

Distribution and diversity assessment of the marine macroalgae at four southern districts of Tamil Nadu, India

K. Sahayaraj^{1,*}, S. Rajesh¹, A. Asha¹, J. M. Rathi² & Patric Raja³

¹Crop Protection Research Centre, Department of Advanced Zoology and Biotechnology, St. Xavier's College (Autonomous), Palayamkottai – 627 002, Tamil Nadu, India,

²Department of Chemistry, St. Mary's College, Thoothukudi – 628 001, Tamil Nadu, India

³Department of Plant Biology and Biotechnology, St. Xavier's College (Autonomous), Palayamkottai – 627 002, Tamil Nadu, India

*[Email: ksraj42@gmail.com]

Received 16 July 2012 ; revised 17 December 2012

Present paper consists study on macroalgae seaweeds from Southern districts of Tamil Nadu viz., Kanyakumari, Tirunelveli, Tuticorin and Ramanathapuram. In total 57 taxa belonging to 37 genera representing Chlorophyta (18 taxa), Ochrophyta (14 taxa) and Rhodophyta (25 taxa) were recorded from 19 sampling sites during our study period (June 2009 to June 2010). Species wise, higher number of algae was recorded from Idinthakarai (84.21%). *Gracilaria corticata* has been distributed in 10 localities (= 52.63%). Among various localities, maximum (59%) and minimum (1%) species were recorded from Idinthakarai (Tirunelveli district) and Keelvaipaar (Tuticorin), respectively which situated in Bay of Bengal. Higher number of algae was recorded from the Bay of Bengal (67.7%) followed by Indian Ocean (25%) and Arabian Sea coasts (8%). *Caulerpa cupressoides*, *Caulerpa veravalensis*, *Chaetomorpha crassa*, *Galoxaura marginata*, *Hormophysa triquetra* and *Spyridia asperum* were recorded for first time from Tamil Nadu. This study contributes to the inshore marine macroalgae knowledge of these four coastal districts situated in Indian Ocean, Arabian Sea coasts and Bay of Bengal.

[**Keywords:** Seaweeds– Distribution, Peninsular Indian coast]

Introduction

Macroscopic marine algae, popularly known as seaweeds, constitute one of the important living resources of the ocean. They were found attached to the bottom, in relatively shallow coastal waters areas upto 180 meter depth, on solid substrate such as rocks, dead corals, pebbles, shells and plants. India, a tropical south Asian country has a stretch of about 7,500 km coastline, excluding its island land with 2 million km¹. The seaweed flora of India is highly diversified and comprises mostly of tropical species, in all, 271 genera and 1153 species of marine algae which include forms and varieties². However, a survey carried out in 2000 revealed less number of species (844) with similar genera number of 271³.

Tamil Nadu coast was first surveyed during 1971-1976, covering a distance of 320 Km from Rameshwaram and adjoining islands to Colachel by CSMCRI (Central Salt and Marine Chemicals Research Institute), in collaboration with Central Marine Fisheries Research Institute (CMFRI), Cochin and Department of Fisheries of Government of Tamil Nadu⁴. They reported that seaweeds have been distributed in 20,000 ha. Moreover, Tamil Nadu stands first in marine resources among all the states of India^{1,5}. To strengthen the diversity information's of the regional and sub-regional level with the preparation and publishing of seaweeds guide for identification both in the electronic as well as print media is essential⁶. In this study, we examined the occurrence and seasonal distribution of marine

*Author for correspondence

macroalgae from four Southern districts (Kanyakumari, Tirunelveli, Tuticorin and Ramanathapuram) of Tamil Nadu, India. A list of species is also presented.

