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# FISHCULTURE SURVEY REPORT

# FOR HAITI

by
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## 1.0 ITINERARY

| | |
|---|---|
| March 22 | Survey team arrived Port-au-Prince, Haiti, from San Juan, Puerto Rico<br>United States Embassy, dicussed purpose of visit with H. E. Mattox, Second Secretary, and Don Fiester, U. S. A. I. D., Chief of Rural Development, Latin American Region |
| March 23 | Village of Fond Parisien<br>Lake Azuey |
| March 24 | Fisheries Office of the Department of Agriculture, Natural Resources and Rural Development<br>Fish markets in Port-au-Prince<br>United Nations Mission in Haiti |
| March 25 | Damien Fishculture Experiment Station<br>Minister of Agriculture, National Resources and Rural Development<br>Village of Saintard |
| March 26 | Fisheries Office of the Department of Agriculture, Natural Resources and Rural Development<br>United States Embassy, de-briefing with H. E. Mattox |
| March 27 | Departed Haiti for United States |

## 2.0 RECOMMENDATIONS

2.01 The basic program in fishculture that was established in 1950 under auspices of the United Nations Mission in Haiti appears to be an effective plan for increasing fish in diets of many low-income Haitians and should be revitalized and implemented to the extent that funds and facilities will allow. Primary emphasis should be placed upon stocking fish in farm ponds, providing technical assistance to farmers on fishculture, and stocking natural waters that presently are poor sources of food fish, such as Lake Peligre.

2.02 Additional equipment is absolutely essential to the existence of a fishculture program in Haiti. The most critical equipment needs, in rank of importance, and estimated costs are listed below. In addition are recurring annual expenses that are required for operating such a program.

| | | |
|---|---|---|
| 1. | Truck, 1 1/2 tons, for hauling fish to the distribution centers | $6,000 |
| 2. | Jeep or landrover pickup truck, 1/2 ton, for extension work | 4,500 |
| 3. | Jeep or landrover pickup truck, 1/2 ton, to use on the experimental station and for extension work | 4,500 |
| 4. | Four, 1 1/2 cubic meter tanks for hauling fish | 200 |
| 5. | Nets and other supplies on experimental station | 600 |
| 6. | Gasoline for vehicles, per year | 1,200 |
| 7. | Additional labor on experimental station, per year | 400 |

2.03 Extension workers from the Fisheries Office should provide demonstration sessions at Lake Azuey and other inland waters to instruct and encourage artisan fishermen to use improved fishing methods, construct boats or rafts, build nets and traps, and preserve fish by salt- and/or sun-drying.

2.04 A fish population survey of Lake Azuey should be made to ascertain the success of the stocking of carp and tilapia and determine total standing crop and species composition.

2.05 Marketing and utilization aspects of the cultured fish should be considered as the program expands. Farmers should be encouraged to preserve a portion of their crop for marketing which will enhance commercialization and improve distribution of fish in inland areas.

2.06 The feeding recommendations presently advocated by the Fisheries Office result in inefficient conversion values. Several factors which may improve feed conversion are feeding larger particle-size feed (although meal may be adequate for the first month of feeding), reducing the daily feed allowance, and using combinations of feedstuffs to improve the nutritive value of the diet.

2.07 The experimental station at Damien needs improvement. The ponds should be cleaned and kept free of vegetation. Dams should be repaired. A larger building with concrete tanks for holding fish and for more storage for feed and equipment is needed. Feed mixing and pelleting equipment would allow more economical and nutritious feeds to be prepared. An independent water supply for the fishculture station would allow more efficient use of the ponds.

2.08 The U.S.A.I.D. contribution to the fishculture program in Haiti should assist in purchasing the equipment listed in 2.02 above. The Government of Haiti, in turn, should provide an increased budget for proper maintenance of the Damien Fishculture Station and operation of an effective extension program in fishculture. Immediate funding for these needs would allow the fishculture

program to proceed at once inasmuch as the organization and staff are already established. One man-month of technical services from the International Center for Aquaculture, Auburn University, Auburn, Alabama, should be provided by U.S.A.I.D. on an annual basis for short courses in fishculture and to assist the Government of Haiti with the planning of a fisheries development program.

# 3.0 FISHCULTURE SURVEY REPORT FOR HAITI

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## 3.01 Introduction

Under sponsorship of the United States Department of State, an inland fisheries survey of Haiti was conducted by a team from the International Center for Aquaculture, Auburn University, from March 22 to March 27, 1971. The initial intent of the visit was to investigate the causes of low yield of fish from Lake Azuey to local artisan fishermen. While in Haiti, the Auburn Team surveyed the fishing industry and reviewed the Government-sponsored fishculture program for the purpose of making technical recommendations toward improvement of fishculture in the country.

## 3.02 Geography, Topography and Climate

The Republic of Haiti occupies the western one-third of the Island of Hispaniola in the Caribbean Sea between Puerto Rica and Cuba. Haiti has a land area of 27,749 square km (10,714 square miles). Some 75 per cent of the area is dominated by mountains with intervening highlands and deep valleys. Only approximately 31 per cent of the total is suitable for any type of agriculture. Much of the farm land is semi-arid and irrigation is extensively practiced. Normal rainy seasons are from April through June and October through November; rain is heaviest along the coast on the windward side of the slopes.

