail region.

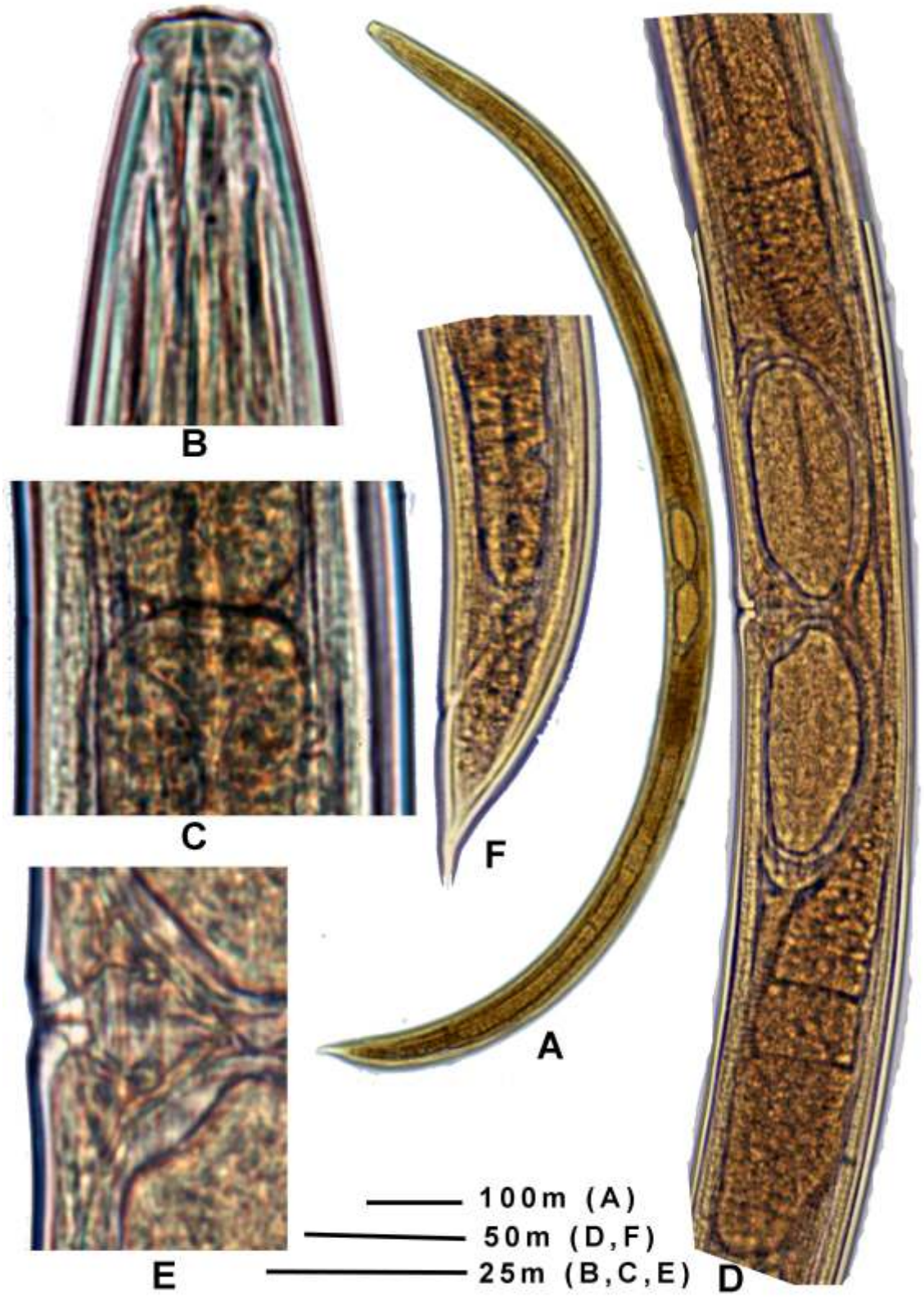

Fig. 14: Photomicrographs of *Aporcelaimellus subhasi*. Female: A. Whole body; B. Lip region and Odontostyle; C. Cardia; D. Gonads; E. Vulval region; F. Tail region.

tapering pointed tip, its length about half to one third as long as corresponding body width. Genital system amphidelphic with reflexed ovary and oocytes arranged in a single row. Oviduct joins the ovary subterminally. Vulva transverse. Vagina extends about 27-42% of the corresponding body width. Presence of triangular, sclerotised *pars refringens vaginae* at vagina vulval junction. Prerectum 1.9-2.4 and rectum about one anal body width long. Tail convex conoid with the tip pointed with a pair of caudal pores on each side.

Male: Notfound

Remarks: The species *A. subhasi* was described by Gantait *et al.*, (2006) from the rhizospheric soil of banana (*Musa paradisiaca* L. cv. Kanthali) from Murarichak village under Sabang Block in Paschim Medinipur district, West Bengal, India. The presently described species completely resembles the previously described species but slightly differs from it in having posteriorly located guiding ring (*vs* 7-8.4 µm), longer odontostyle (*vs* 19-21 µm), anteriorly placed nerve ring (*vs* 132-146 µm) and shorter tail length (*vs* 53-66 µm), may be due to intraspecific variations. This is the first report fom the district North 24 Parganas.

SUMMARY

Three new and four known species of dorylaimid nematodes viz. *Aporcelaimellus istvani* n. sp.; *A. tiasiae* n. sp.; *A. wasimi* n. sp.; *A. amazonicus* Andrassy, 2004; *A. budauniensis* Khatoon and Sharma, 2000; *A. obtusicaudatus* (Bastian, 1865) Altherr, 1968 and *A. subhasi* Gantait *et al.*, 2006, collected from rhizospheric soil of different cucurbitaceous plants from different localities of the district North 24-Paganas, West Bengal, India have been described and illustrated.

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