ALASKA LEGISLATURE COMMITTEE FILES 1991-1992 8672
7191 HOUSE RESOURCES

Floating Processors - continued

- Almost all of the floating processors surveyed said their fish go to either fresh or frozen markets. Roughly half (53%) said they make every effort of freeze their fish in less than 12 hours, while 61% said they would allow up to one day maximum.
- Nearly three-out-of-five floaters (58%) monitor the core temperature of the fish; of those, 54% monitor temperature when the fish are ready to be glazed. Sixty-four percent (64%) reported the average core temperature to be minus 5 degrees F or lower at the time fish were removed from the freezer.
- Over half (56%) monitor freezer temperature on an hourly basis, using remote temperature probes the majority of the time (58%).
- Asked how long it would take to freeze fish under full freezer capacity, 47% said it would take eight hours or less, while 39% gave no answer.
- Floaters had mixed feelings on holding mandatory seafood quality inspection programs -- 47% felt it would improve fish quality, and 53% felt it would not.

Perceptions of Quality

- When asked how they believe consumers perceive the quality of Alaskan salmon, virtually the same percentages (61 - 68%) of fishermen, tenders, and processors say that consumers rate it either high or very high quality. On the other hand, floaters had a significantly different opinion -- only 53% felt consumers rated Alaska salmon as either high or very high quality.
- When asked which country produces the highest quality salmon, fishermen (54%), tenders (46%) and floaters (39%) most frequently mentioned Alaska; but on-shore processors are more likely to give the advantage to Norway (33%).
- However, when asked which country produces the lowest quality salmon, all four industry sectors rate Chile as poorest (29 - 44%), and Alaska as second-poorest (12-28%).

Perceptions of ASMI

- Tender operators (61%), on-shore processors (71%) and floating processors (64%) are quite familiar with ASMI's quality control program; but more than half of the fishermen (51%) are not familiar with ASMI.
- Only half of the fishermen (50%) have read ASMI's *Recommended Salmon Quality Handling Guidelines*; compared to 61% of the tenders, 72% of the on-shore plants and 64% of the floaters.

On-Site Observations

- There does not appear to be any uniformity in the quality-related requirements or incentives given by processors to fishermen; this was said to be a result of competition for the fish among shore-based plants, floaters, and cash buyers.
- The trend of some fishing boats and most tender vessels to RSW chilling systems is welcomed by most respondents, but many say that salmon are often held too long on those RSW vessels (i.e. - even though a vessel might have an RSW system, it still might not deliver frequently enough).
- Further, it is unclear if the RSW systems are of adequate size (horsepower) to chill the amount of fish that are actually packed in the holds.
- Mixed-species salmon fisheries put the fish at greater risk of thermal and mechanical damage than single-species fisheries do, because of the additional handling that is done on sorting tables onboard the tenders -- the fish are out of refrigeration for a longer time, they undergo an additional handling step, and they are often handled roughly (dropped 6-10 feet into deep metal baskets or onto the deck, left lying on deck where they are kicked or stepped on, etc.) at the time of sorting.

On-Site Observations - continued

- Some Bristol Bay fishermen hold the opinion that RSW systems can be installed on 32-foot driftnet boats. In fact, one such fisherman reports that his group of 10-12 drifters, each with "older" fiberglass or aluminum boats, have all installed RSW in their holds -- he said that they bought the systems as a group, they fish and deliver as a group, and get a premium price.
- During the on-site fieldwork, it was impossible to verify the statements that the fish on a given fishing boat are not exposed to heat from the engine or exhaust. For example, a few fishermen would say that the fish are not exposed to heat, but would later mention that that was because of frequent deliveries, rather than because of insulation in the hold (i.e. - there was no insulation).
- When the fish are delivered to the dock by a tender (rather than by the fishermen), it is usually impossible for the processor to know which fishermen produced the good fish and which produced the bad fish, because the fish are mixed onboard the tender.

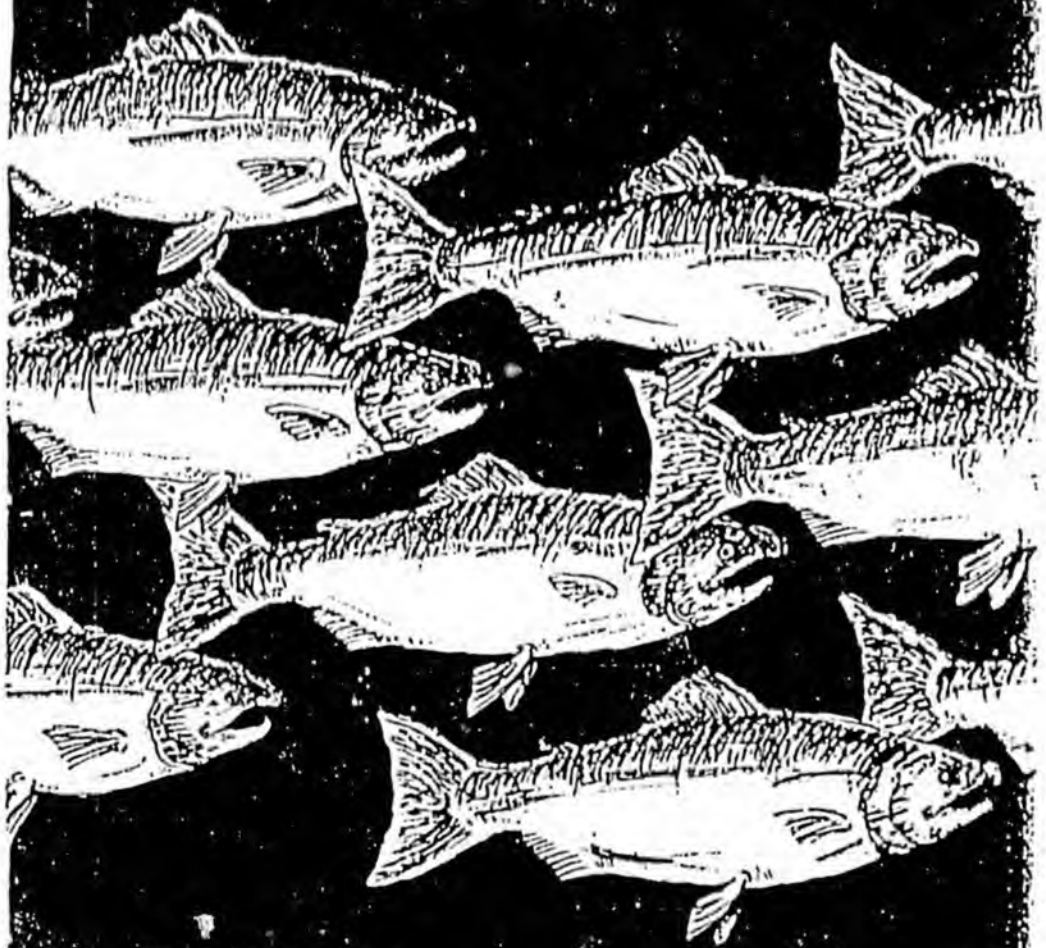
On-Site Observations - continued

- Onboard chilling is practiced by many fishermen, but some tenders, processors, and fishermen say that there are still three kinds of problems --
  - Some ice boats only top-ice the fish (rather than layer-ice).
  - Some RSW boats and tenders either do not pre-chill their systems, or do not turn on the systems until shortly before delivery, in order to qualify for the chilling-bonus price.
  - For competitive reasons (i.e. - to get enough fish), some processors pay the chilling-bonus price, even if the fish are not chilled at all.
- At the end of a short fishing period , most driftnetters deliver their catch to the dock, rather than to a tender; however, because of considerations of large tide ranges and restricted dock space, the boats anchor away from the dock, so that the fish are lightered to the dock by skiffs (not tenders). The skiffs are not equipped to lift brailers out of a fish hold, so the fish are handled individually (tossed), and the handlers stand on the fish during this off-loading.

