# AN UPDATE ON THE STATUS OF AQUACULTURE IN BELIZE

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## INTRODUCTION

### Geographical Location and Climate

Belize is situated on the lower half of the Yucatan Peninsula bordered by Guatemala on the west and south and by Mexico in the north. The coastline is 280 km and is part of the Western Caribbean.

Belize has the longest Barrier Reef in the Western Hemisphere (200 km) which is second only to the Great Barrier Reef of Australia.

At 15-19°N latitude, Belize lies in the subtropical geographical belt. Mean monthly minimum temperatures range from 16-17°C in winter to 24-25°C in the summer while mean monthly maxima are from 28°C in the winter to 32-33°C in summer.

The coast is exposed to southeast tradewinds averaging 10-13 knots.

Rainfall ranges from 53 inches (1,347 mm) in the north to 178 inches (4526 mm) in the south of the country.

Seasonal effects are greatest in the central and northern part of the country where January through May are dry (less than 100 mm/month) whereas in the south, the dry season is shorter, lasting from February through April. A short dry season also occurs in August.

The northern half of the country is predominantly flat, gradually rising to a height of 800 m in the south and west. A large portion of the coast consists of wetlands, mainly mangrove swamps which account for about 2408 $km^2$ or 11 per cent of the total land territory. Open savannah grasslands account for 2116 $km^2$ or 10 percent of land territory whereas pine and woodland forest account for 986 $km^2$ or 5 percent Closed or broadleaf forest account for 15812 $km^2$ or 74 percent of the total land area.

### Population Ethnicity

The 1990 population of the country was 184,340, with 44.5 percent of the country of age group less than 14 years and 28 percent of age group 15-29.

Belize is ethnically diverse with about 40 per cent of the people being Creoles (various degree of Anglo-Saxon/African mix). Thirty-three per cent of Mestizo also called 'Spanish' (latin descent), 10 per cent are descendants of original Maya stock and 8 per cent are descendants of Carib Indians (Amerindian, African extraction) who migrated from the islands of the Caribbean.

English is the official language but a large per cent of the population is bilingual, speaking Spanish as a second language.

### Government

Belize attained political independence in 1981 and is a constitutional monarchy with the Queen of the British Commonwealth as titular head of State, represented in Belize by a Governor General whom the monarch appoints after consultation with the Prime Minister.

The Cabinet directs the policy of the Government of Belize. The Cabinet is collectively responsible to the National Assembly for all actions of its Ministers in the execution of their duties.

### Investment 'Climate'

The productive sector of Belize invests its energy in export oriented enterprises. The Government of Belize pursues private foreign

investors to undertake capital investment through incentive and policies.

The reasons for attracting foreign investment are as follows:

1. Accelerate diversification of the country's economic base;
2. Increase exports and foreign exchange earnings;
3. Utilise local raw material;
4. Produce an inflow of technological and managerial resources not otherwise available in Belize;
5. Provide for the transfer of skill and technology to Belizeans.

For priorities are in agro-industries, tourism, mineral exploitation, garment manufacture, deep sea fishing and aquaculture (including mariculture).

**General Aquaculture and the Fishing Industry**

Export earnings from Fisheries averaged BZ$15-$20m over the past six years. Estimated export earnings from farmed shrimp and cultured ornamental (aquarium) fish in 1987 was Bz$1,955,000. 1991 estimates are $11,280,429.

Trawled shrimp production has averaged 210,000 lbs. shrimp tails over the past five years. This was about the same as the production of farmed shrimp for 1990 (Table 1). Production of farmed shrimp from January to May 15th, 1991 has already overtaken the production average of trawled shrimp. 1991 Export Earnings from farmed shrimp are expected to be about the same as for lobster and traditional number one fishery commodity earner. Present trends in production and prices indicate that export earnings of farmed shrimp for 1992 should significantly surpass that of the lobster capture fishery.

**Preliminary Orientation to Shrimp Mariculture**

Investment in Aquaculture in Belize has been predominantly in Shrimp Mariculture which in turn has been exclusively dedicated to the culture of Penaeids.

By far the most widely cultured species has been *Penaeus vannamei*. However *P. monodon, P. stylirostris* and *P. schmitti* have also been utilized.

*P. schmitti* is the only native shrimp in this listing.

Other Penaeids native to Belize are the pink shrimp. *P. duorarum* and the brown shrimp *P. aztecus*. By far the most abundant in trawlable areas is *P. duorarum*.

Since 1990, *P. vannamei* has been the only Pennaeid cultured in Belize. This is as a result of marketability, broader knowledge base and longer experience in the culture history of this species in the region. Farmers have indicated however that they are still interested in again culturing some of the above mentioned Penaeids.

