

Report of deep-sea epibiont ciliates (Ciliophora) from more than 1000 m depth of the Arabian Sea, Indian Ocean

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Abstract

The present article deals with the report of 7 suctorian epibiont species viz. *Thecacineteta calix*, *Actinocyathula homari*, *Loricophrya bosporica*, *L. cf. stresemanni*, *Acinetides gruberi*, *Trematosoma rotunda* and *Brachyosoma* sp. on benthic meiofauna collected from the deep Arabian Sea (> 1000 m). The data on the distribution and host prevalence of found species are discussed. The finds of other deep-sea ciliate species are also mentioned.

Keywords: ciliates, deep-sea, meiofauna, Arabian Sea, Indian Ocean

Introduction

Different species of ciliates are common epibiont on marine meiofauna. Ciliates epibionts on intertidal, subtidal, shallow-depth marine meiofauna from the Indian Ocean were studied by several authors (e.g., Dovgal *et al.* 2008, 2009; Chatterjee 1996; Chatterjee *et al.* 2013, 2019a, b, c, d, 2020 a, b, c, d, e; 2021 a, b, c, 2022; Ansari *et al.* 2017).

It is known (Gooday *et al.* 2020) that the deep-sea habitats are extremely heterogeneous due to the presence of submarine canyons, deep trenches, mid-ocean ridges and fracture zones, seamounts, deep-water coral reefs, pockmarks, sulfurated zones, etc., which provide a basis for inhabiting of numerous organisms including ciliates.

This circumstance leads to increasing of interest to investigation of ciliates from deep-sea. As a result, the numerous species of classes Karyorelictea Corliss, 1974, Heterotrichea Stein, 1859, Spirotrichea Bütschli, 1889, Armophorea Lynn, 2004, Litostomatea Small & Lynn, 1981, Phyllopharyngeade Puytorac *et al.*, 1974, Suctorea Claparède & Lachmann, 1859, Nassophorea Small & Lynn, 1981, Colpodea Small & Lynn, 1981, Prostomatea Schewiakoff, 1896, Plagiopylea Small & Lynn, 1985 and Oligohymenophoreade Puytorac *et al.*, 1974 were registered in the depths more 1,000 m (Schoenle *et al.* 2017).

Hence, during investigations of microbial eukaryotic communities associated with bacterial mats in the Guaymas Basin hydrothermal vent system (depth 2000 m) the high diversity of dinoflagellates, ciliates and cercozoans were registered (Coyne *et al.* 2013; Pasulka *et al.* 2019). It was found that so called Blue Mats occupied about 70 % of the substratum in certain Juan de Fuca Ridge vent fields create by folliculinid ciliates *Folliculinopsis* sp. (Kouris *et al.* 2007).

However, most of these ciliates were investigated only with molecular methods, whereas only a few deep-sea ciliate species were morphologically investigated.

Thus, some abyssal ciliates belonging to the classes Karyorelictea Corliss, 1974, Suctorea Claparède & Lachmann, 1858 and subclass Peritrichia Stein, 1859 have been found as epibionts on arthropods collected from the deep sea (Bartsch & Dovgal 2010; Sedlacek *et al.* 2013). About 30 ciliate species (including the apostome *Conidophrys* sp., chonotrich *Chilodochona* sp., peritrich *Vorticella* sp., and suctorians *Ephelota* sp. and *Corynophrya* sp.) were recorded on isopods at depths from 203 to 1141 m (Ólafsdóttir & Svavarsson 2002).

A deep-sea record of a ciliate epibiont on halacarid mite was reported from the Mid-Atlantic Ridge, Snake Pit, at a depth of 3500 m (Bartsch 1994). Suctorian *Corynophrya abyssalis* Bartsch & Dovgal 2010 was reported as epibiont on halacarid mite *Copidognathus nautiliei* Bartsch, 1997, from

a hydrothermal vent field of the Mid-Atlantic Ridge at 4090 m depth (Bartsch & Dovgal 2010). *Loricophrya mediterranea* Fernandez-Leborans, Román & Martin, 2017 was reported from Blanes Canyon (canyon of the Catalan margin, Iberian Peninsula) at 1227 m and 1450 m depth on nematode species of genus *Tricoma* Cobb 1894 (Fernandez-Leborans *et al.* 2017). Sedlacek *et al.* (2013) reported ciliate epibionts on deep-sea harpacticoid copepods from the continental rise off central California at 3607 m depth.