On-Site Observations - continued

- Many processors say that their customers have complained about internal damage caused by winding the fish onto the gillnet reels, picking the fish up by the tail, or throwing the fish so that it bounces off the wheelhouse before falling into the hold; some of these processors display photographs (taken by the customers) of this damage, for the fishermen to see.
- In brailers, the critical factor seems to be the depth of the fish, rather than the total weight of the fish in the brailer. Fish coming from tall, thin brailers (of 400 pounds in weight) appear to be more compressed than those coming from wide, flat, shallow brailers (of as much as 2,000 pounds).
- In response to the question: "Where do you think that the most damage to the fish occurs?" -- many fishermen criticized other fishermen rather than tender operators and processors. They report incidences of rough handling, lack of chilling, long holding times, or exposure to heat or contaminants (bilge water, etc.).
- In a few plants, processed fresh fish were observed to fall on the floor, and then get picked up and put back on the line, with no cleaning or rinsing.
- Some RSW tenders over-pack their holds, which impedes the circulation of cold water.

Recommended Salmon Quality Guidelines



For Fishing, Tendering and Processing Operations

Recommended Salmon Quality Guidelines

For Fishing, Tendering and Processing Operations

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Preface

Salmon is Alaska's single most valuable seafood resource. The complexities of harvesting, processing, transporting and distributing salmon from remote points along Alaska's 34,000 miles of coastline and extensive inland river system create challenges for all those who participate in this fishery. One of these challenges is the consistent production of high quality salmon products.

Consumer surveys show that the approximately one billion pounds of Alaska seafood produced and distributed annually have a favorable reputation with respect to quality. But these products are faced with ever-increasing competition in today's marketplace. The Alaska Seafood Marketing Institute (ASMI) recognizes the critical role quality plays in consumer purchase decisions, and is committed to maintaining and improving the quality of Alaska seafood products so that all members of the industry will benefit from the economic advantage of a consistent, high quality product image in the world marketplace.

The production of high quality seafood requires the collective efforts of fishermen, processors, distributors and resource managers. The ASMI Quality Assurance Program is designed to unite representatives from these industry and government sectors into an effective partnership. ASMI believes this cooperation will be helpful in shaping educational programs aimed at improving seafood quality, and is vital to the future of the state of Alaska and the seafood industry.

Notice to Users

These recommended guidelines for Pacific salmon have been developed by ASMI to assist fishermen, tender operators and processors in producing high quality salmon products. The guidelines are not intended to replace the advice of trained and experienced technologists concerning the construction, operation and maintenance of vessels, facilities or equipment, or regarding operating procedures in specific geographic areas. These guidelines are also designed for reference by public service agencies. This information should not, in any way, be construed as replacing existing local, state or federal regulations.

ASMI recognizes the limitations inherent in general guidelines of this type. The reader should be aware that certain guidelines may not apply to all fishing, tendering and processing operations, vessels and facilities in all regions of the state, due to variations in vessel construction, facility design, tides, air or water temperatures, intrinsic characteristics of the fish, or other factors.

Nothing contained in these guidelines is intended to be, or shall be construed to create or form, the basis for any liability on the part of ASMI, its officers, employees or agents, for any injury or damage resulting from the failure of the person who engages in operations or activities subject to the provisions of, or guided by, these guidelines to comply with their provisions, or by reason or in consequence of any act or omission in connection with the implementation or enforcement of these guidelines on the part of ASMI by its officers, employees or agents.

I

Scope

These guidelines apply to all five species of Pacific salmon (*Oncorhynchus* sp.) that are harvested, transported or processed in Alaska and which may be offered for sale in many styles, including, but not limited to:

a) Round
b) Eviscerated, head-on
c) Eviscerated, head-off
d) Heads, fins and tail removed
e) Steaks or portions
f) Split sides, backbone removed
g) Fillet, skin-on
h) Fillet, skin-off
i) Canned

II

Definitions

Belly burn is the softening and discoloration of the interior belly wall, caused by enzymatic activity in the body cavity, which may occur between the time the fish dies and when the viscera is removed.

Chilled sea water (CSW) is a type of cooling system, sometimes referred to as "slush ice," which uses a mixture of sea water and ice for chilling and holding chilled fish. If compressed air is bubbled through the mixtune of sea water and ice for circulation, it is called a champagne system.

Contamination means direct or indirect transmission of objectionable matter to the fish.

Cold storage facility is any facility, whether a shore-based establishment or on a vessel, in which fish are kept cold by the use of ice or mechanical refrigeration. A cool room is any facility where fish are held at a temperature of 40° F or below. A cold storage room is any facility where fish are held at a temperature of zero degrees F or below.

Dry vessels are fishing or tendering vessels which are not using ice, chilled sea water (CSW) or refrigerated sea water (RSW) systems to chill the fish.

Extrinsic quality is a term which refers to the condition of a fish due to factors which affect the fish during and after it is harvested. Extrinsic quality defects are caused by improper catching, handling, processing and storage procedures.

Fish refers to Pacific salmon everywhere it is used in these guidelines.

Hatch coaming is the raised area on the deck of a vessel around a hatch, and is designed to prevent runoff from the deck from entering the fish hold.

Intrinsic quality is a term which refers to the inherent physical characteristics of a fish before it is harvested, including but not limited to: species, size, sex, physiological condition, and presence of parasites or disease.

Prepare means to kill, eviscerate, dress, clean, cut or divide round fish.

Process means to can, cure, freeze, cook or otherwise preserve fish, at any temperature.

Processing facility is any facility, whether shore-based or aboard a vessel, where fish is either prepared or processed for human consumption.

Refrigerated sea water (RSW) is a type of system which uses se water that is cooled by mechanical refrigeration for chilling and holding fish.

Sanitize means to treat surfaces so that the number of microorganisms is substantially reduced.

Unwholesome fish are those of such poor quality that they are unfit for human consumption, as defined by U.S. Food and Drug Administration regulations.

III

General Information About Fish Quality

Although there are many factors that fishermen, tender operators and processors must consider when defining "high quality" as applied to fish products, two major ones are: 1) the intrinsic quality of the fish before it is harvested, and 2) the extrinsic quality of the fish as it is delivered to the tender, processor, and ultimately, the consumer.

The intrinsic quality of the fish is determined by its physical condition at the time of harvest, and is affected by species, size, sex, stage of maturity and other physiological characteristics. These characteristics are inherent to a particular fish, and will not be significantly altered by handling methods.

Extrinsic quality is determined by the methods employed in the harvesting, handling, processing and storage of fish. Proper handling procedures will result in fish of high extrinsic quality; improper handling methods will result in a loss of extrinsic quality.

Deterioration of extrinsic quality is also caused by the action of microorganisms and enzymes, and by other chemical changes that take place in the fish after death. The flesh of a live fish is normally considered to be sterile, but bacteria naturally can be found living on gills, skin and in the fish's gut. These bacteria flourish after the fish dies, multiplying rapidly as temperatures elevate.

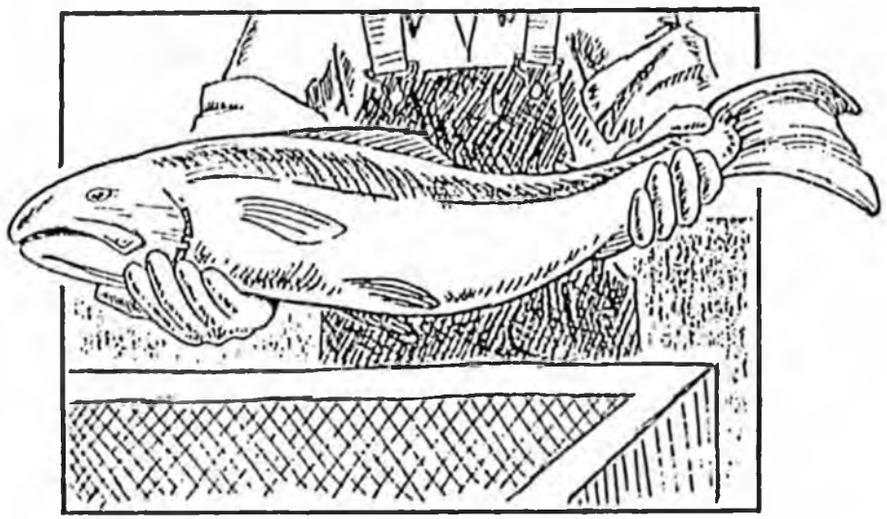
Enzymes are secreted into the fish's digestive tract so that it may digest and utilize the food it eats. After the death of feeding fish, enzyme activity continues, but is not controlled as it was during the fish's life. Digestive enzymes will leach out of the stomach and intestines and begin to attack the proteins in the flesh of the fish, resulting in what is commonly called "belly burn."