Pond construction activities are usually carried out during the drier month (February to June and August and September). Earthwork costs are about Bz$2.00 (US$1.00) per cubic yard.

Shrimp Mariculture is not a labour-intensive activity. There are 55 permanent employees for the three farms that are operational. This includes, management, technical, clerical, maintenance and security personnel.

Historically, most farms have a Business or General manager and/or a Technical Manager. These posts are generally occupied by non-nationals. People who have been working in these positions for some time have obtained Belizean residency or citizenship. The remainder of the staff are usually locals.

Skills required for junior managers and technicians are usually imparted with minimum in house training. People in these positions are normally high school or sixth form (junior college) graduates. Hands on labour is usually readily available.

In the early stages of shrimp mariculture in Belize (1983-1987), results were inconsistent over successive harvests. Various reasons have been offered for this, the most often touted being under financing and mismanagement. Farming shrimp in Belize in the early days of the industry proved to be less efficient, more expensive and more of a technical challenge than in some other regional countries such as Panama with a longer history in shrimp mariculture.

Many farms went out of business and

those that have remained have gathered the necessary resources and made modifications that have led to a complete and positive turn around. Those farms that are operational are successful. They have also developed and engendered the necessary infrastructure and services to accommodate other participants in the industry. There is a general feeling of optimism for the industry.

Apart from the shrimp farms, there is one other freshwater ornamental (aquarium) fish farming in operation (Table 2).

The most reliable production statistics of shrimp mariculture operations date back to 1987 are given in Tables 1 and 3.

### Rationale for Aquaculture in Belize

Belize has good potential for Aquaculture because of the following:

1. It has a politically stable government engendered by long democratic traditions.
2. Semi-tropical conditions allow for year round culture.
3. Water (both fresh and marine) is abundant and of good quality.
4. Logistical advantages by virtue of geography, international status and language.

   Belize is only two hours by direct commercial flight from Houston, Miami and New Orleans. It is served by five major airlines viz: American, Continental, Pan Am, Taca and Tan Sasha with daily schedule flights to the above-mentioned cities as well a Mexico City, San Francisco, Los Angeles and all of Central America.

   Belize is the only country in North and Central America that qualifies for duty-free trade preferences into the Caribbean Community (CARICOM) and the European Economic Community (EEC) markets.

   English makes for easier communications with US citizens who have been the major investors in Aquaculture in Belize.
5. Available labour at virtually all level of aquaculture enterprise. The country has a literacy rate of 92 percent which affords the easy training of semi and low skilled labourers.
6. Expanding infrastructure and services.
7. Lucrative and competitive development incentives.

Belize as yet does not have any comprehensive aquaculture specific regulations. Belize can be classified as being a 'Country with an enabling law'; the Fisheries Act makes provision for the elaboration of aquaculture specific regulations *[FAO, 1989]*.

## PROJECTS ADMINISTERED OR OTHERWISE ASSOCIATED WITH THE FISHERIES DEPARTMENT

### Conch Hatchery Project

The Fisheries Department has been administering an experimental project to rear Queen Conch *(Strombus gigas)* since 1985. The project is being funded by USAID. The earlier efforts of the project have been to test the technical viability of conch larvae culture and juvenile rearing.

The project is its third phase, the objective of which is to assess dispersal rate and survival of conch seeded to the *'wild'*. This aspect of the project is to conclude in April 1992.

### GOB/Taiwanese Shrimp Mariculture Project

In October 1990, a technical cooperation agreement was signed between the Belize Government and the Government of the Republic of China (Taiwan) to undertake activities in rice cultivation; feed crop research and extension, vegetable crop research and demonstration and Shrimp Mariculture.

A shrimp facility is to be located near Cucumber Beach at 5.5 mls. Western Highway, to assist small farm operations.

Site preparation began in mid-1991. This includes the construction of a hatchery that will house larval rearing facilities. The proposal also includes the construction of production ponds. The project is to utilize 20 acres of land.

### GOB/World Bank Shrimp Mariculture Project

There is also a Government of Belize/ World Bank Loan Programme where a little over BZ$2 million is to be made available to assist in the establishment of smaller start-up operations.

The Development Finance Cooperation (DFC), the Quasi-government lending institution, is to administer the credit component of the programme.

### Aquaculture Inventory

The Fisheries Department has also designed a project to demonstrate and quantify coastal areas of mainland Belize suitable for earthen pond culture (both Mariculture and Fresh culture).

