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Diversity Of Seaweed And Seagrass In Arokkiyapuram, Kanyakumari Coast, Tamil Nadu, India

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ABSTRACT

Study on the distribution of seaweed and seagrases resources in Kanyakumari region was carried out for a period of one year from December 2020 to December 2021 by making monthly collection of Seaweeds and seagrass from intertidal and subtidal regions at one stations (Arockiapuram) along the south east coast of Kanyakumari, Tamil Nadu. Totally 39 genera and 84 seaweed species belonging to Chlorophyta, Phaeophyta and Rhodophyta were recorded. The following six seaweed species namely *Ulva faciata*, *cheatomorpha antenna Ceramium spp*, *Sargassum whgiti, Gracialaria carticata, Padina tetrastomatica* and are commonly distributed in entire study period. Three species of seagrasses *Cymodocea serrulata. Halophila ovails* and *H. ovalis* were also recorded.

Keywords: Seaweeds; Seagrass: Arokkiyapuram: Kanniyakumari; India

INTRODUCTION

As over 70% of Earth's surface is covered in water, and 97% of that water is salt water, marine ecosystems are the largest types of ecosystems on the planet. But presently due to increasing population level several human induced activities were making major impact on the remaining 30% of the land. The purpose of ecological study is to clarify the present conditions of seaweed and seagrass communities in keep monitoring the communities to assess their changes by a common methodology. Taxonomical studies are indispensable to exactly identify seaweed or seagrass species composing the target communities and are also necessary to know the biodiversity in full details. Plants are the primary producers for the precious life to run on earth. They form the basic direct food for the herbivores and indirectly to the carnivores and hence form part of food web / chain. They are the primitive group of plants evolved first in the universe and are microscopic as well as macroscopic commonly known as microalgae and macroalgae respectively. In general benthic, macrophytic algae present in marine environment (Seas/ Oceans) are called seaweeds. In the marine ecosystem, marine algae are the major primary producers. Macroalgae are bigger, having simple thallus

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structure without true leaf and roots. But they have pseudo roots known as hold fasts / rhizoids. They do photosynthesis through their thallus (Dawson 1966).

The recent study by (John 1994), suggests that there are around 36000 known species of algae and represent only about 17% of the existing species. According to (Dring.,1982) over 90% of the species of marine plants are algae and roughly 50% of the global photosynthesis on the plant group is algal derived (John, 1994). Thus every second molecule of oxygen the humans inhale is produced by an alga, and every second molecule of carbon dioxide they exhale is reused by an alga. In earlier days, usages of these marine aquatic plants otherwise called weeds (Marine algae) were not understood well. Hence the name was given to these marine plants/ weeds as "Seaweeds". Now, the utilities of the marine plants (marine algae) have been studied well in various forms and are being used in day today life of human beings. Seaweeds naturally grow in seawater and their growth is greater where nutrition and sunlight are adequate. Earth has 71% of marine water and harbour huge quantity of marine plants. Marine plants include phytoplankton, cyanobacteria, seaweeds and sea grasses, and among these seaweeds are known for the better livelihood option to the coastal community (Subba Rao 2009).

Seagrasses grow in areas dominated by soft substrates such as sand or mud, but some species can be found growing on more rocky substrates. Seagrasses require high levels of light, more than other marine plants, because of their complex below-ground structures that include considerable amounts of non-photosynthetic tissues. As a result they are normally abundant in shallow waters. Seagrasses are productive components of near-shore environments that provide food and shelter for many economically important species (Heck and Orth, 1980). Seagrass communities play two important roles in the marine ecosystem; one is the direct contribution through the primary production, and the other one is the provision of surface for the epiphytic growth and shelter to animal communities thereby sustaining a diverse food-web (Duarte, 1989). Seagrass meadows provide critical spawning, nursery, and refuge habitats for a wide variety of fishes and crustaceans (Bell and Pollard, 1989). They support large numbers of fish species and individuals, and provide nursery habitats for juveniles of many species, as compared to adjacent vegetated areas that have different fish assemblages, usually characterized by fewer species and fewer individuals . The structural complexity provided by seagrass is considered one of the major factors responsible for these differences. Greater habitat complexity provides shelter from predation, increased microhabitat availability and more diverse and abundant prey, thereby strongly influencing mortality and growth rates of individual fish (Crowder and Cooper 1982) The data on on the algal and seagrass diversity are presented and discussed. This provides information to seaweeds and seagrass industries to locate the areas of occurrence of seaweed and seagrass biodiversity information and identify gaps with recommendations for future research.

