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MARINE ALGAE DIVERSITY AT COASTAL AREA OF VERAVAL, GUJARAT

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ABSTRACT

The Veraval coast situated at (20°54'30° N 76°21'20° E) the gulf of Kachchh, western coast of Gujarat, India. This site has a rich diversity of marine algae, corals and gastropods at intertidal region. The main aim of present study focusedon occurrence and diversity of marine algae at coastal site. The study carried outin month of December- 2019. Algae collection was done during low tide situation,at this condition algae were collected with their holdfast/rhizoid. Total 33 speciesof algae were collected from three different phylum. Among these maximum 18 species were recorded from red algae, 8 species were recorded from green algae and 7 species were recorded from brown algae.

INTRODUCTION

In the marine ecosystem, marine algae are a primary producer. They are developing the base of theaquatic food chain thus they are significant for the ecosystem and almost all aquatic animals depend on Primary producer (marine algae) (Hyynh and Seredial, 2006). The rapid growth of marine algae makes the important to every ecosystem that exists on the earth. Marine algae are divided into three types based on their pigments which absorb specific wavelengths and gave themthe particular colour of green, brown, and red the group is known as Chlorophyta, Phaeophyta, andRhodophyta (Dave *et al.,* 2019 and Muth *et al.,* 2019). The diversity of marine algae supports several other taxa and supply required ecosystem services in the coastal zone (Wernberg *et al.,* 2011). Generally, they found in the shallow part (Tahira, 2011) of the ocean because they need light to survive and grow in salt water. In India, marine algae grow abundantly in the coastal zoneof Gujarat, Tamilnadu, Andaman-nikobar and Lakshadweep (Rao and Mantri, 2006).

India's coastal zone is endowed with a wide range of mangroves, coral reefs, sea grasses, salt marshes, sand dunes, estuaries, lagoons, and unique marine and terrestrial flora and fauna. At about1600 km, Gujarat on the west coast has the longest coastline amongst the Indian states. The Gujaratcoast is having two gulfs, namely, Gulf of Kachchh and Gulf of Khambhat. Both of the Gulfs are highly diversified due to their varied coastal features including geomorphology, physiography, andcoastal processes. Total seven estuaries exist in Gulf of Khambhat and delivering large amount ofwater and sediments, whereas in Gulf of Kachchh riverine inputs are very little (GEER, 2004). InGujarat coast, seaweeds occur abundantly at Okha, Dwarka, Porbandar, Veraval, Diu and Gopnath(Kaliaperumal *et al.,* 1987 and 1995). The different coastal areas of India provide ideal habitat to the marine algae for their growth (Rao and Mantri, 2006). The first diversity of marine algae in India was carried out in 1970 and they had reported only 153 species belonging to 95 genera fromthe beach of Gujarat (Krishnamurthy and Joshi, 1970).

Marine algae are a rich source of minerals, macro, and micronutrient, protein, carbohydrate, vitamin, amino acid, etc. the extract of brown algae Laminaria showed anticoagulant and antibioticproperties (Anantharaman *et al.,* 2010). Macroalgae are used in thyroid disorders because they arethe source of trace nutrients in thyroid disorders (Schurch and Empt, 2007). Marine algae are always exhibit in harsh environment such as high temperature, salinity, uv-radiation, high oxygen concentration etc., the harsh condition promote the formation of oxidizing agents and secondary metabolites (Dang *et al.,* 2018), these type of compound can potentially link with biological systemand give significant pharmacological and nutraceutical properties (Gupta and Ghannam, 2011). The main objective of the present study is to check the diversity of marine algae at Veraval chowpati, Gujarat.

STUDY AREA

Biodiversity of marine algae was studied from Veraval coast and Veraval is situated on the westerncoast of Gujarat, India. The algae were collected in December month, 2019 during low tide schedule. Samples were collected at a minimum tidal height (0.28 meter) to get more exposure at the collection site. Firstly algae were quickly identified using reference photographic plate then collected in separate zip-locked plastic bags with labels. After that transported in wet condition tothe laboratory. The material was cleaned thoroughly to remove debris and other foreign materialsby repeated washing in water and again washed in distilled water and finally stored in 5% formalinin lab identified by using a standard taxonomic reference book (Jha *et al.,* 2010). Further all the samples were preserved in standard bottle with labels.

