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FISHING AND FISHERIES (BRAZIL)^{1/}

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Introduction

Brazil is not at present a large producer of fish, when its population is taken into consideration. In 1946 the total production for market was estimated at about 122,000,000 kilograms, valued at about Cr\$355,000,000 (a little under US\$20,000,000), based on the average price received by the fisherman, estimated at Cr\$2.90 per kilogram. The retail value would of course be much higher.

There are great possibilities of expanding and improving the fishing industry in Brazil, with benefit not only to the fisherman but also to the nutrition and health of the consuming public. The greatest obstacles to the development of the industry have been its lack of modern equipment, unsatisfactory marketing arrangements, and above all the absence of adequate refrigerated storage and transportation facilities for its perishable product. Small returns to fishermen, inefficient and unsanitary marketing conditions, and inability to deliver fish in good condition to inland communities have seriously retarded the development of the industry.

^{1/} Excerpts from the Report of the Joint Brazil-United States Technical Commission, Publication 3487, International Organization and Conference Series II, American Republics 5, Division of Publications, Department of State. (For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., price \$1.00.)

The subcommission which was appointed to study the problems of the fishing industry has made an extensive analysis of all aspects of the industry's problems and has submitted a comprehensive report which reviews the existing situation and makes recommendations with respect to a long-range program offering great possibilities for future development.

The goal of this program is an increase in the production and distribution of fresh, canned, and salted fish to about three times the current volume. Attainment of this objective will require, among other things, a considerable expansion and improvement of the coastal and deep-sea fishing fleets, expansion of port facilities, provision of greatly enlarged capacity for ice making and refrigerated storage at the ports, provision of refrigerated transportation facilities, development of retail markets in a number of cities, with refrigeration and more sanitary conditions than prevail in existing markets, and expansion of canning and processing plants.

The subcommission estimates the required expansion of the fishing fleet at approximately 500 boats, with total fish cargo capacity of 20,000 tons and an estimated cost of about Cr\$800,000,000 (about US\$43,000,000). These boats would be acquired by private operators with the aid of the Government in the financing of their construction or purchase abroad. While it is expected that the marine engines and motors for this fleet would have to be imported, it is believed that many of the boats could be built in local shipyards.

Receiving ports at 45 cities are planned to provide refrigerated storage and ice and other supplies for fishermen. It is proposed that these ports, as well as retail markets, be operated by private interests under Government supervision and regulation, with Government aid in their construction where necessary. Transportation requirements will call for refrigerated trucks and railway cars and refrigerated ships to bring to the ports the catch of fishing fleets at the principal fishing grounds.

In addition, the program of the subcommission includes the establishment of schools to improve fishing methods, the extension of oceanographic surveys and development of research, the reorganization of fishermen's associations and protection of fishermen's colonies located on navy and public lands, more effective prevention of harmful practices and other measures to improve the welfare of fishermen and to promote the sound development of the industry. The subcommission urges that efforts be made, with the assistance of the United States Government, to obtain the services of competent technicians for the oceanographic surveys and for the development of improved methods in the industry.

Present Situation.

Relatively speaking, Brazil is not a large producer of fish. According to the Diretoria de Marinha Mercante, there are 67,911 professional fishermen in Brazil, ranging from 13,214 in the State of Rio de Janeiro and the Federal District to 6 in the State of Mato Grosso. The total production (or take) for 1946 was estimated at 122,410,038 kgs., or approximately 1803 kgs. per fisherman. The value of the take for that year was about Cr\$354,989,110.20, figured at the average price of Cr\$2.90 per kilogram. Actually, the average prices varied from Cr\$6.30 in Pernambuco to Cr\$2.00 and Cr\$1.80 in the States of Rio de Janeiro and Rio Grande do Sul--the heaviest producers and canners of fish. The national per capita consumption of fresh and canned fish, including 4,516,735 kgs. from foreign sources, was 2.7 kgs. for the year 1946.

Organization of commercial fishing. - The Division of Hunting and Fishing of the Department of Animal Production of the Ministry of Agriculture supervises commercial fishing, subject to the Fishing Code of October 19, 1938. This Division has five operating units in the National Capital: research, supervision, industries, inauguration and inspection of sanitary facilities, and fishermen's clinics and administration of the Fish Market of Rio de Janeiro. It also maintains experiment stations at Pirassununga (São Paulo) and Lagoa dos Quadros (Rio Grande do Sul), supervisory posts, regional dispensaries, and primary schools in several States.

