

## Economically Important Species of Benthic Marine Algae in the central Visayas, Philippines<sup>1</sup>

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The biological and economic importance of algae is less appreciated by laymen than that of higher plants. Yet algae play both beneficial and detrimental roles in nature (Bold and Wynne, 1978, p. 28).<sup>2</sup> Beneficial roles include the following:

1. *As primary producers* — Algae form the base of marine foodwebs as primary producers of organic matter by virtue of their photosynthetic activities. Were they to disappear from their aquatic environments, animal life would collapse due to the lack of a major source of food and energy.
2. *As food* — More than seventy species of marine algae have been used as food, especially in Oriental countries. Reyes (1970) lists twenty-one edible species as occurring near Dumaguete, the most popular of which are *Caulerpa racemosa* and *C. lentillifera*, both locally called *lato*, and *Gracilaria verrucosa* and *Eucheuma* species, locally called *guso*. These "seaweeds," mixed with tomatoes, onion, and vinegar, are eaten as salads. Madlener (1977) cites several other species eaten elsewhere. She also gives the amounts of proteins (up to 25% of the dry weight), carbohydrates (in the form of a polysaccharide, gel), vitamins (especially the vitamin B complex), minerals, fats and oils, and trace elements that man can get from algae.
3. *Phycocolloids* — These are substances found in cell walls of certain algae. The most abundant are algin in brown algae and agar and carragenan (carragenin) in red algae. Agar extracted from such algae as *Gracilaria*, *Gelidium*, and *Pterocladia*, collectively called agarophytes, has a variety of uses. In microbiology, it is used as a culture medium, substituting for the more expensive animal gelatin. For human consumption, it is made into desserts and jellies, used as an anti-drying agent in breads and pastries, as an additive to cheese to improve its slicing quality, and in frozen dairy products. In the cosmetic industry, it is used as emulsifier in shaving creams, lotions, and soaps. It is also used in dental molds and shoe polish. In drugs, agar is used for making capsules. Agar finds many other uses in industry, replacing starch for sizing fabrics, as waterproofing for paper, in photographic film, in tanning leather for gloss and stiffness, and for making rice paper durable.

Carragenan, extracted from *Eucheuma*, is like agar but has a higher ash content and requires a higher concentration to form gels. It is used as a stabilizer in chocolate, milk, egg nog, ice cream, sherbet, frozen specialties, whipped cream, confectioner's syrup, creamed soup, insect spray and water base paint. Algin has similar uses to agar and carragenan but its major source (*Macrocystis*) does not occur in the Philippines. The Philippines is one of the leading exporters of dried *Eucheuma* to Japan, some European countries, and the United States.

4. *As animal feeds* — Preparations of brown and certain unicellular green algae have been used as supplements to the food of poultry, cattle, and hogs. Locally, *Sargassum* is dried and mixed with animal feed.
5. *As fertilizer* — Algae are rich in minerals and trace elements. Worthy of mention is the potash concentration in brown algae, which makes it a good source of fertilizer. Blue-green algae are efficient nitrogen fixers and are now being utilized in the Philippines to fertilize rice farms.
6. *Pollution and waste disposal* — The role of algae in pollution control and waste disposal should not be overlooked. Raw sewage and sewage products are in some areas of the United States introduced into shallow waste stabilization ponds where the photosynthetic oxygen of associated algae enhances bacterial oxidation.
7. *As medicinal herbs* — Ancient Chinese and Scottish books of medicine have included algae as cures for certain diseases. Agarophytes are good laxatives; *Sargassum* can prevent goiter; *Gelidium* has been used for stomach and heat-induced illnesses, *Halimeda* as vermifuge (Cordero, 1980).
8. *Other uses* — The role of coralline algae in reef formation, of algal detritus in ecological cycles, the importance of fossil diatoms as sources of oil, the widespread use of the algae *Chlamydonomas*, *Chlorella*, and others in biological research at the cellular and molecular levels (photosynthesis and sexual reproduction), should also be mentioned.

On the other hand, a few negative roles are attributed to algae. Toxicity is exhibited by certain species (*Lyngbya* in Madlener, 1977). During algal blooms, toxins are liberated which kill fish and other organisms and help create an anaerobic condition.

