

## Diversity and distribution of seaweeds in the shores and water lagoons of Chennai and Rameshwaram coastal areas, South-Eastern coast of India

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### ABSTRACT

Seaweeds are floating and submerged plants of shallow marine meadows. Seaweeds belong to a group of plants known as algae. Seaweeds are classified as Rhodophyta (red algae), Phaeophyta (brown algae) or Chlorophyta (green algae) depending on their mode of nutrients, pigments and chemical composition. Many of the rocky beaches, mudflats, estuaries, coral reefs and lagoons along the Indian coast provide ideal habitats for the growth of seaweeds. The present study was conducted at shores and water lagoons of Chennai and in Rameshwaram, formed of different inter-tidal rock shores with algal vegetation. A total of 25 algal taxa were collected during the study period (Dec 2014–Feb 2016), including 10 Chlorophyta, 8 Phaeophyta and 7 Rhodophyta. Among them, *Enteromorpha compressa* L., *Ulva lactuca* L., *Sargassum polycystum* C.Agardh, *Padina pavonica* L. were the commonly occurring seaweeds in all the monsoon periods. Interestingly, *Ectocarpus siliculosus* (L.) Kjellman belonging to the family Phaeophyceae was found in the post monsoon period–Oct 2015 at Pulicat lake, Chennai, Tamil Nadu. This study is the first report of macro algal diversity along Ennore, Thiruvottiyur and Royapuram coasts.

### KEY WORDS

Seaweed diversity; Chennai shores; Rameshwaram coastal areas.

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### INTRODUCTION

The marine ecosystem provides a vast habitat for macro algal communities as they occupy the rocky shores and submerged intertidal zone. The coastline of Tamilnadu has a length of about 1076 kms, whereas Chennai covers 19 km of coastal area, Thiruvallur and Ramanathapuram covers 27.9 km and 236.8 km respectively (Ramesh et al., 2008). Seaweeds are intercommuting with other organisms in marine environment and they are hallmarks in the coastal biodiversity. It is estimated that about

90% of the species of marine plants are algae and about 40% of the global photosynthesis is contributed from algae (Andersen, 1992). Due to their habitat and biology, seaweeds are relatively easy to observe, manipulate and measure. Therefore, they have been widely used as model organisms for studying biogeographic patterns and testing various ecological theories, both in intertidal and subtidal habitats (Murray & Littler, 1984; Bolton et al., 2004; Prathep, 2005). The marine ecosystem is changing simultaneously due to the natural processes and anthropogenic causes like over-exploit-

ation of resources, land use changes and alteration of habitats. Taking into account the change in environment and resources, it is necessary to study their effect on the seaweed diversity and to ensure their regular distribution in the ecosystem. Therefore in our present study we investigated the diversity and distribution of seaweeds in rocky coastal areas of Chennai and water lagoons and Rameshwaram shores.

**MATERIAL AND METHODS**

The present study was conducted for a period of 15 months (December 2014 to February 2016) to evaluate the seaweed diversity. Habitats chosen for sampling seaweeds included the Chennai coastal areas, Royapuram shore (Lat 13° 6' 25 N, Long 80° 17' 43 E), Ennore rocky shore (Lat 13° 6' 26 N,

Long 80° 17' 38 E), Covelong beach (Lat 12° 78' 70 N, Long 80° 25' 04 E) and Thiruvottiyur shore (Lat 13° 9' 28 N, Long 80° 18' 15 E), Pulicat lake water lagoon (Lat 13° 34' 46.056, Long 80° 11' 2.616) - Thiruvallur and in Keezhakarai (Lat 9° 14' 25 N, Long 78° 50' E) and Mandapam rocky shores (Lat 9° 27' 70 N, Long 79° 12' 52 E) - Rameshwaram, Ramanathapuram district, Tamil Nadu. The algal samples were collected in three months interval during the study period. Fresh samples were brought to the laboratory at Department of Plant Biology and Plant Biotechnology, Quaid-E-Millath Government College for Women, Chennai for further studies. The samples thus collected were washed thoroughly in running water and preserved in 4% (v/v) formalin. The parameters like nature of substratum, habit of seaweed and abundance of species were observed. The identification of taxa was done by keys (Umamaheswara Rao, 1987;