The Ministry of Marine registers fishing personnel and their boats. The Caixa de Crédito da Pesca (Fishing Industry Bank of Credit) was created in 1945 to render financial assistance to fishermen, shipowners, and packers. The resources and profits of the Bank are not adequate to meet the urgent needs of a developing fishing industry.

Fishermen's associations. - Every Brazilian commercial fisherman is required by law to join the "Colony" of the locality in which he lives or docks his boat. These Colonies of some 150 men each are supposed to contribute to the social, educational, and economic welfare of their members. In each State they combine to form a federation. These, in turn, make up the General Confederation of the Fishermen of Brazil (Confederação Geral dos Pescadores do Brasil), with headquarters in Rio de Janeiro. The entire organization is in urgent need of reform, if it is to serve its members in an efficient manner.

Fishing areas and methods. - The Fishing Code of Brazil classifies areas as "interior" and "maritime," the latter being divided into "beach" (litoral), "coastal" (costeira), and "deep-sea" (do alto).

Note: The official exchange rate is 18.50 Cruzeiros to the dollar; one kilogram equals 2.2 pounds.

Fishing in the interior is done in all streams and bodies of fresh water; the beach fishing, in beach areas, bays, estuaries, lakes and canals of salt or briny water; coastal fishing, within the traditional 12-mile limit; and deep-sea, beyond that limit.

In the interior, the methods employed are casting, traps, hand lines, reeds, and nets (both casting and under-water nets). In beach fishing, the equipment employed is identical, plus circular nets and trawlers; in coastal fishing: hand lines, depth reeds, circular and drifting nets, dories, and trawlers; in deep-sea: hand lines, depth reeds, and trawlers.

Fishermen are active along the Amazon and its many tributaries, the lower Tocantins, the upper São Francisco, the Parana, and the Paraguay Rivers. There seems to be little need to encourage any increase in the take, but great need for more regulation and control posts to prevent the impoverishment of certain waters, even the extinction of several species.

The maritime fishing zones might be designated as follows:

Northern Zone: Territory of Amapá and the States of Pará, Maranhão, and Piauí.

Northeast Zone: Territory of Fernando de Noronha Island and the States of Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas, and Sergipe.

Eastern Zone: States of Bahia and Espírito Santo.

Central Zone: Distrito Federal and States of Rio de Janeiro and São Paulo.

Southern Zone: States of Parana, Santa Catarina, and Rio Grande do Sul.

In the Northern Zone, the salt and fresh water cycle (the salt content increases or diminishes according to the rainy or dry seasons) creates favorable breeding conditions for numerous commercially valuable fish. Crabs, oysters, and shrimp are found in abundance. Efforts toward industrial utilization have not been entirely successful.

About 300 identified marine species inhabit the waters of the Northeastern and Eastern Zones. Fish hatcheries, in existence since the period of the Dutch colonists, constitute a system of capture and breeding that should be further developed.

Much more is known about the Central and Southern Zones. The fish industry of Rio de Janeiro has grown to sizable proportions. The almost completely motorized fleet, however, suffers from the lack of refrigeration. Ships with longer cruising ranges, equipped with modern refrigeration facilities, are a necessity for the increase

of production and the resultant lowering of prices to consumers. The conditions of the industry in São Paulo are similar to those in Rio de Janeiro, while the waters along the entire coast line are rich in valuable sea life. Even so, a considerable fish canning industry has developed in the Central and Southern Zones.

Fish markets. - A program to construct fish markets in the heavy production and consumer centers was initiated in 1934. These were to render inspection and refrigeration services, supervise sales by auction or retail, furnish ice and fuel to the fishermen, and collect statistical data. The first such market was established in Rio de Janeiro, but the inability to secure proper refrigeration and ice-making equipment during the war delayed its completion. The cold-storage chambers of this market will have capacity for 440 tons of fish--132 tons frozen and 308 refrigerated.

The following additional markets are already constructed and equipped:

Cananéa, São Paulo: capacity of cold-storage chambers, 40 tons; daily ice production, 3 tons;

Angra dos Reis, Rio de Janeiro: capacity of chambers, 15 tons; ice production, 2 tons;

Recife, Pernambuco: capacity of chambers, 30 tons; ice production, $2\frac{1}{2}$ tons.

These markets, constructed and equipped by the Division of Hunting and Fishing, are being operated by private firms.

The over-all program calls for similar markets at the following points: Rio Grande (Rio Grande do Sul), João Pessoa (Paraíba), Manaus (Amazonas), Belém (Pará), and Vigia (Pará).