Materials and Methods

The study area includes coastal regions of four southern districts of Tamil Nadu such as, Kanyakumari (5 localities), Tirunelveli (4 localities), Tuticorin (7 localities) and Ramanathapuram (3 localities) (Fig. 1). A total of 19 localities were selected from these four districts, and the seaweeds were recorded once in a month from July 2009 to June 2010. In each locality five to six areas were randomly selected (3×3 m each) for this study. Macroalgae samples were collected manually using transects method (1×1 m), from the submerged



Fig. 1—Map showing the marine macro algal seaweed collection sites located at four Southern districts of Tamil Nadu

Table 1—Macroalgal seaweeds taxa collected from various places of Kanyakumari, Tirunelveli, and Tuticorin and Ramanathapuram districts of Tamil Nadu, India

District	Location	Latitude and Longitude	Number of taxa
Kanyakumari	Manavalakurichi	N 08°08'30.8"E 077°18'09.7"	03 (06)
	Kadiapattinam	N 08°07'46.6"E 077°18'23.7"	04 (08)
	Muttam	N 08°07'27.5"E 077°18'48.8"	07 (13)
	Kanyakumari	N 08°04'39.8"E 077°33'01.8"	21 (39)
	Circular Fort & Leepuram	N 08°07'37.9"E 077°34'02.7"	18(34)
Tirunelveli	Kootapuli	N 08°08'44.2"E 077°36'02.5"	07(09)
	Idhinhakarai	N 08°10'32.3"E 077°44'31.3"	48(59)
	Kuthankuli	N 08°12'49.0"E 077°46'58.4"	23(29)
	Uvari	N 08°17'05.1"E 077°54'01.0"	02(03)
Tuticorin	Manapaad	N 08°22'28.5"E 077°03'54.6"	26(35)
	Tiruchendur	N 08°29'48.4"E 078°07'47.8"	08(11)
	Tuticorin-Harbour &Hare island	N 08°46'32.1"E 078°11'56.5"	25(34)
	Therkukalmaedu	N 08°56'37.5"E 078°11'55.0"	08(11)
	Jalli island	N 09°02'49.4"E 078°12'57.4"	04(05)
	Keelvaipaar	N 09°02'31.4"E 078°12'54.6"	01(01)
Ramanathapuram	Vaembaar	N 09°04'31.4"E 078°21'50.3"	02(3)
	Kizhakarai	N 09°02'31.4"E 078°12'54.6"	03(14)
	Mandapam	N 09°04'31.4"E 078°21'50.3"	15(68)
	Rameshwaram	N 09°13'34.7"E 078°47'03.2"	04(18)

Value in parentheses indicates in percentage with total algal population distributed with in the district

marine rocks, soft substratum, during low tide in the intertidal and sub-tidal regions.

Collections were made during dawn and morning hours (1-2 m) where the vegetation was discontinuous and also occurs in patches. Moreover, drift algae were also collected using disposable latex gloves in glass bottles and polythene bags. Fresh samples were preserved in 4% formalin. Voucher specimens and herbarium sheets were prepared and deposited in Crop Protection Research Centre, St. Xavier's College, Palayamkottai. Algal samples were micro photographed using Olympus camera (Model E-420) (Olympus Image Corporation, Japan). The algal specimens (both preserved and Herbarium) were identified at Central Salt and Marine Algal Research Station (CSMARS), Mandapam. We also referred AlgaeBase for the identification. In all sampling sites, the percentage cover of different algae was also recorded. Latitude and longitudes of the study areas were recorded using GPS- map 76 (GARMAN).

Data analysis

Specific species score of the localities (SSpLs) and species score of a locality (SSpL) (in %) were calculated for each species and locality by using the following formula:

Specific species score of localities (SSpLs) (in %) = Number of localities where species is present/Total number of localities studied \times 100 and

Species score of a locality (SSpL) (in %) = Number of species in a locality/Total number of algal species collected during study period \times 100

Number of species collected from each district was compared with unpaired student 't' test and significance was expressed at 5% level using the SPSS statistical software (Version 11.5). In addition, the Simpson's, Shannon – Wiener⁷, Berger–Parker and Evenness Indices⁸ were calculated using standard methods.

