

challenge to conservationists and researchers, and it is a challenge that must be met.

Canning Tuna in Puerto Rico

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THE CALIFORNIA TUNA INDUSTRY dates back to 1903 when failure of the pilchard fishery inspired a resourceful packer to try packing albacore in an effort to keep the cannery in operation. After a few years of experimentation the new white meat tuna pack received acceptance and by 1914 over 200,000 cases reached the consumers' market. In 1915 canneries had started canning skipjack, yellow-fin and bluefin.

The tuna fleet kept abreast of the growing demand for this new fish product and changed from the small forty to sixty feet ice boats to the present modern clippers with capacities up to 600 tons and cruising ranges of 10,000 miles.

Over the years the tuna industry went through various upheavals and reverses. The first and second World Wars helped to increase the domestic production from 200,000 in 1914 to 1,000,000 cases after the former war and from 4,000,000 to 6,000,000 after the latter. The present domestic catches have stabilized around 300,000,000 pounds per year yielding from forty to forty-five million dollars to the fishermen.

Most of the larger canners of the West Coast combined tuna and pilchards as the production mainstay. In 1952-53, when the California sardine fishery collapsed, many of the West Coast canneries could not survive on tuna alone. Many packers closed their doors and others moved their operation to more favorable locations. This decentralization opened canneries in Peru, Ecuador, Puerto Rico, and in remote Samoa. The Puerto Rican cannery commenced production during the later part of 1953, and has always depended on the clipper fleet for its fish. The lack of market outlets, limited fishing fleet and other factors made it an unprofitable venture for the original owners, and in 1956 was sold to Van Camp Sea Food Company of California.

The National Packing Company cannery, located in Ponce, Puerto Rico, has several advantages over stateside canneries. It affords a closer market to the East Coast of the United States than California, cheaper labor, lower freight rates by sea as compared to rail freight across the United States, tax exemption grant under the Puerto Rico Industrial Development plan and shorter distance from the Eastern Central Pacific fishing grounds to Puerto Rico through the Panama Canal than to California and North Western ports. Conversely, the disadvantages in having a cannery in a practically isolated geographic area include lack of trained personnel, lack of services and supplies for a new industry, poor harbor and docking facilities for the tuna clippers, hazardous ocean crossing of the Caribbean, and reluctance of experienced key administrators and technicians to take jobs in another country.

Since its inception in 1953, National Packing Company has increased its daily production in Ponce from 15 to 100 tons and lengthened the yearly packing period from six to nine months. When Van Camp took over the plant major

expansions occurred. Production increased from 40 to 100 tons per day and the fleet was augmented by five ships, with intentions of adding at least three others to make a total of twelve or thirteen vessels. Additional foreign fish imports supplement the Company's fleet landings.

Fishing Operation

A fishing trip for one of the Puerto Rican clippers involves more preparation than any other fishing vessel except those in the whaling industry. These ships may be out from two to four months before returning to their home port; a complete set of spare parts for all engines and special equipment must be carried, and 30 to 90,000 gallons of diesel fuel plus supplies and provisions to last throughout the trip are loaded before departing.

From Ponce or San Juan, the boats proceed across the Caribbean through the Panama Canal. At Balboa, after incidental supplies are taken aboard, the ships sail for the bait grounds. If the captain plans to fish in warm water (75-85°F), baiting will be done in the Gulf of Panama area for anchovetta (*Cetengraulis mysticetus*) which abound along the coastal waters and exhibit ideal characteristics for bait tuna fishing. After filling the ships' bait tanks and wells with 2,500 to 4,000 scoops, (an equivalent of twelve to twenty tons of anchovettas), the clippers sail for the tuna fishing areas. This encompasses the off-shore waters between the Gulf of Guayaquil and the Gulf of Tehuantepec for our fleet. Whenever the captain decides fishing is better farther south or off the Galapagos Islands, he will take the ship directly to either of these localities and follow the same baiting procedure. In this case, anchovy, *Engraulis* sp. and sardine, *Sardinops* sp., are commonly taken.

Upon reaching tuna areas, a sharp lookout is kept for signs of yellowfin tuna (*Neothunnus macropterus*) and skipjack (*Katsuwonus pelamis*) which may be located by breezing schools (slow moving aggregate of fish just under the surface), jumping porpoises traveling with tuna, or birds working over feeding fish. While looking for tuna, a feather jig may be trolled in an attempt to discover possible schools not showing on the surface..

When a potential biting school is sighted the captain will approach it by whatever technique may seem more desirable, the chummer (in charge of the live bait to be used to attract and hold the tuna or skipjack) will commence throwing bait over the side, and the fishermen will concentrate on hooking the fish which strike their feather lure (squid) fixed with a barbless hook. Since the bamboo poles used in this bait fishery have a six to seven feet overall line and leader tied to it, a man can swing the fish over his shoulder without undue strain or loss of time, and a considerable amount of fish can be landed in a short time. The barbless hook makes unnecessary any handling of the tuna to remove the hook. If the fish are particularly large, two or three men will work as a team on one hook. A size classification of tuna is made by stating the number of men fishing one hook; one pole tuna—up to 35 lbs.; two pole tuna—35 to 60 lbs.; three pole tuna—60 to 100 lbs.

