AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D. C. 20523

BIBLIOGRAPHIC INPUT SHEET

FOR AID USE ONLY
Batch #18

1. SUBJECT CLASSIFICATION

A. PRIMARY
Agriculture — AM00-0000-0000

B. SECONDARY
Fisheries

2. TITLE AND SUBTITLE
Fish that mean life

3. AUTHOR(S)
Morris,F.B.

4. DOCUMENT DATE	5. NUMBER OF PAGES	6. ARC NUMBER
1972	5p.	ARC

7. REFERENCE ORGANIZATION NAME AND ADDRESS
AID/OPA

8. SUPPLEMENTARY NOTES *(Sponsoring Organization, Publishers, Availability)*
(In War on hunger,v.6,no.7)

9. ABSTRACT

10. CONTROL NUMBER	11. PRICE OF DOCUMENT
PN-RAA-992	
12. DESCRIPTORS	**13. PROJECT NUMBER**
Foreign aid Nutritive value Research	**14. CONTRACT NUMBER** AID/OPA
	15. TYPE OF DOCUMENT

AID 590-1 (4-74)

A Reprint

"FISH THAT MEAN LIFE"

From

War on Hunger

A report from the Agency for International Development

VOLUME VI, NO. 7 JULY 1972

FISH THAT MEAN LIFE

By Fred B. Morris

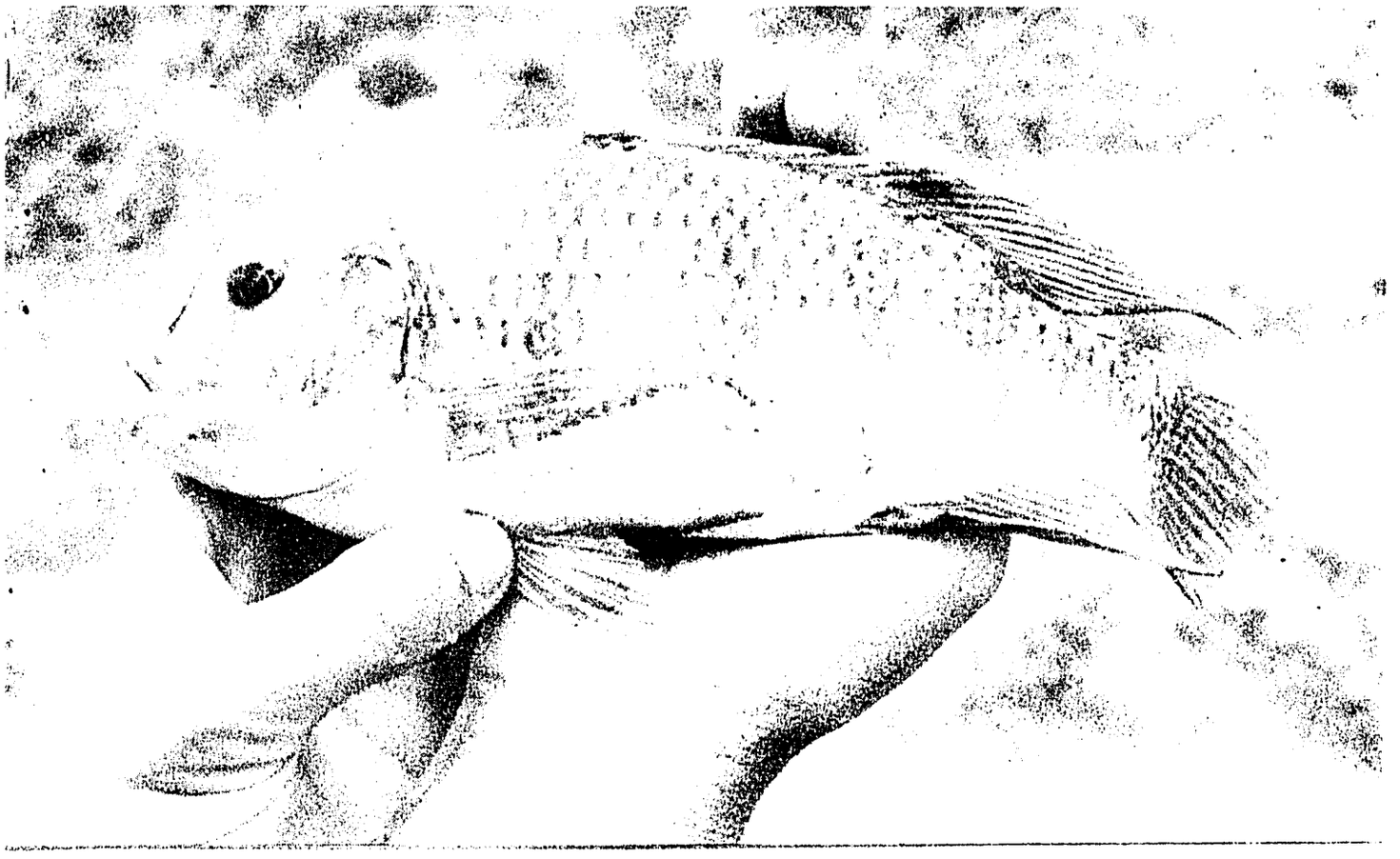
"Fish is all that's keeping us alive. Without the few fish in this pond, we would have all long since died off." Senhor Severino stood on the edge of a shrunken but still surviving pond on the *fazenda* (farm) in the interior of Ceara, Brazil, where he and his wife, Dona Raimunda, live and work with their six children.

