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Macrobenthic polychaetes in Manakkudy Backwater, South West Coast of India

Balasubramanian, S.[1], Citarasu, T.[1*], Michael Babu, M.[1], Lazarus, S.[2], Renu, A.[3] and Mary Mettilda Bai, S.[4]

[1] Aquatic Animal Health Laboratory, Centre for Marine Science and Technology, Manonmaniam Sundaranar University, Rajakkamangalam - 629 502, Tamil Nadu, India.
[2] Institute for Environmental Research and Social Education, 150, Nesamony Nagar, Nagercoil - 629001, Tamil Nadu, India.
[3] SR Centre for Scientific Research and Social Resource, 54th,4th Jawahar street, Ramavarmapuram, Nagercoil-629001. TamilNadu, India.
[4] Department of Zoology, Holy Cross College (Autonomous), Nagercoil-629004, TamilNadu, India(Affiliated to Manonmaniam Sundaranar University, Tirunelveli).
**E.mail: citarasu@gmail.com*

ABSTRACT

Polychaetes are wide diverse group of organisms, contributing significantly to marine biodiversity, supporting a wide range of ecological niches and roles within different habitats.They are playing a vital role in nutrient cycling within marine ecosystems. They are often involved in the breakdown of organic matter, helping to decompose dead plants and animals. This process releases essential nutrients back into the environment, supporting the overall health of the ecosystem. The current study documented 14 species were collected from this Manakudybackwater and mangrove ecosystem. Its including 6 species newly recorded from the west coast of India and Two species newly documented from south west coast of India. *Nephtys dussumieri* Quatrefages, 1866 re recorded after 150 years; *Spio bengalensis* Willey, 1908 rediscovered more than 110 years ago and *Goniadopsis agnesiae* (Fauvel, 1928) recorded morethan 90 years back. The current study important for polychaete fauna of India and exploration of future polychaete research.

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1. Introduction

Macro benthic polychaetes are essential to the food web; they prey onvarious predators, including fish, crustaceans, and other invertebrates. Their abundance influences the dynamics of higher trophic levels and contributes to energy transfer through the ecosystem (Ricci et al., 2019).Changes in the abundance and diversity of macrobenthic polychaetes can indicate shifts in environmental conditions. Their presence or absence can reflect changes in sediment quality, pollution levels, and overall ecosystem health. Monitoring polychaete populations can provide valuable insights into ecosystem changes and assist in assessing environmental impacts (Herman et al., 1998).Macrobenthic polychaetes are pivotal components of marine ecosystems due to their roles in bioturbation, nutrient cycling, habitat structuring, and serving as indicators of environmental health. Their activities contribute to marine ecosystems overall functioning and resilience, underscoring their significance in maintaining ecological balance (Lalli and Parsons, 1996; Gage, 2000;Joye and Anderson, 2007).

Annelida are found in nearly every marine habitat, from intertidal algal mats to the deepest sediments (Rouse et al., 2022).The phylum Annelida exhibits high morphological diversity, describing over 21,000 species and a lot of ecological diversity (Glasby, 2008; Rouse et al., 2022). Climate change can affect the physical characteristics of marine habitats, such as changes in sediment composition or alterations in currents and wave patterns. Since polychaetes are closely tied to sediment habitats, such changes can impact their survival and reproductive success(Nunes et al., 2021). Altered ocean conditions might lead to changes in primary productivity and the dispersal of phytoplankton and other primary producers, which can, in turn, affect the availability of prey for polychaetes (Mitra et al., 2014; Bindoff et al., 2019).

Polychaetes are one of the main components in the estuarine and marine environment and play an important role in plankton, finfish, and shellfish populations. They are the main food for bottom fishes (Parulekar et al., 1980) and are preferred as food by snails, crustaceans, fishes and birds and thus form an essential component of the complex food chain both in their adult as well as larval stages (Willey 1905). In India,727 species belonging to 334 genera and 72 families were recorded (Sivadasand Carvalho 2020). A total of 152 species have beendescribed from various parts of the Indian coasts, and 88 species are endemic to the regionof Indian coastal waters (Sivadasand Carvalho 2020).

Manakkudy is a pristine, eco-sensitive zone where the river Pazhayar joins the sea, forming a big estuarine ecosystem with a mangrove forest and bird sanctuary. Near the estuary, there is a salt pan, sand dune, turtle nesting ground and two thickly populated coastal villages, Melamanakkudy and Keezhamanakkudy. Because of this unique nature of the ecosystem, the Manakkudy site was selected for the study of polychaete taxonomy. Further, a detailed systematic work on the polychaete fauna of the Manakkudy mangrove is lacking, and hence an attempt was made here. In this study, species composition and taxonomic description of polychaete fauna of the Manakkudy estuary Barmouth and mangrove were examined.This is the first study of the soft bottom intertidal polychaete assemblages in the Manakkudy Backwater.

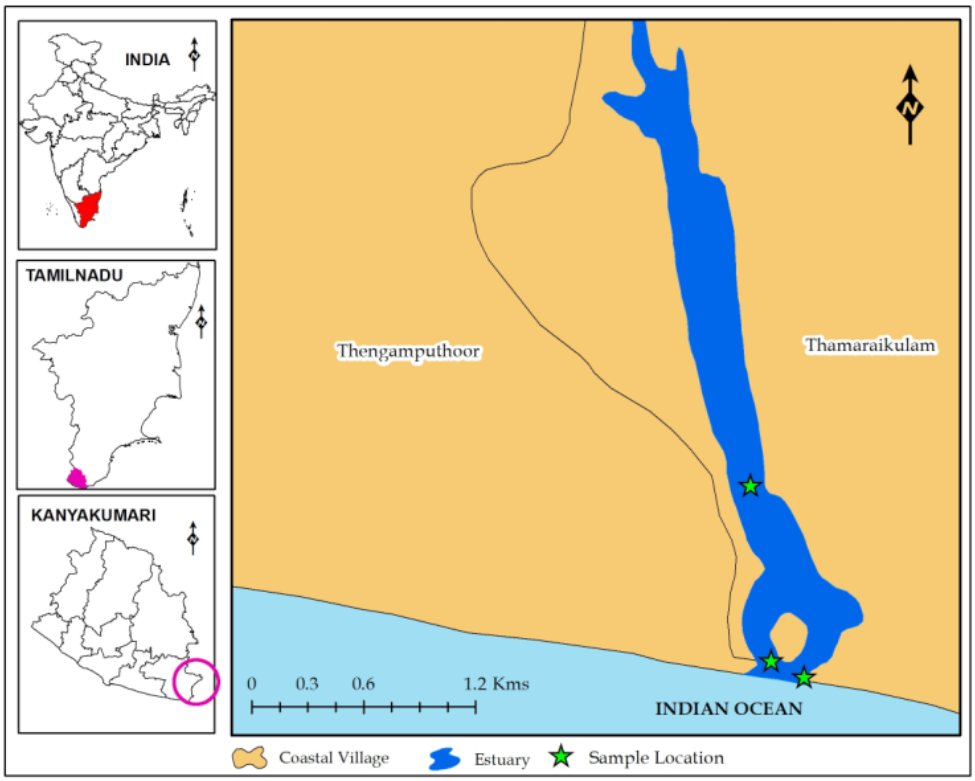

Fig. 1. Map showing the study area of Manakkudy backwater

2. Materials and Methods

For the present study polychaete sampling was made from 3 stations (Fig.1) of Barmouth, including seaweed bed in rocks (Lat. 8°5'14.04" N, Long. 77°29'8.42" E), estuary (Lat. 8°5'22.00" N, Long. 77°29'4.00" E) and mangrove sediments (Lat. 8°6'11.34" N, Long. 77°28'59.69" E). Manakudy estuary where the pazhayar river and the Arabian sea meets; this is main hub of birds and a mangroves. Sediment samples were collected by using a scoop with an effective sampling area of 0.1m^2 diameter. Collected samples were sieved using 500-micron mesh sieve and brought to the laboratory. The sieved samples were washed in seawater and fixed in 7% formalin diluted with seawater and later transferred to 70% ethanol. Specimens were examined under a light microscope, and the external and internal body features of the polychaetes were drawn using a Prismtype Camera Lucida. The measurements of the animals were taken using a micro-occulometer with 10X magnification. Species were identified using standard keys (Fauvel, 1953; Day, 1967; Blake 1994; Glasby *et al.,* 2000; Wilson et al., 2003; Glasby and Hakim 2017; Pamungkas and Glasby 2019; Magalhães *et al.,* 2021; Rouse *et al.,* 2022). All the scientific names taxonomically corrected from the WoRMS Editorial Board (2023).

3. Results

The survey of the polychaete fauna of Manakkudy Backwaters, South west coast of India, Tamil Nadu, recorded the presence of 14 species classified under 6 orders (Cossurida, Spionida, Capitellida, Phyllodocida, Eunicida and Oweniida), 14 families and 14 genera (Fig. 2). The species diversity was the highest in the orderPhyllodocida(7 species), followed by Capitellida(3 species) and Cossurida, Spionida, Eunicida and Oweniida (1 species) respectively. The report include *Myriochele picta* Southern, 1921, *Euclymene annandalei* (Southern, 1921),*Sigambra constricta* (Southern,1921) *Perinereis maindroni* Fauvel, 1943, *Platynereis dumerilii* (Audouin and Milne-Edwards,1833) and *Goniadopsis agnesiae* (Fauvel, 1928) recorded for the first time from the West coasts of India. *Cossura coasta* (Kitamori, 1960) and *Spio bengalensis* Willey, 1908, recorded first time from the South west coasts of India.

Systematics

Phylum: Annelida
Class: Polychaeta
Subclass: Errantia
Order: Cossurida
Family: Cossuridae
Genus: *Cossura*

3.1.1.*Cossura coasta* (Kitamori, 1960) (Fig. 3.A-F)

Cossura coasta Kitamori, 1960: I082, fig, I a-f; Day, 1963: 427.

Materials examined:5specimens collected from muddy sediment in Manakkudy estuary, Lat. 8°5'22.00" N, Long. 77°29'4.00"E (Fig.3;site2); 4 specimens: collected in Manakkudy mangrove, Lat. 8°6'11.34" N, Long. 77°28'59.69" E (Fig.3;site 2).

