

# Nematode fauna of Rajaji National Park, with First record of *Granonchulus subdecurrens* Coetzee, 1966 (Mononchida: Mylonchulidae) from India

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**Abstract:** A total 26 species of terrestrial nematode (15 from order Dorylaimida and 11 from order Mononchida) has been recorded from Rajaji National Park (RNP), Uttarakhand, India. All are being reported first time from RNP. Of these, *Granonchulus subdecurrens* Coetzee, 1966 is being recorded from first time from India.

**Keywords:** Dorylaimida, Mononchida, *Granonchulus*, New Records, Rajaji National Park, India

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## 1. Introduction

India is a rich faunal diversity country. In invertebrate fauna, nematode constitute second largest group after arthropods. Significant work on terrestrial nematode already being done in India by reporting 2100 species of nematodes from different ecosystem [9]. A number of Indian Nematologist [1-3,5-7] made their contribution to work out nematode fauna of Protected areas viz., Keoladeo National Park, Kaziranga National Park, Rajaji National Park and Ranthambore National Park and Silent Valley National Park.

In Uttarakhand, Rajaji National Park (RNP) is one of the important conservation area, because it has rich bio-diversity. In nematode fauna only 5 species have been already recorded from by the present authors [5] from this protected area. In the present paper an account of identified 26 species of nematode from this protected area is presented, of which *Granonchulus subdecurrens* is first reported from country.

## 2. Materials and Methods

During survey for nematode fauna of RNP in 2013, soil samples were collected soil around the of forest tree species from Chilla Range, Jhabar and Hazra Beats, RNP, Haridwar, were processed by sieving and decantation and modified Baerman's funnel techniques. Extracted nematodes were heat-killed and fixed in hot 4% formalin. The nematodes will be transferred from fixative to a solution of 5 parts of glycerin and 95 parts of 30% alcohol in a cavity block and

dehydrated by slow evaporation method [8] and mounted in anhydrous glycerin. The mounted nematodes were later measured by ocular micrometer and drawn using drawing tube attached to Olympus BX-51 DIC Microscope. LM photographs were taken using Olympus digital camera.

## 3. Results

During nematode survey 26 species has been recorded from RNP, belonging to 11 genera, 7 families and 2 orders, of Dorylaimida and Mononchida. Four species of *Xiphinema* are plant parasitic in nature.

All 26 species are recorded for first time from this protected area, of which *Granonchulus subdecurrens* Coetzee, 1966 is being reported from India. All the specimens are registered in National Zoological Collection, NRC, ZSI, Dehra Dun, India.

Order Dorylaimida

Family Aporcelaimidae Heyns, 1965

1. *Aporcelaimellus capitatus* (Thorne & Swanger, 1936) Heyns, 1965
2. *Aporcelaimellus clamus* Throne, 1974
3. *Aporcelaimellus invisus* Tjepkema, Ferris and Ferris, 1971
4. *Aporcelaimellus obscurus* (Thorne & Swanger, 1936) Heyns, 1965

Family Qudsianematidae Jairajpuri, 1965

5. *Eudorylaimus chauhani* (Baqri & Khera, 1975) Andrassy, 1986

6. *Allodorylaimus irritans* (Cobb in Thorne & Swanger, 1936) Andrassy, 1986
7. *Discolaimus major* Thorne, 1939
8. *Discolaimus tenax* Siddiqi, 1964
9. *Discolaimus texanus* Cobb, 1913
10. *Discolaimus similis* Thorne, 1939  
Family Xiphinematidae Dalmasso, 1969
11. *Xiphinema americanum* Cobb, 1913
12. *Xiphinema inaequale* Khan & Ahmad, 1974
13. *Xiphinema insigne* Loos, 1949
14. *Xiphinema opisthosternum* Siddiqi, 1961  
Family Mydonomidae Thorne, 1964
15. *Dorylaimoides micoletzkyi* (de Man, 1921) Thorne & Swanger, 1936  
Order Mononchida Jairajpuri, 1969  
Family Mylonchulidae Jairajpuri, 1969
16. *Mylonchulus armus* Khan & Jairajpuri, 1979
17. *Mylonchulus brachyurus* (Butschli, 1873) Andrassy, 1958
18. *Mylonchulus hawaiiensis* (Cassidy, 1931) Andrassy, 1958
19. *Paramylonchulus mashhoodi* (Khan & Jairajpuri, 1979) Jarajpuri & Khan, 1981
20. *Paramylonchulus mulveyi* (Khan & Jairajpuri, 1979) Jarajpuri & Khan, 1981
21. *Granonchulus subdecurrens* Coetzee, 1966  
Family Iotonchidae Jairajpuri, 1969
22. *Iotonchus indicus* Jairajpuri, 1969
23. *Iotonchus parabasiodontus* Mulvey & Jensen, 1967
24. *Iotonchus trichurus* (Cobb, 1917) Andrassy, 1958
25. *Iotonchulus longicaudatus* (Baqri, Baqri & Jairajpuri, 1978) Andrassy, 1993  
Family Bathyodontidae Clark, 1961
26. *Bathyodontus mirus* (Andrassy, 1956) Andrassy in Hooper & Cairns, 1959

