

# Potential for Mariculture Development in the Bahamas

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The most important resources of the Caribbean region in general and the Bahamas in particular are its people, the sun and the sea. The exploitation of these resources has led to the development of tourism in the region. Tourism, however, is subject to seasonal cycles and is very sensitive to economic cycles. The marine fisheries do not suffice to supply the fish needed and the region is a large importer of seafood, for instance of cod from Canada. The scarcity of arable land and fresh water and the high cost of energy and petroleum based fertilizer make traditional land-based, agriculture and animal husbandry uneconomical to provide the food for the population.

However, the Bahamas do have very large areas of flat land very near the sea and an abundance of sunshine and clean unpolluted seawater. These three factors provide the essential requirements for the development of a potentially important mariculture industry in these islands. The climate in the southern Bahamas is favorable for year round production of farmed seafood. Transportation from the Bahamas to major consumer markets in the U.S. and Europe is already well established. At least 40% of the region's population is 21 years of age and younger. The mariculture industry could provide new jobs, income and ancillary opportunities for a country which must be prepared for this rapidly growing work force with industries other than tourism.

I have spent 15 years to develop this new industry for the Caribbean Basin Region. Beginning in 1967, 6 years before the enormous OPEC oil price increase and while a professor at Columbia University, I initiated the Artificial Upwelling Project on the island of St. Croix in the U.S. Virgin Islands. This unique mariculture system can operate in combination with commercial freshwater production (desalination) and large scale Ocean Thermal Energy Conversion (OTEC). The results of this 7 million dollar mariculture research and development work are widely applicable in the entire Caribbean region, and especially in the Bahamas.

The 13-year St. Croix Research and Development project received its main support from the Sea Grant office of the U.S. Department of Commerce: approximately 60% of the total funding for the project came from Sea Grants and 40% of the support came from private foundations and industry. The objective of this project was to lead to the development of commercial mariculture farms in the Caribbean. In brief, the results of these activities indicated on a small scale, that, utilizing a pipeline supply of deep ocean water close to shore: (1) The nutrient-rich water can be used to greatly stimulate algal growth and thus speed the growth of shellfish of commercial quality. (2) The quality of the water makes it uniquely suitable for growing a wide variety of seafood which can provide a substantial return on investments. (3) Prior to its use in the mariculture operation, the cold temperature of the deep sea water can be used in tropical areas for desalination, power generation, air conditioning, ice making and other cooling applications, thus contributing to the profitability of the overall operation. More broadly, it was demonstrated that the culture of many commercially valuable marine species, was technically possible in the Caribbean area. Clams, scallops, conch, oysters, shrimp, lobster, abalone, fish and seaweed were successfully grown in the system.

The project has attracted wide attention in the Caribbean: in February 1980, a "Case Paper for the Establishment of a Mariculture System in the Commonwealth Caribbean" was presented to the Caribbean Development Bank at the request of Dr. J.B. Yankey, deputy director, Agriculture Division of CDB, by P.J.H. Slessor, Export Marketing Officer. It recommended the rapid expansion of mariculture systems, such as the one developed in St. Croix, to other Caribbean areas. The Caribbean Development Bank has subsequently provided funding for the study of mariculture in various areas of the Caribbean region. Similarly, the United Nations Development Program, at the request of the Government of the Commonwealth of The Bahamas, has commissioned a study entitled "Feasibility of Aquaculture in The Bahamas" which was published in February 1981.

Mariculture systems for the Bahamas and the Caribbean region are not limited to the use of deep ocean water. In those areas, where deep water is not close to shore, more conventional mariculture systems using surface sea water or marine well water can be used. Similar systems are presently operating in Panama, Costa Rica, Ecuador and Honduras.

Shrimp is one of the best species to be produced commercially in mariculture systems because of the declining production from natural fisheries, the rising price of the commodity and the very large world market demand for this product. The world market for shrimp was estimated at US\$1 billion in 1980, rising to US\$4 billion (in constant 1979 dollars) by the year 2000. The market for shrimp in the U.S. is very large: during 1981, shrimp landings (catches) in the U.S. were 339.7 million pounds, and another 223 million pounds were imported into the U.S. from foreign countries.

Many areas in the Bahamas are eminently suitable for mariculture development: very high quality, pollution-free seawater is abundantly available as is year round sunshine and high temperatures, which are all requirements for tropical mariculture. It has been demonstrated in the St. Croix system that even in these regions where fresh water is scarce for conventional agriculture, *mariculture utilizing seawater ponds, can produce at least 10 times more plant protein per acre per year than can the most intensely mechanized and fertilized land-based agriculture*. Similarly, marine animals can be grown at very much higher densities in saltwater ponds than land animals can be reared in the most technologically advanced land based animal husbandry. Of crucial importance is that these are sophisticated labor intensive industries of great attraction to young development-minded populations.

Whereas the seventies have been without any doubt the decade of the "oil crisis" it is very likely that the eighties will be the decade of the "food crisis." The mariculture system proposed for the Caribbean by Worldwide Protein, Inc. plans to produce large quantities of high quality animal protein such as clams, scallops, oysters, shrimp, abalone, finfish, etc. which will not only provide substantial employment to the people in the Caribbean Basin, but will make use of land that is now at best marginal for any use because of lack of rain and other factors. The system will also provide substantial employment and foreign exchange earnings for the Caribbean nations.

With its abundance of sunshine, its clean and unpolluted seawater, the availability of large tracts of flat land near the coast at reasonable prices, its stable and democratic government, its free banking system, the government's tax incentive programs for new industries and the government's encouragement of foreign investment, the Commonwealth of The Bahamas offer truly outstanding opportunities for large scale mariculture development.