This digestive action by enzymes is part of the decomposition process, causing undesirable changes and making it easier for bacteria to invade the flesh of the fish. Spoilage occurs more rapidly as a result of this enzymatic activity.

Biochemical changes also contribute to deterioration. The progress of these changes is most evident as the muscles of the fish change from soft and flexible to hard and rigid as *rigor mortis* sets in, and as they later return to a relaxed state.

The deterioration of fish and fish products caused by bacteria, enzymes and other chemical actions cannot be stopped, but it can be slowed down. To delay deterioration, you should:

a) Control temperatures to keep bacterial and chemical activity at the slowest rate possible, i.e. chill the fish as quickly as possible to a range of 32° to 35° F;
b) Prevent unnecessary contamination through good sanitary practices and proper design and construction of equipment and facilities; and
c) Handle the product in a manner which minimizes physical damage.



Careful handling reduces risk of physical damage to fish.

IV

Fishing Vessels and Operations

A. Vessel Guidelines

General Design

The design and construction of a fishing vessel must take into consideration both efficiency and performance as a seaworthy harvest unit, as well as capabilities necessary to deliver a high quality catch to the processor. Design and construction must therefore ensure:

a) Rapid and efficient handling of fish;
b) Adequate facilities for proper storage and temperature control; and
c) Use of materials and design that will facilitate cleaning and disinfection, and prevent damage or contamination of the catch.

Due to the limited space available on a fishing vessel, there is a high potential for contamination of the fish with bilge water, sewage, fuel, oil, grease, smoke, chemicals or other objectionable substances. Design and layout must consider these potential problems in the organization of space, functional areas and facilities.

These recommendations provide guidance for design, construction or retrofitting to ensure that vessels are adequately equipped for the proper handling and consistent delivery of a quality catch.

Deck Areas and Fish Holds or Tanks

All vessels should have a suitable holding area for storing the catch, whether it is below or on-deck. Plastic totes with drainage capability are acceptable for use as fish containers when properly sheltered or covered.

Fish holds should have watertight bulkheads designed to protect the fish from contaminants such as bilge water, fuel and lubricants.

Fish holds on dry vessels should have removable floor boards or some other system to facilitate drainage from the hold.

Fish holds should have pumps and sumps with the capability to pump the hold dry.

Fish holds should be adequately insulated to control the transfer of heat from engine, living quarters or heated pipes.

Fuel and hydraulic lines running through fish holds should be enclosed to protect the fish in case of line failure, and insulated where necessary to prevent heat transfer.

Vessels should have hatch coamings high enough to prevent the flow of contaminants from the deck to the fish holds.

Vessels should be equipped with sufficient hatch covers or suitable covering material to eliminate the exposure of fish to sunlight or airborne contaminants. Hatch covers should be watertight to protect fish from salt or fresh water intrusion.

All lights in fish handling areas should be shatterproof or have protective coverings which will prevent product contamination should breakage occur.

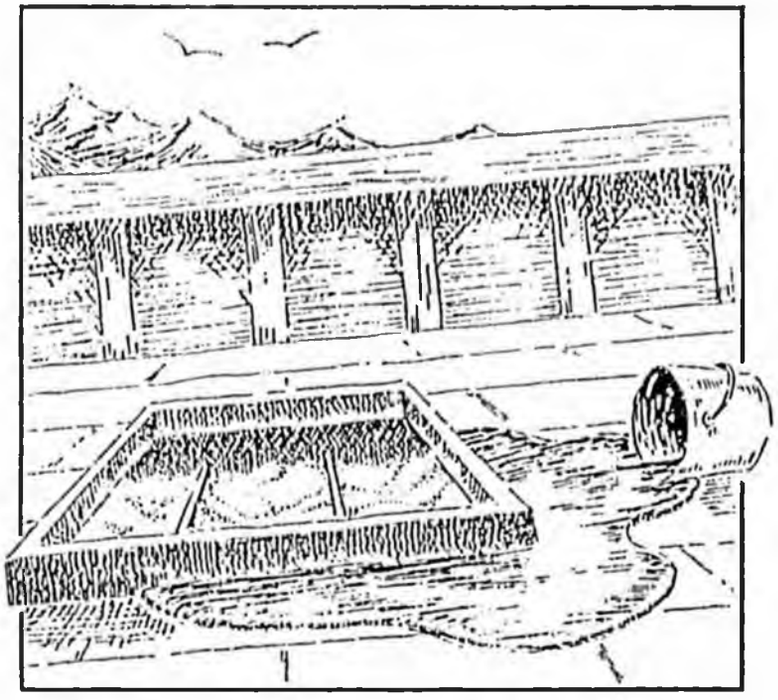
There should be no exposed ribs or untreated wood on surfaces in the fish hold or in fish handling areas on deck. The hold lining should be smooth and watertight. A plywood-lined hold, caulked with non-toxic seam compound and coated with a suitable paint or covering is acceptable. Ideally, holds should have an impermeable lining with rounded corners and no obtrusions. Holds should be conducive to easy and complete cleaning to prevent build-up of bacteria.

Fish holds or tanks should be insulated to minimize heat transfer into fish storage areas. A minimum "R" factor of 10 is recommended for chilled storage areas, or a factor of 20 for frozen storage areas. Insulation should be installed so that it is completely sealed, to prevent water, blood and slime from entering and reducing its effectiveness.

On vessels with refrigeration systems, equipment should be in good operational condition, and capable of chilling a full load of fish to a range of 30° to 35° F within a reasonable amount of time. RSW vessels should limit loads to a maximum of 45 pounds of fish per cubic foot of hold space.

On vessels with freezing systems, equipment should be fully operational and capable of reducing the core temperature of a full load of fish to zero degrees F or lower within a reasonable amount of time.

Tanked vessels and freezer vessels should be equipped with recording thermometers which accurately measure and record the temperature of the hold, freezers or cold storage area. Vessels which do not have tanked holds should be equipped with bi-metal thermometers which accurately measure the internal temperature of the fish.



Care should be taken to prevent contaminants from coming into contact with fish.

B. Recommended Operating Procedures for Fishermen

General Guidelines for All Gear Types

The best-designed and constructed vessel or equipment will do little to ensure delivery of a high quality catch if fish are not handled and stowed properly. These recommendations will assist you in delivery of a quality catch: Handle fish carefully at all times. This includes, but is not limited to the following steps:

a) Remove fish from gear gently;
b) Do not handle fish by the tail;
c) Do not throw, kick or step on fish;
d) Protect fish from damage in shaft alley or any other part of the vessel.

Note that pulling a fish by the tail stretches the backbone, breaking blood vessels along the spine. Blood seeps into the surrounding tissue and forms a bruise that cannot be seen until the salmon is filleted or split.

No pughs, forks, picks, hooks or pumps which damage fish should be used.

Fish should be protected from heat, sunlight, air-drying, and inclement weather.

Fish should be protected from bilge water, gas, diesel oil, hydraulic fluid, grease and other contaminants.

On vessels with below-deck holds, chutes or other devices should be used to convey fish into the hold gently, to reduce handling, and prevent damage caused by throwing or dropping fish into the hold.

Fish held in bulk on vessels without tanked holds should be shelved at no greater than 35-inch intervals.

On tanked vessels, fish holds should be divided, as necessary, to prevent damage to fish due to the vessel's motion.

No pets should be permitted on vessels used for catching or transporting fish.

Live fish should be stunned in the water or as soon as they are brought on board.

Feeding cohos and kings should be eviscerated and washed as soon as they are brought on board.

