Retail Seafood Temperature Control

Temperature control is the most effective way to slow bacterial growth, delay seafood spoilage, and maintain seafood quality.

Seafood Spoilage

Bacteria are the major cause of seafood spoilage. Millions of bacteria are on the surface, on the gills, and in the gut of living fish and shellfish. After harvest, bacteria invade the flesh of fish and shellfish through the gills, along blood vessels, and directly through the skin and belly cavity lining. These bacteria grow and multiply in the flesh. They produce the "fishy" smelling and tasting compounds associated with old seafood. If food-poisoning bacteria are present, they can multiply and cause illness.

Enzymes also cause spoilage. Enzymes in living seafood help build tissue, contract and relax muscles, and digest food. After harvest, enzymes continue to work and start to digest or breakdown the flesh. This causes the flesh to soften and lowers the quality. Enzymes also produce more food for bacteria which increases the rate of spoilage.

Oxygen in the air attacks the oils in seafood and causes rancidity, off-odors and off-flavors. This commonly occurs in fatty fish such as salmon and mackerel.

Temperature Control and Shelf Life

High temperatures increase rates of bacterial growth, enzyme activity, and chemical reactions. Low temperatures slow bacterial growth and chemical activity. For many seafoods, increasing the temperature from 32°F to 40°F doubles the rate of spoilage and cuts the shelf life in half. Theapproximate shelf life for fresh fish fillets is:

Holding Temperature (°F)	High Quality Shelf Life	Edible Shell Life
90	14 hours	1 day
60	1½ days	2½ days
42	3 days	6 days
32	8 days	14 days
30	10 days	17 days
29	12 days	20 days

Seafood shelf life relates directly to storage time and temperature. Your supplier cannot guarantee a shelf life for a seafood product without knowing the catch date and the temperature history. Ideally, time-temperature monitors should accompany seafood from the fishing vessel to the retail store, but this is rarely feasible.

Temperature Recommendations

- 1. Inspect seafood shipments at the central warehouse before distribution to local stores.
- Train store personnel to conduct seafood delivery inspections. They should have the ability and authority to accept or reject any shipment. Rejection may be for odor, appearance or temperature.

- 3. Have store personnel meet the delivery truck. They should record the temperature of the vehicle and each individual seafood container. Reject seafood products above 35°F and return them to the supplier.
- 4. Time-temperature monitors should accompany all seafood shipments. Monitors can be color changing temperature sensitive badges, recording thermometers, etc.
- 5. Require a statement indicating when the processor attached the time-temperature monitor to the product.
- 6. Reject products when temperature records are not available from suppliers.
- 7. Thaw frozen seafood under refrigeration. Thaw only enough seafood to sell in a 24 hour period.
- 8. Store fresh seafood at 29-32°F. A double pan system using ice will help maintain the temperature.
- 9. Do not display red meat and seafood in the same display case. These products have different storage temperature requirements.
- 10. Display unpackaged fresh seafood at 29-32°F. Use a mechanically refrigerated display case equipped with an accurate thermometer. Refrigeration coils should be at the top of the case, not at the bottom.
- 11. Display over-wrapped fresh seafood under dry refrigeration below 32°F. Keep all products below or behind the load line.
- 12. Routinely check display case and seafood temperatures. Check seafood with a sanitized accurate thermometer.

Effect of Temperature on Shelf Life

Determine the equivalent age of a seafood at 32°F by reading down the left holding temperature column to find the holding temperature, and then reading across until you reach the holding temperature column. For example, a fish held for 12 hours at 45°F has an equivalent age of 1.5 days at 32°F. In other words, holding a fish for 12 hours or day at 45°F uses 1.5 days of shelf life, and results in the loss of 1 day of shelf life.

Holding Temperature (°F)

					•		•		•	,		
	29	30	32	34	36	38	40	45	50	55	60	65
Time at	_			_				_				
Holding		uival	ent /	Age	of F	rod	uct	in D	ays	at 3	2°F	
Temperature												
2 hours	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.4	0.5	0.7
4 hours	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.5	0.7	0.9	1.1	1.3
6 hours	0.2	0.2	0.3	0.3	0.4	0.4	0.5	0.7	1.0	1.3	1.6	2.0
12 hours	0.3	0.4	0.5	0.6	0.7	0.9	1.0	1.5	2.0	2.6	3.3	4.0
18 hours	0.5	0.6	8.0	0.9	1.1	1.3	1.6	2.2	3.0	3.9	4.9	6.0
1 day	0.7	8.0	1.0	1.2	1.5	1.8	2.1	3.0	4.0	5.2	6.5	8.0
2 days	1.4	1.6	2.0	2.5	3.0	3.6	4.2	5.9				
3 days	2.1	2.4	3.0	3.7	4.5	5.3	6.3					
4 days	2.8	3.2	4.0	4.9	7.1	8.4						
5 days	3.5	4.0	5.0	6.2								
6 days	4.1	4.7	6.0									
7 days	4.8	5.5	7.0									
8 days	5.5	6.3	8.0									
9 days	6.2	7.1										
10 days	6.9	7.9										
11 days	7.6											

12 days 8.3

	Example		
	Actual Elapsed Time	Temp.	Equivalent Age at 32°F
Fish Caught	2 hours	60°F	0.5 days
Storage on vessel	3 days	34°F	3.7 days
Processing	12 hours	45°F	1.5 days
Distribution	12 hours	36°F	0.7 days
Retail case	1 day	38°F	1.8 days
TOTAL	5.1 days		8.2 days
Remaining high quality	y shelf life at	32°F	5 hours
Remaining edible shel	f life at	32°F	5.8 days
		40°F	2.7 days

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