

Abundance and Harvest of *Caulerpa racemosa* (lato) at Siquijor Island, Central Visayas, Philippines*

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ABSTRACT. The abundance and harvest of edible *Caulerpa racemosa* at Siquijor Island; central Philippines, were surveyed. The *C. racemosa* community occupied an area of about 0.9 km² (90 ha), where 13 families harvest a total of 60 baskets daily, each weighing (wet) 30-40 kg and selling at ₱8.00/basket. The area yields an annual harvest of 21,900 baskets (657,000-876,000 kg wet weight) valued at a minimum of ₱175,200. Greatest values for standing crop and biomass (0.734 kg/m²; 1.123 kg/m² wet weights) were taken from depths of 0.5 to 1.0 m in the lower intertidal, approximately 160 m from shore, where the substrate was mud.

Of the fifty-three taxa of *Caulerpa* reported from the Philippines, twenty occur in the central Visayas (Meñez and Calumpong 1982), the most important economically being *C. lentillifera*, *C. microphysa* and the different varieties of *C. racemosa*. These "grapelike" representatives of *Caulerpa* are eaten in most parts of Asia as an appetizer in the form of salad.

In certain parts of the Philippines, like Lingayen Gulf in Luzon and Mactan Island in Cebu, edible *Caulerpa* is farmed in ponds for local consumption and for export to Japan. The harvests and potential of this farming have been documented (Horstmann 1978; Sotto 1978). In other parts of the country, *Caulerpa* is harvested from its natural habitat. This paper reports on the abundance and harvest of wild *C. racemosa* at Siquijor Island.

Study Area

Located off the island of Negros in the central Visayas, Siquijor Island is characterized by wide intertidal areas generally dominated by seagrass communities fringed with coral reefs (Fig. 1). Eleven species of *Caulerpa* (*lato* in the Cebuano language) grow abundantly on the island's northwestern side, particularly in the adjacent barrios of Pasiha-gon, Tambisan, Cang-alwang and Solongon, where the substrate is generally mud.

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combination of transect and point was used to determine the status of the Central Visayas standing crop and biomass. Data on the amount of harvested, selling price and type of harvesting were

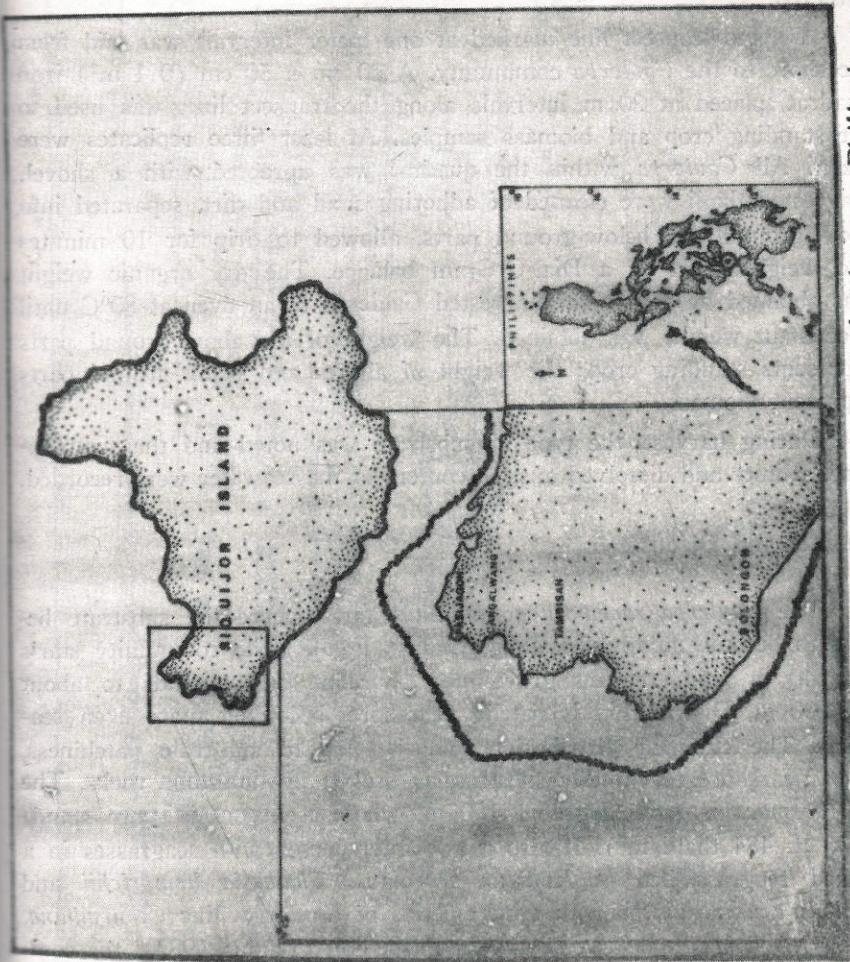


Figure 1. Study site. Siquijor Island, Central Visayas, Philippines.

county water... the... and extend to 250-400 m. It is most dense at 10-20 m. Within the substrate is mud and water depth ranges from 0.5 to 1 m at low tide. Water clarity at the time of sampling ranged from 31 to 33 parts per thousand; water temperature was 26.7-27.0°C and dissolved oxygen varied between 11.50 and 12.75 parts per million.

