

Morphological Studies of Some Edible seaweeds of Indian Coastal Areas of Southern India

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ABSTRACT

Seaweeds has a significant role to maintain the ecological balance of Marine Ecosystem. The morphology of different types of seaweeds something varied in their growth and chemical composition. They have stems commonly called stipes having primary, secondary and tertiary branches. The whole thallus attached to the rocky seashore area with rhizoids. The leaves of seaweeds are called Blades. Seaweeds are used in many Industries like Fertilizer, Food Industry, Cosmatic Industry, Biverage Industry, Textile Industry etc. Seaweeds are responsible for Production of Phycolloids which are used in Laboratory foor research works. Phycocolloids are of two types i.e. Agar and Algin. Both Algin and Agar are polysaccharides . As we know that Seaweeds are found in marine rocky seashore areas. In marine ecosystem, we have different types of Seaweeds. Generally, they are categorized into three division i.e Chlorophyta, Rhodophyta and Phaeophyta. Some examples of Chlorophyta is *Ulva fasciata*, *Ulva radiata*, *Ulva rectuculata*, *Enteromorpha intestinalis*, *Codium fragile*, however Rhodophyta includes *Gracilaria corticata*, *Gracilaria verrucosa*, *Kappaphycus alvarezii* Besides we have some examples of Phaeophyta are *Turbinaria conoids*, *Sargassum tenerrimum*, *Sargassum jhonstonii*, *Sargassum muticum*, etc. The objective of this study was to field visit in coastal areas for Morphological studies of different types of Seaweeds.

Keywords: Morphology, seaweeds, red seaweeds, brown seaweeds, green seaweeds, *Sargassum* species, *Gracilaria* species, *Ulva* species, *Turbinaria conoids*, *Chaetomorpha* species, etc.

INTRODUCTION

Seaweeds are a type of significant macroalgae which maintain entire marine ecosystem. They are found in rocky substratum areas of Sea. They are referred as Marine algae. They played an important role in photosynthesis of aquatic plants (Clendinning 1964, Detheir 1981)).[7-9] They are classified as Green, Brown and Redmacroalgae. Seaweeds are used in many Industry like food industry, textile industry, cosmetic industry, Fertilizer industry, Medicinal and Pharmaceutical industry etc. From Red Seaweeds, Agar is extracted and Brown seaweeds are

responsible for Algin Production. Both Agar and Algin are highly used as stabilizing and thickening agents (Mohammad 2020). [5] They are also used in laboratory for culture of *in vitro* protocols. One example of Seaweeds are kelps provide an essential role for providing fisheries. They are responsible for providing food sources to aquatic organisms. Besides, planktonic algae also play a vital role in capturing carbon, producing at least 50% of Earth's oxygen.[3].

Since decades, Seaweeds has been harvested for multibillion dollars. In recent years, seaweed farming has become a global agricultural candidate for providing food such as carrageenan, agar and algin for cattle feeds, textile industry, food industry, cosmetic industry and fertilizer industry (Zhang, *et al.* 2012, Bindoff, *et al.* 2019, Buschamnn, *et al.* 2017).[2,4] Because of the importance of marine algae for absorbing carbon dioxide, the global

states started for cultivating seaweeds. In recent report, it has been mention by several scientists and researchers that seaweeds become a potential climate change mitigation strategy for biosequestration (Duarte, *et al.* 2017)[1] of carbon dioxide. Seaweeds seems to have a large capacity for absorbing pollutants and heavy metals which results in pollution reduction and also has a major role in reducing local ocean acidification.

MORPHOLOGY OF SEaweeds

Codium Fragile

Dvision:	<u>Chlorophyta</u>
Class:	<u>Ulvophyceae</u>
Order:	<u>Bryopsidales</u>
Family:	<u>Codiaceae</u>
Genus:	<u>Codium</u>
Species:	<u>C. fragile</u>



Codium fragile is a type of seaweeds mostly found in the southwest of Ireland around 1808, which may spread by rafting or floating in the sea. *Codium fragile* is generally found in the low intertidal and subtidal zone of several beaches. Here the male and female gametes are both produced on separate plants (Hay 1981).[12,13] *Codium fragile* resembles Green sea

fingers. They belong to the family *Codiaceae*. This siphonous type of macroalga is dark green in colour. It has tubular fingers which appears down from rocks during low tide, so its nickname is "dead man's fingers". The fingers, are measures up to 1 cm wide, and lengths aises nearly 30 cm.

