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SOME BACTERIVOROUS NEMATODES FROM UTTARAKHAND, INDIA

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INTRODUCTION

Nematodes are biologically diverse and versatile, occupying an enormous range of habitats with variable feeding habits. They constitute nearly 90% of all Metazoan in number and have 26646 recorded species with 8359 species parasitic in vertebrates, 10681 species free-living, 4105 species parasitic in plants and 3501 species parasitic in invertebrate hosts (Hugot *et al.*, 2001). Further, soil-inhabiting nematodes predominate over all other soil animals, both in numbers and species. On the basis of feeding habits these soil inhabiting nematodes are classified as plant feeders, bacterial feeders, fungal feeders, predators and omnivores (Yeates *et al.*, 1993). Earlier most of the researches were focused on plant feeders because of the economic losses to agriculture. Though free-living nematodes (bacterial and fungal feeders) accounts to a large number of species, they have remained ignored for a long time due to their apparent low economic value. However, recent researches proved that these groups are important components of food chains and possess several attributes that make them useful ecological indicators (Freckman, 1988; Bongers, 1990; Neher, 2001). The Bacterivorous (bacterial feeders) nematodes occur in several orders like Rhabditida, Alaimida, Monhysterida, Aerolaimida, Enoplida, etc.

A few papers on bacterivorous nematodes from Uttarakhand are of Siddiqi & Husain (1967) who recorded two species from Nainital and Dehradun districts; Khera & Chaturvedi (1977) recorded several species from the Tea Plantations of Dehradun; Jairajpuri & Khan (1982) recorded 3 species from Nainital & Dehradun Districts. Recently, Rizvi recorded these nematodes from Corbett Tiger Reserve (CTR), district Nainital (Rizvi, 2008) and from the Western Doon Shivalik (WDS) region of district Dehradun (Rizvi, 2007). The present paper reports 5 new records of bacterivorous nematodes from Uttarakhand, belonging to 3 orders, namely, Rhabditida (2 species); Aerolaimida (2 species) and Alaimida (1 species). Out of these 5 species, 4 are being recorded from district Dehradun and 1 species from district Chamoli.

MATERIALS AND METHODS

Soil samples collected from soil around roots of Sugarcane, Mango, Litchi, Deodar, Sal and Pine from Dehradun, were processed by sieving and decantation technique. The nematodes were fixed, dehydrated and mounted in anhydrous glycerine. Measurements were made with an ocular micrometer on Leica WILD MPS 32. Photomicrographs taken with BX51DIC Olympus microscope and DP20 digital camera.

OBSERVATIONS

Order RHABDITIDA

Suborder RHABDITINA

Superfamily RHABDITOIDEA

Family RHABDITIDAE

Subfamily PELODERINAE

Genus *Caenorhabditis* (Osche, 1952) Dougherty, 19531. *Caenorhabditis elegans* (Maupas, 1899) Dougherty, 1953

(Fig. 1)

1899. *Rhabditis elegans* Maupas, *Arch. zool. expt. gen.*, **8** : 480.1953. *Caenorhabditis elegans* Dougherty, *Thapar Comm. Vol.*, : 70.*Material examined* : (n = 5) Female : L = 0.70-1.1 mm; a = 19-21; b = 6-8; c = 8-10; V = 52-55.

Male : (n = 2) L = 0.53-0.65 mm; a = 16-18; b = 4.2-4.8; c = 22-25.

Description : Body tapering slightly at extremities. Lips with the usual circles of six labial papillae and four cephalic papillae. Stoma 15 µm long, 4 µm wide; denticles on metarhabdions not clearly visible. Pharyngeal collar surrounds about half the stoma. Pharyngeal corpus with prominent basal swelling. Pharyngeal corpus without a median bulb. Basal bulb with valve plate. Lateral fields marked by four incisures. Nerve ring located at the middle of isthmus. Excretory pore opposite to anterior end of bulb. Vulva median, ovaries paired, opposed, reflexed. Female tail conical and long, 88-110 µm. Phasmids located at one-fourth-one-third of the tail.

