

Reference

- Basu, A. K. 1965. Observation on the Probable Effects of Pollution on the Primary Productivity of the Hooghly and Mutlah Estuaries *Hydrobiologia*, 25, 302–316.
- Beeton, A. M. & Edmondson, W. T. 1972. The Eutrophication Problem. *J. Fish. Res. Bd., Can.*, 29, 673–682.
- Chan, George L. 1972. The Use of Pollutants for Aquaculture – Conditioning of Wastes for Aquaculture. 15th Session IPFC Wellington. FAO Bangkok.
- Jhingran, V. G. 1972. A critical appraisal of the water pollution problem in India in relation to Aquaculture. 15th Session IPFC Wellington. FAO Bangkok.
- Oren, O. H. & Ravid, Rosa. 1969. Phosphate in Lake Kinnereth. *Verh. Intern. Verein. Limnol.*, 17, 334–341.
- Prowse, G. A. 1964. Some Limnological Problem in Tropical Fish Ponds. *Verh. Intern. Limnol.*, 15, 480–484.
- Slak, E. B. 1972. Sewage and Aquacultural Production. 15th Session IPFC Wellington. FAO Bangkok.
- Watts J. C. D. 1965. The Chemical Analysis of Muds from the Pond Systems of the Tropical Fish Culture Research Institute. TECRI, Malacca. Investigational Report No. 3

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The Seaweed Industry of the Philippines

by

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INTRODUCTION

Until 1966 the seaweed industry in the Philippines was a negligible item in the country's economy. Seaweeds were mainly used locally. Only a few species were exported. One of these was *Digenea simplex* a uermifuge source, which used to be exported years ago but is now no longer in demand, although there have been occasional inquiries as to their sources. *Galidium* and *Gracillaria* were exported to Japan as sources of agar. With the discovery of *Eucheuma* as a source of Carrageenin for industrial purposes, our natural grounds were exploited and our export of seaweed in 1966 was some 800 tons. In the next five year, our exports dwindled to a mere 318 tons in 1970. This indicated an over-exploitation of our *Eucheuma* weeds so that culture of this weed had to be started. The 1972 statistics now show that exports have gone up to about 570 tons valued at P1.6 million pesos.

The greatest bulk of our seaweed exports go to the United States of America which received 270 tons in 1970. Japan bought 26 tons, France 5 tons, 17 tons went to other countries in this same year.

There are two known exporters of seaweeds in the Philippines: the Marine Collids (Phil.) Inc. at # 7 Masunurin St., Sikatuna Village, Quezon City and the Kah Development Corporation of Cebu City. Marine Collids (Phil.) buys and exports dried *Eucheuma* as raw material.

Some local factories which produce processed *gulaman* bars are the Nomer Chomical Products Inc., in Caloocan City, the Rizal Agar-agar Factory in 47 K Manalo St., San Juan and the Goodwill Products Corporation in 28 Capitan Tiago St., Malabon, Rizal.

What part is *Eucheuma* and what part is *Gracillaria* is not reported but it has been observed that there is a

growing demand for *Gracillaria*. Hence, studies are now being initiated on the culture of *Gracillaria* in addition to *Eucheuma*.

COMMERCIAL USEFUL SEAWEED

There are many species of seaweed found in Philippines waters owing to its warm seas and shallow areas. These are described in the order of their importance.

1. *Eucheuma* (gozo)

Eucheuma, locally known as "gozo" in Visayan, is a red alga which is now the most important commercial seaweed in the Philippines. This alga grows on coral reefs and in the rocky and sandy bottom of marine intertidal or subtidal zones where the water is very salty, clear and fastmoving. The soft body is light brown to light green with erect or prostrate branches. There are various species found in Philippine waters. Of these, *S. striatum* and *E. spinosum* are found best suited for cultivation. At one time (1965–66) it constituted the biggest single marine export commodity of the country. Due to poor conservation practices by gatherers, who take all the available seaweeds of the area and leave nothing to grow, the yearly export of this product has been diminishing for the past five years. For this reason it is necessary to culture this particular genus of seaweeds in order to have a steady supply, as it is badly needed by all developed countries.