Gelidiella Acerosa

Division:	Rhodophyta
Class:	Florideophyceae
Order:	Gelidiales
Family:	Gelidiellaceae
Genus:	<i>Gelidiella</i>
Species :	<i>G. acerosa</i>

Gelidiella acerosa are a type of cylindrical thallus arises like stolon which gives rise to erect branches. The rhizoids arises from each thallus are has axial branches. They are cylindrical to compress upto 8.5 cm tall, 07 to 0.9 mm in diameter. They are

sometime arranged in filiform shape (Dixon 1958, 1960), [10,11] bears several branches with tetrasporangia. These tetrasporangia are borne on the swollen tips of branches..

Kappaphycus Alvarezii

Division:	Rhodophyta
Class:	Florideophyceae
Order:	Gigartinales
Family:	Solieriaceae
Genus:	<i>Kappaphycus</i>
Species:	<i>K. alvarezii</i>



Kappaphycus alvarezii belong to Rodophyceae Family. It is a species of red alga. It is used for extraction of carrageenans. It is a type of gel forming polysaccharides. This macroalga grows up to two meters in length. It is generally green or yellow in color. It is very fast- growing macroalgae and harvest biomass in 15 days. There are different types of carrageenan types like alpha, beta and gama carrageenan. The different types of carrageenan are differ in composition and conformation. Sometime they seems to be resulting in a wide range of rheological and functional properties.

Carrageenans has a wide distribution in different types of Industries. They are used

in a wide variety of commercial applications such as gelling, thickening, and stabilizing agents. They are widely used in different types of food products includes frozen sweets, flavor of milk, yogurt, jellies, sauces and animal food (Gernard *et al.* 1976, Hay 1981). [13] Besides they are highly used in medicines and in some industrial applications such as mining. The extraction of Carrageenan is generally conducted in two ways: native extraction and alkaline – modified method. Here, the seaweed is made into an aqueous solution, and the residue is filtered, leaving nearly pure carrageenan. The alkaline-modified method is seems to be less expensive and easier.

Padina Gymnospora

Divisionl:	Phaeophyta
Class:	Phaeophyceae
Order:	Dictyotales
Family:	Dictyotaceae
Genus:	<i>Padina</i>
Species:	<i>gymnospora</i>



Padina gymnospora belongs to Dictyotaceae family. Thallus of *Padina gymnospora* are generally fan-shaped and funneled type when they attain maturity. The length generally ranges up to 120 mm long and 10-100 mm broad. The frond of thallus is thin and translucent, olive to yellow-brown, darker near the base, irregularly (Kaliaperumal *et al.* 1993). [14]

The thallus are forked-lacinate type. Here there is lacking of midrib. In most of the cases, there is silvery colour of bands having calcium carbonate deposition. They are attached by a heavy mass of attachment rhizoids. **Some** brownish or silvery colour hairs are also seen. It is found in the lower portion of intertidal zones. They are associated with soft rock, sand and detritus.

Enteromorpha Intestinalis

Division:	Chlorophyta
Class:	Ulvophyceae
Order:	Ulvaes
Family:	Ulvaceae
Genus:	<i>Ulva</i>
Species:	<i>U. intestinalis</i>



