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Porphyra Fisheries in the Northern Philippines: Some environmental issues and the socio- economic impact on the Ilocano Fisherfolk

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Abstract

Porphyra gathering as a source of livelihood for fisherfolk has continued for more than a decade now in the Philippines. Around 287 *Porphyra* gatherers, who are fisherfolk, were documented to benefit from the resources especially since their occurrence corresponds with the lean months for fishing operations in the area. Three species of *Porphyra* are known to thrive in the coastal waters of the Northern Philippines. These are different from the clade of species found in Japan and other Asian, temperate countries. The seaweed is geographically distributed along the inter-tidal zones of Claveria, Sta. Praxedes. Sta. Ana, and Calayan in Cagayan province and in Burgos and Pagudpud in the province of Ilocos Norte. The results of this study reveal that *Porphyra* grew well at temperatures ranging from 20 - 24 °C, salinity in the range of 29-30 ppt, humidity of 85 - 87% and wave splashing of 5 - 8 times per minute. Growth is indirectly influenced by rainfall, however it is hastened by the lowering of salinity and temperature due to precipitation. The seaweed can withstand extreme desiccations during summer months thus enabling it to withstand unfavorable weather and thrive again when conditions permit. This study determines the environmental factors affecting the growth of *Porphyra* species in the Philippines and their economic importance to the Ilocano fisherfolk

Key words: economic importance, Ilocanos, Northern Philippines, physical parameters, *Porphyra*

Introduction

Porphyra is a red, papery sea vegetable known for its nutritive values. It contains a high percentage of protein, iodine and vitamins A, B, and C. This seaweed is one of the most promising seaweed species for culture with great revenue potential in local and international markets. It is probably the most valuable among all the economically important seaweed species present in the Philippines aside from *Eucheuma*. Locally known as '*gamet*' in the Philippines, Laver in the West, Nori in Japan, Kim in Korea, Zicai in Chinese its nutritional value and wide acceptance as a food give it an advantage over other edible and cultivable species in the world. There are at least 133 reported species worldwide, 28 species in Japan, 30 along North Atlantic Coasts, 27 along the Pacific coasts of Canada and the US and 7 along Indian coasts. In the Philippines, three species have been identified as thriving in the coastal areas of Ilocos Norte and Cagayan province.

Porphyra production is estimated at 1500 Mt worldwide with most coming from artificial propagation mainly in Japan. The annual value of the crop is 1.4 billion US$ (porphyra.org). In the Philippines however, the *Porphyra* industry remains underdeveloped, as raw materials are mainly gathered from the wild and processing is traditionally done using the sun drying method.

To the fisherfolk and the *Ilocano* community, the huge local and global demand, increased gathering pressure, and natural and man-made threats make it imperative for resource managers to seek ways to ensure continuous production. Ilocanos are the third largest Filipino ethno linguistic group in the Philippines. Ilocano *balikbayans* or returning expatriates buy dried '*gamet*' in bulk as a gift for their relatives when they return. Ilocanos find *Porphyra* gathering a good alternative source of income even for the local market. Incidentally, its occurrence coincides with the lean

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fishing season in the northern Philippines – a time when most fishermen are idle and fishing ventures are not feasible due to unfavorable sea conditions.

The seasonality of these seaweeds and the difficulty of their gathering and drying make them a relatively high-priced food item. More often than not, gatherers are exposed to hazards because they have to wait for the waves to retreat before quickly starting to pick '*gamet*' stuck in the crevices of sharp-edged rocks. In effect, the resource is now under threat of depletion due to unregulated and destructive gathering methods. Fisherfolk use knives and other sharp objects to scrape the thallus from the rocks where it is attached resulting in habitat destruction and the elimination of the mother plant.

In order to sustain the productivity of *gamet* in the Philippines, baseline information on its socio-economic impact, its morphological and physiological characteristics, and the physical characteristics of the environment where it grow, are needed to serve as a basis or guide to the fisherfolk, Local Government Units (LGU) and other stakeholders in the formulation of ordinances and production protocols.

1. Methodology

1) Research design

The study made use of a descriptive correlational research design to determine the socio-economic factors affecting the variables in the study. Structured questionnaires and survey questionnaires were used in gathering data. The correlational section investigates the possible relationship among variables involved in the study.

The questionnaire contains information on the profile of respondents, the activities involved in processing, production, marketing and the problems encountered by the gatherers.

