# Inventory and Distribution of Edible Seaweeds in Ilocos Sur

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## Introduction

Seaweeds are among the country's economically important fishery resources. This is due to their potential value as food, items for research, and raw materials in the manufacture of commercial products like animal feeds, food additives, cosmetics.

In Ilocos Sur, a number of seaweed species are extensively utilized as part of the local diet, In the meals of families living along the coastal barangays, the "ar-arusip", "pocpoclo", and "culot" are a usual sight. During peak seasons, these edible seaweeds are dried and stored for days or even months. These are used for future consumption, or as 'pabaon" to balikbayan relatives and friends going back to foreign lands.

Aside from utilizing seaweeds as food, locals engage in seaweed collection as an alternative source of livelihood. Edible seaweeds are collected in the wild, sold in local markets or nearby towns or even nearby provinces.

Despite the importance of the seaweed resource and its abundance in the province, no report has been made on its diversity. The only report made was that of Trono (1984) who mentioned that seaweed production through the gathering of local stocks appears to be sizeable in northern Philippines including llocos Sur, llocos Norte, and Pangasinan. There was no mention, however, on the species composition neither on its distribution.

It is then the purpose of this study to determine the available edible seaweed species of the province. Further it aims to determine areas where these seaweed species abound. Data obtained will be useful, as it will serve as baseline information on edible seaweeds biodiversity in Ilocos Sur. It will also serve as basis for future research activities on edible seaweeds to include culture and product formulation. Further, the data obtained will be important for the proper management and development of the resource.

## Objectives

This study aimed to inventory and assess the edible seaweed species of I locos Sur. In particular, it aimed to:

1. Conduct taxonomic studies on the edible seaweed species of Ilocos Sur, and
2. Study the species composition, biomass, occurrence, and seasonality of the resource.

## Scope and Limitation

This study aimed to conduct taxonomic studies on the edible seaweeds of Ilocos Sur. It further aimed to study the species composition, biomass, occurrence and seasonality of the resource. Taxonomic studies were conducted from September, 2000 to November, 2001 while ecological studies were conducted from October, 2000 to September, 2001.

**Definition of Terms**

For a better understanding of this research, the technical terms used are hereby defined:

Cervicorn - resembling a deer's horn
Clavate - club-shaped
Decumbent - reclining on the substrate
Dichotomous - forked into two similar parts
Epiphyte - growing on another plant but not parasitic
Holdfast - basal attachment organ of seaweeds
Lanceolate - narrow and tapering toward the apex
Moniliform - resembling a string of beads
Obovate - inversely ovate
Ovate – twice or less as long as broad
Percurrent - extending throughout the entire length
Prostrate - lying flat on the ground
Ramuli (ramulus, sing.) - determinate branchlets
Rhizoidal. - filamentous
Serrate - having flat small teeth that are projected forward
Stolon - a slender branch or shoot
Thalli (thallus, sing.) - the plant body of seaweeds
Trichotomous - having three angles or corners

**Review of Related Literature**

The natural tendency of Filipinos to locate themselves near or along the coastal areas and the archipelagic nature of the country have led to the very close dependence of the coastal inhabitants on the sea as a source of nutriment and livelihood (Trono, 1988). Seaweeds and seaweed products are among the resources on which the lives of coastal inhabitants are very much dependent.

Trono (1984), in his study on the assessment of local stocks of commercially important seaweed species in Lingayen Gulf, mentioned that seaweeds for local consumption are utilized directly as food either as vegetable salad or in soups. The study also mentioned that the local stocks are presently subjected to intense gathering which slowly results in the decrease in natural production through the past years. It covered Lingayen Gulf and included a list of economically important seaweeds from the Philippines.

Taxonomic and ecological studies on Philippine seaweeds have been conducted. In Northwestern Luzon, the earliest studies were conducted by Domantay (1961) and Galutira and Velasquez (1963). Domantay reported the algal vegetation of Hundred Islands, Pangasinan. Galutira and Velasquez identified some species of edible seaweeds in Ilocos Norte. The species included Porphyra, Gracilaria, Hypnea, Acanthophora, Caulerpa, and Codium among others. In 1979, Moreland made a study on the edible seaweeds of Northern Luzon. His study focused on the market prices, local taste preference, seaweed recipes and other local uses. No mention was made on the spatial and seasonal distribution of these resources.