The time was January, 1971, during one of the worst droughts the Brazilian Northeast has ever experienced. Senhor Severino, a sun-scorched and wizened *nordestino* (northeasterner), related how he had lost all of his crops in 1970 due to the lack of rain, and observed: "We've got nothing at all now. But the pond still has some fish, thanks be to God!" So Severino's family, like thousands of others in the Northeast, was holding on, fishing and praying for rain to break the drought. The rains finally came in March.

Though it seems strange in such an arid land, fish play a major and sometimes crucial role in the diet of many of the inhabitants of the periodically drought-stricken Northeast. Consequently, the Brazilian National Department of Works against Drought (DNOCS) and the U.S. Agency for International Development

A young "nordestino" weighs his catch of fish from the Pentecoste reservoir at a government weighing station.

A tilapia fish that selection experiments have shown will produce rapidly on naturally available foods in the Northeast.



have been working together in recent years to try to improve the numbers and quality of the fresh-water ish in the area.

At the end of the last century, the federal governnent of Brazil created DNOCS to deal with drought roblems. One of the major results of the work of)NOCS was the construction of nearly 6,000 ponds and eservoirs that offer potential for irrigation.

The people have traditionally fished these waters, oth large and small, in order to supplement their food upply. Some years ago, DNOCS established two fish atcheries in the state of Ceara for the purpose of helpng to stock fish in the reservoirs and required all fishrmen to take their catches to the DNOCS *posto* for veighing.

AID Assistance Requested

In 1962, the people in charge of the fisheries program ecame concerned over an apparent drop in fish production and requested AID's assistance in a survey of the roblem and of possible solutions. As a result of preiminary surveys, the Superintendency for Development f the Northeast (SUDENE) requested further assistnce for a feasibility study on the development of a resh-water fishing industry in the Northeast.

In 1966, AID and DNOCS signed a contract whereby AID would assist in the creation of a major research enter at Fortaleza in the Northeast state of Ceara. A 1968 AID contract with Auburn University's International Center for Aquaculture tied the project into the Center's international research network.

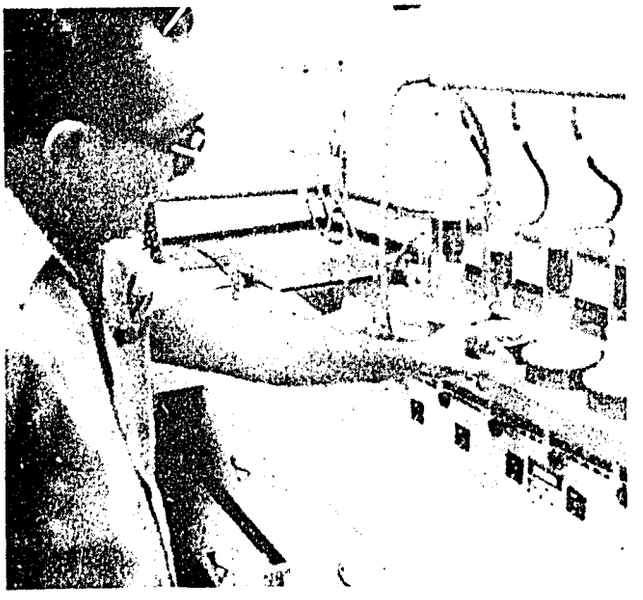
The Fresh-Water Fishery Development Project, as he research center came to be known, had two goals. First, increasing supplies of animal protein for the people of the Northeast who fish the ponds and reservoirs, and, second, the possible development of commercial fresh-water fishing as an industry.

Both objectives are important to the development of the Northeast and, in the long run, to the development of Brazil. The nine northeastern states, with some 30 percent of the country's total population, cover 620,000 square miles, an area roughly three times the size of France and 19 percent of the total area of Brazil. Though Brazil is in a phase of rapid industrial expansion and development that is being heralded as an "economic miracle", the Northeast has yet to be touched by this miracle in a serious way.