Enteromorpha intestinalis is a green alga which belongs to family Chlorophyta. The

genus is *Ulva*, commonly known as gutweed and grass kelp. In early 2000s, the

genus *Ulva* were reported in the genus of *Enteromorpha*. They are traditionally credited with having first made the combination (Molloy *et al.* 1995)[15] Thalli of this species of green alga are yellow green to vibrant or dark green and tubular, hollow, wrinkled, convolute, intestine-like, and crumpled looking. Here the individual cells are in the form of round or ovoid. In some species, they are rectangular or polygon-shaped. These cells are always found in disorganized rosettes. *E. intestinalis* has capacity to form blooms in eutrophic condition. It exhibits rapid nutrient uptake, growth, and osmoregulation, particularly in conditions of reduced salinity and light. Optimal salinity for growth may be around 15–24‰ but varies greatly depending on the population. Although growth is typically

positively related to salinity, many populations can survive and grow in freshwater conditions. In fact, the negative effects of low salinity can be offset by increased nutrient concentrations. In reality, *E. intestinalis* populations around the world consist of various ecotypes that are somewhat genetically different from each other, each specifically adapted to grow best in a different salinity regime. The central region (medulla) is composed of long, colourless filaments (medullary filaments) that run longitudinally within the thallus and are densely intertwined. These are vary in size among different subspecies but are typically 26-68 µm in diameter. The peripheral region (cortex) is formed of cylindrical or club-shaped siphonous swellings called utricles that are tightly compressed together.

Division:	Chlorophyta
Class:	Ulvophyceae
Order:	Ulvales
Family:	Ulvaceae
Genus:	<i>Ulva</i>
Species:	<i>U. fasciata</i>

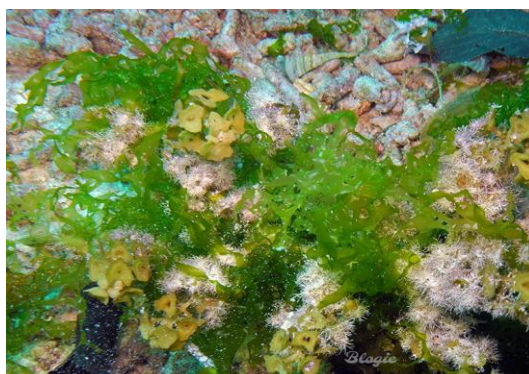


Ulva fasciata is an important macroalga in marine ecology. Its fronds are soft, sheetlike structures that are two cells thick, and this morphology is the reason for its common name “sea lettuce”. Recently, production of alternative fuels from non-starch biomass has also directed the attention to utilization of marine algae, including seaweed or macroalgae, as sources of biomass for biofuels production

(Brinkhuis 1977).[6] The rapid growth of *U. fasciata* is attributed to its high photosynthetic rates and high C and N nutrient uptake capacity. *Ulva fasciata* also a good source of Vitamin A, B2, B12, and C and is rich in γtocopherol. *U. lactuca* extracts have been shown to exert antioxidant, anti-microbial and anti-viral activities in various in vitro assays.

Ulva reticulata

Division:	Chlorophyta
Class:	Ulvophyceae
Order:	Ulvaes
Family:	Ulvaceae
Genus:	<i>Ulva</i>
Species:	<i>U. reticulata</i>



U. reticulata always attached to a rocky substratum with the help of hold fast which is discoidal in shape. The holdfast is a type of disc. Thsc is made up of primary cells. They are elongated, compact and strong nature. The thallus is has two layered and thick in nature. It has net like appearance. The colour is pale green. They are smooth and delicate in texture. The thallus is flat having numerous lacunae. The diameter of lacunae measures from 0.4 to 7.0 cm. The surface cells are irregularly arranged. They are polygonal in shape and are arranged on the surface of the thallus ranging from 12.4 - 18.6 u to 24.8 - 27.9u. Thallus grows parallel to the substratum and grows upto 62.4 cm to 187.2 cm in length and 10 to 20 cm in width (Mottio *et al.* 2009).[16-20]

The layers of the cells dilate in some parts of thallus and functions as air bladder; the marginal cell walls are stretched forming elongated marginal strands. These marginal strends give additional strength to the air bladder and avoid bursting very frequently in the T.S. of the thallus where the two layers of the cells separated by a cavity and the cells are arranged in two layers with distinct vesicular cavity and are covered with the thick cuticle measuring 9.3 to 12.4 cm towards the surface. The cell has a single parietal chloroplast. They contain a single pyrenoid along with chloroplast. They are located on the outer side of the cell. The nucleus is present in the inner cell wall.

