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The Distribution Of Seaweed Resources In Kanyakumari Coast, Tamil Nadu, India.

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Abstract

Seaweeds are a renewable marine resources and have not yet received considerable attention in the field of taxonomy in India as compared to their terrestrial counterparts, essentially due to the lack of awareness of their economic potential. Although the recent inventory from the Indian region documented the presence of approximately 865 seaweed taxa, of which only a few are taxonomically well characterized, more precise information still awaits with respect to microscopic and molecular examinations of many. Thus far, in terms of spatial extent, probably only a few of the total hospitable seaweed habitats have been explored, and large portions, including island territories and sub tidal waters, remain virtually untouched. Surveying those may lead to the reporting of several taxa new to science. Furthermore, more focused efforts are required to understand the endemic and endangered taxa which have high conservation implications. Considering the unprecedented pressures seaweeds are facing, including coastal pollution and human-induced global warming, it is critical to reinforce our knowledge of seaweed biodiversity. In the present communication, we intended to address the status of seaweed biodiversity in Kanyakumari coast. with the gaps, challenges, and opportunities.

Keywords: *Biodiversity, Conservation, Kanniyakumari, Seaweeds*

INTRODUCTION

Seaweeds refer to any large marine benthic algae that are multicellular, macro thallic and thus differentiated from most algae that are of microscopic size (Smith, 1944). These plants form an important renewable resource in the marine environment and have been a part of human civilization from time immemorial. The seaweed flora of India is highly diversified and comprises mostly of tropical species, but temperate and subtropical elements have also been reported. Seaweeds form one of the important living resources grouped under three classes namelyChlorophyceae (green algae), Phaeophyceae (brown algae) and Rhodophyceae (red algae). About 6000 species of red seaweeds 2000 species of brown seaweeds and 1200 species of green seaweeds occurred globally and the world production of seaweeds was estimated as 21,65,675 million tons per year (Kaliaperumal, 2007). The greatest variety of red seaweeds is found in subtropical and tropical waters, while brown seaweeds and green seaweeds are more common in cooler and temperate waters respectively (Dowes, 1981). Seaweeds form an important renewable resource in marineenvironment and have been a part of human civilization from time immemorial.

The first report on seaweed diversity was published by Iyengar (1927) on the flora of Krusadai Island, Southeast coast of India. Subsequently, Boergesen (1928) investigated the seaweeds of the west coast and

published a new record of Rosenvinge astellata Boergesen. Later Thivy (1948), Krishnamurthy (1957) and Umamaheswara Rao (1969) made substantial contributions to increase our knowledge of India's seaweed diversity. Oza and Zaidi (2001) updated the checklist of seaweed diversity based on secondary data and reported 844 species of seaweeds with 434, 194, and 216 species of red, brown, and green seaweeds, respectively. The CSMCRI team explored the seaweed diversity of the Gujarat and Tamil Nadu coasts (Jha et al. 2009) known for their relative abundance of seaweeds. These two maritime states, collectively, are home to 366 seaweed species that account for nearly half of India's total seaweed diversity.The climate change and global warming will have considerable adverse impacts over the natural resources of Tamilnadu. Tamil nadu is famous for its seaweeds diversity.There are only some studies on the distribution, frequency, density and abundance of seaweeds. Boergesen (1934) was the first researcher to have worked on the geographical distribution of some marine algae. Anand (1940, 1943) and Nizermuddin and Gessner (1970) also worked on the distribution, dominance and abundance of some seaweeds. 3 Saifullah (1973) listed out the abundance, biomasses variation and tidal variation of seaweeds. Qari (1985) worked on ecology and biochemical composition of seaweeds. The ecology of seaweeds is dominated by two specific environmental requirements. These are the presence of sea water and the presence of light sufficient to drive photosynthesis and another important common requirement is to have a firm point of attachment. Therefore, seaweeds are most commonly found in the littoral zone and within that zone more frequently on rock shores than on sand or shingle shore (Smith, 1944).