In Ilocos Sur, a comprehensive study on the marine benthic algae was made by Domingo (1988). In this study, Domingo reported 103 species, with ninety-one species reported for the first time for Ilocos Sur. The structure of the algal communities in terms of species composition and distribution was determined. No identification of the edible species in the area was made. And, so far, no other study has been conducted in the province.

All these readings show that no exclusive study on the edible seaweeds of Ilocos Sur had been conducted. These readings guided the researchers in this undertaking.

## Material and Methods

A. Taxonomic Studies

Collection of edible seaweeds for taxonomic studies was done monthly for a period of fifteen months, from September 2000 to November 2001. Collected specimens were brought to the UNP Marine Resources Development Center, Sta. Maria llocos Sur, for identification. Samples of each species were preserved in liquid and in herbarium sheets.

B. Distribution of Seaweed Species

Collection of data for species composition, occurrence, and seasonality of edible seaweeds was done monthly for a period of one year, from October 2000 to September 2001. Sampling design to gather data on biomass, and seasonality was based on the method of Saito and Atobe (1970).

Five collecting stations were considered:

Station I - Teppeng, Sinait
II - Salomague, Cabugao
III - Nalvo, Sta. Maria
IV - Bateria, San Esteban
V - Gabao, Santiago

## Results and Discussion

A. Taxonomic Studies

There were twenty-three (23) species of edible seaweeds identified in the province. These species represent the green (Chlorophyta), brown (Phaeophyta), and red (Rhodophyta) seaweeds. A simplified description of the seaweed species is hereby presented.

1. Chlorophyta (Green Algae)

a. Scientific Name: *Caulerpa racemosa*
Common Name: Ar-arusip

Plant thalli forming stolons giving right to ascending branches bearing stalked, clavate to spherical ramuli. Rhizoidal holdfasts penetrate among sand particles or rock crevices.

b. S. N.: *Caulerpa peltata*
C. N: Ar-arusip, butbutones, saluysoy

Thalli with stolons producing descending rhizoidal branches and ascending branches bearing several ramnuli consisting of a short pedicel ending in a disc-like head. The disc like head differentiates this species from the spherical ramuli of *C. racemosa*.

c. S. N.: *Caulerpa microphysa*
C. N.: Ar-arusip

Thalli forming dense clusters consisting of prostrate, naked, branched stolons bearing crowded, stalked, minute spherical ramuli. This species has the tiniest ramuli of all Caulerpa species.

d. S. N.: *Caulerpa serrulata*

C. N.: Gal-galacgac

Thalli made up of stolons giving rise to ascending branches with flattened, slightly curved or spirally twisted upper portion. Rhizoidal holdfasts attached to sandy or rocky substratum.

e. S. N.: *Caulerpa sertularioides*
C. N.: Salsalamagi

Thalli made up of stolons giving rise to erects blades which are feather-like in appearance. Attached to substratum by well-developed branched rhizoids.

f. S. N.: *Codium edule*
C. N.: Pocpoclo

Thalli erect with decumbent portions, branching dichotomously or subdichotomously. branches cylindrical, Fronds dark green at middle and light green to almost transparent at the periphery.

g. S. N.: *Codium geppii*
C.N.: Pocpoclo

Thalli procumbent, branching irregularly to trichotomously. Fronds deep green forming extensive mats on coral reefs or rocks. Differs from *C. edule* in its darker green and shorter fronds.

h. S. N.: *Chaetomorpha crassa*
C.N.: Pansit-pansit

Thalli with unbranched filaments, forming loose clumps, entangled with other species of algae. The filaments are light to dark green in color, made up of cylindrical shaped cells. Basal cells absent

2. Phaeophyta (Brown Algae)

a. S. N.: *Hydroclathrus clathralus*
C. N.: Balbalulang

Thallus reticulate, unbranched, forming irregular net-like structure, golden brown when fresh, soft and slimy, becoming dark brown when dried.

b. S.N.: *Sargassum spp.*
C.N.: Aragan

Thallus tall, primary branches erect, leaves ovate, obovate to lanceolate. Midrib prominent in some, not distinct in others, cryptostomata scattered or irregularly arranged, vesicles serving as floats present. Attached to substratum by means of rhizoidal or discoidal holdfasts.

