

A SURVEY OF *CAULERBA* (CHLOROPHYTA, CAULERPALES) SPECIES IN THE KANNIYAKUMARI COAST, TAMIL NADU, INDIA.

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Abstract

This study aimed to identify the abundance, and the biodiversity of *Caulerpa* from three different locations in kanniyakumari coast. In a survey conducted from February 2020 to January 2021, High diversity was observed in the following taxa: *Caulerpa maxicana* (vahl.)C. Agardh, *C. peltata* (Lamouroux), *C. racemose* (Forsk.) J. Agardh, *C. fastigiata* Montagne, *C. scalpelliformis* (Turner) C. Agardh, *C. taxifolia* (Vahl) C. Agardh.

Keywords; Seaweeds; Seaweeds: *Caulerpa* : Kanniyakumari; India

Introduction

Caulerpa is a well-known and distinctive genus with over 350 associated species and infraspecific taxon names, of which about 85 species are currently accepted (Guiry and Guiry 2013). *Caulerpa* is one of the most distinctive edible green algae genera come from a Caulerpaceae family and Bryopsidales order, widely distributed in a range of habitats throughout the tropical and subtropical areas with a group of conspicuous algae and identifiable solely with their growth form and internal morphology. Although lacking transverse cell walls (siphonous thallus), *Caulerpa* species display a complex habit, with the thallus differentiating into stolons, rhizoids, and upright assimilators (fronds) that usually bear ramuli (Fritsch 1965). The morphology of these various structures has been historically used for species delimitation. *Caulerpa* species having with a distinctive suite of anatomical, cellular and biochemical characters with a little relative morphological variation including reinforcement of the saphenous structures of fibrous algal wall materials and expanded their ranges into the more temperate environment (Meinesz. et.,al 1991, Piazzini L .et.,al1994 and Dalton R.et .,al 2000)

However, environmentally controlled phenotypic plasticity in all these characters, but especially in the ramuli, has led to much confusion, a large number of synonyms, and a classification scheme involving subspecies, varieties, forms, and “ecads” (Calvert et al. 1976) Furthermore, there can appear to be continuous morphological gradations between many species (e.g. *C. cupressoides/ urvilleana/ serrulata*) and, as discussed by Svedelius (1906), if a purely morphological standpoint was used to define species “one might just as well reduce the whole genus to one, or a few species”.Recent molecular studies of the genus have further added to this confusion with the uncovering of a considerable conflict between morphological and molecular species concepts (Fama et al. 2002, Stam et al. 2006 and Sauvage et al. 2013).The aim of this

research was the taxonomic and floristic study of the genus *Caulerpa* in the southern coast of kanniyakumari due to the abundance of this genus, as well as the importance of this genus. In the other hand, due to the complexity of morphology and taxonomy of this genus, Sometimes it has a problem. The widespread distribution of these algae on the southern coast of kanniyakumari. Therefore, it is better to carry out further research for several consecutive years and complete sampling of the entire southern coast of kanniyakumari

Materials and Methods

Kanyakumari District is situated on the southern tip of peninsular India (Lat 80° 5' N, Lon 77° 32' E) and its coastal area comprises of about 68 km in length. Coastal length of Kanyakumari district along Arabian Sea is 59 km and along Bay of Bengal are 11 km is shown in figure The coast encompasses a diverse range of features including beach terraces, low cliffs, sandy beaches, dunes, rocky shores, estuaries wetlands and forests. The area has rocky shore and extensive beaches with temples nearby Kanyakumari Coast very confluence of the three water-bodies. The southern eastern boundaries is formed by the Gulf of Mannar. The south-west boundaries are Indian Ocean and the Arabian Sea, both these seas mingle with the Indian Ocean. The east and west coasts are markedly different in their geo-morphology. The west coast is generally exposed with heavy surf and rocky shores and headlands. The coast has a wide range of wild flora and fauna. The nature of the sand in the beaches of Kanyakumari is unique as it is multicolored. The southern parts of the coast are sandy beaches with beaches with beach sands containing heavy minerals on the eastern and western sides of Kanyakumari.