Methods

A combination of transect and quadrat was used to determine the extent of the *Caulerpa* community, standing crop and biomass. Data on the amount of harvest/day, selling price and type of harvesting were gathered.

A nylon transect line marked at one meter intervals was laid from the shore to the *Caulerpa* community. A 20 cm x 50 cm (0.1 m²) iron quadrat, placed at 20 m intervals along the transect line, was used to get standing crop and biomass samples. At least three replicates were taken. All *Caulerpa* within the quadrat was uprooted with a shovel. Harvested thalli were cleaned of adhering sand and dirt, separated into above-ground and below-ground parts, allowed to drip for 10 minutes and weighed wet on a Dial-O-Gram balance. The dry organic weight was obtained by drying the harvested *Caulerpa* in an oven at 80°C until a constant weight was obtained. The weight of the above-ground parts represents standing crop; the weight of above- and below-ground parts represent biomass.

During harvest, the type of substrate was noted and the temperature, salinity and dissolved oxygen content of the seawater were recorded.

Results and Discussion

The *Caulerpa racemosa* community starts where the substrate begins to become muddy. In Cang-alwang (Fig. 2) the community starts 130-140 m from the mangrove-lined shoreline and extends to about 400-600 m. Distribution is patchy nearshore, becoming more even seaward. The clumped distribution may be due to substrate patchiness, since nearshore the muddy substrate is broken by limestone rocks. The *C. racemosa* is most dense at 160 m, where it occurs in pure stands (773 ± 484 thalli/m²). It also grows interspersed with seagrasses in a mixed seagrass bed of *Enhalus acoroides*, *Thalassia hemprichii* and *Halodule uninervis* or with other species of *Caulerpa*, like *C. urvillana*, *C. sertularioides* and *C. taxifolia*. In Pasihagon (Baguio 1983), the community starts 20-60 m from the shoreline and extends to 300-600 m. It is most dense at 150-250 m, where the substrate is mud and water depth ranges from 0.5 to 1 m at low tide. Water salinity at the time of sampling ranged from 31 to 33 parts per thousand; water temperature was 26.5-27°C and dissolved oxygen varied between 14.76 and 18.27 parts per million.