### Abbreviations

L = Total body length; a = Body length/greatest body width; b = Body length/neck length; c = Body length/tail length; c' = Tail length/body width at anus; V = Distance of vulva from ant. end x 100/body length

### Description and Diagnosis

1. *Aporcelaimellus capitatus* (Thorne & Swanger, 1936) Heyns, 1965

Morphological taxonomic calculation: Female: L=2.0mm; a=27; b=3.7; c=53; c'=1.1; V=54; Odontostyle=20µm; Odontophore= 40µm

Description: Female: Body ventrally arcuated upon fixation. Lip region discoid. Lips with prominent papillae. Vulva a transverse slit. Reproductive system amphidelphic. Tail dorsally convex.

Male: Not found.

Locality and habitat: Soil around the roots of *Shorea robusta*.

2. *Aporcelaimellus clamus* Thorne, 1974

Morphological taxonomic calculation: Female: L=2.3mm; a=29; b=4.0; c=59; c'=0.9; V= 53; Odontostyle=18µm; Odontophore= 38µm

Description: Female: Body slightly arcuate upon fixation. Lips region set off by slightly narrowing of neck. Vulva a transverse slit. Reproductive system amphidelphic. Tail bluntly conoid.

Male: Not found.

Locality and habitat: Soil around the roots of *Shorea robusta* from Hazra Beat.

3. *Aporcelaimellus invisus* Tjepakema, Ferris and Ferris, 1971

Morphological taxonomic calculation: Female: L=2.1mm; a=26; b=3.7; c=55; c'=0.9, V=54; Odontostyle=20µm; Odontophore= 40µm.

Description: Female: Body slightly arcuate upon fixation. Lips region set off by slightly narrowing of neck. Odontostyle aperture 63% of odontostyle length. Vulva a transverse slit. Reproductive system amphidelphic. Tail long, bluntly conoid.

Male: Not found.

Locality and habitat: Soil around the roots of unidentified trees from Hazra Beat.

Remarks: The measurements of present specimens fit well with the specimen described by Tjepakema, Ferris and Ferris, 1971 except odontophore (length obscure in type).

4. *Aporcelaimellus obscurus* (Thorne & Swanger, 1936) Heyns, 1965

Morphological taxonomic calculation: Female: L=2.2mm; a=28; b=3.6; c=68; c'=0.76, V=58; Odontostyle=21µm; Odontophore= 40µm

Description: Female: Body ventrally arcuated upon fixation. Lips distinct, well separated. Vulva a transverse slit. Reproductive system amphidelphic. Tail convex-conoid, tip blunt.

Male: Not found.

Locality and habitat: Soil around the roots of *Ehretia laevis* from Jhabar Beat.

5. *Eudorylaimus chauhani* (Baqri & Khera, 1975) Andrassy, 1986

Morphological taxonomic calculation: Female: L=1.5mm; a=29; b=4.0; c=24; c'=2.3; V=50; Odontostyle=18µm; Odontophore= 30 µm

Description: Female: Body curved ventrally upon fixation. Lip region well offset by constriction. Vulva a transverse slit. Reproductive system amphidelphic. Tail dorsally convex-conoid with sub-acute tip.

Male: Not found.

Locality and habitat: Soil around the roots of *Tectona grandis* from Hazra Beat.