An initial survey was conducted earlier along the Kanniyakumari coast from Colachel to vattakaotai, to identify the major areas of seaweed prone sites. The entire coast was studied thoroughly via Kurumpannai, Colachel, Manavalakurichy, Muttom Kanniyakumari Leepuram Arokkiyapuram and vattakottai. The survey and collection of the seaweeds along the coast of kanniyakumari (Fig. 1) were started from September 2011 to October 2013. During this period, totally 17 sites along the coast were surveyed in all the seasons. The seaweed samples were collected randomly during low tides. The time for making field trips was fixed accordingly the hours of low tides as predicted by the tide table. The nature of the coasts and the seaweed vegetation were noted and the field photographs were taken Samples are collected and kept into polythene bag with seawater. In laboratory condition, the specimen was cleaned of sand particles, small shell mud epiphytes and adhering other materials with gentle force, specimen spread in plats for making herbarium and part of specimen stored in 4% formalin solution for future study. All the wet and dry specimens were examined carefully under the light and sophisticated microscopes in the laboratory. All the species of seaweeds were identified authentically following the standard literatures (Seaweeds-a field manual-NIO-Goa), Seaweeds of India and Common seaweeds of India (Dinabandhusahoo., et al.,2009).

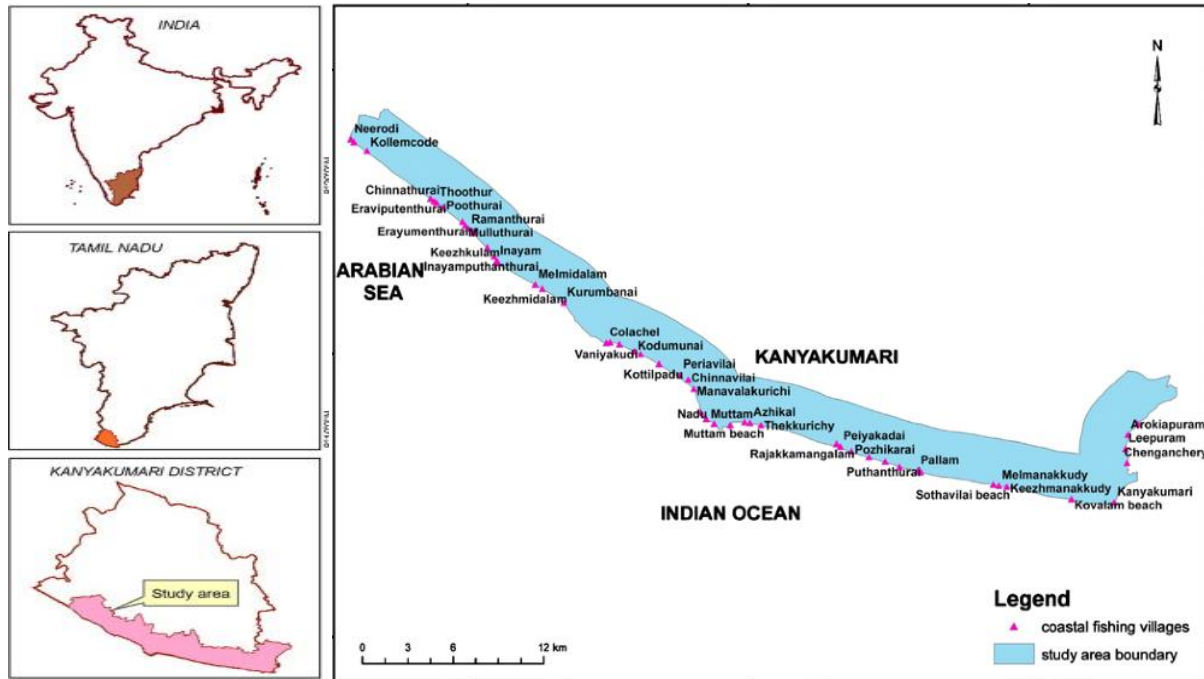


Fig- 1: Study area and localities of collection for *Caulerpa* species in kanniyakumari coast