A special case of deep-water extreme habitats is the deep-water hydrogen sulfide zone of the Black Sea, where observe the cumulative effects of the absence of oxygen and the presence of H₂S. It is believed that only bacteria can exist in the zone, and eukaryote life absent (Dovgal & Sergeeva 2016). However, the commensal peritrich ciliate *Cothurnia maritima* Ehrenberg, 1838 was found on oligochaetes *Tubificoides* sp., while suctorians *Paracineta livadiana* (Mereschkowski, 1881) and *Corynophrya lyngbyi* (Ehrenberg, 1834) were registered on the harpacticoids *Amphiascella subdebilis* (Willey, 1935), *Haloschizopera pontarchis* Por, 1959, *Cletodes tenuipes* Scott, 1896 and *Enhydrosoma longifurcatum* (Sars, 1909) of depths 80-300 m (Sergeeva & Dovgal 2014; Dovgal & Sergeeva 2016; Sergeeva *et al.* 2017). The species of commensal suctorian *Loricophrya bosporica* Sergeeva & Dovgal, 2016 was in turn discovered in similar habitat (on 252.4 m water depth) on the nematodes *Desmoscolex* cf. *minutes* Claparede, 1863 (Sergeeva & Dovgal 2016; Dovgal & Sergeeva 2016; Sergeeva *et al.* 2017).

Very few studies deal with ciliate epibionts on benthic meiofauna from the deeper depths of the Indian Ocean. Thus, suctorian ciliate *Thecacineteta calix* (Schroder, 1907) was reported on the cuticle of meiobenthic nematodes from the Andaman Sea, Indian Ocean at a water depth of 1301 m (Ingole *et al.* 2010). Baldrighi *et al.* (2020) reported *Actinocyathula homari* (Sand, 1899) (named as *Paracineta homari*) and *Trematostoma rotunda* (Allgén, 1952) on nematodes from NW Madagascar region, Indian Ocean at the depth 528-775 m.

The present account deals with the report of 7 suctorian epibiont species viz. *Thecacineteta calix*, *Actinocyathula homari*, *Loricophrya bosporica*, *L. cf. stresemanni*, *Acinetides gruberi*, *Trematosoma rotunda* and *Brachyosoma* sp. on benthic meiofauna from the deep Arabian Sea.

Material and methods

Sediment samples were collected by lowering multicore on board RV Sindhu Sadhana (SSD 068) during December-January 2019-20. Undisturbed sediments were collected from acrylic cores (60 × 10 cm; length × dia) fixed with multicore. These cores were sectioned at 2 cm intervals from surface to 10 cm deep in the sediment. One core was preserved in 5% buffered formalin mixed with Rose-

Bengal and sea water solution in containers while another core was preserved in 70% ethanol. In the Laboratory, the sediment was sieved through 300 µm to remove large fauna (macrofauna) and the fauna retained on 28 µm mesh were considered as meiofauna. The nematode and other meiobenthic forms were considered for study the suctorian ciliates. Shorting of meiofauna was done under the stereo microscope (Leica S8APO). Observation, identification and images of ciliates are carried out under the upright microscopes (Carl Zeiss Primostar and Nikon Ei with attached camera Digitalsight 1000). Specimens are kept in the collection of the second author (Sabyasachi Sautya), in the museum of National Institute of Oceanography Regional Centre, Mumbai.

Station MUC-13: Arabian Sea, Lat 20°58'45.0732"N, Long 68°53'18.258"E (Fig.1); date of the collection - 19/12/2019, Collector: Sabyasachi Sautya & Santosh Gaikwad.

Station MUC-16: Arabian Sea, Lat 19°0'0.486"N, Long 64°0'14.1192"E (Fig.1); date of collection - 23/12/2019, Collector: Sabyasachi Sautya & Santosh Gaikwad.

Station MUC-18: Arabian Sea, Lat 13° 0' 13.6728"N, Long 64° 0' 9.8316"E (Fig 1); date of the collection - 27/12/2019, Collector: Sabyasachi Sautya & Santosh Gaikwad.

Station MUC-20: Arabian Sea, Lat 15°0'2.5776"N, Long 72°0'18.8388"E (Fig.1); date of the collection - 03/01/2020, Collector: Sabyasachi Sautya & Santosh Gaikwad.

Details on ecological parameters of each station are provided in Table 1.

Results and Discussion

Class Suctorea Claparéde & Lachmann, 1859

Subclass Exogenia Collin, 1912

Order Vermigemmida Jankowski, 1973

Family Thecacinetae Matthes, 1956

Genus *Thecacineta* Collin, 1909

***Thecacineta calix* (Schröder, 1907) (Fig 2 A-B)**

= *Acineta calix* Schroder, 1907

= *Paracineta moebiusi* Kahl, 1934

= *Thecacineta desmodorae* Schulz, 1931

= *Thecacineta donsi* Allgén, 1935

= *Thecacineta subantarctica* Allgén, 1949

= *Thecacineta paradesmodorae* Allgén, 1949

= *Thecaineta oblonga* Allgén, 1955

= *Thecacineta laophontis* Jankowski, 1981

Material examined: One individual found as epibiont on nematode host belongs to the family Desmodoridae Filipjev, 1922 collected from stn MUC-16, at sediment depth 0-2 cm, water depth 3463 m, Arabian Sea, Indian Ocean.

