



Free-living Marine Nematodes from the Andhra Pradesh Coast, India: One New Record from India and Three New State Records

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Abstract

The present study is an attempt to explore the diversity of free-living marine nematodes along the Andhra Pradesh coast, India. Herein, four species are reported, namely *Gammanema fennicum* (Gerlach, 1953) Gerlach, 1964, *Chromaspirina parapontica* Luc & De Coninck, 1959, *Corononema parvum* Nicholas & Stewart, 1995 and *Rhynchonema hirsutum* Hopper, 1961. *Gammanema fennicum* (Gerlach, 1953) Gerlach, 1964 is being recorded for the first time from India, originally described from the East Baltic Sea. The other three species reported are new state records for Andhra Pradesh: *Chromaspirina parapontica* Luc & De Coninck, 1959, *Corononema parvum* Nicholas & Stewart, 1995, and *Rhynchonema hirsutum* Hopper, 1961. These species were originally recorded in southwest England, Australia and the Atlantic coast of the USA (Gulf of Mexico), respectively. In India, *C. parapontica* was previously reported from Tamil Nadu and West Bengal, while *C. parvum* and *R. hirsutum* were earlier recorded only from Puducherry. The study provides detailed morphological descriptions and photomicrographs of all identified species. The findings highlight the importance of continued biodiversity assessments in Indian coastal ecosystems, emphasizing the need for further research on marine nematode diversity across different geographic regions.

Keywords: *Gammanema*, *Chromaspirina*, *Corononema*, *Rhynchonema*, Bay of Bengal

Introduction

Free-living marine nematodes are important components of benthic marine ecosystems. They play an important role in decomposition of organic matter, recycling of nutrients, serves as a food source for higher trophic groups and are significant bioindicators, capable of monitoring environmental qualities (Austen, 2004; Nascimento *et al.*, 2012; Du *et al.*, 2014). The present study records the occurrence of four species of free-living marine nematodes from Andhra Pradesh coast, India. These nematodes belong to three different orders. The species *Gammanema fennicum* (Gerlach 1953) Gerlach, 1964 belong to order Chromadorida Chitwood, 1933 (superfamily Chromadoroidea Filipjev, 1917; family Selachinematidae Cobb, 1915). The genus *Gammanema* Cobb, 1920 comprises 15 valid species (Ahyong *et al.*, 2025),

four of which, *G. cancellatum* Gerlach, 1955, *G. conicauda* Gerlach, 1953, *G. polydonta* Murphy, 1965, and *G. rapax* (Ssaweljev, 1912) Ditlevsen, 1918 were previously reported from India, however *Gammanema fennicum* (Gerlach, 1953) Gerlach, 1964 is being recorded for the first time from India.

Apart from the new record, three species are reported for the first time from Andhra Pradesh. The species *Chromaspirina parapontica* Luc & De Coninck, 1959 belongs to the order Desmodorida De Coninck, 1965 (superfamily Desmodoroidea Filipjev, 1922; family Desmodoridae Filipjev, 1922). The genus *Chromaspirina* Filipjev, 1918 comprises 21 valid species (Ahyong *et al.*, 2025). *Chromaspirina parapontica* Luc & De Coninck, 1959 was previously reported from Tamil Nadu (Sivaleela, 2016) and West Bengal (Ansari and Bhadury, 2016), forms first distributional record from

Andhra Pradesh. Whereas, the other two species recorded, *Corononema parvum* Nicholas & Stewart, 1995 and *Rhynchonema hirsutum* Hopper, 1961 belong to the Order Monhysterida Filipjev, 1929 (superfamily Sphaerolaimoidea Filipjev, 1918; family Xyalidae Chitwood, 1951). The genus *Corononema* Nicholas & Stewart, 1995 consists of only 3 valid species, while *Rhynchonema* Cobb, 1920 with 39 valid species (Ahyong *et al.*, 2025). *C. parvum* and *R. hirsutum* were previously reported only from Puducherry, India (Sivaleela *et al.*, 2023; Datta *et al.*, 2022) and herein recorded for the first time from Andhra Pradesh, India. The present study provides updates on the distribution of free-living marine nematodes of coastal ecosystems of India, emphasizing the significance of continued biodiversity assessments in Indian coastal ecosystems, and the need for further research on marine nematode diversity across different geographic regions.