In contrast, the determination of physical factors affecting the growth of stocks was done weekly. Water parameters such as temperature and salinity at the collection sites were measured using a thermometer and refractometer respectively. Rainfall, air temperature and humidity were assessed through data from Philippine Atmospheric and Geo PAGASA. Wave action was measured through direct observation of the number of times waves hit the reef per minute. Productivity was estimated using a quadrat method to measure abundance, distribution and the species composition found at the collecting stations. Samples were also sent to Japan for DNA fingerprinting.

2) Data analysis and statistical treatment

The data were analyzed using the Statistical Package for Social Sciences (SSPS) Program. Percentages, frequency counts and the Pearson correlation were used to test the relationship between variables.

2. Location of the study

Claveria and Sta. Praxedes in Cagayan particularly in barangay San Juan, Centro 01 and 02 of Sta. Praxedes and Pata East and De Leaño of Claveria are the main study areas (Figure 1). Centro 1 and 2 are not coastal barangays, however most of the gatherers came from these places.

Sta. Praxedes is the northwestern most town of Cagayan and is bounded by three municipalities: Claveria, Cagayan to the northeast; Calanasan, Apayao to the southeast; and, Pagudpud, Ilocos Norte to the south. The southwest coast is lapped by the waves of the Babuyan Channel. Geographically, it is located in the northwestern most part of Cagayan and lies between coordinates 18º 31' 22" and 18º 27' 21" north and between 120º 57' 24" and 121º 2' 50" east.

Fig. 1 Map of the study area

The municipality of Claveria, on the other hand, lies on the northwestern portion of Cagayan. It is bounded to the north by the Babuyan Channel, to the east by the Municipality of Sanchez Mira, to the south by the Province of Apayao and to the west by the Municipality of Sta. Praxedes. It is the second municipality serving as a gateway to Cagayan via Ilocos Province. It lies geographical at coordinates 121°05' north and 18°35' east.

3. Results and Discussion

1) Species identification

In 1974 Cordero identified three species thriving in the Philippines: *Porphyra marcosii*, *Porphyra crispata and Porphyra suborbiculata*. These three species, according to Cordero, have peculiar characteristics such as the presence of microscopic denticulate, marginal growths, and monoecious and monostromatic types of thallus.

2) Distribution and relative abundance in the Philippines

Porphyra in the Philippines was found to be distributed along the reef coasts of Sta. Praxedes (Sitio Nanaplaan and Sitio Mingay), Claveria (Taggat Norte, De Leaño and Pata East) in the west of Cagayan and in the municipality of Sta. Ana (Cape Engano) which is located east of Cagayan. Some species were also collected along the island municipality of Calayan which is located north of Aparri, Cagayan.

In the Ilocos Region, it is particularly found along the coastal area of Burgos and Pagudpud, Ilocos Norte. These two municipalities are adjacent to Sta. Praxedes, Cagayan from where the majority of the supply came.

Abundance is highest during cold and rainy months in the Philippines and correspondingly decreases with the onset of summer (Figure 2). Average percentage cover was highest in December (90%) and January (87.5%), and lowest during the months of October (7.5%) and March (5%). *Porphyra* production totaled 33.79 Mt wet or around 5.63 Mt dry in 2008. The Kuroshio Current influences the settlement of *Porphyra* in the Philippines. The unique sea conditions explain why this seaweed is found only in the northern part of the country.

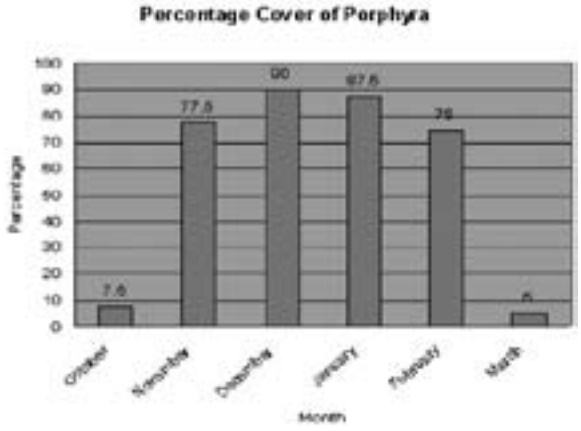

Fig. 2 Relative abundance of *Porphyra*, Sta. Praxedes, Cagayan, 2008

3) Physical characteristics of the environment affecting the growth of *Porphyra*

Six parameters were measured to determine the physical characteristics of the environment where *Porphyra* grew. These included salinity, water temperature, atmospheric temperature, rainfall, relative humidity, and wave action. Rainfall and wave action were considered because of the common local belief that rainfall hastens the growth of *'gamet'* more than any other factor.