Despite the economic importance of algae, little information is available on where various species may be found. In 1978 and 1979, the Smithsonian Institution conducted a floristic survey of the central Visayan

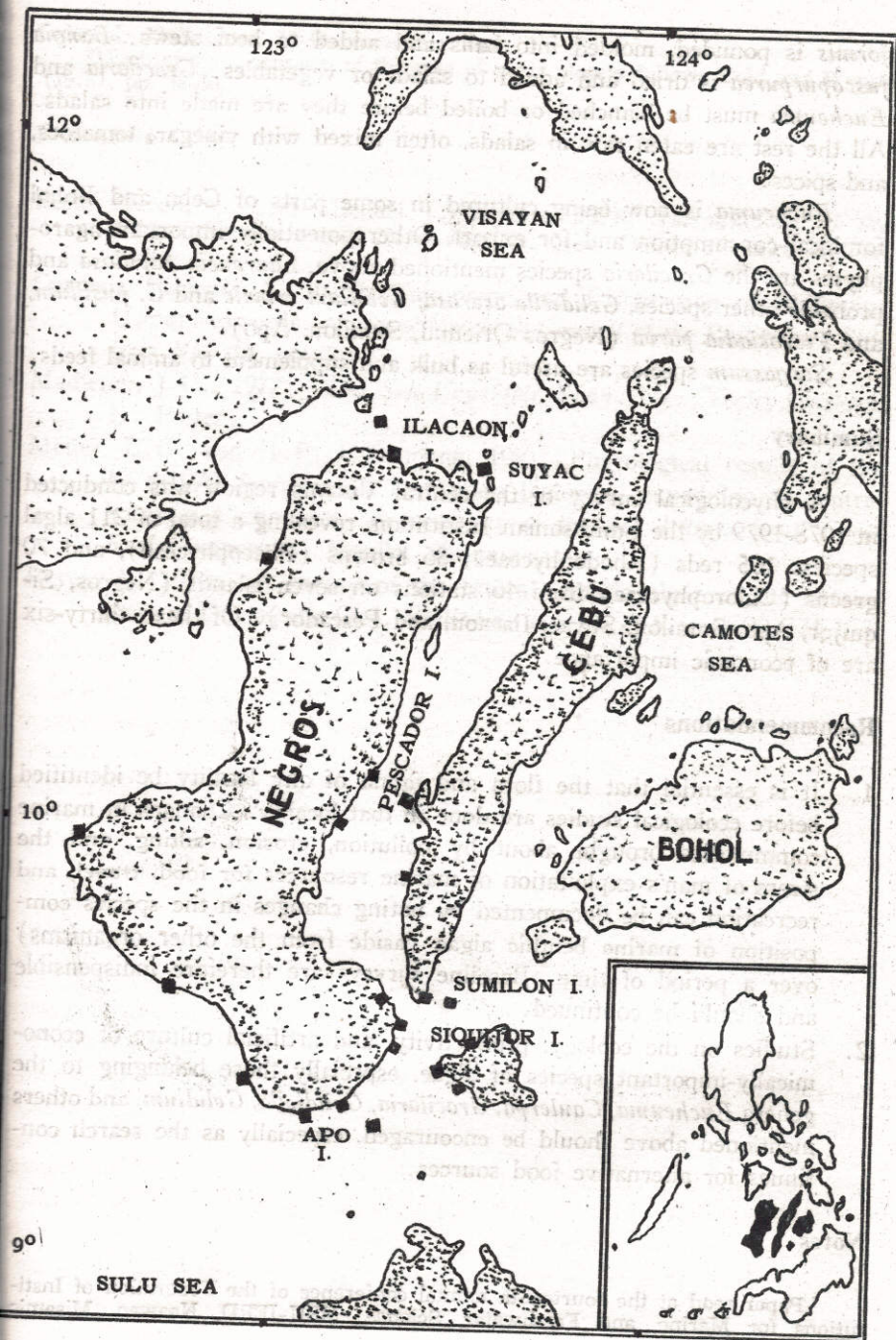
region of the Philippines, covering the islands of Negros, Cebu, Siquijor, Apo, Pescador, Ilacaon, and Suyac. Of the 211 species reported by Meñez and Calumpong (1981), thirty-six species are of economic importance, as food or as sources of phycocolloid, fertilizer, animal feed, or herbal cure. The following report locates these economically important species and notes their uses.

### Report

Included in this survey are thirty-six species of algae which are used as food, as sources of phycocolloids, fodder, or herbal medicine, or which have the potential for such uses. Location is indicated in parenthesis.