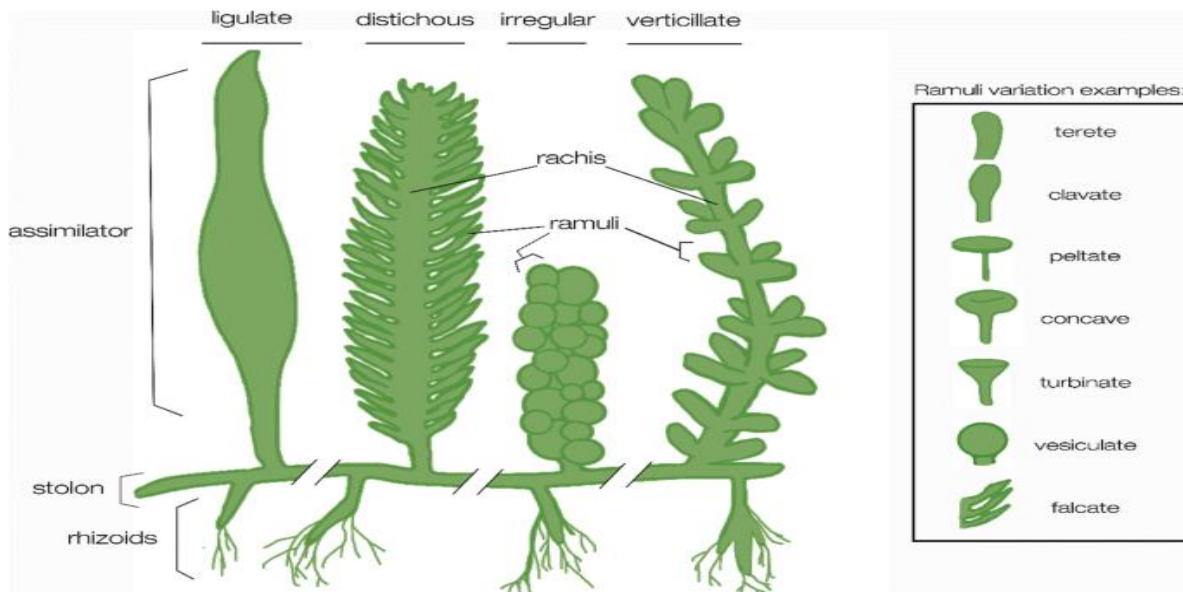


Fig- 2-Structure and morphological variations of *Caulerpa* (Mayalen zubia et.,al 2020)

Result



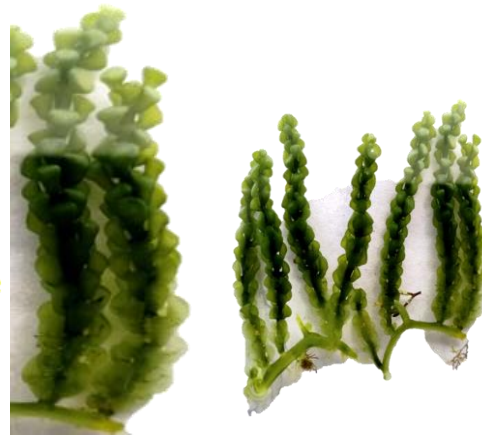
CAULERPA LAETEVIRENS



CAULERPA FASTIGIATA



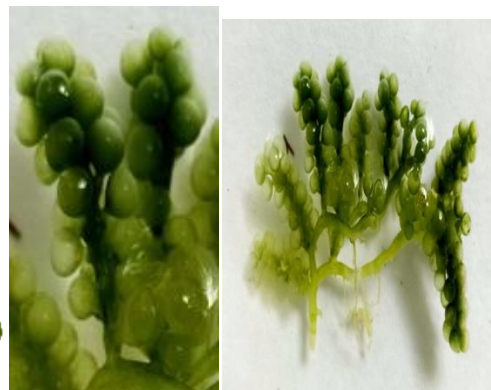
CAULERPA RECEMOSA



CAULERPA RECEMOSA VAR TURBINATA



CAULERPA RECEMOSA VAR LAETIVIRENS



CAULERPA MICROPHYSA



CAULERBA RECEMOSA VAR CHEMNITZIA



CAULERBA RECEMOSA VAR CYLIDRACA



CAULERBA RECEMOSA VAR CORYNOPHORA



CAULERPA TAXIFOLIA



CAULERPA SCALPELLIFORMIS



CAULERPA MEXICANA



TAXONOMIC POSITION:**Kingdom**-plantae**Sub kingdom**- Viridiplantae**Division**-Chlorophyta**Class**-Ulvophyceae**Order**-Bryopsidales**Family**-Caulerpaceae**Genus** –Caulerpa***CAULERPA FASTIGIATA* Montagne**