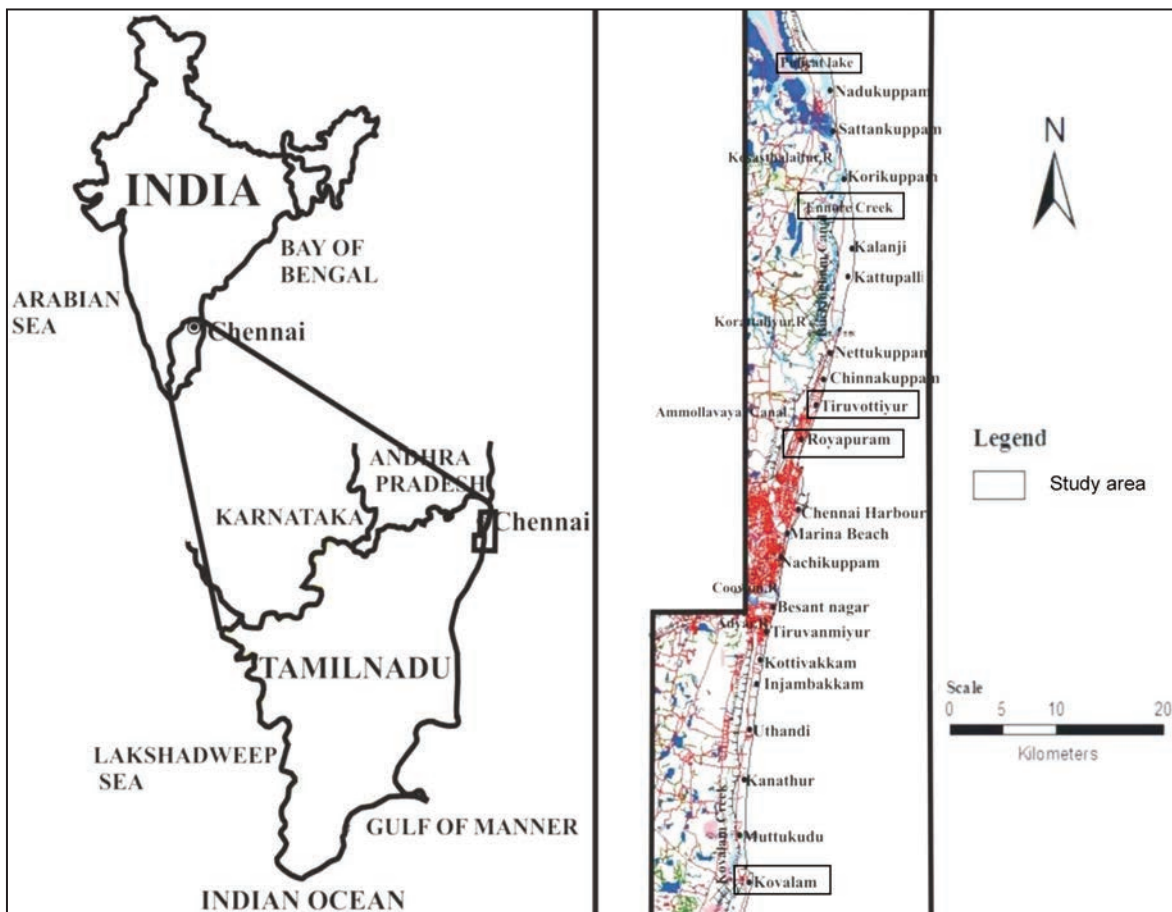


Figure1. Map showing the study area in Chennai coastal areas (courtesy Santhiya et al. 2010, modified).

Desikachary et al., 1990, 1998; Krishnamurthy, 1999) and the nomenclature was updated using Appeltans et al. (2012).

## RESULTS

A total of 25 algal taxa were collected during the study period (Dec 2014–Feb 20 16). They included 10 Chlorophyceae (16.6%), 8 Phaeophyceae (41.6%) and 7 Rhodophyceae (41.6%) (Fig. 24). Among these, *Enteromorpha* sp., *Ulva lactuca* Linnaeus, *Sargassum polycystum* C. Agardh, *Padina pavonica* Linnaeus were the commonly occurring seaweeds throughout the collection periods. Interestingly, the Brown alga *Ectocarpus siliculosus* was found in Pulicat Lake and is reported from this area for the first time.

### Systematics

Phyllum CHLOROPHYTA  
Subphyllum CHLOROPHYTINA  
Classis ULVOPHYCEAE  
Ordo ULVALES  
Familia ULVACEAE

#### 1. *Enteromorpha compressa* (Linnaeus) Nees

**DESCRIPTION.** Thalli slightly yellowish green in colour, up to 7 cm long; fronds profusely branched from the stalk-like base, narrow, tubular at the base and gradually expanded and compressed above with obtuse or round apices.

**LOCATION.** Royapuram (Lat 13° 6' 25 N, Long 80° 17' 43 E); Thiruvottiyur (Lat 13° 9' 28 N, Long 80° 18' 15 E); Ennore (Lat 13° 6' 26 N, Long 80° 17' 38 E); Mandapam (Lat 9° 27' 70 N, Long 79° 12' 52 E); Keezhakarai (Lat 9° 14' 25 N, Long 78° 50' E).

**BIOLOGY.** Thalli found attached to intertidal rocks, found growing throughout the year.

#### 2. *Enteromorpha flexuosa* (Wulfen) J. Agardh

**DESCRIPTION.** Pale green in colour, up to 30 cm long, grown throughout the year, attached by a small, round basal disk, fronds simple or branched, tubular with cylindrical stalks below and expanding blades above, becoming flexuous, ending in an obtuse apex.