RESULTS

Total of 33 species of marine algae recorded at the coastal site of Veraval (Fig 2). Out of these 8 species were belongs to Chlorophyta phylum, 7 species belonged to Phaeophyta phylum, and 18 species belonged to Rhodophyta phylum (Table 1 and Fig 3). Among 8 species of Chlorophyta maximum species recorded from caulerpaceae (4 species) family followed by ulvaceae (1 species)family, bryopsidaceae (1 species) family, cladphoraceae (1 species) family, and Siphonocladaceae (1 species) family. Veraval coast has the least diversity for Phaeophyta phylum compared to Chlorophyta and Rhodophyta phylum. Total 7 species of Phaeophyta recorded at the study site, ofwhich maximum species recorded from dictyotaceae (5 species) family followed by sargassaceae(2 species) family. It was found that among the three groups of marine algae, the majority of algaecollected from rhodophya group. Red algae represent an as dominant group with 18 species from cystocloniaceae (5 species) family followed by gracillariaceae (3 species) family, corallinaceae (3 species) family, champiaceae (1 species) family, lomentariaceae (1 species) family, rhodymeniaceae (1 species) family, gelidillaceae (1 species) family, halymeniaceae (1 species) family, rhodomelaceae (1 species) family, and galaxuraceae (1 species) family (Table 1 and Fig 4). Generally, different groups of marine algae are found in zonation pattern but at Veraval coast,all three groups of algae are present in small puddles like structure, no zonation pattern was observed at collection site (Fig 5).

DISCUSSION

In present study the maximum 4 species collected from caulerpaceae family, 5 species collected from dictyotaceae family and 5 species collected from Cystocloniaceae family, were as the biodiversity study of marine algae from the Beyt Dwarka coast was conducted and they collectedmaximum 3 species from caulerpaceae family, 4 species collected from dictyotaceae family and 5species collected from gracilariaceae family (Kalsariya *et al.,* 2019). Similarly, a biodiversity studywas conducted from the Okha coast and collected a total of 39 species of marine algae from which,16 species from Chlorophyta, 10 species from Phaeophyta and 13 species from Rhodophyta phylum (Dave *et al.,* 2019).

CONCLUSION

The Veraval coast is a rich in diversity of marine algae; the rocky coast with many puddles gave the best support to marine algae for their habitat. This coastal site consists of three major orders bryopsidales, dictyotales and gigartinales. The higher diversity of red marine algae suggested thatthe ecosystem is healthy for the growth of red algae.

Table 1: List of algae recorded at coastal site of Veraval, Gujarat

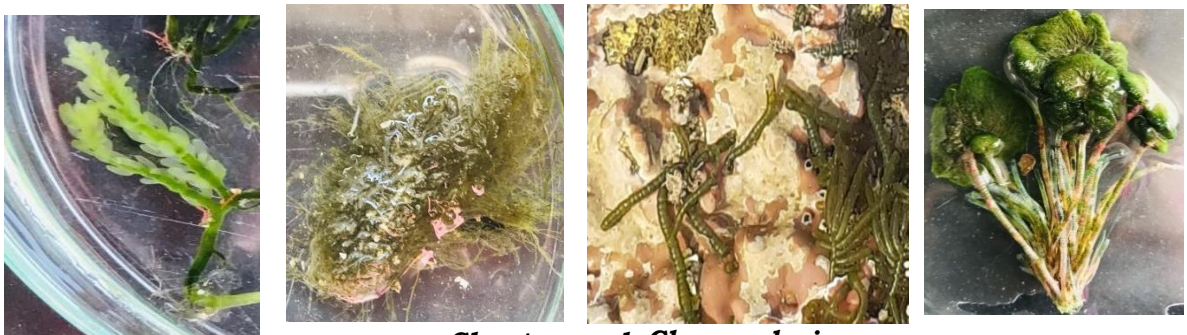
Sr. No.	**Group of Algae**	Scientific name **of algae**	**Order**	**Family**
1.		*Ulva conglubata* Kjellman	Ulvales	Ulvaceae
2.		*Bryopsis pennata* Lamouroux	Bryopsidales	Bryopsidaceae
3.		*Caulerpa racemosa*(Forsskal) J.Agardh	Bryopsidales	Caulerpaceae
4.		*Caulerpa scalpelliformis* (Brown ex Turner) C. Agardh var. *denticulate*	Bryopsidales	Caulerpaceae

