COOPERATIVE EXTENSION CUIMR-G1-77-009 C. 2

CALIFORNIA Sea Grant

Marine Advisory Publication

MARINE BRIEFS

10: Storage of Dressed Salmon in Refrigerated Sea Water

Refrigerated sea water (RSW) systems have been used extensively on North Pacific fishing vessels for more than 30 years. These systems have been used primarily for preserving round Pacific salmon.

On West Coast trollers, salmon are usually dressed and then preserved in ice. Recently, however, many fishermen have expressed interest in converting from ice to RSW for preserving dressed salmon.

RSW vs. ICE

Advantages of RSW:

1. Fish placed in rapidly circulating RSW are cooled more rapidly than they would be even if iced in single layers.

2. RSW maintains the temperature of fish at -1.1°C (30°F) while the temperature of fish packed in ice often exceeds 1.7°C (35°F).

3. Fish in RSW have a buoyancy almost equal to their weight and thus are not subjected to significant pressure in storage.

4. Preserving fish in RSW reduces handling and storage time and saves labor.

Disadvantages of RSW:

1. Pumps, piping, and heat exchangers can easily become contaminated, and require considerable maintenance.

2. Blood, slime, and bacteria are circulated in a relatively small volume of water and any spoilage could cause rejection of the entire catch.

3. Fish in RSW must be held at a temperature of 29°F to 30°F to have a shelf life equivalent to iced fish at 33°F to 35°F.

4. Dressed fish show significant leaching of color along the belly flaps after several days in RSW.

5. Fish held in RSW absorb salt from sea water. This is important since salt uptake is greater in dressed fish than in round fish, and because salt uptake in salmon can accelerate oxidation and rancidity during subsequent frozen storage.

RESEARCH ON DRESSED SALMON

Several studies have been conducted to determine if dressed salmon can be preserved in RSW on fishing vessels and still retain their quality during subsequent marketing as fresh or frozen products.

In one of these studies, dressed pink salmon were held in a 3% salt solution at 1°C (33.8°F) for 8 days and then stored in ice at 1°C (33.8°F) for 6 days. After 8 days in RSW, the salt content of the salmon ranged from about 1.3% in the light meat to about 2% in the belly flaps. No objectionable flavors were detected in fillets cut from these fish, but the fillets did have a salty taste.

Storage of these fish in ice leached out much of the salt, but the level after 6 days was still several times that found in fresh fish. It is not known if this level of salt would be objectionable to the consumer of the fresh product.

In another study, dressed sockeye and pink salmon were held in RSW at -0.5°C (31°F) for 8 days and then frozen at -35°C (-30°F) and held at -30°C (-22°F) for 10 months.

Dressed sockeye and pink salmon stored in RSW for 4 and 3 days, respectively, had a barely detectable salty flavor. After 8 days in RSW, both species had a slight but not objectionable salty flavor.

The flavor of sockeye and pink salmon frozen after storage in RSW for 4 and 3 days, respectively, was rated "good" after 10 months frozen storage, and only slightly inferior to pre-rigor frozen fish. Salmon frozen after 8 days in RSW, however, had only "acceptable" flavor after 10 months storage.

Rancidity increased during frozen storage of the salmon and was least in pre-rigor frozen fish and those iced before freezing. Salmon frozen after 8 days in RSW were more rancid than those frozen after 3 or 4 days in RSW.

Based on this study, the authors recommended that sockeye and pink salmon should not be held in RSW longer than 4 and 3 days, respectively, if they are to be used in the preparation of good quality frozen products.

CONCLUSIONS

Although research on preserving dressed salmon in RSW has been limited to studies with sockeye and pink salmon, the data indicate that salt uptake and rancidity will probably be a problem with dressed silver and king salmon, too.

Properly operated and maintained RSW systems appear to be a satisfactory substitute for ice as a means of preserving dressed salmon for short (3 or 4 day) fishing trips. Because of problems with salt uptake in dressed salmon and rancidity during frozen storage, RSW systems should not be used for longer trips or as a justification for extending fishing trips.

FURTHER READING

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