Diagnosis: The specimen is very small, measuring 15 to 19 millimeters in length (Figs.3.A-E), characterized by a thread-like form consisting of 98 to 106 segments (Fig. 3.B&C). Its elongated body is cylindrical in shape, tapering at both ends. Notably, it features a distinct prostomium adorned with three elongated anal cirri. The pharynx exhibits lobes

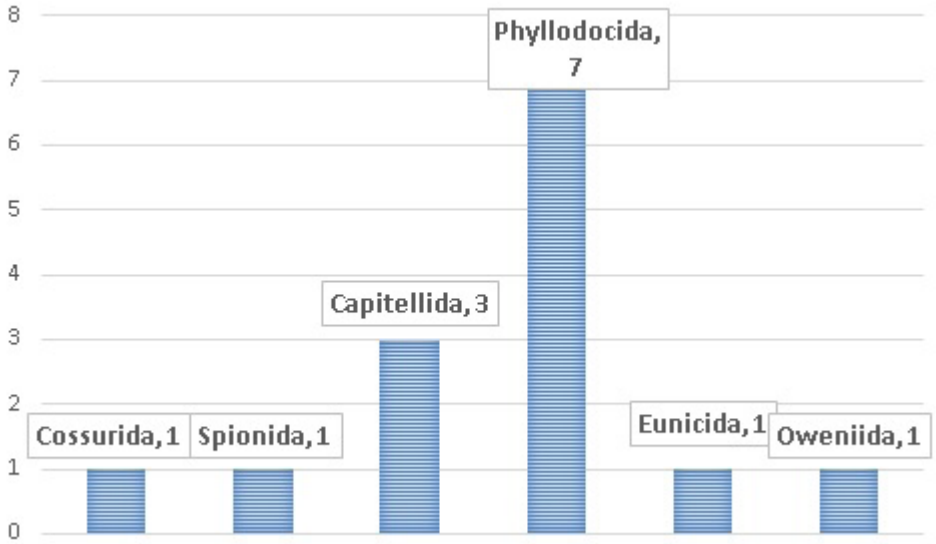

Fig. 2. Polychaete diversity comparison between the orders

and is reversible in nature. Appendages and parapodia are notably absent in this species. Setae emerge from the mid-dorsal region of the third setigerous segment, measuring 8, 10 and 12 millimeters in length. The dorsal and ventral bundles of the first setigerous segment closely converge, creating an almost continuous fan-like structure. The species possesses two varieties of setae: preacicular setae characterized by transverse bars and chaetae of the initial three segments, which are longer and wider, diminishing in thickness across subsequent segments. Two types of post-acicular chaetae are discernible, predominantly comprising elongated, smooth, and slender capillaries along with a smaller number of shorter chaetae featuring finely serrated and flattened blades (Fig. 3.F). Parapodial aciculae project slightly and exhibit a curved configuration. The conical prostomium boasts two nuchal organs, devoid of eye spots. A well-developed pygidium posterior end dorsal view is observed (Fig. 3.E), while noto aciculae are notably small. Neurosetae exhibit a bifurcate structure, with prongs of varying lengths. The foot is substantial in size, except in the anterior and posterior regions (Fig.3.D). The specimen is primarily characterized by a white or pale yellowish hue, with chaetae displaying a light golden-yellowish tint.

Remarks: *Cossura coasta* (Kitamori, 1960) was originally described from the Seto Inland Sea (Japan) and cosmopolitan distribution. Day (1967), Glasby et al. (2016), and Sivadas

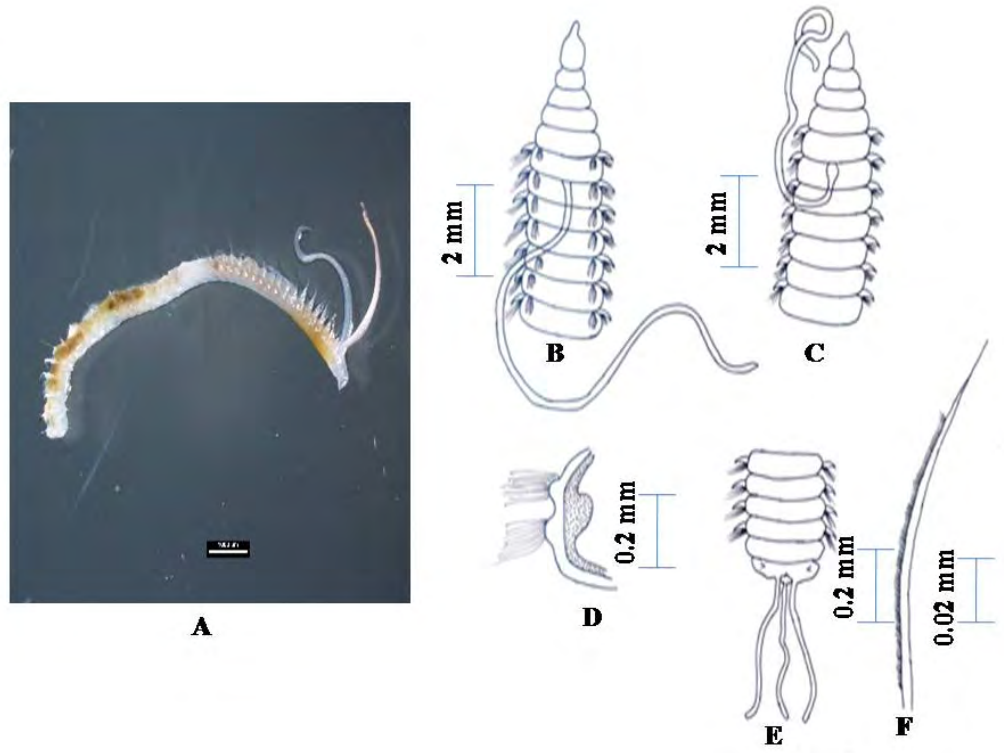

Fig. 3. (A) *Cossura coasta* Kitamori, 1960. (B) Anterior region, head -dorsal view. (C) Anterior region, head - ventral view. (D) Foot from mid - region. (E) Posterior end- dorsal view. (F) Blade

and Carvalho (2020) recorded this species from the Indian coastal waters. This is the first record from the southwest coast of India.

Order: Spionida
Family: Spionidae
Genus: *Spio*

3.1.2. *Spio bengalensis* (Willey, 1908) (Fig. 4. A-I)

Spio filicornis: Fauvel, 1927:43, fig.15 a-g.
Nereis filicornis Muller, 1776:218.

Materials examined:8 specimens collected from muddy sediment in Manakkudy estuary, Lat. 8°5'22.00" N, Long. 77°29'4.00"E (Fig. 3; site2) and two specimens: collected in Manakkudy mangrove, Lat. 8°6'11.34" N, Long. 77°28'59.69" E (Fig. 3; site2).

Diagnosis: The specimen medium in size measured 138 to 155mm in length and comprised 200 segments (Fig.4.B&C). The prostomium, pointed anteriorly (Fig.4.A-I), featured four to six eyes arranged in a row and possessed a triangular caruncle. Notopodial lamellae were articulated to the branchiae at the anterior end but were free posteriorly, with the inferior margin extending downwards towards the neuropodium. Notopodial hooded hooks were well-developed (Fig.4.H). Postchaetal lobes, segmented in subsequent segments, were small and ovoid in shape. Beginning from segment 18-20, postchaetal lobes in anterior segments became short, rounded, and subsequently weak and bilobed. A maximum of twelve neuropodial hooks were observed. Cirriform structures, longer than prolonged gills, initiated at segment 2. Anterior parapodia exclusively featured capillary chaetae (Fig.4.D&E) originating from the neuropodium, alongside the presence of hooded hooks (Fig.4.F). Notosetae were formed from the notopodia. The pygidium exhibited a single lobe (Fig.4.I), with capillary notosetae evident (Fig.4.G). Hooded hooks were typically bidentate, occasionally unidentate, or possessed two small accessory teeth. The colour of the animal appeared yellowish white.

Remarks: Willey (1908) originally described *Scololepis bengalensis* Willey, 1908, from the Bay of Bengal on the east coast of India. After description,there are no records from India or elsewhere (Sivadas and Carvalho 2020). This is the rediscovery of this species from more than 100 years ago and a new distribution record from the southwest coast of India.

Order: Capitellida
Family: Capitellidae
Genus: *Capitella*

3.1.3. *Capitella singularis* (Fauvel, 1932) (Fig. 5.A-F)

Capitella singularis Fauvel, 1932), p.197, pl. VII, figs.9-14.

Materials examined:9 specimens collected from muddy sediment in Manakkudy estuary, Lat. 8°5'22.00" N, Long. 77°29'4.00"E (Fig. 3; site2).

Diagnosis: The specimen is very medium in size measuring 110 to120 mmm (Fig. 5.A-F). The body of the species appeared elongated, oval-shaped, and delicate, tapering at both ends, wider towards the anterior, resembling a thread-like structure, measuring in length with a hundred segments, and displaying a dark red hue. In the anterior region of the body (Fig. 5.B), the prostomium took on a conical form, featuring two small ventral eyes and two nuchal organs positioned behind the eyes. The thorax consisted of 9

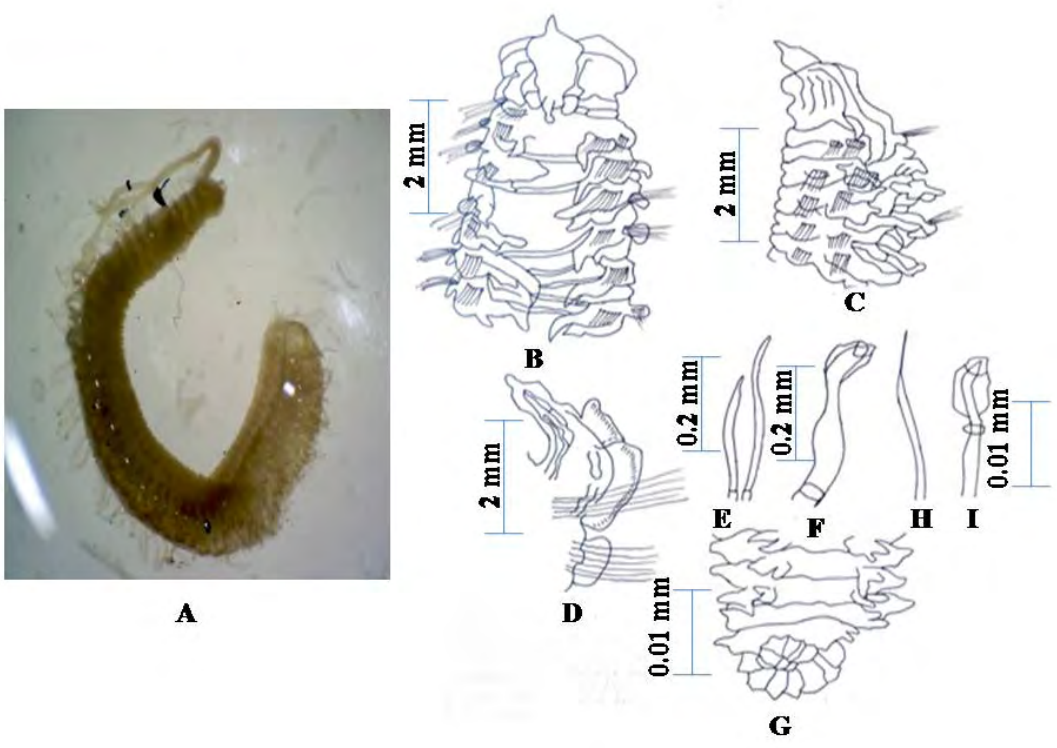

Fig. 4. (A) *Spio bengalensis* Willey, 1908. (B) Anterior region, head - dorsal view. (C) Anterior region, head - lateral view. (D) Parapodium of chaetiger. (E) Capillary neurochaetae. (F) Neuropodial hooded hooks. (G) Capillary notochaetae. (H) Notopodial hooded hooks. (I) Pygidium.