Since 1940, the population of the Northeast has more than doubled, jumping from 14 million to 28.3 million in 1970. The increase would have been considerably more if it had not been for the out-migration that took place during the droughts of 1950 and 1958, when, on each occasion, more than two million people sought refuge in the south of Brazil. The present population growth rate is estimated at about 2.9 percent per year.

Though roughly 60 percent of the population is in rural areas, the vast majority are sharecroppers or renters.

Per capita income in the Northeast in 1955 was $127. By 1970, this had increased to nearly $200. But Dr. Hilberto da Silva, the President of the Bank of the



A Brazilian technician trained in the United States checks the fat and protein content of experimental fish.

Dr. Davies of Auburn University explains the operation of a pellet-making machine donated by AID.

Dr. Amaury points to a pond where tilapia from the Ivory Coast are being tested with Brazilian varieties of fish.

Northeast, a government development bank, acknowledges that the modal income for the 60 percent of the population in the rural areas has not changed and is still around $60 per year. In addition, large numbers of people in the rural areas are outside of the money economy altogether.

Illiteracy in the area is officially estimated at about 64 percent of the population, but the percentage is considerably higher for those who cannot actually put their literacy skills to practical use.

In addition to these and a multitude of other problems, there are the periodic droughts that afflict the region every eight to ten years.

Hunger a Major Problem

One of the obvious results of the many social and economic problems of the Northeast is hunger. In 1968, Dr. Nelson Chaves, a world-renowned nutritionist and the head of the Nutrition Institute of the Federal University of Pernambuco, published the results of a survey carried out in the Northeast's *Zona da Mata* (humid coastal region of the Northeast) that revealed that average daily caloric intake had declined from 1,990 in 1962 to 1,299 in 1968. A caloric intake of 2,500 is considered the minimum necessary for adults. Recently, the Bank of the Northeast published figures that estimated the average daily caloric intake per capita for the whole area was 1,940 during 1971.

Dr. Alfred Chamberlin, former Peace Corps doctor for the Northeast Region, has observed that hunger is as serious and as extensive in the northeast of Brazil as any place in the world. In such a context the importance of the Fresh-Water Fishery Development Project becomes readily apparent: more fish will mean more available food.

Dr. Amaury Bezerra da Silva, current chief of the DNOCS/USAID fisheries project in Fortaleza, explains the project's initial purpose:

"The first step was to build up an institution that could do adequate research. We have had people working in the area of fish culture in DNOCS since the early '30s, but we did not have an institution equipped and dedicated to this purpose. Since the 'contract' started in February, 1966, we have been able to build up this institution."

AID initially provided two technicians from the U.S. Bureau of Commercial Fisheries and in 1970 two more experts were brought in through the Auburn University contract. Twenty-seven Brazilians have received or are receiving training in the United States, and four more are scheduled for such training before the end of the project. Currently, the project has a staff of 30, 12 of whom are professional technicians. All salaries of Brazilian personnel and operating expenses are paid by the Brazilian Government.

Dr. Amaury was one of those who received training in the United States at Auburn University. He notes, "One of the problems we have faced has been that a 'fish technology' did not exist for the Northeast. We needed a research facility and people who could use it to discover an adequate technology for this part of the world."

Dr. William D. Davies, current chief of party for the Auburn contract, a specialist in population dynamics of reservoir fishes, points out "AID has built 43 research ponds and has 30 more under construction at the Pentecoste (Ceara) research center. The present facility is easily the finest in all South America. If it is possible to carry off fishing in the Northeast, DNOCS, with the facility and the research team they have now, will do it."

Basic Research Underway

Now that the research station is in operation, the second step of the project is underway: basic research.

Dr. Amaury explains the research in four steps:

"First we must test species to find those best suited for Northeast conditions. Secondly, we must experiment to find the best combination of species for maximum production. Third, we are experimenting with a variety of fish foods, trying to find an inexpensive but adequate source of nutrition for the fish, using locally available materials. And fourth, we must do research in food technology relating to the species we are working with."

The 43 ponds at Pentecoste Station are being used in the search for the right species for the ponds and reservoirs of the Northeast. As there are some 2,000 different species indigenous to the Amazon drainage basin, this is no small task.

Dr. Davies observes: "One of the problems is choosing and collecting the species for the experimentation. For instance, while the Mississippi River has 20 different varieties of catfish, the Amazon has 400! And, of course, we need to experiment with tropical fish from other parts of the world, as well. One of the major contributions of AID to the project has been its ability to cut red tape and help in the importation of certain

species from Peru, or the Ivory Coast, for instance. It's pretty frustrating when you know you will have to spend two years experimenting with a fish to first have to spend two years in the bureaucracy getting that fish to your ponds."