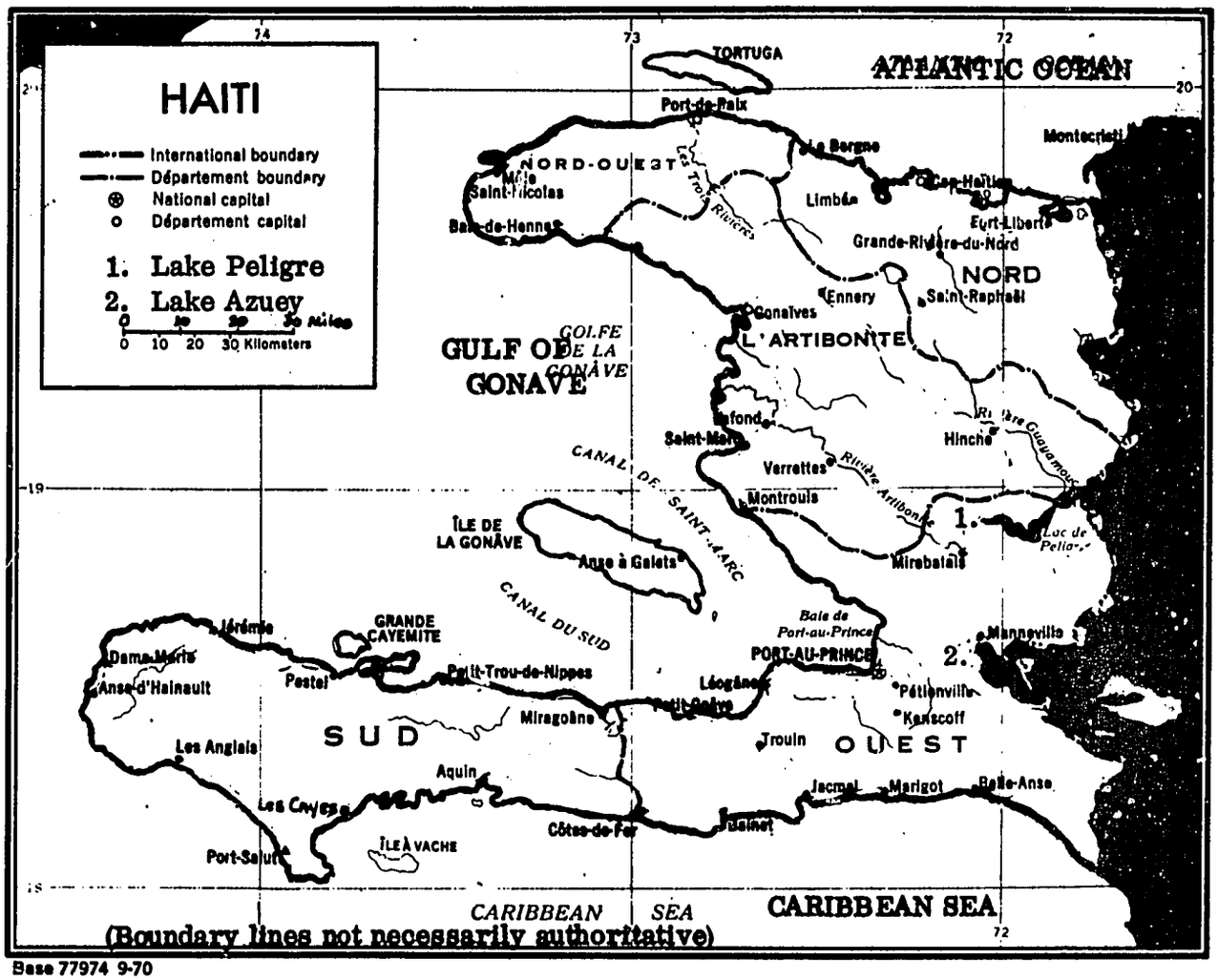


Figure 1. Map of Haiti

There are many short, rapid streams flowing down the mountain slopes to the sea. There is one large river, the Artibonite, which extends from Lake Peligre to the Gulf of Gonave. There are two large lakes; Lake Azuez, a natural lake of approximately 17,000 hectares; and Lake Peligre, a reservoir of approximately 3,200 hectares, created by construction of a hydroelectric dam. Lake Azuey, having no surface outlet, is slightly saline but contains freshwater fishes. Lake Peligre was constructed in the 1950's but was recently drained for the installation of a hydroelectric generator. The Peligre Dam Project is to be completed in 1971 after which the lake will be refilled and stocked with fish.

The temperature of Haiti is tropical along the coasts, rising to above 38 C in the summer. The average summer temperature of the country, except the sparsely populated areas high in the mountains, is 30 C and the average winter temperature is 21 C.

3.03 Population and Culture

The population of Haiti was estimated at 5.3 million in 1970.[1] This amounts to 191 persons per square km, making Haiti one of the most densely populated countries in the world. Approximately 50 per cent of the population is less than 20 years of age. The population growth rate is about 2.4 per cent annually. The infant mortality rate (under one year of age) is high -- approximately 130 per 1,000 live births. Diseases are manifest because of inadequate health and sanitation facilities, and poor nutrition.

1. Haiti - Summary of Basic Data. A.I.D. (PPC/SR). Revision No. 270. July, 1970.

Almost 95 per cent of the Haitians are of African descent with the remainder being of Caucasian or mixed (mulatto) ancestry. French is the official language of the country. Literacy is estimated at only slightly above 10 per cent. Most of the people live in rural areas, and only 10 to 12 per cent are urban.

During the early part of the 18th century, the French developed highly productive sugar and coffee plantations on the western third of the Island of Hispaniola. Slaves were brought from Africa to work the crops. In 1804 independence was granted from France and the name of the western end of the Island was changed from Saint-Domingue to Haiti. Since that time up until the early 1900's, the country experienced considerable political and economic disorder. Industries other than agriculture have been slow to develop. Mineral and forest resources are limited and mostly undeveloped. Tourism was an important source of income prior to 1961, but since that time, tourism declined considerably due to political unrest. Within the last year or so tourism has appeared to be on the rise again.

Because of lack of tourism, limited resources, large population, lack of education and training skills, Haiti has the lowest annual per capita gross national product of any Latin American country. In 1969 it was less than $75.00.[1] Agriculture is the mainstay of the Haitian economy. Most of the productivity is from small, family-size farms although there are a few sizable plantations. Coffee is the main export product of the country but has

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1. Haiti - Summary of Basic Data. A.I.D. (PPC/SR). Revision No. 270. July, 1970.

declined somewhat in recent years. Sugar and sisal are significant export commodities. Corn and rice plus bananas and other tropical products are grown for domestic consumption.