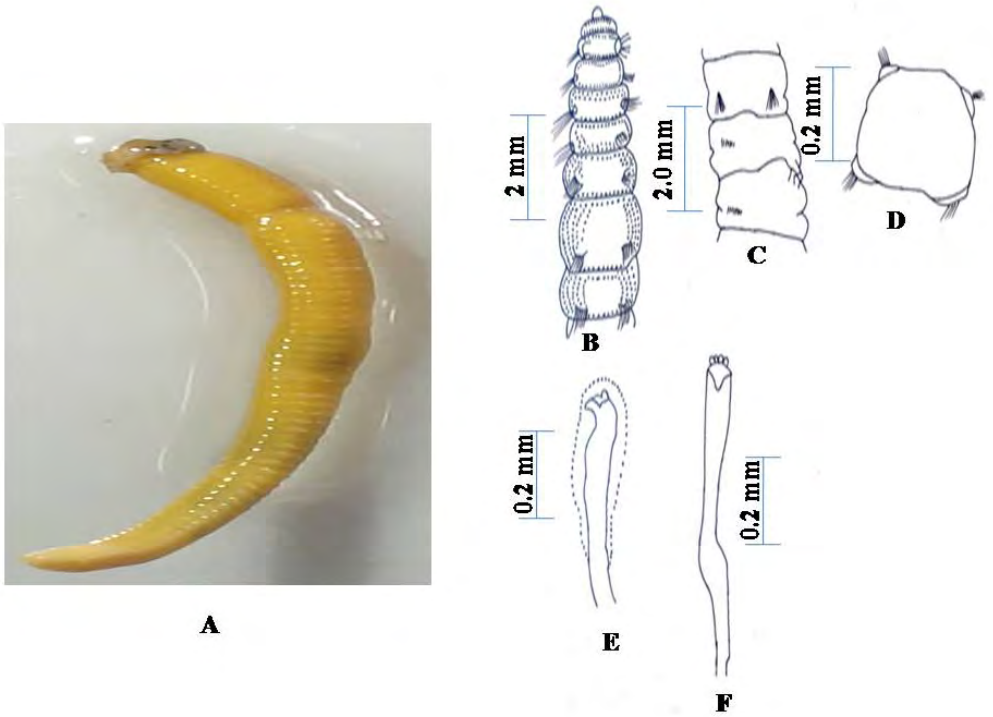

Fig. 5. (A) *Capitella singularis* (Fauvel, 1932).(B) Anterior region, head - dorsal view (C) Setiger 7, 8 and 9 (D) Abdominal segment (E) Profile view of hooded hook (F) Face view of hooded hook.

chaetigers, with biannulate segments. Both rami comprised capillaries from the first segment onwards. The peristomial segment from the sixth to the seventh housed capillaries and hooks. In females, the 8th and 9th segments (Fig. 5.C,&D) bore hooks in both rami, while males possessed 4 stout genital hooks (Fig. 5.E) dorsally positioned towards the genital opening. Normal hooks (Fig. 5.F) were arranged ventrally in a diagonal cross pattern. A single genital pore opened mid-dorsally between chaetigers 8 and 9. A notably large muscular proboscis was present, featuring a pair of chitinous jaws. The parapodia were biramous, displaying divergent setigerous lobes, each adorned with delicate anterior and posterior lamellae. Simple setae were arranged in two rows, with laddered capillaries on the anterior row and long capillaries on the posterior row. Forked setae were also observed. Abdominal neurosetae appeared narrow, with the presence of winged capillaries. Pygidial eye spots were evident, alongside a pair of internal eyes in the collar segment. Winged capillaries adorned the thoracic notosetae. Colour yellow, head greenish yellow.

Remarks: *Capitella singularis* (Fauvel, 1932) was originally described from the Visakhapatnam (India), Bay of Bengal, East coast of India. De Silva (1965) recorded this species from the Srilankan Coast, and Pillai (1965) recorded this material from the Kerala and Tamil Nadu coasts.

Genus: ***Notomastus***

3.1.4. *Notomastus aberans* (Day,1957) (Fig.6.A-E)

Notomastus aberans Sars, 1851.
Notomastus aberans : Day, 1957: 105, fig.7a-b.
Notomastus fauvelii Day, 1955:422, fig. 2 h-l.
Notomastus giganteus Fauvel, 1932:194.
Notomastus latericeus Sars,1851:199; Fauvel, 1927:143, fig. 49a-h.

Materials examined:20 specimens collected from muddy sediment in Manakkudy estuary, Lat. 8°5'22.00" N, Long. 77°29'4.00"E (Fig.3;site2).

Diagnosis: The specimen is small to medium in size measuring 55 to 60 mm (Fig.6.A-F). The body measures 60 millimeters in length and comprises 120 segments. The thorax, featuring an achaetous peristomium, is succeeded by 11 setigerous segments. The initial setigerous segment bears notopodial capillaries and neuropodial capillaries, while the subsequent segments exhibit capillaries in both notopodia and neuropodia. The prostomium (Fig.6.B) bears an elongated cone adorned with eyes, while the peristome remains achaetous. The first thoracic setiger carries notopodial capillaries exclusively, with no neurosetaeobserved. Abdominal segments (Fig.6.C) feature short rows of hooks (Fig.6.D&E) in both notopodia and neuropodia. Gills are situated on the outer edge of the abdominal notopodia and the superior edges of the neuropodia. The first row exhibits four teeth, while the second row displays five teeth. Posterior abdominal segments appear companulate when contracted. Branchiae take on a triangular shape. A median antenna, featuring a large, dark-coloredceratophore, is evident, while lateral antennae comprise short pigmented ceratophores. Palps measure three times longer than the prostomium and exhibit some pigmentation. The tentacular segment features basal lobes. Colour whitish yellow.

Remarks:*Notomastus aberans* (Day,1957) was originally described from the Kosi Bay (South Africa) Indian Ocean. Sivadas and Carvalho (2020) recorded this material from the east and west coasts of India.

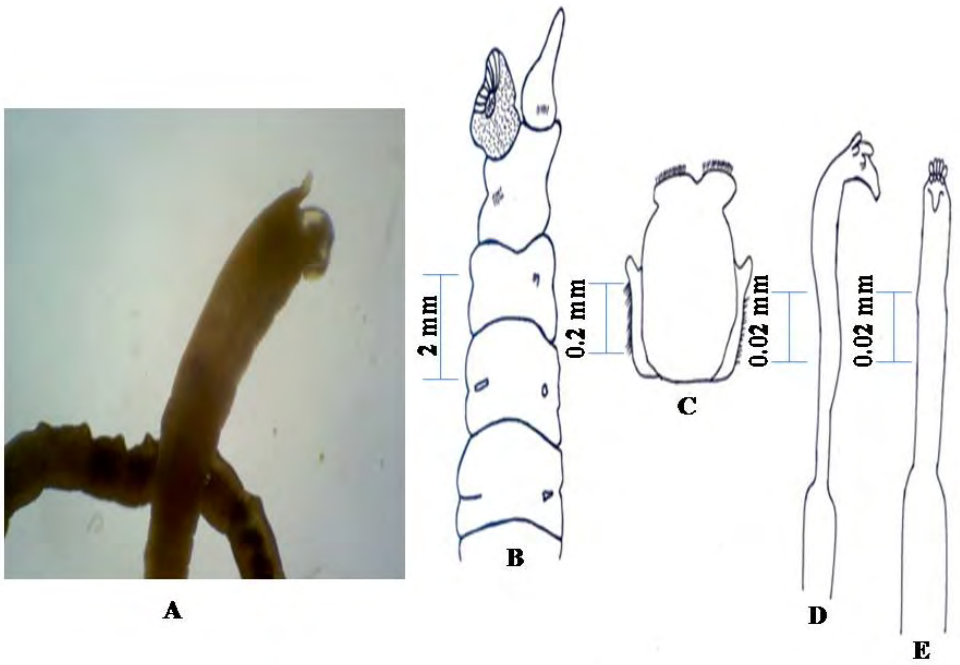

Fig. 6. (A) *Notomastus aberans* Day, 1957. (B) Anterior region, head - dorsal view (C) T/S anterior abdominal segment and (D, E) Profile and face view of hooded hooks

Family: Maladnidae
Genus: ***Euclymene***

3.1.5. *Euclymene annandalei* (Southern, 1921) (Fig.7.A-H)

Euclymene annandalei Southern, 1921:648, pl.28 fig. 22 a-g, pl.29 fig. 22 h-k.

Materials examined:5 specimens were collected from muddy sediment in Manakkudy estuary, Lat. 8°5'22.00" N, Long. 77°29'4.00"E (Fig.3;site1 &2).

