

## DESCRIPTION OF TWO NEW SPECIES OF *CHRONOGASTER* COBB, 1913 FROM INDIA

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**Summary.** Two new species of *Chronogaster*, collected from Pichola lake of Udaipur, Rajasthan, India, are described and illustrated. *Chronogaster laxus* sp. n. is characterized by having L = 1.0-1.1 mm, a = 40.6-44.2, b = 4.4-4.5, c = 7.2-7.4, c' = 9.9-10.3, V = 53.3-54.1, C-shaped body, presence of lateral glandular bodies, 4 µm long cephalic setae, radial tubules 23-25 µm from base of the stoma, tail terminus truncated with a prominent lateral and a fine dorsal spine and absence of male. *Chronogaster udaipurensis* sp. n. is characterized by having L = 1.3-1.5 mm, a = 47.6-49.5, b = 6.2-6.8, c = 8.3-9.6, c' = 7.8-10, V = 49.2-57.1, J-shaped body, presence of lateral field and faint longitudinal lines, 7-8 µm long cephalic setae, radial tubules 29-35 µm from the base of the stoma, tail terminus sharply pointed bearing a terminal mucro with two spines and absence of male.

**Key words:** *Chronogaster laxus* sp. n., taxonomy, *Chronogaster udaipurensis* sp. n., India.

The genus *Chronogaster* was first proposed by Cobb, 1913; it belongs to the order Araeolaimida in accordance with the classification by Andr ssy, 1984. In 2006, Eyualem-Abebe *et al.* (2006) included the genus under the order Plectida. Later, several new species were added to the genus. At present the genus contains 47 species. Species compendia were published by Heyns and Coomans (1980) and Eyualem-Abebe and Coomans (1996) and keys to species identification were given by Heyns and Coomans (1983) and Raski and Maggenti (1984).

The genus *Chronogaster* is a freshwater genus and had never been reported from Indian lakes. However, during a survey of aquatic nematodes of Indian lakes, two nematode populations, collected from Pichola lake of the Udaipur district, Rajasthan, were found to differ from previously described species of this genus and hence are described hereafter as new species.

### MATERIALS AND METHODS

The sediment samples were collected from the periphery of Pichola lake, Rajasthan, using a shovel, and processed by the sieving and decanting method followed by the modified Baermann's funnel technique. The nematodes extracted were heat-killed and fixed in formalin-glycerol fixative. Then they were observed under a stereoscopic microscope, identified to genus level and those suspected to represent new species were separated and kept for dehydration in a desiccator. For permanent mounts, the specimens were mounted in anhy-

drous glycerin. Measurements and drawings were made using a drawing tube mounted on a Nikon Eclipse E600 microscope and photographs were taken using the Nikon digital camera DS-Fi1.

### DESCRIPTIONS

#### *CHRONOGASTER LAXUS* sp. n.

(Table I; Figs 1 and 2)

*Female.* Body medium-sized, cylindrical, C-shaped, tapering at both extremities, more towards the posterior end. Cuticle 2-3 µm thick, transversely annulated, annuli 2-3 µm apart at mid-body. Longitudinal and lateral lines absent. Lateral glandular bodies prominent. Lip region wide, low, non-annulated, continuous with adjacent body contour. Lips fused at the base, labial papillae indistinct. Cephalic setae 4 µm long, arising from the base of non-annulated lip region. Amphids stirrup-shaped, aperture 4 µm across, about half of corresponding body diameter, located at 3-4 µm posterior to or on the second annule from anterior end. Stoma cylindroid, radial tubules 23-25 µm from the base of the stoma. Pharynx cylindrical anteriorly, expanded posteriorly to an ovoid basal bulb of 20-22 × 16-17 µm, with tri-radiate denticulate valve and a long cardia. The nerve ring surrounds the anterior cylindrical part of the pharynx at 50.5-51.6% from the anterior end. Excretory pore located at 56.4-57.7% of pharyngeal length from the anterior end. Intestine thin walled, without distinct lumen. Female reproductive system mono-prodelphic. Ovary reflexed. Uterus thin walled. Post-uterine sac reduced, 9-11 µm or about 1/3<sup>rd</sup> of corresponding body diameter long. Vulva in a depression. Vagina perpendicular to main body axis. Vulva to anus distance 2.3-2.4 times tail

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length. Tail elongate, conoid, ventrally arcuate, tapering regularly with truncated terminus, bearing a terminal mucro of 2  $\mu\text{m}$  long. A prominent lateral and a fine dorsal spine arising on the base of the mucro. Caudal glands and spinneret absent.

