

Commonwealth of Puerto Rico

Department of Natural and Environmental Resources



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06 JUN 2008

Mr. Michael Piccirilli  
Chief, Federal Aid Division  
US Fish and Wildlife Service  
1875 Century Boulevard, Suite 240  
Atlanta GA 30345

Dear Mr. Piccirilli:

Enclosed please find the Final Report for Grant F-35.9 "*Maricao Fish Hatchery Operations and Maintenance*" from period of January 1, 2004 to December 31, 2007.

Should you require further information, do not hesitate to contact us.

Cordially,

Ernesto L. Díaz-Velázquez  
Administrator  
Natural Resources Administration

EDV JMB apv

Enclosures

Commonwealth of Puerto Rico  
Department of Natural and Environmental Resources

MARICAO FISH HATCHERY OPERATIONS AND MAINTENANCE

F-35.9

**Final Report**

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Project Leader

## **FINAL REPORT**

### **MARICAO FISH HATCHERY OPERATIONS AND MAINTENANCE**

Project Title : Maricao Fish Hatchery Operations and Maintenance  
Project Number : F-35  
State : Puerto Rico  
Period Cover : January 1, 2004 through December 31, 2007

#### **INTRODUCTION**

After the remodeling works (1998-2000), the Maricao Fish Hatchery was transformed into a large and more modern facility. Among the improvements made were the construction of three growout ponds and the extension of the others, a new storage building, a public rest room, a bridge and a new dam. Also, the water intake and the water supply system to the ponds were modernized. With six growout ponds and the improvements to the water system, fish production is performed practically all year round. These improvements have augmented the hatchery production capacity and hence the amount of work and maintenance to be performed.

Within the hatchery remodeling plans was the construction of the nursery building. Originally the design was based on needs that were foreseen by some projects and the available space in the building. Project F-41 (Freshwater Sportfish Community Investigation and Management) was researching the feasibility of production of triploid largemouth bass (using private facilities), and some space in the nursery would be dedicated to continuing this work if it proves practical. The nursery would also allow for hatching of eggs on spawning mats, research on native sportfish species, maintenance of broodstock in cases of environmental emergencies, disease treatments, and many other studies, which would require carefully controlled conditions.

Finally, some changes were done to the nursery original plans in order to complete the task. These modifications would facilitate construction of the nursery, with better utilization of the available resources in the hatchery.

## **STUDY I**

### **Maricao Fish Hatchery Operations and Maintenance**

#### **A – MAINTENANCE**

##### **Job 1 - Facilities Maintenance**

##### **OBJECTIVE 1**

*To maintain and improve hatchery facilities*

###### **a. Activities**

###### **1.1- Maintenance of ponds, water supply system, gabions and hatchery grounds**

Control undesirable vegetation in spawning pond (two times per month) and hatchery surroundings (once a week). Clean plastic liners, kettles and valves (after each harvest). Repair and clean sediment trap at the dam (as required). Maintain sidewalks, roads, landscaping and parking gate (once a week), dikes (two times per month), and repair gabions (as required).

- As scheduled

###### **1.2- Maintenance of structures**

Includes routine maintenance (daily), reparations (as required) and painting (2 times per year) of the following structures: restrooms, office, future visitor center, nursery, feed and materials storage building, electrical pedestal on the six growout pond kettles, and railing at each walkway above the kettles.

- As scheduled

###### **1.3- Maintenance of concrete tanks**

Includes draining and cleaning (two times per month), repair (as necessary), and painting (once per year) three circular tanks of 30' diameter each (30' x 3'), five rectangular tanks (three 60'x 17'x 4' and two 60' x 21'x 5'), and twenty-four rectangular tanks (12'x 5'x 2 1/2').

- As scheduled

###### **1.4- Maintenance of equipment**

Perform maintenance on the following hatchery equipment: two pick-up trucks, two mule vehicles, trimmers, lawnmowers, blowers, aerators, live hauler tank, water pumps, welder, electrical generator, manholes at the dam, tools, etc. (as necessary). Perform maintenance on the following nursery equipment: hatching jars, pumps, tanks, filters, glass aquaria, refrigerator, generator, air blower, piping, etc. (as necessary).

- As scheduled

**b. Target Dates for Achievement**

Activity 1.1 – 100%completed

Activity 1.2 – 100%completed

Activity 1.3 – 100%completed

Activity 1.4 – 100%completed

**c. Job Summary**

Maintenance was performed on the hatchery facilities according to established schedules and procedures. Grass and bushes were trimmed on a biweekly basis. Plastic liner, kettles and valves were cleaned after each harvest. The parking area and sidewalks were conditioned and repaired when necessary. In addition, gabion repair was performed in the parking area next to the entrance bridge. All structures were painted as scheduled, and routine maintenance was performed on each one of them. Concrete tanks were drained, cleaned and repaired as needed. Circular tanks were modified to be used in the nursery system. Also, routine maintenance was performed on the hatchery equipment.

A 600 gallon water tank was installed to provide water during drought to the office and the photoperiod research building (F-53R Project).