Materials and Methods

Study area

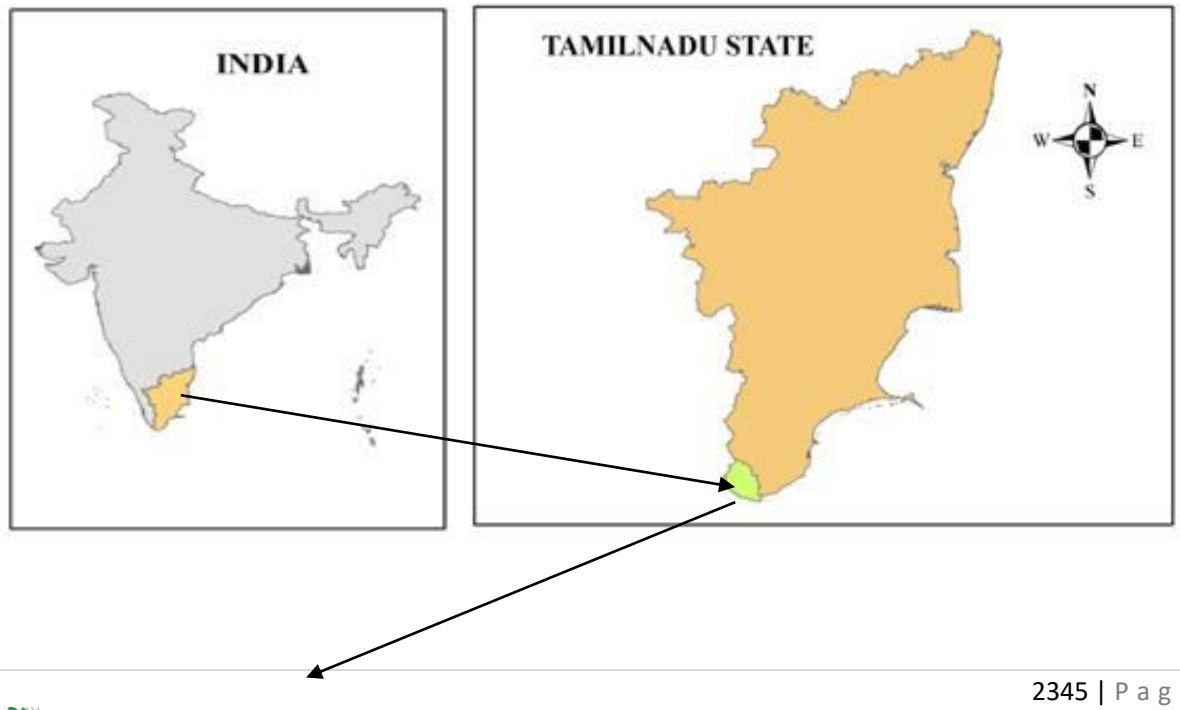
ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 11,S Iss 3, Dec 2022

An initial survey was conducted earlier along the Kanniyakumari coast from Colachel to vattakotai, to identify the major areas of seaweed and seagrass prone sites. The entire coast was studied thoroughly via Colachel, Chinavilai, Muttom, China muttam Kanniyakumari leepuram Arokkiyapuram Vattakotai but only in Arokkiyapuram cost the rich seaweeds and seagrass flora and funa were found. For in this reason, the sampling point is selected according to availability of seaweeds and seagrass accessibility of Arokkiyapuram coastal area(Fig.1).