		Borgesen		
5.		*Caulerpa sertularioides* (S. Genelin) Howe f. *brevipes* (J. Agardh) Svedelius	Bryopsidales	Caulerpaceae
6.		*Caulerpa veravalensis* (Thivy&Chauhan)	Bryopsidales	Caulerpaceae
7.		*Chaetomorpha spiralis* Okamura	Cladophorales	Cladophoraceae
8.	Chlorophyceae	*Chamaedoris auriculata Borgesen*	Cladophorales	Siphonocladaceae
9.		*Padina boergesenii* (Allender&Kraft)	Dictyotaceae	Dictyotales
10.		*Padina tetrastromatica* Hauck	Dictyotaceae	Dictyotales
11.		*Padina boryana* Thivy	Dictyotaceae	Dictyotales
12.		*Stoechospermum Marginatum* (C. Agardh) Kiitzing	Dictyotaceae	Dictyotales
13.		*Cystoseira indica* (Thivy&Doshi) Mairh	Sargassaceae	Fucales
14.		*Sargassum cinereum* J. Agardh	Sargassaceae	Fucales
15.	Phaeophyceae	*Sargassum cinctum* J. Agardh	Sargassaceae	Fucales
16.		*Amphiroa anceps* (Lamark) Decaisne	Corallinales	Corallinaceae
17.		*Coralline chilensis*	Corallinales	Corallinaceae
18.		*Jania cultrate* (Harvey)	Corallinales	Corallinaceae
19.		*Champia compressa* Harvey	Rhodymeniales	Champiaceae
20.		*Gelidiopsis variabilis* (J. Agardh) Schmitz	Rhodymeniales	Lomentariaceae
21.		Rhodymenia sonderi P. Silva	Rhodymeniales	Rhodymeniaceae
22.		*Gelidiella acerosa* (Forsskal) Feldmann and Hamel	Gelidiales	Gelidiellaceae
23.	Rhodophyceae	*Gracilariasalicornia* (C. Agardh)Dawson	Gracilariales	Gracilariaceae
24.		*Gracilaria corticata* (J. Agardh)	Gracilariales	Gracilariaceae
25.		*Gracilaria foliifera* (forsskal) Borgesen	Gracilariales	Gracilariaceae
26.		*Halymenia Porphyraeformis* Parkinson	Halymeniales	Halymeniaceae
27.		Hypnea esperi Bory de saint-Vincent	*Gigartinales*	Cystocloniaceae
28.		Hypnea musciformis (Wulfen) Lamouroux	*Gigartinales*	Cystocloniaceae
29.		Hypnea pannosa J. Agardh	*Gigartinales*	Cystocloniaceae
30.		Hypnea valentiae (Turner) Montagne	*Gigartinales*	Cystocloniaceae
31.		Hypnea spinella (C. Agardh) Kiitzing	*Gigartinales*	Cystocloniaceae
32.		Laurenci apapillosa (C. Agardh) Greville	*Ceramiales*	Rhodomelaceae

33.		Tricleocarpa fragilis (Linnaeus) Huisman and Townsend	*Galaxauraceae*	Nemaliales

Fig 1: Location of marine algae collection. A. Map showing coastal site. B. Map showing Veravalbeach C. Collection site