Results show that the vegetative growth of *Porphyra* has a strong inverse relationship with water temperature, air temperature and salinity (Figure 3). Decreasing measurements of these parameters hastens the vegetative growth of the species. Growth has been monitored as occurring in water temperatures that range from 20°C to 24°C, and air temperatures of 21°C-26°C. No growth was observed from March to October when water temperature was 26°C to 31°C and air temperature is 27°C - 30°C. During the occurrence of low temperatures the photo period was shorter.

Likewise for salinity, the most favorable range was from 29 ppt to 31 ppt. The lowering of salinity due to rainfall hastens the vegetative growth of *Porphyra*. It serves as a stressor that facilitates the shedding of spores from their spermatogonia. Growth was also influenced by cold temperature. Normally, the salinity reading in the study area ranged from 33 to 35 ppt (March to October). At this time the gathering area was dryer and the water was calm.

There was also a significant correlation between the growth of *Porphyra*, wave action and humidity. Vegetative development is hastened by a more frequent wave action and by a more humid environment. An average of seven wave splashing intervals per minute was recorded (daytime). No growth was seen in areas totally submerged in water.

From among the parameters measured, light, temperature and photoperiod are the factors that affect the life cycle of *Porphyra* and that they can be manipulated to produce the conchocelis stage. In other countries conchocelis are usually reared in large in-door tanks at temperatures ranging from 20 -25°C. At certain times, conchospores are released and allowed to settle in collecting nets which are placed inside the tanks. During this time, light intensity is increased to encourage thallus growth. When the spores attach to the nets, they are then transferred and ready for outdoor culture.

4) Processing techniques employed by the fisherfolk

Unlike in other countries where *Porphyra* is processed into nori sheets by machine, processing in the

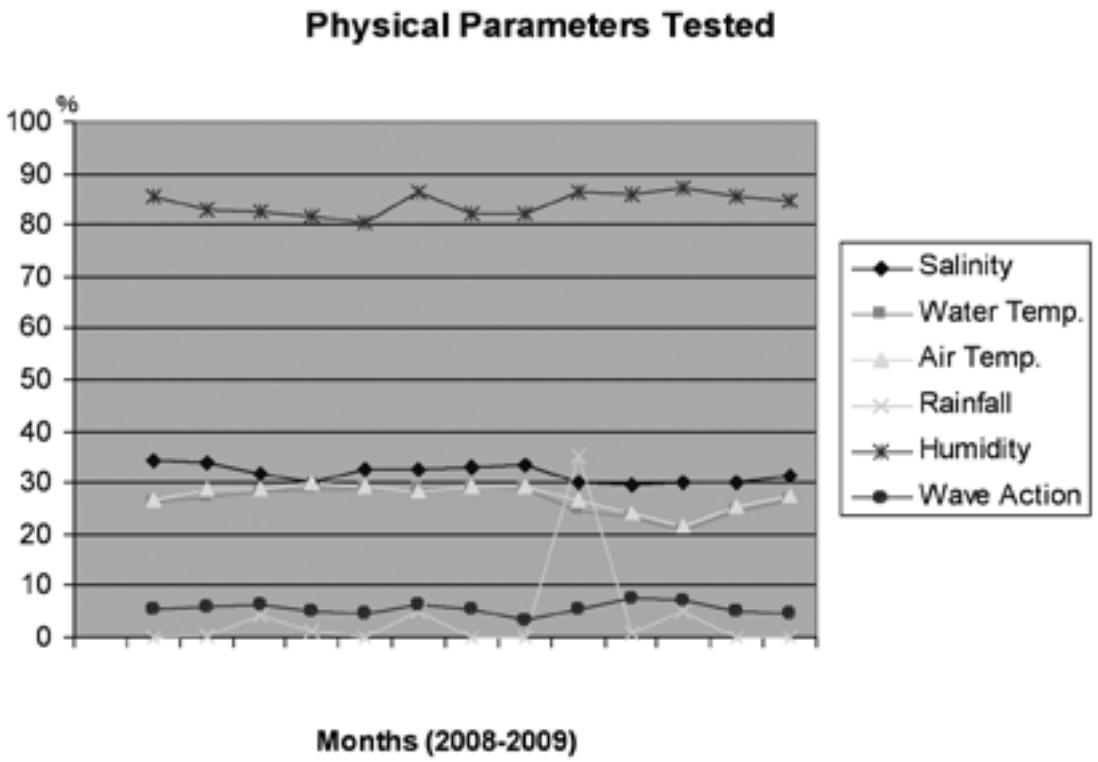

Fig. 3 Physical parameters tested in the study area, 2008 – 2009 (Data are presented as means)