3.04 Nutrition and Fish Consumption

Data for the period 1959-61[1] showed that Haiti had the lowest per capita calorie and protein intake of any country in the western hemisphere. The daily calorie consumption for Haiti was 1,780 as compared with 3,190 for the United States. Protein consumption was 45.8 grams with only 6.8 grams coming from animal sources. The world-wide average minimum protein requirement has been estimated to be 57.3 grams per day of which 19 grams should be animal protein.

Malnutrition and undernutrition are serious problems in Haiti. Dr. Ary Bordes, Director of the Family Hygiene Center in Port-au-Prince, stated that 70 per cent of infant mortality was attributed to malnutrition, intestinal diseases, and tetanus. He estimated that 10 per cent of all infants showed "swelling" which is a symptom of malnutrition.

The annual per capita consumption of fish in Haiti during the 1959-61 period was 4.6 kg, and 9.1 kg for all other meat. It is quite evident that the need for dietary animal protein is extremely critical. The availability of meat and poultry is short and much too expensive for most Haitians. Fish was marketed

1. Food Balances for 24 Countries of the Western Hemisphere, 1959-61. Economic Research Service, U.S.D.A., ERS Foreign 86. 1964.

both fresh and frozen, but it too was very expensive. Table 1 shows prices of meat, poultry, eggs, and fish in markets in Port-au-Prince, in an inland village on Lake Azuey, and in a village on the coast.

## 3.05 Status of the Fishing Industry in Haiti

### 3.051 Marine Fisheries

Haiti's limited fishing industry is concerned essentially with providing fish for immediate local consumption. Most of the commercial fish come from the sea. The fishing crafts are small wooden-hull sail boats similar to those shown in Figure 2. These boats are made locally and sell for approximately $60.00 (U.S.). No power boats for fishing were observed. Traps like the one shown in Figure 3 are used extensively to catch fish and lobsters. Hand lines are used to some degree but nets are uncommon.

Most of the fish are sold and consumed fresh. Because of the limited supply and great demand, there doesn't appear to be a serious need for preservation unless there is a substantial increase in catch. In fishing villages along the coast, the fish are sold along the shore within a short time after being unloaded from the boat. Some of the fish are purchased by "brokers" who may take the fish to another market, such as Port-au-Prince, for resale. Fish are not usually sold by weight in the fresh markets, but by the fish or by the string. The most commonly observed fish in the markets in Port-au-Prince and Saintard were snapper types. Other shallow-bottom forms were found. In addition there were rock lobster and conch plus a few shrimp.

Table 1. Prices of meat, poultry, eggs, and fish in markets in Haiti

| Market location | Commodity | Preservation method and quality | Price/lb ($U.S.) |
|---|---|---|---|
| Fond Parisien | tilapia | fresh, small | .10-.20 |
| Saintard | snapper, | | |
| | parrot fish | fresh, excellent | .30 |
| | rock lobster tail | fresh, excellent | 1.25 |
| | conch meat | fresh, excellent | .20 |
| Port-au-Prince | | | |
| Fresh market | snapper, parrot fish | fresh, fair | .30 |
| | conch meat | fresh, fair | .20 |
| | shrimp | fresh, fair | .30 |
| Frozen fish market | snapper | frozen, fair | .40 |
| | common fish | frozen, fair | .32 |
| | rock lobster tail | frozen, fair | 2.50 |
| Retail store | salted cod, | | 1.20 |
| | imported | dry, salt-smoked, fair | 1.20 |
| | ground beef | fresh, fair | .36-.50 |
| | beef filet | fresh, fair | .90 |
| | steak, round | fresh, fair | .50 |
| | steak, loin | fresh, fair | .50 |
| | ham, imported | cured, good | 1.20 |
| | chicken | frozen, good | .55 |
| | eggs | fresh, good | .50-.80 |

