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OBSERVATIONS ON THE SEA VEGETABLE ALGAE OF PANAY ISLAND, CENTRAL PHILIPPINES[1]

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ABSTRACT

The eco-morphology and seasonality of the edible marine algae or Sea Vegetable Algae of Panay Island, Western Visayas is presented. A total of sixty-one (61) sea vegetable algae species belonging to three (3) taxa were identified: Green algae or Class Chlorophyceae is represented with twenty (20) species, brown algae or Class Phaeophyceae with nine (9), and red algae or Class Rhodophyceae with thirthy-two (32). Green *Caulerpa peltata* var. *macro-disca* is the most popular sea vegetable algae in the island.

Ecological parameters determined such as surface water temperature, hydrogen ion concentration and salinity were found not to vary significantly in the four (4) collecting stations/provinces of Aklan, Antique, Capiz and Iloilo. Likewise, they have insignificant effects on the morphologies and/or growth and development of the algae. However, topography and type of substrates appear to influence the growth and the general morphology of the test algae species selected for this study.

Introduction

The Philippines, considering its tropical location and topography coupled with attendant favorable ecological factors, finds its marine waters rich in living organisms. One such organisms are the seaweeds.

The central part of the Philippines, occupied by several islands forming the Visayan provinces is divided into Central, Eastern and Western regions. The physiography presents a picture of a phycologically interesting area. Outstanding of these marine plant organisms/resources are the edible seaweed species, more appropriately called as *sea vegetable algae.*

The present project, therefore, is an attempt to assess the potentials of the sea vegetable algae in Panay Island including notes on their biology.

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Review of Literature

To date there is no comprehensive documentation of the sea vegetable species of the country. Previous attempts were sporadic listings of few species such as those by Quisumbing (1951), Sulit *et al.*, (1952), Montilla and Blanco (1953), Domantay (1961), Galutira and Velasquez (1963), Cordero (1974), Modelo (1979) and Agngarayngay (1980), among others.

In 1981, Cordero described seventy six (76) species of useful seaweeds collected from select areas of the country. However, from the island of Panay, there is not a single literature on the sea vegetable algal species present. The few available literature containing incidental descriptions of algal materials from the island include the works by Carreon (1974) from Aklan, Aligaen (1977) from Guimaras Island, and Cordero (1978, 1980) from Aklan and Iloilo, respectively. Calmorin (1981) in his master thesis accounted for eighty nine (89) algal species gathered from northern Iloilo, of which seventeen (17) species are reportedly edible.

Materials and Methods

The choice and designation of collecting stations for the four provinces of Panay Island, viz., Aklan, Antique, Capiz and Iloilo, criteria ranging from physiography and topography to the type of habitat and substrates, presence of algal standing crop and some relevant ecological parameters were used in the determination of the study areas. Standard pre- and post- activities that treat on marine algae were adopted. The determination of ecological parameters like surface water temperature, hydrogen ion concentration and salinity were recorded using ordinary laboratory paraphernalia. Seasonal occurrence of the sea vegetable algae were monitored periodically during the dry and wet months of the year. Consequently, was the *in situ* observations on marked representative algal species in predesignated areas by taking into considerations of the aforementioned ecological factors. The extent of growth and morphological development of the test algal species were noted. Field interviews among fishermen and coastal inhabitants were conducted randomly by taking into account the species of edible algae present in the area, their seasonal occurrence and mode of utilization, common names, etc.