**LOCATION.** Royapuram (Lat 13° 6' 25 N, Long 80° 17' 43 E); Ennore (Lat 13° 6' 26 N, Long 80° 17' 38 E).

**BIOLOGY.** Thalli found attached to intertidal rocks or any floating structures.

#### 3. *Enteromorpha intestinalis* (Linnaeus) Nees

**DESCRIPTION.** The mature thallus is a hollow tube, wrinkled and convoluted, intestine-like and up to 11 cm long. Branching is from the base. The wall is one cell thick and the plant appears yellow green to dark green. The young plant is attached to the substratum by a basal rhizoidal cell (Fig. 8).

**LOCATION.** Covelong (Lat 12° 78' 70 N, Long 80° 25' 04 E).

**BIOLOGY.** Thalli found attached to intertidal rocks.

#### 4. *Enteromorpha prolifera* (Müller) J. Agardh

**DESCRIPTION.** Plants are green to dark green in colour with tubular branches that have numerous slender branchlets, up to 10 cm long, attached by means of a disk-like holdfast. Fronds tubular, profusely branched with numerous slender branches (Fig. 2).

**LOCATION.** Covelong (Lat 12° 78' 70 N, Long 80° 25' 04 E); Thiruvottiyur (Lat 13° 9' 28 N, Long 80° 18' 15 E).

**BIOLOGY.** Thallus found attached to intertidal rocks.

#### 5. *Ulva lactuca* Linnaeus

**DESCRIPTION.** Thallus 2–5 cm long, soft, leafy, membranous, foliaceous, bright green, blades lanceolate to broadly ovate to rounded, often irregularly and deeply incised to form lobes, lettuce type morphology, margins of lobes ruffled and wavy or undulate, membrane thick near the base (Fig. 7).

**LOCATION.** Covelong (Lat 12° 78' 70 N, Long 80° 25' 04 E); Royapuram (Lat 13° 6' 25 N, Long 80° 17' 43 E); Pulicatlake (Lat 13° 34' 46.056, Long 80° 11' 2.616); Mandapam (Lat 9° 27' 70 N, Long 79° 12' 52 E); Keezhakarai (Lat 9° 14' 25 N, Long 78° 50' E).

**BIOLOGY.** Attached to floating substances, found in shallow waters, found growing in post monsoon periods.

Ordo CLADOPHORALES  
Familia CLADOPHORACEAE

6. *Chaetomorpha antennina* (Bory) Kützing

DESCRIPTION. Algal thallus dark green in colour, grows brush-like tufts; filaments erect, unbranched, cylindrical or barrel-shaped, up to 10 cm tall; cells 200–250 µm at the upper parts, 2–4 times longer than broad with a thick cell wall; chloroplasts reticulate or free, but close together, filaments attached by irregularly branched rhizoidal basal cell; cell walls of the basal cells thick with annular constrictions.

LOCATION. Thiruvottiyur (Lat 13° 9' 28 N, Long 80° 18' 15 E); Ennore (Lat 13° 6' 26 N, Long 80° 17' 38 E).

BIOLOGY. Found attached to rocks and calcareous stones, found growing in post monsoon periods.

7. *Chaetomorpha linum* (O.F. Müller) Kützing

DESCRIPTION. Free floating, sometimes attached to rocks and shells; plant body filamentous, less than 20 cm long, bright green to yellowish green in colour, filaments wiry and stiff, unbranched; cell walls thick, appear jointed or articulated with dark green bands; cells constricted at the transverse walls (Fig. 6).

LOCATION. Covelong (Lat 12° 78' 70 N, Long 80° 25' 04 E); Mandapam (Lat 9° 27' 70 N, Long 79° 12' 52 E).

BIOLOGY. Found attached to rocks and calcareous stones, found growing in post monsoon periods.

Ordo BRYOPSIDALES  
Familia HALIMEDACEAE

8. *Halimeda gracilis* Harvey ex J. Agardh

DESCRIPTION. Thallus prostrate, moderate to strongly calcified, branching di-trichotomous; attachment by multiple holdfasts; segments sub cylindrical, cuneate to reniform, with a smooth and shiny surface, margin undulate, about 18 mm wide and 11 mm long (Fig. 11).

LOCATION. Keezhakarai (Lat 9° 14' 25 N, Long 78° 50' E).

BIOLOGY. Attached to Intertidal rocks and calcareous stones, found growing during Nov–Feb.

9. *Halimeda tuna* (Ellis et Solander) Lamouroux

DESCRIPTION. Dark green in colour, 8–10 cm tall, generally tufted, moderately calcified and attached by compressed conical holdfast, branching in one plane, dichotomous or trichotomous upper segments, cuneate reniform discoid, 6–13 mm high, 5–23 mm broad, margins entire, entangled, fusing 2–3 together at the nodes, dichotomously branched above the fused filaments (Fig. 10).

LOCATION. Keezhakarai (Lat 9° 14' 25 N, Long 78° 50' E).

BIOLOGY. Attached to Intertidal rocks and calcareous stones, found growing during Nov–Feb.

