

coasts and with the precedents established in the treaty on the Northwestern Atlantic, there is every reason to believe that effective federal-state cooperation in these matters will be the pattern of the future.

Potential Products From Gulf or Sargassum Weed

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IN THE 1948 ANNUAL of the magazine, *Southern Fisherman*, it was said, "One of the least publicized and underexploited . . . yet one of the most valuable marine resources of the world is seaweed." This is just as true of the Caribbean area as of any other, and a few words regarding the possible utilization of the seaweeds are certainly not out of order.

The Caribbean area has various kinds of seaweeds, but this paper is limited to comments on one, the brown marine alga, *Sargassum*, perhaps more commonly known as Gulf Weed. Actually there are two types. One is attached to the bottom and grows along the coast in comparatively shallow water. So far as is known there are no large beds of this type and it is, therefore, not likely to become of much importance. The other type of *Sargassum* is free floating and is found in the Sargasso Sea and the Atlantic west of there, in some parts of the Caribbean Sea and in the Gulf of Mexico.

A study of the literature discloses that the brown algae, in general, are sources for algin, among other constituents. This study of *Sargassum*, one of the brown algae, has been directed primarily to determine the amount of algin available and the best methods of recovering it, but with consideration of the other constituents also.

Parr, in a paper titled "Quantitative Observations on the Pelagic *Sargassum* Vegetation of the Western Atlantic," has given the only general report on the availability of the floating *Sargassum*. He states that the Sargasso Sea includes about two million square miles and that floating *Sargassum* averages 2 to 5½ tons per square mile. On the other hand, he estimates floating *Sargassum* in the Gulf of Mexico to average one ton per square mile for a total of 90,000 tons. Furthermore, it is indicated that the seaweed in the Gulf is the result of fresh weed floating in from the Atlantic. Hence there is a large quantity of Gulf Weed available, and probably concentrated in several places so that it would not be too difficult or expensive to harvest. Collection of a floating seaweed would be much easier than mowing of an attached and perhaps submerged one. Some of the beaches of the Atlantic and Caribbean islands should be good for collection of *Sargassum*.

Is it worth collecting seaweed generally for colloid materials? Samples have been taken of both the fixed and the floating varieties of *Sargassum*. Complete analysis has been made of the former. Determination of algin, laminarin, mannitol, and fucoidin have been made on both types on actual separation of these constituents. At the present time there is underway at the Marine Laboratory of the University of Miami a year-round monthly analysis for these main constituents in the floating *Sargassum*, along with other simpler sugar materials. Obviously, for any commercial utilization it is necessary to know all about any variations in the amount of algin and other substances available.

Analyses show the fresh *Sargassum* to be about 85 per cent water and the air-dried seaweed about 15 per cent moisture. On the dry basis it averages 17

per cent algin, less than one per cent mannitol, 4 per cent fucoidin, and no laminarin. The algin content is an average for a considerable part of the year, actual figures having ranged from 13 per cent to 23 per cent. The others are reported on one sample of a fixed Sargassum. Fat content was about one eighth of one per cent, proteins 4 per cent.

Algin is the important constituent in this study. In the United States alone, several million pounds are used yearly and the demand is growing. Alginic acid is used in the manufacture of fibers, thickeners, protective colloids, and in insulating materials. The sodium salt, usually called Algin, and the calcium salt have been used in the production of textiles, plastics, transparent paper, cosmetics, films and coatings, ice cream, salad creams, custards, jams, sauces and jellies, and as an emulsifier in pharmaceutical, medical, and surgical preparations. Other uses are being frequently reported. Fucoidin has no known use at present but it may prove similar to agar. The protein and fat in Sargassum are of little value, as such. But Sargassum, dried and washed free of some of the salt, can be used as a cattle feed and has been reported to have a fairly high digestibility factor.

Dried Sargassum can be used as a fertilizer material. The minerals extracted during the production of algin can be recombined with the spent weed and this used as a fertilizer. Properly prepared Gulf Weed is a good mulching material, since the colloidal materials present will hold large amounts of moisture.

In any discussion of ways for increasing the available foodstuffs, consideration should be given to the fermentable sugars obtainable from Sargassum. As with such sugars from other sources, the extract of the Sargassum can be used as a liquid on which to grow high-protein yeast. This yeast can be dried and used as a protein supplement in human nutrition. Since the sugar solution can be obtained before extraction of the algin, it is possible to obtain two products from the same lot of Sargassum.

From the 90,000 tons of Sargassum which Parr has calculated is present in the Gulf of Mexico, and estimating that this quantity will produce 12 or 13,000 tons dried, recovery of 15 per cent algin would produce close to 2,000 tons of this material, or about four million pounds. Of course, it would not be possible to harvest all the weed in the Gulf, but if it is true that the supply there is replenished by fresh weed floating in from the Atlantic, it is possible that somewhere near the tip of Florida there is a good place for collecting Sargassum in large quantities. There might also be such a place near Nassau. The process of extraction and purification is neither difficult nor expensive, and it is probable that a worthwhile industry can be built up on this one seaweed.

The Place of Systematics in Commercial Fisheries Research

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BEFORE DISCUSSING the part played by systematics in fisheries research, a few words should be said about the modern concept of, and approach to, systematics, especially in what concerns the study of fishes.

In the "old days," from about the time of Linnaeus until very recently, the practice of taxonomy consisted in the morphological study of single or, at the most, very few individuals collected by miscellaneous persons. In most instances, these specimens were not even accompanied by a locality label. Few, if any, natural history notes were taken in those days. In other words, an "ichthyolo-