*Male.* Not found.

*Type habitat and locality.* Sediment from the periphery of Pichola lake, Udaipur, Rajasthan, India.

*Etymology.* The species name is derived from Latin word (*laxus* = lateral). It denotes the origin of one spine laterally.

*Type Specimens.* Holotype female mounted on slide No. IV/2383 and eleven paratype females mounted on slide No. IV/2384 are deposited in the National Zoological Collection (NZC) of Desert Regional Centre, Jodhpur, Rajasthan, India.

*Diagnosis and relationship.* *Chronogaster laxus* sp. n. is characterized in having medium-sized C-shaped body, thick cuticle, absence of longitudinal and lateral lines, presence of lateral glandular bodies, stirrup-shaped amphids, large stoma, truncated tail terminus bearing two terminal mucros with a prominent lateral and a fine dorsal spine and absence of male.

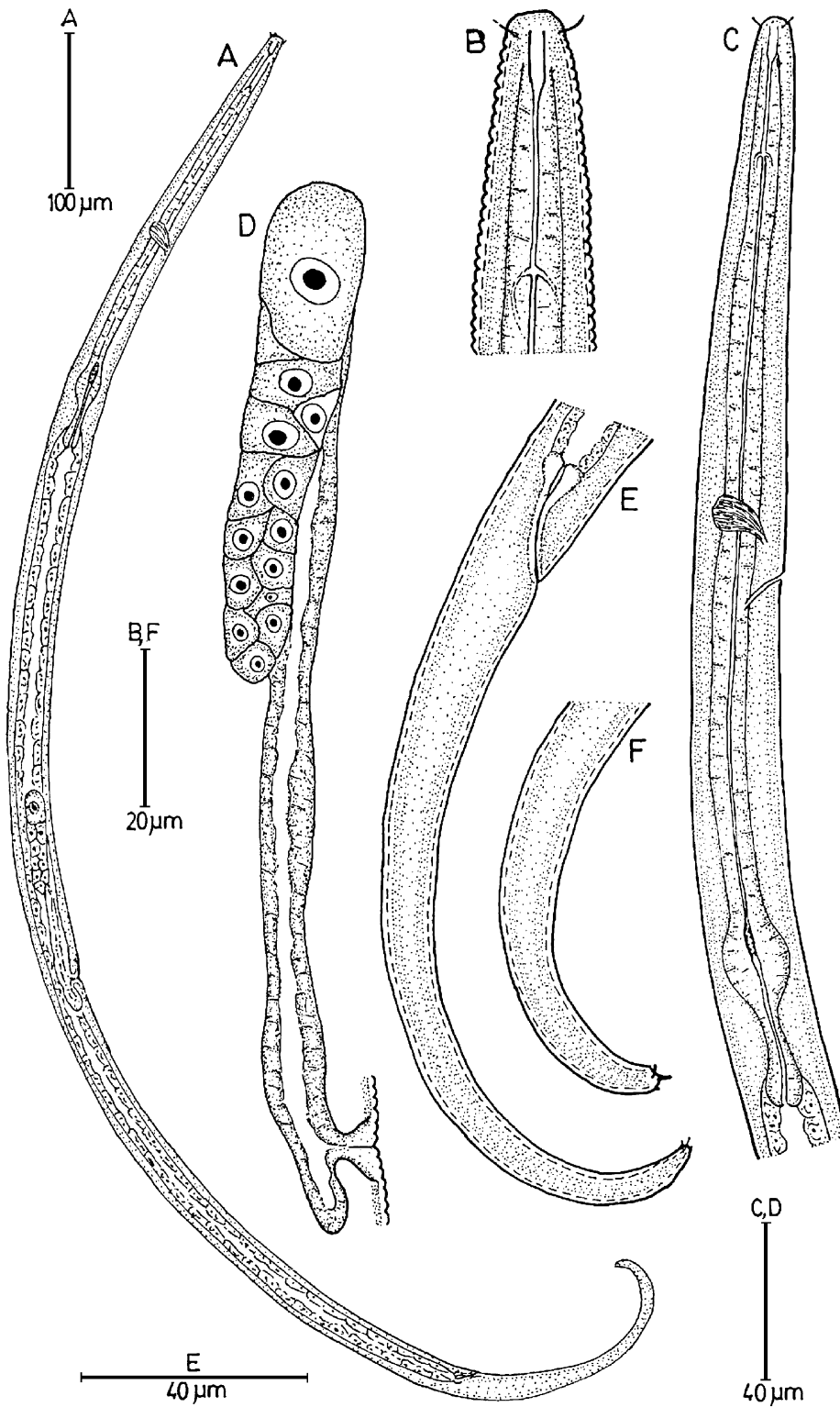
**Table I.** Morphometric characteristics of *Chronogaster laxus* sp. n. and *Chronogaster udaipurensis* sp. n. Measurements are in mm and in the form: mean  $\pm$  standard deviation (range).