Ordo BRYOPSIDALES  
Familia CAULERPACEAE

10. *Caulerpa racemosa* (Forsskål) J. Agardh

DESCRIPTION. Pale green in colour, growing as patches, coenocytic with prostrate rhizomes and erect assimilators, often crowded on the rhizomes, 2–5 cm tall with turbinate or trumpet shaped ramuli with truncated apices (Fig. 9).

LOCATION. Mandapam (Lat 9° 27' 70 N, Long 79° 12' 52 E).

BIOLOGY. Attached to Intertidal rocks and calcareous stones, found in lower littoral zone and in calm waters during Nov–Feb.

Phyllum RHODOPHYTA  
Subphyllum EURHODOPHYTINA  
Classis FLORIDEOPHYCEAE  
Subclassis RHODYMENIOPHYCEAE  
Ordo GRACILARIALES  
Familia GRACILARIACEAE

11. *Gracilaria foliifera* (Forsskål) Børgesen

DESCRIPTION. Bushy, 5–15 cm tall, the lower part relatively slender, when compared to the above

portion that is coarser, thick, sub-terrate to compressed or expanded and 2–15 mm or somewhat more in width, sublinear or lacinate, the margin often proliferous, branching of one to several degrees, usually in the plane of the blade, ditrichotomous or alternate, tetrasporangia 20–35 micron diameter long, 30–45 micron long, formed in the upper mature branches just below the surface, pericarps projecting strongly on faces or margins of the blades.

LOCATION. Covelong (Lat 12° 78' 70 N, Long 80° 25' 04 E).

BIOLOGY. Found in lower intertidal rocks, found growing throughout the year.

#### 12. *Gracilaria textorii* (Suringar) De Toni

DESCRIPTION. 9–15 cm tall, flat, foliose, membranous to thick coriaceous, ribbon-like dichotomously / sub-dichotomously or irregularly branched forming a flabellate expanse; branches 0.5–2.0 cm broad with rounded or somewhat attenuated apices; margins entire or proliferous; cystocarps prominent, emergent, globose and scattered all over the thallus.

LOCATION. Mandapam (Lat 9° 27' 70 N, Long 79° 12' 52 E); Pulicat Lake (Lat 13° 34' 46.056, Long 80° 11' 2.616).

BIOLOGY. Attached to intertidal rocks, found in lower littoral zone during Nov-Feb.

#### 13. *Gracilaria verrucosa* (Hudson) Papenfuss

DESCRIPTION. Brownish red in colour, up to 30 cm tall, erect, terete, attached to small stones by small circular discs, branching lateral, sub-dichotomous, alternate, branch tips attenuated and ultimate branches small, with branches up to 3rd or 4th order (Fig. 14); cystocarps sub-spherical, elevated and scattered over the thallus.

LOCATION. Pulicat Lake (Lat 13° 34' 46.056, Long 80° 11' 2.616); Mandapam (Lat 9° 27' 70 N, Long 79° 12' 52 E).

BIOLOGY. Found attached to intertidal stones and shells, throughout the year.

Ordo GIGARTINALES  
Familia SOLIERIACEAE

#### 14. *Kappaphycus alvarezii* Doty ex Silva

DESCRIPTION. Bushy and succulent, erect and profusely branched with cylindrical axis and branches; branches larger at the basis, small spinous tapering above, axiferous (Fig. 12).

LOCATION. Keezhakarai (Lat 9° 14' 25 N, Long 78° 50' E).

BIOLOGY. Grown throughout the year, attached to any floating material.

Familia RHIZOPHYLLIDACEA

#### 15. *Portieria hornemannii* (Lyngbye) P.C. Silva

DESCRIPTION. Thalli are orange-red coloured, gelatinous, 3–12 cm in height, overlapping flattened branches with discoid holdfast, irregularly pinnate-alternate branching in one plane. The terminal branches at the distal portion of the thalli have slightly expanded curved tops. Gland cells are scattered in both nemathecial and normal cortical tissue (Fig. 13).

LOCATION. Keezhakarai (Lat 9° 14' 25 N, Long 78° 50' E); Mandapam (Lat 9° 27' 70 N, Long 79° 12' 52 E).

BIOLOGY. Found attached to shells, pebbles and calcareous rocks, during Apr–July.

Familia CYSTOCLONIACEAE

#### 16. *Hypnea musciformis* (Wulfen) J.V. Lamouroux

DESCRIPTION. Pinkish red in colour, clumps or masses of loosely intertwined, cylindrical branches, 5–10 cm tall, 0.5–1.0 cm diameter, that become progressively more slender towards the tip region. Firm, cartilaginous, highly branched. Branching is variable and irregular, often tendril-like and twisted around axes of other algae. The ends of many axes and branches are flattened with broad hooks (Fig. 16).

LOCATION. Mandapam (Lat 9° 27' 70 N, Long 79° 12' 52 E).

BIOLOGY. Epiphytic, found in calm waters during the post monsoon period.