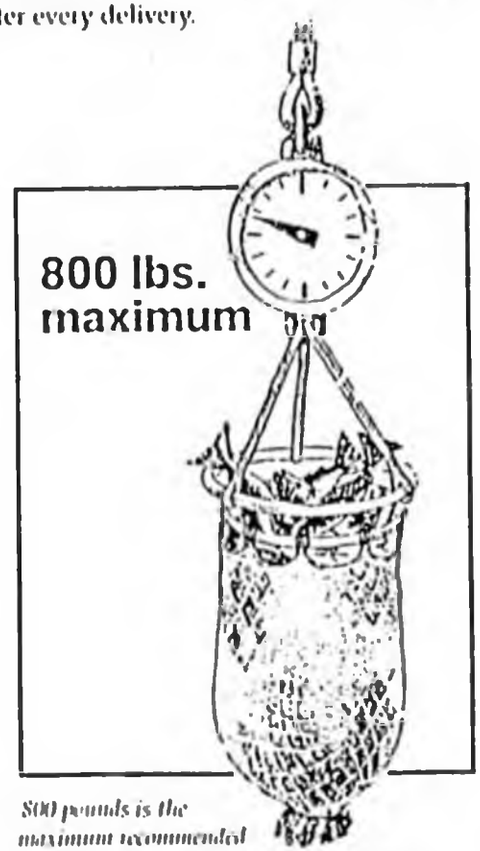
Handling fish by the tail may result in backbone separation and bruising of the meat.

Round and eviscerated fish should not be intermingled in the holding area. A separate bin or on-deck totes should be used to store eviscerated fish on vessels carrying both round and eviscerated fish.

Fish should be delivered to tenders or processing facilities as rapidly as possible. All fish should be chilled as soon as possible after being caught.

Fish should be held and unloaded in a manner which minimizes physical damage. Use of knotless, small mesh brailers or cargo nets is recommended. No more than 800 pounds of fish should be loaded in a brailer and/or cargo net.

The holds, bin boards and decks should be thoroughly cleaned and sanitized in accordance with the Fishing Vessel Sanitation Procedures described later in these guidelines. The vessel should be cleaned after every delivery.



800 pounds is the maximum recommended weight load for transferring fish with brailers.

Additional Guidelines for Drift Gill Net Operations

Drift gill net sets should not be longer than two hours.

Drift gill nets should not be wound onto the reel until all fish have been picked from the net.

Additional Guidelines for Set Gill Net Operations

Set gill net sets should not be longer than six hours.

Do not drag set nets on the beach unless all fish have been picked from the net.

Salmon should be removed from set nets before gear is exposed at low tide.

Burlap used to protect fish from exposure to sun and air should be washed in salt water after every use and should be replaced often.

Fish must be protected from fecal contamination by pets and other animals.

Fish should be thoroughly washed in salt or fresh water as soon as possible after catching, and should be stored in clean containers until delivery to a tender or processor.

C. Chilling and Chilled Storage During Fishing Operations

General Guidelines for Round Fish

Temperature is the single most important factor affecting the keeping quality of fish. The rate of bacterial growth, and therefore the speed at which fish spoil, depends on temperature. The lower the temperature, the slower the process occurs. It is not possible to completely stop bacterial growth by chilling fish, but the rate of growth and spoilage can be significantly reduced by keeping fish chilled to temperatures as close to freezing as possible.

All fishermen should use ice or some other method of chilling their fish. Whatever method is used, fish should be chilled as soon as possible after catching.

Ice is an excellent, inexpensive medium for cooling and storage of chilled fish, capable of maintaining fish at slightly above 30° F. The amount of heat which must be absorbed from fish to melt ice is approximately 72 times as great as is necessary to increase the temperature of cold water by two degrees.

If all of the cooling capacity of ice could be applied to the fish, one pound of ice could cool seven pounds of fish from 55° to 32° F. In practical use, however, much of the cooling capacity of ice is used up on the air and other materials in the fish holding area, making it necessary to use approximately one pound of ice per two pounds of fish. Even at this ration, ice is still over twenty times more efficient than cold water.

If ice is chosen as the chilling and storage medium, enough ice should be used to melt ice and hold the temperature of the fish at a range of 32° to 35° F. Finely divided ice cools most efficiently by providing the most surface contact with the fish. All ice used for chilling fish must be made with clean water from an approved source.

Refrigerated sea water (RSW) and chilled sea water (CSW) or slush ice, are often used for cooling and storage of fish. The primary difference between the two systems is that RSW uses mechanical refrigeration and CSW is cooled by adding ice to the water. RSW offers the advantages of rapid cooling, lower holding temperatures and less pressure on fish. The disadvantages are salt and water uptake, potentially greater protein loss, and anaerobic spoilage.

If a chilled (CSW) or refrigerated (RSW) sea water system is used, the fish should be maintained at 30° to 35° F. All tanks should be prechilled to 30° to 32° F before loading fish.

All sea water used in CSW and RSW systems should be obtained from open waters, away from populated areas or fresh streams.

The internal temperatures of iced fish and/or the temperature of the hold on vessels with CSW or RSW systems should be monitored and logged at regular intervals, preferably every six hours. Bi-metal thermometers should be used to measure the internal temperature of the fish. The thermometer should be carefully inserted in the anal vent of the fish until the reading stabilizes, or for approximately one minute.

Additional Guidelines for Dressed (Eviscerated) Fish

Dressed fish should be iced in plastic tubs, boxes or small removable bins as soon as possible after evisceration. Drainage capability should be provided for these containers.

Neither CSW nor RSW systems should be used for holding eviscerated fish.

D. Freezing and Frozen Storage Aboard Fishing Vessels

Fish should be frozen in either a pre- or post-rigor condition, when the fish is flexible, to avoid tissue damage and/or gaping.

Freezing systems should be tested by measuring the core temperatures of several average-size fish with a thermocouple while the freezer units are operating with full loads of fish.

Fish should be positioned straightly on freezer trays. Overlapping of belly flaps will result in damage after freezing is complete.

Fish should not be removed from freezers until the core temperature has been reduced to a maximum of five degrees F, and preferably to zero degrees F.

If brine freezers are being used, core temperatures may be slightly higher, provided that the fish are immediately placed in cold storage and held at zero degrees F or below.

The core temperature of fish in storage should remain at zero degrees F or lower.

Fish should be frozen and held at a constant temperature. Temperature fluctuations should be minimal. The temperature of freezers and storage areas should be monitored at regular intervals.

Fish should be glazed as soon as possible after freezing to prevent dehydration and oxidation.

E. Fishing Vessel Sanitation

General Information

Fish stored in an unsanitary hold will be contaminated with bacteria and will have a greatly reduced storage life. Fish slime and blood make excellent food for bacteria and should be removed as soon as possible after fish have been unloaded from the vessel.

Refrigeration systems are easily contaminated because the circulating water includes considerable amounts of slime and blood that can accumulate in the piping, heat exchangers and other equipment. All RSW systems should be designed to permit proper cleaning and sanitizing of the sea water piping and the heat exchangers. Backflush lines and cleaning loops are recommended.

Cleaning and Sanitation Procedures

The following steps should be followed when cleaning and sanitizing a fishing vessel:

a) Flush all fish contact surfaces with clean fresh water or clean sea water;
b) Scrub all fish contact surfaces with a brush or a high pressure washing system, using a detergent solution;
c) Rinse with cold fresh water or sea water;
d) Sanitize with a solution containing chlorine or iodine; and,
e) After five to 10 minutes, rinse off the sanitizing solution.

Wooden boats should not be steam-cleaned. Fatty and proteinaceous materials (fish slime and gurry) can be forced into the wood, making the job of thorough cleaning almost impossible.

As soon as possible after fish have been removed from an RSW system, the sea water piping and heat exchangers should be cleaned, sanitized and rinsed, using an alkaline solution as the cleaner and iodine as the sanitizer.

Detergents and Sanitizers

The cleaner used should be one suited to removal of fish gurry. Alkaline detergents are best for removal of fat and protein materials. Most common household detergents are mixtures of alkaline phosphates and a wetting agent, and are suitable for use on a fishing vessel.

A sanitizing agent containing either chlorine or iodine should be used to kill bacteria left after the vessel has been cleaned. Liquid chlorine solutions (five percent hypochlorite) are suitable, provided they have been properly diluted. Use these preparations according to the labeled instructions. An iodine sanitizer can also be used; it is less corrosive to metal parts of the vessel, but costs about twice as much.

Under no circumstances should sanitizers containing pheno's (such as Lysol and Pinesol) be used in a fish hold or on fish handling surfaces. Most phenols are insoluble in water and impart strong undesirable odors which may affect fish taste.

Clean water should be used to rinse all fish contact surfaces before and after scrubbing and sanitizing.