Results and Discussion

Study area

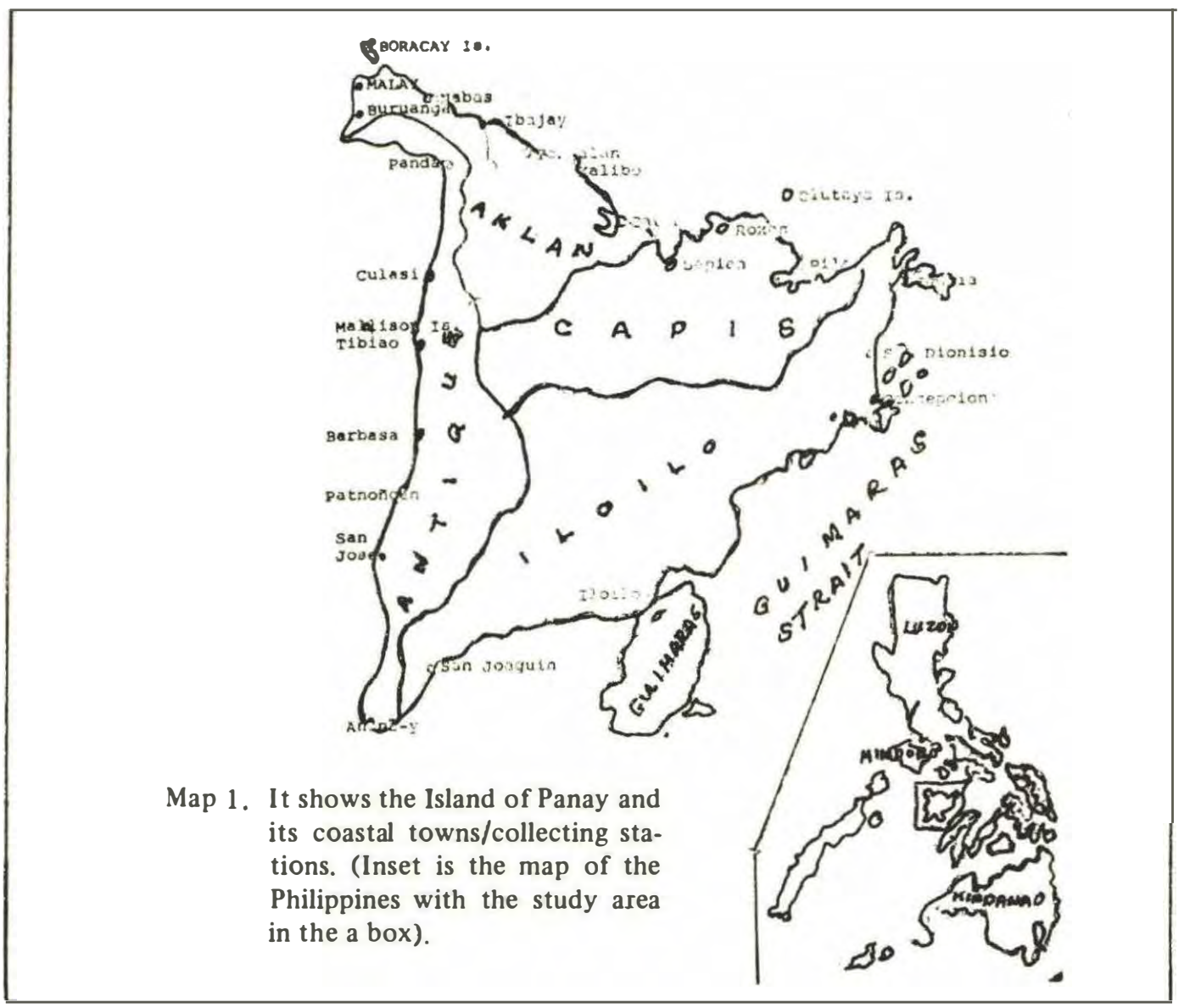
Panay Island, located south of Manila, is the sixth largest island in the Philippines. It is composed of four (4) provinces, namely: Aklan, Antique, Capiz and Iloilo (Map I).

For the present investigation the four provinces had the following number of collecting stations/towns and sub-collecting stations (Table 2). Thus, each collecting

station was artificially divided into north and south using towns as natural boundaries (Table 1).

Table 1. Subdivision of four provinces

A.	AKLAN	
	North	- Tañgalan to Buruanga
	South	- Makato to Batan
B.	ANTIQUE	
	North	- Tibiao to Pandan
	South	- Barbasa to Anini-y
C.	CAPIZ	
	North	- Sapian to Roxas
	South	- Panay to Pilar
D.	ILOILO	
	North	- Barotac Nuevo to Carles
	South	- Dumagas to San Joaquin



Map 1. It shows the Island of Panay and its coastal towns/collecting stations. (Inset is the map of the Philippines with the study area in the a box).