1. *Allodorylaimus irritans* (Cobb in Thorne & Swanger, 1936) Andrassy, 1986

Morphological taxonomic calculation: Female: L=1.2mm; a=23; b=3.7; c=27; c'=1.8; V=51; Odontostyle=20µm; Odontophore= 45µm

Description: Female: Body curved ventrally upon fixation. Lip region offset. Lips well separated. Odontostyle aperture

is 50% of odontostyle length. The expanded part of the oesophagus occupies 1/3 of total oesophageal length. Vulva a transverse slit. Reproductive system amphidelphic. Tail dorsally convex and tail tip acute.

Male: Not found.

Locality and habitat: Soil around the roots of unidentified plants from Hazra Beat.

#### 2. *Discolaimus major* Thorne, 1939

Morphological taxonomic calculation: Female: L=2.2mm; a=37; b=4.4; c=55; c'=1.2, V=50; Odontostyle=21 $\mu$ m; Odontophore= 43 $\mu$ m

Description: Female: Body slightly curved ventrally upon fixation. Lip region discoid, set off from body. Vulva a transverse slit. Reproductive system amphidelphic. Tail dorsally convex-conoid, with rounded tip.

Male: Not found.

Locality and habitat: Soil around the roots of *Shorea robusta* from Chilla Range.

#### 3. *Discolaimus similis* Thorne, 1939

Morphological taxonomic calculation: Female: L=1.3mm; a=45; b=3.7; c=50; c'=1.3; V=56; Odontostyle=14 $\mu$ m; Odontophore= 20 $\mu$ m

Description: Female: Body slightly curved ventrally upon fixation. Lip region discoid, set off from body. Odontostyle aperture 54% of odontostyle length. Vulva a transverse slit. Reproductive system amphidelphic. Tail dorsally convex-conoid, with rounded tip.

Male: Not found.

Locality and habitat: Soil around the roots of *Ficus benghalensis* from Hazra Beat.

#### 4. *Discolaimus tenax* Siddiqi, 1964

Morphological taxonomic calculation: Female: L= 1.5 mm; a=39; b=4.5; c=53; c'=1.5; V= 54; Odontostyle=16 $\mu$ m; Odontophore= 26 $\mu$ m

Description: Female: Body ventrally arcuate upon fixation. Lip region set off by constriction. Vulva a transverse slit. Reproductive system amphidelphic. Tail convex conoid, rounded.

Locality and habitat: Soil around the roots of *Dalbergia sissoo* from Chilla Range.

#### 5. *Discolaimus texanus* Cobb, 1913

Morphological taxonomic calculation: Female: L=1.2mm; a=41; b=3.9; c=46; c'=1.2; V=37; Odontostyle=14 $\mu$ m; Odontophore =28 $\mu$ m

Description: Female: Body ventrally arcuate upon fixation. Lip region set off by constriction. Vulva a transverse slit. Reproductive system amphidelphic. Tail convex conoid, rounded.

Male: Not found.

Locality and habitat: Soil around the roots of *Terminalia bellirica* Roxb. from Hazara Beat.

#### 6. *Xiphinema americanum* Cobb, 1913

Morphological taxonomic calculation: Females: L=1.6-1.9mm; a=46-50; b=5.2-5.7; c=42-63; c'=1.4-1.9; V=50-55; Guiding ring=70-75 $\mu$ m; Odontostyle=75-88 $\mu$ m; Odontophore= 48-53 $\mu$ m; Prerectum= 143 $\mu$ m

Description: Females: Body C shaped upon fixation. Lip region rounded and set off from body. Amphid stirrup shaped with slit like apertures and located at the base of lip region. Basal bulb of oesophagus 23-25% of the length. Reproductive system amphidelphic. Tail short, convex-conoid.

Male: Not found.

Locality and habitat: Soil around the roots of *Dalbergia sissoo* from Chilla Range.

#### 7. *Xiphinema inaequale* Khan & Ahmad, 1974

Morphological taxonomic calculation: Females: L=2.2-2.4mm; a=65-66; b=5.9-6.0; c=26-29; c'=3.8; V=28-3; Guiding ring=100 $\mu$ m; Odontostyle=108 $\mu$ m; Odontophore= 58 $\mu$ m; Prerectum= 250  $\mu$ m

Description: Females: Body C shaped upon fixation. Lip region rounded almost continuous with body. Amphid stirrup shaped with slit like apertures. Basal bulb of oesophagus 23-25% of the length. Reproductive system amphidelphic. Tail short conoid,

Male: Not found.