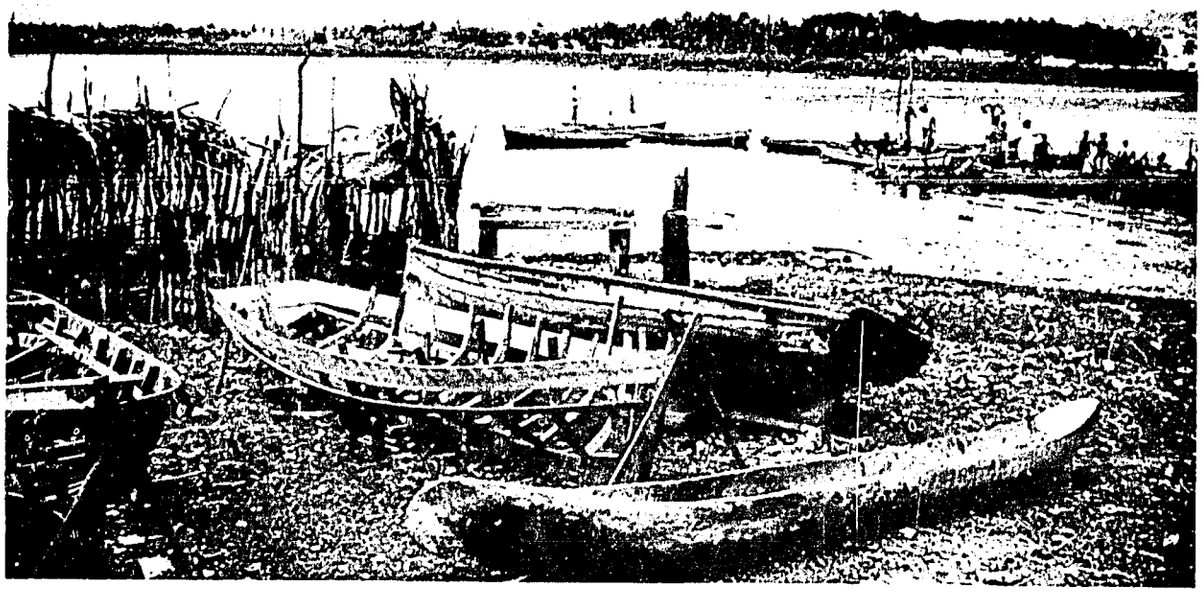
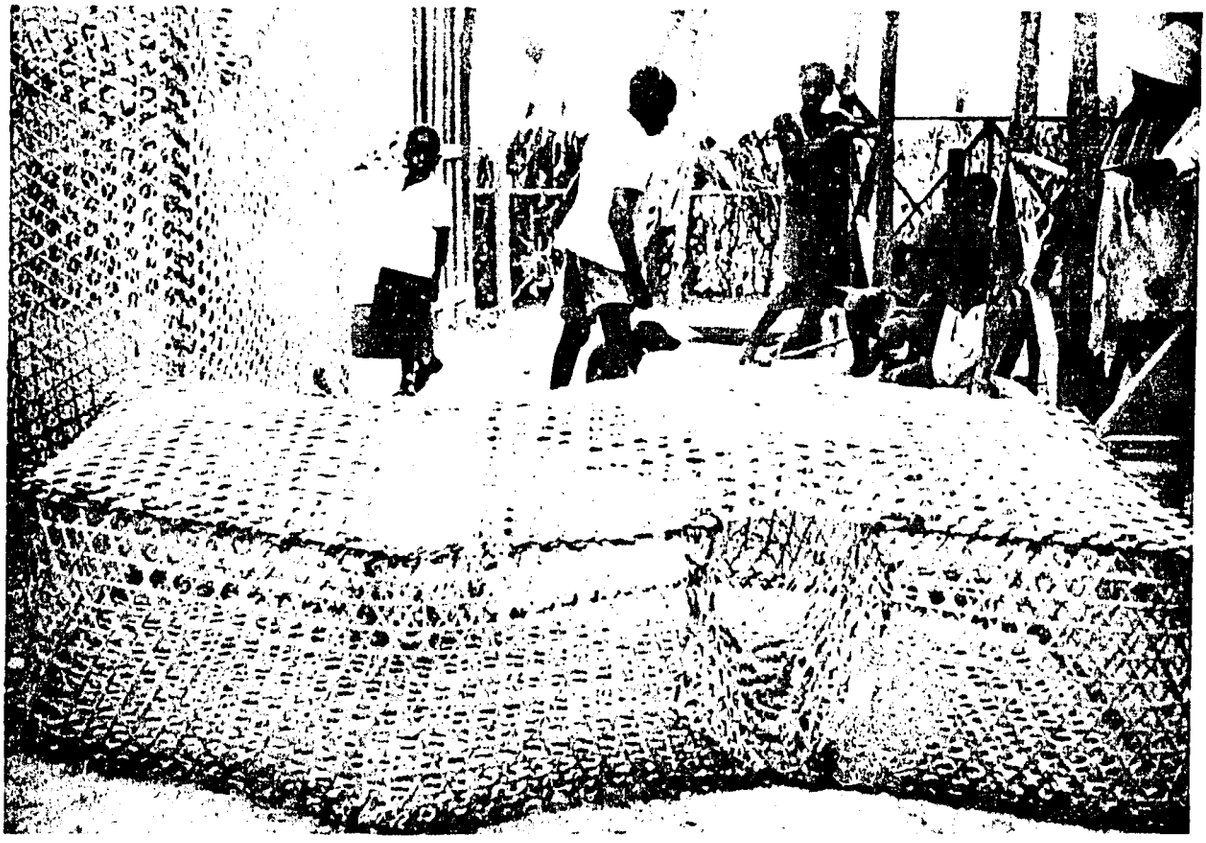


Figure 2. When completed, this 14-foot sailboat will sell for $60.00. It will be used by fishermen in coastal waters around Haiti.

Figure 3. Traps made from sections of bamboo strips are used for catching fish and lobsters. The trap sells for about $2.00 new and will last about 2 years under normal conditions.



Thompson, in a report on the fisheries of Haiti made for the United Nations Mission in 1948[1], pointed out that the Haitian marine fishery did not show a great deal of potential for becoming large. He observed that the fishermen of Haiti did not have a love of the sea and were not happy far from land, that these fishermen were not enthusiastic about learning of new equipment or methods, and, that the main deficiency of the marine fishery in Haiti was human temperament instead of technical inadequacies. This appears to be the situation at the present time. The supply of fish in waters around Haiti has not been well determined. It was reported that Japanese fishing boats had explored the waters around Haiti and apparently did not find significant quantities. Local fishermen were seen unloading catches weighing less than 2 kg after a day's fishing; however, the catch may have been more of a reflection of the fishermen's expertise than the supply of fish.

A few frozen fish were found in Port-au-Prince but they were quite expensive. Imported smoked-salted fish were seen in some of the food stores, but very few dried local fish were observed. Apparently, the supply and consumption pattern does not justify this type of preservation at the present time. The use of refrigeration or ice was extremely limited.

### 3.052 Freshwater Fisheries

A few freshwater fish were found in a market in the village of Fond Parisien on Lake Azuey. The small lot of tilapia shown in the cover

1. Thompson, E. F. 1948. Report of the Fisheries of Haiti with Suggestions for their Future Development and Expansion. Submitted to the United Nations Mission in Haiti.

Figure 4. Various marine fishes sold for approximately $0.20 to $0.30 per pound of whole fresh fish in markets in Port-au-Prince. Fish were not eviscerated prior to sale and no preservation was used.

Figure 5. A few smoked, salt-dried fish were found in the market at Saintard selling for about $0.40 per pound.

photograph constituted all of the fish found that day in the village. These fish sold for about 10 cents (U.S.) per pound. The population of Fond Parisien is about 4,000 and a number of the residents are part-time fishermen. A discussion with some of the fishermen revealed that fishing methods were quite primitive. There were no boats and the only net reported in the village was the one shown in Figure 7. Fishing was done with hand lines by the fishermen casting from shore or wading out into the lake. The fishermen claimed that a few boats and nets were used by some of the fishermen in villages on other parts of the lake.