Ordo CERAMIALES  
Familia RHODOMELACEAE

17. *Acanthophora spicifera* (M.Vahl) Børgesen

DESCRIPTION. Dark red in colour, epiphytic, 10–15 cm tall, solid cylindrical branches, 2–3 mm wide, branched either sparingly or repeatedly. The main branches have short, determinate branches, irregularly shaped and spinose, with spines numerous and radially arranged.

LOCATION. Mandapam (Lat 9° 27' 70 N, Long 79° 12' 52 E).

BIOLOGY. Found throughout the year in tide pools.

Phyllum PHAEOPHYTA  
Classis PHAEOPHYCEAE  
Subclassis FUCOPHYCIDAE  
Ordo FUCALES  
Familia SARGASSACEAE

18. *Sargassum ilicifolium* (Turner) C.Agardh

DESCRIPTION. 30–40 cm high with elliptical leaves in the upper part of the plant, 1–3 cm long and 8–15 mm broad; the margin is toothed, midrib is visible for 2/3 of the length of the leaf, vanishing near the tip; mature receptacles are either flat and branched, they are provided with spiny outgrowths; vesicles are nearly globular, 3–5 mm in diameter with a stalk of the same length.

LOCATION. Keezhakarai (Lat 9° 14' 25 N, Long 78° 50' E); Mandapam (Lat 9° 27' 70 N, Long 79° 12' 52 E).

BIOLOGY. Found growing as submerged thalli throughout the year.

19. *Sargassum polycystum* C.Agardh

DESCRIPTION. Thalli are 1–2 m high, the creeping branches found post-maturation are smooth on the edges and form secondary branches with secondary holdfasts on the terminal portions. Leaves are lanceolate to oblong with serrations, and vesicles are spherical.

LOCATION. Keezhakarai (Lat 9° 14' 25 N, Long 78° 50' E); Mandapam (Lat 9° 27' 70 N, Long 79° 12' 52 E).

BIOLOGY. Large communities on rocks in lower intertidal zones, occurring throughout the year.

20. *Turbinaria conoides* (J.Agardh) Kuzin

DESCRIPTION. Dark brown in colour, up to 50 cm tall, bushy, axis arising from dichotomously branched holdfast; main axis erect, cylindrical and irregularly branched; distal ends of the leaves triangular, sub-concave with double row of spines on the surface with terete stalks.

LOCATION. Keezhakarai (Lat 9° 14' 25 N, Long 78° 50' E).

BIOLOGY. Found growing as submerged thalli, throughout the year.

21. *Turbinaria ornata* (Turner) J.Agardh

DESCRIPTION. Erect and stiff, 2–20–(30) cm long, holdfast conical or irregular, usually with several unbranched or dichotomously branched stolons growing from basal area of the erect axis. Leaves with petiole and double rows of stiff spines around the margin of the leaves in apical view. Petiole cylindrical near base, becoming triangularly compressed in distal portions (Fig. 15).

LOCATION. Keezhakarai (Lat 9° 14' 25 N, Long 78° 50' E).

BIOLOGY. Found growing as submerged thallus throughout the year.

Subclassis DICTYOTOPHYCIDAE  
Ordo DICTYOTALES  
Familia DICTYOTACEAE

22. *Padina pavonica* (Linnaeus) Thivy

DESCRIPTION. Light to dark brown in colour, up to 15 cm tall, 12 cm in breadth, basal portion forming rhizomatous discs; thallus divided into broad lobes, three cells thick, hairs developing all over the thallus as concentric zones, grows as dense mats in large rock pools in intertidal zone (Fig. 17).

LOCATION. Mandapam (Lat 9° 27' 70 N, Long 79° 12' 52 E).

BIOLOGY. Found throughout the year in tide pools.

**23. *Ectocarpus siliculosus* (Dillwyn) Lyngbye**

DESCRIPTION. The alga is unbranched and filamentous; it forms soft beards on larger plants or other firm substrata and grows up to 2 feet long. Plants tufted, often only one to a few centimeters tall, but in exceptional cases, up to 20 cm. Axis freely branched, main axis not distinguishable. Filaments up to 30 µm in diameter, tapering toward the apices, rarely forming terminal pseudo-hairs (Fig. 4).

LOCATION. Pulicat Lake (Lat 13° 34' 46.056, Long 80° 11' 2.616).