Sargassum spp. was found to be poly-specific. In this study, however, no distinct differentiation was made.

3. Rhodophyta (Red Algae)

a. S.N.: *Halymenia durvillaei*

C.N.: Aragan-ilek

Thalli large, bushy, reddish purple, soft and gelatinous. Fronds without stipe, margins of fronds serrate. Attached to the substratum by a disk-like holdfast.

b. S.N.: *Kappaphycus cottonii* (Eucheuma cottonii)
C.N.: Kanot-kanot

Thalli generally prostrate, branching irregular, attached to each other to form cartilaginous frond covering the substrate. The tipper surface of the frond wrinkled, covered by numerous warts, the ventral surface smoother, with numerous hapters for attachment.

c. S.N.: *Kappaphycus striatum* (*Eucheuma striatum*)
C.N.: Kanot-kanot

Thalli consist of prostrate and erect branches, covered with spinose brachlets irregularly arranged, attached to rocky substratum by well-developed hapters arising from the ventral portions of the prostrate branches.

d. S.N.: *Hypnea valentiae*
C.N.: Culot ti pusa

Thalli forming tufts of fine entangled branches attached to the substrate by a discoid holdfast, sometimes on other algae, Main axis cylindrical, giving rise to straight indeterminate branches, which in turn giving rise to slender determinate branchlets.

e. S.N.: *Hypnea cervicornis*
C.N.: Gurguraman, guraman

Thalli forming bushy mats, attached to the substratum by a discoid holdfast, or sometimes epiphytic on other algae, branches dense, lateral ultimate branchlets numerous, short, tapering or forked. Differs from H. valentine by its cervicorn apical branchlets.

f. S. N.: *Hypnea esperi*
C.N.: Ragutirit

Thalli soft, forming dense tufts, attached to the substratum by small hapters. Main branches very fine, bearing short, spinose, determinate branchlets. *H. esperii* is the finest of' the three Hypnea species collected.

g. S. N.: *Gracilaria coronopifolia*
C.N.: Cao-caoayan

Thalli bushy, erect to decumbent, greenish brown to reddish purple in habitat, cartilaginous, attached to the substrate by a disc-like holdfast. Main axis cylindrical, branching frequent, irregularly alternate, with slight constriction at the base of the branches.

h. S.N.: *Gracilaria eucheumoides*
C.N.: Canot-canot, kinkintal

Thallus prostrate, creeping on rocks, cartilaginous, reddish purple to dark brown in color, with irregular branching. The dorsal and ventral surfaces smooth with coarse teeth line along margins.

*i.* S.N.: *Gracilaria salicornia*
C.N.: Kinkintal

Thallus erect to decumbent, greenish brown to yellowish orange, cartilaginous, attached to the substrate by a discoid holdfast. Main axis cylindrical, irregularly branched, base of branches with constrictions.

j. S.N.: *Acanthophora spicifera*
C.N.: Culot

Thalli erect, busily, dull grayish purple, alternately branched, with short, spirally placed spinose branchlets. Anchored to the substratum by an irregularly-lobed disc-like holdfast.

k. S. N.: *Laurencia papillosa*
C.N.: Culot, Culot-tumeng

Thalli erect, forming low dense clusters, irregularly branched, main axis percurrent, naked at lower portions.

Plants are attached to the substratum by a discoid holdfast, the plant appearing dirty due to the dense branchlets filled with sand and other corals.

1. S.N.: *Gelidiella acerosa*
C.N.: Lali-lali

Thalli erect to decumbent, wiry in texture, light to dark brown in color, regular to irregular branching evident. Attached to the substratum by a discoid substrate.

m. S. N.*: Scinaia hormoides*
C.N.: Ar-aritos, korkorales

Plants reddish purple, frond dividing up to several dichotomies to form moniliform branches. Plants found in deep areas attached to rocky substratum by means of discoid holdfast.