## **B – OPERATION**

### **Job 2 - Operation of Maricao Fish Hatchery**

#### **OBJECTIVE 2**

*To achieve optimum hatchery production of fingerling fish under prevailing conditions*

##### **a. Activities**

###### **2.1- Water quality and pond preparation**

Measure and record dissolved oxygen and temperature (every day), secchi disk transparency, nitrite and pH of growout pond water (three times per week), measure and record dissolved oxygen and temperature (before stocking) at each reservoir or private pond stocking site (as required), pond fertilization (as required), and zooplankton sampling and identification in growout ponds (once per week).

- As scheduled

###### **2.2- Fish production**

Coordination of broodstock capture, broodstock capture and maintenance, broodstock reproduction, egg disease treatment, coordination of fingerling stocking, stockings of fingerlings, fry transfer to growout ponds, fingerling harvest and transport to reservoir and tilapia and sunfish feeding (as required).

- As scheduled

###### **2.5- Data analysis and computerization**

Acquisition and computerization of water quality data, broodstock records, fingerling production and stocking records, analysis and integration of information (as required).

- As scheduled

###### **2.6- Annual Report**

Prepare annual report, by Dec 2007

- Extended to June 30, 2008

##### **b. Target Dates for Achievements**

Activity 2.1 – 100%completed

Activity 2.2 – 100%completed

Activity 2.5 – 100%completed

Activity 2.6 – Extended to June 30, 2008

##### **c. Job Summary**

Water quality was measured as proposed and pond preparation was performed as required. For pond fertilization, we were using a combination of inorganic fertilizers (triple phosphate) and Alfalfa pellets to promote microorganism growth. Adult

largemouth bass were fed with tilapia fingerlings. Generally, dissolved oxygen was within desirable levels (>4mg/l). Lowest oxygen levels were in July 2004 and June 2006. Highest temperatures were in April 2004; lowest were in January 2004. Tables 1 to 4 present mean values, standard deviation and maximum and minimum values for selected water quality parameters, from **January 2004 to December 31, 2007**, for Maricao Fish Hatchery growout ponds.

#### 2004

Parameters	Mean	S.D.	Maximum	Minimum
T°C	23.88	1.85	29.90	18.90
D.O. (mg/L)	5.48	1.24	9.96	2.85
pH	8.44	0.52	9.50	7.50
Nitrite	0.00	0.02	0.20	0.00
*Secchi Disk (cm)	-	-	-	-

\*Secchi disk measurements were not taken.

#### 2005

Parameters	Mean	S.D.	Maximum	Minimum
T°C	23.74	1.81	28.80	19.90
D.O. (mg/L)	5.62	1.94	9.98	3.05
pH	8.48	0.43	9.50	7.50
Nitrite	0.02	0.19	2.00	0.00
Secchi Disk (cm)	11.61	2.19	14.0	5.10

#### 2006

Parameters	Mean	S.D.	Maximum	Minimum
T°C	24.25	1.69	28.40	19.10
D.O. (mg/L)	6.70	1.53	12.68	2.67
pH	8.44	0.43	0.00	0.00
Nitrite	0.00	0.01	0.10	0.00
Secchi Disk (cm)	9.54	2.91	14.00	5.10

#### 2007

Parameters	Mean	S.D.	Maximum	Minimum
T°C	23.60	1.89	28.70	20.10
D.O. (mg/L)	5.92	1.35	12.08	3.06
pH	8.37	0.90	9.00	8.00
Nitrite	0.00	0.00	0.00	0.00
Secchi Disk (cm)	8.99	2.63	12.70	5.10

In summary, water quality averages were within desirable limits for fish production, although on rare occasions dissolved oxygen fell below desirable levels. Emergency aeration was available to remedy this situation when it occurred.

Fish production and stocking were performed during these years without major complications. A total of **754,579** fingerlings were produced at the hatchery. Of this

quantity, approximately 59,824 were tilapias, which were mainly used to feed largemouth bass at the hatchery or stocked in private ponds (requested by farmers). Table 5 shows the quantity of fingerlings stocked during the study period and in which reservoir they were stocked. Nearly 694,755 fingerlings were stocked in 15 reservoirs and private ponds. Among the stocked reservoirs were Guajataca, La Plata, Lucchetti and Cerrillos where facilities managed by the PR-DNER are located. From the total of stocked fingerlings, 226,253 (32.57%) were largemouth bass, 466,213 (67.10%) were sunfish (two different species) and 2,289 (0.33%) were tilapias.

Table 5. Detailed fingerling/reservoir stockings performed from January 1, 2004 to December 31, 2007.

Location Reservoir/	Quantity <i>M. salmoides</i>	Quantity <i>L. microlophus</i> / <i>L. macrochirus</i>
Guajataca	54,645	32,094
La Plata	40,299	62,499
Caonillas	25,598	36,236
Dos Bocas	34,570	39,304
Carite	11,003	34,679
Lucchetti	4,195	N/A
Cerrillos	N/A	208,934
Guayo	N/A	41,834
Carraizo	19,296	N/A
Cidra	19,020	N/A
Patillas	7,589	N/A
Garzas	N/A	8,595
Guayabal	7,857	N/A
Coamo	N/A	1,000
Las Curias	196	N/A
Private pond	1,985	2,067