

Fundashon Marcultura

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ABSTRACT

The island governments of Aruba, Bonaire, and Curaçao (ABC Islands) are committed to the development, demonstration, and promotion of aquaculture. To achieve these purposes a new facility was constructed for Fundashon Marcultura. Funding was also provided for labor and venture costs of this facility. The new facility is designed for aquaculture research and also for commercial scale cultivation of economically feasible aquaculture species.

The foundation is opting for a multi-species approach. The intensive culture of marine shrimp (*Penaeus vannamei*) both grow-out and larval culture, has a high priority. Commercial culture of *Tilapia* in seawater, the mass production of freshwater and marine ornamental species for export, and the continued mass production of queen conch (*Strombus gigas*) all share an equally high priority. The new facilities also offer greater opportunities for research on other potential species for aquaculture, as well as research on management practices for fishery resources. This paper will discuss results of operating a multi-sided aquaculture facility.

INTRODUCTION

Aquaculture has only recently been introduced in the ABC islands. In 1981 the governments of Aruba, Bonaire, and Curaçao cooperated together to start a conch rearing/releasing program. Success of this program inspired the participants to formalize this inter-island cooperation in a foundation: Fundashon Marcultura. Objectives of this foundation are:

To research and develop aquaculture practices on the participating islands that are economical, as well as technically feasible.

To provide information on aquaculture to those interested in developing local aquaculture projects.

To continue with conch fishery enhancement.

The islands are very arid, soils are limited, and often highly saline. Conventional agriculture is difficult.

Due to the aridity of the land masses, coral reefs around the three islands are well developed and represent a great tourist attraction. Coral reefs although they are among the most diverse ecosystems on earth are not well known for their fisheries. Fishery efforts around Bonaire and Curaçao, and to a lesser degree Aruba already are close to the maximum sustainable yield.

The geography of these islands is favorable for aquaculture. There are large areas on the coast or very close to it that are of no use for agriculture and of limited use for tourism. This is especially the case on the north, windward, side

of the islands. Tropical storms and hurricanes are very rare events. Air temperatures generally remain between 26 and 30°C. Marine waters are relatively unpolluted and are extremely clear. The three islands have to import between 80 and 90% of their food from outside the country.

The three island governments are fully aware of the potential impact aquaculture can have on their economy:

- Economic diversification.

- Generation of products for export and local usage, evening out trade balances.

- Creation of opportunities for small farmers, fishermen, and large investors.

To investigate the opportunities presented by aquaculture it was decided to cooperate on an equal basis in a foundation dedicated to the investigation of aquaculture. A local facility staffed with local knowledge might produce a viable working industry.

FUNDASHON MARCULTURA

In 1981, a small laboratory was built and aquaculture started on Bonaire. At first the aim was to grow conch juveniles for reseeding in the natural environment. Soon the decision was made to diversify and develop other aquaculture activities.

Success was such that in 1987 it was decided that expansion of the facilities was a necessity. Due to hotel activities, expansion on the old site was not practical and a new location was found on the windward side of Bonaire. Construction was started in January 1988 and finished on May 30, 1990.

The facilities were constructed on 22 hectares of land and consist of:

- A wet laboratory, with supporting dry laboratories (200 m²).

- A reverse day/night room, hatchery and larval rearing facility (400 m²).

- Storage and construction facilities.

- Offices.

- Polyester tank area with tanks from 90 cm diameter to 6 m diameter, with a total volume 5,000,000 l.

- 48 concrete 1.5 x 4 x 1 vaults.

- Raceways 16 x 30 x 6 m.

- Four earthen ponds 40 m x 100 m.

The whole facility has running seawater, fresh water, and air. Seawater comes in raw and can be filtered to the requirements desired. Incoming seawater is Caribbean and has the following characteristics:

- Normal temperature 27 °C

- Salinity 36 ppt

- PO₄ 0.22 µmol/l

NH ₄	0.24 µmol/l
NO ₃ /NO ₂	0.12 µmol/l
Si	2.4 µmol/l

Marcultura has to investigate every possible effect of aquaculture practices on the environment, economy, and sociology of the islands. The facility was designed with these parameters in mind.