## JURISDICTIONAL RESPONSIBILITIES OF GOVERNMENT AGENCIES

Matters of aquaculture are dealt with mainly by three government agencies viz; Department of Lands, the Office of Economic Development and the Fisheries Department.

### Role of the Lands Department

The Land Department is responsible for Land seafloor tenureship. Non natural tenureship is permissible and is dealt with in the Lands Regulation as 'The Alien Land Holding Act'.

### Role of Office of Economic Development

The Office of the Economic Development is charge with affairs of fiscal incentives. Mariculture and freshwater culture are an industry of priority. Government concessions include:

- Tax holiday on corporate profits for up to 25 years,
- Exemption on import duties for capital and material used for producing export products,
- Tax exemption on share holders profits or dividends equivalent to their original investment,
- Guaranteed repatriation of initial investment, profit and capital gains,
- Carrying forward of losses incurred during the tax holding for an additional five years after the expiration of the tax holiday.

(Most of the shrimp farms have been/are beneficiaries of these concessionary privileges. Apart from this, the 5 per cent export tax on seafood has been lifted for farmed shrimp since 1989.)

### Role of Fisheries Department

The Fisheries Department is the leading agency in devising and implementing strategies to ensure development of a viable aquaculture industry.

The Department is responsible for the granting of licenses to undertake both research and commercial scale operation.

The Fisheries Department is responsible for aquaculture extension, loaning of in-house technical advice, the collection of statistical information, and the issuing of permit(s) for exotic seed/broodstock importation.

The Fisheries Department also evaluates the technical feasibility of aquaculture projects in coordination with the Office of Economic Development. Application for the development concession made to this Office are routed to the Fisheries Department for its input.

## SOURCE OF FINANCING FOR COMMERCIAL OPERATIONS

### Foreign Sources

Most of the financing for commercial aquaculture operations has been made by American lending institutions. Two of the large shrimp mariculture operations however, have received significant financing from local commercial banks.

### Local Sources

The Development Finance Corporation has also been approached recently by business interest seeking finance for aquaculture projects.

## POTENTIAL FOR FURTHER DEVELOPMENT OF SHRIMP MARICULTURE

The Fisheries Department feels that the Shrimp Mariculture Industry is on the threshold of unprecedented expansion and success because of the following:

1. Local confidence in the industry has been rejuvenated by the improved yields obtained by NOVA Companies and Laguna Madre over the past two years.
2. An increased number of people are available with administrative and technician skills for employment in the industry. These people have received tertiary (post-high school) training either from local institutions or abroad, most notably from the Belize Technical College and the University College of Belize locally, and from The University of the West Indies, American universities and Mexican technical institutes regionally.

   Apart from this, there are a number of former employees of some of the shrimp farms that have ceased operations who have indicated a willingness to resume working in aquaculture.
3. The Aquaculture Unit in the Fisheries Department is to be expanded and shall undertake further training to improve its capabilities at in-house consultation and extension. (This should greatly assist the more modest-scale operations.)
4. Seedstock and processing facilities provided by the two larger farms and the two larger fishing cooperatives processing house in Belize City should greatly assist small scale and new operations coming on-stream.
5. Rural electrification project of the Belize Electricity Board is reaching outlying areas.
6. Improvements in the logistics of shipping to EC Countries in addition to markets in CARICOM and the US should expand market volume and product variability which should catalyse further investments in Shrimp Mariculture.
7. Shrimp Mariculture has been included in the Government of Belize (GOB) 1990-94 Macro-Economic Plan. It was also included in the Antecedent 1984-89 Economic Plan.

   This signifies that this activity is a priority area of investment. Government through its Fisheries Department and Office of Economic Development is attuned to the dynamics of the industry and remains positive in its attitude to explore appropriate fiscal incentives to keep Belize in a competitive position.
8. Large tracks of suitable coastal lands, water of good quality and amenable land tenureship policies makes for easy accommodation of expansion in production ponds and ancillary facilities.

## POTENTIAL CONSTRAINTS

Major constraints to the anticipated expansion of industry can be grouped as being; endogenous and exogenous.

The Endogenous Constraint is:

1. Poor site selection. The land acquisition process in the past and to a lesser extend the present, makes it possible for shrimp farmers to end up with lands of little shrimp mariculture potential.

   This is mainly because there is as yet no established procedure by which the Lands Department solicits the inputs of the Fisheries Department in this matter.

   This situation has been pointed out to the Lands Department and the time frame in which the situation should be rectified, should be in the not too distant future.