A serious problem faced in the testing of species in ponds is that some fish do not breed in captivity. One of the technologies the Auburn-trained people employ to stimulate certain species to reproduce in captivity is called hypophization. Dr. Davies explains "When the female is nearing the normal time for ovulation, we give her a series of injections of pituitary extracts that promote the ovulation which would not normally take place in captivity. This is an extremely important technique in both our experimentation and in fish production for stocking purposes, as well as for commercial purposes.

"What is fascinating to us is that this technique, now used all over the world, was discovered back in 1934 right here in the Northeast by some early DNOCS technicians. Since then it has been refined and developed further, but the basic technology we are using here is one that was invented by Northeastern Brazilians nearly 40 years ago!" Dr. Osmar Fontenele, a member of the team that first used hypophization in the '30s, is still serving in the DNOCS Fish Culture Section in Fortaleza.

As a result of the experimentation in fish selection to date, a variety of *tilapia*—there are nearly 100 varieties of *tilapia* found in the tropics—is now being used for experimental distribution in a limited number of reservoirs. It promises to provide a marked increase in fish production, as it reproduces rapidly on naturally available foods and is an excellent source of protein for the consumer. In February, 1972, some 18,000 *tilapia* were stocked into one reservoir near Pentecoste for experimental purposes.

Combinations of Fish Tested

Along with the selection experiments goes the second step, the testing of combinations of fish that will yield the best production. Dr. Amaury notes: "We find that putting certain catfish in the same waters with *tilapia* gives better production. The catfish eat a lot of the young *tilapia,* allowing those that survive to have more food and thus grow more rapidly and to a larger size. And the catfish are good eating, too."

AID provided a pellet-making machine for the experiments with special rations, the third area of research. Locally available products such as cotton-seed meal, soybean meal and fishmeal are being tried. These feeds, for use only in pond culture of fish for commercial purposes, include vitamins to increase fish growth and cut feed costs. Fish production in pond cultures for commercial purposes can reach as high as 10,000 kilos of fish per hectare of water per year, as compared to perhaps 100 kilos under natural conditions. The key is in developing an efficient ration at a low cost per pound of fish produced.

The fourth area of research is that of food technology. In the laboratory, protein and fat content of the flesh of various species is evaluated to determine their desirability as a food source. This research is also important in the development of more adequate methods of preservation. In an underdeveloped area such as the Northeast, fishermen do not have access to ice and fish are often lost due to inadequate preservation techniques. Salting is the most common method used at present, but this can be much improved.

"We have a real problem here," says Dr. Amaury. "As our people learned about DDT after the war, they began using it to help preserve their fish to avoid flies and maggots. Some people (not yet involved in the AID project) in the interior mix one kilo of DDT with salt for every 200 kilos of fish! It does resolve the fly problem, but with often unhappy results for the consumer. Now its gotten to the point where in many areas people won't buy fish that don't show some signs of maggots because they are afraid of the DDT. And it's very hard to teach the fishermen not to use DDT. It's become a part of their fishing culture. So we need to develop better ways of preserving the fish, and then we need to develop an extension program that will teach this to the people."

Commercial Potential Investigated

Dr. Davies adds: "In addition to this kind of basic research, six commercial-type ponds are being set up now on *fazendas* in Ceara, to see if we can make pond fish culture pay off commercially. We know we can raise fish in large quantities, but what we need to do is show that it can be done at a profit in the Northeast. This will take some market research and development. But there is about $4 million a year spent in the Northeast on imported dried codfish, so if we can show how to raise and dry *tilapia* economically enough, somebody can make a lot of money—and a new industry could be developed."

The project has now reached the point where serious basic research is well underway. As in all biological research, it takes time, as it is not possible to rush the growth of fish. But the base has been built and the Brazilian team is now hard at work doing the research. The success to date has been in the building of the research station and team. The pay off will come later.

Dr. Amaury notes: "We're already distributing *tilapia* on a large-scale experimental basis. Some people are going to start eating better right away. But the eventual success of the project will depend on our ability to develop an adequate extension service once we get the pay off from the research. We've got to get the fish and the know-how out where the people are, or we're only going to be helping the rich. Extension should be a major goal during the next stage of development."

Multiplying the fishes will not alone solve the hunger problem for the multitudes in the Northeast of Brazil. But Senhor Severino and his family should start eating better in the near future.

Workers at the Fishery Development Project struggle to haul in a large catch of fish from one of the experimental ponds. The fish will be weighed to measure growth rates.

A peasant family in the Northeast of Brazil. Most of the people in the rural areas are sharecroppers or renters.

Some of the 43 ponds at the Pentecoste Station, considered one of the finest research facilities in South America.