Table 2. *Summary of collecting/subcollecting stations in Panay Island*

I *AKLAN NORTH*

A. Buruanga
1. Bay/Poblacion
2. Santander
3. Bel-es
4. Tigum

B. Malay
1. Bay/Poblacion
2. Argao
3. Caticlan
4. Boracay Island
4.1 Balabag
4.2 Manok-manok

C. Nabas
1. Rizal
2. Union

D. Ibajay
1. Naisud
2. Bugtong-bato

E. Tañgalan
1. Jawili
2. Dumatad
3. Afga Point

II. *ANTIQUE NORTH*

A. Pandan
1. Mag-aba

B. Culasi
1. Malalison Island
2. Batbatan Island
3. Lipata Point

C. Libertad
1. Bay/Poblacion
2. San Roque

D. Tibiao
1. Bay/Poblacion

ANTIQUE SOUTH

A. Patñongon
1. Ipayo
2. Igbanwa

B. Anini-y
1. Bay/Poblacion
2. Negas

C. San Jose
1. Bay/Poblacion
2. Tiringting

D. Barbasa
1. Bay/Poblacion

III. *CAPIZ NORTH*

A. Roxas
1. Olutaya Island

B. Sapian
1. Lonoy
2. Culasi

CAPIZ SOUTH

A. Pilar
1. Punta Bang-ugay

IV. *ILOILO NORTH*

A. Estancia
1. Bituon-Point
2. Nabaye-tiknop

B. Ajuy
1. Bay/Poblacion

C. San Dionisio
1. Bay/Poblacion

D. San Joaquin
1. Bay/Poblacion

Taxonomic treatment

A total of sixty one (61) sea vegetable algae were identified. These belong to the three (3) major taxa: Class Chlorophyceae with twenty (20) species, Class Phaeophyceae with nine (9) and Class Rhodophyceae with thirty two (32).

Class : Chlorophyceae
Order : Ulvales
Family : Ulvaceae
Genus : *Enteromorpha* Link

Enteromorpha compressa (Forssk.) Greville
Enteromorpha prolifera(Muell.) J. Agardh

Genus : *Ulva* Linnaeus

Ulva lactuca Linnaeus
Ulva pertusa Kjellman
Ulva reticulata Forsskal

Order : Cladophorales
Family : Cladophoraceae
Genus : *Chaetomorpha* Kuetzing

Chaetomorpha crassa (Ag.) Kuetzing
Chaetomorpha spiralis (Ag.) Kuetzing

Family : Valoniaceae
Genus : *Dictyosphaeria* Decasine

Dictyosphaeria cavernosa (Forssk.) Boergesen

Family : Valoniaceae
Genus : *Valonia* Ginnani

Valonia aegagrophila (Roth) Agardh
Valonia ventricosa J. Agardh

Order : Caulerpales
Family : Caulerpaceae
Genus : *Caulerpa* Lamouroux

Caulerpa lentillefera J. Agardh
Caulerpa peltata var. *macro-disca* Decaisne
Caulerpa racemosa var. *lamourouxii* (Turn.) W. van Bosse
Caulerpa racemosa var. *occidentalis* (W. v. Bosse) Gilbert
Caulerpa racemosa var. *racemosa* Papenfuss et Egerod
Caulerpa serrulata (Forssk.) J. Agardh

Order : Siphonales
Family : Codiaceae
Genus : *Codium* Stackhouse

Codium adhaerens (Cabr.) J. Agardh
Codium fragile (Sur.) Hariot

Codium intricatum Okamura
Codium tenue Kuetzing

Class : Phaeophyceae
Order : Punctariales
Family : Scytosiphonaceae
Genus : *Colpomenia* Derbes et Solier

Colpomenia sinuosa (Roth) Derbes et Solier

Genus : *Hydroclathrus* Bory

Hydroclathrus clathratus (Bory) Howe

Order : Chordariales
Family : Leathesiaceae
Genus : *Leathesia* S. F. Gray

Leathesia difformis (L.) Areschoug

Order : Fucales
Family : Sargassaceae
Genus : *Sargassum* C. Agardh

Sargassum confusum C. Agardh
Sargassum duplicatum J. Agardh
Sargassum fulvellum C. Agardh
Sargassum gigantiefolium Yamada
Sargassum hemiphyllum (Turn.) J. Agardh
Sargassum piluleferum J. Agardh

Class : Rhodophyceae
Order : Nemaliales
Family : Helminthocladiaceae
Genus : *Helminthocladia* J. Agardh

(?) Helminthocladia australis Harvey

Genus : *Liagora* Lamouroux

Liagora boergesenii Yamada
Liagora ceranoides Lamouroux
Liagora farinosa Lamouroux
Liagora japonica Yamada