Uses: In the Visayas and Mindanao areas, it is common to see *Eucheuma* together with other species of seaweeds offered for sale in the market. They are eaten raw as salad. *Eucheuma* is commercially important due to its demand for industrial uses. From this alga is taken or extracted "carrageenin", a valuable substance used in products that need gelling, suspending, thickening or water-holding

properties. There are countless products needing carrageenin such as ice cream, peanut-butter, paints, cosmetics, textiles, rubber products, etc.

Sources: There are various places where *Eucheuma* may be found growing in a natural state. The biggest natural ground and best areas for farming are the wide shallow areas in the Sulu Archipelago, where these grow in great abundance. Other good growing areas are around Zamboanga, Palawan, Cebu, Bohol Samar, Surigao and Polilo. They may also be found in Pangasinan, Mindoro, Negros Panay, Leyte, Masbate, Catanduanes, Batangas, Camarines Norte, Camarines Sur, Davao, etc. and practically around all small island of the country, although the distribution is affected by the seasons.

2. *Gracilaria* (gulaman dagat)

Gracilaria confervoides (gulaman dagat) is the species most extensively used in agar manufacture in the Manila area.

Gracilaria is our main source of agar-agar or *gulaman*. The value of agar lies in its strongly hydrophilic colloid and high gelstrength qualities. It is used where bulk is wanted, or where a suspending, stabilizing, thickening or gelling agent is desired. It is used in some bakery and dairy products and in candy, jelly, canned foods and other items. Its most important service to mankind, however, is as a bacteriological culture medium, although the amount used for this purpose is relatively small. In the fresh state, this is used for food in the form of salad and also as supplemental food for the baños *chanos chanos*. Quite recently, *Gracilaria* became a big export item in our economy. Japan especially was our biggest importer of the product, so that a need for development of the industry, especially keeping up a constant supply through its culture, is in order.

Sources: The greatest amount of this seaweed comes from Manila Bay area, from November to May. Other sources are Zamboanga, Sulu and Cagayan. This seaweed is gathered by the use of rakes in areas from the shore to a water depth of one to two meters. When the Southeast wind (habagat) blows all the *Gracilaria* are uprooted and washed to the shore by the strong waves. These, however, have left spores in their growing areas and these grow again during the following season so that there is a natural closed season for the seaweed, and there is provision for a supply every season. However, with indiscriminate gathering these weeds may not get a chance to reproduce and therefore the fishery may be depleted.

3. *Gelidium* – agar weed

The entire plant reminds one of the frond of a fern and is sometimes known as “sea-fern.” It grows in tufts and attaches itself firmly to the rocky substratum by numerous rhizoidal filaments. *Gelidium* grows most abundantly around the edges and on the slanting surfaces of rocks and boulders in places where the water is generally turbulent and the water movement fast. They abound in the intertidal and subtidal littoral zones.

This is one of the sources of high quality agar and is very much in demand in Japan.

4. *Porphyra* (gamet)

Gamet is another seaweed of great commercial pos-

sibility as food and livestock feed. It is similar to the *amanori* (*Porphyra tenera*) of the Japan. Tseng (1944) reported that Japan was able to convert 12,000 acres of her useless rocky shores into a sea garden of *amanori*, giving that country an annual income of no less than \$3,000,000. This seaweed is found in abundance along the shores of Burgos, Claveria, Aparri, and other towns of the northern provinces of Luzon growing on boulders that are sprayed by sea water. It is a delicacy among the Ilocanos and is the most common edible seaweed.

Gamet may be cultivated by collecting their spores and allowing them to grow during the months of November to March.

The fronds of seaweeds are plucked and washed thoroughly in fresh water and dried under the sun. The dried *gamet* appears like thin sheets of paper, shiny and dark green. These can be eaten with soy sauce to improve the taste.

5. *Codium* (pokpoklo)

Another species of seaweed that is consumed as food in the fresh state is *Codium* (pokpoklo).