Character	<i>Chronogaster laxus</i> sp. n.		<i>Chronogaster udaipurensis</i> sp. n.	
	Holotype ♀	Paratype (n = 11) ♀♀	Holotype ♀	Paratype (n = 7) ♀♀
Body length	1151	1138 $\pm$ 49.2 (1084-1180)	1429	1449 $\pm$ 98.5 (1362-1564)
Maximum body diameter	26	26.6 $\pm$ 2.0 (25-29)	29	30 $\pm$ 1.7 (29-32)
a	44.2	42.7 $\pm$ 1.8 (40.6-44.2)	49.3	48.5 $\pm$ 0.9 (47.6-49.5)
b	4.4	4.4 $\pm$ 0.1 (4.4-4.5)	6.8	6.4 $\pm$ 0.3 (6.2-6.8)
c	7.2	7.2 $\pm$ 0.1 (7.2-7.4)	16	8.7 $\pm$ 0.7 (8.3-9.6)
c'	9.9	10.1 $\pm$ 0.2 (9.9-10.3)	9.3	9.3 $\pm$ 1.6 (7.8-10)
V (%)	53.8	53.7 $\pm$ 0.4 (53.3-54.1)	57.1	52.3 $\pm$ 4.2 (49.2-57.1)
G1	20.6	23.3 $\pm$ 5.6 (20.6-29.6)	28.4	29.9 $\pm$ 7.4 (23.6-38.1)
Lip region height	5	4.3 $\pm$ 0.6 (4-5)	5	4.7 $\pm$ 0.6 (4-5)
Lip region diameter	8	7.5 $\pm$ 6 (7-8)	6	7 $\pm$ 1 (6-8)
Stoma length	11	11.8 $\pm$ 1 (11-13)	9	8.6 $\pm$ 0.6 (8-9)
Pharyngeal length	256	253.3 $\pm$ 6.3 (246-257)	210	227 $\pm$ 20.7 (210-250)
Nerve ring from anterior end	130	129.3 $\pm$ 2 (127-131)	112	105.3 $\pm$ 9.8 (94-112)
Excretory pore from anterior end	147	144.6 $\pm$ 2.5 (142-147)	135	129.3 $\pm$ 5.5 (124-135)
Cardia length	28	26.6 $\pm$ 2.3 (24-28)	29	31.6 $\pm$ 3 (29-35)
Vulva-anus distance	372	370.6 $\pm$ 18 (352-388)	463	527.3 $\pm$ 75.1 (463-610)
Rectum length	20	22 $\pm$ 3.4 (20-26)	19	19.3 $\pm$ 0.5 (19-20)
Anal body diameter	16	15.3 $\pm$ 1.1 (14-16)	16	18 $\pm$ 2.6 (16-21)
Tail length	159	155.3 $\pm$ 9.1 (145-162)	149	166.3 $\pm$ 19.2 (149-187)