Diagnosis: The specimen is small to medium in size measuring 75-83 mm (Fig.7.A-H). The body measures 80 millimeters in length, displaying an oval shape that is longer and wider. An encircling rim, elevated anteriorly, laterally, and posteriorly, is notable (Fig. 7.C). The prostomium (Fig. 7.B&F) is blunt and triangular, adorned with numerous ocelli. It appears oval, longer than wide, with an encircling rim that is higher anteriorly. Nuchal grooves are straight, extending two-thirds of the length of the cephalic lobe and parallel, reaching posteriorly to the onset of the lateral incision, accompanied by numerous ocelli. The cephalic rim is elevated anteriorly but lower, exhibiting approximately eight crenulations posteriorly. A total of 21

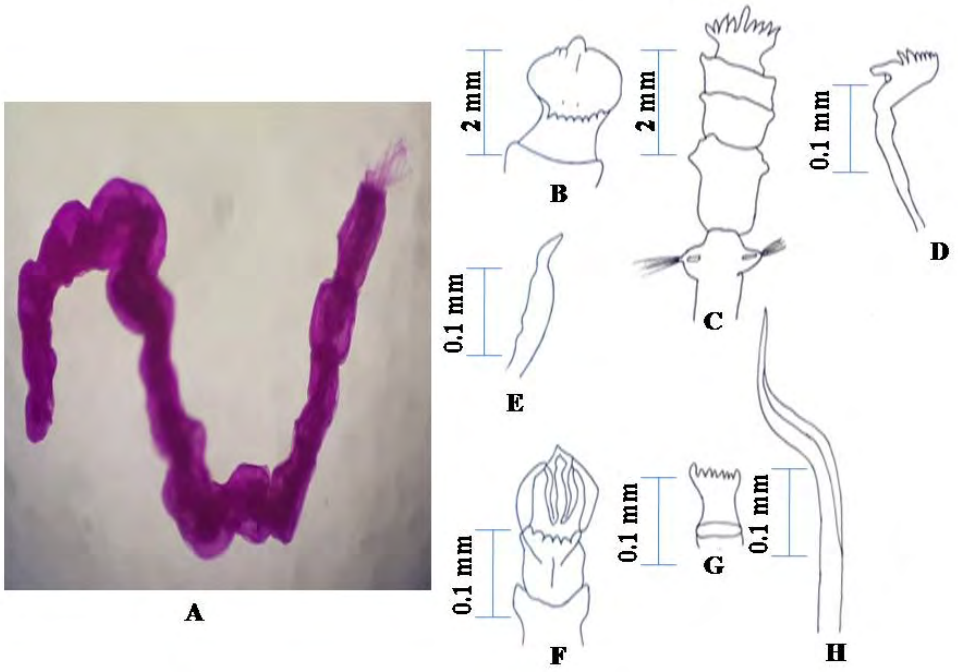

Fig. 7. (A**)** *Euclymene annandalei* Southern, 1921 (B) Anterior region, head- dorsal view (C) Ventral view of posterior end (D) Normal hook (E) Acicular spine of setiger (F) Posterior region, head - ventral view (G) Anal funnel and (H) Straight winged seta

setigerous bodies, preceded by two achaetouspreanals, are followed by the pygidial ring and anal funnel (Fig.7.G). Anterior segments are shorter, while posterior segments are lengthier. Segments feature strongly reduced ventral hooks, alongside acicular spines observed on the aciculum (Fig.7.E). Three segments posteriorly lack chaetae. The pygidium is funnel-shaped, with subsequent neurosetae bearing numerous hooks. Dorsal tubercles are present on the 3rd and 6th segments. Straight winged setae are visible (Fig.7. H). The elytra are oval and elongated in shape. Hooks exhibit a normal size (Fig.7.D). Live colour pale reddish.

Remarks: *Euclymene annandalei* (Southern, 1921) was originally described from the Chilka Lake, Odisha, East coast of India. Tikadar *et al.,* (1986) recorded from Andaman and Nicobar Islands; Srikrishnadhas *et al.,* (1998) recorded from the Parangipettai coast; Ramakrishna *et al.,* (2003) recorded from the Digha coast, Bay of Bengal, east coast of India. The present record is newly recorded from the west coasts of India.

Order: Phyllodocida
Family: Pilargiidae
Genus: ***Sigambra***

3.1.6. *Sigambra constricta* (Southern,1921) (Fig. 8.A-G)

Sigambra constricta Southern,1921:573,pl.19 figs. 1A-G;Day,1957:71, fig. 2 a-d.
Sigambra constricta, Fauvel,1930:p.64.
Sigambra constricta, Fauvel,1953:p.111, figs. 54-a-d.

Materials examined:6 specimens collected from muddy sediment in Manakkudy estuary, near to the Mangroves, Lat. 8°5'22.00" N, Long. 77°29'4.00"E (Fig.3;site2).

Diagnosis : The specimen is small to medium in size112-127 mm. The body is elongated, exhibiting a round shape with 36 setigers. At the anterior end (Fig8.A-G), the prostomium is truncated, slightly broader than long, divided by a longitudinal furrow into two parts, and anteriorly (Fig.8.B&G), somewhat incised, fused to the first segment, featuring 1-3 cirriform antennae and two palps. The short palps are articulated with an indistinct base, and two pairs of eyes are present. Three pairs of gills, each composed of numerous simple filaments arising from a basal stump, are observed. The foot of this species is broad in nature (Fig.8.C). Notosetae are elongated and curved at the anterior and posterior ends (Fig.8.D). The palps are massive and bent ventrally, bearing slender palpostyles. The pharynx is muscular, and jaws are absent. The peristomium is distinct from the prostomium and bears two pairs of tentacular cirri, with no constricted neck region. Each setiger features dorsal and ventral cirri, both tapered, alongside a blunt setigerous lobe. Ventral cirri are absent on setiger 2. Typical notopodia with aciculums are present. Fine capillaries and a stout recurved hook first appear on setiger 8. Neurosetae (Fig.8.E&F) exhibit serrations, with capillaries also visible. Capillary chaetae arise with fine teeth at the tip on antopodia. Prominent uncinigerous tori on neuropodia are observed from the 2nd chaetiger, long on the thorax and short on the abdomen. Uncini are present in double rows on segments 11-20. A large pygidium with appendages is present, while eye spots are absent.

Remarks:*Sigambra constricta* (Southern,1921) was originally described for the Chilka lagoon, Odisha, on the East coast of India. After the description, Hartman (1974) recorded the occurrence of the material from ChilkaLake, and Misra (1995) recorded it from Hugli Matla Estuary, West Bengal. This species was newly recorded from the west coast of India.

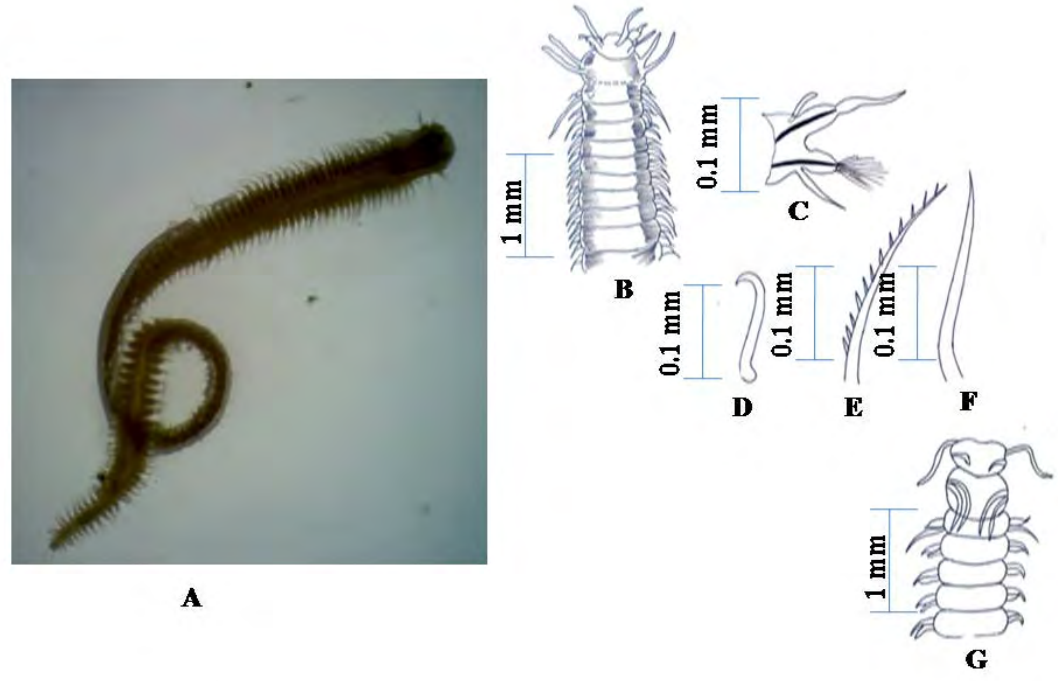

Fig. 8. (A) *Sigambra constricta* Southern,1921. (B) Anterior region, head - dorsal view. (C) Foot. (D) Notosetae. (E) Outer neurosetae. (F) Central neurosetae. (G) Anterior region, head -ventral view.

Family: Nereidae
Genus: *Dendronereides*

3.1.7. *Dendronereides gangetica* (Misra,1999) (Fig. 9.A-I)

Dendronereides heteropoda, Southern,1921, p.603, text-fig.10a,b, pl.XXI, fig.6, a-n Fauvel, 1932, p.87,pl. II, figs.3-9.
Dendronereides zululandica Day,1951:30, fig.5 a-j.
Dendronereis aestuarina, Southern,1921:p.598, pl.xx, fig. 4.
Dendronereis arborifera, Peters,1854:612; Fauvel, 1919:399, pl.15 figs. 5-8.

Materials examined:14 specimens were collected from mangroves muddy sediment in Manakkudy estuary, Lat. 8°5'22.00" N, Long. 77°29'4.00"E (Fig.3;site3)two specimens: collected from mangroves areas of Manakkudy, Lat. 8°6'11.34" N, Long. 77°28'59.69" E (Fig.3;site 2).

Diagnosis: The specimen ranges from small to medium in size, measuring between 27 to 33 millimeters in length and 1.7 millimeters in width, featuring 52 setigers and is complete posteriorly (Fig.9.A-I). Anterior parapodia (Fig.9.B&C) exhibit notopodia from setiger 3 with short, stout subconical dorsal cirri, triangular-subconical dorsal ligules, and slightly longer median ligules. Superior lobes are present as low rounded fillets, positioned anteriorly to the median ligule. Neuropodia feature 3 digitiform lobes, including 2 acicular and 1 postacicular lobe, with a short, blunt subconical ventral cirrus. Median and posterior parapodia showcase notopodial dorsal ligules that are divided, forming branchiae which originate from setiger 6 or 7 and extend to setiger 29 or 30. The branchial filaments are fine and feathery (Fig.9.D). The prostomium is deeply indented anteriorly, adorned with two short tapered antennae, and four pairs of tentacular cirri. Branchiae commence from setiger 10 and extend up to setiger 38, initially in the form of simple filaments, gradually forming a whorl involving 2 superior notopodial ligules. Notosetae comprise homogomph spinigers with long and short blades, while neurosetae include homo- and hemigomph spinigers (Fig.9.H&I), as well as homo-heterogomph falcigers (Fig.9.E,F&G). The pharynx is eversible, featuring soft papillae on both rings. The biramous parapodia consist of 3 conical notopodial ligules and a short anterior acicular lobe, with the neuropodium displaying a bluntly bifid presetal lobe and a short rounded postsetal lobe. Branchial filaments are arranged in a whorl pattern.

Remarks:*Dendronereides gangetica* (Misra,1999) was originally described from Hugli Matla Estuary, West Bengal. Kumaraswamy Achari 2005 was recorded same species *Dendronereides gangetica* from the Cochin Backwater.