In 1964 mirror carp and Tilapia mossambica were released into the lake. Tilapia, ranging in length from 8 to 16 cm, appeared to be the predominant catch. Carp up to 45 cm in length were occasionally taken in addition to a few other types of fish, which according to description by fishermen, appeared to be cichlids. S. Y. Lin, an FAO fishculture expert, surveyed the Haiti freshwater fishery in 1950 and reported that the natural waters were poorly supplied with fish and blamed this on the fact that the indigenous freshwater fish were not prolific or fast-growing.[1]

The low catch of fish from the lake was possibly due to both low productivity of the lake and poor fishing technique by the fishermen. A quantitative as well as qualitative evaluation of the fish population in Lake Azuey should be make to estimate the productivity of the lake and to determine how well the stocked species of carp and tilapia have thrived. Instruction and encouragement

1. Lin, S. Y., and Shimon Tal. 1956. Rapport au Gouvernement de Haiti sur la Pisciculture. Proj. HAI/Fi. Rapport No. 538. FAO/56/9/6935.

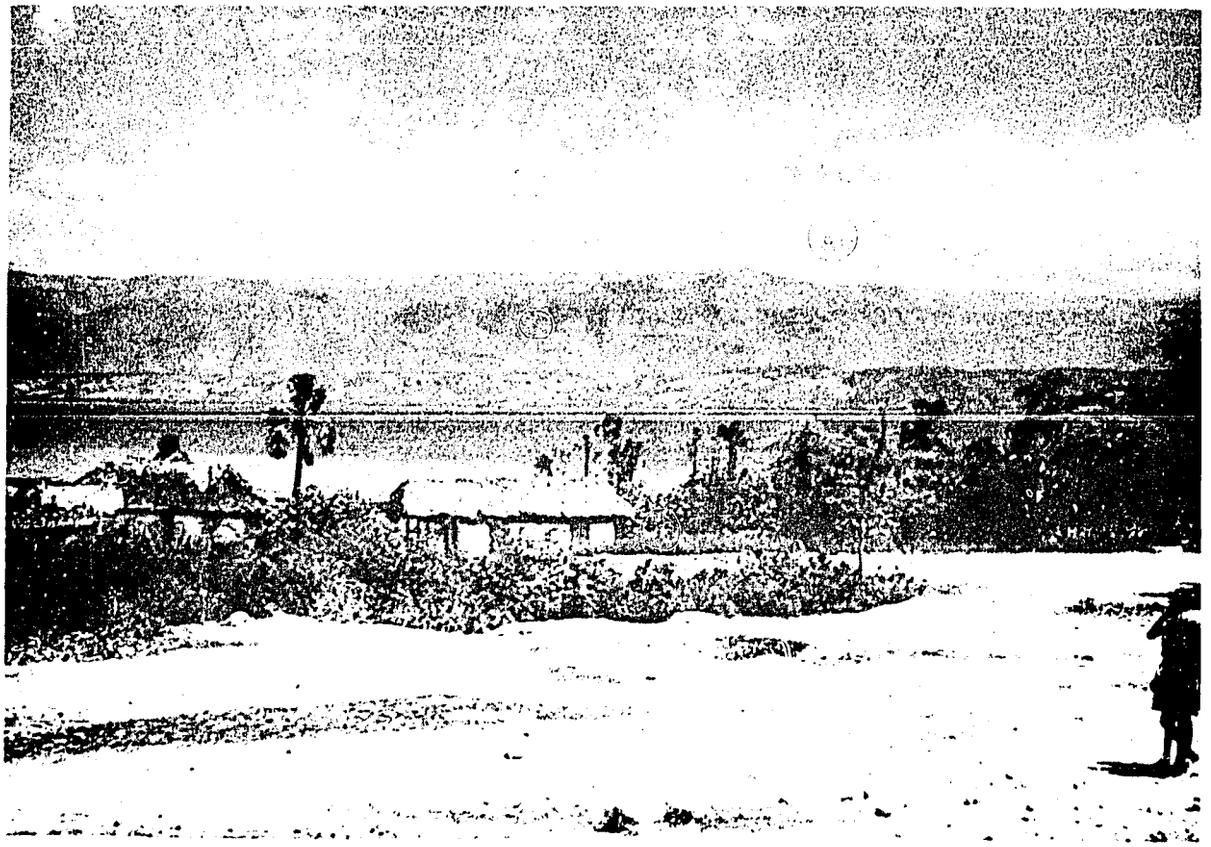


Figure 6. View of Lake Azuey located near the village of Fond Parisien. This 17,000-hectare lake is the largest lake in Haiti but little is known of its fishery resources.

Figure 7. The only fishing gear that was observed at Fond Parisien, other than hook and line, was this multi-patched seine.

of the local fishermen to use improved methods would undoubtedly increase the catch from the lake. This could be done by extension personnel from the Fisheries Office; however, at the present time these workers have no transportation for this purpose. Mr. J. E. Garnier, the Director of the Fisheries Office, is knowledgeable in this area and has indicated willingness to make this contribution if transportation can be provided.

3.053 Government-Sponsored Fishculture Program in Haiti

In 1950, with the help of the United Nations Mission in Haiti, the Government of Haiti initiated a program to provide more food fish for Haitians by cultural methods and by restocking natural waters. Mr. S. Y. Lin was in Haiti from 1950 to 1953 to develop the program. He was joined by Mr. Shimon Tal in 1952 who stayed until 1954. The program was designed as a three-stage project to be completed over a five-year period. The first stage consisted of developing an experimental station with ponds for raising fingerlings and for research purposes. The second stage consisted of establishing demonstration centers in different areas of the country for producing fingerlings or for holding fingerlings produced at the central experimental station. Fish could be provided from the distribution centers for stocking farmers' ponds or natural waters. The second stage also included the establishment of an extension staff to help with pond construction and stocking of fish. The third stage concerned the construction of large ponds around cities where fish could be produced to sell in markets.