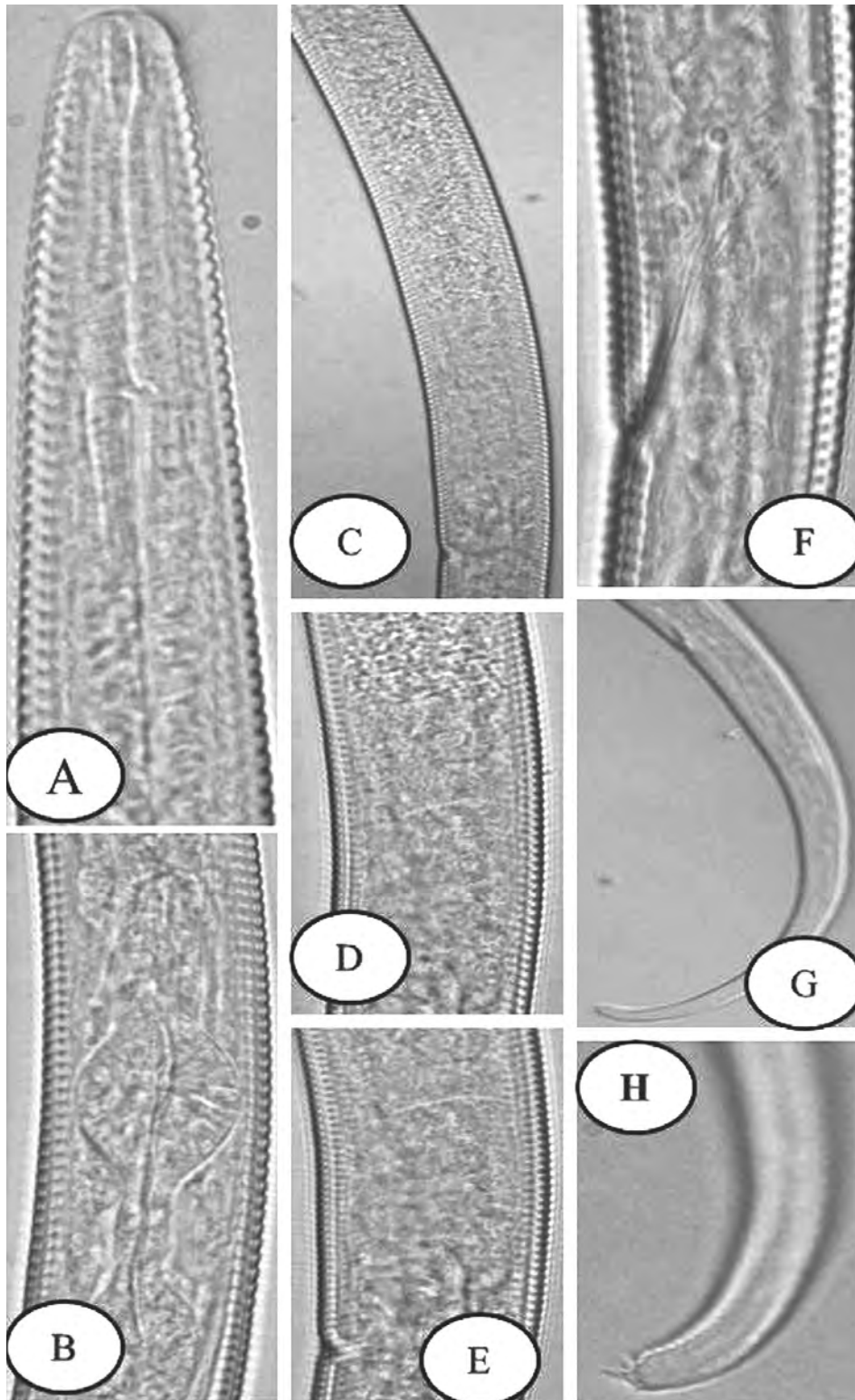
*Chronogaster laxus* sp. n. comes close to *C. longicollis* (Daday, 1899) Andrassy, 1958 but differs from it in having thick (*vs* thin) cuticle, annuli 2-3  $\mu\text{m}$  (*vs* 1.2-1.3  $\mu\text{m}$ ) wide; presence (*vs* absence) of lateral glandular bodies; smaller cephalic setae (4  $\mu\text{m}$  *vs* 9  $\mu\text{m}$ ); larger cardia (24-28  $\mu\text{m}$  *vs* 22  $\mu\text{m}$ ); tail terminus with a prominent lateral