Results

In the studied area a total of 1050 specimens of seaweeds were collected by our team. Nineteen sampling sites at four regions of Tamil Nadu during

four different seasons [winter (January-February), summer (March-May), South West Monsoon (September-December) and North East Monsoon (June-August)] allowed us to record 57 taxa of marine algae (25 species of Rhodophyta, 18 Chlorophyta and 14 Ochrophyta) (Table 1; Fig. 2).

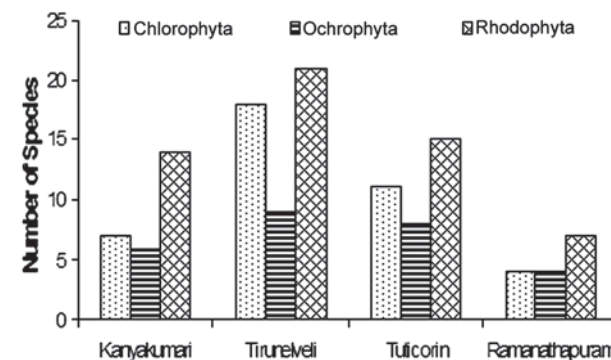


Fig. 2—Total numbers of marine macroalgal taxa belonging to different classes distributed at four districts of south Tamil Nadu coast

District-wise distribution

Tirunelveli district harbored a maximum of 48 taxa (SSpL = 84.21%) ($t = 1.69$; $p < 0.05$) with high Berger – Parker Index (0.615) followed by Tuticorin (SSpL = 54.64%), Kanyakumari (SSpL = 47.36%) and Ramanathapuram (SSpL = 26.31%) (Table 2, Fig. 3). In all districts, red algae dominated over green and brown algae. For instance, the red alga *Gracilaria*

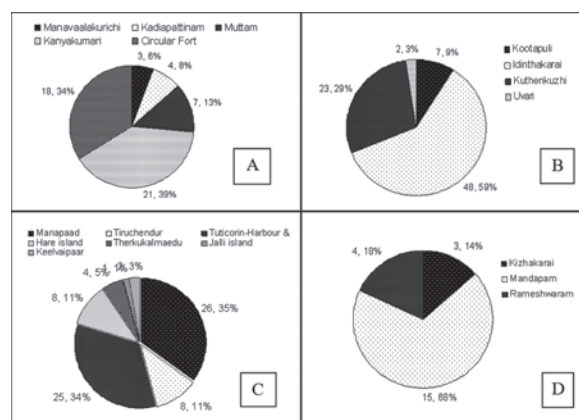


Fig. 3—Distribution of algal seaweeds taxa (%) in Southern districts of Tamil Nadu, A – Kanyakumari; B - Tirunelveli; C – Tuticorin; D - Ramanathapuram

