

A photograph of a fishing boat deck. Two men are visible: one in the foreground wearing a light-colored shirt and dark trousers, and another in the background wearing a light-colored shirt and dark trousers. A large pile of small fish is in the foreground. The background shows the ocean and a cloudy sky. The title 'Fish By-Catch . . . Bonus From The Sea' is overlaid in white text.

Fish By-Catch . . . Bonus From The Sea

Fish By-Catch . . .
Bonus From The Sea

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Fish By-Catch... Bonus from the Sea

Report of a Technical Consultation
on Shrimp By-Catch Utilization held in
Georgetown, Guyana, 27-30 October 1981



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Pepepez — a New, Frozen Minced Product

Productos Pesqueros Mexicanos
*Generencia General de Investigación y
Desarrollo Industrial, Mexico, D.F.*

Pepepez is a frozen, breaded product made from the minced flesh of fish by-catch. It was developed by Productos Pesqueros Mexicanos and is being produced on an industrial scale. The chemical composition, microbiological status, and physicochemical analysis of the product have been standardized. The product is now being produced in a plant at Tepepan, Xochimilco, and operations have been extended to fishing harbours on the Pacific coast and the Gulf of Mexico.

The main objective of the Pepepez project is to utilize the unmarketable but edible fish found in shrimp by-catch in new low-cost products for human consumption. In the past, the use of the by-catch was primarily for the production of fish meal. Industrial processing for direct human consumption was constrained by the great range of size, weight, and number of species within the catch.

However, mechanical flesh-and-bone separators increased the potential uses of the catch many fold. Mincing the fish has particular appeal in Mexico, where 46.2% of the population is younger than 14 years and many people do not eat fish, among other reasons, because of the fear of swallowing a bone. Annual per-person consumption of fish in Mexico is 8.8 lb. (4.02 kg) — the comparable figure for meat is 35 lb. (15.9 kg).

Productos Pesqueros Mexicanos (PPM) assumed the responsibility of developing a product that would increase fish consumption, especially among low-income groups. Its goal was to manufacture a product with a

texture, taste, colour, and appearance acceptable to the consumers, a long shelf life, and an appropriate packaging.

Pepepez went through several stages: the formula was developed and market tested; production was undertaken in a pilot plant and evaluated; a large-scale plant designed; and the product marketed.

The two main sources for minced fish are the by-catch from trawling operations and the by-products from filleting of species that command high prices. The first is the most important and has been the key to Pepepez production. As the quality of the final product depends upon careful selection and handling of the raw material, only fresh or frozen fish have been used in this project.

During product development, researchers studied experiences from countries with a long history of fish processing, such as Japan, Sweden, and the United States. They integrated the information into the plans for the project to increase efficiency and control costs.

The two basic methods available for mechanical separation of flesh and bone render mince that is equivalent to more than 70% of the gutted, cleaned raw material. The capacity of both processes ranges from 200 to 2500 kg/hour. Separation is a crucial step because it determines the organoleptic properties (colour, elasticity, and microbiological quality) of the product. The lower the temperature during separation and the lower the pressure of the fish flesh against the perforated drum, the better the results in terms of texture. The main factor affecting texture is the presence of soluble protein and inorganic salts that form a viscous elastic system in the mince. Texture has been improved by the addition of agglutinating substances and salts. Washing has been introduced to the process to eliminate the pigment in the mince. At present, the water/mince ratio is 3 : 1, although research is being conducted into the use of a reducing agent to increase efficiency and save water.

A rotating screw press has proved to be more efficient in concentrating the mince than either a fine cloth sieve or a centrifuge. Flavours are added, and the product is moulded, frozen, and breaded. Research has indicated that better functional properties, as well as better colour, taste, and texture are obtained in products from mixed species.

The product comes in different shapes and in both breaded and unbreaded forms. Minced

flesh and fish balls are also available. The ingredients, presentation, and labeling are standardized. Chemical, physicochemical, microbiological, and organoleptic qualities are also controlled. Chemical composition is moisture 55.0–70.0%; fat 0.1–9.0%; protein 13.0–20.0%; ash up to 1.0%; and carbohydrates up to 2.0% for unbreaded and up to 9.0% for breaded products. Peroxyde contents are no higher than 1 mEq; the pH is no higher than 7.0; and nitrogenated volatile base no higher than 30.0 mg N/100 g. The total count of microorganisms is not to exceed 1×10^6 /g, and the coliform count is no more than 1×10^2 /g; fungi and yeasts are not to exceed 5×10^2 /g, and material containing *E. coli* or pathogenic organisms is rejected.

The taste, flavour, odour, and colour conform to a frozen standard, replaced every 3 months. The frozen product is fried in corn oil at about 150°C for 4–5 minutes on each side.

The manufactured product is packaged in polypropylene bags and thermosealed with low-density polyethylene; each 0.5-kg package includes a white, rigid, 6-mm thick polyurethane tray. The bags are packed in corrugated cardboard boxes (having a strength of 14 kg/cm²) with a capacity of 20 bags each.

So far, Pepepez has demonstrated that minced flesh from species of fish of low commercial value can be used in the manufacture of a product having a high-protein content and good organoleptic properties at a price (cost/g protein) less than any semiprocessed meat available in the domestic market.

In addition, studies at PPM have shown that dark-fleshed species should be washed, then mixed, in a proportion of 40–50%, with white fish mince, which does not have to be washed. In general, minced flesh from species high in fat content is dark and, when washed, loses from 14% to 19% in weight (fat, organic matter, soluble protein, and salts). A handbook has been produced; it includes information on minces from flesh of different species so that methods of handling and proportions of mixed minces can be standardized.

White, lean species longer than 20 cm give the highest percentage (70) return from raw material; however, the efficiency of processing as well as the quality of the product de-

pends on careful control of temperature and pressure in flesh-and-bone separation. The optimum temperatures for the process were found to be 6°C for the product and 10°C for the environment.

Microbiological analyses of the manufactured products showed widely different total bacteria and coliform counts, but the marketed products conformed to the standards. Both frozen, uncooked and control samples were used for the analyses.

Conclusions

The firm in charge of marketing and distribution of the product estimated that sales could reach 9091 t during the first year, just in the 35 cities where marketing structures are already available. The population in these cities represents 70.5% of the urban population and 39.7% of the total population.

Sales could increase 13.3% if distribution were extended from 35 to 54 cities. An estimated 10 249 t could then be marketed.

The finding that washing and mixing different minces can improve their colour and texture means that a great variety of currently unmarketable species can be used as raw material. In general, products from deboned, white flesh show the highest potential.

Pepepez is just the beginning of a program aimed at increasing fish consumption, making better use of fish resources in Mexico, and contributing to food self-sufficiency. In September 1979, a plant at Tepepan, Xochimilco, was opened, and, later, operations were extended to fishing harbours on the Pacific coast and the Gulf of Mexico.

Not all shrimp by-catch is suitable for use in food products. The PPM experience is that fish longer than 14 cm, are the most suitable, especially if they have been harvested in the last catches of a fishing trip.

At present, partial delivery of the by-catch to processing plants is provided for in the legislation regulating shrimp trawling. In the opinion of staff at PPM, this is the best way to encourage further exploitation of this valuable, but previously wasted, natural resource. The promotion of research and use of the by-catch is fundamental to the country's progress.