Sampling period and procedure

Study was conducted for one year from December-2020 up to December-2021. Once in an every month, sampling was undertaken from the selected study location for ecological observations and for seaweed and seagrass collection. The time for making field trips was fixed accordingly the hours of low tides as predicted by the tide table. Ecological observations were made in the field itself, Samples are collected and kept into polythene bag with seawater. the photograph was taken in natural condition and in plastic tray with white back ground. 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. The seaweeds species identified using (Seaweeds-a field manual-NIO-Goa),Seaweeds of india nd Common seaweeds of India (Dinabandhu sahoo., et al., 2009). The collected seagrass were manually separated based on the genus and taxonomically identified by standard identification manual and tropical seagrass identification (Northern fisheries centre)



ISSN PRINT 2319 1775 Online 2320 7876

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Fig. 1 Map showing the study area of Arokkiyapuram, Kanyakumari coast, Tamil Nadu, India.

Result and discussion

Through the present work we obtained a considerable knowledge on various aspects of biodiversity and the current status of seaweed and seagrass communities in Arokkiyapuram, Kanyakumari coast, India Some of our result are mentioned below

A total number of 84 seaweed species were observed throughout the study period. Out of those, 29 species were Chlorophyceae, 16 species were Phaeophyceae, and 39 species were Rhodophyceae. The ratio of Chlorophyceae: Phaeophyceae: Rhodophyceae was 29:16:39. Thus species of red algae show more dominance in the seaweed flora at the coasts. Red algae grow better in the lower littoral zone and maybe more tolerant of the tropical environmental conditions. That may be the reason for the good growth of Rhodophyceae (red algae) as compared to Chlorophyceae of the Phaeophyceae. Chauhan (1994), Joshi and Murthy (2004), and Jha et al., (2009) also observed more number of Rhodhophycea compared to Phaeophyceae of the Chlorophyceae. During the diversity survey, economically important species like Ulva, Caulerpa, Sargassum, Padina, and Gracilaria were reported. Among them, Sargassum spp. was highly dominated followed by Gracilaria spp. During the survey, it is hypothesized that in general Green algae and Brown algae are observed during the months of the survey i.e. September to January while the majority of Red algae are found from January to March months. Results of the present study are satisfied with earlier reports of (Chauhan and Mairh,.1979) and (Domettila et al., 2013) along Muttom coastal waters of the southwest coast of India, Reddy et al., (2014) in seaweed resources of India, and (Naik et al., 2015) in Karwar Bay. A similar observation was recorded in the present investigation

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 11,S Iss 3, Dec 2022

also. (Ishakani et al., 2016) from the Veraval coast reported a total of 67 species comprises of 21 species of Chlorophyta, 14 species of Phaeophyta, and 32 species of Rhodophyta species which revealed that the results of the present study are much similar to earlier researchers During the survey on seagrass resources of Arokkiyapuram coast, 3 seagrass species under 5 genera were recorded (Table 1). Out of 3 species, *Syringodium isoetifolium, Cymodocea retundata* was found to be dominant. *Halophila ovalis* was found only in rare condition.

Table. 1 Taxonomic classification of seaweed species from Arokkiyapuram, Kanyakumari coast, Tamil Nadu, India.