Valoniaceae	<i>Valoniopsis</i>	<i>pachynema</i> (Martens) Børgesen©	X	X	✓	X	X	✓	X	✓	X	X	X	X	X	X	X	26.31
Scytosiphonaceae	<i>Chnoospora</i>	<i>fastigiata</i> J. Agardh©	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	5.27
Sargassaceae	<i>Hormophyssa</i>	<i>triquetra</i> (C. Agardh) Kützing©	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	5.27
	<i>Sargassum</i>	<i>wightii</i> Greville ©	X	X	✓	X	X	X	X	X	X	X	X	X	X	X	X	15.79
		sp 1©	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	15.79
		sp 2 ©	X	X	X	X	✓	X	X	X	X	X	X	X	X	X	X	26.31
		sp 3 ©	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	36.84
		sp 4 ©	X	✓	X	X	X	X	X	X	X	X	X	X	X	X	X	10.52
	<i>T urbinaria</i>	<i>ornata</i> Turner (J. Agardh) ©	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	21.10
Dictyotaceae	<i>Lobophora</i>	<i>variegata</i> (Lamouroux) Womersley ex Oliveira ©	X	X	X	✓	X	X	X	X	X	X	X	X	X	X	X	31.58
	<i>Padina</i>	<i>gymnospora</i> (Kützing) Sonder©	X	X	X	✓	X	X	X	X	X	X	X	X	X	X	X	26.31
		<i>pavonica</i> Linn. ©	X	X	X	✓	X	X	X	X	X	X	X	X	X	X	X	31.58
		<i>tetraspematica</i> Hauck ©	X	X	X	✓	X	X	X	X	X	X	X	X	X	X	X	26.31
	<i>Spatoglossum</i>	<i>asperum</i> J. Agardh ©	X	X	X	X	X	✓	X	X	X	X	X	X	X	X	X	26.31
	<i>Stoechospermum</i>	<i>marginatum</i> (C. Agardh) © Kützing	X	X	X	X	X	✓	X	X	X	X	X	X	X	X	X	36.84
Rhodomelaceae	<i>Acanthophora</i>	<i>spicifera</i> (Vahl) Børgesen ©	X	X	X	✓	X	X	X	X	X	X	X	X	X	X	X	10.52
	<i>Laurencia</i>	<i>ceylanica</i> J. Agardh ©	X	X	X	X	✓	X	X	X	X	X	X	X	X	X	X	15.79
	<i>Polysiphonia</i>	sp. ©	X	X	X	X	✓	X	X	X	X	X	X	X	X	X	X	10.52
	<i>Ceramium</i>	<i>truncatum</i> H.E. Petersen ©	X	X	X	✓	X	X	X	X	X	X	X	X	X	X	X	21.10
		sp. ©	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	5.27
	<i>Spyridia</i>	sp. ©	X	X	X	✓	X	X	X	X	X	X	X	X	X	X	X	15.79

Phylum: RHODOPHYTA

Order: Ceramiales

		Order: Corallinales																			
Corallinaeae	<i>Amphiroa</i>	<i>anceps</i> (Lamarck) Decaisne ©	X	X	X	√	√	√	X	√	X	X	X	X	X	X	X	X	X	26.31	
		<i>fragilissima</i> (L.) Lamouroux ©	X	X	X	X	√	√	X	X	X	X	X	X	X	X	X	X	X	X	10.52
	<i>Jania</i>	<i>adhaerens</i> Lamouroux ©	X	X	X	√	√	X	√	X	√	X	X	X	X	X	X	√	X	√	42.10
	Order: Gigartinales																				
Rhizophyllidaeae	<i>Chondrococcus</i>	<i>hornemanni</i> (Mertens) Fr. Schmitz ©	X	X	X	X	X	√	X	X	X	X	X	X	X	X	X	X	X	X	5.27
Cystocloniaceae	<i>Hypnea</i>	<i>valentiae</i> (Turner) Montagne ©	X	X	X	√	√	X	√	X	√	X	X	X	X	X	X	X	√	√	42.10
		<i>musciformis</i> (Wulfen) Lamouroux ©	X	X	X	√	√	X	√	X	√	X	X	X	X	X	X	X	X	X	21.10
		<i>sp.</i> ©	X	X	X	X	X	√	X	X	X	X	X	X	X	X	X	X	X	X	5.27
Solieriaceae	<i>Sarconema</i>	<i>filiforme</i> (Sonder) Kylin ©	X	X	X	X	√	X	√	X	√	X	X	X	X	X	X	X	X	X	10.52
	<i>Sarconema</i>	<i>sp.</i> ©	√	X	X	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	10.52
	Order: Nemaliales																				
Galaxauraceae	<i>Galaxaura</i>	<i>marginata</i> (Ellis & Solander) Lamouroux ©	X	X	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	5.27
Liagoraceae	<i>Liagora</i>	<i>ceranoides</i> Lamouroux ©	X	X	X	X	X	X	X	X	√	X	X	X	√	X	X	X	√	X	15.79
	Order: Gelidiales																				
Gelidiaceae	<i>Gelidium</i>	<i>pusillum</i> (Stackhouse) Le Jolis©	X	X	X	√	X	X	√	X	X	X	X	X	X	X	X	X	X	X	10.52
	Order: Gracilariiales																				
Gracilariaceae	<i>Gracilaria</i>	<i>corticata</i> J. Agardh©	X	X	√	√	√	√	X	√	√	√	√	X	X	X	X	X	X	X	52.63
		<i>corticata</i> var. <i>cylindrica</i> Umamaheshwara Rao©	X	X	X	X	X	√	X	X	X	√	√	X	X	X	X	X	X	X	15.79
		<i>edulis</i> (S.G. Gmelin) P.C. Silva ©	X	X	X	X	X	√	X	X	X	√	√	X	X	X	X	√	X	√	26.31
		<i>fergusonii</i> ('fergusonii') J. Agardh ©	X	X	X	√	X	X	√	X	√	√	X	X	X	X	X	X	X	X	26.31
		<i>foliifera</i> (Forsskal) Børgesen ©	X	X	X	√	X	X	√	X	√	X	√	X	X	X	X	X	√	√	26.31
		<i>verrucosa</i> (Hudson) Papenfuss ®	X	X	X	√	√	X	√	X	X	√	√	X	X	X	X	X	√	√	21.10
	Order: Halymeniales																				
Halymeniaceae	<i>Grateloupia</i>	<i>sp.</i> ©	X	X	X	X	X	X	X	X	X	X	X	X	√	X	X	X	X	X	5.27
	Overall Score (%)		5.26	7.01	12.29	36.84	31.57	12.29	84.21	40.35	3.50	45.61	14.03	43.85	14.03	7.01	1.75	3.50	5.26	26.31/7.01	