V

Tendering Vessels and Operations

A. Vessel Guidelines

General Information

All tendering vessels should be designed for rapid and efficient handling of fish and ease of cleaning and sanitation. They should be constructed, operated, and maintained so as to prevent contamination and minimize physical damage and deterioration of fish.

All vessels should have a suitable fish holding area for storing the catch, whether it is below or on-deck. Plastic totes with drainage capability are acceptable for use as fish containers when properly sheltered or covered.

Fish holds should have watertight bulkheads designed to protect the fish from contaminants such as bilge water, fuel and lubricants.

Fish holds on dry vessels should have removable floor boards or some other system to facilitate drainage from the hold.

Fish holds should have pumps and sumps with the capability of pumping the hold dry.

Fish holds should be adequately insulated to control the transfer of heat from the engine, living quarters or heated pipes.

Fuel and hydraulic lines running through fish holds should be enclosed to protect the fish in case of line failure, and should be insulated where necessary to prevent heat transfer.

Vessels should have hatch coamings high enough to prevent the flow of contaminants from the deck to the fish holds.

Vessels should be equipped with sufficient hatch covers or suitable covering material to eliminate the exposure of fish to sunlight or airborne contaminants. Hatch covers should be watertight and designed to protect the fish from fresh or salt water intrusion.

All lights in fish handling areas should be shatterproof or have protective coverings which will prevent product contamination should breakage occur.

There should be no exposed ribs or untreated wood on surfaces in the fish hold or in fish handling areas on deck. The hold lining should be smooth and watertight. Holds should have an impermeable lining, with rounded corners and no obtrusions, and should be insulated. Hold construction should be conducive to easy and complete cleaning to prevent build-up of bacteria.

On vessels with refrigeration systems, equipment should be in good operational condition and capable of chilling full loads of fish to a range of 30° to 35° F within a reasonable amount of time. Circulation systems should be adequate to ensure an even temperature throughout the hold.

Tanked vessels should be equipped with recording thermometers which accurately measure and record the temperature of the hold. Vessels which do not have tanked holds should be equipped with bi-metal thermometers which accurately measure the internal temperature of the fish.

Vessels with below-deck holds should be equipped with chutes or other devices designed to convey fish into the holds with a minimum of damage.

B. Recommended Operating Procedures Aboard Tenders

General Guidelines

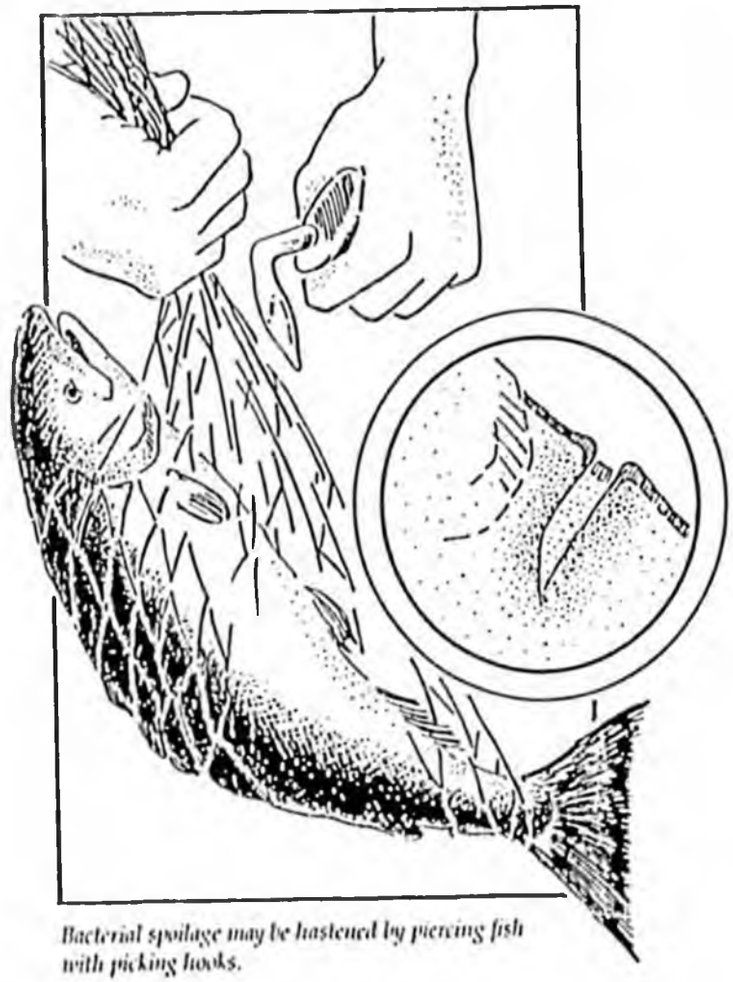
Fish should be handled carefully at all times. This includes, but is not limited to these practices:

a) Do not handle fish by the tail;
b) Do not throw, kick or step on fish;
c) Protect fish from damage in the shaft alley or any other part of the vessel.

While receiving fish from a fisherman, do not overload equipment.

On vessels with below-deck holds, chutes or other systems should be used to convey fish into the hold. This will reduce handling and prevent damage. Fish should not be dropped into the hold or on hard surfaces such as the deck. If loading into a tanked hold, lower brailers close to the surface of the water in the hold before releasing fish.

Pughs, forks, picks, hooks or pumps which damage fish should not be used. Alaska regulations prohibit the pughing of fish.



Bacterial spoilage may be hastened by piercing fish with picking hooks.

Fish should be protected from heat, sunlight, air-drying and inclement weather.

Fish should be protected from bilge water, gas, diesel oil, hydraulic fluid, grease and other contaminants.

Fish held in bulk on vessels without tanked holds should be shelved at intervals of no more than 35 inches.

On tanked vessels, fish holds should be divided, as necessary, to prevent damage to fish due to the vessel's motion.

No pets should be permitted on vessels used for transporting fish.

The presence of pets aboard fishing vessels and in processing plants is unlawful.

Round and eviscerated fish should be kept apart in the holding area. A separate bin or on-deck totes should be used to store eviscerated fish on vessels carrying both dressed and round fish.

Fish should be chilled and delivered to processing facilities as rapidly as possible.

Pumps, brailers or elevators used for unloading fish should be operated in a manner that minimizes physical damage to fish, and in accordance with the manufacturer's instructions. The recommended maximum load per brailer is 800 pounds. Use of small mesh, knotless brailers is recommended.

Tender vessel holds, bin boards and decks should be thoroughly cleaned and sanitized in accordance with the Tendering Vessel Sanitation Procedures described later in these guidelines. The vessel and equipment should be cleaned after every delivery.

Fish Quality Evaluation Procedures

Both the intrinsic and extrinsic quality of all fish should be evaluated as received. Evaluation of general fish condition should be logged if fish are of questionable quality. The evaluation should include, but need not be limited to:

a) Correct species identification;
b) External appearance of eyes, gills, scales, and skin;
c) Odor;
d) Internal fish temperature; and,
e) Sexual maturity.

The internal appearance of viscera, kidney and belly walls may also be noted.

Deterioration of quality caused by refrigeration system failure, adverse weather conditions, contamination by bilge water, fuel, lubricants, phenols (lysol) or other contaminants, or any other adverse conditions, should be documented.

Fish suspected of being unwholesome or contaminated should be segregated from all other fish on the tender, and the condition of the fish noted.

Fish found during evaluation to be unwholesome or contaminated by bilge water, fuel, lubricants, phenols or other undesirable substances should not be accepted by tenders.

C. Chilling and Chilled Storage Aboard Tenders

General Guidelines for Round Fish

All tender operators should use mechanical refrigeration or some other method of chilling fish. Whatever method is used, fish should be chilled as soon as possible after being loaded on the tender.

If ice is used, the fish should be stored in enough finely divided ice to reduce the temperature of the fish to a range of 32° to 35° F within a reasonable amount of time and to hold it within that range. Finely divided ice will ensure the greatest surface contact with the fish. All ice used for chilling fish must be made with clean water from an approved source.

If a chilled (CSW) or refrigerated (RSW) sea water system is used, the fish should be maintained at 30° to 35° F. All tanks should be prechilled to 30° to 32° F before receiving fish.

All sea water used in CSW and RSW systems should be obtained from open waters, away from populated areas and fresh water sources.