Ulva lactuca

Division:	Chlorophyta
Class:	Ulvophyceae
Order:	Ulvaes
Family:	Ulvaceae
Genus:	<i>Ulva</i>
Species:	<i>U. lactuca</i>



Ulva lactuca is very common on rocks and on other algae in the littoral and sublittoral on shores all around the Kovalam coast of Kerala. It is particularly prolific in areas where nutrients are abundant. This has been the case off the coast of Brittany where a high level of nitrates, from the intensive farming there, washes out to sea. *Ulva lactuca* are always washed up their decay yield methane, hydrogen sulphide, and other gases (Mottio etl. 2010) [22,23]. Here sporangial and gametangial thalli are morphologically not similar. The diploid

and mature plant produces haploid spores by meiosis. These haploid are settled down and further grown up to form haploid male and female plants which is similar to the diploid plants. The thallus of *Ulva lactuca* is a thin and flat green alga. The plant reaches upto 18 cm but sometime up to 30 cm. The thallus grows without a stipe found attached to rock by a small disc-shaped holdfast. In cross section, the chloroplast of thallus is cup-shaped having 1 to 3 pyrenoids.

Chaetomorpha Aerea

Division:	Chlorophyta
Class:	Ulvophyceae
Order:	Cladophorales
Family:	Cladophoraceae
Genus:	<i>Chaetomorpha</i>
Species:	<i>C. aerea</i>

Chaetomorpha aerea is a green filamentous alga. Currently the species is widely distributed in coastal areas of Mandapam & Rameshwaram etc.

Chaetomorpha sp. is known to prefer more saline water. *Chaetomorpha* sp. develops well, which can be contributed to the increased salinity of the surface waters.



Thallus is a medium to dark green, unbranched, filament with a single file of cells (uniseriate). Cells are cylindrical measuring 75-150 mm 11 diameter. Rhizoidal branches are usually lacking.

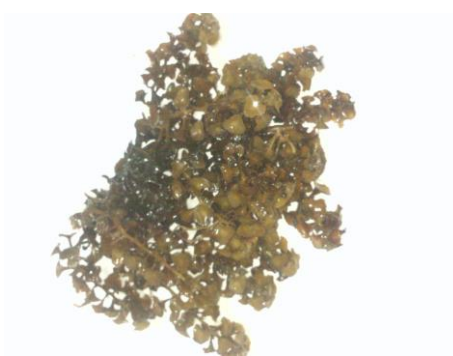
This species often forms dense, tangled mats that float around or snag on other seaweed in low intertidal in summer. They are found in protected to semi-exposed habitats, tidepools and mud flats.

Turbinaria Conoids

Division:	Eukaryota
Phylum:	Gyrista
Subphylum:	Ochrophytina
Class:	Phaeophyceae
Order:	Fucales
Family:	Sargassaceae
Genus:	<i>Turbinaria</i>
Species:	<i>T. conoids</i>

Turbinaria conoids is found in tropical marine waters. The thallus belongs to Phaeophyceae family. It is usually cultivates on rocky substratum. The thallus of *T. conoids* is erect measuring 13 cm tall. The shade of thallus is dull brown in variety. The entire thallus is appended to

substrate with hold fast. The branches are arranged with stalked turbinate leaves; leaves are 13 - 20 mm long with substrate stalk slightly tapering below and becoming expanded triangular above (Mon *et al.* 2015).[21]



The distal marginal blade may be vesiculate or evesiculate 10 - 15 mm broad, concave at the centre which may be surrounded fully or partially by an inner crown of teeth, the

outer margin is lined by sharp prominent teeth; paricular receptacular cluster are racemose attached to the stalk at 1/4 distance from the main axis.

Turbinaria Ornata

Division	Eukaryota
Phylum:	Gyrista
Subphylum:	Ochrophytina
Class:	Phaeophyceae
Order:	Fucales
Family:	Sargassaceae
Genus:	<i>Turbinaria</i>
Species:	<i>T. ornata</i>

Turbinaria is a genus of brown algae found primarily in tropical marine waters. *Turbinaria ornata* belongs to order Fucales. It is generally found in coral reef ecosystems. In marine ecosystem, they are

often consumed by herbivorous fishes and echinoids. Turbinaria conoids has relatively a low level of phenolics and tannins.