Family : Chaetangiaceae
Genus : *Scinaia* Bivona

Scinaia moniliformis J. Agardh

Order : Gelidiales
Family : Gelidiaceae
Genus : *Gelidiella* Feldmann et Hamel

Gelidiella acerosa (Forssk.) Feldmann et Hamel

Family : Gracilariaceae
Genus : *Gracilaria* Greville
Gracilaria arcuata Zanardini
Gracilaria blodgetti Harvey
Gracilaria coronipifolia J. Agardh
Gracilaria crassa Harvey
Gracilaria edulis (Gmel.) Silva
Gracilaria eucheumioides Harvey
Gracilaria incurvata Okamura
Gracilaria salicornia (C. Agardh) Dawson
Gracilaria verrucosa (Huds.) Papenfuss

Order : Cryptonemiales
Family : Cryptonemiaceae
Genus : *Carpopeltis* Schmitz
Carpopeltis crispata Okamura
Carpopeltis divaricata Okamura

Genus : *Halymenia* C. Agardh
Halymenia dilatata Zanardini
Halymenia durvillaei Bory
Halymenia harveyana J. Agardh

Order : Gigartinales
Family : Hypneaceae
Genus : *Hypnea* Lamouroux
Hypnea cervicornis J. Agardh
Hypnea charoides Lamouroux
Hypnea nidulans Setchell
Hypnea saidana Holmes

Family : Solieriaceae
Genus : *Eucheuma* J. Agardh
Eucheuma gelatinae Weber van Bosse
Eucheuma muricatum (Gmel.) Weber van Bosse
Eucheuma spinosum Weber van Bosse
Eucheuma striatum Schmitz

Order : Ceramiales
Family : Rhodomelaceae
Genus : *Acanthophora* Lamouroux
Acanthopora spicifera (Vahl) Boergesen

Genus - *Laurencia* Lamouroux
Laurencia okamurai Yamada
Laurencia papillosa (Forssk.) Greville

Ecological parameters

Basic ecological parameters such as surface water temperature, salinity and hydrogen ion concentration were recorded during the dry and wet seasons in the predesignated localities of Aklan, Antique, Capiz and Iloilo (Table 3).

Table 3. *Average ecological data measured in four representative localities* (1982-1983; 1983-1984)

LOCALITIES	DRY SEASON			WET SEASON		
	Water Temp.	pH	Salinity (PPT)	Water temp.	pH	Salinity (PPT)
A. Estancia, Iloilo	30°C	7.5	31	28°C	7.5	30
B. Tañgalan, Aklan	29°C	7.5	30.5	28°C	7.5	30
C. Pandan, Antique	29°C	7.5	31	28°C	7.5	30
D. Olutaya, Is., Capiz	29°C	7.5	31	28°C	7.5	30

An analysis of Table 3 tends to show that the four localities present almost identical average ecological parameters even during the dry and wet seasons. Earlier studies conducted by Cordero (1981) for Iloilo and Antique appear to duplicate the aforementioned data. It might be well to theorize that the significantly identical ecological data could be attributed to the physiographiic location of Panay Island. The island is classified under the inland water category which is neither directly affected by the activities of the South China Sea nor the Pacific Ocean. The interplay of ecological factors obtaining in these areas support the generally even distribution of algal species in the four provinces of Panay Island. The case of *C. peltata* var. *macro-disca* having been recorded, initially in Aklan, Iloilo and recently in Capiz and its 'absence' in Antique appears as an exception. An in depth study on the biology of this edible green alga is a challenge to future students of phycology. Correspondingly, are the exceptionally large *Ulva lactuca* specimens gathered from Boracay Island, Malay, Aklan.

Seasonal occurrence

Based on the data monitored during the wet months of 1983 and dry months of 1984, a study on the seasonal occurrence of select algal species in two provinces

is in order. As trace species, therefore, it was necessary to include both edible and non-edible forms naturally growing in Aklan and Antique (Table 4-a; 4-b).