Genus: *Perinereis*

3.1.8. *Perinereis maindroni* (Fauvel, 1943) (Fig. 10. A-G)

Perinereis maindroni Fauvel, 1943, p201, fig. 1, e-i

Materials examined:6 specimens were collected from fine muddy sediments of the Manakkudy estuary, Lat. 8°5'22.00" N, Long. 77°29'4.00"E (Fig.3;site 3).

Diagnosis: The specimen ranges from small to medium in size, 31 mm in length, 2 mm in width, with jaw lengths varying from 0.5 to 2.0 mm, comprising a maximum of 63 setigers (Fig.10.A-G).Body small, slender, divided into three regions(Fig.10.B). Four eyes set in a trapezium. Tentacles shorter than the conical palps. The longer dorsal cirrus reaches back to the third setigerous segment. Proboscis with very small, transparent, conical paragnaths, not easily detected (Fig.10.C).Cylindrical palpophores are observed in the palp, featuring rounded palpostyles. The longest tentacular cirri extend to setiger 1. The peristomium showcases long jaws with approximately

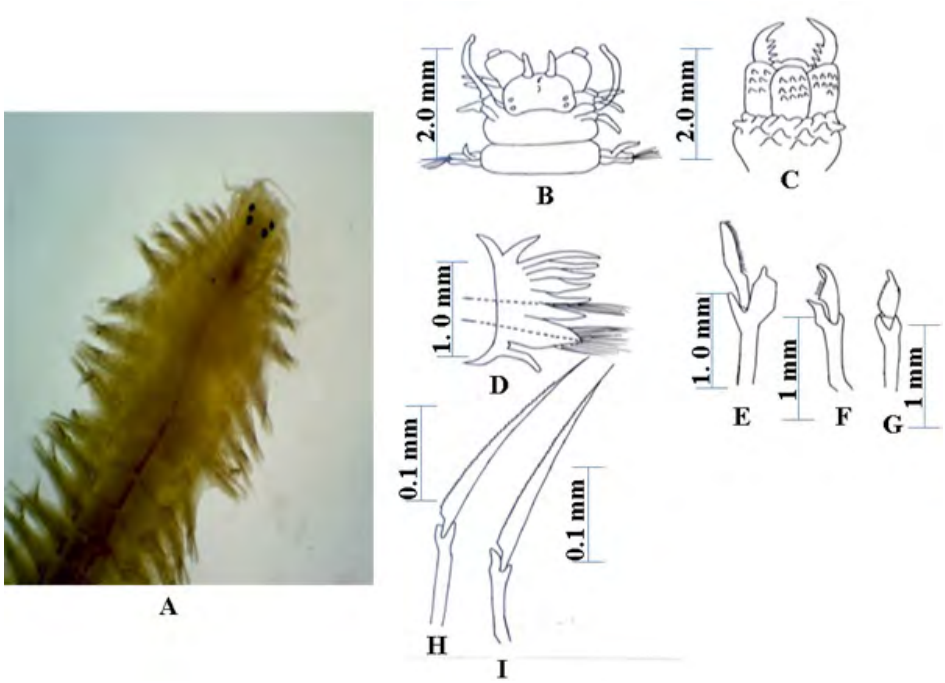

Fig. 9. (A)**.** *Dendronereides gangetica* (Misra,1999). (B) Anterior region head dorsal view
(C) Dorsal and ventral views of Proboscis (D) Branchiferous foot (E) Falciger (F) Heterogomph falciger
(G) Homogomph falciger (H) Homogomph spiniger (I) Hemigomph spiniger

seven teeth.The pharynx exhibits conical paragnaths on both rings, with smooth bars also present on Area VI, arranged as follows: 1=2-9, II=7-27 in 2-3 crescent-shaped rows (usually between 10-20), 1II=13-32, sometimes with 1-2 cones displaced laterally, separate from the main group, IV=IO-31, V=1 (very rarely 2), VI=1 short crescent-shaped bar, VIIVIII=22-38 in 2 rows. Area IV lacks bars. Anterior notopodia feature subtriangular notopodial ligules, slightly shorter, conical median ligules, and the presence of superior notopodial lobes.Anterior region with ascore of middle segments, the feet of which carry three dorsal subequal ligules and three ventral ones, with the intermediate shorter (Fig.10.D).The dorsal cirrus is slightly longer than the dorsal notopodial ligule, which is longer than the remaining ligules. Neuropodia exhibit a digitiform superior lobe and conical inferior lobe, approximately equal in length, with a slightly convex postsetal lobe shorter than the superior and inferior lobes. The ventral ligule is conical, with the ventral cirrus measuring two-thirds to three-quarters as long as the ventral ligule. Notopodial ligules of median and posterior notopodia are enlarged, triangular, approximately twice as long as the superior and inferior neuropodial lobes. The dorsal cirrus is distally inserted on posterior setigers, extending slightly beyond the tip of the notopodial ligule. Ventral neuropodial ligules are elongated and triangular, with the ventral cirrus measuring three-quarters as long as the ventral ligule. Neurosetae consist of homogomphspinigers and heterogomphfalcigers in the supra-acicular fascicle, and heterogomphfalcigers and a few heterogomphspinigers in the subacicular fascicle (Fig.10.E,F&G).Colour creamishyelloe, often exhibiting brown pigmentation on the prostomium and three transverse patches on the anterior dorsal setigers.

Remarks:*Perinereis maindroni* Fauvel, 1943, was originally described from the Pondichery coast, southeastern coast of India. After the description, there are no more records from the type locality or the Indian coasts. This is the new record from the west coast of India. *Perinereis maindroni* Fauvel, 1943, was originally described from Pondichery, on the east coast of India. After the description, there are no more records from the Indian coasts (Sivadas and Carvalho 2020). This is the rediscovery of this species from the Indian coasts and new record from the west coasts of India.

Genus: *Platynereis*

3.1.9. *Platynereis dumerilii* (Audouin and Milne-Edwards,1833) (Fig. 11. A-H)

Nereis dumerilii Audouin and Milne-Edwards,1834:19b.
Platynereis dumerilii : Fauvel,1923:359, fig.141 a-f.
Materials examined:11 specimens were collected from soft muddy sediments in Manakkudy estuary, Lat. 8°5'22.00" N, Long. 77°29'4.00"E (Fig.3;site2& 3).

Diagnosis: The specimen ranges from small to medium in size, 45 to 53 mm in length and multisegmented (Fig.11.A-H),). In the anterior region of the body (Fig.11.B), the prostomium appears longer than broad, with enlarged, flattened, and swollen palps, numbering two. The proboscis is well-developed (Fig.11.C), rendering the prostomium distinct. Long tentacular cirri are also present. The anterior feet are long, featuring two rounded large notopodial lobes, a minute intermediate lobe, and a long dorsal cirrus. Numerous spinigers (Fig.11.H) adorn the notosetae from the middle feet onwards, alongside two or three homogomphfalcigers, characterized by elongated blades that are deeply bent backward at the top and

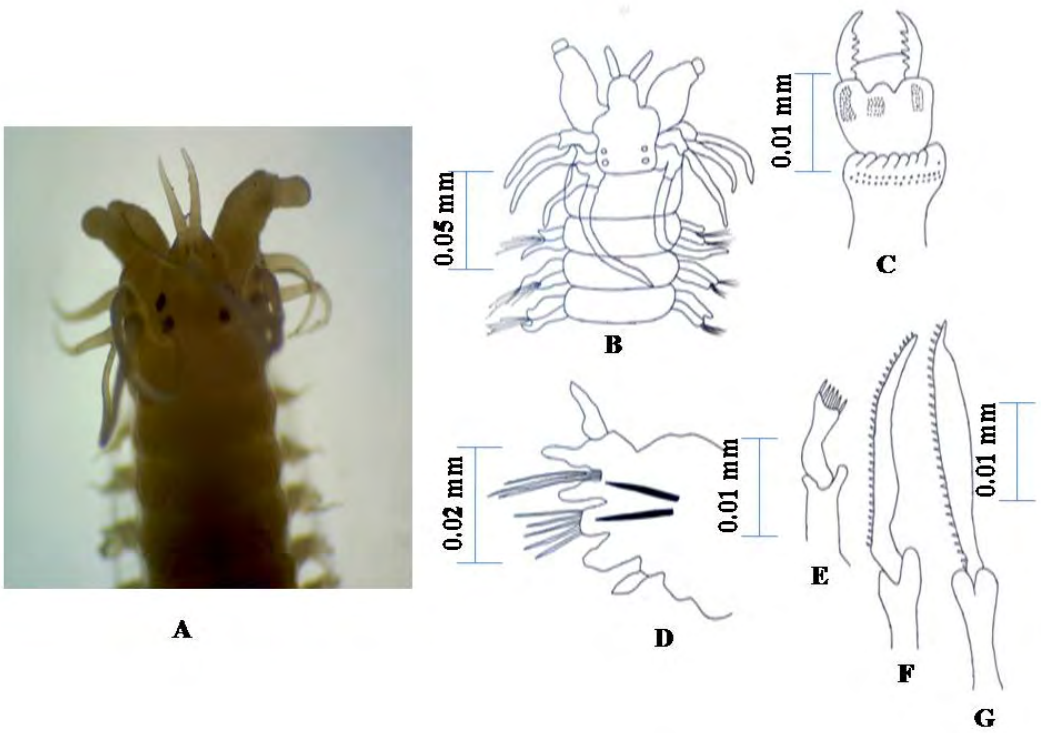

Fig. 10. (A) *Perinereis maindroni* Fauvel, 1943 (B) Anterior region, head - dorsal view (C) Proboscis - ventral view (D) Middle parapodium (E) Heterogomph falciger (F) Heterogomph spiniger and (G) Homogomph spiniger