Male tail peloderan with 9 pairs of bursal papillae. Spicules straight to slightly curved, 40-48 µm long. Gubernaculum straight to slightly curved, 28-30 µm long.

Remarks : The measurements are in agreement with the earlier workers. This species is being recorded for the first time from district Dehradun, Uttarakhand.

Distribution : India : Uttar Pradesh and Uttarakhand.

Elsewhere : Germany, France, Bulgaria, Italy, England, Denmark, Soviet Union, China, Algeria and United States.

Habitat and Locality : Soil around roots of Pine, *Pinus* sp from FRI forest, Dehradun.

Suborder CEPHALOBINA

Family CEPHALOBIDAE

Subfamily ACROBELINAE

Genus *Zeldia* Thorne, 19372. *Zeldia punctata* (Thorne, 1925) Thorne, 1937

(Fig. 2)

1925. *Acrobeles punctata* Thorne, *Trans. Amer. Micr. Soc.*, **44** : 200.1935. *Acrobeles glaphyrus* Steiner, *Proc. Helm. Soc. Wash.*, **2** : 41.1937. *Zeldia punctata* Thorne, *Proc. Helm. Soc. Wash.*, **4** : 15.1972. *Zeldia minor* Allen & Noffsinger, *Proc. Helm. Soc. Wash.*, **39** : 220.

Material examined : (n = 2) Female : L = 0.75-0.85 mm; a = 18.6-21; b = 3.5-4.1; c = 11.5-12.5; V = 58-60.

Description : Body straight or slightly curved ventrally upon fixation. Cuticle without punctuation. Cuticle annulated, annules 1.8-1.9 μm at at midbody and 2.6 μm on tail. Lateral fields marked by five incisures. Outer incisures widely spaced, three inner incisures very closely placed and not visible clearly. Lip region 10-12 μm wide, 2.5 μm high. Labial probolae with rounded margins and shallow grooves. Cephalic probolae six, flap-like, edges crenate anteriorly projecting margins at the primary cephalic axils. Amphidial apertures elongate oval. Cheilostome wall prominent. Gymnostom smaller than stegostom. Pharyngeal corpus cylindrical, six or eight times isthmus length. Basal bulb valvated, 22-25 \times 18-22 μm . Excretory pore opposite nerve ring. Cardia conoid, 3.0-3.5 μm long. Gonad single, prodelfic. Ovary reflexed, with additional flexures near the tip. Post-uterine sac 15-20 μm long. Vulval lips depressed, radially ridged. Rectum, 24-25 μm long. Tail 0.065-0.068 mm long, conoid, with pointed terminus. Phasmids anterior to middle of tail.

Male : Not found.

Remarks : This species is being recorded for the first time from Uttarakhand. Soil around root zone of Deodar is a new habitat record.

Distribution : India : Uttar Pradesh and Uttarakhand.

Elsewhere : Namibia, Hungary, Poland, Spain and U.S.A.

Habitat and Locality : Soil around roots of Deodar from Chakrata, district Dhradun.

Order ARAEOLAIMIDA

Superfamily PLECTOIDEA

Family PLECTIDAE

Subfamily PLECTINAE

Genus *Plectus* Bastian, 1865

3. *Plectus cirratus* Bastian, 1865

(Fig. 2)

1865. *Plectus cirratus* Bastian, *Linn. Soc. Lond. Trans.*, **25** : 95.

Material examined : (n = 2) Female : L = 0.90-0.93 mm, a = 21-22; b = 4.1-4.3; c = 7.9-8.1; V = 51-52.

Description : Female : Body arcuate ventrally upon fixation. Cuticle thick finely striated. Lip region slightly set off, 9-10 μm wide. Setae behind the lip region. Amphid opening circular. Stoma 21-30 μm long, 4-5 μm wide. Pharyngeal corpus cylindrical with a valvular terminal bulb. Cardia long, surrounded by intestine. Vulva median. Ovaries two, opposed reflexed. Tail, 0.113-0.114 mm long, tapering terminus with spinneret.

Male : Not found.