Diagnosis: Marine loricate suctorian. Cell body entirely fills the lorica and attach to its base. Lorica ribbed with a series of transverse annular ridges that become progressively closer toward the base. Apical part of the body protrudes beyond lorica aperture. Up to 30 clavate tentacles from the apical surface of the body. Stalk with various length, from one fourth to the same length as lorica. Macronucleus ovoid, located in the basal region of the cell body. Large contractile vacuole located in basal region of the body usually near macronucleus.

Measurements from present find (based on one individual, in μm): Lorica length 55, maximal lorica width 24, body length 45, maximal body width 15, stalk length 45, stalk diameter 3, length of tentacles 11-16.

Host and substrate specificity: *Thecacineta calix* has been reported as an epibiont on nematodes, crustacean copepods, halacarid mites and algae (Chatterjee *et al.* 2019c). As epibiont of nematodes *T. calix* has been reported on *Croconema cinctum* Cobb, 1920, *Croconema sphaerica* (Kreis, 1928) (= *Desmodora sphaerica*), *Croconema stateni* (= *Desmodora stateni* Allgen, 1928), *Desmodora communis* (Butschli, 1874), *Desmodora* sp., *Desmodorella schulzi* (Gerlach, 1950) (= *Desmodoraschulzi* Gerlach, 1950), *Desmodorella tenuispiculum* Allgén, 1928, *Paradesmodora* sp., etc. (e.g., Schröder 1907; Schulz 1931; Steiner 1931; Allgén 1935, 1949, 1955; Susetiono 2006; Ingole *et al.* 2010; Panigrahi *et al.* 2015; Ansari *et al.* 2017; Chatterjee *et al.* 2019c).

Distribution: Atlantic, Pacific, Antarctic and Indian Oceans, from the intertidal region to the deep sea (for detail see Chatterjee *et al.* 2019c); Arabian Sea, 3463 m depth (present report).

Remarks: Earlier this species was reported as epibiont on nematode species *Croconema sphaerica* (Kreis, 1928) (= *Desmodora sphaerica*) (reported as *Desmodora sphaerica*) and *D. pontica* (Filipjev, 1922) (invalid species), Andaman Sea, Indian Ocean at a water depth of 1301 m (Ingole *et al.* 2010).

Order Metacinetida Jankowski, 1978

Family Paracinetidae Jankowski, 1975

Genus *Actinocyathula* Corliss, 1966

***Actinocya thulahomari* (Sand, 1899) Curds, 1987**

(Fig. 2 C-D)

= *Acineta homari* Sand, 1899

= *Paracineta homari* (Sand, 1899) Collin, 1911

= *Corynophrya homari* (Sand, 1899) Batische, 1975

Material examined: One individual found as epibiont on nematode host belongs to the genus *Tricoma* collected from stn MUC-18, at sediment depth 0-2 cm, water depth 4119 m, Arabian Sea, Indian Ocean.

Diagnosis: Marine, loricate suctorian with ovoid body that protrudes from the apical region of the stylotheca. Cell body fills the upper half of lorica and attach to its aperture. Tentacles clavate, retractile, arranged at the anterior body surface. Stylotheca unflattened, smooth, triangular to bell-shaped, equipped with a robust rigid pseudostyle that length is the same or shorter that the rest of stylotheca. Contractile vacuole single, centrally or laterally located. Macronucleus spherical, located at posterior of body. Reproduction by semi-invaginative budding.

Measurements from present find (based on one individual, in μm): Stylotheca length 24, stylotheca width 18, body length 15, body width 15, macronucleus diameter 5, tentacle length 5-6.

Host and substrate specificity: The species firstly described from the setae of the telson and orbit of lobster (Sand 1899), next found on the setae of pagurid *Pagurus cuanensis* Bell, 1845 (Collin 1912) and was mentioned as epibiont of decapod crustaceans (Curds 1987). However, Baldrighi *et al.* (2020) reported the species from nematode worms of genera *Desmodora* de Man, 1889, *Paradesmodora* Schuurmans Stekhoven, 1950 and *Pseudochromadora* Daday, 1899.