Hypnea Musciformis

Division:	Rhodophyta
Class:	Florideophyceae
Order:	Gigartinales
Family:	Cystocloniaceae
Genus:	<i>Hypnea</i>
Species:	<i>H. musciformis</i>

Hypnea musciformis is a seaweed belongs to Rodophyta family. The thallus forms clumps or masses. They are cylindrical branches measuring 4-8 cm tall and 0.1-0.2 inches. They are slender towards the tips. It is firm, cartilaginous, and highly branched. Branching is variable and

(Noormohammad *et al.* 2010) irregular, often tendril-like and twisted around axes of other algae. The ends of many axes and branches are flattened with broad hooks. Holdfasts are small, inconspicuous, or lacking.



This species is easily distinguished from other native. Occasionally, It is found as an epiphyte attached to other algae.

Caulerpa Racemosa

Division:	Chlorophyta
Class:	Ulvophyceae
Order:	Bryopsidales
Family:	Caulerpaceae
Genus:	<i>Caulerpa</i>
Species:	<i>C. racemosa</i>



Caulerpa racemosa is a type of genus of belongs to family Caulerpaceae. These species have a stolon more than 3 metres long having 200 fronds. Some species of ***Caulerpa*** example *Caulerpa lentillifera* and *Caulerpa racemosa* are eaten in the name of sea grape. They have a peppery taste.

C. racemosa consists of a number of branches grows as stolons which are anchored to the sandy substrate by rhizoids. *C. racemosa* is widely distributed in shallow temperate and tropical seas.

Sargassum Tenerrimum

Division:	Eukaryota
Phylum:	Gyrista
Subphylum:	Ochrophytina
Class:	Phaeophyceae
Order:	Fucales
Family:	Sargassaceae
Genus:	<i>Sargassum</i>
Species:	<i>S. tenerrimum</i>

Sargassum tenerrimum (J. Agardh) thallus is dark brown in colour, and grows upto 25cm in height. Mature thallus consists of a holdfast, stipe and primary branches which support primary leaves, secondary leaves, air bladders and receptacles. Holdfast are dark brown in colour and exhibit a smooth

or slightly rough surface Usually a single stipe arises from each holdfast, but rarely two or three stipes arise from the largest and oldest holdfast. From the holdfast, the main axis arises that bears long primary branches which in turn possess many secondary branches. These secondary branches bear

spirally arranges leaves which reveal size and variation from proximal to distal ends.



Most of primary leaves are simple but basal leaves formed upto formed three lateral branches. Secondary leaves are densely arranged than primary leaves. Both primary and secondary leaves possess a distinct midrib and short stalks. Many cryptostomata are irregularly scattered on

the surface of leaves. The air vesicles are borne on short stalks or occasionally associated with receptacles. Each receptacles forms a dense cluster with an apparently dominant axis which is branched from the base and supports lateral branches.

Sargassum Jhonstonii

Division:	Eukaryota
Phylum:	Gyrista
Subphylum:	Ochrophytina
Class:	Phaeophyceae
Order:	Fucales
Family:	Sargassaceae
Genus:	<i>Sargassum</i>
Species:	<i>S. jhonstonii</i>

Sargassum Jhonstonii found it in the Sargasso Sea, naming it after the wooly rock rose (*Halimium lasianthum*) that grew in their water wells at home, and that was called *sargaço* in Portuguese (Portuguese

pronunciatio)The Florida Keys and mainland South Florida are well known for their high levels of *Sargassum* covering their shores. Gulfweed was observed by Columbus.



They are generally found in Sargasso sea so named as Sargassum. They are used as thickening and stabilizing agents. Many Chinese herbalists prescribe powdered *Sargassum*—either the species *S. pallidum*, or more rarely, hijiki, *S. fusiforme*—in doses of 0.5 gram dissolved in warm water and drunk as a tea. It is called *hǎizǎo* in traditional Chinese medicine, where it is used to resolve "heat phlegm".