corticata J. Agardh was recorded in all districts dominating other algae (SSpLs = 52.63%), followed by the green alga, *Caulerpa scalpelliformis* (SSpLs = 47.37%). On the other hand, *Caulerpa cupressoides* (SSpLs = 5.27), *Caulerpa racemosa*, *Ceramium* sp., *Chondrococcus hornemanni*, *Cladophora fascicularis*, *Chnoospora fastigiata*, *Galaxaura marginata*, *Grateloupia* sp., *Hormophysa triquetra*, *Hypnea* sp. were found only in particular sites (Table 2). During the study period, 57, 21 and 7 species were recorded from Bay of Bengal, Indian Ocean and Arabian Sea, respectively (Fig. 4).

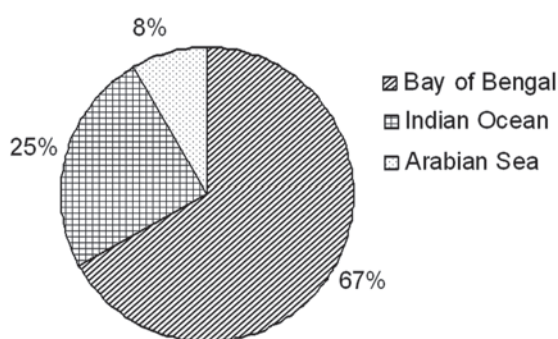


Fig. 4—Distribution of algal seaweed taxa (%) at Bay of Bengal, Indian Ocean and Arabian sea of Southern Tamil Nadu

Locality-wise distribution

Kanyakumari is the southern point of Indian peninsula; algae were abundant in Muttam (SSpL = 12.27%), Kadiapattinam (SSpL = 7.01%), Manavaalakurichi (SSpL = 5.26%), Kanyakumari temple and Vivekanandha Kendra. Muttam, Kadiapattinam and Manavaalakurichi are located in the Arabian Sea. A large number of huge boulders

act as excellent substrata for algae to attach and grow. However, this stretch is highly disturbed by human activity by pilgrims the temple and fishermen. *Bryopsis plumosa* and *Galaxaura marginata* were new records to these sites. *Bryopsis plumosa* was also recorded in Tirunelveli district (Idinthakarai and Kuthenkuzhi). Circular Fort (SSpL – 31.57%) is located between Kanyakumari and Idinthakarai harboring rich algal vegetation throughout the year. We recorded *Lobophora variegata* in Circular Fort; this was a new report for this site.