Construction of the experimental station at Damien began in 1950. A

diagram of the station as it exists today is shown in Figure 8. Most of the ponds are generally well designed and can be conveniently filled and drained. Several of the newer ponds do not hold water well but may improve with age as others have done. Excessive growths of water weeds were seen in several ponds which made it difficult to recover fish.

Mr. J. E. Garnier was hired at the beginning of the program as its director and continues to serve in that capacity.

In 1951, common carp fry were imported from Alabama and Tilapia mossambica were imported from Jamaica, and in 1953, Israeli carp were imported from Singapore. In the fall of 1951, carp and tilapia fry were stocked in rivers, lakes and irrigation canals. These fish are reproducing as evidenced by the fact that they are being caught from these waters at the present time. In 1954, 17,000 mirror carp and 50,000 T. mossambica were stocked in Lake Azuey. Since that time, carp and tilapia have been stocked in this lake on an annual basis until 1967. Lake Peligre, which is expected to be filled in late 1971, is being stocked at the present time.

In 1952 carp and tilapia fry were stocked in farm ponds to be cultured for food. According to Mr. Garnier, since the inception of the program, approximately 6,000 ponds have been constructed in Haiti for fishculture. Most of the ponds were built by hand and are less than 100 square meters in size. Water is fed into the ponds from irrigation canals or natural water sources. Fry are produced at the experimental station and delivered to distribution centers in various parts of the country. The farmer picks up the fish at the distribution center and takes them to his ponds. The stocking rate for carp fry which are

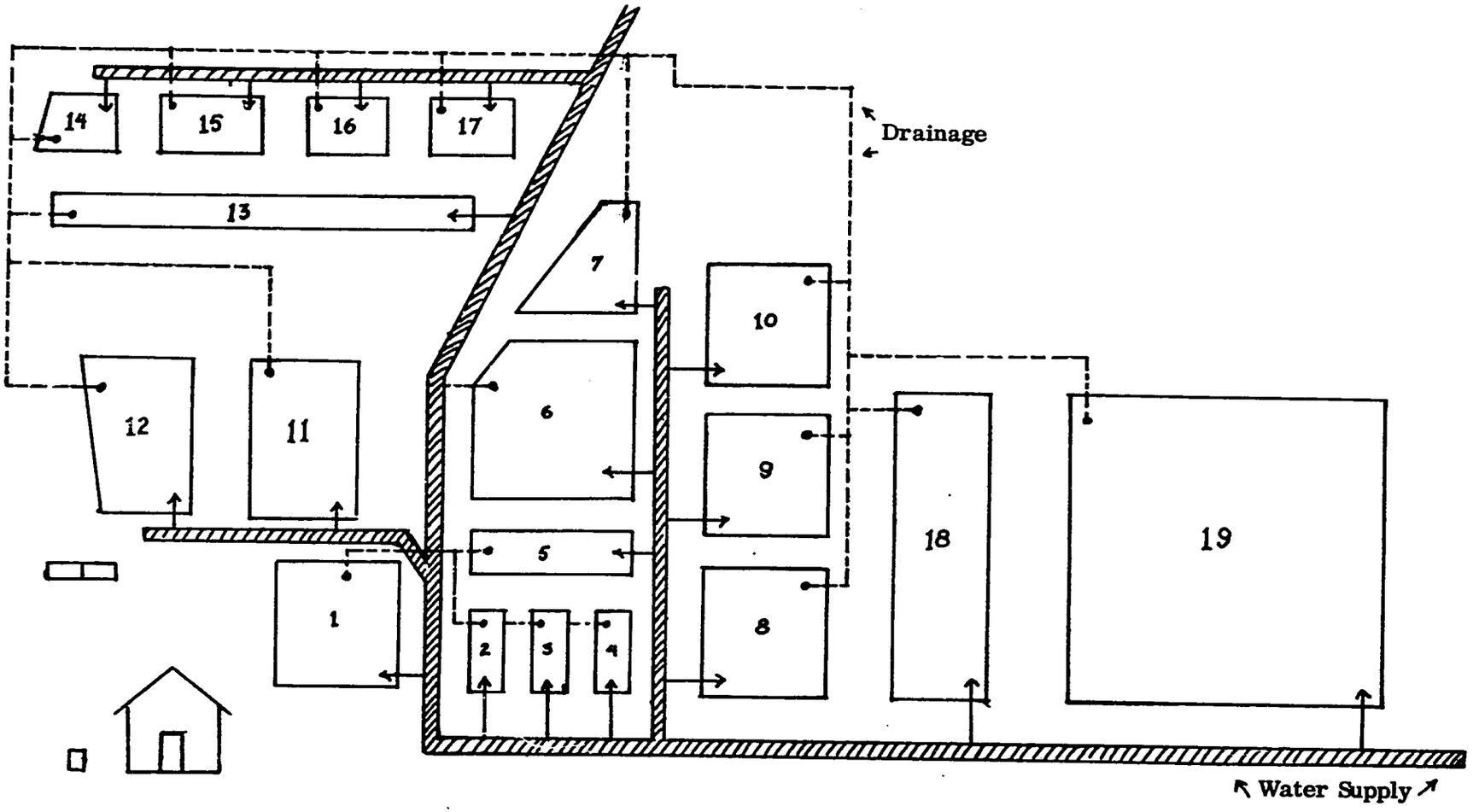



Figure 8. Damien Fishculture Experiment Station

Pond Sizes ($m^2$)

| | | | |
|---|---|---|---|
| 1. | 1,200 | 6. | 2,000 |
| 2. | 290 | 7. | 840 |
| 3. | 290 | 8. | 1,600 |
| 4. | 290 | 9. | 1,500 |
| 5. | 300 | 10. | 1,400 |

Pond Sizes ($m^2$)

| | | | |
|---|---|---|---|
| 11. | 1,600 | 16. | 400 |
| 12. | 1,400 | 17. | 400 |
| 13. | 600 | 18. | 3,000 |
| 14. | 420 | 19. | 10,000 |
| 15. | 600 | | |