Ulva Caulerpa Caulerpa Caulerpa scalpelliformis



Caulerpa veravalensis ***Bryopsi*** ***Chaetomorph*** ***Chamaedoris***

Cystoseira indica

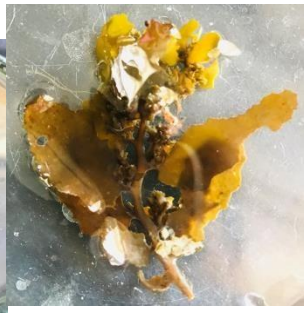
Padina boergesenii

Padina

o

m

Padina boryan



Sargassum cinctum ***Sargassum*** ***Stoechospermum***

Amphiroa anceps ***Coralline chilensis*** ***Jania cultrate*** ***Champia compressa***

Gelidiopsis Rhodymenia Gelidiella acerosa Gracilaria



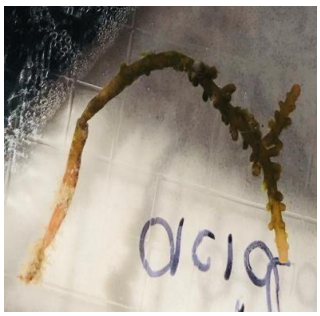
Gracilaria

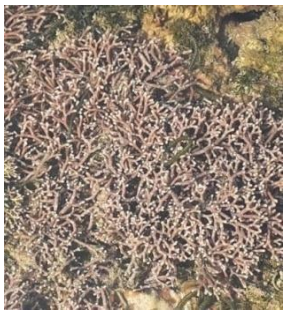