Plant dark green in colour ,growing as vast mats with filamentous rhizomes. This plants has filamentous and cylindrical branches that divide in to dichotomously or alternately .The runners creep along the substrate.Plants are found on sandy rocks and gravel in the mid to lower intertidal zone of calm shore.

***CAULERPA PELTATA* Lamouroux**

Plats small, generally bright green in colour. The stolon freely forked, giving off rhizoids-bearing branches below and foliar branches above, Erect branches 5-50 mm tall, bearing one to several peltate branch lets consisting of a rather slender pedicel 1-2 mm long, ending in a disc 3-5 mm thick, diameter. Plants are found on sandy rocks and gravel in the mid to lower intertidal zone of calm shore.

***CAULERPA RECEMOSA*(Forsskal)J.Agardh**

This plant has erect branches arising from a horizontal stolon attached to the sediment at intervals by descending rhizomes. The erect branches arise every few centimetres,. A large number of branch lets, resembling ovate or spherical bodies on stalks, arise from each erect branch. Where branches and stolons are close together, the branch lets form a dense mat of seemingly spherical structures. It occurs from shallow muddy bays to clear water reef environments.

***CAULERPA RECEMOSA VAR TURBINATA*(J.Agardh)Eubank**

This juicy looking seaweed is made up of little bell-shaped 'grapes'. The seaweed resembles bunches of little bells, with a flattened top. Each bunch about 6-8cm long, with bell-shaped bead (the 'grapes') arranged on a vertical 'stem'. These bunches of 'grapes' emerge from a long horizontal 'stem' that creeps over hard surfaces or just under the sand. Colors range from green to bluish-green. Plants are found on sandy rocks and gravel in the mid to lower intertidal zone of calm shore.

CAULERBA RECEMOSA VAR LAETIVIRENS (Montagne) Weber van bose

Plants green, rapidly forming tangled mats in shallow water and amongst seagrass meadows. 2. upright branches arise from a runner (stolon). Club-shaped, bladder-like branches (ramuli) arise upwardly in a radial or irregular pattern from the upright branches (axes) 3. the plant is capable of rapid propagation from fragments even when partly covered by sediment. Plants are found on sandy rocks and gravel in the mid to lower intertidal zone of calm shore.

CAULERBA RECEMOSA VAR CHEMNITZIA Lamouroux

Thallus light green, fleshy, consisting of creeping slender stolons, bearing branched rhizoids and erect branches 1–5.5 cm high. The branches bear numerous branchlets closely set on erect axis in all directions. The branchlets at the lower part of the axis are club-shaped, become swollen in the upper part and are often flat-topped, 3–5 mm long, 0.25 mm in diameter at the lower portion, and 0.5–1.5 mm in diameter at the top. Rhizoids fine, branched, yellowish. Growing on rocks covered with sand, dead coral colonies intermixed with other algal species in turf communities, commonly forming dense patches and occupying extensive areas of the bottom at the low intertidal zone.

CAULERBA RECEMOSA VAR CYLIDRACA

C. racemosa var. *cylindracea* has a slender thallus, fixed to the substratum by means of thin root-like rhizoids 1-mm, that are closely arranged along the stolon. The diameter of the stolon ranges from 0.7 to 2.0 mm; it bears simple or occasionally branched upright axes, 1-11 cm high and 3-10 mm across. The basal part of the upright axes is slightly inflated immediately above the attachment to the stolon. The upright axes bear uncrowded, vesiculate branchlets that are radially or distichously arranged on a cylindrical rachis. The branchlets are clavate, (1.5-) 2-5 (-7) mm long, 1-2 mm in greatest diameter shortly below the rounded apices, and upwardly directed. Plants are found on sandy rocks and gravel in the mid to lower intertidal zone of calm shore.