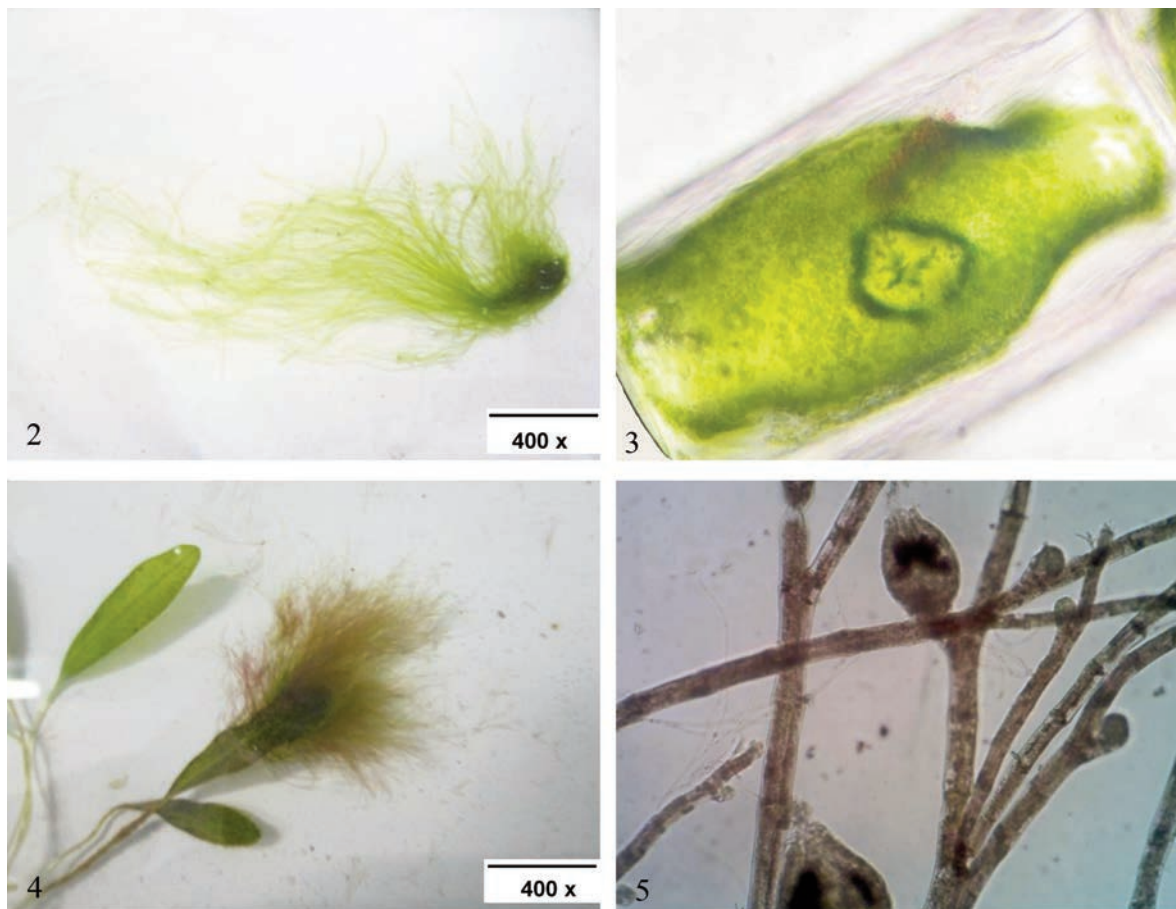
BIOLOGY. Epiphytic, found growing attached on sea grass during monsoon period.

**24. *Dictyota ciliolata* Kützing**

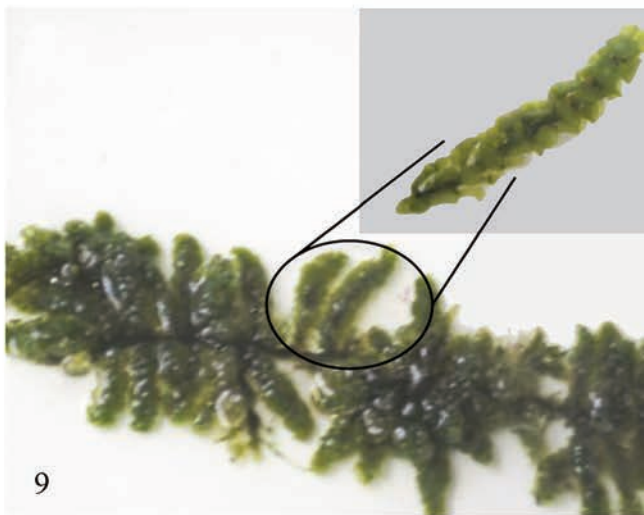
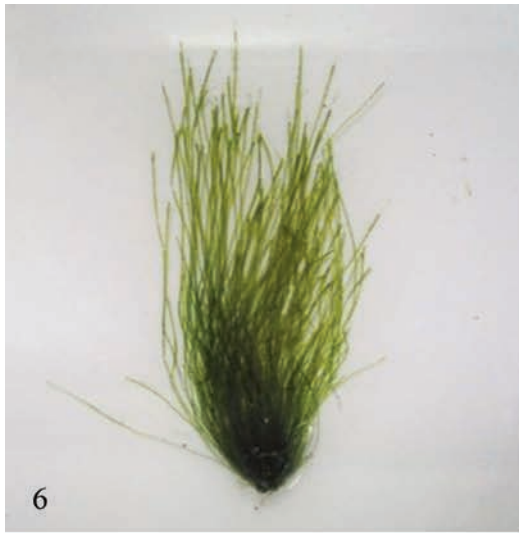
DESCRIPTION. Up to 15–20 cm in height, membranous, ribbon like, upper parts regularly dichotomously branched and attached to the substratum by a small cuneate disc. Branches usually of uniform breadth, forking angles between the branches acute or round, apices acute or sub-acute. Margin of the branches are sub-entire or regularly dentate, possessing small ascending projections.