Material and Methods

Sediment samples were collected from Kakinada Industrial area beach, Kakinada (17.00994° N, 82.280903° E) and Rushikonda beach, Vishakapatnam (17.784386° N, 83.385707° E) both located in Andhra Pradesh, India. Sediment samples were collected in zip-lock bags along with all the required information using a hand-held corer and fixed with 5% Formalin solution (Chen *et al.*, 2012), buffered in sea water and brought to the laboratory for further study. The samples were then sieved through 2 mm Coarse sieve to remove the larger particles followed by decantation and sieving through 53 µm mesh sieve for retaining the nematode specimens. The sieved nematode specimens were then preserved in buffered 5% formalin. The specimens were then picked in to cavity blocks containing Glycerin-Alcohol under SZX-16 Olympus Microscope and kept in desiccator with anhydrous Calcium Chloride (McIntyre and Warwick, 1984) for dehydration and left for 2-3 weeks. The dehydrated specimens were then mounted on glass slides on a drop of anhydrous glycerin and sealed by paraffin wax ring method (De Maeseneer and D'Herde, 1963). Specimens were identified under BX-53 DIC Olympus research microscope and photomicrographed using DP27 camera.

Abbreviations used: a = body length/maximum body diameter; b = body length/pharynx length; c = body length/tail length; c' = tail length/ (anal/ cloacal diameter); V% = distance of vulva from anterior end/ body length.

Systematic Account

Phylum NEMATODA Cobb 1932

Class CHROMADOREA Inglis, 1983

Order CHROMADORIDA Chitwood, 1933

Superfamily CHROMADOROIDEA Filipjev, 1917

Family SELACHINEMATIDAE Cobb, 1915

Genus *Gammanema* Cobb, 1920

1. *Gammanema fennicum* (Gerlach, 1953) Gerlach, 1964

Order DESMODORIDA De Coninck, 1965

Superfamily DESMODOROIDEA Filipjev, 1922

Family DESMODORIDAE Filipjev, 1922

Genus *Chromaspirina* Filipjev, 1918

2. *Chromaspirina parapontica* Luc & De Coninck, 1959

Order MONHYSTERIDA Filipjev, 1929

Family XYALIDAE Chitwood, 1951

Genus *Corononema* Nicholas & Stewart, 1995

3. *Corononema parvum* Nicholas & Stewart, 1995

Genus *Rhynchonema* Cobb, 1920

4. *Rhynchonema hirsutum* Hopper, 1961

Results

1. *Gammanema fennicum* (Gerlach, 1953) Gerlach, 1964

(Fig. 1, Table 1)

Materials examined: 7 females and 3 males: India, Andhra Pradesh, Kakinada Industrial area beach, Kakinada; 17.00994° N, 82.280903° E, 9.v.2024, coll. R. Datta. (Reg. No. ZSI-HQ/ WN. 4827).

Description: *Male:* Medium-sized body varies from (1635-1994 µm), stout and cylindrical in males. Cuticle annulated. Head truncate. All anterior sensilla are setiform. Outer labial setae and cephalic setae are present in a circle. Cervical setae present. Amphids oligospiral with 1.5-1.75 turns. Rugae of cheilostoma poorly developed. Buccal cavity divided into two compartments; anterior compartment cone shaped with thick solid rhabdions, without tooth and a posterior cylindroid compartment without sclerotization. Pharynx

cylindrical varies from (209-255 μm). Outstretched anterior testis and opposed posterior testis. Spicules arcuate (47-59 μm), slightly arched gubernaculum present (18-20 μm). 13 sucker-like precloacal supplements observed. Short cylindroid tail (53 -91 μm), with finger-like tip.

Female: Almost similar to males. Body medium-sized (1840-1868 μm), much stouter and cylindrical than males. Reproductive system is didelphic with antidromously reflexed ovaries.

Distribution: India: Andhra Pradesh.

Elsewhere: East Baltic Sea and Kandalaksha Bay, White Sea (Northern Russia).