Hypnea musciformis
Gracilaria foliifera

Hypnea pannosa
Halymenia


Hypnea valentiae
Hypnea esperi

Hypnea spinella





Laurencia papilosa Tricleocarpa

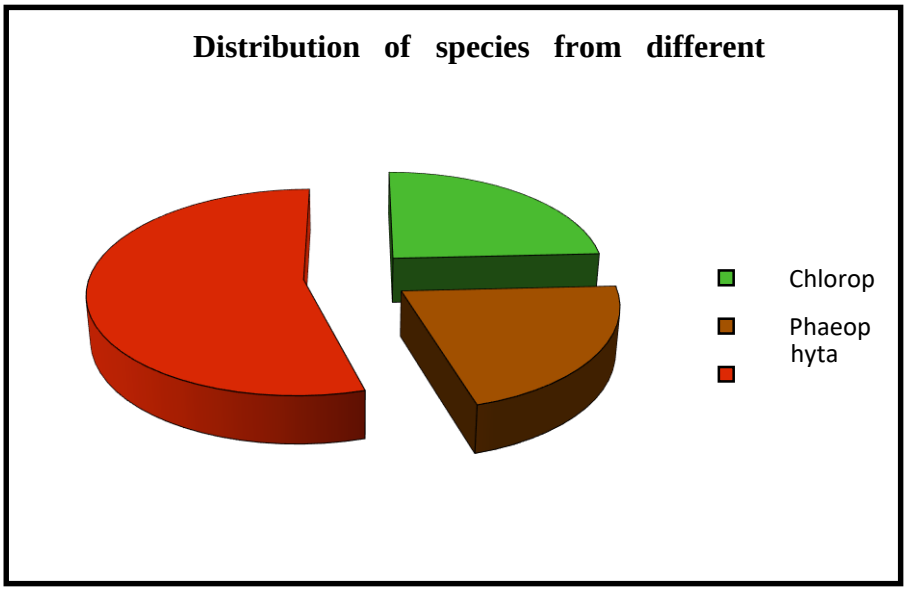


Fig 3: Distribution of collected marine algae from Veraval coast

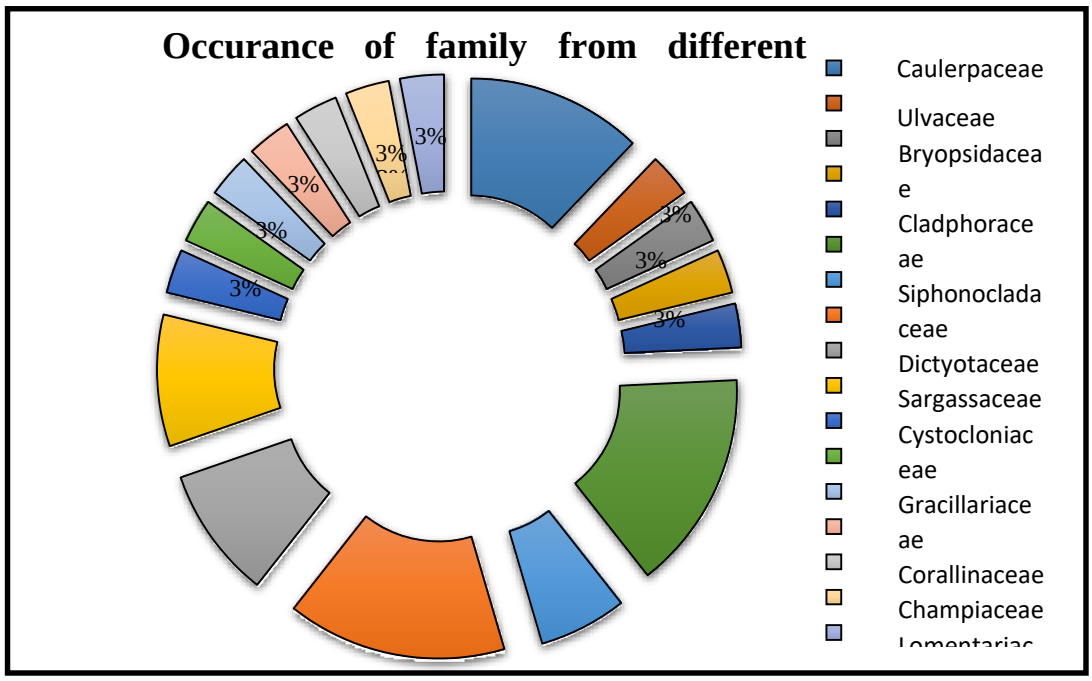


Fig 4: Occurrence of different family from collected marine algae.

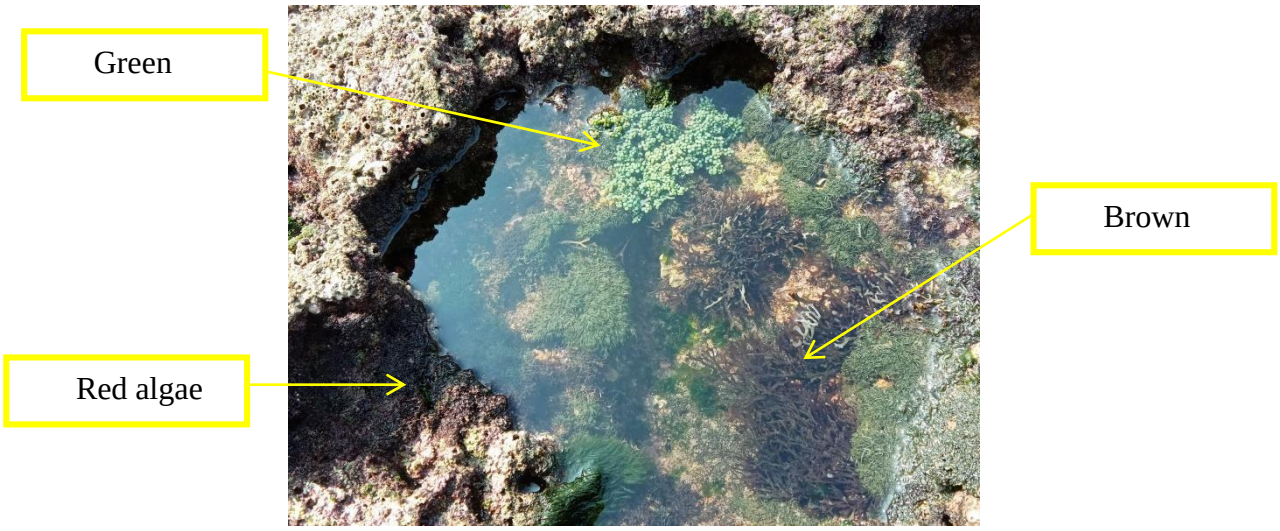


Fig 5: Habitat of marine algae in small puddle.

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