The above results show that there are twenty-three (23) identified species of edible seaweeds in Ilocos, Sur: eight belonging to Chlorophyta, two Phaeophyta, and thirteen to Rhodophyta. It is to be noted that have not been identified to the species level considering the variations in form.

B. Ecological Studies

1. Species Composition and Spatial Distribution

Table I presents the species composition and spatial distribution of' the edible seaweed species in Ilocos Sur.

The species composition of the edible seaweeds in Ilocos Sur conforms with the commonly observed species representation of the seaweed flora in the tropics, that is, the red algae are the most diverse, followed by the green algae, and the brown algae the least diverse.

Table I. Species Composition and Spatial Distribution of Edible Seaweeds

| Species | Station | | | | |
|---|---|---|---|---|---|
| | **I** | **II** | **III** | **IV** | **V** |
| **Chlorophyta (Green)** | | | | | |
| *Caulerpa microphysa* (ar-arusip) | X | - | X | - | X |
| Caulerpa racemosa (ar-arusip) | X | - | X | - | X |
| *Caulerpa peltata* (butbutones) | - | - | X | - | X |
| *Caulerpa serrulata* (galgalakgak) | X | X | X | - | X |
| *Caulerpa sertularioides* (salsalamagi) | - | X | X | X | X |
| *Codium edule* (pocpoclo) | X | - | - | - | - |
| *Codium geppii* (pocpoclo) | - | - | X | - | X |
| *Chaetomorpha crassa* (panpansit) | X | X | X | X | X |
| **Phaeophyta (Brown)** | | | | | |
| *Hydroclathrus cclathratus* (balbalulang) | X | X | X | X | X |
| *Sargassum spp.* (aragan) | X | X | X | X | X |
| **Rhodophyta (Red)** | | | | | |
| *Halymenia durvillaei* (aragan-ilek) | X | - | X | - | X |
| *Kappaphycus cottonii* (kinkintal, kanot-kanot) | X | - | X | - | X |
| *Kappaphycus striatum* (kanot-kanot) | X | - | X | - | X |
| *Hypnea valentiae* (kulot ti pusa) | - | - | X | - | X |
| *Hypnea cervicornis* (gurguraman) | X | - | X | X | X |
| *Hypnea esperi* (ragragutirit) | X | X | X | X | X |
| *Gracilaria coronopifolia* (kawkawayan) | - | - | X | X | X |
| *Gracilaria eucheumoides* (kanot-kanot, kinkintal) | - | - | X | - | X |
| *Gracilaria salicornia* (kinkintal) | X | X | X | X | - |
| *Acanthophora spicifera* (kulot) | - | - | X | - | X |
| *Laurencia papillosa* (kulot-tumeng) | - | - | X | - | X |
| *Gelidiella acerosa* (lali-lali) | - | - | X | - | - |
| *X*(korkorales, ar-aritos) | X | X | X | | X |
| **Total** | 14 | 8 | 22 | 8 | 20 |

Of the live stations selected for edible seaweeds community studies, Station III (Nalvo, Sta. Maria) supported the highest number of species (22) , followed by Station V (Gabao, Santiago) with 20 species. Stations II (Salomague, Cabugao) and IV (Bateria, San Esteban) have the least number of species (8).

This spatial distribution of' the edible seaweeds was observed to be largely influenced by the nature or the substrate. Some seaweed species showed preferences in the type of substratum they occupied, i. e., some species were substrate-specific while others were non substrate-specific. In Stations III and V where the substrates vary from sandy to sandy-rocky to rocky, the number of species present was found to be more as compared to Stations II and IV where the substrate was predominantly sandy and Station I which was predominantly rocky, Hence, in Stations III and V, species which can thrive in sandy, sandy-rocky and rocky substrates were found. In Stations II and IV, only seaweeds which thrive in sandy substrate were found, while in Station I, only seaweeds which thrive in rocky substrates were observed. These results conform with the results of studies of Dawson ( 1966), Ganzon-Fortes ( 1981 ), and Castro (1986).

