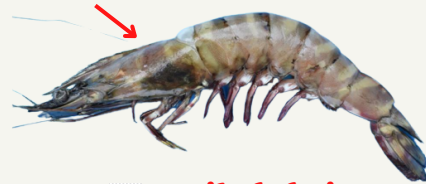


Differentiation of fresh and spoiled fish



✓ Fresh shrimp



✗ Spoiled shrimp



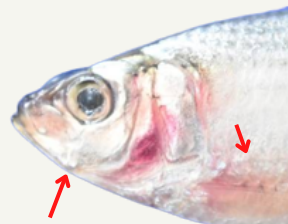
✓ Fresh fish



✗ Spoiled fish



✓ Fresh fish



✗ Spoiled fish

Microbiological Spoilage of Fish



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Microbiological Spoilage of Fish

What is spoilage in fish and fishery products?

Fish is an important source of nutrients and its consumption is associated with various health benefits. Spoilage is the deterioration in the quality of fish resulting from microbiological, chemical, and physical changes. Spoiled fish becomes unacceptable to the consumer. Spoilage results in changes in the appearance, odor, and taste of the fish meat. More than 25% of the food produced worldwide is wasted due to microbial spoilage. Fish and fishery products are highly perishable commodities and if not properly stored, undergo deterioration.

Why microbiological spoilage?

The growth of microbes in the fish produces enzymes that cause offensive off-flavor that is associated with the spoilage of seafood. Spoilage is a continuous process and it starts immediately after the harvest with the rigor mortis. Fish is a rich source of various essential amino acids, vitamins, polyunsaturated fatty acids, and beneficial micronutrients. It has water activity between 0.98-0.99 and pH around 6-7 which makes them highly predisposed to microbial spoilage.

What are the indicators of spoilage in fish?

The community of bacteria that causes spoilage of seafood/fish and fishery products are called specific spoilage organisms (SSO). The SSOs tolerate various preservation/storage conditions.

What are the factors that promote spoilage in fish and fishery products?

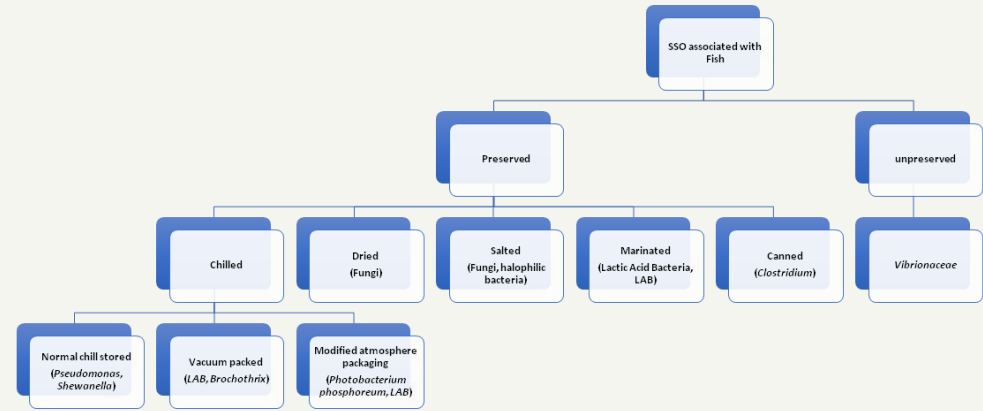
Environmental factors that affect spoilage are the temperature of storage, relative humidity, presence of microbes, and other factors such as food structure and composition, water activity, pH, temperature, and oxidative-reduction potential of the fish.

Gross appearance of spoiled fish?

- Slime layer formation on the external surface
- Discoloration of eyes and gills
- Softening of muscles



Main SSO in seafood under preservation/storage conditions



- Spoilage flora changes based on the preservation/storage condition
- Other psychrotrophs such as Moraxella, Acinetobacter, Flavobacterium, Photobacterium, and Aeromonas are also involved in the microbial spoilage

How to determine microbial spoilage in fish and fishery products?

The microbes that cause off-odors can be enumerated from the fish using specific/selective media. The metabolic end products of spoilage can also be determined qualitatively or quantitatively.

Qualitative assessment is based on the microorganism's ability to produce off-odors and that determines its spoilage potential. The metabolic byproduct of spoilage microorganisms can also be determined quantitatively. Metabolites produced by SSO are trimethyl amine (TMA), biogenic amines, organic acids, sulfur compounds, and volatile amines. The microbiological examination includes enumeration of Hydrogen sulfide-producing bacteria, psychrotrophs, Pseudomonads, lactic acid bacteria, total heterotrophic count, and total yeast and molds.