S. No.	ORDER/FAMILY	
	ULVALES/ULVACEAE	**CHLOROPHCEAE**
1		*Enteromorpha compressa (L.) Nees*
2		*Enteromorpha flexuosa (Wulfen) J. Ag.*
3		*Enteromorpha linza (L.) J. Ag.*
4		*Ulva fasciata Delile*
5		*Ulva lactuca L.*
6	***CLADOPHORALES/CLADOPHORACEAE***	*Chaetomorpha antennina (Bony) Kutzing*
7		*Chaetomorpha media (C. Ag.) Kuetzing*
8		*Chaetomorpha crasassa Kuetzing*
9		*Cladophora vagabunda (L.) Van den Hoek*
10		*Cladophora fasicularis. Kutzing*
11	***CLADOPHORALES /SIPHONOCLADACEAE***	*Boodelea composita (Harvy)Brand.*
12	***CLADOPHORALES/ VALONIACEAE***	*Valoniopsis pachynema (Martens) Boergs*
13		*Halimeda macroloba Decaisne*
14		*Halimeda tuna (Ell. et. Sol.) Lamour*
15	***BRYOPSIDALES /CAULERBACEAE***	*Caulerpa chemnitzia (Esper) Web v Bosse*
16		*Caulerpa crassifolia (C. Ag.) J. Ag.*
17		*Caulerpa latevirens Montagne*
18		*Caulerpa microphysa Feldman*
19		*Caulerpa peltata Lamour*
20		*Caulerpa racemosa (Forssk.) Web. v. Bosse*
21		*Caulerpa scalpelliformis (R. Br.) Web. v.*
22		*Caulerpa taxifolia (Vahl.) C. Ag.*
23		*Caulerpa maxicana Kutzing*
24		*Bryopsis plumosa (Huds.) C. Ag.*
25		*Bryopsis pinnata*

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 11,S Iss 3, Dec 2022

26		*Codium arabicum kuetzing*
27	***BRYOPSIDALES /HALIMEDACEAE***	*Halimeda opuntia*
28		*Halimeda tuna*
29		*Halimeda macroloba*
		PHAEOPHCEAE
1	***ECTOCARPALES/DICTYOTACEAE***	*Dictyota dichotoma (Huds.) Lamouroux*
2		*Dictyota divaricata Lamouroux*
3		*Padina boergesenii Allender & Kraft*
4		*Padina pavonica (L.) Thivy ex Taylor*
5		*Padina tetrastromatica Hauck*
6		*Lobophora varigataLamourex*
7		*Stoechospermum marginatum (C. Ag.) Kutzing*
8		*Spatoglossum asperum J. Ag.*
9		*Spatoglossum variable Figari*
10		*Chnoospora implexa J. Ag*
11		*Colpomenia sinuosa (Mertens ex Roth) Derb. et Sol.*
		Rosenvingea intricata (J. Ag.) Boergesen
12	***FUCALES/CYSTOSEIRACEAE***	*Hormophysa cuneiformis*
13	***FUCALES/SARGASSACEAE***	*Sargassum linearifolium (Turner) C.Ag.*
14		*Sargassum ilicifolium (Turn.) J. Ag.*
15		*Sargassum tenerriumJ.Agarth*
16		*Sargassum wighti Grevile*
17		***RHODOPHYCEAE***
1	***NEMALIALES/LIAGORACEAE***	*Liagora ceranoides Lamouroux*
2	***GELIDIALES/ GELIDIACEAE***	*Gelidium micropterum Kuetz. A.*
3		*Gelidium pusillum (Stackhouse) Le Jolis*
4		*Gelidiella acerosa (Forssk.) Feldm. & Hamel*
5		*Cheilosporum spectabile (Harvey) Weber van Bosse*
6		*Jania rubens (L.) Lamouroux*
7		*Portieria hornemannii (Lyngbye) Silva*
8	***GRACILARIALES/GRACILRIACEAE***	*Gracilaria corticata J. Ag.*
9		*Gracilaria crassa (Harvey) J. Ag.*
10		*Gracilaria cylindrica Boergesen*
11		*Gracilaria edulis (Gmelin) Silva*
12		*Gracilaria fergusonii J. Ag.*
12		*Gracilaria foliifera (Forsskal) Boergesen*