2. Seasonal Distribution

Tables 2a - 2e present the seasonal distribution expressed in monthly biomass (g/.25 $m^2$ ) of the edible seaweeds in Ilocos Sur.

Table 2a. Mean Monthly Biomass of Edible Seaweeds in Station I (Teppeng, Sinait) from October, 2000 to September, 2001 (g/.25 $m^2$)

| | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | Jun | Jul. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C. racemosa | 28.2 | 32.0 | 46.6 | 22.4 | | | | | | | | |
| C. serrulata | 2.2 | 1.8 | 2.6 | | | | | | | | | 2.6 |
| C. crassa | 40.2 | 42.0 | 48.0 | 52.6 | | | | | | | 48.2 | 36.6 |
| H. clathratus | | | 38.2 | 76.8 | 228 | 206.2 | 156.2 | | | | | |
| K. cottonii | 42.4 | 46.0 | 32 | 22.4 | 16.2 | | | | | | | |
| K. striatum | 16.4 | 24.8 | 16.0 | 12.2 | 8.4 | | | | | | | |
| H. cervicornis | | | 28.2 | 21.3 | 18.6 | 12.0 | | | | | | |
| H. esperi | | | | 48.8 | 63.6 | 44.6 | | | | | | |
| G. salicornia | 4.2 | 2.2 | 3.2 | | | | | | 5.2 | | 4.6 | 2.8 |
| A. spicifera | 32.8 | 30.2 | 48.2 | 22.6 | | | | | | | 8.2 | 28.6 |
| C. microphysa* | | | | | | | | | | | | |
| C. edule* | | | | | | | | | | | | |
| H. durvillae* | | | | | | | | | | | | |
| S. hormoides* | | | | | | | | | | | | |

* Deeper-area species

The above table shows that there are several seaweed species collected in Station I (Teppeng, Sinait). Of the fourteen species present in the area, four are collected in deeper areas while ten are collected in shallow portions. Most of the species appear in August and disappear during the summer months.

Table 2b. Mean Monthly Biomass of Edible Seaweeds in Station II (Salomague, Cabugao) from October, 2000 to September, 2001(g/.25 $m^2$ )

| | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | Jun | Jul. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C. serrulata | 1.4 | 2.2 | 3.6 | 1.6 | | | | | | | | |
| C. sertulariodes | 2.8 | 6.2 | 1.8 | 3.4 | 2.4 | | | | | | | |
| C. crassa | 32.8 | 48.2 | 58.2 | 68.2 | | | | | | | 52.5 | 42.4 |
| H. clathratus | | | 48.6 | 120.4 | 322.6 | 312.0 | 284 | | | | | |
| H. esperi | | | | 32.2 | 48.6 | 26.4 | | | | | | |
| G. salicornia | | 2.6 | | | | | | 2.8 | | | 4.2 | 3.0 |
| A. spicifera | 6.8 | 2.4 | 3.4 | 2.6 | | | | | | | 6.2 | 7.6 |
| S. hormoides* | | | | | | | | | | | | |

* Deeper-area species

There were only eight edible seaweed species collected in Station II(Salomague, Cabugao). Of this number, one is collected in the deeper areas, and all others from shallow portions. Some species tend to appear in August and disappear during the Summer months. *H. clathratus* and *H. esperi* were found to be dominant during the summer months.

This station was observed to be characterized by sandy substrate with *Sargassum* beds on the deeper portions. The sandy substrate was observed to be inhabited by sandy substrate-specific species.