The fish trade. - The hygienic conditions under which fish are sold in the Rio de Janeiro market leave much to be desired. The fish consumed by this city of 2,000,000 people are first bought at the market by stall-sellers, peddlers, and retail fish-market owners, then resold to the public. Only small amounts are subject to refrigeration in the process. The greater part of the fish are exposed for resale in open stands improvised at the street fairs (feiras livres) and in the baskets of peddlers. This small-quantity type of marketing requires high profits per weight unit, while contributing to the deterioration of the product. Fish which are refrigerated at the market are handled in the same manner. It seems unbelievable that such conditions should exist in the nation's Capital, under the eyes of public authorities responsible for the health and welfare of the city.

Industrial processing of fish. - Most of the fish-processing plants are located in the States of Rio de Janeiro, Rio Grande do Sul, São Paulo, and Santa Catarina. Of the 120 establishments registered

with the Division of Hunting and Fishing, 45 are devoted to the process of canning and 75 to preservation by salting. The annual value of fish canned and salted in the two States of Rio de Janeiro and Rio Grande do Sul is around Cr\$80 million. Figures on the other States are not available.

Technical instruction in fishing techniques is provided by three institutions: Instituto de Pesca Marítima (Santos), maintained by the State of São Paulo; another at Paranaguá, maintained by the State of Paraná; and Escola de Pesca Darcy Vargas (Marambaia, State of Rio de Janeiro), maintained by private funds with some assistance from the Federal Government.

These schools, however, do not seem to have been very effective either in increasing the number of fishermen or in achieving any marked improvement of fishing techniques. The last-named institution possesses one training vessel, which is unfortunately used exclusively for commercial fishing. The others lack such equipment. The result is that the training programs are not very effective. Most Brazilian fishermen still learn their trade through routine apprenticeship under their fathers.

Oceanographic research is under the direction of the Division of Hunting and Fishing and conducted in collaboration with other interested organizations and public institutions. In the past, the work has been limited to a few studies made by official scientists on their own initiative, particularly in the field of biology. Among these, "Fauna Brasiliense--Peixes" by Professor Alipio de Miranda Ribeiro of the National Museum deserves special mention.

At present, the Ministry of Marine conducts a course in oceanography, with adequately equipped ships available for training and research. It is to be hoped that scientists from appropriate private and public agencies, also selected fishing-boat masters, will be permitted to participate in the work.

Research in pisciculture. - In the Experiment Station of Biology and Pisciculture of the State of São Paulo, scientists are assembling data regarding the life span, food, growth, and reproduction of species of fish to be found in the Mogi-Guaçu River. By applying the knowledge thus gained, they have bred some 350,000 fry of species of commercial value. The Experiment Station at Lagoa dos Quadros (Rio Grande do Sul) has achieved encouraging results in the artificial spawning of the kingfish and in acclimating this species to the waters off nearby States. Similar work has been conducted by the Station at the Rural University and the Goeldi Museum (Pará) with such species as the tucanaré, apaiari, bass, pirarucú, curimatã, pescada branca, mandi, and pacú.

Of course, the Division of Hunting and Fishing is active in experimentation and research. Also, the Department of Drought Control of the Ministry of Transportation and Public Works administers a Pisciculture Service at Fortaleza. Since 1933 this Service has been very active in the States of Piauí, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas, Sergipe, and Bahia.

Stocking and restocking interior waters. - The research and experimentation work of the above-mentioned agencies make possible the annual reproduction and distribution of more than a million fry of commercially valuable species, especially in the States of São Paulo, Rio Grande do Sul, Ceará and Pernambuco.

Possible Plans for the Development of Commercial Fishing and Pisciculture.

Fishing zones. - In plans for the organization and development of the fishing industry, it would be well to divide the Brazilian coast into the five fishing zones already defined, each embracing at least one fishing port and as many markets and reception and distribution posts as the production and consumption capacity would seem to require. The fishing ports--Belém, Natal, Salvador, Angra dos Reis, Florianópolis--should have the following equipment: wharves, docks, and piers; shipyards for the construction and repair of fishing craft; shops for the manufacture and repair of nets and other fishing gear; motor repair shops; fuel and water supplies; plants for the processing of fish; and stores for sale of fishermen's supplies.

Increased production. - In view of the great possibilities of already known fishing banks, Brazilian production should be tripled. However, this increase can be achieved only through the expansion and modernization of the coastal and deep-sea fishing fleet at an estimated cost of Cr\$800 million. The necessary purchases might be financed directly by the interested parties, the Caixa de Crédito da Pesca, or some other credit organization.