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 11,S Iss 3, Dec 2022

14	***CRYPTONEMIALES/ CORYNOMORPHACEAE***	*Cryptonemia coriacea Schmitz*
15		*Cryptonemia lomation (Bertoloni) J. Ag.*
16	***CRYPTONEMIALES/HALYMENIACEAE***	*Grateloupia LITHOPHILA Borgesen*
17		*Grateloupia filicina (Wulf.) J. Ag.*
18		*Halymenia venusta Borgesen*
19	***CORALLINALES/CORALLINACEAE***	*Amphiroa anceps (Lamarck) Decaisne*
20		*Amphiroa foliacea Lamouroux*
21		*Amphiroa fragilissima (L.) Lamouroux*
22	***GIGARTINALES/HYPNEACEAE***	*Hypnea flagelliformis Greville ex J. Ag.*
23		*Hypnea musciformis (Wulf.) Lamouroux*
24		*Hypnea valentiae (Turner) Montagne*
25	***GIGARTINALES/SOLIERIACEAE***	*Sarconema scinaioides Boergesen*
26		*Solieria robusta (Grev.) Kylin*
27		*Coralina berteroi*
28	***RHODYMENIALES/CHAMPIACEAE***	*Champia indica Boergesen*
29		*Champia compressa Harvey*
30		*Champia glomerata Harvey*
31		*Rhodeminia sonderi Silva*
32	***RHODYMENIALES/RHODYMENIACEAE***	*Gelidiopsis variabilis (Grev.) Schmitz*
33	***CERAMIALES/CERAMIACEAE***	*Centroceras clavulatum (C. Ag.) Montagne*
34		*Ceramium diaphanum Roth*
35	***CERAMIALES/SPYRIDIACEAE***	*Spyridia hypnoides (Bory) Papenfuss*
36		*Spyridia filamentosa Harvey*
37	***CERAMIALES/RHODOMELACEAE***	*Laurencia obtusa (Hudson) Lamouroux*
38		*Laurencia papillosa (Forsskal) Greville*
39		*Laurencia pedicularioides Harvey*
	ORDER/FAMILY	***Name of the seagrass***
1	***ALISMATALES /CYMODOCEAE***	*Syringodium isoetifolium*
2	***LILIOPSIDA/ MAGNOLIOPHYTA***	*Cymodocea retundata*
3	***ALIAMATALES/ LILIOPSIDA***	*Halophila ovalis*