Remarks : All measurements are in agreement with earlier workers except for slightly posteriorly situated vulva (41-50% of body length). This species is being recorded for the first time from Uttarakhand and also for the first time from rice fields.

Distribution : India : Uttarakhand, Uttar Pradesh, Sikkim.

Elsewhere : South Africa, Hungary and USA.

Habitat and Locality : Soil from rice fields, Sahiya, district Dehradun.

Genus *Chiloplectus* Andrassy, 1984

4. *Chiloplectus indicus* Tahseen *et al.*, 2004

(Fig. 3)

2004. *Chiloplectus indicus* Tahseen *et al.*, *Nematology*, **6** : 760-763.

Material examined : (n = 3) Female : L = 0.48-0.52 mm, a = 17-20; b = 3.5-3.7; c = 8.7-9.0; V = 53.2-53.

Description : Female : Body arcuate towards posterior extremity. Cuticle thick, strongly annulated. Lateral Fields with three incisures. Lip region strongly set off, with conical lips, separated from each other by a distinct gap, with inner setose projections pointing towards oral aperture. Cephalic setae 2-3 μ m long, originating from second to third annule. Cervical setae 7-9 in number. Stoma with cuticularized cheilostome. Amphidial apertures plectoid, located anterior to middle of stoma, at 5-6 annules from base of lips. Pharynx with corpus, slightly narrower isthmus and a basal bulb with post bulbar extension leading to a small cardia. Basal pharyngeal bulb with a six pairs of denticulate ridges in grinder. Reproductive system didelphic, amphidelphic, genital tract weakly developed. Ovaries small, reflexed. Vagina straight with weak sphincter muscles. Vulval lips protruding. Tail 55-75 μ m long, ventrally curved, gradually narrowing towards tip with a subterminal mid dorsal spur and three pairs of caudal setae.

Male : Not found.

Remarks : *Chiloplectus indicus* is being recorded for the first time from Uttarakhand (district Chamoli) at an altitude of 10,000 ft. Soil around roots of thumer is a new habitat record. All the measurements are in agreement with Tahseen *et al.*, (2004) except for smaller body length and slightly smaller tail length (L = 0.695-1.041 mm; Tail = 0.068-0.105 mm).

Distribution : India : Uttarakhand, Uttar Pradesh, and Arunachal Pradesh.

Habitat and Locality : Soil around roots of thumer, *Taxus baccata* and silver oak from Ghangharia, district Chamoli.

Order ALAIMIDA

Family ALAIMIDAE

Genus *Alaimus* de Man, 1880

5. *Alaimus primitivus* de Man, 1880

(Fig. 3)

1880. *Alaimus primitivus* de Man, *Tijds. Nederland Dierk. Vereen*, **5** : 10.

Material examined : (n = 5) Female : L = 0.8-1.2 mm; a = 42-58; b = 3.7-4.3; c = 7.1-8.4; V = 39-55.

Description : Female : Body tapering uniformly at both extremities. Cuticle smooth. Lip region rounded. Pharynx in two parts, anterior narrow tubular and posterior slowly expanding to form an

elongated basal swelling. Vulva a transverse slit. Ovary reflexed about half way to vulva. Gonad mono-opisthodelphic. Tail long and narrow, 0.11-0.14 mm.

Male : Not found.

Remarks : This species is being recorded for the first time from Uttarakhand. Sugarcane fields and Pine plantations are new habitat records.

Distribution : India : Uttar Pradesh, Sikkim and Uttarakhand.

Elsewhere : U.S.A. South Africa, Germany, Belgium, Hungary, Poland, Sweden and Australia.

