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FACT SHEET

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SEAFOOD PRESERVATION

Purpose: To provide guidance and education to seafood processors and entrepreneurs on the production of value-added, preserved seafood products.

Target Audience: Anyone, directly or indirectly, involved in the production and sale of seafood products.

Why and how are seafood products preserved?

Preservation methods are frequently applied to seafood products to extend their shelf life and provide more favourable product storage conditions that are otherwise unachievable with fresh products. Processes such as smoking, salting, marinating, canning, drying and fermenting are commonly adopted to control the growth of pathogenic bacteria in seafood products by modifying one or a combination of the following product characteristics:

• Water activity	• pH
• Salt content	• Microbial composition

Before the invention of refrigeration and freezing, the high spoilage rates of fresh seafood captured in large quantities limited the opportunity for coastal communities to engage in trade with these products. Smoking, salting and air drying were processes traditionally adopted by these communities to prevent the degradation of these products.

Preservation processes represent the traditional strategy for processing fishery products, and today represent a large segment of premium value-added seafood products due to the differentiated processing and packaging that is attractive to both the modern and traditional seafood consumer.

What are the potential hazards associated with preserved seafood products?

Preserved seafood products are often sold as ready-to-eat (RTE), are packaged in either oxygen-reduced or oxygen-impermeable containers and are processed with mild-to-no heat treatment. These attributes make products susceptible to potential food safety hazards, including *Clostridium botulinum (C. bot)* and *Listeria monocytogenes* growth, as well as the presence of parasites and biogenic amines.

Seafood products generally are susceptible to non-proteolytic *C. bot* type E. In contrast, smoked fish and multi-ingredient products containing smoked fish are susceptible to all proteolytic and non-proteolytic C. bot strains. Control of non-proteolytic C. bot can be achieved by maintaining storage temperatures below 3.3 °C, pH < 5.0, and water activity (Aw) < 0.97, whereas control of proteolytic C. bot strains can be achieved using storage temperatures below 10 °C, pH < 4.6, and Aw < 0.94.

In contrast, *L. monocytogenes* can grow in the presence and absence of oxygen at temperatures from -0.4 to 45 °C, pH value > 4.4, and water activities > 0.92. An environmental sampling plan should be established in the processing facility to minimize contamination in the finished product.

Parasites are commonly found in the marine environment and within fish muscle tissues. Inactivation of parasites can be achieved by freezing (-35 °C or below for at least 15 hours, or -20 °C or below for at least 7 days) either before or after smoking. Inactivation can also be achieved by heating to temperatures over 70 °C for at least 1 minute.

Biogenic amines are produced from free amino acids in fish and shellfish tissue by enzymes (Histidine —> Histamine, Ornithine —> Putrescine, Lysine —> Cadaverine, Tyrosine —> Tyramine, Tryptophan —> Tryptamine, Phenylalanine —> Beta-phenylethylamine). These chemical reactions are facilitated by enzymes found naturally within fish tissues or by enzymes produced by microorganisms found on the surface of seafood products. The formation of biogenic amines occurs when products are exposed to elevated temperatures for a sufficient period of time. Biogenic amines (primarily histamine) are the sources of scombroid poisoning.

Common Seafood Preservation Methods

Where preserved fishery products are sold and marketed as RTE foods, they must follow strict processing and packaging controls to ensure their compliance and safety for consumption. To support producers of these products globally, standards and guidelines for the production of preserved fish and seafood products have been developed and are freely available in the Codex Alimentarius.

Definitions of Traditional Seafood Preservation Techniques:

Canning is a process of treating foods packed in hermetically sealed containers and shall have received a processing treatment sufficient to ensure commercial sterility.

Drying is a process in which the moisture content in the fish is decreased to the appropriate required characteristics under controlled hygienic conditions.

Salting is a process of treating fish with salt of food-grade quality to lower water activity in fish flesh and enhance the flavour by any appropriate salting technology (e.g., dry salting, brining, injection salting).

Smoking is a process of treating fish by exposing it to smoke from smouldering wood or plant materials. This process is usually characterized by an integrated combination of salting, drying, heating and smoking steps in a smoking chamber.

Quality of Preserved Seafood Products

Preservation techniques prevent the growth of pathogenic bacteria to ensure the safety of seafood products under convenient storage conditions. Importantly, these techniques will not mask any deterioration to the quality attributes of products that occur before preservation processes are performed. Additionally, quality attributes of products remain at risk for deterioration after preservation processes have been applied that are dependent on the packaging and storage environment.

Seafood products intended for preservation must be handled with care. Products that are bruised, broken, damaged or squished during handling and stowage are poorly suited for preservation. Damage to tissues because of rough handling will be easily identifiable following preservation and could impact the value of finished products.

When handling seafood products fated for preservation, products should be stored at the lowest achievable temperature for the shortest time to limit the progress of spoilage in these products. Products stored with viscera (internal organs) intact will spoil quicker than those which have been eviscerated. Eviscerated products must be effectively cleaned to prevent residues of blood or viscera from accelerating spoilage and degrading the appearance of finished products. Products thawed before preservation should be thawed as quickly as possible.

Preservation techniques may not completely arrest spoilage through both enzymatic and oxidation mechanisms. Fatty fish will continue to oxidize if stored without an appropriate oxygen barrier, which can be accelerated by exposure to light and persist through frozen storage. Products may be susceptible to contamination after processing, so following hygienic practices is essential to maintain the safety and quality of finished goods.

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