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 11,S Iss 3, Dec 2022

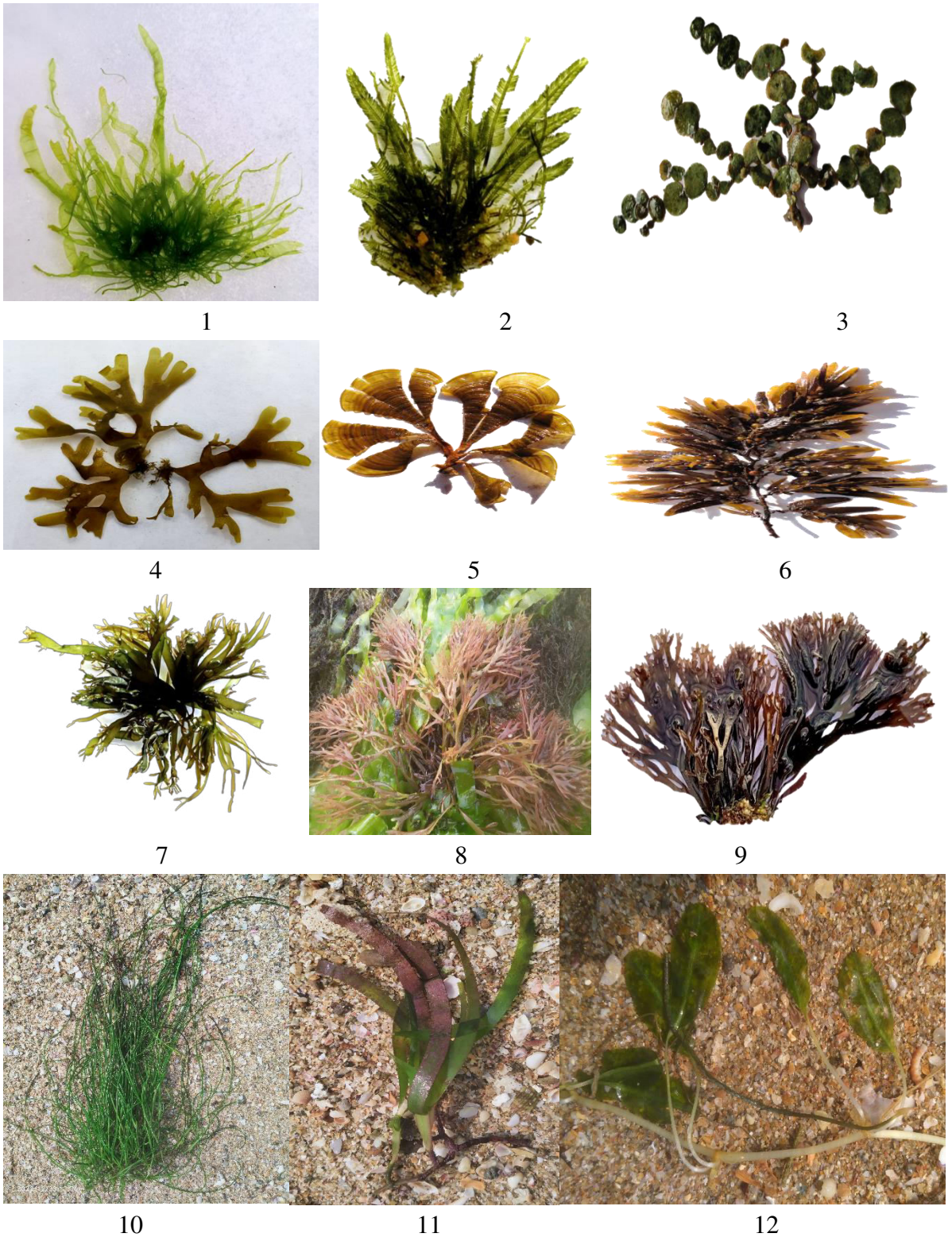

Fig. 2(1-9)-Some common Seaweeds and seagrass species photos collected from Arokkiyapuram, Kanyakumari coast, Tamil Nadu, India.

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 11,S Iss 3, Dec 2022

1. Chetomorpha crasa 2. Chetomorpha antennia 3. Caulerpa laetevirens 4. Lobora varigata 5. Stoechospermaum marginatum 6. Hormophysa cuneiformis 7. Padina pavonica 8. Gracilaria filicina 9. Laurencia obusta:Seagrass-10.Syringodium isoetifolium 11.Cymodocea rotundata 12.Halophila ovalis

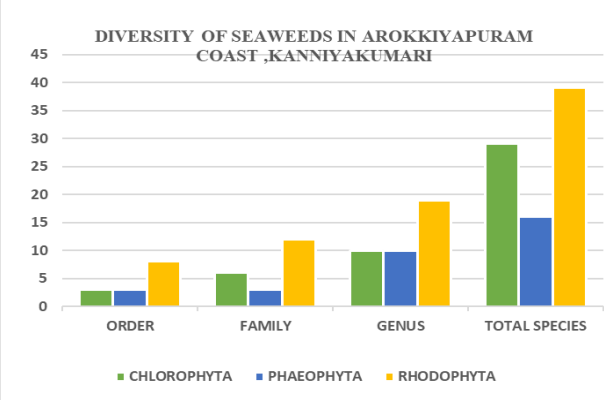

Fig. 3 - Percentage distribution of Seaweeds Seagrass species diversity at Arokkiyapuram, Kanyakumari coast, Tamil Nadu, India.