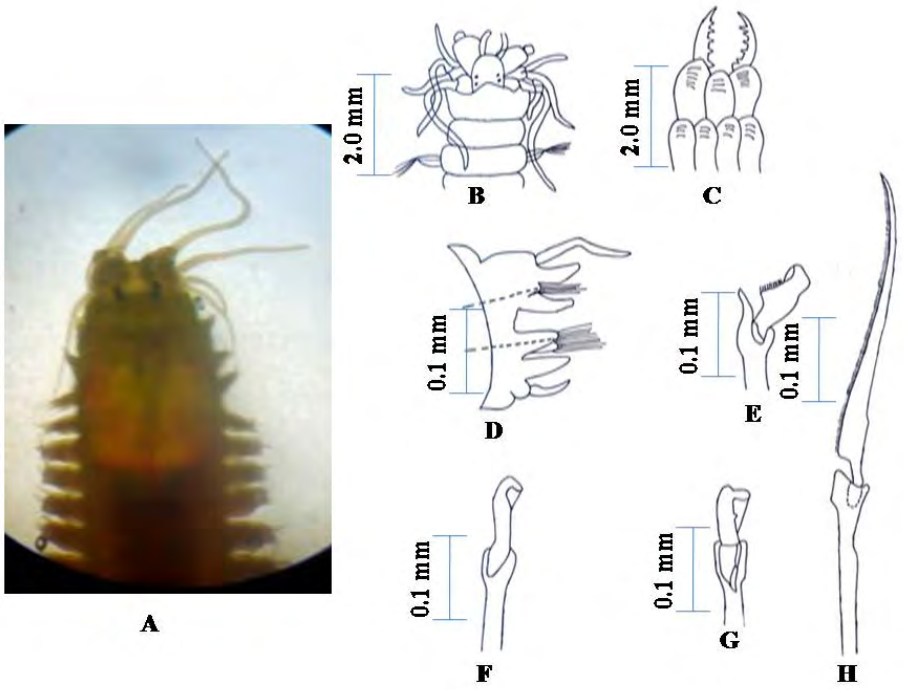

Fig. 11. (A)*Platynereis dumerilli*, Audouin& Milne-Edwards,1833(B) Anterior region, head - dorsal view (C) Ventral views of proboscis (D) Posterior foot (E) Neuropodial falciger (F) Notopodial falciger - dorsal view (G) Notopodial falciger - ventral view and (H) Heterogomph spiniger.

feature a terminal knob. Neurosetae consist of spinigers and falcigers (Fig.11.F&G), with tendons attached to the blades. In the heteronereid stage, the first modified foot (Fig.11.D) of the male is observed on the 15th segment, and of the female on the 18th segment. Setae are composite or simple, spinigerous or falcigerous (Fig.11.E). Anterodorsal and posterodorsal cirri are approximately the same length, while anteroventral ones are slightly shorter, bent downwards, and posterodorsal cirri extend to chaetiger 2. Parapodia feature conical acicular neuropodial ligules, while dorsal cirri are cirriform and about half as long as dorsal cirri. Notochaetae are absent, and the antennae are short, not reaching the tip of the prostomium. Anterior segments are six times broader than long, while posterior segments are about as broad as they are long.

Remarks:*Platynereis dumerilii* (Audouin and Milne-Edwards,1833) was originally described from the La Rochelle, Bay of Biscay (France) and the species was distributed worldwide Day (1967); Fauvel (1953); Wehe & Fiege (2002). Sivadas and Carvalho (2020) recorded this material from Andamans and the East coast of India, Tamil Nadu. This species was newly recorded from the west coast of India.

Family: Glyceridae

Genus: *Glycera*

3.1.10. *Glycera cochinensis* (Southern, 1921) (Fig. 12. A-H)

Nereis alba Muller,1788: p.217, pl. 2, figs. 6-7.

Glycera alba var. cochinensis Southern, 1921:p.627, pl.xxvii, fig.17.

Glycera alba Fauvel,1953: p.292, figs.149 i-m.

Materials examined:13 specimens were collected from the barmouth part of the Manakkudy estuary, Lat. 8°5'22.00" N, Long. 77°29'4.00"E (Fig.3;site2).

Diagnosis:: The specimen ranges from small to medium in size, the body measured 96-100 mm in length and comprised 150 segments (Fig.12.A&H). The prostomium, composed of rings with palps and antennae forming a cross at the tip (Fig.12.B&E), exhibited papillae on the proboscis with a distal flange, while midbody segments were biannulate. Parapodia featured both pre- and postchaetal lamellae, with long presetal lobes present. The superior postsetal lobe was pointed, while the inferior one was rounded. Postchaetal lamellae were long, pointed, uniform in size, and clearly separated. Branchiae emerged from the dorsal edge of the parapodium (Fig.12.D&H) at the level of the presetal lobe. Dorsal cirri were ovoid, while ventral cirri were triangular.Branchiae simple, inserted on the dorsal edge of the foot. Parapodia with lateral two anterior, subequal, triangular or cirriform lobes and two posterior lobes, the upper one triangular, shorter than the anterior, the lower rounded and still shorter (Fig.12.F). Gills appeared on the dorsal side of the parapodium starting at chaetiger 20. The pharynx featured papillae of three kinds: fingernail, finger-shaped, and conical. The aileron comprised an inner branch united to the outer branch by an interramal plate. Papillae of the proboscis obliquely truncated (unguiculate), with a transparent nail-like appendage. Supports of the jaws triangular, with a single process (Fig.12.C). The ramus was not divergent, and ventral cirri were short in length. Toothed jaws were visible,with an oral ring forming the mouth opening and lips. The head and half of the anterior segments exhibited a dark brown coloration. Tentacular cirri were fairly short, except for the posterior dorsal one. All paragnaths were small and conical in shape. Falcigers were slightly hooked, while the aciculums (Fig.12.G) diverged and consisted of an acicular seta.

Remarks:*Glycera cochinensis* Southern, 1921, originally

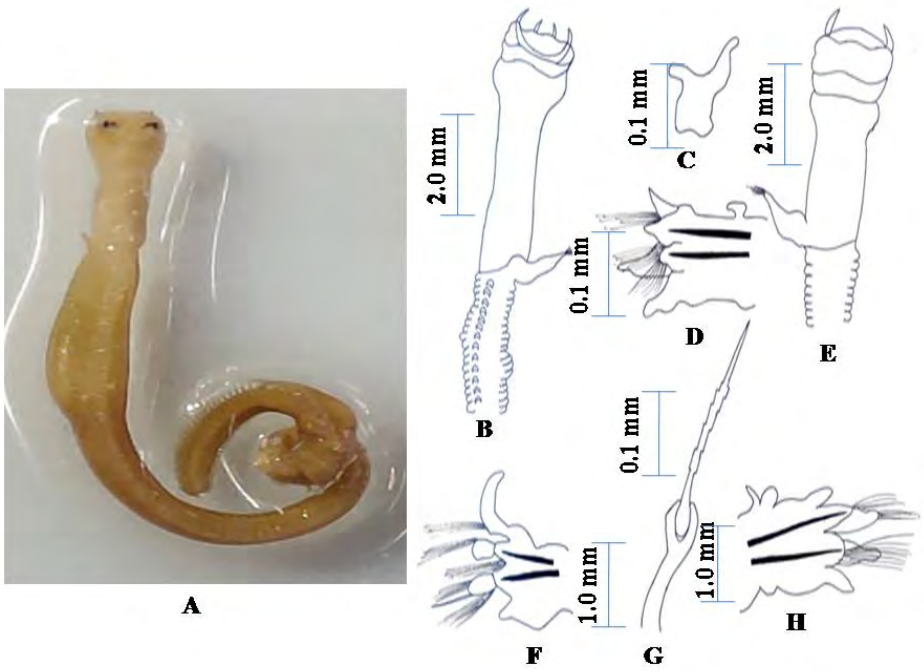

Fig. 12. (A) *Glycera cochinensis* Muller,1788 (B) Anterior region, head -dorsal view (C) Jaw support (D) Parapodium dorsal view (E) Anterior region head- ventral view (F) Parapodium lateral view (G) Aciculum and (H) Parapodium ventral view.

described from Cochin backwaters. Sunil Kumar (1995) recorded from the Cochin backwaters.

Family: Goniadidae

Genus: *Goniada*

3.1.11. *Goniadopsis agnesiae* (Fauvel, 1928) (Fig.13.A-K)

Goniadopsis incerta Fauvel, 1932:122, pl.4 figs.1-10; Fauvel, 1953:286, fig.146 a-k.

Goniadopsis maskkallensis Gravier, 1904:145,pl.1figs.170-174,text-figs.307-312.Day, 1957:88.

Materials examined:5 specimens were collected from muddy sediment in Manakkudy estuary, Lat. 8°5'22.00" N, Long. 77°29'4.00"E (Fig.3;site2); two specimens: collected in Manakkudy mangrove, Lat. 8°6'11.34" N, Long. 77°28'59.69" E (Fig.3;site 2).

Diagnosis: The specimen small to medium, ranging from 65 to 76 mm in length, with 58 setigers, and a width of 1 to 1.2 mm at the widest or biramous region. The body comprises 22 anterior uniramous and more than 36

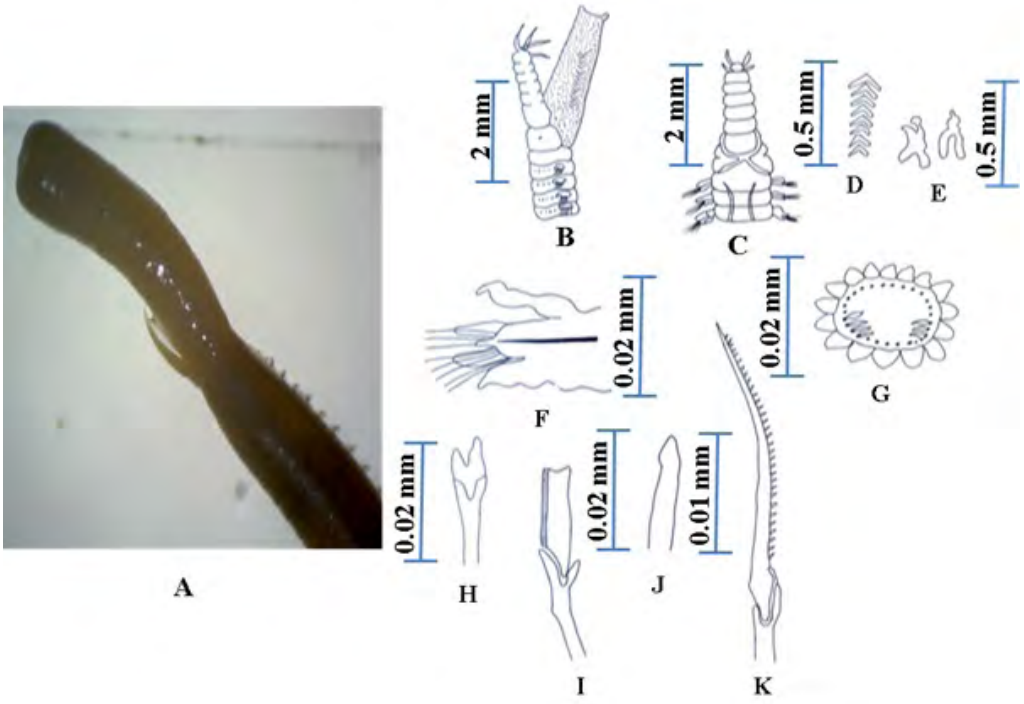

Fig. 13. (A) *Goniadopsis agnesiae* Fauvel, 1928.(B) Anterior region, head-dorsal view (C) Anterior region, head-ventral view (D) Chevrons (E) Micrognaths (F) Middle parapodium (G) Mouth (H&I) Stalks of compound bristles (J) Acicular notoseta and (K) Spinigerous notoseta.

