

culture sponges there in large quantities, perhaps as many as twenty thousand to an acre. The waters in the lagoons of the atolls are policed effectively by the natives who live around the atoll, so there is not the trouble of stealing which in some parts of the world interferes with artificial cultivation. The natives have the requisite skill, and partly from Japanese teaching and partly from what I have shown them, are ready to go ahead. (From letter of October 3, 1949.)

Unfortunately, based on specimens submitted to the Sponge Institute, the cultivated sponges of the Marshall Islands do not appear to possess high commercial value. The question which comes to mind is: Would high quality commercial sponges, such as sheepswool, transplanted to these waters, reproduce high grade commercial sponges? Studies are in progress to determine the practicability of transplanting sheepswool or other desirable species from the West Indies to the Marshalls for determining whether they would grow and produce quality sponges. Fortunately Dr. de Laubenfels, in a letter dated October 31, advises that he was able to move live sponges as much as 200 miles to be used for cuttings, "and these are growing rapidly and healthily. There is good evidence that now I know how to move them." It therefore appears desirable to attempt such a venture. Dr. de Laubenfels' work was conducted under the auspices of the Pacific Science Board, comprising the National Research Council and the U. S. Navy, which provided excellent facilities.

In summary: The annual production of genuine sponges has sunk to such a low level that they are rapidly being replaced by synthetic products which are much cheaper in price, that under such circumstances the arguments favoring increased tariffs on imports of genuine sponges are specious and would merely lead to the more rapid displacement with cellulose and other synthetic sponges. If consumers, especially those who find no acceptable substitute for the natural sponge, are to retain their interest in the genuine article, they must get the supplies they need. Every possible effort must be made to provide a sponge fishery management program, to stabilize production and assure a sustained yield. This should be supplemented by encouraging the cultivation of sponges on a commercial basis. If a constant source of supply is to be assured it may be found desirable to transplant high grade sponges to other areas.

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## **Some Possibilities for Fisheries Development in the Gulf of Mexico**

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THE DIVISION OF OCEANOGRAPHY of the Southwest Research Institute was established only a few months ago after long consideration and study as to whether or not an independent not-for-profit institution of this character, dedicated to the economic advancement of the states of the Southwest, and the nation in general, could contribute to the development of the Gulf of Mexico as a great asset to the nation. Recommendations came from every direction that this field should be entered because there is so much to be learned, and because the other activities of the institution relating to production of food, of petroleum, and the processing of natural resources are so closely related to

this effort. The Division of Oceanography is confident that through scientific research and development it will be able, along with other institutions, to improve the usefulness of the Gulf of Mexico for the benefit of the public and at the same time enhance the opportunities for close collaboration among the various industries and sciences that want to take advantage of this great asset.

The great nutritive values of Gulf waters are widely recognized, partly brought about by the draining into them of major rivers. The problem of diminishing soil nutrients on agricultural lands is certainly not a problem that exists in Gulf waters. The Gulf offers an ever increasing opportunity as a major source for human and animal food.

In addition, the Gulf is the "meeting place of all sciences" and through an understanding of its actions it is possible to learn about the formation of sediments, such an important factor in the geological sciences, its abilities and limitations to absorb land wastes, its action on shore and offshore structures, and its effect on climatic conditions, both here and in other parts of the world. The Gulf is unusual in that it is one of the few bodies of water in the world that has a continental shelf of the character that gives us a great expanse of relatively shallow, saline, and warm water the year around. Any water area on or adjacent to the United States that can produce at least two times as much plant life as the best agricultural lands is certainly something to look into. The large numbers of papers on the subject of products from the sea presented before the recent United Nations Scientific Conference on the Conservative Utilization of Resources definitely shows exciting possibilities.