The southern coastal region of Tamil Nadu has rich seaweed diversity because it has a lot of rocky coastal regions which face several problems due to various environmental changes and human activities. In 2004, the Mannar Biosphere Reserve especially Kanyakumari and its neighboring places were disturbed by human activity. In the recent years the seaweed resources have been disturbed by Thermal Power Station at Thoothukudi and its surrounding areas. The construction of the Atomic Power Station at Koodankulam will definitely affect the diversity of seaweeds at nearby places such as Idinthakarai and Kootapuzhi. Seaweed resources of Rameswaram and its neighboringplaces may also be affected by Sethusamudram project. These developments necessitate a survey of seaweed resources along the coast of Tamil Nadu. Although a number of systematic surveys have been made on seaweed resources of the southern coastal region of Tamil Nadu, there is no proper documentation for the seaweed resources availability with reference to the seasons. There are only a few scattered reports about seaweed resources in the selected area of the southern coastal region of Tamil Nadu. All the previous studies carried out during the last 50 years are only from scattered localities with small area as follows: Kanyakumari region (Nair et al., 1993; Stella et al., 1997; Edwin, 2004), Tirunelveli region (Kaliaperumal and Pandian, 1984; Kaliaperumal et al., 1995; Selvaraj and Selvaraj, 1997), Thoothukudi region (Mahadevan and Nagappan, 1967; Krishnamurthy, 1980; Kaliaperumal and Pandian, 1984; Kaliaperumal et al., 1998) and Ramanathapuram region (Chacko et al., 1955; Varma and Krishna, 1962; Umamaheswara Rao, 1969; Krishnamurthy and Joshi, 1970; Subbaramiah et al., 1977; Kaliaperumal and Kalimuthu, 1994; Kaliaperumal et al., 1998). From such scattered and sporadic reports, the actual number of seaweeds is obscure from the southern coastal region of Tamil Nadu, because each and every researcher has given different number of seaweeds from the same locality.The study is carried out to accesses the basic status of seaweeds diversity occurring in kanyakumari. In this context, a study on seaweeds diversity along the coast of kanyakumari is undertaken. Although many studies have been undertaken to evaluate the species diversity of seaweeds in India, no scientific studies have been carried out on the species composition of seaweeds of kanyakumaritamilnadu; hence, the present study is undertaken.

METERIALS AND METHOD

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 December 2016 to November 2017.The specimens have been collected in the intertidal and sub tidal zones during the low tide when a large expanse of the shore was exposed. In this study, the specimens were collected along the intertidal and sub tidal zone of sampling location by snorkeling or wading through shallow water .Then, the specimens were put in the plastic bags or vials, washed in the seawater to remove any debris or attached

epiphytes. The vials or plastic bags were labeled with informative data such as the shape and colour of the specimens, substrate type, locality and date of the collected specimens. An image of the specimen had been captured using a digital camera or underwater digital camera to capture the specimen in its natural habitat. The specimens were undergoing preservation process where it was preserved in 4% formalin. Some specimens were also preserved as dry mounted specimens on herbarium sheets. Species identification follows standard taxonomic books and world's algae base at www.algaebase.org.