Table 4-a. Seasonality of select marine algae in Aklan

	SPECIES	DRY SEASON/MONTHS	WET SEASON/MONTHS
A.	Class Chlorophyceae		
1.	*Ulva lactuca*	mature, fertile	young to juvenile
2.	*U. reticulata*	mature, fertile	young sterile
B.	Class Phaeophyceae		
1.	*Hydroclathratus clathratus*	young to juvenile	mature, fertile
C.	Class Rhodophyceae		
1.	*Amphiroa fragilissima*	young to juvenile	mature
2.	*Hypnea cervicornis*	young to juvenile	mature, fertile

Table 4-b. Seasonality of select marine algae in Antique

	SPECIES	DRY SEASON/MONTHS	WET SEASON/MONTHS
A.	Class Chlorophyceae		
1..	*Ulva reticulata*	mature, fertile	young to juvenile
2.	*Halimeda opuntia*	mature	young to juvenile
B.	Class Phaeophyceae		
1.	*Hydroclathratus clathratus*	young to juvenile	mature, fertile
C.	Class Rhodophyceae		
1.	*Actinotrichia fragilis*	mature, fertile	young to juvenile
2.	*Mastophora rosea*	mature, fertile	young

From northern Aklan, Buruanga, Bel-es, the following species were considered namely: *Ulva lactuca* and *U. reticulata* (Chlorophyta), *Padina arborescens* and *P. crassa* (Phaeophyta) and *Amphiroa fragilissima* and *Hypnea cervicornis* (Rhodophyta). While for northern Antique, Pandan, Mag-aba, had *Ulva reticulata* and *Halimeda opuntia* (Chlorophyta); *Hydroclathratus clathratus* (Phaeophyta) and *Actinotrichia fragilis* and *Mastophora rosea* (Rhodophyta).

The general picture on the seasonal occurrence of the representative algal species in the two provinces is significantly similar. This is so with the green and brown algae, but for the red group which has varied morphological and fertility data observed. Incidentally, of the four red species, three are calciferous, viz., *A. fragilissima, A. fragilis* and *M. rosea;* while *H. cervicornis* is membranaceous.

Eco-morphological observations

A. Chlorophyceae Test Species.

(1) *Caulerpa peltata* var. *macro-disca*

Initial collections of *C. peltata* var. *macro-disca* came from Estancia, Iloilo (back of then Western Visayas College of Fisheries presently known as the Northern Iloilo Polytechnic School), during the wet months of 1983. This green sea vegatable alga was observed growing luxuriantly in colony and in predominantly clayish soft bottom. The plant showed morphologically well developed growth with profuse branching, robust thalli/branches and its peltate disc averaging 20 (-25) cm in diameter.

The kind of growth and development exhibited by the green sea vegetable alga are attributed to the favorable ecological factors prevailing in the area. The topography of the natural habitat is such that it draws protection from the direct effects of wind-driven water movement owing to several island/islets surrounding it. The sandy, siltish to corally type of substrate favors the plant's fragile root-system to gain easy anchorage. Other physico-chemical factors noted periodically during the designated wet and dry months are deemed contributory to the presence of a good standing crop of *C. peltata* var. *macro-disca* in Estancia, Iloilo. These factors were the average reading of the pH at 6.5 and 6.8, salinity at 32 and 33 ppt., and the water temperature at 27 and 28°C, respectively, for the wet and dry periods. The differences in the factors measured are negligible for the two seasons of the year. It is the interplay of ecological factors that contribute to the favorable growth and development of marine algae. Incidentally, despite the proximity of the natural habitat of this particular test species to the landing area of motorized boats (fishing and commercial), there is no sign of oil pollutant accumulating in the area. This could be due to the continuous and moderate flow of water pushed by currents flowing through channels in between islands/islets in the vicinity.

It is worth mentioning that *C. peltata* var. *macrodisca*, like other marine algae, shows "migration" activity. Following a strong water disturbance caused by a tropical storm that hit Iloilo, the area marked as natural habitat of this green sea vegetable in 1983 was 'bare' in 1984. Thorough underwater investigation showed that the plant had migrated southernly into an underwater canal and growing in identical substrate composition as that found at the back of the WVCP or NIPS. Plants in the new habitat showed no morphological difference when compared with those collected in 1983 from the old habitat. Neither were there variations in the ecological factors between the old and the new habitats of the green sea vegetable.