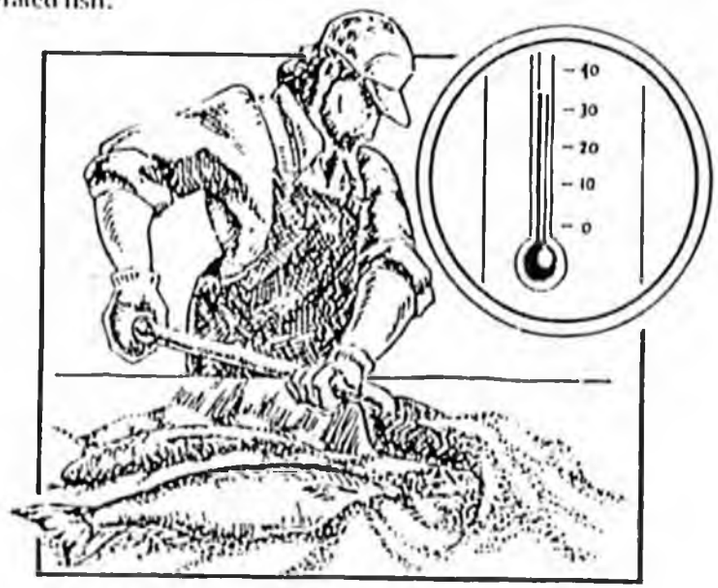
The internal temperatures of iced fish and/or the temperature of the hold on vessels with CSW or RSW systems should be monitored and logged at regular intervals, preferably every six hours. Hold temperatures can be monitored with a recording thermometer. Bimetal thermometers should be used to measure the internal temperature of the fish. The thermometer should be carefully inserted in the anal vent of the fish until the reading stabilizes, or for approximately one minute.

RSW tenders should limit their loads to a maximum of 45 pounds of fish per cubic foot of hold space.

Additional Guidelines for Dressed (Eviscerated) Fish

Dressed fish should be stored in ice, either in impermeable tubs with drainage capability, or in boxes or small removable bins.

Neither CSW or RSW systems should be used for holding eviscerated fish.



When using ice to chill fish, it should be finely divided and maintain a temperature range of 32° to 35° F.

D. Tendering Vessel Sanitation

General Information

Fish slime and blood make excellent food for bacteria and should be removed as soon as possible after fish have been unloaded from the vessel.

Refrigeration systems are easily contaminated because the circulating water includes considerable amounts of slime and blood that can accumulate in the piping, heat exchangers and other equipment. All RSW systems should be designed to permit proper cleaning and sanitizing of the sea water piping and the heat exchangers. Backflush lines and cleaning loops are recommended.

Cleaning and Sanitation Procedures

The following steps should be followed when cleaning and sanitizing a tendering vessel:

a) Flush all fish contact surfaces with clean fresh water or clean sea water;
b) Scrub all fish contact surfaces with a brush or a high pressure washing system using a detergent solution;
c) Rinse with cold fresh water or sea water;
d) Sanitize with a solution containing chlorine or iodine; and,
e) After five to 10 minutes, rinse off the sanitizing solution.

Wooden boats should not be steam cleaned. Fatty and proteinaceous materials can be forced into the wood, making the job of thorough cleaning almost impossible.

As soon as possible after fish have been removed from an RSW system, the sea water piping and heat exchangers should be cleaned, sanitized and rinsed, using an alkaline detergent solution followed by a suitable sanitizer.

Detergents and Sanitizers

The cleaning agent used should be one well-suited to removal of fish gurry. Alkaline detergents are best for removal of fat and protein materials such as fish slime. Most common household detergents are mixtures of alkaline phosphates and a wetting agent and are suitable for use on a fishing vessel.

A sanitizing agent containing either chlorine or iodine should be used to kill bacteria remaining after the vessel has been cleaned. Liquid chlorine solutions (five percent hypochlorite) are suitable if properly diluted. Prepare these solutions according to the directions provided on the label. Iodine sanitizers can also be used. Iodine solutions are less corrosive to metal parts of the vessel, but cost about twice as much as chlorine sanitizers.

Under no circumstances should sanitizers containing phenols (such as Lysol and Pinesol) be used in a fish hold or on fish handling surfaces. Most phenols are insoluble in water and impart strong undesirable odors which may affect fish taste.

VI

Shore-Based and Floating Processing Facilities and Operations

A. Facility and Equipment Guidelines

General Information

All vessels, vehicles and equipment used in the transportation, unloading or processing of fish should be constructed, operated and maintained so as to minimize physical damage to and deterioration of the fish, and prevent contamination of the fish.

Many aspects of fish processing operations, including facility requirements, equipment and utensils, plumbing, sanitary facilities, water supply and ice, thermal processing and waste disposal are regulated by the Alaska Department of Environmental Conservation and the U.S. Food and Drug Administration. The guidelines and procedures outlined in this section are intended to be complementary to applicable state and federal regulations and should not, in any way, be construed as replacing or conflicting with such regulations.

All aspects of salmon canning in Alaska should meet the requirements of the current Canned Salmon Control Plan, a voluntary cooperative agreement between the canned salmon industry, the National Food Processors Association and the U.S. Food and Drug Administration.

General Guidelines

The facility should be large enough to accommodate processing operations without interfering with proper sanitary practices. Floors, walls and ceilings should be constructed of materials that can be kept clean, sanitary and in good repair.

Each room should have natural or artificial lighting that is adequate for the operations to be conducted there, and to provide adequate visibility for cleaning and sanitary inspection.

All lights must be shatterproof or have a protective covering which will prevent product contamination should breakage occur.

Ventilation should be sufficient to prevent mold growth, objectionable odors or the accumulation of excessive condensates.

Toilet facilities should be totally enclosed, well-lighted, and ventilated to the outside. They should be adequately screened and equipped with self-closing doors. Facilities should be adequate, operational and in compliance with local and state codes.

Adequate handwashing facilities should be provided, and should be equipped with soap, running water at suitable temperature(s) and drying facilities. Directions should be posted which instruct employees to wash hands thoroughly before reentering the processing area. Where practicable, portable hand dips containing a sanitizing solution should be provided and employees instructed in their use.

Equipment which comes in contact with butchered fish should be constructed of smooth, non-toxic, corrosion-resistant metal or other nonabsorbent material capable of being sanitized, or should be covered by another material with equivalent characteristics and which does not contaminate the fish.

Where applicable, grounds surrounding the plant that are under the control of the operator should be free from conditions incompatible with sanitary food manufacturing, processing, packing or holding operations. Such conditions include, but are not limited to: litter, refuse, tall weeds or inadequately drained areas that could contribute to contamination of food products by providing a place for insects, rodents or microorganisms to generate.

All outside conveyors and flumes for transporting round fish should be protected so as to prevent fecal contamination by birds and other animals.

Outside holding bins and outside conveyors used to transport butchered fish should be protected so as to prevent fecal or other contamination by birds, insects or other animals and contamination by airborne dust and dirt.

Cloth should not be used at water outlets or on sliming tables.

Water Supplies

The natural water supply intake should be located so as to avoid pollution from shore facilities, marine vessels or processing residuals.

There should be no cross-connections between potable and nonpotable water. For example, a cross-connection can occur when the end of a potable water hose is placed below the surface level in a wash tank full of water, and a cross-connection occurs when a potable water service pipe is directly connected to prime a nonpotable water pump. Cross-connections may occur under other circumstances, and care should be taken to avoid creating circumstances where cross-connections are possible.

Natural water which comes in contact with fish being processed should be sanitized unless the water source is currently approved by a federal state or local agency.

Natural water may be used for unloading, fluming or refrigerated holding of round fish only if:

a) It has been effectively sanitized;
b) It has been approved by a federal, state or local agency; or,
c) If the fish are rinsed with effectively sanitized water before entering storage bins and/or tanks.