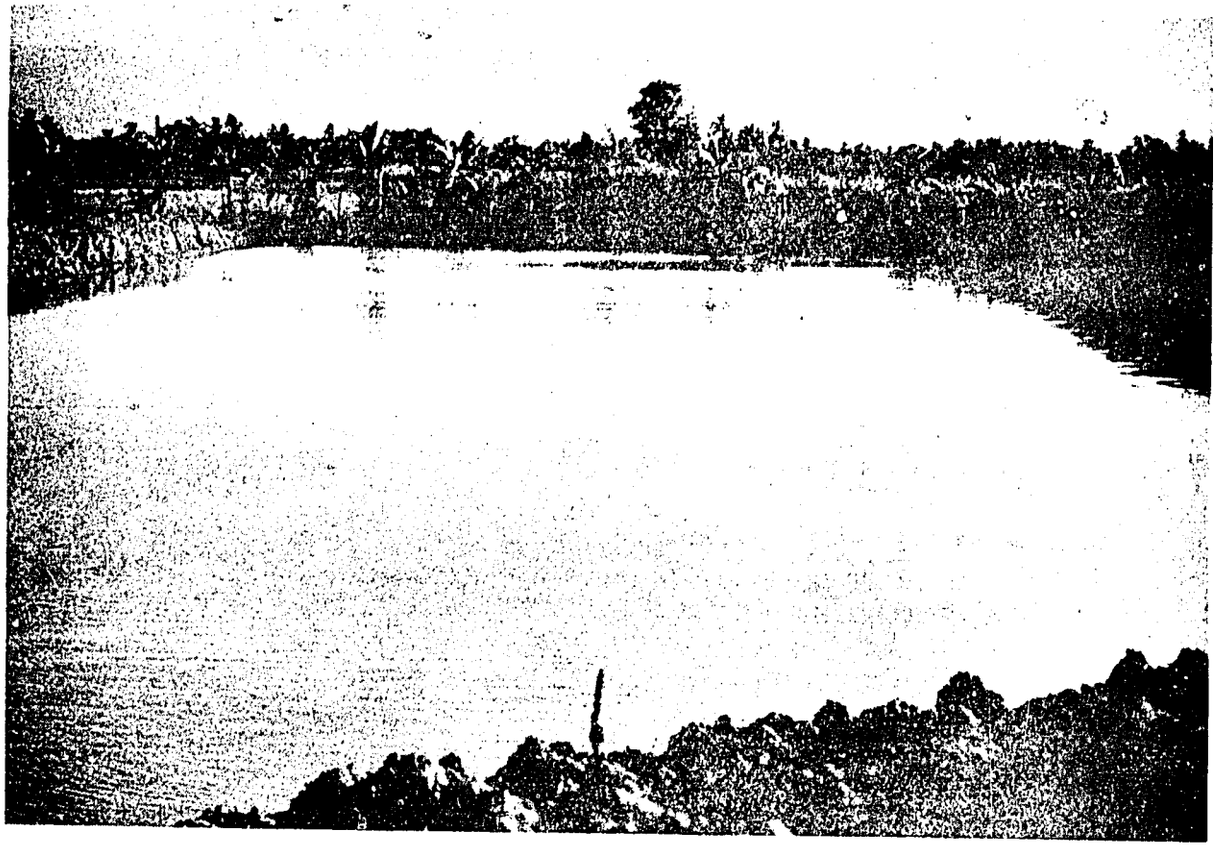


Figure 9. This recently constructed fish pond, one-third hectare in size, was stocked with carp. The fish will be harvested approximately 6 months from the date of stocking and marketed fresh in Port-au-Prince.

Figure 10. At the Damien Fish Culture Station carp are being counted and weighed prior to distribution to rice fields in the Artibonite River Valley.

about 2 grams in size, is one fish per 2 to 3 square meters. The recommended feeding program calls for 2 grams of cottonseed meal per fish per day for the first month, 10 grams for the second month, and 20 grams for the third and fourth months. Cow manure is often used as a supplement. The average size of of the fish harvested from farm ponds after 4 months is approximately 250 grams, according to Mr. Garnier.

Table 2 shows the number of ponds constructed and number of fish stocked for each year from 1958-69. Stocking of fish in ponds has been essentially discontinued since 1969 because of a lack of transportation. The Fisheries Office currently has no vehicles or funds for transporting fish to the distribution centers; consequently, distribution of fish has been restricted to the area around Damien.

A commercial farm with fish ponds near Damien was visited. One pond approximately one-half hectare in size was stocked with carp at a rate of one fish per two square meters. Another of similar size was under construction and a third was planned. Hand labor was used for construction. The fish were fed a feed mixture similar to that fed hogs on the farm. In the mixture were wheat bran, cottonseed meal, blood meal, rice bran, and minerals. The feed, which was fed in a meal form, appeared to be of good nutritive value and would probably produce efficient gains if it were fed in a pelleted form. The farmer planned to sell his fish in Port-au-Prince.

### 3.06 Resources Available for Fishculture Development in Haiti

The fishculture program established by Mr. Lin is a satisfactory design for Haiti, provided it can be rehabilitated. This is evidenced by the

Table 2. Record of fish stocked and ponds constructed under the fishculture program in Haiti from 1958 through 1969

| Years | Fish | | Ponds | | Stocking | |
|---|---|---|---|---|---|---|
| | Carp | Tilapia | Constructed | Stocked | Rivers | Lakes |
| 58-59 | 113,428 | 106,428 | 400 | 400 | 3 | 2 |
| 59-60 | 94,428 | 212,856 | 754 | 754 | 2 | 1 |
| 60-61 | 115,428 | 165,000 | 754 | 754 | 3 | 1 |
| 61-62 | 89,428 | 64,428 | 600 | 600 | 1 | 2 |
| 62-63 | 99,428 | 106,428 | 800 | 800 | 2 | 1 |
| 63-64 | 115,428 | 63,625 | 900 | 900 | 4 | 1 |
| 64-65 | 117,428 | 70,500 | 414 | 414 | -- | 1 |
| 65-66 | 25,000 | 15,000 | 100 | 100 | -- | -- |
| 66-67 | ------- | ------- | --- | --- | -- | -- |
| 67-68 | 13,000 | 8,000 | 62 | 62 | -- | -- |
| 68-69 | 15,673 | 3,500 | 40 | 40 | -- | -- |
| Totals | 798,669 | 815,765 | 4,824 | 4,824 | 15 | 9 |

number of ponds built and the number of fish stocked during the 10- to 15-year period following its inception. Mr. Garnier has had training in fishculture and is a capable director. A number of the fisheries employees have had several years of experience with the program.