Remarks: The genus *Gammanema* Cobb, 1920 presently consist of 15 valid species. *G. fennicum* was originally described as *Halichoanolaimus fennicus* Gerlach 1953 based on only female and juvenile specimens from the Baltic Sea. Later, Gerlach (1964) transferred this species under the genus *Gammanema*. This species was later reported by Okhlopkov (2002) based on both male and female specimens. *G. fennicum* is differentiated from the other species of the genus by the non-toothed and non-sclerotized buccal cavity in males and also by the shape of the precloacal supplements. Recently Tchesunov *et al.*, (2020) published identification key to all the valid species under *Gammanema*. The Indian specimens of *G. fennicum* slightly differs from the original description in having smaller body length (1635-1994 μm vs 2165-2600 μm in males; 1840-1868 μm vs 1672-2782 μm in females), smaller inner labial setae (7-9 μm vs. 17-24 μm in males; 3-7 μm vs. 9-13 μm in females).

2. *Chromaspirina parapontica* Luc & De Coninck, 1959

(Fig. 2; Table 2)

Materials examined: 2 females and 1 male; India, Andhra Pradesh, Vishakapatnam, Rushikonda beach; 17.784386° N, 83.385707° E, 7.v.2024, coll. R. Datta. (Reg. No. ZSI-HQ/WN. 4826).

Morphometrics: Table 2

Distribution: India: Tamil Nadu, West Bengal and Andhra Pradesh.

Elsewhere: South West England and Tunisia.

Remarks: The genus *Chromaspirina* Filipjev, 1918 presently comprises 21 valid species. *C. parapontica* mainly differs from the other species of the genus by the finer and

discreet annulations, smaller amphid, smaller and two-piece gubernaculum, larger cephalic setae and body length larger than other species (Luc and De Coninck, 1959). The specimens of the present study conform well with original description except with slightly smaller body length (2234.5 μm vs. 2546-3732 μm in males; 2245.6-2295.9 μm vs. 3250-4642 μm in females) and shorter cephalic setae (8.2-8.7 μm vs. 16-17 μm).

3. *Corononema parvum* Nicholas & Stewart, 1995

(Fig. 2; Table 3)

Material examined: 1 female and 2 males; India, Andhra Pradesh, Kakinada Industrial area beach, Kakinada; 17.00994° N, 82.280903° E, 9.v.2024, coll. R. Datta. (Reg. No. ZSI-HQ/WN. 4829).

Morphometrics: Table 3

Distribution: India: Puducherry and Andhra Pradesh.

Elsewhere: Australia.

Remarks: The genus *Corononema* Nicholas & Stewart, 1995 presently comprises three valid species. *C. parvum* differs from *C. thai* Nicholas & Stewart, 1995 in having longer head and denser annulations. *C. parvum* differs from the other species *C. vulgare* Phuong *et al.*, 2023 by the shape of the gubernaculum. The specimens of this study conform well with the original description except in having smaller buccal cavity length (7.09-7.89 μm vs. 11-16 μm in males; 7.89 μm vs. 13-18 μm in females).

4. *Rhynchonema hirsutum* Hopper, 1961

(Fig. 2; Table 4)

Material examined: 1 female and 2 males; India, Andhra Pradesh, Vishakapatnam, Rushikonda beach; 17.784386° N, 83.385707° E, 7.v.2024, coll. R. Datta. (Reg. No. ZSI-HQ/WN. 4825).

Morphometrics: Table 4

Distribution: India: Puducherry and Andhra Pradesh.

Elsewhere: Atlantic Coast of USA and Gulf of Mexico.

Remarks: The genus *Rhynchonema* Cobb, 1920 presently has 36 valid species. *R. hirsutum* is most closely related to *R. lyngei*, only differing in the location of amphid, number of cephalic setae and spicule length. Recently Datta *et al.*, (2015) published a key to all the valid species of genus *Rhynchonema*. The specimens of the present study conform well with the original description.

Table 1: Morphometrics of *Gammanema fennicum* (Gerlach, 1953) Gerlach, 1964 (measurements in μm). Range values in parenthesis.