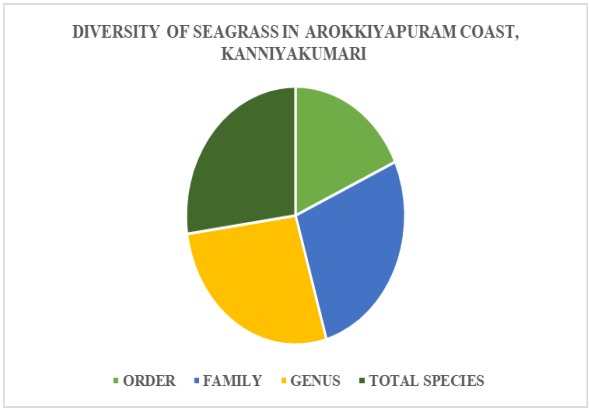

Fig. 3 - Percentage distribution of Seagrass species diversity at Arokkiyapuram, Kanyakumari coast, Tamil Nadu, India.

Taxonomic classification of collected seaweed species at coasts Taxonomically, a total of 84 seaweeds and 3 seagrass species belonging to 3 phyla (Chlorophyta, Phaeophyta, and Rhodophyta), 3 orders, 6 families,10 genus and 29 species belong to Chlorophyceae viz., *Bryopsis plumosa*, *Caulerpa racemosa*, *C. taxifolia*, *C.scalpelliformis*, *Ulva fasciata, U.lactuca, U.reticulate, Enteromorpha compressa, Halimeda tuna, H.macroloba, Codium indicum, Chaetomorpha sps, Chaetomorpha antennina, Valonia sps, Cladophora sps, Boodlea composita,* and *Vallonia sp*. In brown algae, 16 species,belongs to 3 order,3family and 10 genera- Cystoseira indica, Sargassum whigtii , *S. polycystum, S. tenerrimum, S. cinereum,*
S. johnstonii, Padina tetrastromatica, P.gymnospora, P.boergesenii, Spatoglossum asperum, In red algae, 39 species viz., *Acanthophora spicifera, Chondria armata, Ceramium rubram, Ceramium cruciatum, C. tenerrimum, , Champia indica, Gelidiella acerosa, Gelidium* pusillum, Gracilaria corticata, Gracilaria foliifera, Gracilaria salicornia, Halymenia venusta, Hypnea musciformis, Scinaia moniliformis, S.carnosa, belongs to 8 order,12 family and 19 genera. The collected seagrass were taxonomically classified into 2 order, 3 family, 3 genus (Fig.2) and 3species are *Syringodium isoetifolium, Cymodocea retundata and Halophila ovalis were* investigated in the coast (Fg.3)

The present study concluded that Arokiyapuram cost has a higher diversity of seaweeds and seagrass compared to the other coastal areas of Kanyakumari district. The

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coastal environment in the Kanniyakumari region especially along the Arokkiyapuram coast where anthropogenic activities were affected by the coastal ecological communities. The climatic change and global warming as well as anthropogenic activities will have considerable adverse impacts over natural resources particularly seaweeds. Seaweed diversity information could also provide a baseline for future more complex ecological studies, planning the conservation and sustainable use of inshore marine resources, useful as an indicator of climatic change and coastal management as well as applied aspects of the uses of seaweed.

CONCLUSION

As described above, the present work has increased our knowledge on the current status of seaweed and seagrass biodiversity in. For precise evaluation of the present status and future prediction of marine ecosystems, much more quantitative information on variability of seaweed and seagrass communities must be compiled. In this sense, new ecological observation on seaweed and seagrass will provide more efficient ground truth. Marine plants are usually archived as dried herbarium specimens. to clearly understand the present status of seaweed and seagrass communities; to know the changes of these communities by keeping monitoring them; to clarify the marine plant biodiversity in full details and to predict the future of the marine ecosystems in this region. Specimens for current and future investigations.

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