Fishculture is implemented through the Fisheries Office in the Department of Agriculture, Natural Resources and Rural Development. This office contains, in addition to the Director, eight administrative personnel and 15 extension workers who are all salaried employees. The budget for the current year for maintaining the experimental station and the fish stocking and extension program is $1,400. This amount must fund wages for four full-time employees and several part-time employees on the station, feed for the fish and other expenses at Damien. The Fisheries Office has no vehicles for performing functions such as moving feed and supplies on the station, transporting fish for stocking, or extension work. Without transportation, the fishculture program cannot extend far beyond the area around Damien.

The experimental station at Damien is a good, basic facility to build upon. The station presently has stocks of carp and tilapia. In 1960-61, it dispersed 280,400 fry. This number could easily be increased with modest improvements in facilities; however, if fishculture is to expand much beyond its present scope, improvements are necessary.

Sites for pond construction are plentiful along irrigation canals and near rivers or natural water impoundments. The long, dry seasons in Haiti make it impractical in most areas to construct ponds remote from a permanent supply of water. Most of the ponds are small and were built by hand. Machinery

is scarce and too expensive for small farmers. Most farmers do not have the capital to develop large fishculture operations and the Fisheries Office has indicated that funds for loans to farmers for fishculture are not available.

The fishculture program in Haiti should concentrate primarily upon small pond production for family use and local sale. Lack of transportation and preservation facilities plus the low purchasing power of the people make rapid commercialization of fishculture unfeasible. Farmers who produce more than their family consumes may sell part of their yield locally. The original fishculture program was planned to develop into a commercial phase. This goal should not be ignored and it is likely that commercial operations can find markets for large poundages of fish, but fish protein will reach the diet of the low-income rural dweller to a greater extent through the family-size fishculture operation.

Cottonseed meal is available in Haiti at a reasonable price. The product, which is coarser, more fibrous and lower in protein than that found in most other parts of the world, tests about 28 per cent protein and costs $15.00 to $20.00 per ton excluding delivery. Rice bran is also a moderately priced local product selling for $8.00 to $10.00 per ton. Wheat bran is available but its price of $38.00 to $50.00 per ton is prohibitively expensive for fish feeding. Mineral supplements which were used in swine rations were available but probably have limited value in non-pelleted fish feeds.

No pelleted fish feeds were found in Haiti. No information was found regarding equipment for making pelleted feeds. Fish utilize feed in large-particle form much more efficiently than in finely-ground meal form. Feeds in meal form

quickly disperse in the water and consumption by the fish is restricted. It was reported that cottonseed byproduct was available in a cake form. This product could be broken into particles small enough for fish to consume, or the cake could be fed intact allowing the fish to consume it as it softens. Another possible way in which the cake could be fed efficiently is to suspend it on a string above the water with an inch or tw. xtended below the surface and lower the string as the fish eat the cake away.

The feeding rates given by Mr. Garnier seem excessive. They would result in conversion values of 6.0 to 9.0 if 250-gram fish were harvested in four months. Feeding guides recommended by the Auburn Agricultural Experiment Station for pond cultured catfish that are intensively fed good quality feeds prescribe a daily feed allowance equivalent to 3 to 5 per cent of bodyweight, not to exceed 35.8 kilograms per hectare. More research is needed in areas relating to improved feed conversions, such as feed particle size, feeding allowance, and the use of combinations of feedstuffs to improve the nutritive value of the diet.

## 4.0 SUMMARY

A team from the International Center for Aquaculture, Auburn University, made a six-day visit to Haiti to survey the potential for increasing the availability of fish for food for the low-income, rural and small village dwellers in that country. Haiti has the lowest per capita protein and calorie consumption of any

country in the western hemisphere. Malnutrition is a serious and widespread problem. Although Haiti is bordered on three sides by the sea and has several large inland water sources, fish is not an important food or export product. The basic reasons are perhaps that Haitians are not seafaring people and have been ignorant of or reluctant to adopt improved fishing methods, and the waters in this region are not rich sources of fish. It was evident that if price, supply, and distribution of fish were more favorable, more fish would be consumed in Haiti.

A freshwater fishculture program was established under the auspices of the United Nations Mission in Haiti in 1950. The program consisted essentially of building an experimental station at Damien, providing an extension staff to work with farmers on fishculture, and stocking carp and tilapia in small farm ponds and in rivers, lakes, irrigation canals and rice fields. Through 1969, over 1.6 million fish were stocked into 4,824 ponds and 24 lakes and rivers. The program has declined since 1966 because of inadequate funds. The Fisheries Office, which administers the program, presently has an adequate staff to continue the program. Although its effectiveness is limited at the present time, the experimental station at Damien is operational. With additional funds and equipment, the program could be revitalized and increase the supply of food fish in Haiti appreciably.

It was the opinion of the Auburn Team that this program be continued and the recommendation was made that U.S.A.I.D. assist by providing equipment, namely a truck for hauling fish and two smaller vehicles for extension use. The Government of Haiti would share in rehabilitating the fishculture

program by increasing the budgetary allowance for that purpose. U.S.A.I.D. should provide for one man-month of technical services annually for training courses and to aid the Fisheries Office with the fishculture program.

## 5.0 CONFERENCES

UNITED STATES GOVERNMENT

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