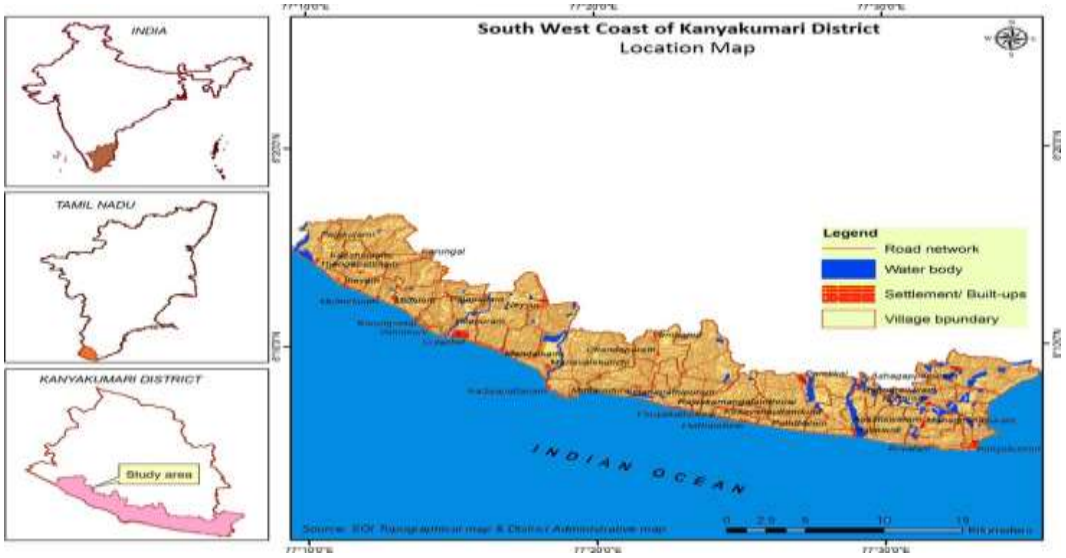

Fig.1.Map showing the study area of kanyakumari coast,Tamilnadu,India

RESULT AND DISCUSSION

A total number of 101 seaweed species were observed throughout the study period. Out of those, 31 species were Chlorophyceae, 20 species were Phaeophyceae, and 50 species were Rhodophyceae. The ratio of Chlorophyceae: Phaeophyceae: Rhodophyceae was 31:20:50. 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 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 (Table 1).(Fig.2)

Table1:Taxonomic classification of seaweed species from Kanniyakumari coast,Tamilnadu, India.

S.No.	**DIVISION : CHLOROPHYTA** **CLASS : CHLOROPHYCEAE**
	Order : Ulvales Family : Ulvacea
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	*Ulva reticulata Forssk.*

	Order : Cladophorales Family : Cladophoraceae
7	*Cladophora fasicularis (Bony) Kutzing*
8	*Chaetomorpha litorea Harvey*
9	*Chaetomorpha media (C. Ag.) Kuetzing*
10	*Chaetomorpha tortuosa Kuetzing*
11	*Chaetomorpha crasassa Kuetzing*
12	*Cladophora vagabunda (L.) Van den Hoek*
13	*Cladophora fasicularis. Kutzing*
	Order : Cladophorales Family : Siphonocladaceae
14	*Boodelea composita (Harvy)Brand.*
	Order : Cladophorales Family : Valoniaceae
15	*Valoni pachymia (Martens) Boergs*
	Order : Bryopsidales Family : Caulerpaceae
16	*Bryopsis plumosa (Huds.) C. Ag.*
17	*Bryopsis pennata*
18	*Bryopsis hypnoides*
19	*Caulerpa chemnitzia (Esper) Web v Bosse*
20	*Caulerpa latevirens Montagne*
21	*Caulerpa parvula Svedelius*
22	*Caulerpa peltata Lamour*
23	*Caulerpa racemosa (Forssk.) Web. v. Bosse*
24	*Caulerpa scalpelliformis (R. Br.) Web. v.*
25	*Caulerpa taxifolia (Vahl.) C. Ag.*
26	*Caulerpa microphysa Feldman*
27	*Caulerpa maxicana Kutzing*
	Order : Bryopsidales Family : Codiaceae
28	*Codium decorticatum*
	Order : Bryopsidales Family : Halimedaceae
29	*Halimeda macroloba*
30	*Halimeda opuntia*
31	*Halimeda tuna*
	DIVISION : PHAEOPHYTA **CLASS : PHAEOPHYCEAE**
	Order : Dictyotales Family : Dictyoceae
32	*Dictyota bartayresiana Lamouroux*
33	*Dictyota dichotoma (Huds.) Lamouroux*
34	*Dictyota divaricata Lamouroux*
35	*Dictyota pinnutifida Kutzing*
36	*Stoechospermum marginatum (C. Ag.) Kutzing*
37	*Hormophysa cuneiformis*
38	*Padina boergesenii Allender & Kraft*
39	*Padina pavonica (L.) Thivy ex Taylor*
40	*Padina tetrastromatica Hauck*
41	*Lobophora varigata Lamourex*
42	*Spatoglossum asperum J. Ag.*
43	*Spatoglossum variable Figari*
	Order :Scytosiphonales Family : Scytosiphonaceae
44	*Colpomenia sinuosa (Mertens ex Roth) Derb. et Sol.*
45	*Hydroclathrus clathratus (C.Ag)Howe*
46	*Rosenvingea intricata (J. Ag.) Boergesen*
	Order :Fucales Family : Sargassaceae
47	*Sargassum duplicatum C.Ag*
48	*Sargassum linearifolium (Turner) C.Ag.*
49	*Sargassum ilicifolium (Turn.) J. Ag.*
50	*Sargassum tenerriumJ.Agarth*
51	*Sargassum wighti Grevile*
	DIVISION : RHODOPHYTA **CLASS : RHODOPHYCEAE**
	Order :Halymeniales Family : Halymeniaceae
52	*Cryptonemia coriacea Schmitz*
53	*Cryptonemia lomation (Bertoloni) J. Ag.*
54	*Liagora ceranoides Lamouroux*
55	*Grateloupia filicina (Wulf.) J. Ag.*