Distribution: Roscoff, France (Sand, 1899); Sète, France (Collin, 1912); NW Madagascar margin-deep sea pockmark, Gulf of Naples-shallow vent area, French Guiana-Mangrove forest (Baldrighi *et al.* 2020); Arabian Sea, 4119 m depth (present report).

Genus *Loricophrya* Matthes, 1956

***Loricophrya bosporica* Sergeeva & Dovgal, 2016**

(Fig. 2 E-F)

Material examined: One individual found as epibiont on nematode host belongs to the genus *Tricoma* collected from stn MUC-18, at sediment depth 2-4 cm, water depth 4119 m, Arabian Sea, Indian Ocean.

Diagnosis: Marine loricate suctorian with elongate cell body completely covered with a lorica. Stylothecha, conical, characterized by a gradual thickening of the walls toward the lorica aperture. There is a transverse wrinkle in the lower part of stylothecha in some individuals. The lower part of stylothecha, which separated from the upper part by a well-visible septum, slightly longitudinally striated, have thinner walls, finishes by widening (basal disc) that use for the attachment to the host's body surface. The cell body is attached to the lorica in the mouth with the help of its edges folded inwards. A few clavate tentacles are located at the apical surface of the body. Macronucleus rounded.

Measurements from present find(based on two individuals, in μm): Lorica length 31-37, lorica width 15-16, lorica aperture width 14-16, macronucleus diameter 6-8, length of the tentacles 5-13.

Host and substrate specificity: The species reported as epibiont on nematodes *Desmoscolex* cf. *minutus* Claparede, 1863 (Sergeeva & Dovgal 2016); on *Metachromadoroides remanei* (Gerlach, 1951) (Ivanova *et al.* 2017). Baldrighi *et al.* (2020) reported the species from nematode worms of genera *Desmodora* and *Desmoscolex* Claparède, 1863.

Distribution: Istanbul Strait's area, Bosphorus region, the Black Sea (Sergeeva & Dovgal 2016); from methane seep of the Ria Formosa lagoon, Southern Portugal (Ivanova *et al.* 2017); Gulf of Naples-shallow vent area and French Guiana-Mangrove forest (Baldrighi *et al.* 2020); Arabian Sea, 4119 m depth (present report) .

Remarks: The species was found on nematode hosts only and was mentioned as extremophile (Dovgal & Sergeeva 2016).

***Loricophrya* cf. *stresemanni* (Allgén, 1951)**

(Fig. 3 A-B)

Material examined: One individual found as epibiont on nematode host belongs to the genus *Tricoma* collected from stn MUC-20, at sediment depth 0-2 cm, water depth 2054 m, Arabian Sea, Indian Ocean.

Diagnosis: Marine loricate suctorian with elongate cell body protruding from the edge of the stylothecha, conical, pseudostyle with varying degrees of development. The edge of the lorica is even, without cuts and toothings. There are a transverse wrinkles at the pseudo-style, which can be poorly discernible in individuals with short pseudo-style. The cell body is attached to the edges of the lorica

aperture. Clavate tentacles (4-16) are located at the apical surface of the body. Macronucleus rounded, slightly elongated.

Measurements from present find (based on one individual, in μm): Lorica length 31, lorica width 17, lorica aperture width 17, body length 34, body width 14, stalk length 9, length of the tentacles 4-5.

Host and substrate specificity: The species described (Allgén 1951) as epibiont of nematode *Spirina parasitifera* (Bastian, 1865), also registered on nematode specimens of the family Desmodoridae Filipjev, 1922 (Chatterjee *et al.* 2019b) and on representatives of genus

Paradesmodora (Baldrighi *et al.* 2020).

Distribution: Trondheims fjord (Norway), Norwegian sea (Allgén 1951); Miramar Bay, Goa, west coast of India at the mouth region of Mandovi River mixing with the Arabian Sea (Chatterjee *et al.* 2019b); Archipelago of Maldives - coral reef (Baldrighi *et al.* 2020); Arabian Sea, 2054 m depth (present report).

Remarks: The species was found on nematode hosts only.

Subclass Endogenia Collin, 1912

Order Acinetida Raabe, 1964

Family Acinetidae Ehrenberg, 1838

Genus *Acinetides* Swarczewsky, 1928

***Acinetides gruberi* Curds, 1985**

(Fig. 3 C-D)

Material examined: One individual found as epibiont on nematode host belongs to the family Microlaimidae Micoletzky, 1922 collected from stn MUC-20, at sediment depth 0-2 cm, water depth 2054 m, Arabian Sea, Indian Ocean.

Diagnosis: Marine loricate suctorian ciliate. The lorica (stylothecha) laterally flattened, completely cover the body of the ciliate, with short pseudostyle. The body length is approximately two times the width. The tentacles arranged in two apical bundles. Macronucleus spherical or elongated.