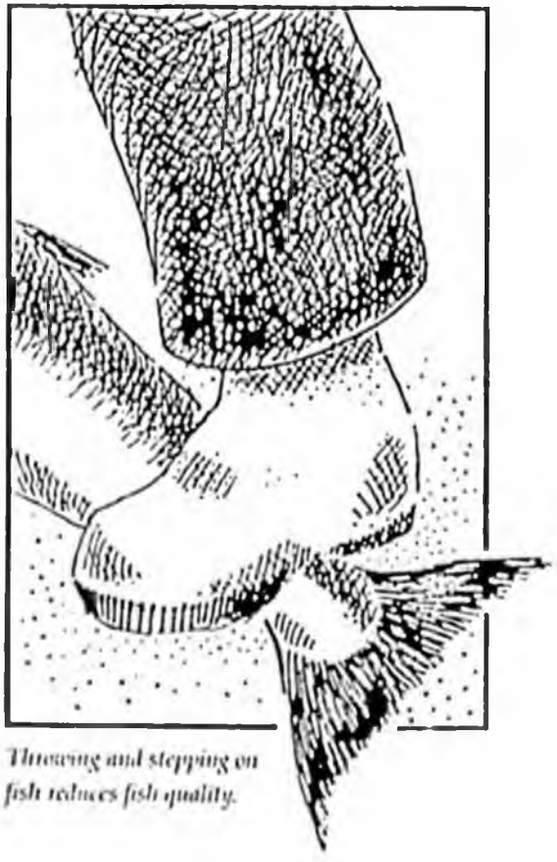
Ice should be made from clean water from an approved source. It should be manufactured, handled, stored and used in a sanitary manner. It should not be reused.

B. Recommended Operating Procedures for all Shore-based and Floating Processors

Employee Education

All processing workers should be instructed as to the need to handle fish with care at all times. This includes, but is not limited to:

a) Handling fish gently;
b) Not handling fish by the tail;
c) Not throwing, stepping on, or in any way abusing fish; and,
d) Not handling fish carelessly.



Throwing and stepping on fish reduces fish quality.

Unloading Fish

Unloading of fish from tenders or fishing vessels should be accomplished with as little delay as possible, while taking care to avoid damaging the fish. Mechanical unloading equipment such as properly designed conveyors, fish pumps or other similar equipment should be used if possible.

All pumps, including the suction end, tubing and discharge end, should be designed and operated so as to avoid physical damage to the fish. The discharge end of wet and dry pumps should deliver fish to containers, bins or conveyors without causing the fish to drop excessive distances. All pumps should be cleaned and sanitized daily.

The recommended maximum individual brailer- or tote-load is 800 pounds.

Elevator buckets and drive mechanisms should be maintained and operated so as to avoid physical damage to the fish. They should be cleaned after every delivery.

Fish should not be allowed to drop excessive distances upon being discharged from a flume, conveyor belt or other transport system, or after being handled on sorting tables. Equipment used in transport and sorting should be cleaned and sanitized at least once a day.

Wagons, totes and bins should be designed and operated so as to facilitate drainage, and should be cleaned and sanitized at least once a day.

Fish Evaluation Procedures at the Processing Facility

Both the intrinsic and extrinsic quality of all fish should be evaluated as the fish is received at the processing plant.

Fish should be evaluated by experienced personnel familiar with regulatory agency requirements, species and company grade specifications.

Fish should be evaluated according to each company's individual grade standards using the general criteria described later in these guidelines.

Any fish which are unwholesome (i.e., do not meet minimum standards for human consumption as established by the U.S. Food and Drug Administration) must be disposed of in an approved manner.

Fish of differing quality should be separated, identified and clearly labeled during all phases of processing operations.

General Guidelines for All Processing Operations

All fish should be kept iced and/or refrigerated before and during processing operations. If ice is used, the fish should be stored in a sufficient amount of finely divided ice to reduce and hold the temperature of the fish within a range of 32° to 35° F. If a mechanical refrigeration system is used, the fish should be maintained at 30° to 35° F. All mechanically chilled holding tanks should be prechilled to 30° to 32° F before receiving fish.

Raw fish should be stacked or stored no more than 35 inches deep in clean, well-maintained containers before and during processing operations. It may be necessary to exceed this depth in holding bins.

Any salmon that accidentally fall on the floor immediately should be picked up by the head and nape, and thoroughly rinsed before further processing.

Only authorized persons should be allowed in processing areas.

Effective measures should be taken to exclude pests and pets from processing areas and to protect against contamination of fish in or on the premises by all animals, including but not limited to dogs, cats, birds, rodents and insects.

Cutting boards used at butchering or sliming tables should not be made of wood or other porous material. Boards should be sanitized daily and replaced or reconditioned annually (more often if necessary) to remove gouged or otherwise worn surfaces.

All utensils and surfaces which come in contact with fish should be cleaned as frequently as necessary to prevent contamination of the fish. The surfaces of equipment which does not come in contact with fish during processing operations should be cleaned as frequently as necessary to minimize the accumulation of dust, dirt, food particles and other debris.

The exterior of fresh fish should be washed and rinsed with clean, chlorinated water prior to evisceration, and the fish should be washed both externally and internally after evisceration.

Each facility should have a written cleaning program which includes the use of appropriate detergents and bactericides. The program should provide for intermediate clean-up, sanitizing of equipment at the end of each processing day, and a washdown of equipment each day prior to processing. Plant personnel should be familiarized with these procedures. (Refer to later sections of this publication for a complete description of processing facility sanitation procedures.)

C. Recommended Operating Procedures for Freezing Plants

Freezing Operations

Freezing and frozen storage cannot improve the quality of fish, but it can maintain fish quality at much the same level as it was prior to freezing. Fish should be frozen as soon after harvest as possible and before quality begins to deteriorate.

Fish should be clean, correctly identified, gently laid straight on clean freezer trays or racks, and promptly sharp frozen.Quick freezing rates must be maintained to prevent protein denaturation and tissue damage. Operators should be aware of the factors which affect freezing times, which include:

a) Freezer type;
b) Operating temperatures;
c) Product type;
d) Product temperatures;
e) Product thickness; and,
f) Contact between the product and the freezing surface.

Fish should not be removed from freezers until the core temperature of the fish has been reduced to five degrees F or lower. Core temperatures may be higher if brine or vertical block freezers are utilized.

After freezing, fish should be gently removed from freezer trays or racks and immediately glazed or shrink-wrapped and/or packaged to prevent dehydration and oxidation.

Glazing Operations

Glazing protects fish from quality loss due to dehydration and oxidation. When the product is in frozen storage, sublimation of the glaze will occur, rather than the sublimation of water from the frozen tissue.

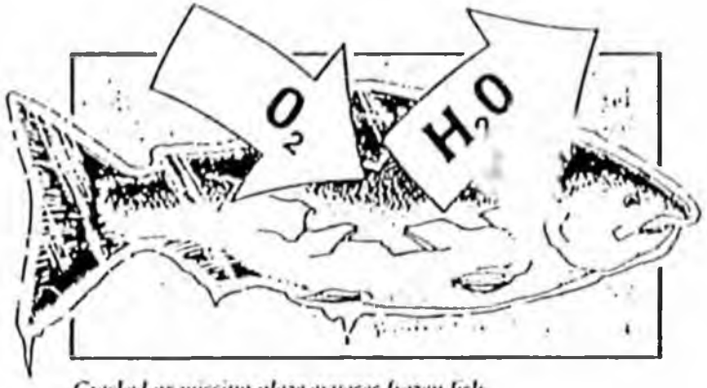
Glaze water should be chilled.

The fish should be completely submerged in glaze water, or sufficiently sprayed so as to provide equal coverage of the fish surface.

Glaze water may contain approved additives and should be changed frequently to prevent microbial build-up.

The glaze should be renewed as necessary during cold storage at the facility.

Frozen products which have been glazed should be handled carefully. If the glaze cracks, or a portion of this protective covering is lost, the fish will be susceptible to quality loss.



Cracked or missing glaze exposes frozen fish to dehydration and oxidation.

Cold Storage Operations

Frozen fish should be stored at zero degrees F or lower, with minimal temperature fluctuations.

Sufficient space should be provided in cold storage rooms to allow adequate circulation of cool air: above, below and around all containers.

While in control of the processor, owner or bonded warehouse, frozen fish glaze and/or packaging should be checked periodically and replaced as necessary.