If the school stops biting or too many fish accumulate on the deck, the men will put the catch in the freezer wells for initial chilling with refrigerated sea water. Complete freezing follows with concentrated brine, which is pumped overboard after reaching a temperature of 19 to 20°F. The fish remains in dry cold storage at approximately 5°F until unloaded.

An average trip for one ship includes various visits to the bait grounds and to

a coastal port, generally Panama in the central area and if fishing farther south, Talara, Chimbote or Callao, for replenishment of fuel and supplies. The loaded clipper will then enter Balboa, drop some fishing gear and supplies, and proceed for Ponce, Puerto Rico, via the Panama Canal.

Unloading and Processing

In Ponce the ship loads salt to thaw the fish for unloading. The method followed is the reverse of the freezing operation: concentrated brine is circulated through the wells until the fish reaches 26° or 27°F, a temperature adequate to permit evisceration and still keep the fish firm enough to prevent breakage while discharging. The tuna is taken to the plant in specially designed carts, where it is weighed and emptied on to conveyor-type butchering tables for gutting and cleaning. The clean fish are placed in baskets and racked according to size and wheeled into pressurized precookers, then steamed at temperatures ranging from 216 to 218°F for one to eight hours, depending on the size of the fish, which ranges from five to eighty or ninety pounds. After cooking and cooling the tuna are cleaned, and the four main longitudinal muscles, or loins, are canned after passing through a chopper or mechanical former. Oil and salt are added, after which the cans are sealed, washed and cooked under pressure of 15 pounds per square inch at 240°F. After the cans have been removed from the retorts and cooled, they are labeled and cased, and the pack is ready for shipment to the East and Gulf States.

Future Outlook of the Tuna Fishery in the Caribbean and Atlantic

From time to time, since 1950, various attempts have been made by private, federal and foreign agencies to determine the potential tuna fishery in the Caribbean and adjacent Atlantic waters. These attempts have shown limited success except for the present Japanese endeavor. The extensive Japanese longline fleet operating in the Caribbean and Atlantic, upward of sixteen vessels, is proof enough of the rich tuna fishery available in these waters. Undoubtedly their initial trials would not have been possible without substantial aid from the Japanese Fishery Ministry. Also, the knowledge and experience of the Japanese on this type of fishery gives them a great advantage in exploiting this natural resource.

Gauging the population of subsurface tunas by the Japanese landings, a comparable stock should be available on the surface for a pole fishery, assuming, of course, that the Atlantic fish follows the same pattern of behavior as those in the Pacific. Pacific tuna often feed near the surface during the earlier stages of their development and follow deeper ocean currents at later stages. During the former stage the fish are available to the pole fishing boats, and during the latter to the longline vessels.

The increased demand for canned tuna and tuna-like fish in the world market has broadened the fishery to an extent where a much greater interest has been shown in the exploration and exploitation of formerly unfished oceanic and coastal areas. The Japanese, through government aid, have a unique advantage in low operation costs and broad experience in longline fishing and lead the world in exploratory fishing and as tuna suppliers. Ports of the Caribbean Sea and neighboring waters may soon be developed into a Pacific-type tuna fishery, but a combined and cooperative effort by participating governments and private concerns in this area would hasten the verification of the fishery potential and simplify its development.

A long range program to establish a tuna fishing industry requires planning and services similar to those of the Pacific Coast, including:

1. Training program for local fishermen.
 2. Adequate baiting facilities.
 3. Accurate plotting of fishing banks and recording of seasonal variation in abundance and locality.
 4. Studies of ocean currents as an aid for fishing and navigation.
 5. Establishment of reciprocal customs port entry requirements, regulations, etc., between participating governments for the fishing vessels.
 6. Forming a control organization for collecting and disseminating information.
 7. Installing adequate freezers for collection and distribution of fish.
- The pioneering aspect of this project may seem complex, but the comparatively close association with the Pacific fishery and world interest in tuna should be an excellent source of information and assistance for its initiation.

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Haiti's Fisheries and Their Potential Development

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In 1954, following the missions of two FAO fish culture experts to Haiti, during which much was done to establish fish culture in the country, the Haitian Government requested FAO's assistance to survey her existing fisheries, potential fisheries resources, and to advise and assist her in formulating and implementing a fisheries development program. In May, 1955, the writer arrived in Haiti to carry out this assignment.

The basic economic reasons for this request are clear. Haiti imports each year some 15,000,000 pounds of salted and smoked herring and cod, mostly