Sargassum wightii

Division:	Eukaryota
Phylum:	Gyrista
Subphylum:	Ochrophytina
Class:	Phaeophyceae
Order:	Fucales
Family:	Sargassaceae
Genus:	<i>Sargassum</i>
Species:	<i>S. wightii</i>

The Species of this genus of algae may grow to a length of several metres.



They colour of thallus is brown or dark green in colour. The whole thallus contains of a holdfast, a stipe, and a frond. The reproductive organs comprise Oogonia and antheridia. It happens in conceptacles embedded in receptacles. The receptacles are arranged on special branches. The

thallus has berrylike gas-filled bladders. These air bladders help the fronds float in sea and also promote photosynthesis. They have a rough and sticky texture. The thallus has a flexible body which helps the thallus to withstand strong water currents.

Sargassum Muticum

Division:	Eukaryota
Phylum:	Gyrista
Subphylum:	Ochrophytina
Class:	Phaeophyceae
Order:	Fucales
Family:	Sargassaceae
Genus:	<i>Sargassum</i>
Species:	<i>S. muticum</i>

Sargassum muticum is large seaweed belongs to family Phaeophyceae. The thallus appended to the rough foundation with the assistance of discoidal holdfast. The holdfast compares 5 cm in diameter. From this holdfast, sevra essential and seconday branches emerge. It estimates the

most extreme level upto 5 cm. The branches emerge from the stipe. Plus, the thallus likewise has various air vesicles give lightness. The reproductive organs are called receptacles joined to the stipes. The receptacles are self-fertile.



Sargassum Vulgare

Division:	Eukaryota
Phylum:	Gyrista
Subphylum:	Ochrophytina
Class:	Phaeophyceae
Order:	Fucales
Family:	Sargassaceae
Genus:	<i>Sargassum</i>
Species:	<i>S. vulgare</i>



The Thallus of *Sargassum vulgare* has a place with phaeophyta family. The thallus is ranges upto 10-20cm long. The stipes developed on the thallus estimating 1-20 cm long. All thallus connected to rocks through discoid-cone shaped holdfast. Essential branches 10 cm to 200 cm. The basal branches are packed and leaf-like.

They are wide and have dentate edges. Air bladders joined to stipes are ovoid in shape. Thallus are monoecious or dioecious. The regenerative organs called containers are unisexual or sexually unbiased. They created in spread groups. They are smooth, verrucose or spinous, with dissipated conceptacles and ostioles.

Gracilaria Edulis

Division:	Rhodophyta
Class:	Florideophyceae
Order:	Gracilariales
Family:	Gracilariaceae
Genus:	<i>Gracilaria</i>
Species:	<i>G. edulis</i>



It occurs in the Indian Ocean (East Africa, Mauritius, Laccadive Islands, India, Sri Lanka, Nicobar Islands, Andaman Islands) and in the Pacific Ocean (China, Japan, Micronesia, north-eastern Australia). In South-East Asia it is found in Burma (Myanmar), Thailand, Vietnam, Malaysia, Singapore, Indonesia, the Philippines and Papua New Guinea. *G. edulis* is collected by coastal communities for food and used either as a salad after blanching with hot water or as a source of home-prepared agar.

It is also used for animal feed, as fertilizer and in waste water purification plants. In traditional medicine it is used especially for poulticing knee joints and to treat unhealthy sores.

Thalli up to 27 cm tall, brownish-red, each arising from a discoid holdfast; branching dense and fastigiate, divaricate, dichotomous to trichotomous, up to 7 orders and with long branch intervals;

branches 1-1.5 mm in diameter, cartilaginous, flexuous, with or without a constriction at their bases or with only a slight constriction, cylindrical, ending in pointed apices.

Thalli in transverse section consisting of roundish thin-walled medullary cells, 100-300 µm in diameter, and 1-2 rows of small cortical cells, 5 µm in diameter, with an abrupt transition from medulla to cortex.