Table 2c. Mean Monthly Biomass of Edible Seaweeds in Station III (Nalvo, Sta. Maria) from October, 2000 to September, 2001 (g/.25 $m^2$ )

| | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | Jun | Jul. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *C. racemosa* | 2.2 | 1.8 | 1.6 | 2.2 | | | | | | | | 1.4 |
| *C. serrulata* | 1.8 | 2.4 | 1.6 | 2.2 | | | | | | | | |
| *C. sertularioides* | 1.2 | 1.8 | 2.0 | 2.2 | | | | | | | | |
| *C. geppii* | | | 2.4 | 3.8 | | 1.8 | 1.2 | | | | | |
| *C. crassa* | 3.8 | 4.2 | 2.2 | | | | | | | | 10.6 | 21.2 |
| *H. clathratus* | | | 10.2 | 86.8 | 242.2 | 320.2 | 456.2 | 210.4 | 28 | | | |
| *K. cottonii* | 6.2 | | 4.6 | | | | | | | 3.2 | 4.8 | 8.4 |
| *K. striatum* | 4.6 | 5.2 | | | | | | | | | 2.8 | 3.6 |
| *H. valentiae* | | 78.2 | 140.2 | 40.6 | 22 | | | | | | | |
| *H. cervicornis* | 48.2 | | 28.4 | 46.2 | 82.8 | 51.6 | 18.4 | | | | | |
| *H. esperi* | | | | | 26.2 | 18.4 | 68.2 | 48 | | | | |
| *G. coronopifolia* | 30.8 | 42.0 | 39.2 | 45.5 | 26.6 | 42 | 54.6 | 28.4 | 18.2 | | 28.2 | 14.0 |
| *G. eucheumoides* | 3.2 | 2.6 | 2.8 | | | | | | | | | |
| *G. salicornia* | 1.8 | 2.2 | 2.1 | 3.2 | | | | | | | | 1.8 |
| *A. spicifera* | 22.4 | 38.6 | 83.8 | 62.4 | 62.2 | 31.2 | 18.6 | 8.6 | | | 36.4 | 50.2 |
| *L. papillosa* | 42.5 | 28.0 | 24.2 | 32.8 | 14.8 | 84.6 | 78.4 | 88.2 | 18.2 | | 64.2 | 52 |
| *G. acerosa* | 140.8 | 126.0 | 258 | 140 | 86.4 | 24.6 | 12.8 | | | | 92.2 | 172.6 |
| *C. microphysa** | | | | | | | | | | | | |
| *C. peltata** | | | | | | | | | | | | |
| *H. durvillae** | | | | | | | | | | | | |
| *S. hormoides** | | | | | | | | | | | | |

* Deeper-area species

Twenty-one edible species were collected in Station III (Sta. Maria). Of this number, four were collected from the deeper areas and seventeen from the shallow portions. It can be observed from the table that several species were persistent like G. coronopifolia, A. specifera, L. papillosa, and G. acerosa. These species are present in the area almost all year round. H. clathratus, H. cervicornis and H. esperi are shown to be dominant during summer months.

Table 2d. Mean Monthly Biomass of Edible Seaweeds in Station IV (Bateria, San Esteban) from October, 2000 to September, 2001(g/.25 $m^2$)

| | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | Jun | Jul. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *C. sertulariodes* | 2.6 | | 4.2 | 3.8 | 2.5 | | | | | | | |
| *C. crassa* | 6.5 | 8.6 | 10.2 | 7.5 | 2.8 | 3.6 | | | | | 8.6 | 4.8 |
| *H. clathratus* | | | | 48.2 | 362 | 242 | 160 | 84.6 | | | | |
| *H. cervicornis* | | | 24 | 28.3 | 31.6 | 16.4 | | | | | | |
| *H. esperi* | | | | 12.3 | 46 | 32.5 | 19.6 | 8.3 | | | | |
| *G. coronopifolia* | 6.2 | 2.8 | 4.2 | 1.4 | | | | | | | 2.8 | 4.2 |
| *G. salicornia* | | 2.6 | 3.8 | 6.2 | 2.3 | | | | | | | 1.5 |
| *A. spicifera* | 6.4 | | 7.2 | 15.6 | | | | | | | 3.4 | 6.2 |

* Deeper-area species

The above table shows that there were only eight species of edible seaweeds collected from Station IV (Bateria, San Esteban). All these species were collected from the shallow portions. It can be observed that no seaweed species occurred all year round. *H. clathratus, H. cervicornis,* and *H. esperi* were observed to be dominant species during summer months.