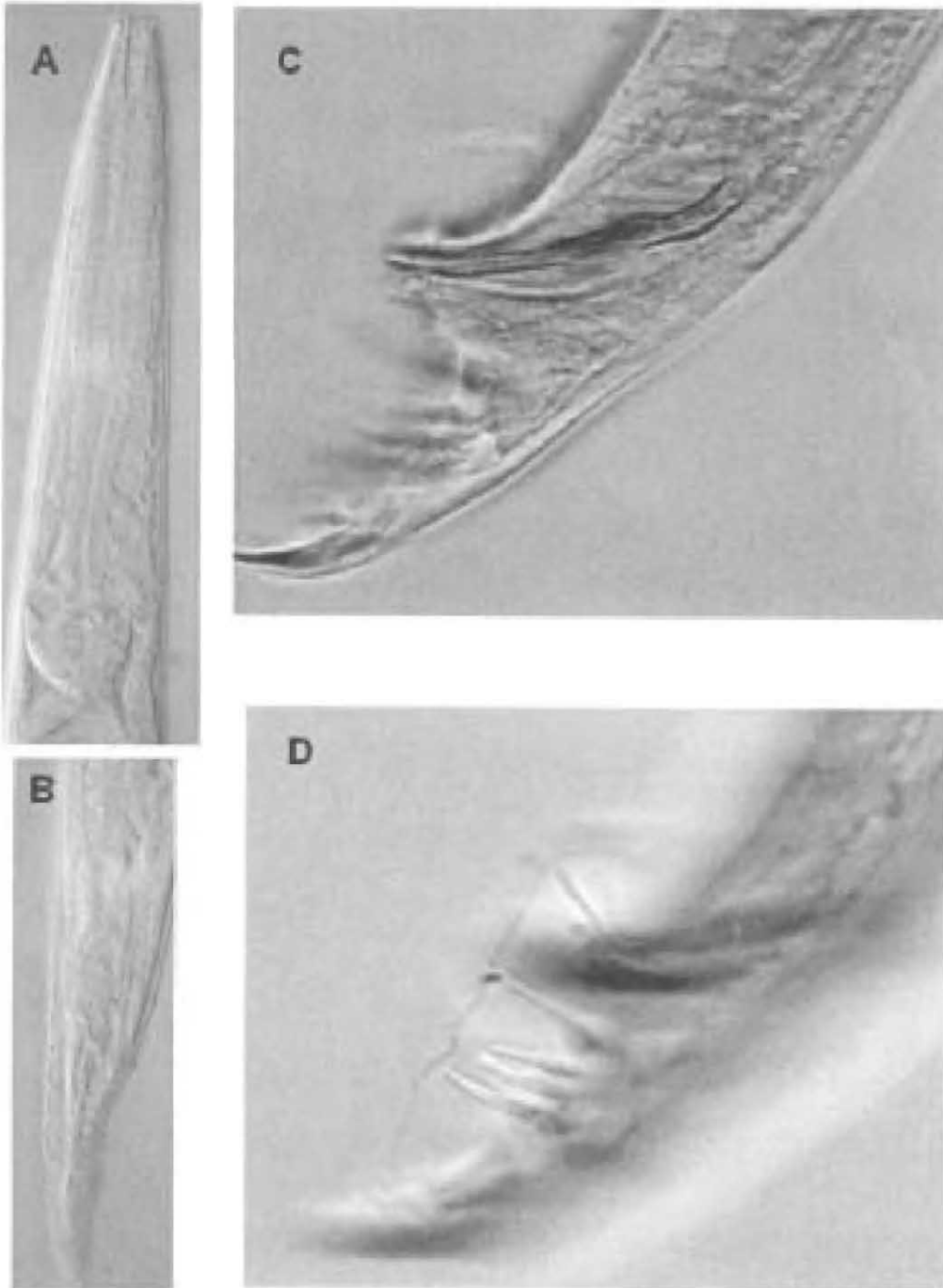
Habitat and Locality : Soil around roots of Sugarcane, Mohand Rao, Doiwala and Pine from FRI, Dehradun.