The distribution of this increased production will require additional fish markets, receiving and distribution posts; retail markets, cold storage facilities, and refrigerated trucks, railway cars, and possibly planes.

The fish markets, located in some 25 coastal cities, will be equipped with refrigeration, freezing, and ice-making installations. The receiving and distribution posts will supply the fish markets, large consumers (where transportation facilities permit), and limited local needs. It is planned to establish these posts at some 45 points in 16 States.

In determining the needed capacities of the freezing chambers of the fish markets and receiving posts mentioned above, the following formulae^{2/} were adopted:

$$(1) \text{ Capacity of chamber at market} = 7 \times 30 \text{ percent} \frac{\text{AAS}-20\%}{360}$$

$$(2) \text{ Capacity of chamber at receiving post} = 7 \times 20 \text{ percent} \frac{\text{AAF}}{360}$$

^{2/} The factor 7 represents the number of days that the fish are retained in freezing chambers; the 30 percent represents the quantity retained each day for refrigeration; AAS, the average annual production for the five-year period 1942-1946 of the respective State; the 20 percent represents the quantity of fish withheld from the markets for local consumption; the 360 represents the number of days in the commercial year; and AAF, the annual average production of fishing locality.

The ice requirements of the receiving posts and the markets are estimated at one kgm. and one-half kgm. of ice per kgm. of fish, respectively.

The reception and distribution posts should be constructed and operated, preferably by private interests, through concessions obtained by public bidding, on bases determined by the Division of Hunting and Fishing. In case there are no bidders, the Government must proceed to achieve these goals through the expansion of the limited operations of existing fishermen's associations.

At the Fish Market in Rio de Janeiro, there is need for the Government to construct two additional piers and increased platform space for the unloading of fish. The Federal District also needs five fully equipped submarkets of 20 tons storage capacity each to supply directly the local population in the suburban areas.

The privately owned retail markets are still necessary in all populous centers. These, however, must be required to install refrigeration facilities. The continuation of present unhygienic sales conditions must be forbidden.

The use of refrigerated ships, motor vehicles, railway cars, and even planes would facilitate the transportation of fish to new and expanded consumption centers, particularly in the Interior.

The processing of fish has reached an appreciable stage of development in the States of Rio de Janeiro and Rio Grande do Sul. It is just beginning in São Paulo and Santa Catarina, and is practically non-existent in the other States. Even where the greatest progress has been made, the industry is presently suffering from the lack of adequate credit facilities and from foreign competition. If the national industry is to survive, appropriate credit arrangements must be made available and some protection must be provided against the saturation of the domestic market with the products of related foreign industries.

Equally important is Government assistance for new installations to process such species as shrimp, albacore, guriyuba; lobster, sardine, cavalinha, anchovy, tainha, corvina; abrotea, bagre, cacão (shark), and whale.

The fishing shipyards now in use are small and too poorly equipped to construct the craft needed for the projected development of the fishing industry. It is necessary therefore, to import some new vessels. Meanwhile, modern yards for the construction and repair of fishing craft should be provided at Belém, Natal, Angra dos Reis, and Florianópolis. Preferably, these should be built by private parties, with some Government credit and even subsidy. In some cases, however, it may be necessary for the Government to construct the yards and lease them to private parties for operation.

The financing of the fishing industry is the function of the Caixa de Crédito da Pesca, an agency of the Ministry of Agriculture. The principal income of this agency is derived from a 3 percent tax on the catch entering the fish markets. It should have at its disposal initial capital of at least Cr\$100 million--if necessary, furnished by the Government.

Professional training in fishing techniques.-- Present schools exercise little influence on the fishing industry. The Escola Darcy Vargas, with better equipment and a revised teaching program, could be made very effective. New schools, possibly supported by the Federal Government, would be desirable at Belém, Natal, Salvador, and Florianópolis. The total cost of these institutions is estimated at Cr\$10 million.

Oceanographic research is indispensable to the development of the fishing industry and to the protection of the fauna and flora of Brazilian waters. Data are needed to prepare fishing charts, providing such information as the depth of fishing banks, condition of sea bottom, local densities and temperatures, marine currents, and the occurrence of various species.