Measurements from present find (based on one individual, in μm): Stylothecha length 133, stylothecha width 34, stylothecha aperture width 42, pseudostyle length 51, body length 81, body width 32.

Host and substrate specificity: Gruber (1884) did not mention any substrate or host. This species was found as epibiont on harpacticoid (Chatterjee *et al.* 2020a).

Distribution: Italy (Gruber 1884); Black Sea (Dovgal 2013); west coast of India, Arabian Sea (Chatterjee *et al.* 2020a); Arabian Sea, 2054 m depth (present report).

Remarks: The species was described by Gruber (1884) as *Acineta* sp. from the water area of the port of Genoa (Italy) without mentioning the substrate or host and was observed in the Black Sea without mention of locality or substrate (Dovgal 2013). This species was redescribed by Curds (1985a) based on Gruber's data as *Acinetides gruberi* Curds, 1985.

Genus *Trematosoma* Batisse, 1972

***Trematosoma rotunda* (Allgén, 1952)**

(Fig. 3 E-F; Fig. 4 A)

(for synonym see Chatterjee *et al.* 2020a)

Material examined: One individual found as epibiont on nematode host collected from stn MUC-13, at 0-2 cm sediment depth, 1495 m water depth (Fig. 3 E-F); four individuals found as epibiont on nematode host belongs to the genus *Tricoma* collected from stn MUC-17, at 0-2 cm sediment depth, 3918 m water depth (Fig. 4 A) from Arabian Sea, Indian Ocean.

Diagnosis: Marine loricate suctorian. Cell body short, rounded, laterally flattened, entirely fills up the lorica and clamped to their aperture border. Lorica delicate gently striated. Tentacles clavate, short, arranged in two groups of rows at the upper body surface. Macronucleus spherical or oval, centrally or slightly posteriorly located. Stalk short, thin, slightly ribbed.

Measurements from present find (based on three individuals, in μm): Lorica length 27-31, lorica width 13-16, stalk length 6-13, body length 17-23, body width 12-14, macronucleus diameter 5-6, length of the tentacles 3-4.

Host and substrate specificity: This species was reported as epibiont on nematodes *Desmodora tenuispiculum* Allgén, 1928, *Desmodora stateni* Allgén, 1928 (Allgén 1952); on nematode *Pseudochromadora* sp. (Dovgal 2009); on nematode *Chromaspirina* sp. (Bhattacharjee 2014); on *Dorylaimopsis punctata* (Ansari & Bhadury 2016); on *Desmodora scaldensis* de Man 1889 (Ghosh & Mandal 2019); on nematode *Tricoma* sp. (Chatterjee *et al.* (2020d); on *Desmodora* sp. (Baldrighi *et al.* 2020).

Distribution: Falkland Islands (Allgén 1952); Argentina (Allgén 1952); Antarctica (Allgén 1952); Ratnagiri, Maharashtra, west coast of India, Arabian Sea (Dovgal *et al.* 2009); Odisha, India, Bay of Bengal (Bhattacharjee 2014); Sagar Island, Sundarbans, India, Bay of Bengal (Ghosh & Mandal 2019); Karwar, Karnataka, India, Arabian Sea (Chatterjee 2020d); Goa, west coast of India, Arabian Sea (Chatterjee *et al.* 2000e); Madagascar, Indian Ocean, 528-775 m depth (Baldrighi *et al.* 2020); Gulf of Naples (Baldrighi *et al.* 2020); Arabian Sea, 1495 m and 3918 m depth (present report).

Remarks: Earlier report of Baldrighi *et al.* (2020) of this species was from 528-775 m depth of Madagascar region, Indian Ocean. Present record of this species extends its bathymetric distribution upto 3918 m depth in Indian Ocean.

Order Trichophryida Jankowski, 1978

Family Trichophryidae Bütschli, 1879

Genus *Brachyosoma* Batisse, 1975

***Brachyosoma* sp.**

(Fig. 4 B-D)

Material examined: Five individuals found as epibiont on unidentified Ostracoda host collected from stn MUC-13, at 0-2 cm sediment depth, 3918 m water depth (Fig. 4 A) from Arabian Sea, Indian Ocean.

Diagnosis: Small unloricate suctorian ciliate with guttate cell body, lacking of stalk, with a single apical fascicle of capitate tentacles. Attached to the host body surface by very short posterior body projection. Actinophores absent. Macronucleus spherical, centrally located. Reproduction not described.

Measurements (based on two individuals, in μm): Body length 26-32, body width 12-16, macronucleus diameter 6-7, length of the tentacles 5-17.