and a fine dorsal (*vs* three prominent) spines and absence of male (*vs* presence of male in *C. longicollis*).

*Chronogaster laxus* sp. n. comes close to *C. andrassyi* Loof *et* Jairajpuri, 1965 but differs from it in having a shorter body (1.0-1.1 mm *vs* 1.2-1.3 mm); smaller value of a (40.6-44.2 *vs* 48-54); greater c and V values (7.2-7.4



**Fig. 1.** Drawing of *Chronogaster laxus* sp. n. A: entire female; B: anterior end; C: pharynx; D: female reproductive system; E, F: posterior end.



**Fig. 2.** Photographs of *Chronogaster laxus* sp. n. A: anterior end; B: pharynx showing basal bulb; C-E: female reproductive system; F: posterior region showing rectum and anal opening; G, H: tail region.

*vs* 5.5-6.4 and 53.3-54% *vs* 49-52%, respectively); smaller cephalic setae (4  $\mu$ m *vs* 8  $\mu$ m) and small mucro (2  $\mu$ m *vs* 5  $\mu$ m) with two *vs* four spines in *C. andrassyi*).

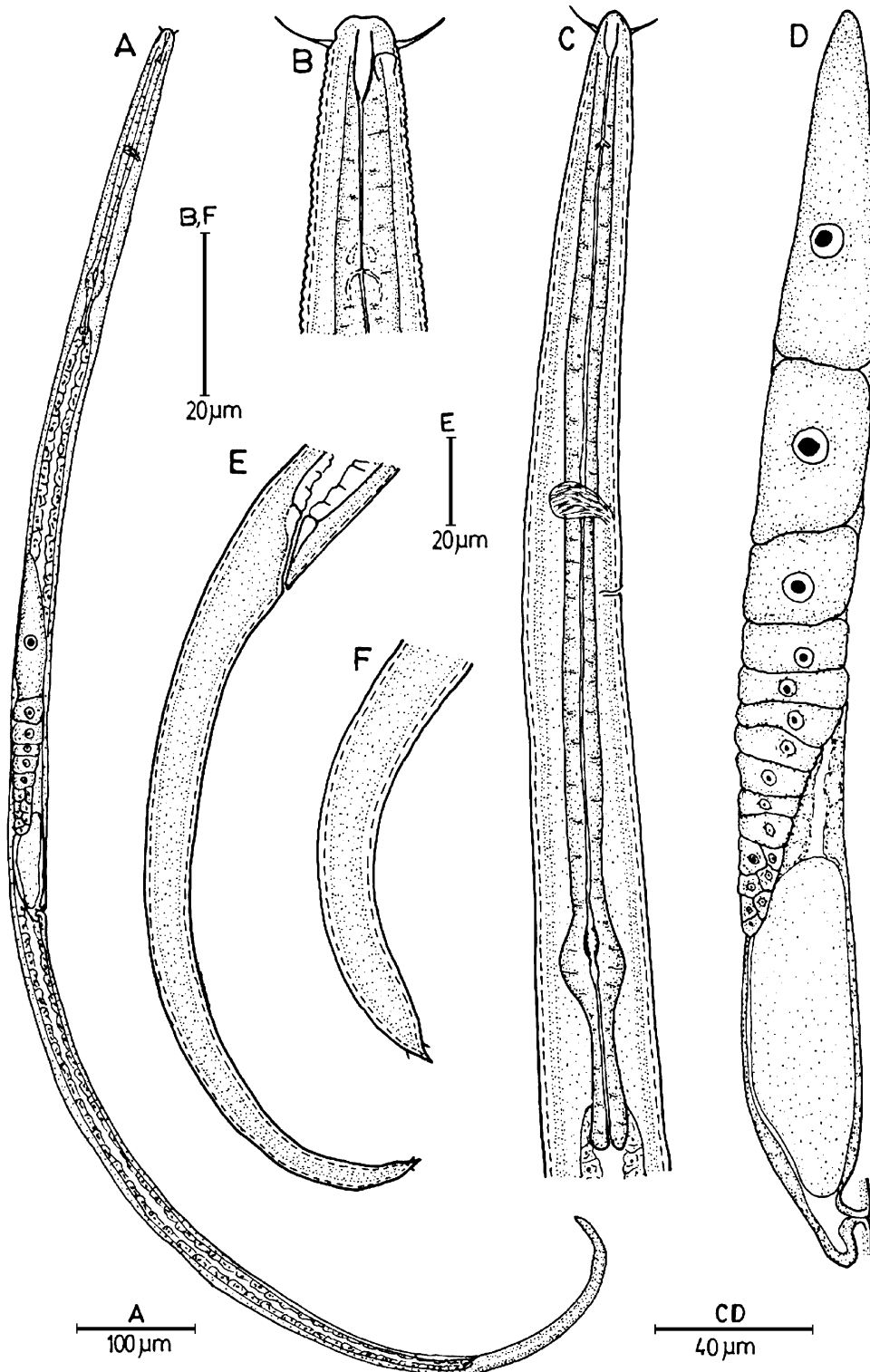
*Chronogaster laxus* sp. n. comes close to *C. citri* Khan *et* Nanjappa, 1973 but differs from it in having smaller cephalic setae (4  $\mu$ m *vs* 6-7  $\mu$ m); presence (*vs* absence)

of lateral glandular bodies; greater c value (7.2-7.4 *vs* 4.5-6.5); relatively smaller c' value (9.9-10.3 *vs* 10-15) and smaller mucro (2  $\mu$ m *vs* 5  $\mu$ m) with a prominent lateral and a fine dorsal spine (*vs* one dorsal and one ventral spine in *C. citri*).

*CHRONOGASTER UDAIPURENSIS* sp. n.  
(Table I; Figs 3 and 4)

*Female.* Body medium-sized, cylindrical, J-shaped upon fixation, tapering at both extremities, more towards posterior end. Cuticle thin, transversely annulated, annuli 1-2  $\mu\text{m}$  apart at mid-body. Lateral glandular

