Scientific Research Publishing

Open Journal of Ecology, 2024, 14, 747-753
https://www.scirp.org/journal/oje
ISSN Online: 2162-1993
ISSN Print: 2162-1985

Caulerpa J. V. Lamouroux (1809) (Chlorophyta: Bryopsidales) Species and Sites in Eastern Samar, Central Philippines

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How to cite this paper: Ciasico, M.N.A. (2024) Caulerpa J. V. Lamouroux (1809) (Chlorophyta: Bryopsidales) Species and Sites in Eastern Samar, Central Philippines. *Open Journal of Ecology*, **14**, 747-753.
https://doi.org/10.4236/oje.2024.1410043

Received: August 27, 2024
Accepted: October 9, 2024
Published: October 12, 2024

Abstract

A descriptive survey was conducted in Eastern Samar to identify the Caulerpa species, sites where these species exhibit massive populations, and the most preferred edible species. Results revealed that only four of the eleven species, *C. racemosa, C. lentillifera*, *C. chemnitzia var. peltata*, and *C. cylindracea*, have massive populations; The four Caulerpa sites are the municipalities of Arteche, Guiuan, Salcedo (Matarinao Bay) and Quinapondan, and species *C. racemosa, C. lentillifera*, and *C. chemnitzia var. peltata* are most preferred edible species which are considered in the local diet. The study concludes that the distribution of Caulerpa in Eastern Samar is area-specific and should therefore be considered in resource planning and management, particularly in relation to aquaculture.

Keywords

Caulerpa Species, Caulerpa Sites, Caulerpa Massive Populations, Edible Species, Central Philippines

1. Introduction

Caulerpa (green seaweed) is one of the common edible and nutritious substances that have the potential for bioactive and medical applications [1]-[4]. The species is common in almost any type of substrate, from sandy-coralline-rubbles to sandy-muddy substrate, in shallow intertidal to subtidal areas [5]-[7]. Considering the species as one of the salad dishes in the coastal regions of the country [8]-[10], harvesting of Caulerpa provides an alternative source of income similar to the other crops that have a specific market in coastal communities.

Caulerpa is widely distributed in the Philippines, *i.e.* Central Visayas [10]-[14], Luzon [6] [15], and Mindanao [9] [16]. Locally, in Eastern Samar, three Caulerpa

species were reported from the southern region [17]-[19]. Considering that the whole stretch of the province is a coastal area from north to south, that the species has a wide range of adaptability relative to substrate, salinity and temperature; and the availability of the local market, a study is necessary to document the status of the resource and to identify feasible economic but sustainable opportunities. Generally, the objective of the study is to describe the aquaculture potential of Caulerpa in the province, considering the specific area with massive populations and the most preferred edible species. The results of this study are delimited to the natural populations observed in the months of April to June 2023.

2. Methods

Matarinao Bay and Guiuan in the southern region of the province were pre-identified collection sites [19], while the other sites were identified based on secondary data. Validation was done through a site survey and collection of samples with the guide of at least two Caulerpa collectors. The indicator of massive population was based on the area of 100 sqm with 50% cover (category 5) using the line transect-quadrat method (Saito & Atobe, 1970) with modifications by Ganzon-Fortes (2011) [20].

Voucher samples were collected and were initially identified on-site based on morphological characters (frond type and shape or presence and absence of ramuli) [8] [6] [9] [21] [22]. Images of the species were photographed before they were stored in plastic bags for further identification. An informal interview on the most preferred species for local consumption was conducted with at least 30 to 50 residents per sampling site.

3. Results

The natural communities of Caulerpa in the province were widely observed in varied substrates, from sandy-rocky rubbles to sandy muddy and muddy, from intertidal to subtidal areas. The survey revealed five coastal areas in the province with a natural population of Caulerpa, Guiuan, and Salcedo in Matarinao Bay (south), Borongan (center), Quinapondan (west), and Arteche (north). However, the percentage of coverage of the Caulerpa area in Borongan was below 50%; hence, it was not included in the sampling sites.

The five locations revealed a total of 11 Caulerpa species, with four variations of fronds, as described in **Table 1**.

Of the 11 species observed in this study, nine were common to other regions [23] [24], except *C. chemnitzia* and *C. cylindracea*. Similarly, *C. cylindracea* was the only species with no report suggesting the first observation in the area. Other species observed in the Eastern Islands of Guiuan [17]-[18] were absent, which suggests seasonality [25].

The two sites in the south, Guiuan and Salcedo (Matarinao Bay) are both located along the Pacific Ocean. Though there were seven more species observed in Guiuan, similar species were observed with massive populations. Other species were observed in association with the two dense populations of *C. racemosa* and *C. lentillifera*.

These species were the most common in the sites, except in Quinapondan.