It is possible that the people of the Gulf Coast states do not sufficiently realize the potentialities of this asset, and believing that the petroleum industry is the only group that has a stake in the matter, may have been somewhat indifferent in fighting for the sovereign rights of their states and their own heritage in allowing Federal control to develop to its present controversial

The fishing industry is under discussion here, and it may be because some Texans are better cattlemen than they are fishermen that some rather unorthodox fish industry methods have been suggested there. Sufficient investigation has already been made to justify the feeling that fish can not only be "ranched" but can also be "herded." It is recognized, of course, that normal types of ranch fencing are impossible in Gulf waters for the reason that any activities in the Gulf must give right-of-way to ships. At the same time it is recognized that if fish can be fenced in much as cattle are, not only can their movements be controlled, but control can be exercised over the raising of various varieties and various sizes. In one area one-year olds could be penned and in the adjoining area two-years olds. In other areas, similarly, other species of varying ages and so on.

The "fencing" problems leads to the realization that devices must be restricted to those that can be used on the floor of the Gulf and of a character that will not obstruct the movement of ships. These devices could be in reality "corner posts" located at a quarter or half mile intervals, providing blocked off areas for the control of the movement, and retention of fish, provided that some invisible and non-metal "fence" can connect these devices and thereby create what might be called "fish pastures." This, of course, limits possibilities to directed electronic or other rays of a type which, if arranged to create fencing comprising a very narrow band of an environment highly objectionable to the fish, would keep them in control. Work already done, and in some cases applied, with various devices for highly localized control of fish, shows that when they get into certain electrically charged zones, they

appear to have no faculty for knowing the source of their discomfort and are as likely to go in one direction as another. Investigations have already shown that there is almost as much likelihood of their going through the experimental zones as there is of their backing out. Therefore, it becomes essential that an exhaustive study be made on the response of fish to various types of environment and inexpensive ways found to restrain them within the "water pastures."

In this connection, Southwest Research Institute has developed a cooperative arrangement with the American Institute of Radiation at Belmont, California, an organization which has been conducting exhaustive studies on fish reaction to various environments. In the past months, this program has progressed to the point where there is increasing promise of being able to herd and ranch fish in the future, and the Division of Oceanography plans to extend this basic work into large water areas.

The American Institute of Radiation is fast becoming a national center in the use of rays and radiation of all kinds, and some other exceedingly interesting work is being conducted there. One point of particular interest to the fishing industry is a new sterilization method which has much promise of being of great value in fish packaging and marketing.

"Fenced-in" fish must have food in addition to that available in the normal water environment, at least during certain times of the year and particularly at certain periods in their growth cycle, and the American Institute of Radiation has also been studying this phase of the problem. Their present work is limited to fresh water operations but the Southwest Research Institute oceanography division expects, in the reasonably near future, to extend this work in the saline Gulf waters. It is interesting to note that there is a great similarity between the types of food that are attractive to hogs and those attractive to fish. Certain feeds accelerate their rate of growth just as fertilizers speed the growth and size of agricultural harvests. Reports will be given to the industry from time to time as to the progress of this program. Drastic as some of these ideas may seem, it is by the process of reorientated approaches that major problems are often solved.

Some of the other projects in the field of oceanography are not as unorthodox as the fish program. A developmental project is under way for the utilization of algenates in combination with hydrocarbons that result in "solid gasoline" pellets comprising approximately 96 per cent gasoline and four per cent algenate—a new form of non-explosive fuel. Algenates not only have extensive applications in our food industry, but are finding uses in other industries, where they have advantages due to the peculiar characteristics of the material.

The effect of industrial wastes on fish and marine life is a major project that has been in progress for over a year and is sponsored by the Celanese Corporation of America. Already a great wealth of information has been developed on the effects of various types of chemical waste products on a variety of fish types, and in due course this material will be published. Other phases of the problem of industrial wastes and their effects on marine life, both in fresh and salt waters, are being studied.

Work being done for the petroleum industry is concerned with the effect of geophysical exploration methods on fish life, and a method is in process which has the promise of minimum harm to fish life, although it must be further proved that it has value as a geophysical exploration tool over water areas.

The Division of Oceanography and Meteorology is in the process of distributing its first publication, entitled "Bibliography on Offshore Petroleum Developments," by Emory N. Kemler, which is available for distribution.