Idinthakarai (N 08°10'32.3', E 077°44'31.3') is a coastal village located about 40 km from Tiruchendur on the way to Cape Comorin. Idinthakarai has plenty of rocks that are completely submerged and exposed only during low tides on one side and rocks that are partially submerged even during high tides on other side. All these rocks host abundant algal vegetation. Considering all marine algae collection sites of Tamil Nadu, Idinthakarai is the best site for algae collection. We recorded 48 species (SSpL-84.21%) ($t=1.684$; $p<0.05$) from this locality which included Chlorophyta (35.41%), Ochrophyta (20.83%), and Rhodophyta (43.75%).

Next to Idinthakarai, Manapaad (N 08°22'28.5', E 077°03'54.6') has rich distribution of algae (SSpL-45.61%) ($t=1.680$; $p<0.05$); the wave action in this place is miraculous with shallow water in one area whereas its adjacent side has high wave action throughout the year. Tiruchendur shore is mainly sandy with outcrops of a few sandstone rocks. The rocks are completely submerged during high tides and are just exposed during low tide. These rocks host abundant algal vegetation. Minimum number of

Table 3—Total number of genera and taxa of marine algae belonging to different groups occurring at four districts of south Tamil Nadu Coast

Districts	Chlorophyceae		Phaeophyceae		Rhodophyceae		Total	
	Genera	Species	Genera	Species	Genera	Species	Genera	Species
	a	s	a	s	a	s	a	s
Kanyakumari	05	07	03	06	10	14	18	27
Tirunelveli	10	18	06	09	13	21	29	48
Tuticorin	07	11	06	08	10	15	23	34
Rameshwaram	02	04	04	04	05	07	11	15

Table 4—Seasonal influence on the distribution of Algal seaweeds in Southern districts of Tamil Nadu

Location	Season	Species	Number of species
Manavaalukurichi	Summer	<i>Gracilaria corticata</i>	01
Kadiapattinam	Summer	<i>Sargassum</i> sp.	01
Muttam	South West monsoon	<i>Enteromorpha fasciata</i>	01
	Summer	<i>En. fasciata, Sargassum</i> sp.	02
Kanyakumari	South West monsoon	<i>Sargassum</i> sp. <i>Sargassum wightii</i>	02
	North East Monsoon	<i>Sargassum</i> sp. <i>Sargassum wightii</i>	02
	Winter	<i>Sargassum</i> sp. <i>Sargassum wightii</i>	02
Circular Fort & Leepuram	South West monsoon	<i>Caulerpa scalpelliformis</i> , <i>Ceramium truncatum</i> <i>Chaetomorpha crassa</i> <i>Lobophora variegata</i> <i>Padina</i> <i>tetrastromatica</i>	05
	North East Monsoon	<i>Sargassum</i> sp.	01
	Summer	<i>Chaetomorpha crassa</i> , <i>Padina tetrastromatica</i>	02
Kootapuli	South West monsoon	<i>Sargassum</i> sp.	01
	Summer	<i>Amphiroa anceps, Chaetomorpha crassa</i>	02
Idinthakarai	South West monsoon	<i>Caulerpa scalpelliformis</i> , <i>Sargassum</i> sp., <i>Enteromorpha fasciata</i>	03
	Winter	<i>Caulerpa scalpelliformis, Caulerpa veravalensis</i>	02
	Summer	<i>Caulerpa scalpelliformis, Caulerpa veravalensis</i>	02
Kuthenkuzhi	South West monsoon	<i>Caulerpa scalpelliformis, Enteromorpha fasciata</i>	02
	Winter	<i>Caulerpa scalpelliformis, Caulerpa veravalensis</i>	02
	Summer	<i>Caulerpa scalpelliformis, Caulerpa veravalensis</i>	02
Uvari	South West monsoon	<i>Sargassum</i> sp.	01
Manapaad	South West monsoon	<i>Padina pavonica, Sargassum</i> sp.	02
	Winter	<i>Enteromorpha lactuca, Stoechospermum marginatum</i>	02
Tiruchendur	North East Monsoon	<i>Caulerpa scalpelliformis, Gracilaria corticata</i>	02
Tuticorin–Harbour & Hare island	South West monsoon	<i>Padina pavonica, Enteromorpha lactuca, Sargassum</i> sp.	03
	North East Monsoon	<i>Padina pavonica, Chaetomorpha crassa</i>	02
	Summer	<i>Padina tetrastromatica, Stoechospermum marginatum</i>	02
Therkukalmaedu	North East Monsoon	<i>Padina pavonica, Stoechospermum marginatum</i>	02
Jalli Island	North East Monsoon	<i>Padina pavonica, Stoechospermum marginatum</i>	02
Keelvaipaar	North East Monsoon	<i>Sargassum</i> sp.	01
Vaembaar	North East Monsoon	<i>Sargassum</i> sp.	01
Kizhakarai	Summer	<i>Sargassum</i> sp.	01
Mandapam	Summer	<i>Caulerpa scalpelliformis, Gracilaria corticata</i>	02
Rameshwaram	Summer	<i>Caulerpa scalpelliformis</i>	01