LOCATION. Keezhakarai (Lat 9° 14' 25 N, Long 78° 50' E).

BIOLOGY. Found submerged and attached to coralline stones, during monsoon period.

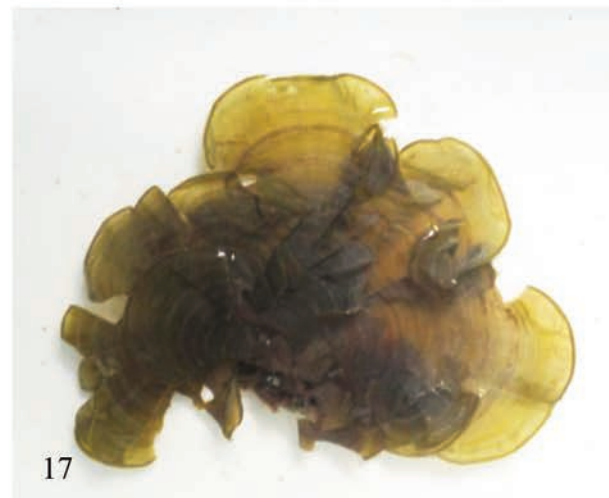
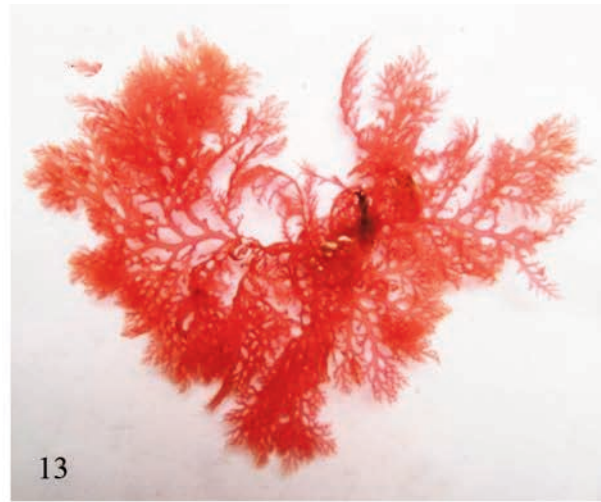


Figures 2–5. Photographs of collected seaweeds. Fig. 2: *Enteromopha prolifera*. Fig. 3: microphotograph of *Enteromopha prolifera* showing cellular contents. Fig. 4: *Ectocarpus siliculosus* grown as epiphyte in a seagrass. Fig. 5: microphotograph of *Ectocarpus siliculosus* with their sporophytes.

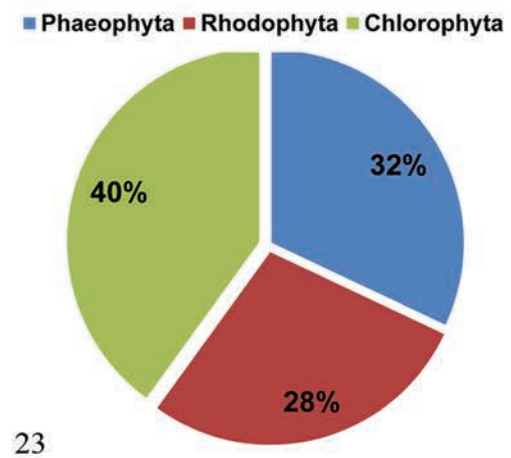
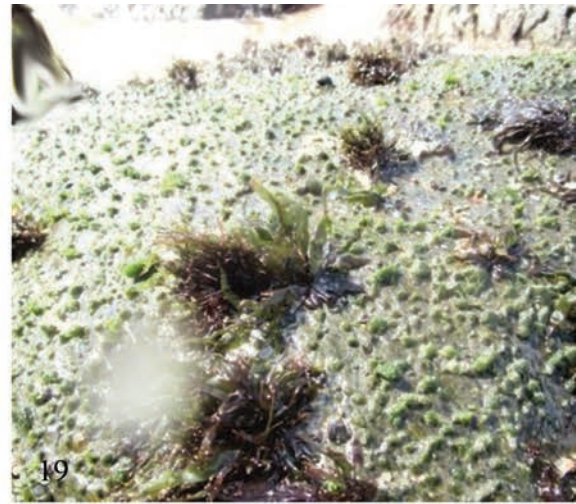


Figures 6–11. Photographs of collected seaweeds. Fig. 6: *Chaetomorpha linum*. Fig. 7: *Ulva lactuca*. Fig. 8: *Enteromorpha intestinalis*. Fig. 9: *Caulerpa racemosa* and trumpet shaped ramuli of *C. racemosa*. Fig. 10: *Halimeda tuna*. Fig. 11: *Halimeda gracilis*.





Figures 12–17. Photographs of collected seaweeds. Fig. 12: *Kappaphycus alvarezii*. Fig. 13: *Portieria hornemannii*. Fig. 14: *Gracilaria verrucosa*. Fig. 15: *Turbinaria* sp. Fig. 16: *Hypnea musciformis*. Fig. 17: *Padina pavonica*.