Tetrasporangia ovoid to oblong, cruciate, 8 µm × 16 µm, scattered over surface of thalli. Spermatangia in deep, pot-like conceptacles with multiple cavities, which are arranged in groups of up to 10.

Cystocarps globose, up to 2 mm, with rostrate tips and constricted at the bases; pericarp thick, consisting of 9-14 rows, cells of the outer rows oval, inner cells horizontally compressed, basal absorbing filaments robust with many branches .

Gracilaria Corticata

Division:	Rhodophyta
Class:	Florideophyceae
Order:	Gracilariales
Family:	Gracilariaceae
Genus:	<i>Gracilaria</i>
Species:	<i>G. corticata</i>



The thallus of *Gracilaria corticata* has a place with Rodophyceae family. The thallus is dim brown to greenish in variety. The thallus estimating 10-12cm in level which is joined to rough base. Fronds of thallus are cartilaginous and show rehashed dichotomous stretching.

The thali are usually 1-2mm wide, flat with acute segmented tips. The cystocarpic thallus can be easily distinguished due to the presence of done shaped cystocarps.

***Gracilaria Verrucosa* (Hudson) Papenfuss**

Division:	Rhodophyta
Class:	Florideophyceae
Order:	Gracilariales
Family:	Gracilariaceae
Genus:	<i>Gracilaria</i>
Species:	<i>G. verrucosa</i>



The thallus is profound brown, purple or light yellow in variety. They are tracked down filling freely in the sloppy foundation or in exceptionally turbid water. The thallus is similarly more modest than the connected sort. The thallus is erected tall and

cylindrical. Branching reached upto 3rd to 4th Order, occasionally sub-dichomotous and attenuated at tips. The plants are sterile throughout the year.

Thallus has a many kinds of edges estimating 3 m long. Edges are emerges from a little discoid holdfast. Cells of the conchocelis have parietal, band-shaped chloroplasts. Pit plugs present. The foliose phase of many, but not all species may reproduce asexually by archeospores, agamospores, or neutral spores. Sexual reproduction is present in many, but not all

species. Spermatia are white to yellowish in appearance due to disintegration of the chloroplast during spermatogenesis. The haploid nuclei produced are not incorporated into four spores and dispersed, therefore the foliose thallus, resulting from conchospore germination, is a genetic chimera.

Fucus Vesiculosus

Division:	Eukaryota
Phylum:	Gyrista
Subphylum:	Ochrophytina
Class:	Phaeophyceae
Order:	Fucales
Family:	Fucaceae
Genus:	<i>Fucus</i>
Species:	<i>F. vesiculosus</i>



Fucus vesiculosus are a sort of thallus has a place with Phaeophyceae family. They are generally known as bladder wrack. The thalluses has a ton of fronds and are

dichotomously organized. They are additionally referred as rockweed, bladder fucus, ocean oak, dark tany, cut weed, dyers fucus, red fucus, and rock wrack.

Chondrus Crispus

Division:	Rhodophyta
Class:	Florideophyceae
Order:	Gigartinales
Family:	Gigartinaceae
Genus:	<i>Chondrus</i>
Species:	<i>C. crispus</i>



The thallus is usually called Irish greenery. They are carrageen delivering ocean growth has a place with red green growth. They develops bounteously along the rough pieces of the Atlantic shoreline of Europe and North America. *Chondrus crispus* is a little purplish-red ocean growth estimating upto 22 cm long. They are tracked down on rough shores and in pools. The fronds develop dichotomously and have unbranched stipe. They are level and wide with adjusted tips. It occurs sublittorally to 24 m. It can tolerate some reduction in salinity and can be found in estuaries. *Chondrus crispus*, or Irish moss, is a common edible red seaweed that can be found on rocky shores in the Northern Atlantic.

CONCLUSION

The overall study shows that Seaweeds plays an important role in marine aquatic ecosystem. A diverse study was highlighted on the morphology and adaptation of different types of red seaweeds, brown seaweeds and green seaweeds. The commercialization of different types of product like caraggenan, agar and algin was also discussed. Thus, it was concluded that seaweeds has a great significant and beneficial aspects of human life to restore and safeguard the entire ecosystem.

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