Table 2e. Mean Monthly Biomass of Edible Seaweeds in Station V (Gabao, Santiago) from October, 2000 to September, 2001 (g/.25 $m^2$)

| | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | Jun | Jul. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *C. racemosa* | | | 6.4 | 7.5 | | | | | | | | |
| *C. serrulata* | 8.3 | 4.3 | 3.6 | | | | | | | | | |
| *C. sertularioides* | | 8.6 | 15 | 12 | | | | | | | | |
| *C. geppii* | | 28 | 40 | | | | | | | | | |
| *C. crassa* | 14.4 | 16 | 16.8 | 8.4 | 6.2 | 20 | 15 | | 12 | 16.2 | 28.4 | 22 |
| *H. clathratus* | | | | 58.4 | 520 | 428 | 320 | 180.8 | | | | |
| *K. cottonii* | 20.2 | 16 | 12.4 | | | | | | | | 1 | 16 |
| *K. striatum* | 18.3 | 14 | 20 | | | | | | | | | |
| *H. valentiae* | 14.8 | 17.6 | 54 | 24.2 | 26.2 | | | | | | 3.5 | 16.2 |
| *H. cervicornis* | | | 22.5 | 20 | 15 | 4.8 | | | | | | |
| *H. esperi* | | | | 28.4 | 86 | 42.4 | 38.2 | 12.8 | | | | |
| *G. coronopifolia* | 4.8 | 10.2 | 16 | 10.8 | | | | | | | | |
| *G. eucheumoides* | | 6.8 | 7.8 | 8.6 | 4.5 | | | | | | | |
| *A. spicifera* | 44.2 | 38.2 | 26.0 | 42.6 | | | | | 12.2 | 48.4 | 62.6 | 82.4 |
| *L. papillosa* | 11.2 | 22.8 | 12.0 | 88.2 | 72.4 | 79.2 | 14.2 | | | | 36.4 | 19.1 |
| *G. acerosa* | | | | | | | | | | | | |
| *C. microphysa** | | | | | | | | | | | | |
| *C. peltata** | | | | | | | | | | | | |
| *H. durvillae** | | | | | | | | | | | | |
| *S. hormoides** | | | | | | | | | | | | |

* Deeper-area species

The above table shows that nineteen (19) species were collected from Station V (Gabao, Santiago). Of this number, four were collected from deeper areas while fifteen were collected from shallow portions. It can be observed that only a few species (*C. crassa, L. papillosa*) are persistent. H. clathratus, H. valentiae, antd H. esperi tend to be dominant in some months of the year.

All the preceding tables show the seasonal distribution of the edible seaweeds in the five stations included in this study. It can be observed that most of the species had wider distribution, occurring in most, if not all five stations.

The five tables further show that the edible seaweeds rnay be characterized into seasonal and non-seasonal species. The seasonal forms appeared only in certain months of the year (e.g. *H. clathratus*) while the non-seasonal forms were the persistent species, which thrive almost all year-round.

Different species were also observed to be dominants. These species were found to cover all other species in the area. These dominant species were also found to be seasonal.

**Conclusions:**

From the results of this study, the following conclusions are drawn:

1. There is a high diversity of edible seaweeds in Ilocos Sur. Chlorophyta is represented by eight species, Phaeophyta by two species, and Rhodophyta by thirteen species.
2. The spatial distribution of the edible seaweeds in ilocos Sur appeared to be largely affected by the type of substrate. Stations having sandy to rock v substrates had more species than the sandy or rocky substratum.
3. There is a pronounced variation in the seasonality of edible seaweeds in Ilocos Sur. Some seaweed species are persistent others are seasonal.
4. Dominant species like *Hydroclathrus clathratus, Hypnea valentiae*, and *Hypnea esperi* occurred in some months of the year,

**Recommendations:**

Considering the high diversity of edible seaweeds in llocos Sur, the researchers forward the following recommendations:

1. Coastal resources management should be an integral part of the programs of local government units and academic institutions to ensure proper collection and utilization and conservation of these edible seaweeds.
2. Product formulation should be undertaken especially for dominant edible seaweed species to maximize the use of these resources.
3. Researches on possible culture of the edible seaweeds in Ilocos Sur should be undertaken.

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