Codium is low in food value but is exceptionally high in potassium. It is highly watery in the fresh state (93% moisture) and is much relished as food by the Ilocanos. This can be found in Ilocos Norte and Gagayan.

6. *Caulerpa* (lato or ararosep)

Caulerpa is also low in food value but widely used as food in northern Luzon, Visayas, Mindanao and Sulu. Recent studies of our peppery type of *Caulerpa* at the University of Hawaii show the possibility of deriving some active alkaloids for certain medicinal purposes from this source.

7. *Sargassum*

Sargassum, a brown alga, that has been reported floating in great abundance in the marine waters all over the Philippines grow attached to some anchors at the bottom, but are eventually destroyed by wave action and currents. These are most abundant in the coral reef areas like the Hundred Islands in Pangasinan, the Palawan area, Mindoro, Cebu, and Batangas. It was found to have a high content of alginic acid and may be used in the production of commercial alginate chemicals. Because of the high amount of minerals present in the ash in the form of calcium and potassium, the waste materials may be useful as fertilizer. There are great possibilities for this alga.

8. *Digenea simplex* (bodo-bodo)

Another kind of seaweed, *Digenea simplex*, found in the northern coast of Luzon, has an immediate value as medicine. It is locally known as *digenea* and *tserkoots'ai* or *Hayen-ts'ao* in Chinese. Pharmaceutical preparations such as macnin and helminal, are derived from this seaweed. It is an efficient vermifuge and is claimed to be much better than santonin as it gives no secondary bad effect, especially to children. It contains an appreciable amount of agar although of poor gelling quality.

It is also reported to be eaten fresh or dried by some people.

9. *Hypnea*

This red seaweed is good material for the extraction of

commercial agar. It is also being utilized directly as food in many parts of the Philippines like Manila Bay, Mindoro, Zamboanga and Santa Ana, Cagayan.

10. *Turbinaria*

This brown alga, like *Sargassum* could be tapped commercially as good material of alginic acid. It has been reported in Cebu and Sulu.

11. *Hydroclathrus*

This is another source for alginic acid. Its main source is Pangasinan.

USES OF SEaweEDS

Seaweeds are major sources of agar, alginic acid and carrageenin. The red algae are generally sources of agar and carrageenin. While the brown algae are sources of alginic acid.

The uses of agar are manifold but probably its most important use is in bacteriological and fungal culture work.

Some of the many products in which seaweed extracts are used as follows:

Pharmaceutical products

- Aureomycin tablets
- Terramycin suspensions
- Triple sulfa tablets
- Penicillin suspensions
- Anti-acid tablets
- Sulfa suspensions
- Aspirin compound tablets
- Calamine lotion
- Hemostatic powders
- Baking laxatives
- Dental impression compounds
- Toothpaste
- Orthopedic impression compounds
- Surgical jellies
- Suppositories
- Mineral oil emulsions
- Rubbing ointment

Miscellaneous food products

- Bakery icings and meringues
- Salad dressings
- Frozen foods
- Fountain syrups
- Orange concentrates
- Candy
- Puddings

Rubber

- Natural and synthetic latex creaming and thickening
- Finished articles
 - Automobile carpeting
 - Electrical insulation
 - Babies, rubber pants
 - Foam cushions
 - Rubber coating
 - Tyres

Textile products

- Size compound for cotton and rayon
- Textile print pastes
- Plastic laundry starch

Dairy products

- Ice cream
- Dry ice cream mix
- Sherbet
- Chocolate milk
- Chocolate toddy
- Sterilized cream
- Cheese

Adhesive

- Wall board
- Paper bags
- Shipping containers
- Gummed tape
- Decals

Paper products

- Food packages
- Pharmaceutical soap and detergent packages
- Milk containers
- Butter cartons
- Frozen food packages
- Insulation board
- Food wrappers
- Greaseproof paper
- Acoustical tile

Miscellaneous products.

- Paints
- Ceramic glazes
- Porcelain ware
- Leather finishes
- Auto polishes
- Welding rod coatings
- Boiler compounds
- Battery plate separators
- Wallboard joint cement
- Beet sugar processing
- Wax emulsions