Figures 18–22. Sample collection sites. Fig. 18: Covelong shore - rock is fully covered with alga *Enteromorpha prolifera*. Fig. 19: Covelong shore - an intertidal region rock rich in seaweed. Fig. 20: Pulicat lake - *Ulva lactuca* blooms. Fig. 21: Pulicat Lake sampling area - dark area represents the presence of *Ectocarpus* sp. Fig. 22: Ennore rocky shore enriched with alga *Chaetomorpha* sp. Figure 23. Chart showing distribution of seaweed in the study area.

### 25. *Dictyota cervicornis* Kützing

**DESCRIPTION.** Yellowish brown in colour, 10–25 cm tall, erect, twisted thallus, membranous, entangled, irregularly dichotomous and attached by small holdfast; fronds 0.8–1.5 cm broad at the base, 2–4 mm towards apices; margins entire with rounded and acute apices.

**LOCATION.** Keezhakarai (Lat 9° 14' 25 N, Long 78° 50' E).

**BIOLOGY.** Found submerged and attached to coralline stones, during monsoon period.

## DISCUSSION

The potential areas for luxuriant growth of several species of green, brown and red algae occur along the southeast coast of Tamilnadu from Mandapam to Kanyakumari covering 21 islands in the Gulf of Mannar. The other places in the east and west coast where rich seaweed beds occur are Bombay, Karwar, Ratnagiri, Goa, Varkaja, Vizhinjam, Pulicat and Chilka (Kaliaperumal & Kalimuthu, 1997). Present study was carried out in Chennai coastal areas, water lagoons and in Rameshwaram coastal areas. The results indicated the occurrence of 20 seaweed taxa belonging to Chlorophyceae (6 genera), Rhodophyceae (6 genera) and Phaeophyceae (8 genera). The dominance of red algae over green and brown algae during the study period indicated the presence of rocky and coralline substrate that is essential for their attachment. Similar observations are reported in 4 districts of southern Tamil Nadu by Anantharaman et al. (2010) and Sahayaraj et al. (2014).

In Pulicat lake and Covelong rocky shore, we collected the seaweed *Enteromorpha compressa*, *E. flexuosa*, *Gracillaria foliifera* and *G. textorii* during December 2015. Jeyanthi Rebecca et al., (2013; 2014) reported the presence of *Gracilaria cortica*, *G. edulis*, *Enteromorpha flexuosa*, *E. clathrata*, *E. intestinalis*, *Ulva lactuca* from Covelong Beach and Pulicat lake. The other algae reported for Covelong shore were *Bryocladia thwaitesii* and *Ulva covelongensis* (Vanitha et al., 2011), *Gracilaria corticata* J. Ag, *Grateloupia lithophila* Boerg, *Gelidium* sp. and *Bryocladia thwaitesii* (Harvey) Detoni (Vanitha & Chandra, 2012). Due to rapid anthropogenic activities like industrialization and urbanization,

etc. (Santhiya et al., 2010) changes of seaweed flora could be evident in Ennore, Pulicat lake and in Covelong. Seemingly, the inadvertent rains that lashed the Chennai coasts during Nov–Dec 2015 were also responsible for the change in quality and quantity of the collected seaweed flora.

Incidentally, there are no previous reports available for seaweed distribution along Ennore, Royapuram and Thiruvottiyur coasts. Hence, this study pioneers the macroalgal distribution along these coasts.

Several reports are available for seaweed diversity in Mandapam and Keezhakarai coastal areas, Rameshwaram. (Anantharaman et al., 2010; Kokilam et al., 2013; Seenivasan & Indu, 2013). Mary et al. (2013) identified 90 seaweed species from the Hare Island in Gulf of Mannar. Sathianeson & Wesley (2012) recorded 32 seaweed species from the Kudankulam region of Gulf of Mannar. Recently, ENVIS Centre (2015) reported the presence of *Lithothamnion* (calcareous alga), *Padina*, *Caulerpa* (ten species), *Ulva reticulata*, *Sargassum*, *Martensia*, *Clandia*, *Anadyomene*, *Gelidiella acerosa* - Mandapam to Keezhakarai. Komalavalli and Lalitha (2015) reported *Caulerpa racemosa*, *C. sertularioides*, *Ulva lactuca*, *Ulva reticulata* and *Codium tomentosum* from Vadakadu (Rameswaram) coastal regions.

## CONCLUSIONS

The present investigation of diversity of seaweeds clearly states the change in algal vegetation of Chennai coastal areas. Apart from the natural destruction like heavy rain, it is important to realize and reduce the anthropogenic activities to withhold the disappearance of macro algal genera. Seaweed diversity in Rameshwaram coastal areas were satisfactory when compared with earlier reported works. Since, the Ennore and Royapuram coasts are quite polluted; there must be some checkpoints to prevent loss of the macroalgal population in these areas so as to balance the biotic factor in the Marine Ecosystem.

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