posterior biramous setigers (Fig.13.A-K).Body divided into three regions: (Fig.13.B&C), the anterior and middle one slender, cylindrical, and the posterior one somewhat broader and more flattened. The prostomium tapers forward to a truncated end with four biarticulate antennae, of which the basal article is longer. Middle region of 39 segments, with uniramous parapodia (Fig.13.F), including a finger-shaped dorsal cirrus, two ligules, one short, triangular, the other longer, finger-shaped; a ventral cirrus, twice or thrice as long, an aciculums and two bundles of compound setae (Fig.13.H&I), thinner than the former, with long, narrow, delicately spinose end piece. Weakly annulated, the prostomium exhibits six or seven hardly visible rings, with the basal ring being the longest. Eyes are not visible. The everted proboscis is short, thick, and translucent, extending the length of the first eight setigers. It features seven chevrons on each side near mid-length (Fig.13.D), with the largest pieces at the middle and oral ends and the smallest at the maxillary end. Surface papillae are small, widely dispersed, and arranged approximately in longitudinal rows, each resembling a low cone with a terminal pore. The distal end terminates in a circlet of thick papillae.Proboscic cylindrical, armed with two large pectinate jaws, four bi-dentate paragnaths between the jaws and, on the other side, a semicircular row of about twelve smaller bidentate denticles apparently simple. Each macrognath has three to five teeth; the dorsal arc or micrognath has two (Fig.13.E&G), and the ventral arc has four larger, X-shaped pieces. The first 22 parapodia are uniramous each featuring a long lateral neuropodium with a short dorsal cirrus, a much longer ventral cirrus, a short, tumcate presetal lobe, and a much longer postsetal lobe directed forward or somewhat erect. Notosetae are slender, entirely composite spinigers (Fig.13.K). Parapodia abruptly become biramous from setiger 23; the notopodium is represented by a long, flat presetal lobe superiorly and a shorter setal lobe below. Posterior region with biramous parapodia including, in the dorsal ramus, a short conical cirrus, a blunt setigerous process with an aciculum and two short acicular setae (Fig.13.J), blunt at the tip; in the ventral ramus, a tri angular posterior ligule, an anterior one longer and finger-shaped, a short, thick, ventral cirrus, an aciculum and two bundles of compound spinigerous setae, with a long terminal piece, like those of the middle region.A yellow aciculum is accompanied by four to six limbate, distally pointed setae with a lightly serrated cutting edge. Neuropodia are larger, featuring a conspicuous postsetal lobe longest in its superior part and distally attenuated. The presetal lobe is shorter, inferior, and a fan-shaped fascicle of 25 or more setae emerges between pre- and post-setal lobes. Setae are composite spinigers, with the appendage marginally serrated. The ventral cirrus is thick, long, and distally blunt. The biramous parapodia are distended with large spherical ova.

Remarks:*Goniadopsis agnesiae* (Fauvel, 1928) described the species from Krusadai Island, Gulf of Mannar (India), and the southeast coast of India. Day (1967) and Böggemann (2005) recorded the occurrence of this species from South Africa. This is the rediscovery of this species from India and the new occurrence of this species from the west coasts of India.

Family: Nephtyidae
Genus: *Nephtys*

3.1.12. *Nephtys dussumieri* (Quatrefages, 1866) (Fig. 14. A-I)

Nephtys inermis, Ehlers, 1887, p.125,pl.XXXVIII, figs.1-6;Fauvel 1923a, p.375, fig.147;1933,p.47,fig.3 a-d: Monro, 1937,p.283.

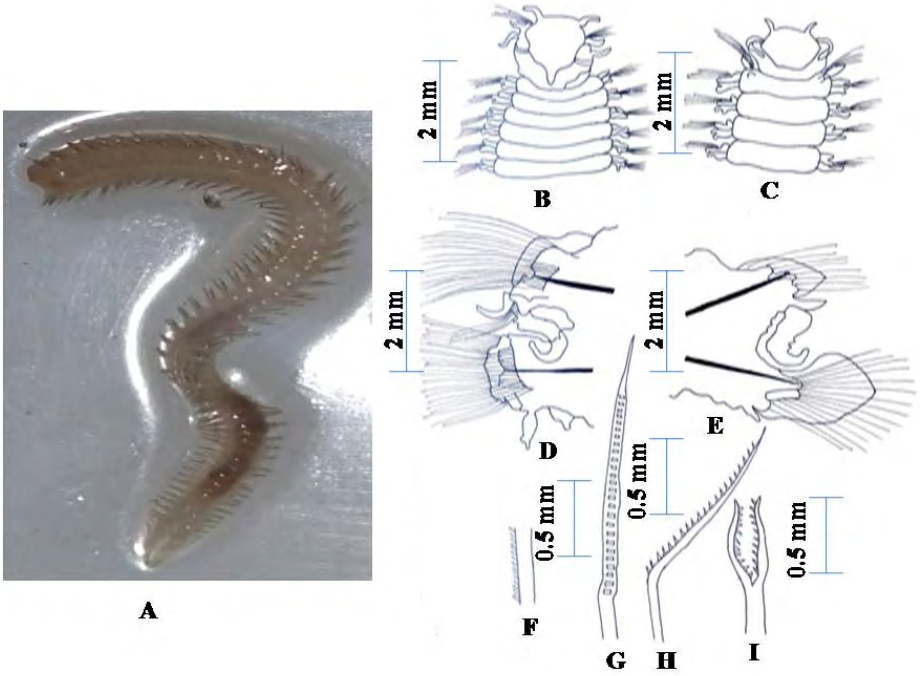

Fig. 14. (A) *Nephtys dussumieri* Quatrefages, 1866.(B) Anterior region, head - dorsal view (C) Anterior region, head - ventral view (D) Median parapodium (E) Anterior foot (F) Marginal spinules (G) Laddered capillary (H) Geniculate seta and (I) Forked seta.

Nephtys gravieri, Augener, 1913, p.123, fig.6,pl.II, fig.5;1927a, p.116: Fauvel, 1932, p.118.

Materials examined:9 specimens were collected from fine sandy substrate in the Manakkudy estuary, Lat. 8°5'22.00" N, Long. 77°29'4.00"E (Fig.3;site2).

Diagnosis: The specimen, ranging from small to medium, measures between 65 to 76 mm exhibiting an elongated, depressed, and slender body (Fig.14.A-I). Numerous segments characterize this worm. Two well-developed antennae are present, with one longer than the other. In the anterior region, the prostomium appears arched and pentagonal in shape (Fig.14. B&C), accompanied by two equal-shaped palps. Dorsal tentacular cirri adorn the first segment, exhibiting a leaf-shaped appearance, while ventral tentacular cirri are slightly longer than the palps. Geniculate setae (Fig.14.H) and forked setae are developed (Fig.14.I). The postsetal lamellae of notopodia are simple, rounded, and slightly longer than the acicular lobe, while neuropodia are oval and broadly rounded, much longer than the acicular setae. Eyes are visible through the skin, and the dorsal cirrus of the first foot is well-developed. Cirriform gills emerge on setiger 4 and project straight out, with tapered notopodial cirri at the base. In the anterior feet, all lamellae exceed the setigerous lobes (Fig.14.E), and well-developed parapodia are observed (Fig.14.D). The entire body is covered with marginal spinules (Fig.14.F). The notopodium features a round presetal lamella and a larger, orbicular postsetal one. Similarly, the neuropodium displays round presetal lamellae and larger, orbicular postsetal lamellae. In the posterior feet, all lamellae decrease in size. The neuropodium's main lobe is inferior, while a posterior lobe is very long, featuring flattened and laddered capillaries (Fig.14.G).

Remarks: *Nephtys dussumieri* Quatrefages, 1866, originally described from the Kerala Coast, Southwest coast of India. After the description, there are no more records from India or elsewhere (Sivadas and Carvalho, 2020). This is the rediscovery of thespecies from the Indian coasts more than 150 years ago.

Order: Eunicida
Family: Eunicidae
Genus: *Eunice*

3.1.13. *Eunice indica* (Kinberg, 1865) (Figs. 15. A-H)

Eunice indica Vitatta Fauvel,1923:404, fig.158 h-n.
Eunice indica : Kinberg,1865: 562; Crossland,1904: 318, pl. 21 figs. 9-12; Fauvel,1953: 241,fig.119 g.

Materials examined:3 specimens were collected from muddy sediment in Manakkudy estuary, Lat. 8°5'22.00" N, Long. 77°29'4.00"E (Fig.3;site2); 2 specimens: collected from mangrove associated muddy regions of Manakkudy, Lat. 8°6'11.34" N, Long. 77°28'59.69" E (Fig.3;site 1).

Diagnosis: The specimen, ranging from small to medium, measures between 58 to 65mm long, with a small head. Palps are clearly present and fused, resulting in a slightly notched anterior margin (Fig.15.A-H). The antennae are long, smooth, and extend to setiger 7, while long and slender tentacular cirri are also observed. Numerous teeth adorn the jaws. Anterior dorsal cirri are not elongated, and branchiae emerge from setiger 3, rapidly increasing to 10-15 filaments and remaining restricted to the anterior part of the body. The species exhibits compound setae and a foot (Fig.15.C&H), with almost straight, blunt, yellow acicula featuring long pointed guards that are bidentate. Single-margin acicular setae are observed and appear striated (Fig.15.E&G). An antenna, subequal in length and shorter than the prostomium, is also visible (Fig.15.B&F),