56	*Halymenia floresia (Clem.) C. Ag.*
	Order :Gelidiales Family : Gelidiaceae
57	*Gelidium micropterum Kuetz. A.*
58	*Gelidium pusillum (Stackhouse) Le Jolis*
59	*Gracilaria corticata J. Ag.*
60	*Gracilaria crassa (Harvey) J. Ag.*
61	*Gracilaria cylindrica Boergesen*
62	*Gracilaria edulis (Gmelin) Silva*
63	*Gracilaria fergusonii J. Ag.*
64	*Gracilaria foliifera (Forsskal) Boergesen*
65	*Gracilaria kanyakumariensis Umamaheswara Rao*
	Order :Corallinales Family : Corallinaceae
66	*Amphiroa anceps (Lamarck) Decaisne*
67	*Amphiroa foliacea Lamouroux*
68	*Amphiroa fragilissima (L.) Lamouroux*
69	*Amphiroa rigida Lamouroux*
70	*Cheilosporum spectabile (Harvey) Weber van Bosse*
71	*Jania rubens (L.) Lamouroux*
72	*Portieria hornemannii (Lyngbye) Silva*
	Order :Gigartinales Family : Cystocloniaceae
73	*Hypnea flagelliformis Greville ex J. Ag.*
74	*Hypnea musciformis (Wulf.) Lamouroux*
75	*Hypnea valentiae (Turner) Montagne*
76	*Ahnfeltiopsis densa (J. Ag.) Silva et Decew*
	Order :Gigartinales Family : Solieriaceae
77	*Sarconema scinaioides Boergesen*
78	*Solieria robusta (Grev.) Kylin*
79	*Coralina berteroi*
80	*Jania ruben*
81	*Rhodeminia sonderi Silva*
82	*Botrycladia leptopoda (J.Agardh) Kylin*
	Order :Rhodymeniales Family : Rhodomeniaceae
83	*Gelidiopsis variabilis (Grev.) Schmitz*
	Order :Rhodymeniales Family : Champiaceaeae
84	*Champia indica Boergesen*
85	*Champia compressa Harvey*
86	*Champia glomerata Harvey*
87	*Champia parvula (Agardh) Harvey*
	Order :Ceramiales Family : Ceramiaceae
88	*Ceramium procumbens Setchell et Gardner*
89	*Centroceras clavulatum (C. Ag.) Montagne*
90	*Spyridia hypnoides (Bory) Papenfuss*
91	*Spyridia filamentosa Harvey*
92	*Griffithsia corallinoides (Linnaeus) Trevisan*
93	*Dictyurus purpurascens Bory*
94	*Enantiocladia prolifera (Greville) Falkenberg*
95	*Neurymenia fraxinifolia (Mertens) J. Ag.*
	Order :Ceramiales Family : Rhodomelaceae
96	*Acanthophora muscoides (L.) Bory*
97	*Acanthophora spicifera (Vahl.) Boergesen*
98	*Laurencia flagellifera J. Ag.*
99	*Laurencia obtusa (Hudson) Lamouroux*
10	*Laurencia papillosa (Forsskal) Greville*
101	*Laurencia pedicularioides Harvey*

Ulvafaciata

Cchaetomorphaantennina

Caulerba recemosa var turbinata

Colpomenia sinuosa

Champia indica

Fig.1.Some common Seaweeds and species photos collected from Kanyakumari coast, Tamil Nadu, India.

CONCLUSION

As described above, the present work has increased our knowledge on the current status of seaweed in kannyakumari coast. For precise evaluation of the present status and future prediction of marine ecosystems, much more quantitative information on variability of seaweed communities must be compiled. In this sense, new ecological observation on seaweed will provide more efficient ground truth. Marine plants are usually archived as dried herbarium specimens. To clearly understand the present status of seaweed 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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