Moreover, the ability of *C. peltata* var.*macrodisca* to migrate to another habitat with identical ecological parameters was exhibited by the plant in the Province of Aklan. This green sea vegetable used to inhabit the brackish water of Tinagong Dagat at the back of the Municipality of New Washington, Aklan, until the population slowly disappeared in the 1970's. Fishermen blamed the increase in the number of commercial ships and other forms of motorized banca dropping anchor in the area as well as the conversion of the nearby mangrove land into fishponds and the subsequent use of commercial pesticides, herbicides and other chemicals applied into the fishponds. The same chemicals are drained down into the Tinagong Dagat waters especially during the rainy days. The adverse effects of these chemicals upon the aquatic life in the area appears possible as the culprit for the disappearance of *C. peltata* var. *macrodisca* in New Washington. For so many years there was no trace of the green sea vegetable in Panay Island, but for those found in Estancia, Iloilo.

In early 1984, however, the research staff of the present project found another population of *C. peltata* var. *macrodisca* in Sapian, Capiz. The area is very close to New Washington, Aklan than to Estancia, Iloilo, prompting the staff to speculate that the spores of this sea vegetable could have been carried by water current from New Washington, Aklan and settled in the coastal water of Sapian – the first town of Capiz next to Aklan!

The *C. peltata* var. *macrodisca* plants in Sapian, Capiz are found in a more exposed habitat facing the Sibuyan Sea. However, it has a substrate similar to that in New Washington, Aklan and in Estancia, Iloilo. Ecological factors such as pH, salinity and water temperature shows little or no variations at all compared with those observed in Iloilo. Thus, pH had average readings of 6.8 and 7.0, salinity at 32 and 33 ppt., and water temperature at 28 and 30°C for the wet and dry periods, respectively.

However, there was marked difference in the gross morphology, growth and development of the sea vegetable from the later province, viz., not growing luxuriantly, less profusely branched with slender thalli/branches and not so widely spread in their growth. Also, the peltate discs have an average diameter measurement of only 8 (-10) cm across.

The relatively less morphologically developed plants from Sapian, Capiz could be explained in part to the topography of the area being exposed and often hit directly by strong water movement, a situation which disturbs the growth and development of plant life in the aquatic habitat. Also, instead of growing colonially as observed in most prostrate marine algae, *C. peltata* var. *macrodisca* from Sapian, Capiz are often observed in scattered narrow patches–a mode of distribution common among marine algae growing in exposed situation.

(2) *Ulva lactuca*

There is distinct gross morphological variation in the *U. lactuca* observed *in situ* located in Boracay Island, Malay, Aklan and in Jawili, Tañgalan, Aklan. Plants from the former island showed luxuriant growth and in scattered patches, had

broad thalli of up to 250 (-300) cm. at its widest portion. Those from Jawili are relatively smaller plants measuring barely 80 (-100) cm broad and growing thinly in scattered patches.

Again, these morphological differences could be traced to some ecological factors that determine the kind of growth and development of the sea vegetable. The topography at Boracay Island is such that the *U. lactuca* habitat is a cove protected from the effect of strong wind/water activities. It is located at the back of the white sandy beach of this resort island. The substrates for both study areas are practically alike, e.g. rocky, sandy. Their average pH, salinity and water temperature readings during the wet and dry months vary very negligibly. In Boracay Island the average pH reading was 7.0 and 7.5 salinity at 31 and 33 ppt., and water temperature at 27 and 30°C for the wet and dry months, respectively. In Jawili, pH were recorded at 7.0 and 7.5, salinity at 31 and 33 ppt., and water temperature at 28 and 30°C for the same period.

It is safer, therefore, to consider the physical locations of the study areas for *U. lactuca* that cause the marked difference in the growth and development of the papery-frond.

B. Phaeophycean Test Species:

(1) *Hydroclathrus clathratus*

The data show the morphological variations of *H. clathratus* found in Aklan and Capiz, viz., growth and development, being attributable to the varied ecological factors present. Of these, topography and substrate are more likely to have tangible effect(s) on the plant more than the pH, salinity and water temperature measurement.

The physical location and kind of substrate found in Aklan seem to favor the *H. clathratus* plants growth and development exemplified by the broadness of the net-like thalli. In Capiz, the less exposed topography and the soft sandy siltish substrate of the habitat of *H. clathratus* produce thin and frail-looking thalli. The later type of substrate is explained by the proximity of the habitat to a mangrove area and fishponds.

H. clathratus, being a saxicolous alga, grows better on rocky solid substrate. It continues to grow even when detached from an initial substrate and stays afloat and/or trapped on other larger marine plants (seaweeds, sea-grasses) and mangrove trees.