Exogenous constrains include:

1. Shrimp farmers in this country rely on imported seedstock. The sparsity of seedstock supply is a routine trend due to a low reproduction performance Penaeids in the winter months. Research and development needs to be done on the maturation/hatchery aspect of shrimp farming since they represent the future of

the industry. Thus far, this is outside of the hands of Belize shrimp farmers. Therefore, shrimp farmers have to adopt scientific methods of culturing shrimp mainly sourced through US, Mexican and West Indian research/educational institutions.

2. The possibility of a moratorium or ban by the exporting countries especially on broodstock should be contemplated. This has been the situation with Rift Lake Cichlids from Malawi and could well be the situation for the exotic *P. vannamei, P. stylirostris* etc.

   Much of the seedstock are supplied through the sourcing of broodstocks from the wild. The destruction of natural habitats such as mangrove has restricted collection of spawners in exporting countries such as Panama and Costa Rica.

   This is outside the control of the Belizean shrimp farmers. The building of a hatchery(ies) with broodstock/ maturation facilities will certainly make for a more secure industry in the long term.

   The aforementioned Taiwanese/ GOB Shrimp Hatchery project increases the possibilities of this in the sense that the Belize Government is willing to unprecedently pursue activities that would in the normal course of the affairs be considered as the exclusive domain of the private sector.

## FUTURE PROSPECTS FOR THE CULTURE OF FIN-FISH AND OTHER SHELLFISHES

The future for fin-fish and other shellfish culture is also one of great promise. There is the possibility of using various species that have been tested regionally e.g. tilapia, channel catfish *(Ictaluris punctatus),* pacu *(Colossoma mitrei),* cachema *(Colossoma macropomus),* and redfish *(Sciaenops ocellatus).*

There are some locally occurring species that have culture potentials e.g. bay snook *(Petenia splendida),* blue catfish *(Ictalurus furcatus),* Nassau grouper *(Epinephelus striatus),* and queen conch *(Strombus gigas).*

There is the possibility of land based impoundments, lagoon and open-water cage culture, raft and pen culture.

Exotic are generally permissible for culture on the condition that environmental integrity is maintained.

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***Resource Persons:***

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**TABLE 1. SHRIMP CULTURE INBELIZE, 1987-1991**

| Year/Qr. | No. of Farms Operational | No. of Acres Constructed | No. of Acres Operational | Export lbs. Shrimp Tails |
|---|---|---|---|---|
| 1987 1 | 4 | 440 | 440 | |
| 2 | 4 | 440 | 440 | |
| 3 | 4 | 440 | 440 | 22,051 |
| 4 | 4 | 440 | 380 | |
| 1988 1 | 4 | 440 | 380 | |
| 2 | 3 | 501 | 380 | |
| 3 | 5 | 501 | 441 | 36,500 |
| 4 | 5 | 501 | 441 | |
| 1989 1 | 5 | 501 | 501 | |
| 2 | 6 | 695 | 695 | |
| 3 | 6 | 695 | 695 | 119,470 |
| 4 | 6 | 695 | 695 | |
| 1990 1 | 4 | 695 | 269 | |
| 2 | 2 | 695 | 220 | |
| 3 | 2 | 695 | 220 | 217,223 |
| 4 | 2 | 695 | 220 | |
| 1991 1 | 3 | 880 | 225 | |
| 2 | 3 | 880 | 225 | |
| 3 | 3 | 933 | 258 | 345,365 |
| 4 | 4 | 1008 | 533 | |

**TABLE 2. CULTURED ORNAMENTAL FISH (AQUARIUM FISH) EXPORTS**

| Year | Quantity (boxed) |
|---|---|
| 1988 | 16 boxes |
| 1989 | 320 boxes |
| 1990 | 180 boxes |
| 1991 | 150 boxes |

**TABLE 3. BELIZE - POSITION OF SHRIMP CULTURE; 4TH QUARTER 1991**

| Name of Farm | Acres of Ponds Constructed | Acres of Ponds Operational |
|---|---|---|
| Allen's Farm Ltd.[1] | 135 | 0 |
| Aqua-Mar Belize Ltd.[2] | 10 | 10 |
| Caribbean Shrimp Ltd.[2] | 40 | 0 |
| General Shrimp Ltd.[1] | 290 | 0 |
| Laguna Madre Belize Shrimp Farms Ltd.[2] | 48 | 48 |
| NOVA Companies Shrimp Farm Ltd.[1] | 475 | 475 |
| QK Ltd.[1] | 10 | 0 |
| TOTAL | 1008 | 533 |

Key: [1] Semi-intensive operations where sustained yield realized or expected range 800-2000 lbs. per acre per harvest of whole shrimps.
[2] Intensive operations where sustained yields realized or expected range 6000 - 9000 lbs. per acre per harvest of whole shrimps.