CAULERPA TAXIFOLIA (Vahl) C. Agardh

Fronds are feather-like “leaf blades” each of which has a relatively wide central axis (rachis), from which grow many pinnules. Primary fronds grow directly on the stolons at regularly spaced intervals; fronds may be quite short or even absent in shallower branching. Fronds grow from the primary fronds. Pinnules are up to 1 cm long; number 4 to 7 per cm along each side of the frond axis; are usually upcurved, tapering at the ends; some pinnules are split in two at the ends (bifurcate); pinnule spacing and length depend on light availability. Stolons bear the fronds and the rhizoids. New stolons arise from old stolons that have survived the winter. Unlike vascular plants, there are no “roots” on algae. Descend from the stolons, tapering at the ends, having many extremely thin filaments; the rhizoids mimic roots by attaching to rocks and other substrata and taking up and translocating inorganic and organic nutrients from the

substrate; “on rock, the lacework of these rhizoids, trapping grains of sand or mud, may form a felt, completely covering the substrate” Plants are found on sandy rocks and gravel in the mid to lower intertidal zone of calm shore.

CAULERPA SCALPELLIFORMIS (Brown ex Turner) C. Agardh

The body of the alga is grass-green, and the rhizoids are usually transparent. The *Caulerpa scalpelliformis* thallus resembles flat, emarginated ‘leaves’ that are uniformly separated by indentations into lobes. The indentation depth reaches a third of the thallus width. The leaf-like thallus reaches 5-10 cm in length. Its width is about 1 cm, and the indentations between the lobes are a third of the thallus width. In the *Caulerpa scalpelliformis* indentations are about a third of the thallus length. The species has been found in a variety of habitats, upon rocky, sandy or silt substrates. It appears in the wave-breaking area, in tidal pools and in potholes in the intertidal zone and at depths of up to 50 m in the open sea. Plants are found on sandy rocks and gravel in the mid to lower intertidal zone of calm shore.

CAULERPA MEXICANA Souder ex Kutzing

A feather-like structure about 2cm long. The mid-rib or central 'stem' of the feathery structure is flat and usually with a width wider or the same as the length of the side 'branches'. The side 'branches' are short, flat and have rounded to bluntly pointed tips. These little feathery structures emerge along the length of a 'stem' that creeps over hard surfaces or just under the sand. Ecology: The algae usually grow in the middle portions of intertidal zone on rock/sand or soft mud substrate. Plants are found on sandy rocks and gravel in the mid to lower intertidal zone of calm shore.

CAULERPA MICROPHYSA (Weber-van Bosse) J. Feldmann

The plants are small, up to 2 cm in height, and have hemispherical or slightly compressed spherical branchlets that are 1.0-1.5 mm in diameter. This species is similar to *C. lentillifera* however the branchlets of this seaweed are without constrictions between the base of the spherical head and the stalks. This seaweed forms clumps on rocks in mid-intertidal to subtidal zones along shorelines with calm to moderate water movement and in tidal pools. Plants are found on sandy rocks and gravel in the mid to lower intertidal zone of calm shore.

Discussion

This study will provide the baseline data for future studies on economic importance of *Caulerpa* species diversity in the southern coasts of Kanyakumari, Tamilnadu, India. Tropical shallow environments apparently provide all the requirements for a relatively diverse and abundant *Caulerpa* species. Water temperature, in particular, has greatly influenced the abundance of *Caulerpa*. The similar pattern of distribution was also recorded in *Caulerpa* species from Kanyakumari (John Peter Paul J.2013), *Enteromorpha* species from Kanyakumari region (John Peter Paul J.2012). In the earlier reports, seasonal variability of green seaweeds (*Chlorophyceae*) were recorded and all the green seaweeds.

Conclusion

The present study concluded that twelve species of *Caulerpa* identified which it provide the baseline data for future studies on economic importance of *Caulerpa* species diversity in the southern coasts of kanniyakumari. Further systematic studies of the seaweeds may provide useful data for conservation of marine species *Caulerpa* in this region.

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