(2) *Sargassum piluleferum*

A comparative analysis on the gross morphology of *S. piluleferum* observed in Aklan and Capiz reveals some distinct variations in terms of growth and development. In Aklan *S. piluleferum* are moderately distributed, colonial or found mixed with other *Sargassum* species. It reaches maximum height of not more than four feet tall, heavily branched and bearing numerous air-bladders at maturity. This is in contrast to the same brown sea vegetable alga observed in Capiz, e.g. being few, stunted, moderately branched, bearing few air-bladders and barely 1.5 (–2) feet tall upon reaching maturity.

As an explanations to the aforementioned morphological differences of *S. piluleferum* reference may be made to the data under ecology. Hydrogen ion concentration, salinity and water temperature for both Aklan and Capiz show little difference as to affect greatly the morphology of the plant. Again, between topography and substrate, the latter could provide a better explanation to the varied data on the growth and development of *S. piluleferum.* Definitely, the Philippine *Sargassum* species are all saxicolous, their discoid shape rhizoidal structure needs a solid/hard bottom to anchor the plant and withstand strong water disturbance. The plant shuns away from soft shifting substrate such as that found in Sapian, Capiz. More significantly is the plant's low tolerance to habitats rich in hydrogen sulfide common in mangrove areas. In Capiz, *S. piluleferum* were found in few stands dictated by the number of scattered submerged rocks.

C. Rhodophyceae Test Species:

(1) *Gelidiella acerosa*

Data on the morphology of *G. acerosa* observed in Aklan and Capiz account for the different ecological parameters found in the respective habitats of the plant. This red sea vegetable alga grows moderately and are thickly scattered in the intertidal zone of Jawili, Tañgalan, Aklan. The plants are erect not more than 150 cm tall, moderately branched, dark green and wiry when dry. While the same plant found in Sapian, Capiz are few, usually stunted and limited to the narrow portion of the intertidal zone having rocky sandy bottom.

Of the various ecological parameters determined, only the type of substrate and to a lesser extent topography, could provide an explanation to the variation in the morphological features of *G. acerosa.* A soft, loose siltish type of substrate is very selective on the species of marine plants it could hold, e.g., prostrate/creeping seaweeds like *Caulerpa* or the shallow-boring algae with fibrous type of root-system like the codiaceous species of *Udotea* and *Avrainvillea.* Where the root system is discoidal and digitate in structure exemplified by *Sargassum, Gelidiella,* etc., their tendency is to inhabit rocky/solid bottoms for better anchorage.

Strong wave action on the intertidal marine algal population affects their growth and development, viz., producing stunted plants, less developed branches, ruffled or torn leaf-like and reproductive parts, etc. Both *G. acerosa* plants from Aklan and Capiz grow in similar topographic conditions attributing to their negligible height difference.

(2) *Acanthopora spicifera*

The case of *A. spicifera* from Aklan and Capiz follows that of *G. acerosa* as far as the effects of ecological factors on their gross morphological features are concerned. However, pH, salinity and water temperature are factors hardly to be considered vital in the instant case. The type of substrates found in the two study areas provide a better clue to explain the growth and development of the plant. *A. spicifera* from Aklan grows best in the lower intertidal zone and are relatively taller at 150 (–200) cm. The plants are erect and profusely branched, robust, with

well-developed digitate hold-fast anchored firmly on rocky bottom. The colors are predominantly dark purple with shades of green specially becoming green in the shallower portion of the intertidal. Likewise, the texture is consistently membranous. The same plants found in Capiz were few in number/population, short and frail-looking. They barely reach 110 cm tall, bearing few slender branches, but rather softer in texture. Again, the presence of hydrogen sulfide in the siltish bottom attributes to the relatively poor growth and development of the *A. spicifera* in Capiz.

Field interview

Similar set of questions were randomly posted to inhabitants of the coastal towns/barrios of Aklan, Antique, Capiz and Iloilo which produced almost identical answer. Thus:

1. *Presence of Sea Vegetable Algae Species.* We received very limited information on this matter. The abundance of sea vegetable algae species in Panay Island has remained unknown as to their uses. Of the nationally known sea vegetable only the following with local names are known to the inhabitants interviewed, so far.