Philippines follows simple and quite crude steps. After *Porphyra* are gathered, they are washed with plain seawater, drained, placed in round molders, particularly plates or newspaper, dried for about a day or two until ready for market. Some gatherers also use an improvised drying implement called an *akilis*, which is basically a woven bamboo mat. This drying implement allows water to drain thus facilitating drying. Women directly benefit from this economic activity particularly the wives of fisherfolk. They usually do the processing (drying) and marketing of produce. *Porphyra* must be dried within 1 day after gathering otherwise it will be spoiled or rot because of fungal attack. This problem hampers the processing activities and the capacity of the gatherers to earn more.

5) Socio-economic impact

The socio-economic aspect of the study tried to determine the contribution of *gamet* resources to the socio-economic condition of the community. Seventy one respondents were surveyed. More than 60% were male and 40% female. Eighty two percent were married with 18 % single or single parent.

(1) Socio demographic profile of respondents

The age of the respondents ranged from below 20 to more than 50 years old. Household size was from 2 to more than 6 of which 32 % had 4 members. Only about 6 % of the respondents have reached college education. Most of them had either elementary (62%) level or high school level (32%) education. In the study area, all the respondents depended on fishing as their primary source of livelihood. Around 40% were engaged in some farming activities. Of this, 84% or 60 respondents were *Porphyra* gatherers. Most of the respondents were not members of any fishing organization.

Sources of water for drinking and daily usage were through community faucet (48%), dug wells (40%) and pump wells (12%). All respondents were using electricity for lighting. However, 72% were still using wood for cooking and only 28 % were using LPG.

(2) Socio-economic impact of *Porphyra* gathering

The problem of finding a good source of income during the monsoon season is common in the surveyed municipalities because fishing is impossible and looking for an alternative source of livelihood is difficult. Thus, *Porphyra* gathering is of great importance to the Ilocano fisherfolk in those areas. A gatherer can harvest enough fresh *Porphyra* to make 13pcs of dry *'gamet'* per day which translates to an average income of P364.00 (Philippine peso) when sold at P28.00 per sheet. In terms of monthly income, a fisherman can earn around

P5,460.00 a month with only 15 gathering days during its season. *Porphyra* gathering is done at 4 to 5 in the morning and lasts for 6 to 8 hours. Gatherers usually return home after lunch or at around 2 in the afternoon. Gathering is quite risky because they have to descend to the rocky, slippery shore where *Porphyra* grows. Another constraint on the gatherers is drying and the absence of dryers in the area. This results in much lower income because the products have to be sold in wet form to buyers from Burgos, Ilocos Norte. The small income they receive however can cover the cost of buying food and the other household needs of the family for the day.

Another important impact of this livelihood is that most of the gatherers were able to send their children to school for either elementary, high school or even college education. The income derived from this livelihood already supports the needs of the family especially in times when husbands cannot go out to fish. Results also show that most gatherers are able to buy medicine for sick family members which can often be a problem in rural coastal communities, especially during the rainy season.

Conclusion

Porphyra is a promising species of seaweed, the gathering of which can be promoted and developed into an important industry in the Philippines. It can provide a good alternative source of livelihood to the people in coastal communities in the Philippines particularly in areas where cold spells are experienced. The presence of natural populations of *Porphyra* in the northern Philippines and the parallel physical characteristics of the environment in other countries where it is grown commercially are indications that it can possibly be cultured locally. The temperature, salinity and the natural light periodicity of the country is strongly favorable for the vegetative growth of seaweeds. However, further study must be conducted to determine details of conchocelis production in controlled environments. This may serve as a key factor in the determination of the right culture technology, most applicable under Philippine conditions.

Porphyra gathering impacts positively on the lives of the Ilocano fisherfolk gatherers. It supplements their meager income because its abundance coincides with the off season for fishing in the area.

The provision of post harvest facilities is deemed necessary to aid processors in drying the produce. Likewise, product development and improvement must be institutionalized to make the products more attractive to consumers and expand their marketability. For now, the Local Government Units (LGU), Government Organizations (GOs) and the gatherers themselves should jointly formulate ordinances to help protect and sustain the resources and expand the production areas for *Porphyra* in the country.

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