Characters	Male	Female
n	3	7
Body length	1810 (1635-1994)	1879 (1860- 1898)
Pharynx	235 (209-255)	181 (165- 273)
Tail	68 (53 -91)	60 (50-72)
Body diameter at level of cephalic setae	32 (29- 34)	30 (25- 41)
Body diameter at level of nerve ring	36 (34- 39)	32 (27- 42)
Body diameter at level of cardia	32 (31-35)	32 (28-34)
Body diameter at level of midbody	36 (34-40)	37 (26- 49)
Body diameter at level of cloaca	30 (28- 32)	31 (24- 40)
a	50.2 (44.8-58.5)	30.11 (24.25-49.91)
b	7.7 (7.4-7.8)	6.09 (4.77-8.05)
c	27.8 (19.7-33.8)	17.93 (12.77-26.55)
c'	2.2 (1.8-3.1)	1.99 (1.58-2.26)
Inner labial setae	8 (7-9)	5 (3-7)
Lateral outer labial setae length	13 (10- 15)	9 (5-14)
Cephalic setae length	18 (17-18)	18 (13- 23)
Anterior cervical setae length	25 (24- 27)	24 (22-26)
Amphid width	16 (9 -24)	6 (4-8)
Amphid length	13 (8-15)	5 (4- 6)
Spicule length (arc)	52 (47 - 59)	-
Spicule length (chord)	40 (38 - 44)	-
Number of supplements	13	-
Tail terminal cone length	11 (10- 11)	12 (8-18)
Gubernaculum	19 (18- 20)	-