Locality and habitat: Soil around the roots of *Shorea robusta* and *Dalbergia sissoo* from Chilla Range.

#### 8. *Xiphinema insigne* Loos, 1949

Morphological taxonomic calculation: Females: L=2.1-2.4mm; a=64-66; b=5.9-6.0; c=23-29; c'=3.7-3.9; V= 28-29; Guiding ring=88-100 $\mu$ m; Odontostyle=108-118 $\mu$ m; Odontophore= 58- 63 $\mu$ m; Prerectum= 386-540 $\mu$ m

Description: Females: Body almost slightly curved upon fixation Lip region almost flat or rounded and slightly set off from body. Amphid stirrup shaped with slit like apertures and located at the base of lip region. Basal bulb of oesophagus 22-25% of the length. Reproductive system amphidelphic. Tail narrow, elongate conoid,

Male: Not found.

Locality and habitat: Soil around the roots of *Trewia nudiflora* Linn from Chilla Range.

#### 9. *Xiphinema opisthosternum* Siddiqi, 1961

Morphological taxonomic calculation: Female: L=1.4mm; a=61; b=5.4; c=43; c'=2.3; V=67; Guiding ring=56 $\mu$ m; Odontostyle=69 $\mu$ m; Odontophore= 38 $\mu$ m

Description: Female: Body C shaped upon fixation. Lip region rounded and set off from body. Amphid stirrup shaped. Basal bulb of oesophagus 22% of the length Reproductive system amphidelphic. Tail elongate-conoid.

Male: Not found.

Locality and habitat: Soil around the roots of *Dalbergia sissoo* from Chilla Range.

#### 10. *Dorylaimoides micoletzkyi* (de Man, 1921) Thorne & Swanger, 1936

Morphological taxonomic calculation: Female: L=1.3mm; a=36; b=6.3; c=20; V=40; Odontostyle=8 $\mu$ m

Description: Female: Body cylindroids arcuate upon fixation. Head slightly constricted, lips smooth. Amphids cup shaped. Odontostyle dorylaimoid, arcuate. Odontophore arcuate, Reproductive system amphidelphic. Tail elongate conoid, terminus dorsally bent.

Male: Not found.

Locality and habitat: Soil around the roots of *Bahunia variegata* from Chilla Range.

11. *Mylonchulus armus* Khan & Jairajpuri, 1979

Morphological taxonomic calculation: Female: L= 81mm; a=29; b=3.1; c=25; c'= 1.8; V= 58

Description: Female: Lip region 18µm x 8µm. Buccal cavity 20µm x 13µm. Dorsal tooth of median size, its apex at 15µm. from base of buccal cavity. Subventral walls with 5 transverse rows of denticles. Submedian teeth absent. Reproductive system amphidelphic. Tail conoid with clavate terminus. Caudal glands grouped. Spinneret terminal.

Male: Not found.

Locality and habitat: Soil around the roots of *Ehretia laevis* Roxb. from Jhabar Beat.

12. *M. brachyurus* (Butschli, 1873) Andrassy, 1958

Morphological taxonomic calculation: Female: L=1.0 mm; a=22; b=3.0; c=20; c'= 2.2; V= 60%

Description: Female: Lip region 25µm x 10µm. Buccal cavity 22µm x 14µm. Dorsal tooth of massive, its apex at 15µm from base of buccal cavity. Subventral walls with 6 transverse rows of denticles. Submedian teeth present. Reproductive system amphidelphic. Tail conoid with blunt terminus. Caudal glands grouped. Spinneret subterminal.

Male: Not found.

Locality and habitat: Soil around the roots of *Tectona grandis* from Chilla Range.

13. *M. hawaiiensis* (Cassidy, 1931) Andrassy, 1958

Morphological taxonomic calculation: Females: L=0.82-0.86 mm; a=23-27; b=3.2-3.3; c=19-29; c'= 1.4-1.9; V= 58-59

Description: Females: Lip region 22-29µm x 5-10µm. Buccal cavity 16-23µm x 10-14µm. Dorsal tooth of massive, its apex at 13-15µm from base of buccal cavity. Subventral walls with 7 transverse rows of denticles. Submedian teeth present. Reproductive system amphidelphic. Tail tip slightly clavate. Caudal glands tandem. Spinneret terminal.

Male: Not found.