Edible species included *Acanthophora spicifera* (Negros Oriental/Occidental, Siquijor, Ilacaon, Apo), *A. muscoides* (Siquijor, Negros Oriental, Apo), *Asparagopsis taxiformis* (Sumilon, Apo, Negros Oriental), *Bangia fuscopurpurea* (Apo), *Caulerpa lentillifera* (Siquijor, Negros Oriental), *C. microphysa* (Siquijor, Apo, Negros Oriental, Sumilon, Pescador), *C. racemosa* (Siquijor, Negros Oriental, Apo, Cebu, Ilacaon, Suyac, Pescador, Sumilon), *C. sertularioides* (Siquijor, Negros Oriental/Occidental), *Chaetomorpha crassa* (Siquijor, Negros Oriental, Apo), *C. linum* (Negros Oriental), *C. spiralis* (Siquijor, Negros Oriental/Occidental), *Codium geppii* (Negros Oriental), *C. bariletii* (Negros Oriental), *Enteromorpha clathrata* (Negros Oriental, Apo), *E. compressa* (Siquijor, Cebu, Negros Oriental/Occidental, Ilacaon), *E. intestinalis* (Cebu, Apo), *Gelidiella acerosa* (Negros Oriental/Occidental, Ilacaon, Suyac, Cebu, Siquijor), *Gelidiopsis intricata* (Negros Oriental, Siquijor), *Gelidium crinale* (Negros Oriental, Pescador, Cebu, Ilacaon, Apo), *Gelidium pusillum* (Negros Oriental/Occidental, Siquijor, Apo), *Gracilaria arcuata* (Negros Oriental/Negros Occidental, Siquijor, Ilacaon, Suyac, Apo), *G. blodgettii* (Cebu, Siquijor, Apo), *G. crassa* (Siquijor, Apo), *G. eucheumoides* (Cebu, Ilacaon, Negros Oriental/Occidental), *G. salicornia* (Negros Oriental/Occidental, Cebu, Siquijor, Apo, Ilacaon, Suyac), *G. verrucosa* (Siquijor, Negros Oriental, Cebu), *Eucheuma arnoldii* (Cebu, Ilacaon), *E. crassum* (Negros Oriental), *E. cottonii* (Ilacaon), *Halymenia dilatata* (Apo, Sumilon), *H. durvillaei* (Negros Oriental/Occidental, Cebu), *Hydroclathrus clathratus* (Negros Oriental, Cebu, Siquijor, Apo), *Laurencia papillosa* (Negros Oriental/Occidental, Cebu, Siquijor, Ilacaon, Apo), *Sargassum* spp. (Negros Oriental/Occidental, Suyac, Ilacaon, Apo), *Ulva lactuca* (Cebu, Negros Oriental, Siquijor, Ilacaon, Apo).

These algae are consumed in a variety of ways. *Asparagopsis taxiformis*



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*formis* is pounded, molded into balls and added to beef stews. *Bangia fuscopurpurea* is dried and added to salads or vegetables. *Gracilaria* and *Eucheuma* must be blanched or boiled before they are made into salads. All the rest are eaten raw in salads, often mixed with vinegar, tomatoes, and spices.

*Eucheuma* is now being cultured in some parts of Cebu and Bohol for local consumption and for export. Other potentially important agarophytes are the *Gracilaria* species mentioned above, *Laurencia papillosa* and probably other species, *Gelidiella acerosa*, *Gelidium crinale* and *G. pusillum*, and *Pterocladia parva* (Negros Oriental, Sumilon, Apo).

*Sargassum* species are useful as bulk and supplement to animal feeds.

### Summary

A phycological survey of the central Visayas region was conducted in 1978-1979 by the Smithsonian Institution, revealing a total of 211 algal species: 105 reds (Rhodophyceae), 36 browns (Phaeophyceae), and 70 greens (Chlorophyceae) from 46 stations on seven islands (Negros, Siquijor, Apo, Sumilon, Suyac, Ilacaon, and Pescador). Of these, thirty-six are of economic importance.

### Recommendations

1. It is essential that the flora and fauna of any locality be identified before ecological studies are done in that locality. Changes in marine communities brought about by pollution, erosion, silting, and the stress of man's exploitation of marine resources for food, travel, and recreation can be documented by noting changes in the species composition of marine benthic algae (aside from the other organisms) over a period of time. Baseline surveys are therefore indispensable and should be continued.
2. Studies on the ecology, productivity, and artificial culture of economically-important species of algae, especially those belonging to the genera *Eucheuma*, *Caulerpa*, *Gracilaria*, *Gelidiella*, *Gelidium*, and others mentioned above should be encouraged, especially as the search continues for alternative food sources.

### Notes

<sup>1</sup> Paper read at the fourteenth annual conference of the Federation of Institutions for Marine and Freshwater Science, MSU-IFRD, Naawan, Misamis

Oriental, Philippines, 13-14 November 1981.

<sup>2</sup>Much of my discussion of the role of algae closely follows Bold and Wynne (1978), pp. 28-30.

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