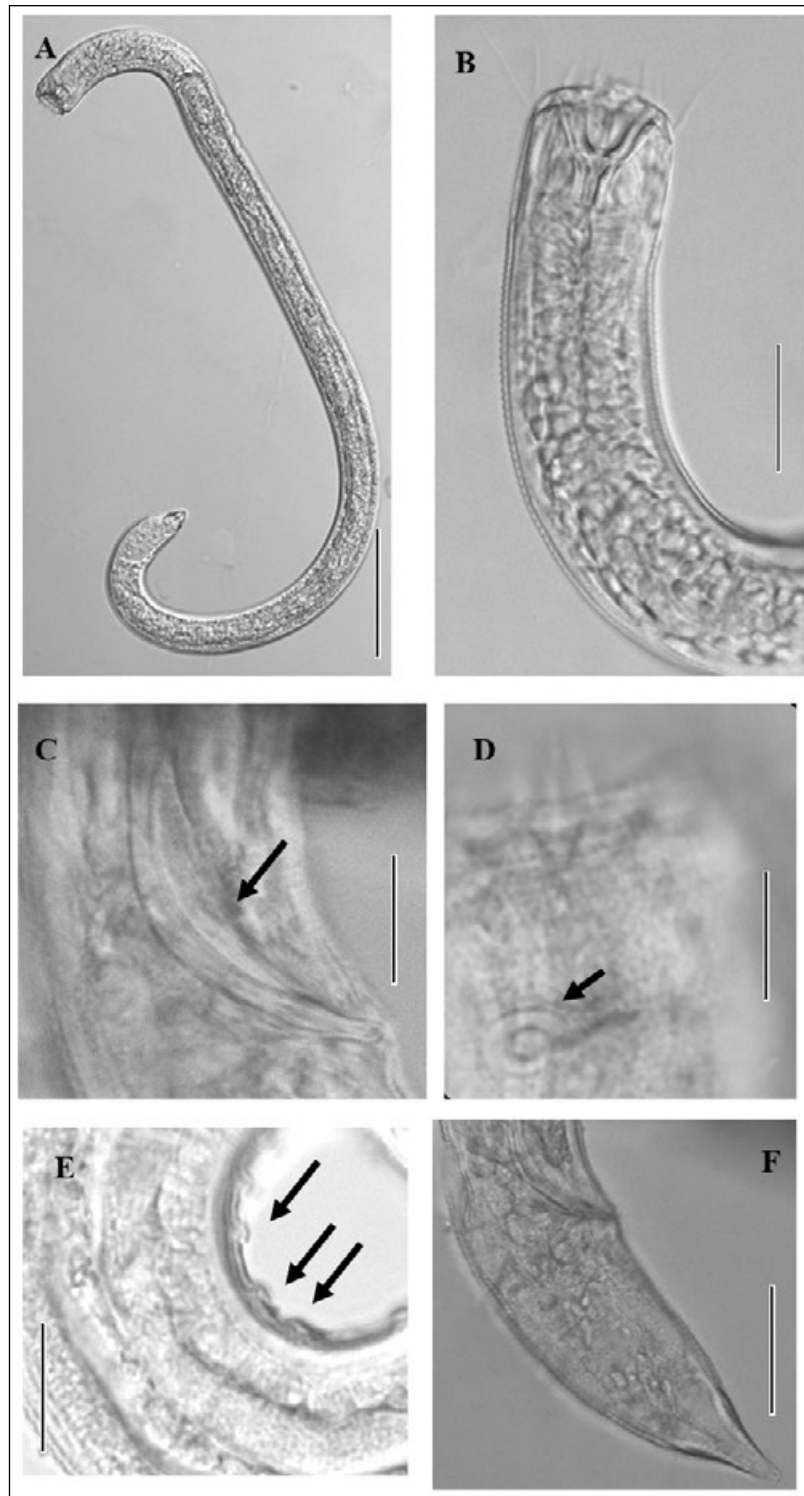


Fig. 1. *Gammanema fennicum* (Gerlach, 1953) Gerlach, 1964. (LM photographs). **A.** Female, whole body. **B.** Male, anterior region. **C.** Male, spicule. **D.** Male, amphid. **E.** Male, preloacal supplements. **F.** Male, tail. Scale bars: A: 200 μ m. B, F: 50 μ m. C, D, E= 20 μ m.

Table 2: Morphometrics of *Chromaspirina parapontica* Luc & De Coninck, 1959 (measurements in μm). Range values in parenthesis.

Characters	Male	Female
n	1	2
Body length	2234.5	2270.75 (2245.6-2295.9)
Cephalic setae	8.7	8.35 (8.2- 8.5)
Head width	23.8	23.9 (23.2- 24.6)
Amphid width	8.5	8.12 (7.9-8.34)
Amphid diameter to corresponding body width percentage	20	17.5 (17-18)
Pharynx length	170.5	181.525 (175.6-187.45)
Diameter of pharyngeal bulb	33.78	35.64 (34.5- 36.78)
Maximum body width	49	48.95 (47.8-50.1)
Distance of anterior end to vulva	-	1352 (1249-1355)
V%	-	59 (59.01-60)
Anal/Cloacal body diameter	46.3	47.445 (47-47.89)
Spicule length	65.45	-
Gubernaculum length	23.6	-
Tail length	111.5	125.665 (121.1- 130.23)
a	45.6	46.4 (45.8-46.9)
b	13.1	12.51 (12.2- 12.7)
c	20	18.08 (17.6-18.5)
c'	2.4	2.64 (2.5- 2.7)

Table 3: Morphometrics of *Corononema parvum* Nicholas & Stewart, 1995 (measurements in μm). Range values in parenthesis.

Characters	Male	Female
n	2	1
Body Length	1039.1 (987.34-1090.9)	1080.4
Maximum body diameter	23.9 (23.4- 24.5)	25.4
Lip height	3.5 (3.4-3.7)	4.3
Outer labial setae	3.6 (3.5-3.78)	3.5
Cervical setae	12.4 (11.9- 12.9)	12.4
Body setae	14.8 (14.3- 15.4)	16.5
Amphid	2.2 (1.9-2.5)	2.3

Characters	Male	Female
Buccal cavity length	7.4 (7.09-7.89)	7.9
Buccal cavity width	8 (7.8-8.2)	8.34
Pharynx length	267.9 (256.8-278.9)	290.3
Mouth to anus/cloaca	956 (911-1001)	821.3
Width at anus/cloaca	18.8 (17.8-19.8)	19.7
Tail length	77.8 (76.4-79.2)	80.1
Spicule arc	26.8 (25.9-27.8)	-
a	43.3 (42.1-44.5)	42.5
b	3.8 (3.5-4.2)	3.7
c	13.3 (12.9-13.7)	13.4
c'	4.1 (3.8-4.42)	4
V %	-	76

Table 4: Morphometrics of *Rhynchonema hirsutum* Hopper, 1961 (measurements in μm). Range values in parenthesis.

Characters	Male	Female
n	2	1
Body length	565.8 (545.6- 586)	589.3
Maximum body diameter	18.3 (17.9- 18.7)	19.2
Length of pharynx	117.5 (111.5-123.5)	130.2
Tail length	79.1 (77.9-80.2)	84.3
Width at anus/cloaca	18.7 (18.4-18.9)	17.9
Buccal cavity length	50.1 (48.9-51.2)	52.3
Diameter of buccal cavity at proximal end	4.65 (4.5-4.8)	4.6
Diameter of buccal cavity prior to amphid	6.7 (6.5-6.9)	5.9
Amphid diameter	3.5(3.09-4.1)	3.9
Length of somatic setae	4.7 (4.5-4.9)	5.6
Spicule length	22.2 (21.5-23)	-
Length of gubernaculum	7.9 (7.8-8.1)	-
Length of caudal apophysis	4.5 (4.5-4.6)	-
a	30.9 (30.2-31.3)	30.6
b	4.83 (4.41-5.2)	4.5
c	7.1 (6.8-7.5)	6.9
c'	4.2 (4.22-4.2)	4.7