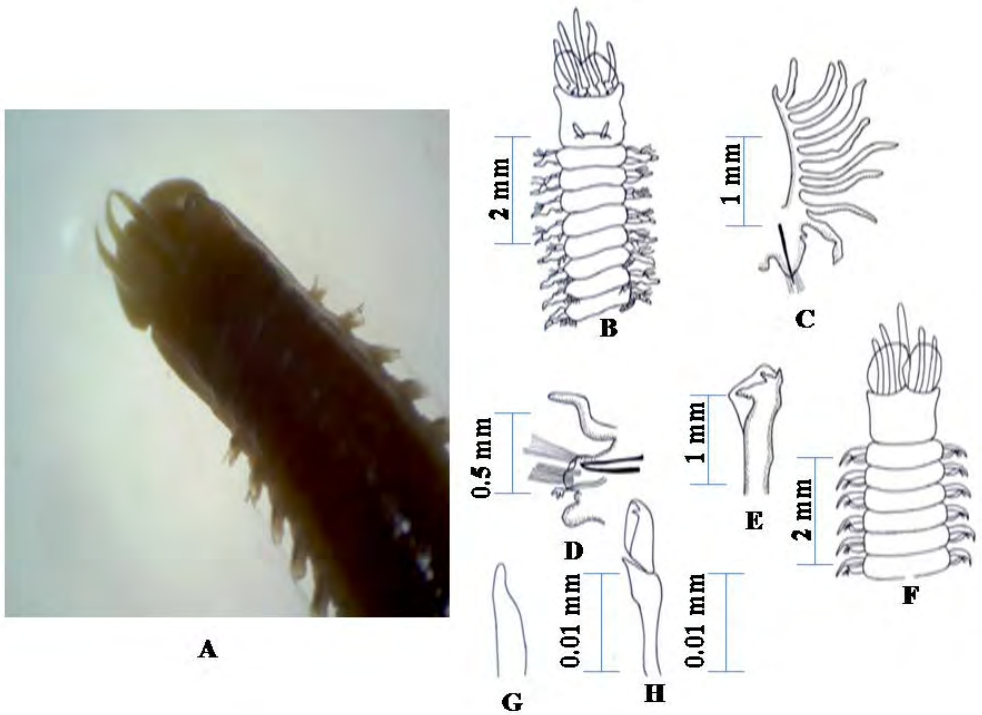

Fig. 15. (A) *Eunice indica,*Kinberg,1865 (B) Anterior region, head - dorsal view (C) Anterior foot (D) Posterior foot (E) Acicular seta. (F) Anterior region, head -ventral view (G) Tip of aciculums and (H) Compound seta

alongside two large, oval-shaped black eyes. The parapodia are bluntly conical, with rounded dorsal cirri and capillaries observed on the setae. Parapodia reach full size around segment 10, each featuring a laminar dorsal cirrus and a longer, bristled lobe with a long cirriform appendage. A posterior uncini with 5 teeth arranged in a row is also present (Fig.16.D). The antennae are subequal and shorter than the prostomium, while the two black eyes are large and oval-shaped. Parapodia are blunt and feature conical dorsal cirri, rounded ventral cirri, and broad setigerous lobes, with capillaries observed on the setae. Mandibles are white in color and calcified distally. Simple gills begin on chaetiger 9 and continue near the end of the body. The first two parapodia consist of winged capillary chaetae and simple stout hooks.

Remarks:*Eunice indica* (Kinberg,1865) was originally described from Bangka Strait, Indonesia. In India (Sivadas and Carvalho 2020) recorded from Goa, Karnataka and Tamil Nadu waters. This species was previously not recorded in Kerala and the western part of Tamil Nadu. So, the presence of this species is the new record from the southern west coast of India.

Order: Oweniida
Family: Oweniidae
Genus: *Myriochele*

3.1.14. *Myriochele picta* Southern, 1921 (Fig. 16. A-I)

Myriochele picta Southern, 1921, p. 638, pl.XXXI, fig.30.

Materials examined:12 adult specimen collected from muddy sediment in Manakkudy estuary, Lat. 8°5'22.00" N, Long. 77°29'4.00"E (Fig.3;site 1); 4 specimens from muddy sediment from Manakkudy mangrove, Lat. 8° 6' 15.78"N, Long. 77° 28' 57.34"E (Fig.3;site3).

Diagnosis: The specimen mediumin size, measures between 100 to 136 mm in length, with a notable deep ventral groove and a pair of lateral grooves seen along its entire length (Fig.16. B). Long internal ventral cirri were present, with the size of the specimen being 100 mm in length with 30 segments. The body appears relatively short and cylindrical anteriorly (Fig. 16.A-I). The entire worm is enclosed in a robust cartilaginous tube hardened by overlapping shell fragments and sand grains. The membrane is mounted on a trilobed base and incised to form six main divisions, enclosing the terminal mouth with three-lobed dorsal and ventral lips (Fig.16.F,C&I) Dorsally, bristles are formed. The thoracic region features three chaetigerous segments, short with notopodia, and two ocular marks are visible at the base of the membrane. Three short setigers in the thoracic region bear capillary setae. The first 5 abdominal segments are notably longer, with both noto- and neuropodia. The posterior end of the body features short middle segments (Fig.16.D). Notopodial chaetae of the thorax are spinose capillaries, with the chaetae of the third bundle shorter than the others. Parapodial lappets are absent on notopodia, while capillary spinules are present (Fig.16.G). Abdominal neuropodia appear as wide, flattened tori with many small bidentate hooks clearly visible (Fig.16.E). Parapodia reach full size up to segment 10, with each parapodium featuring a laminar dorsal cirrus, 2-3 times as long as it is broad. A long bristled lobe is present with a long cirriform appendage, and a smaller ventral cirrus essentially similar to the dorsal one. A sandy tube is evident (Fig.16.H). The worm exhibits a greenish-brown coloration.

Remarks: *Myriochele picta* Southern, 1921, originally described from the brackish water regions of the Chilika Lake, Bay of Bengal, east coast of India. After the

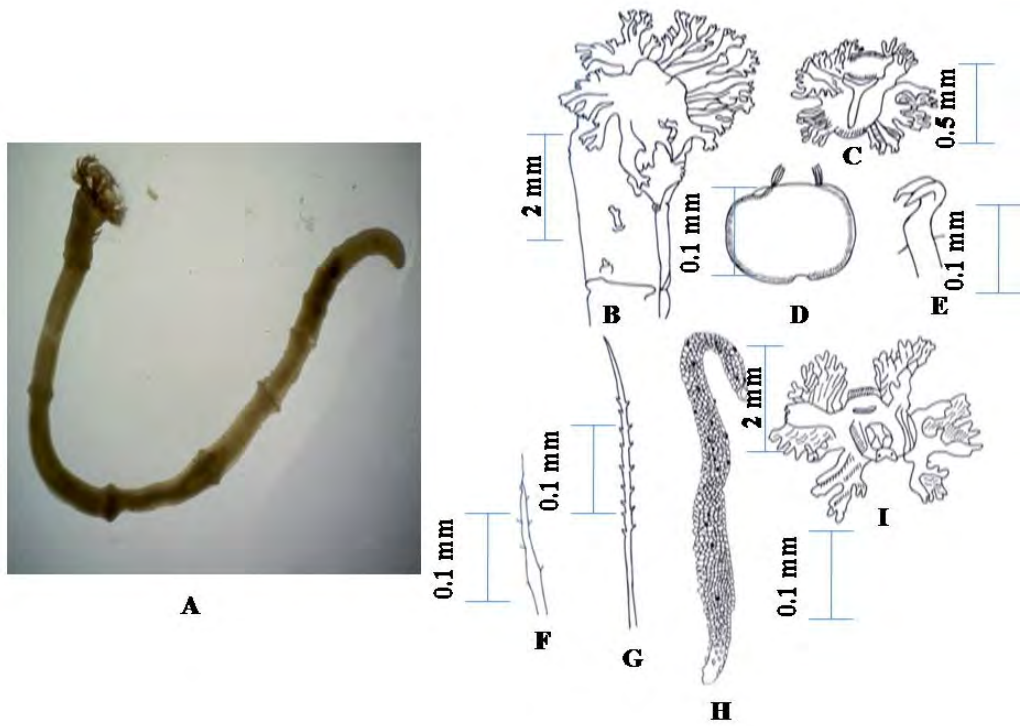

Fig. 16. (A) *Myriochele picta* Southern, 1921. (B) Ventro- lateral view of anterior end (C&I) Head with mouth (D) T/S Middle segment (E) Hook (F) Dorsal bristle (G) Spinulose capillary and (H) Sandy tube.

description, there are no more records from India or elsewhere. This is the rediscovery of this species from India and the New record from the west coast of India.

Several investigations have explored the diversity of polychaetes in Indian estuaries. Notably, these studies have reported a variety of species in different estuarine systems:Thane Creek, bordering the Mumbai metropolis, displayed limited diversity, with only nine identified polychaete species (Quadros et al., 2009).Vasishta Godavari estuary, Srinivasa Rao et al. (2009) documented a total of 42 polychaete species. The Coleroon estuary, as studied by Muniasamy et al. (2013), revealed 44 polychaete species.Ajmal Khan et al. (2014) reported 52 and 14 polychaete species from the Vellar and Uppanar estuaries, respectively.The Mandovi estuary, investigated by Al-Usmani (2018), showcased 21 different polychaete species.In the estuaries of south Tamil Nadu, Selvaraj et al. (2019) identified 49 polychaete species.The Kodungallur–Azhikode estuary, as studied by Jayachandran et al. (2019), featured 33 polychaete species and Rehitha et al. (2019) documented 53 polychaete species from the Cochin estuary. The Sundarbans estuarine system, Bhowmik and Mandal (2021), revealed a rich diversity with 56 polychaete species. The Mahanadi estuarine system, Nayak et al. (2022) reported a total of 45 polychaete species.

As per Bailey-Brock (1984), sediment compaction provides structural support for tube-dwelling and burrowing organisms, with the organic matter in trapped materials serving as a food source for selective detritivores.However, in cases of structurally uniform muddy sediments with elevated organic content, there is an increased risk of toxic metal accumulation and depletion of oxygen levels, ultimately leading to the exclusion of species from the area (John et al., 2002). Maximum polychaete diversity was observed in sediments with moderate organic carbon content (Sivadas et al., 2011). Conversely, areas with over 3% organic matter, high silt, and clay content exhibited low polychaete abundance, suggesting that organisms tend to avoid regions with excessive organic matter and suboxic conditions (Harkantra et al., 1982).Likewise, a reduction in polychaete diversity and an increase in deposit feeder abundance indicate the deterioration of estuarine health (Geetha et al., 2015).

Polychaete community in backwaters serves as a vital component of the local food web. They are prey for various organisms, including fish and crustaceans, and they, in turn, contribute to the diets of higher trophic levels.The presence and abundance of certain polychaete species can serve as indicators of environmental conditions and water quality. Changes in their populations may signal alterations in the ecosystem, such as pollution or shifts in sediment composition. Some polychaetes are known for their burrowing activities, which can significantly impact sediment structure and composition. This bioturbation helps in oxygenating sediments, facilitating nutrient exchange, and influencing the distribution of other marine organisms.Advances in molecular techniques have revealed hidden diversity, and there is ongoing research to distinguish and describe these cryptic species accurately. The integration of traditional morphological taxonomy with molecular techniques is an ongoing challenge. Researchers are working to establish robust molecular markers and methodologies that complement morphological data for accurate species identification(MSSRF, 2007).

Acknowledgements

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