A. Class Chlorophyceae
   a. *Caulerpa peltata* var. *macro-disca*
      - "laba-laba"
   b. *C. lentillefera*
      - "laba-laba"
   c. *C. racemosa* (including varieties)
      - "laba-laba";
      - "lato"

B. Class Phaeophyceae
   (no knowledge as to presence of edible species)

C. Class Rhodophyceae
   a. *Gracilaria verrucosa* - "gulaman"
   b. *Gelidiella acerosa* - "gulaman"
   c. *Eucheuma spp.*
      (E. spinosum, E. striatum
      and *E. cottinii* - "gulaman"
      - "guso"

2. *Uses and Methods of Preparations.* The only known use of the sea vegetable algae species mentioned above is as food for man. The method of preparation is in the form of salad. Another and so far, the most popular is to eat it fresh with broiled sweet potato.

3. *Occurrence of Sea Vegetables.* The highly priced sea vegetable to the inhabitants of Panay Island is *Caulerpa peltata* var. *macro-disca.* Years ago this

green sea vegetable used to abound in the Tinagong Dagat (hidden sea) at the back of the municipality of New Washington. The habitat, more marine than brackish even in the presence of the Lagatik River which mixes with the marine water, started to lose its *C. peltata* var. *macrodisca* population with the constructions of several fishponds in the vicinity of the Tinagong Dagat. The townfolks attributed the disappearance of this sea vegetable to the continued use of herbicides and pesticides by fishpond owners. They believe that these synthetic compounds have detrimental effects to the growth of the sea vegetable. To date, the only supply of *C. peltata* var. *macro-disca* comes from Estancia, Iloilo and a small amount from Sapian, Capiz. Other species of *Caulerpa* come from Capiz province and from the nearby province of Palawan.

So far, there are no traces of *Caulerpa peltata* var. *macro-disca* in both the northern and southern portions of Antique. However, the apparent absence of this popular green sea vegetable alga in Antique is ably compensated by the presence of the green algal species of *Caulerpa, Ulva, Enteromorpha* and *Codium;* brown *Hydroclathrus, Colpomenia,* and *Sargassum* and Gracilaria, Eucheuma, Hypnea, Liagora Acanthopora and *Laurencia* to cite some. Similarly, is the case of the collecting areas of northern Aklan.

4. *As Regard Seasonality of Some Sea Vegetables.* The Antiqueños interviewed generally believe that season does not affect the occurrence of sea vegetable algae. Thus, it is during the dry months (summer) when sea vegetable algae like *Caulerpa* and *Gracilaria* are harvested and sold in the markets.

Comparatively, however, and owing to the natural growth of *Caulerpa peltata* var. *macro-disca* only in select parts of N. Iloilo and S. Aklan, sea vegetable algae as food is popular in the former provinces than in Capiz and Antique.

Summary

The three-year project provided the following results:

1. A total of sixty-one (61) species of sea vegetable algae were collected and identified from the four provinces in Panay Island. There are twenty (20) species of green, nine (9) species of brown and thirty-one (31) are red species.
2. There is hardly significant variations in ecological parameters, viz., surface water temperature, hydrogen ion concentration and salinity randomly taken in the four provinces. Conversely, are their insignificant effects on the morphologies and/or growth and development of the sea vegetable algae observed. However, topography and type of substrates appear to show certain degree of influence in the mode of growth and the general gross morphology of test algal species.
3. The most popular sea vegetable algae accepted as food in the island are the green *Caulerpa peltata* var. *macro-disca, C. lentillefera* and *C. racemosa* including varieties. There are no reports as to edible brown algae though these are present in the four provinces. The reds have the most representations, but

only *Eucheuma spinosum* and *E. striatum* are eaten by the inhabitants. *Gracilaria verrucosa* and *G. coronipifolia* are hardly known for their acceptability as food.

4. The occurrence of sea vegetable algae showed negligible variations as to the time/season of observation in Aklan and Antique. Except for *Hydroclathratus clathratus*, both the green and red test species revealed similar results as to time of maturity and development of reproductive parts viz., mature and fertile during the dry season and young to juvenile during the wet season.
5. Part of the ecological study was to determine the algal species growing in association with the sea vegetable species. There were a total of fifty-six (56) species distributed as follows: seventeen (17) green, thirteen (13) brown, and twenty-six (26) red algal species, which were reported separately.
6. The plan to conduct test culture of *Eucheuma* species programmed for year III of the project had to yield to logistic insufficiency.

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