Winter-January to February; Summer -March to May; South West Monsoon -June to September, North East Monsoon - October to December

taxa was recorded in Keelvaipaar (SSpL-1.75%) (N 09°02'31.4', E 078°12'54.6') probably due to non-rocky shore habitat. *Gracilaria corticata* stands (52.63%) first with maximum number recorded in the studied sites with its prevalence in 10 sites among 19 sites followed by *C. scalpelliformis* (SSpLs - 47.37%). Jalli Island is situated approximately 20 kms from Keelvaipaar, it is surrounded by rocky sea shore, and it is free from human activities and industrial pollution. We recorded *Padina pavonica* from this site.

Season wise distribution

Caulerpa scalpelliformis was recorded during all four seasons at Circular Fort (N 08°07'37.9', E 077°34'02.7'), Kootapuli (N 08°08'44.2', E 077°36'02.5'), Idinthakarai, Kuthenkuzhi, Tuticorin, Therkukulmaedu, Tiruchendur and Mandapam. Similarly, *Caulerpa veravalensis*, *Chaetomorpha crassa* and *Sargassum wightii* were also recorded. *Sargassum wightii* were recorded in abundance from Kanyakumari; *C. veravalensis* in Idinthakarai and Kuthenkuzhi, *Chaetomorpha crassa* in Circular Fort. In all localities rocky shore prevails. *Chaetomorpha crassa* ($p < 0.05$) was found to be dominated over *Sargassum* sp., *Padina pavonica* from June to August 2009 at Tuticorin and Mandapam. *Padina tetrastromatica* was abundant in Circular Fort during March 2010. *Lobophora variegata* was recorded abundant in Circular Fort only during April 2010. Similarly, *Amphiroa anceps* was abundantly collected only in Kootapuli during April 2010. *Enteromorpha lactuca* was found abundant in Tuticorin (June to August 2009), *Enteromorpha fasciata* in Muttam, Idinthakarai and Kuthenkuzhi (September to November 2009) (Table 4). Intense

seasonal variations of macroalgae populations were observed among the four sampling periods.

Indices

Higher Shannon–Wiener Index, Simpson's Index and Evenness Index were recorded for Tuticorin district, whereas Berger–Parker Index was in favour of Ramanathapuram district (0.682) (Table 5).

Discussion

A total of 1050 specimens of macroalgae seaweeds were collected from 19 localities at four regions of Tamil Nadu during winter, summer, South West Monsoon and North East Monsoon. Recorded species belonged to Rhodophyta (25 taxa), Chlorophyta (18 taxa) and Ochrophyta (14 taxa). The red algae significantly dominated ($p < 0.05$) over green and brown algae, which indicates that the presence of the rocky coasts is essential for the attachment which is largely available in Tamil Nadu as observed in Orissa, East coast of India⁹. Presence of higher numbers of epiphyte algae was observed especially those of the genus of *Polysiphonia* (10.52%) and *Ceramium* (26.37%). Kumar *et al.*¹⁰ observed only *Enteromorpha lacuta* and *Valoniopsis pachynema* from Gulf of kutch at Gujarat.