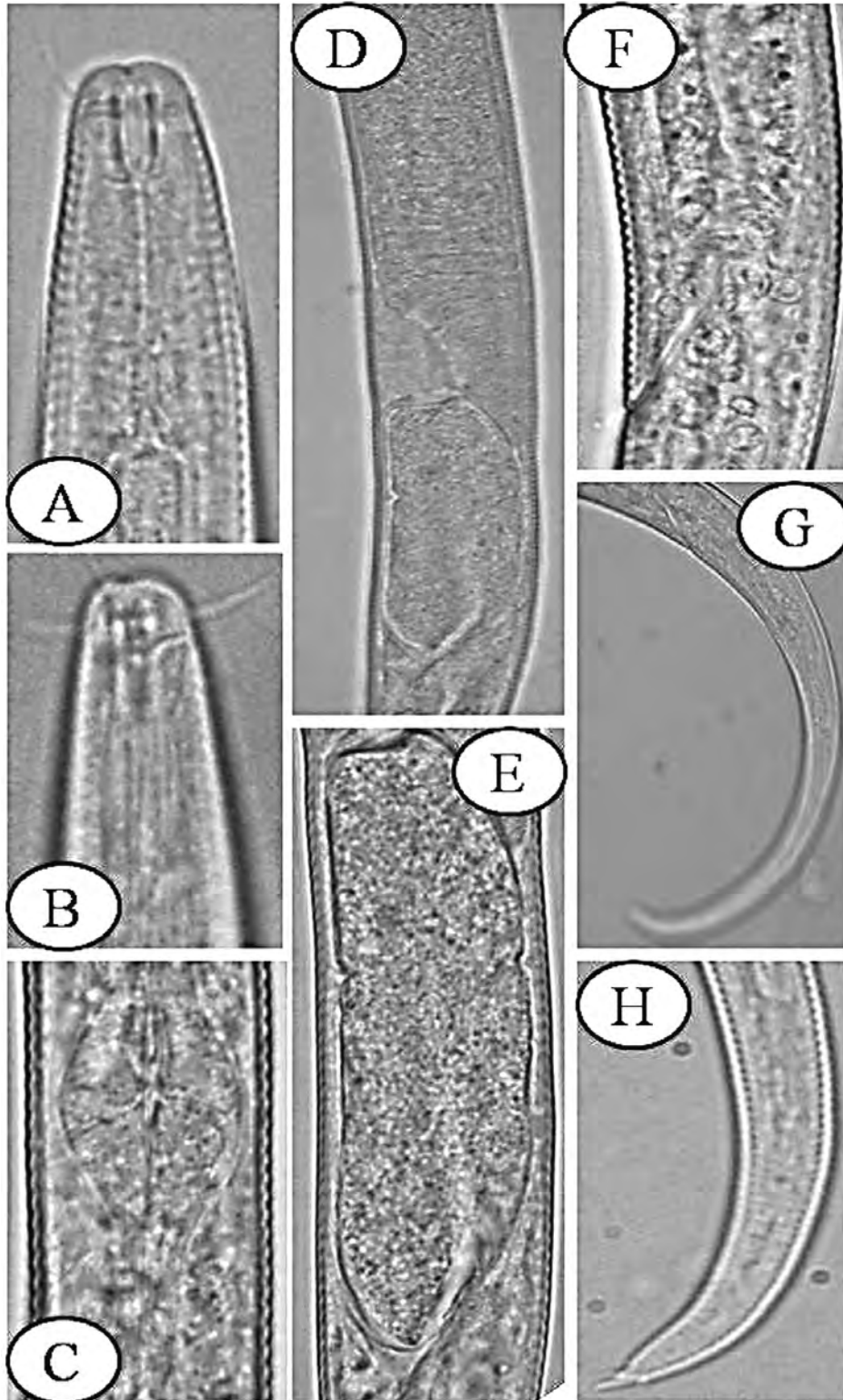
bodies absent. Longitudinal lines faint. Lateral field a narrow band with two crenated lateral lines, one fourth to one fifth of corresponding body diameter. Lip region wide, low, non-annulated, slightly set off with adjacent body contour. Labial papillae indistinct. Cephalic setae 7-8  $\mu\text{m}$  long, arising from base of non-annulated lip region. Amphids stirrup-shaped, aperture 3  $\mu\text{m}$  across,



**Fig. 3.** Drawing of *Chronogaster udaipurensis* sp. n. A: entire female; B: anterior end; C: pharynx; D: female reproductive system; E, F: posterior end.

less than half of corresponding body diameter, located at 5-6  $\mu\text{m}$  posterior to or on first annule from anterior end. Stoma cylindroid, radial tubules 20-30  $\mu\text{m}$  from base of the stoma. Pharynx cylindrical, posteriorly with an ovoid basal bulb of 20-21  $\times$  17-18  $\mu\text{m}$  having tri-radiate denticulate valve and a long cardia. Nerve ring located at 37.6-53.3% of pharyngeal length from the anterior

end. The excretory pore located at 49.6-64.2% of the pharyngeal length from anterior end. Intestine thick-walled, narrow lumen. Female reproductive system mono-prodelphic. Ovary reflexed. Uterus thin walled, usually with a single egg of 80-86  $\times$  23-24  $\mu\text{m}$ . Post-uterine sac reduced, 4-5  $\mu\text{m}$  long. Vulva in a depression. Vagina perpendicular to main body axis. Vulva to anus