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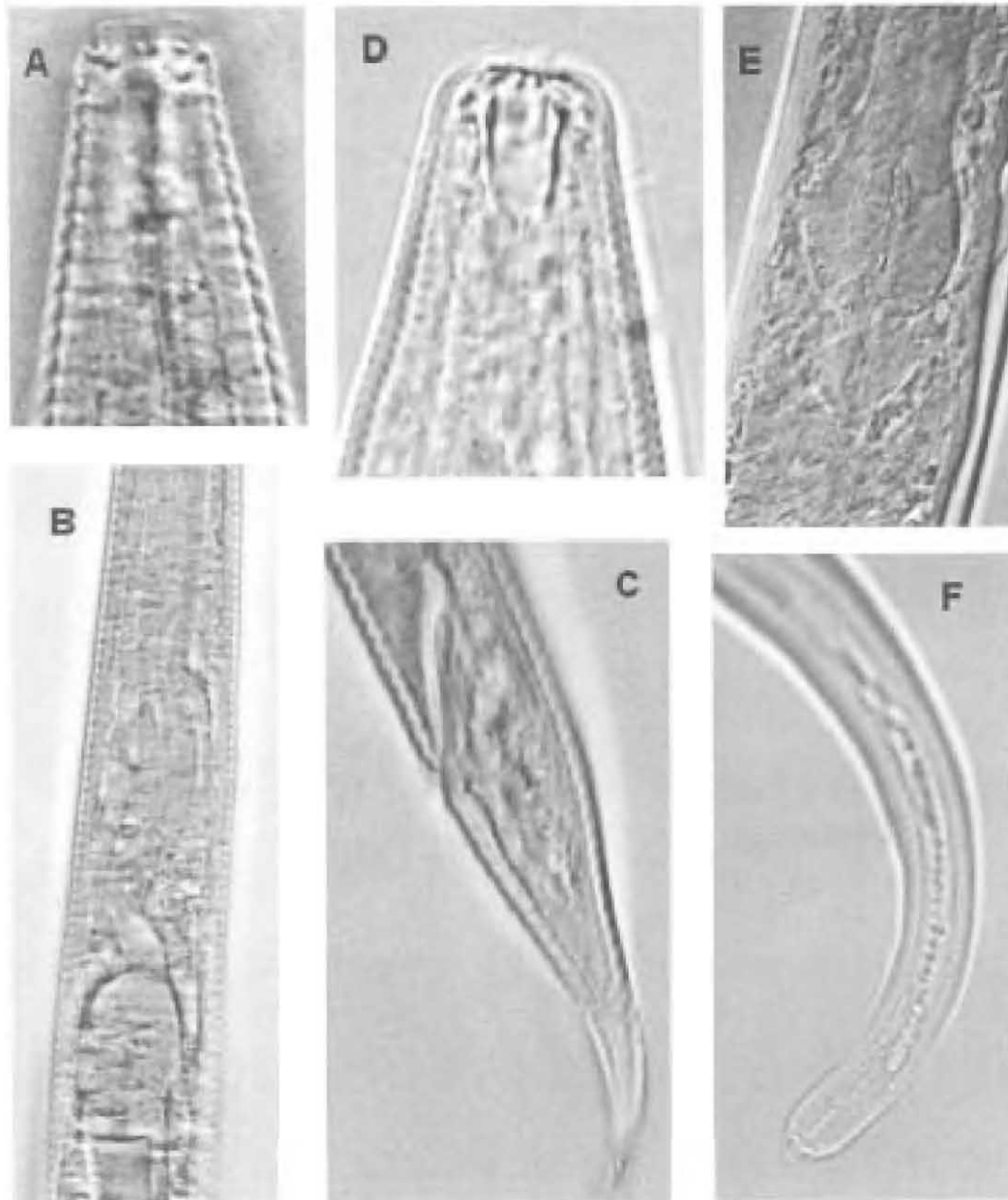
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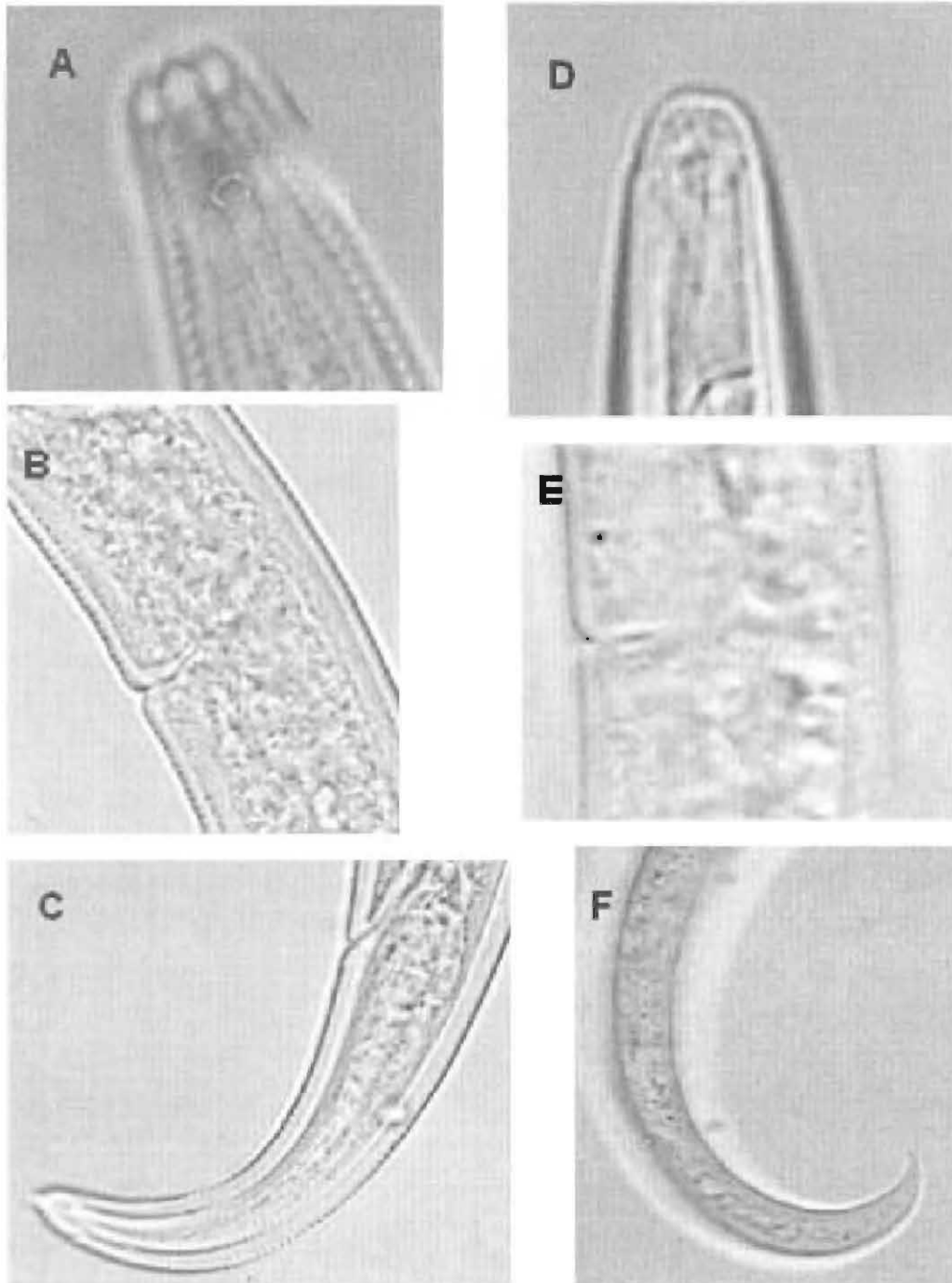
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Figs. 1. Photomicrographs of *Caenorhabditis elegans*; A. Female anterior end. B. Female posterior end. C. Male spicule. D. Male caudal papillae



Figs. 2. Photomicrographs of *Zeldia punctata* (A-C) & *Plectus cirratus* (D-F); A. Female anterior end. B. Pharyngeal bulb. C. Tail. D. Female anterior end. E. Pharyngeal bulb. F. Tail.



Figs. 3. Photomicrographs of *Chiloplectus indicus* (A-C) & *Alaimus primitivus* (D-F); A. Female anterior end. B. Vulval region. C. Tail. D. Female anterior end. E. Vulval region. F. Tail.