Remark: In such characters as unflattened, unloricate cell body, lacking of stalk, the found species is correspond to diagnosis of genus *Brachyosoma* (Batisse 1975; Curds 1985b; Dovgal 2002). The generic name *Brachyosoma* was proposed as substituting for *Hallezia* Sand, 1899 in connection with homonymy of the latter (Batisse 1975). The genus was proposed for endogemmic suctorian ciliates that lack both stalk and lorica and attach to the substrate by a basal cell protuberance. Batisse (1975) and Curds (1985b) assigned the genus to the family Tokophryidae Jankowski in Small & Lynn, 1985 (order Acinetida). However, Dovgal (2002) has transferred the *Brachyosoma* into the family

Trichophryidae (order Trichophryida) based on the lack of the stalk in the representatives of the genus. Lynn (2008) also placed genus *Brachyosoma* into the family Trichophryidae.

There are four species of the genus (Curds 1985b; Dovgal 2002), most of them were found in freshwater habitats. In size and body outlooks the found species is similar to freshwater *B. oviformis* (Sand, 1899) (named as *Hallezia oviformis*) found attached to algae in the river near Brussels, Belgium (Sand 1899). However, it is Jankowski's (2007) opinion, that the species *Hallezia oviformis* is poor defined and indefinable.

It is believed (Curds 1985b) that the endogenous budding is characteristic for representatives of genus *Brachyosoma*. At the same time, the presence of vermiform suctorians warmers at the same host near individuals of *Brachyosoma* sp. (Fig. 4 C, 2) attracts attention. However, the process of reproduction was not observed, hence the identity of these migratory stages to any suctorian taxon was impossible.

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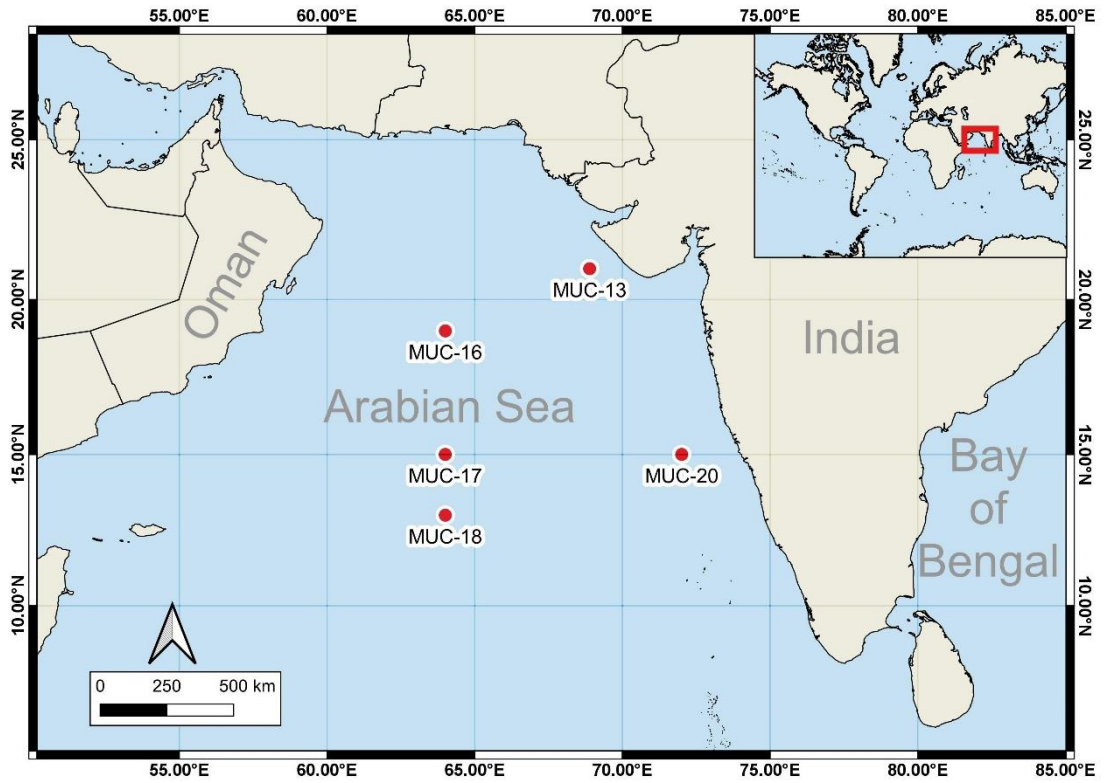


Fig. 1. Map of the study area.