Locality and habitat: Soil around the roots of *Shorea robusta* from Chilla Range.

14. *Paramylonchulus mashhoodi* (Khan & Jairajpuri, 1979) Jarajpuri & Khan, 1981

Morphological taxonomic calculation: Female: L=1.1mm; a=37; b=3.3; c=23; c'= 2.1; V= 76

Description: Female: Lip region 20µm x 5µm. Buccal cavity 18µm x 11µm. Dorsal tooth of median size, its apex at 15µm from base of buccal cavity. Subventral walls with 3 or 4 transverse rows of denticles. Submedian teeth absent. Reproductive system mono-prodelphic. Posterior uterine sac absent. Tail conoid, tapering sharply in posterior half, with a slightly rounded tip. Caudal glands grouped. Spinneret terminal.

Male: Not found.

Locality and habitat: Soil around the roots of *Cassia fistula* Linn. from Hazra Beat.

15. *Paramylonchulus mulveyi* (Khan & Jairajpuri, 1979) Jarajpuri & Khan, 1981

Morphological taxonomic calculation: Female: L=1.0mm;

a=34; b=3.2; c=21; c'= 2.1; V= 78

Description: Female: Lip region 20µm x 8µm. Buccal cavity 15µm x 9µm. Dorsal tooth of massive, its apex at 14µm from base of buccal cavity. Subventral walls with 4 transverse rows of denticles. Submedian teeth absent. Reproductive system mono-prodelphic. Posterior uterine sac absent. Tail elongate conoid. Caudal glands grouped. Spinneret terminal.

Male: Not found.

Locality and habitat: Soil around the roots of *Cordia oblicua* from Hazra Beat.

16. *Granonchulus subdecurrens* Coetzee(1966)

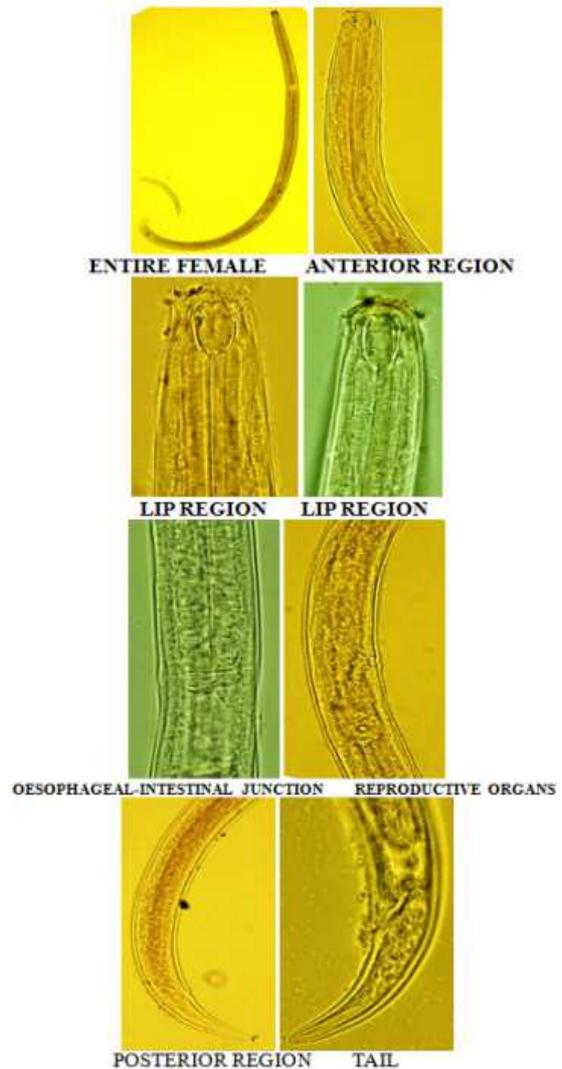


Fig 1. Female *Granonchulus subdecurrens*

Morphological taxonomic calculation: Females: L=1.3-1.4mm; a=33-37; b=4.3-4.5; c=19-21; c'=2.7, V= 59

Description: Females: Body ventrally arcuated upon fixation. Lip region slightly offset, bearing papillae, 23-24µm x 9-13µm. Buccal cavity barrel shaped, 21-22µm x 11-13µm. Amphid cup shaped, situated slightly anterior to dorsal tooth apex; aperture slit like, about 4µm wide. Dorsal tooth moderately developed, anteriorly developed, its apex at

63-67% of the buccal cavity length from its base, sub ventral small denticle, opposed to dorsal tooth, arranged in two groups, an anterior transverse row in line with the dorsal tooth apex and posterior irregular arranged group extending to base of stoma, oesophagus-intestinal junction non-tuberculated. Reproductive system amphidelphic. Valve transverse slit, vagina sclerotized. Pre-rectum absent. Tail conoid, ventrally arcuated with rounded tip. Caudal glands three, arranged in tandem, opening terminal.