The distribution of Caulerpa species is attributed to the ecological features of the collection sites [26]. The number of edible species, population status, and the most preferred species in the local diet are listed in Table 2.

Table 1. The observed caulerpa species in Eastern Samar.

	Caulerpa species	Fronds	Structure/arrangement of ramuli	Reference
1	*C. chemnitzia* (Esper) J.V. Lamouroux	Grape	Clavate, convex, radially crowded	[27] [9]
2	*C. cylindracea* Sonder	Grape	Spherical, complanate	[27]
3	*C. lentillifera* J. Agardh 1827	Grape	Globose to turbinate, constricted at the base, radially crowded	[2] [8]
4	*C. racemosa* (Forsskål) J. Agardh 1873	Grape	Vesiculate, radially crowded	[8]
5	*C. macrophysa* (Kützing) G. Murray 1887	Grape, short	Stout, vesiculate	[21]
6	*C. microphysa* (Weber-van Bosse) Feldmann 1955	Grape	Globular, thin radially crowded	[21]
7	*C. peltata* (*Synonym: C. chemnitzia var. peltate* J.V. Lamouroux) Zanardini 1858	Grape	Disc/peltate, fleshy	[28] [27]
8	*C. lamourouxii* (Turner) Weber-van Bosse 1898	Flat	Sinuous, ramuli variable in Occurrence or often absent	[21] [27] [23]
9	*C. brachypus* Harvey 1860	Flat	Absent	[21]
10	*C. serrulata* (Forsskål) J. Agardh 1837	Toothed	Absent	[21]-[22]
11	*C. sertularoides* (S. G. Gmelin) M. A. Howe 1905	Feather	Absent	[21]-[22]

Table 2. List of species observed in the area, identified according to their edibility and status of the population. Massive population is indicated with "√ √"; presence is indicated with "√"; while "x" for absence.

	Caulerpa species	Sampling sites			
		Arteche	Salcedo (Matarinao Bay)	Guiuan	Quinapondan
1	*C. racemosa*	√ (edible)	√√ (edible; most preferred)	√ √ (edible; most preferred)	x
2	*C. lentillifera*	x	√√ (edible; most preferred)	√ √ (edible; most preferred)	x
3	*C. microphysa*	x	x	√ (edible; most preferred)	x
4	*C. cylindraceae*	√	x	x	√√ (edible)
5	*C. chemnitzia var. peltata*	√ √ (edible; most preferred)	x	x	x
6	*C. chemnitzia*	√√	x	x	x
7	*C. lamourouxii*	√	x	x	x
8	*C. sertularoides*	√	x	√	√
9	*C. serrulata*	x	√	√	x
10	*C. macrophysa*	x	√	√	x
11	*C. brachypus*	x	x	√	x
	Total number of species	6	4	7	2

4. Discussion

With the wide range of substrate preferences, species vary among these sites. Likewise, species with dense populations differ in each region. The distribution of species could be attributed to the water parameters and substrate relative to the location and the adjacent benthic communities. The presence of seaweed was positively correlated to the diversity of macroalgae and negatively to that of sessile invertebrates, suggesting that the species can take advantage of habitat degradation [29]. The species were observed growing densely in areas along with degraded coral rubbles with Halimeda (green seaweed) population at a depth of three meters. *C. cylindraceae* formed massive populations in Quinapondan. The site has a low water quality with muddy silt substrate between two mangrove communities protected from strong water currents and wave action. The species can adapt to low temperatures and colonize in urbanized areas, suggesting that anthropogenic activities might enhance algal diffusion [30]. Most of the species were observed in the northernmost and the southernmost regions of the province, which can be attributed to the salinity [31] [32], with maximum specific growth rate (SGR) of *C. lentillifera* occurring at a salinity of 35 ppt. Of the five sites, only Quinapondan has the lowest salinity of 30 ppt, and the type of substrate best for *C. racemosa* was sandy mud substrate [5] and muddy clay for *C. lentillifera* [33]. However, the levels of nitrate, phosphate, and ammonia drive the distribution and growth of species [34].

5. Conclusion and Recommendation

Caulerpa species is widely distributed in the coastal area of Eastern Samar. However, the distribution of species with massive natural populations differs in the four sites. *C. racemosa*, *C. lentillifera* and *C. cylindracea* were the species observed with massive populations in the south, while *C. chemnitzia* and *C. chemnitzia var. peltata*. and *C. lamourouxii* in the north. Of the five edible species, only four were the most preferred species by the local consumers for their local diet. For economic ventures, the four Caulerpa sites should be considered with respect to the identified species with massive natural populations, and the most preferred species by the consumers.

Acknowledgements

The researcher is grateful for the support of the University, the Caulerpa collectors, and the survey respondents.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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