We reported *Hypnea musciformis* from Cape Comorin, Idinthakarai, Kuthenkuzhi and Tuticorin which was also reported by Desikachary *et al.*¹¹ Similarly, *Ceramium truncatum* and *Acanthophora spicifera* were recorded in Kanyakumari districts¹¹. *Padina tetrastromatica* was found in Tuticorin district and Kanyakumari district¹². Therkukulmaedu and Jalli Island are located in Tuticorin district, to the best of our knowledge this is the first report for macroalgae.

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Table 5—Different indices for macroalgae distributed in Kanyakumari, Tirunelveli Tuticorin and Rameshwaram district of Tamil Nadu, India

Indices	Kanyakumari	Tirunelveli	Tuticorin	Ramanathapuram
Shannon – Wiener Index	1.360	0.874	1.610	0.842
Simpson's Index	0.297	2.119	3.817	1.934
Berger – Parker Index	0.396	0.615	0.342	0.682
Evenness Index	0.343	0.201	0.372	0.272

and west coast of India and other islands were studied by various authors. It is evident from our data that *Caulerpa scalpelliformis*, *C. veravalensis*, *C. crassa* and *S. wightii* were recorded throughout the year in Tamil Nadu. However, none of these macroalgae were recorded at Bhimili coast Visakhapatnam on the east coast of India between the latitudes 17°45'N and the longitudes 83°16' and 83°21' E¹³. Previously it was observed that *C. scalpelliformis*, *C. veravalensis* and *S. wightii* were drifted mainly during January, December and April-May from Gulf of Kutch at Gujarat (Northwest coast of India) indicating that the extensive drifting of seaweeds always occurs during the tail end of the seaweed growth period¹⁴.

Maximum number of red algae (21 taxa) was recorded in Idinthakarai followed by 18 green algae and only 9 brown algae these findings are also supported by Baluswamy¹⁵. He recorded 125 red algae (both micro and macro) from this locality. Similar reports were also stressed by Subbarao and Mantri¹. Coastal region of Idinthakarai is covered with rocky substratum which aids in the growth of algae. *Chnoospora fastigiata* and *Hormophysa triquetra* are new records to Idinthakarai. Shallow water in Idinthakarai, Manapaad is inhabited by rich distribution of algae especially *Padina pavonica*. *Liagora ceranoides* was reported from Manapaad coastal area it was not reported earlier by Desikachary *et al.*¹⁶ and Baluswamy¹⁵.

Macroalgae were distributed in 8 localities of Tuticorin district. These localities are having rocky, corals, and sandy habitats indicating that the distribution, dominance of algae needs diverse habitats. The finding of a new alien macroalgae in the study area (*Hypnea* sp.) seems to confirm that Tamil Nadu coast marine flora is probably at the first stages of serious alterations expected in few years. Therefore, the study of the already introduced alien macroalgae in Tamil Nadu as well as of those that will probably invade into the island in the coming years seems to be very important, so that their impact to indigenous benthic communities could be estimated.

Various species belong to the genus *Sargassum* was available in all seasons. *Caulerpa cupressoides*, *Caulerpa veravalensis*, *Chaetomorpha crassa*, *Galaxaura marginata*, *Hormophysa triquetra* and *Spyridia asperum* were recorded first time from Tamil Nadu. These distribution and diversity of macroalgae seaweed information should be helpful to collect specific algae for various kinds of studies in near future.

Acknowledgements

Authors KS, JMR and PR are grateful to MoES (Ref No. MRDF/01/33/P/07), Govt. of India for the financial support for this research works. Authors are thankful to Dr. Eswaran, Scientist Incharge, Central Salt and Marine Algal Research Station, Mandapam, for aiding in the identification of algae.

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