**Fig. 4.** Photographs of *Chronogaster udaipurensis* sp. n. A, B: anterior end; C: pharynx showing basal bulb; D, E: female reproductive system showing an egg; F: posterior region showing rectum and anal opening; G, H: tail region.

distance 3.1-3.2 times tail length. Tail elongate, ventrally arcuate, tapering regularly with a terminal mucro of 3  $\mu\text{m}$  length. Two spines located on the base of the mucro. Caudal glands and spinneret absent.

*Male.* Not found.

*Type habitat and locality.* Sediment from the periphery of Pichola lake, Udaipur, Rajasthan, India.

*Etymology.* The species name denotes the locality (Udaipur) from where it was collected.

*Type Specimens.* Holotype female mounted on slide No. IV/2385 along with seven paratype females on slide No. IV/2386 are deposited in the National Zoological Collection (NZC) of Desert Regional Centre, Jodhpur, Rajasthan, India.

*Diagnosis and relationship.* *Chronogaster udaipurensis* sp. n. is characterized in having medium-sized J-shaped body, thin cuticle, presence of lateral lines, absence of lateral glandular bodies, stirrup-shaped amphids, large stoma, tail terminus bearing a terminal mucro with two spines and absence of male.

*Chronogaster udaipurensis* sp. n. comes close to *C. citri* Khan *et* Nanjappa, 1973 but differs from it in having a longer body (1.3-1.5 mm *vs* 1.0-1.2 mm); greater b and c values (6.2-6.8 *vs* 4-5 and 8.3-9.6 *vs* 4.5-6.5, respectively); smaller c' value (7.8-10 *vs* 10-15); J (*vs* C) -shaped body; presence (*vs* absence) of lateral lines; straight (*vs* curved) cephalic setae of 7-8  $\mu\text{m}$  (*vs* 6-7  $\mu\text{m}$ ) length and non-cuticularised vagina (*vs* heavily cuticularised vagina in *C. citri*).

*Chronogaster udaipurensis* sp. n. differs from *C. typica* De Man, 1921 in having greater b value (6.2-6.8 *vs* 4.7-6); smaller c' value (7.8-10 *vs* 12-14); relatively smaller cephalic setae (7-8  $\mu\text{m}$  *vs* 8-11.5  $\mu\text{m}$ ); larger cardia (29-35  $\mu\text{m}$  *vs* 21-25  $\mu\text{m}$ ); J- (*vs* C-) shaped body; absence (*vs* presence) of crystalloid bodies; absence (*vs* presence) of lateral glandular bodies and tail terminus with spines (*vs* without spines in *C. typica*).

*Chronogaster udaipurensis* sp. n. differs from *C. laxus* n. sp. in having a longer body (1.3-1.5 mm *vs* 1.0-1.1 mm); greater a and b values (47.6-49.5 *vs* 40.6-44.2 and 6.2-6.8 *vs* 4.4-4.5, respectively); J (*vs* C) -shaped body; thin (*vs* thick) cuticle, annuli 1-2  $\mu\text{m}$  (*vs* 2-3  $\mu\text{m}$ ) wide; absence (*vs* presence) of lateral glandular bodies; presence (*vs* absence) of lateral lines; larger cephalic setae (7-8  $\mu\text{m}$  *vs* 4  $\mu\text{m}$ ); larger cardia (29-35  $\mu\text{m}$  *vs* 24-28  $\mu\text{m}$ )

and smaller post-uterine sac (4-5  $\mu\text{m}$  *vs* 9-11  $\mu\text{m}$  long in *Chronogaster laxus* n. sp.).

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