Male: Not found.

Locality and habitat: Soil around the roots of *Shorea robusta* from Chilla Range.

Distribution: South Africa.

Remarks: This species was originally described from South Africa (Coetzee, 1966) and has been recorded thereafter. The description given agrees well with original description.

This is the first report from India and after original its description.

17. *Iotonchus indicus* Jairajpuri, 1969

Morphological taxonomic calculation: Female: L=2.1mm; a=29; b=4.6; c=6; c'=9; V=58

Description: Female: Lip region 45µm x 15µm. Buccal cavity 45-55µm x 30µm. Dorsal tooth small and basal, its apex at 9µm from base of buccal cavity. Subventral walls with 4 transverse rows of denticles. Submedian teeth absent. Reproductive system amphidelphic. Tail elongate conoid. Caudal glands poorly developed. Opening subterminal dorsally.

Male: Not found.

Locality and habitat: Soil around the roots of *Tectona grandis* from Chilla Range.

18. *Iotonchus parabasiodontus* Mulvey & Jensen, 1967

Morphological taxonomic calculation: Female: L=1.6mm; a=40; b=4.6; c=3.6; c'=18; V=59

Description: Female: Lip region 26µm x 5µm. Buccal cavity 26µm x 17µm. Dorsal tooth minute and basal, its apex at 7µm from base of buccal cavity. Submedian teeth absent. Reproductive system prodelphic. Tail conoid than cyliroids. Caudal glands present. Opening terminal.

Male: Not found.

Locality and habitat: Soil around the roots of *Bahunia variegata* from Chilla Range.

19. *Iotonchus trichurus* (Cobb, 1917) Andrassy, 1958

Morphological taxonomic calculation: Female: L=1.6mm; a=39; b=5.3; c=4; c'=17; V=58

Description: Female: Lip region 28µm x 10µm. Buccal cavity 30µm x 18µm. Dorsal tooth small and basal, its apex at 8µm from base of buccal cavity. Subventral walls with 4 transverse rows of denticles. Submedian teeth absent. Reproductive system mono-prodelphic. Tail long. Caudal glands present. Terminal opening present.

Male: Not found.

Locality and habitat: Soil around the roots of *Ficus religiosa* Linn. from Jhabar Beat.

20. *Iotonchulus longicaudatus* (Baqri, Baqri & Jairajpuri, 1978) Andrassy, 1993

Morphological taxonomic calculation: Female: L=1.3mm; a=37; b=4.5; c=3.8; c'=15; V=59

Description: Female: Lip region 25µm x 15µm. Buccal cavity 18µm x 10µm. Dorsal tooth medium size, in anterior half of buccal cavity, its apex at 19µm from base of buccal cavity. Reproductive system mono-prodelphic. Tail long, filiform. Caudal glands present. Terminal opening present.

Male: Not found.

Locality and habitat: Soil around the roots of *Shorea robusta* from Chilla Range.

21. *Bathyodontus mirus* (Andrassy, 1956) Andrassy in Hooper & Cairns, 1959

Morphological taxonomic calculation: Female: L=1.1mm; a=34; b=3.5; c=45; c'=0.8; V=57

Description: Female: Lip region 23µm x 5µm, set off by a deep constriction, lips rounded. Buccal cavity 20µm x 6µm. Reproductive system amphidelphic. Tail rounded. Caudal glands present. Spinneret terminal.

Male: Not found.

Locality and habitat: Soil around the roots of unidentified tree from Chilla Range.

## 4. Discussion

The present authors have already reported five species of *Mylonchulus* from RNP [5]. Taking into account 5 already reported species, total terrestrial nematode species is now 31.

*Granonchulus helicus* was recorded from Bareilly, Uttar Pradesh, India [10]. *Granonchulus subdecurrens* Coetzee, 1966 is second species recorded from India.

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