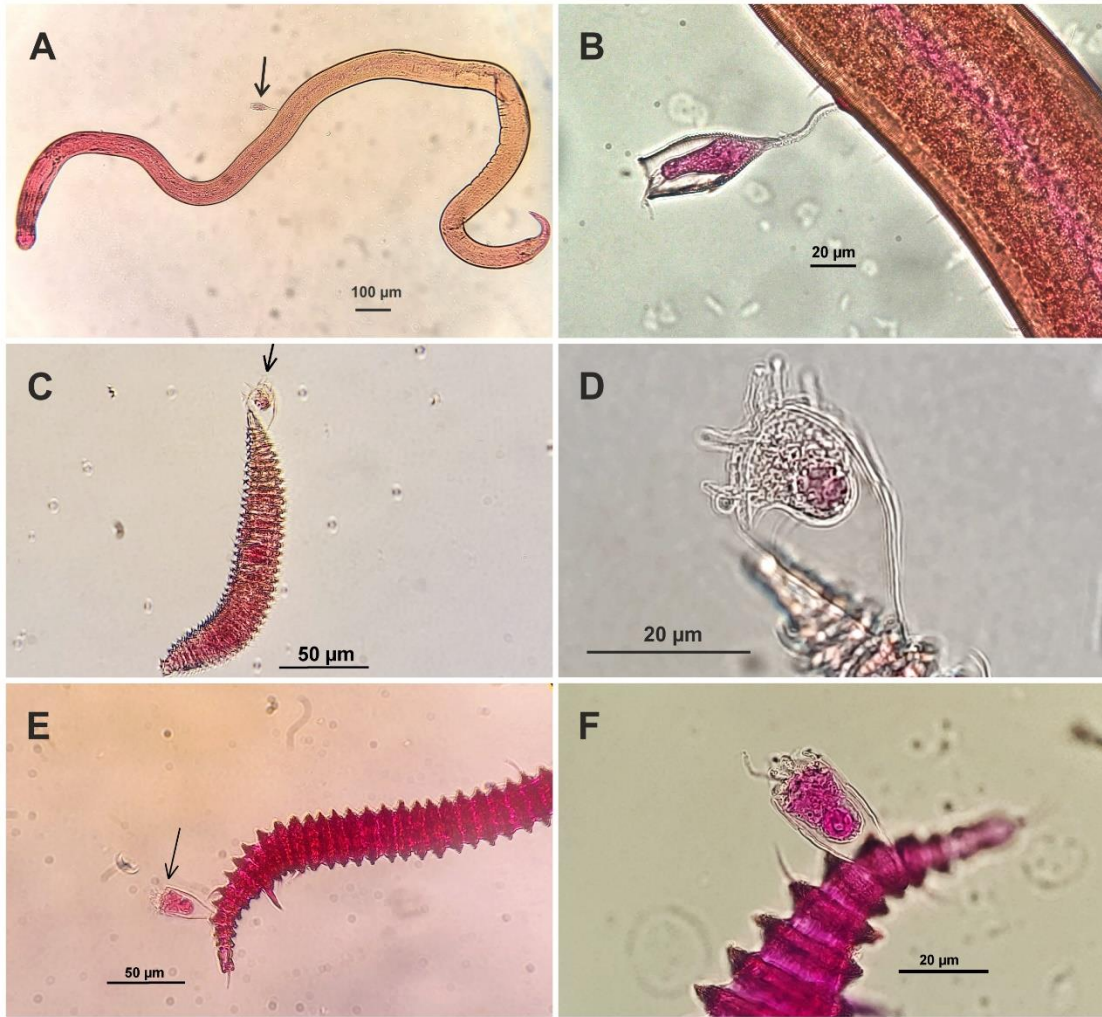


Fig. 2. A-B. *Thecacineteta calix* (Schroder, 1907) on nematode; C-D. *Actinocyathula homari* (Sand, 1899) on nematode; E-F. *Loricophrya bosporica* Sergeeva & Dovgal, 2016 on nematode.