The studies must be pursued aboard specially equipped ships and at marine biological stations along the coast, probably at São Sebastião (São Paulo), Itamaracá (Pernambuco), and Marajó (Pará). Plans for the studies should be prepared by a commission composed of representatives of the Ministries of Marine, Education and Health, and Agriculture, and certain specialized State agencies. Some foreign technical assistance will be highly desirable.

The cost of such a program is estimated at Cr\$40 million, distributed as follows:

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| (1) three marine biological stations | Cr\$15 million |
| (2) three fishing research ships | Cr\$15 " |
| (3) installations and equipment for ships | Cr\$10 " |

The reorganization of the fishermen's associations. - Colônias de Pescadores, Federações das Colônias, and Confederação Geral dos Pescadores do Brasil--is a move of extreme importance and great urgency. These associations must be made more efficient and articulate. They might well expand their economic activities to include the sale of their own fish. Certain recent occurrences involving unjustified evictions make it clear that private interests are guilty of encroachment on the rights of these fishermen. It is recommended that a joint study be made by the Ministry of Marine, the Division of Hunting and Fishing, and the Federal Lands Authority, looking toward guaranteeing to the members of duly organized colônias the possession of the lands that they occupy.

Policing of fishing areas. - Fishing practices prejudicial to the continued abundance of supply must be prevented under the Fishing Code.

It may be necessary to apply more severe fines, in order to discourage some parties from committing infractions merely because the fines involved are much less than the cost of compliance with the law. It is indispensable to proper policing that the Ministry of Marine be granted the authority to prevent such practices as the use of drag nets within the three-mile limit or in places considered breeding grounds, the use of fixed traps prohibited by law, the pouring of oil on inshore waters, and fishing by poisons or explosives. Conservation measures are essential to the future development of Brazil's fishing industry.

Research in pisciculture should be expanded according to some general national plan to be determined scientifically by interested Federal and State agencies. It is suggested that at least nine new well-equipped experiment stations will be needed for the work, if the desired thoroughness is to be achieved.

Conclusions. - The conclusions reached by the Commission on Fishing and Fisheries might be summarized as follows:

1. The present annual volume of fish production in Brazil should be tripled; that is, increased to more than 360,000,000 kilograms.
2. The fishing grounds of Brazil permit a yield many times greater than the present and they will become even more productive with the introduction of modern methods and equipment.
3. Successful development of production will require an expansion of the present fishing fleet by some 20,000 fish-cargo tons.
4. Considering the technical conditions of coastal and deep-sea fishing, the net tonnage required will be approximately 500 boats, the cost of which is estimated at 800 million cruzeiros.
5. This fishing fleet could be acquired by private parties, if the Government would assume the responsibility of financing its construction or importation.
6. The development of maritime fishing should parallel the development of means of distribution and industrialization.
7. Since the quick deterioration of fish makes necessary immediate cleaning and refrigeration, it is absolutely essential to provide receiving stations, fish markets, and additional means of transportation, distribution, and sale of sea food--all properly equipped with refrigeration facilities.
8. The fish markets and receiving stations may be constructed by private capital under a system of public bidding but should be guaranteed the privilege of handling the fish and receiving a commission based on the volume of fish handled or stored and of ice sold to the fishermen, at the same time safeguarding the rights of purchase and sale between consumers and producers.

9. Fishing in the inland waters ought not to be increased, except through the development of production and methods of pisciculture.
10. Coastal fishing, with equipment for small yield, could be increased by direct assistance to the fishermen through their respective occupational associations.
11. The colonies of fishermen, federations, and the General Confederation should be reorganized within the scope of social, technical, and financial assistance, visualizing the demands of national defense.
12. It will be especially necessary to set up the rights of those fishermen whose colonies are located on Navy or public ground, protecting them against intruders or expulsion through prejudicial legal procedure.
13. It is deemed advisable to increase the construction of fishing ports, with shipyards near the major production centers.
14. The industries of frozen, canned, and salted fish should be protected against importation of similar products which temporarily enjoy duty exemptions (giving them undue advantages because of low-cost production in the country of origin), thus constituting a harmful competition to the national industry.
15. The amplification of fishing control and greater severity in the punitive processes are required as an effective means against harmful practices.
16. Fishery schools and laboratories for oceanographic and limnological research should be set up under a single plan for the development of fishery and pisciculture, to be operated jointly throughout the country.
17. The financing of fishing and its correlated activities must be taken care of by the Caixa de Crédito da Pesca or another credit agency with an initial capital of Cr\$100 million.
18. The limits of Brazilian territorial waters for fishing purposes should be extended and protected in a manner similar to the practice of other nations.

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