To eliminate introductions of any exotic and unwanted organism related to aquaculture, Marcultura directs its discharge to the local solar salt works over a distance of 4 km. Over this distance the salinity of discharge water increases, pH changes drastically, temperature increases, etc. Unwanted organisms that survive this trip are passed to a series of solar salt ponds and end up in the brine of the crystallizing ponds.

RESEARCH PROGRAM OVERVIEW

Cultivation and seeding of Queen conch

- Objectives: Mass culture of conch larva, farming and ranching of juveniles and adults.
- Results: Development of mass culture of veliger larva through metamorphosis and to three month old juveniles.
Identified areas for juvenile growth around the three islands.
Seeded almost 2,000,000 juveniles around Aruba, Bonaire, and Curaçao.
Significant increase of conch population around the islands.
Farming conch in tanks not feasible due to the high feeding costs and the low value of the meat.
Ranching of conch in bays or open sea not possible socio-economically; marine organisms are seen as public property and even after the fishery for conch was closed, poaching eliminated all shallow water stocks before maturity.
- Opportunities: Slight, strictly governmental for population enhancement for fishery and/or conservation.
- Continuing: Continuing culture and seeding program.
- Activities: Bi-annual stock inventory.
Public awareness program.

Culture of Penaeid shrimps

- Objectives: Selection of shrimp species and development of culture techniques.
- Results: *Penaeus vannamei* best candidate for commercial shrimp farming.

- Captive *P. vannamei* stocks were bred to F7 in laboratory.
Developed techniques for intensive shrimp farming.
Building of commercial facilities 1989; operative 1990.
- Opportunities: Good, but only for intensive shrimp farm due to high start-up and running costs.
- Continuing Activities: Implementation of commercial farming (50 tons/year).
Hatchery for 50 million post larvae/year.
Consulting and training extension service for farms on Aruba, Curaçao, and Bonaire.

Culture of *Tilapia*

- Objectives: Selection of species and hybrids for seasonal freshwater ponds and seawater.
Implementation and development of cultivation techniques.
- Results: Several farmers have additional income from extensive culture of *Tilapia* in seasonal ponds
Commercial seawater farm to be operational on Curaçao in 1991.
- Opportunities: Good; intensive culture in sea cages or land-based seawater ponds; investment on order of NAfl 300,000; extensive culture in seasonal rain-water reservoirs, investment on order of NAfl 1000 (seedstock only).
- Continuing Activities: Cage experiments and reservoirs.
Feeding trials and testing new hybrids.
Selection of fast growing red *Tilapia* for local seawater conditions
Breeding juveniles for farmers.

Culture of ornamental fish as a business opportunity for small investors

- Objectives: Selection of profitable species for local market and export.
Development of cultivation techniques.
- Results: Focussing on the more expensive species due to high basic costs, labor, water, energy, and feeds.
Excellent export potential.
- Opportunities: Reasonable, feasible with a NAfl 75,000 investment.
- Continuing Activities: Cultivation of broodstock for local growers.
Marketing.

Inventory of the occurrence and collection of spiny lobster postlarva

- Objectives: To estimate recruitment numbers and periods.
Development of local management strategies and ranching/farming possibilities.
- Results: None at present.

Study on the aquaculture potential of *Tridacna* clams in the ABC islands

- Objectives: To see if *Tridacna* culture might be an economically viable alternative to the culture of conch and oysters.
Survivability in outside tanks with closed seawater systems.
Environmental effects of introduction into Caribbean.
- Results: Good survivability and growth.
Good palatability.
No environmental effects discerned.

SUMMARY

The governments of Aruba, Bonaire, and Curaçao are very aware of the opportunities offered by aquaculture. Not only does aquaculture provide an opportunity to grow some of the foods needed for local consumption but also this industry increases the economic base of these islands.

Fundashon Marcultura was founded to investigate the many possibilities for aquaculture the ABC islands have to offer. At the new facility the foundation is able to do research as well as to set up pilot scale commercial ventures which will result in a viable industry.