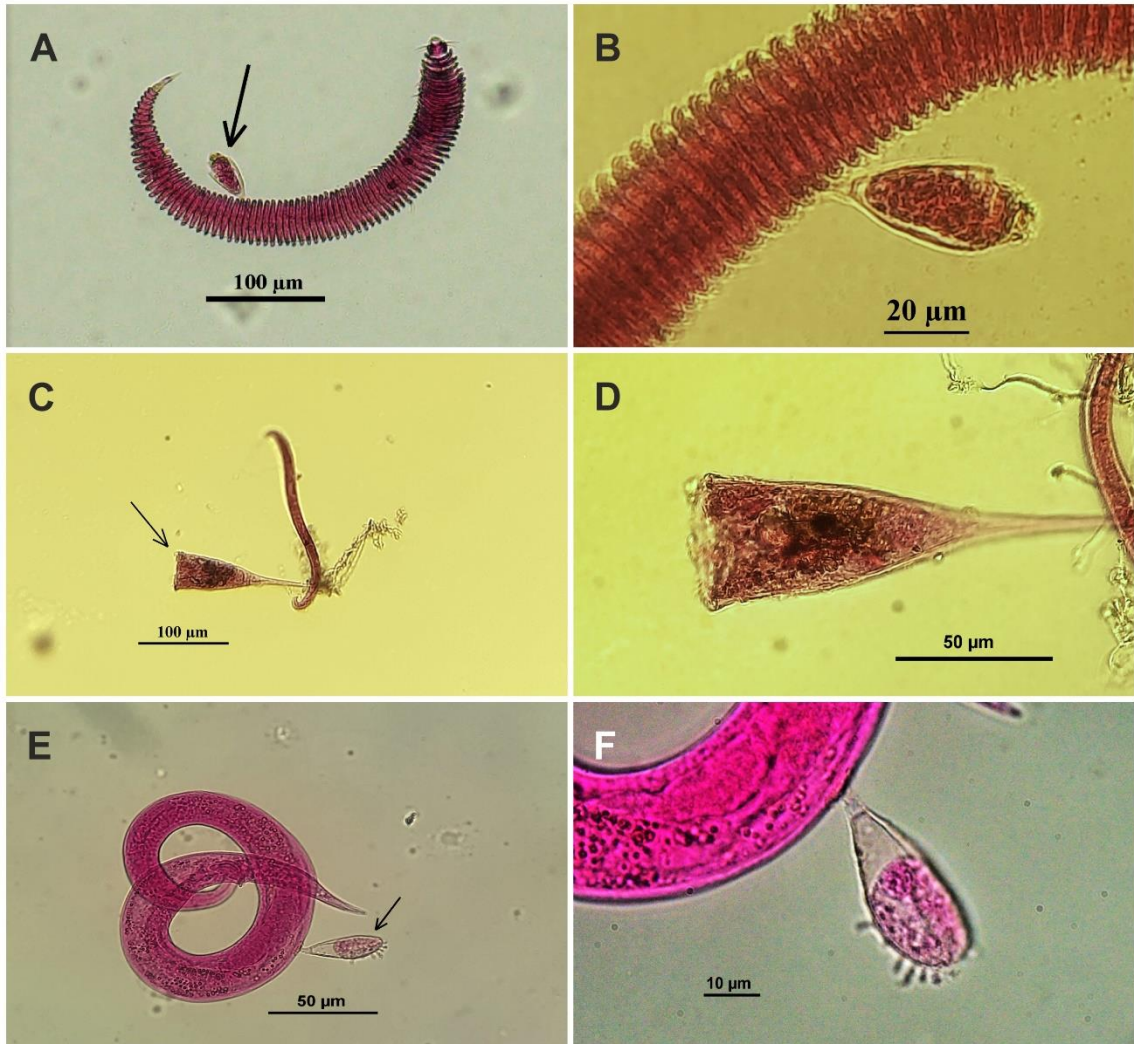


Fig. 3. A-B. *Loricophrya* cf. *stresemanni* (Allgén, 1951) on nematode; C-D. *Acinetides gruberi* Curds, 1985 on nematode; E-F. *Trematosoma rotunda* (Allgén, 1952) on nematode.



Fig. 4. A. *Trematosoma rotunda* (Allgén, 1952) on nematode; B-D. *Brachyosoma* sp. on ostracod; C. 1 – trophont of *Brachyosoma* sp., 2 – vermiform sucktorian swarmer.

Table 1. Geographical and ecological information of the study areas.

Station ID	Latitude (°N)	Longitude (°E)	Sediment depth (core)	Collection Depth (m)	Bottom temperature (°C)	Bottom pH	Bottom Salinity (psu)	Bottom DO (ml/L)	Sediment texture pattern
MUC-13	20° 58' 45.0732"	68° 53' 18.258"	0-2 cm	1495	5.4	7.62	35.0	0.72	Clayey silt
MUC-16	19° 0' 0.486"	64° 0' 14.1192"	0-2 cm	3463	1.7	7.86	34.8	1.95	Silty sand
MUC-17	15° 0' 1.1772"	64° 0' 1.1802"	0-2 cm	3918	1.7	7.82	34.7	2.7	Silty sand
MUC-18	13° 0' 13.6728"	64° 0' 9.8316"	0-2 cm; 2-4 cm	4119	1.7	7.90	34.7	2.8	Sandy silt
MUC-20	15° 0' 2.5776"	72° 0' 18.8388"	0-2 cm	2054	2.9	7.68	34.7	2.50	Clayey silt