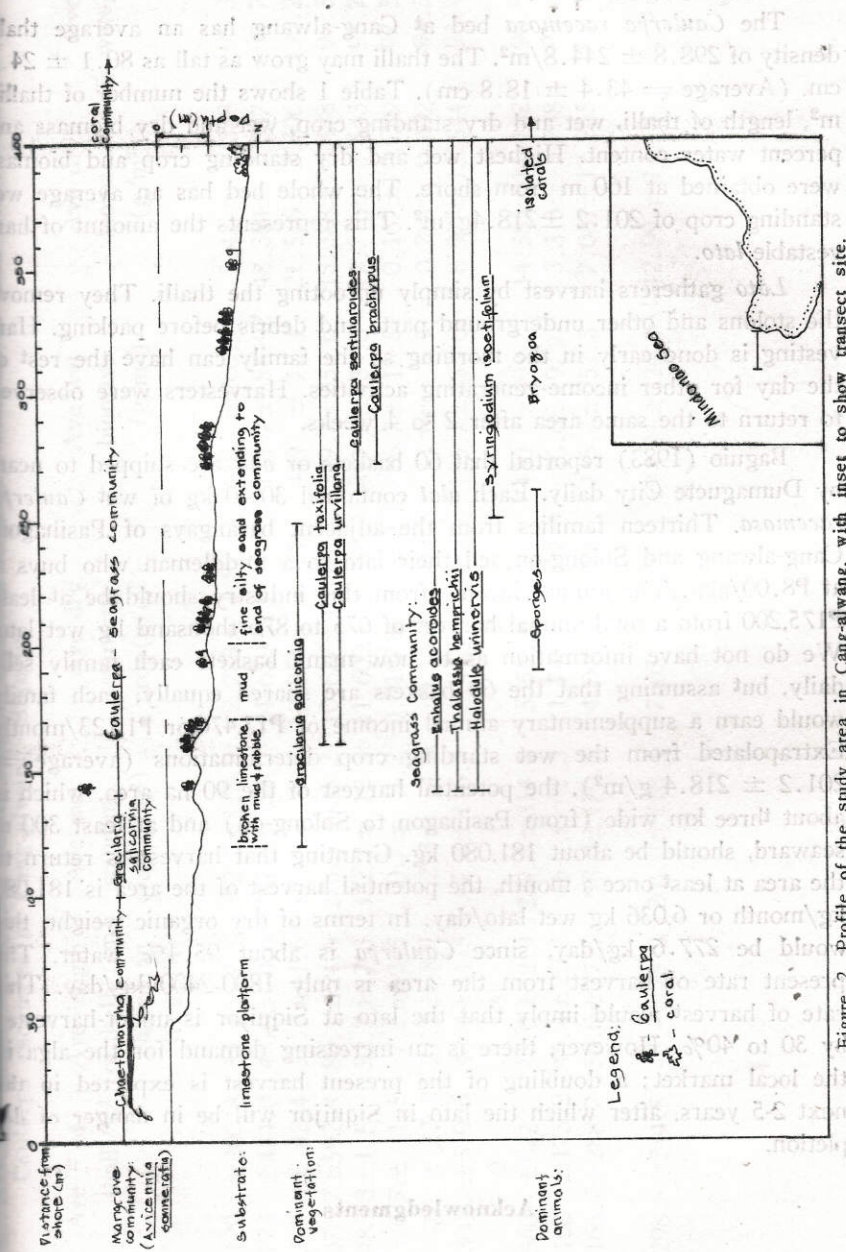


Figure 2. Profile of the study area in Cang-alwang, with inset to show transect site.

The *Caulerpa racemosa* bed at Cang-alwang has an average thalli density of $298.8 \pm 244.8/m^2$. The thalli may grow as tall as 80.1 ± 24.6 cm. (Average = 43.4 ± 18.8 cm). Table 1 shows the number of thalli/ m^2 , length of thalli, wet and dry standing crop, wet and dry biomass and percent water content. Highest wet and dry standing crop and biomass were obtained at 160 m from shore. The whole bed has an average wet standing crop of $201.2 \pm 218.4g/m^2$. This represents the amount of harvestable lato.

Lato gatherers harvest by simply uprooting the thalli. They remove the stolons and other underground parts and debris before packing. Harvesting is done early in the morning so the family can have the rest of the day for other income-generating activities. Harvesters were observed to return to the same area after 2 to 4 weeks.

Baguio (1983) reported that 60 baskets or *alat* are shipped to nearby Dumaguete City daily. Each *alat* contained 30-40 kg of wet *Caulerpa racemosa*. Thirteen families from the adjacent barangays of Pasihagon, Cang-alwang and Solong-on sell their lato to a middleman who buys it at ₱8.00/alat. The annual income from this industry should be at least ₱175,200 from a total annual harvest of 675 to 876 thousand kg wet lato. We do not have information as to how many baskets each family sells daily, but assuming that the 60 baskets are shared equally, each family would earn a supplementary annual income of ₱13,476, or ₱1,123/month. Extrapolated from the wet standing crop determinations (average = $201.2 \pm 218.4 g/m^2$), the potential harvest of the 90 ha area, which is about three km wide (from Pasihagon to Solong-on) and at least 300 m seaward, should be about 181,080 kg. Granting that harvesters return to the area at least once a month, the potential harvest of the area is 181,080 kg/month or 6,036 kg wet lato/day. In terms of dry organic weight, this would be 277.6 kg/day, since *Caulerpa* is about 95.4% water. The present rate of harvest from the area is only 1800-2400 kg/day. This rate of harvest would imply that the lato at Siquijor is under-harvested by 30 to 40%. However, there is an increasing demand for the alga in the local market; a doubling of the present harvest is expected in the next 2-5 years, after which the lato in Siquijor will be in danger of depletion.

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Literature Cited

- Baguio, Bebian D., 1983. A survey on the abundance of *Caulerpa racemosa* in Siquijor Province. Undergraduate Thesis. Foundation University, Dumaguete, Philippines.
- Horstmann, Ulrich, 1978. Nearshore macroalgae culture in tropical developing countries. *Phil. Sci.* 15:67-75.
- Meñez, E.G. and H.P. Calumpong, 1982. The genus *Caulerpa* from central Visayas, Philippines. *Smithsonian Contr. Mar. Sci.*, No. 17.
- Reyes, A. Y., 1976. The littoral benthic algae of Siquijor Province, I. Cyanophyta and Chlorophyta. *Phil. J. Sci.* 105 (3):133-91.
- Sotto, F. B., 1978. The culture of *Caulerpa racemosa* in Kalawisan, Mactan Island, Cebu, Philippines: a potential for the seaweed industry. *Phil. Sci.* 15:109-11.