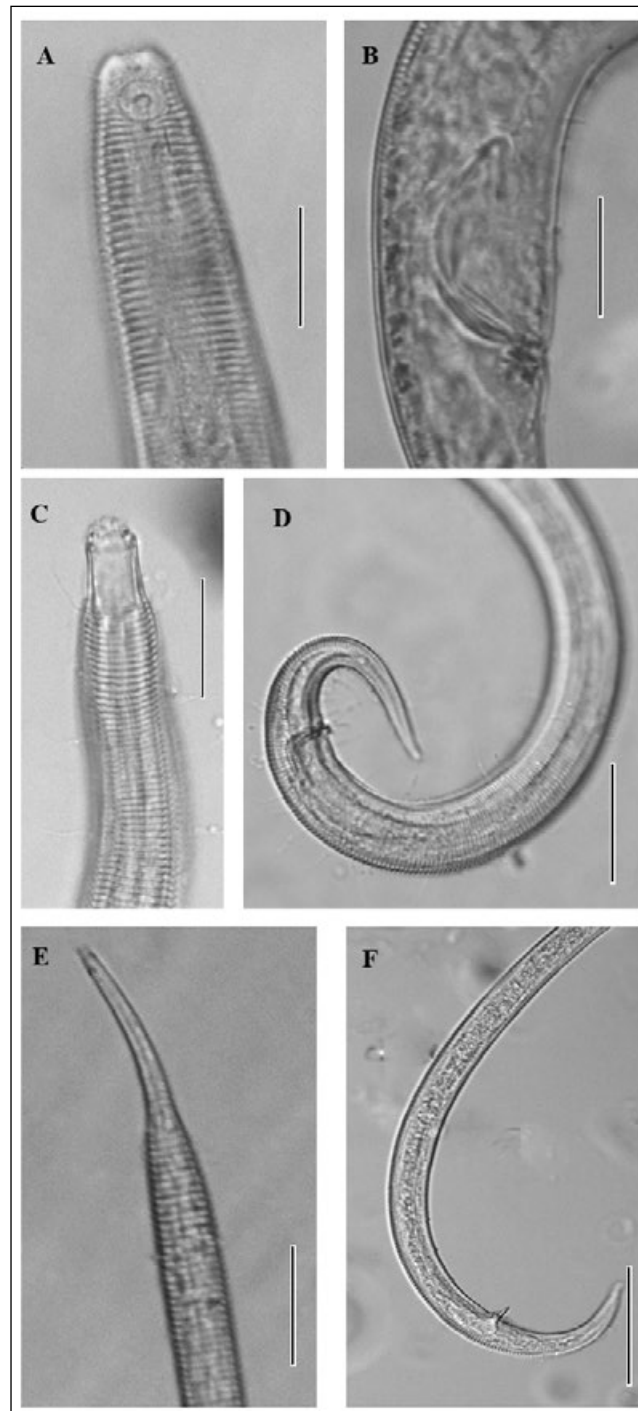


Fig. 2. *Chromaspirina parapontica* Luc & De Coninck, 1959: **A:** Male, Anterior region. **B:** Male, spicule.

Corononema parvum Nicholas & Stewart, 1995: **C:** Male, anterior region. **D:** Male, posterior region.

Rhynchonema hirsutum Hopper, 1961: **E:** Male, anterior region. **F:** Male, posterior region. Scale bars: A- F= 50 μ m.

Discussion

The present study reports four species, *Gammanema fennicum* (Gerlach 1953) Gerlach, 1964, *Chromaspirina parapontica* Luc & De Coninck, 1959, *Corononema parvum* Nicholas & Stewart, 1995 and *Rhynchonema hirsutum* Hopper, 1961. *G. fennicum* is reported for the first time from India, while, *C. parapontica*, *C. parvum* and *R. hirsutum* are the first records from Andhra Pradesh, India.

Acknowledgements

The authors are grateful to Dr. Dhriti Banerjee, Director, Zoological Survey of India (ZSI) for providing support and the research facilities. The first author is highly grateful for being supported with the Junior Research Fellowship of University Grants Commission, [Sanction letter no.: 221610123052].

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