D. Fish Quality Evaluation Criteria

Quality Evaluation Criteria for Fresh Fish

All salmon, while fresh, should exhibit the following characteristics prior to processing in order to be categorized as No. 1:

a) Eyes should be normal in appearance;
b) Gills should be normal in appearance and should smell sea-fresh (practically odorless);
c) Skin should be shiny, and wrinkles should not remain when fish is bent slightly. Methods of catch may mark the skin;
d) Skin color should be characteristic of fresh fish of the same species, stage of sexual maturity, place of harvest (fishing district), and approximate date of capture;
e) Viscera and eggs should be acceptably colored, intact and smell sea-fresh (practically odorless);
f) Interior walls of the belly cavity may have only minimal appearance of tissue breakdown due to enzymatic action or careless handling. Slight breaks (less than one inch) or slight reddening (blushing) of the flesh are permitted in the No. 1 grade;
g) Flesh should be resilient when subjected to finger pressure;
h) Flesh color should be characteristic of fresh fish of the species, harvest location (fishing district) and approximate date of capture;
i) Physical shape should be characteristic of the species and stage of sexual maturity;
j) Scale adherence should be reasonably uniform; some scale loss due to the method of catch and subsequent handling procedures is to be expected, but fish displaying substantial scale loss should be carefully examined, as such losses may indicate poor handling practices; and,
k) Odor should be sea-fresh (almost no odor) and be characteristic of the species. There should be no odor indicating decomposition or contamination.

These evaluation criteria are excerpted from the Alaska Seafood Marketing Institute's *Premium Quality Specifications for Fresh and Frozen Pacific Salmon*. Copies of the specifications are available from ASMI.

E. Processing Facility Sanitation

General Information

A suitable periodic cleaning schedule should be established for each plant, and should conform, where applicable, with state and federal regulations.

A chlorinated alkaline detergent should be used where needed to clean protein material (fish slime and blood) from fish contact surfaces.

Either gaseous chlorine or a hypochlorite compound can be used as a sanitizing agent (see below).

Under no circumstances should sanitizers containing phenols, such as Lysol or Pinesol, be used in a fish hold or on fish handling surfaces.

Detergents and Sanitizers

Different types of detergents or cleaning compounds are designed specifically for different types of soil and cleaning problems. Alkaline detergents (with a pH greater than seven) are best suited for the removal of fats and proteins, while acid cleaners (with a pH under seven) are best for removing mineral deposits. Chlorinated alkaline detergents are most effective for the removal of proteins which accumulate as a result of fish gurry.

The three most common types of sanitizing agents used in commercial sanitizers are chlorine, iodine and phenols.

Sanitizers which contain phenols such as Lysol, Pinesol, creosol or hexachlorophene must not be used in areas where food or materials, including packaging materials, are handled or stored. Fish, ingredients and packaging will readily absorb the flavor and odor of phenols, rendering the exposed products unfit for human consumption, and unmarketable.

Chlorine is available in two basic forms, gaseous chlorine and hypochlorite compounds. Hypochlorite compounds are available in liquid, powder, granular and pellet forms. The free chlorine content of these products ranges from four to 70 percent.

Chlorine is a very effective sanitizer if used properly. The most common misuse of chlorine occurs when solutions are improperly diluted. Chlorine is very effective in solutions with a low pH (eight or below), but the effect of the chlorine dimmishes as the pH rises. Solutions of 25 to 100 parts per million (.0025 to .01 percent) are most effective when using hypochlorite for sanitizing.

The old adage "If a little is good, more is better," is not true when using hypochlorite solutions because as the solution becomes more concentrated, its pH rises, lowering the effectiveness of the chlorine. To avoid this problem all sanitizers should be used in accordance with labeled instructions.

Gaseous chlorine is recommended as the most economical (on a long-term basis) and most effective type of chlorine to use in fish processing plants.

Iodine is an effective sanitizer, but is more expensive to use than chlorine. Use of iodine is recommended when the corrosive effects of chlorine may damage or reduce the life of equipment such as RSW systems, heat exchangers, etc.

All processors must use U.S. Department of Agriculture (USDA)-approved detergents and sanitizers as listed in USDA Miscellaneous Publication Number 1419, *List of Proprietary Substances and Nonfood Compounds Authorized for Use Under USDA Inspection and Grading Programs.*

Recommended References

State and Federal Regulations:

1. Title 21 - Food and Drugs, Part 110, *Current Good Manufacturing Practice (Sanitation) in the Manufacturing, Processing, Packing or Holding of Human Food*, U.S. Food and Drug Administration, effective May 26, 1969, recodified March 15, 1977.
2. *Fish Inspection Regulations*, Title 18 AAC, Chapter 34, State of Alaska, Department of Environmental Conservation, 1984.

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1. John P. Doyle, "Net-Caught Salmon — Handle with Care," *Alaska Seas and Coasts*, Volume 6, Number 3 (June, 1978).
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3. Edward Kolbe, *Onboard Freezing Systems: Some Options for the Small Vessel*, (Oregon State University Extension Marine Advisory Program, Publication SG 67, July, 1969).
4. S.W. Roach, *Operating Instructions for RSW Systems on B.C. Salmon Packers*, (Fisheries Research Board of Canada, Vancouver Laboratory, 1973).

5. *Recommended International Code of Practice for Fresh Fish*, (FAO/WHO Codex Alimentarius Comaission, 1976).
6. *Code of Practice for Frozen Fish*, CX/FFP 77/15 (FAO Fish. Circ. C145, Rev. 1).
7. *Recommended International Standard for Canned Pacific Salmon*, (FAO/WHO Codex Alimentarius Commission, 1969).
8. John P. Doyle, *Fishplant Sanitation and Cleaning Procedures*, (University of Alaska, Marine Advisory Bulletin No. 1, 1970).
9. Jong S. Lee, *Cleaning and Sanitizing Agents for Seafood Processing Plants*, (Oregon State University, Extension Marine Advisory Program, Publication SG 21, 1973).
10. *Fish Handling at Sea*, (Sitka Sound Seafood, April, 1985).
11. *Premium Quality Specifications for Fresh and Frozen Pacific Salmon*, (Alaska Seafood Marketing Institute, 1985).
12. *1985 Canned Salmon Control Plan: A Voluntary Cooperative Agreement Between Participating Salmon Packers, the National Food Processors Association and the Federal Food and Drug Administration*, (1985).
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The Key to Quality

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Contents

I. Introduction

Salmon that are bruised in handling are a major economic drain on the fishing industry. They create an unfavorable market image, have higher weight loss, and are of lower grade and quality than salmon that are handled carefully. Bruised products have long plagued many segments of the food industry. For example, bruising of even the hardy potato is a serious economic problem in the industry it supports (Kline-Schmidt 1959). To compete effectively for the consumer's food dollar, all segments of the food industry must continually improve the quality of their products.

Quality is especially important in today's highly competitive salmon market. Unlike rice, potatoes, or pasta, salmon is not daily fare; it is a speciality food in North America, Asia, and Europe. Consumers must be attracted to salmon, and if they are to be repeat customers, the product must meet their expectations. To meet consumer expectations, the quality of net caught salmon must improve. The old ways of handling and taking care of fish are no longer acceptable.

Over the past 15 years, the following major changes in the salmon market have affected all aspects of the industry: (1) in the mid-1970s, the amount of salmon going to the frozen market increased at the expense of the canned volume, and (2) in the late 1980s, the production of farmed salmon expanded rapidly.

The industry did not react quickly to meet market needs for a better product as consumer demand shifted from canned to frozen salmon. The quantity of frozen salmon increased, but in general its quality still does not meet market expectations. Historically, most Pacific salmon destined for the frozen and mild cure markets were taken by trollers and gillnetters in Southeast Alaska, British Columbia, and the Pacific Northwest. These fishermen traditionally fished for the high value markets and took very good care of their catch, meeting the demand for kings, silvers, and bright Southeast Alaska chum salmon. In the mid-1970s, the demand for fresh and frozen fish, including frozen salmon, increased rapidly in the U.S. market. Later increases in demand were spurred by a devaluation of the dollar against European and Japanese currency. To meet the increased demand, salmon freezing expanded in Southcentral Alaska

(Continued from page 2)

some form of chilling. Some in the gillnet fleet (even in remote areas) use ice or chilled sea water to cool their fish.

The problem facing the Alaskan salmon industry is that its competitors have advanced so rapidly in marketing a high-quality product. For example, handling of farm reared salmon is designed to produce the freshest, most defect-free product possible. Farm reared salmon, regardless of their source of origin, are usually in transit to market within four hours after they are slaughtered.

B. The opportunity

The world supply of salmon increased rapidly during the 1980s, and by 1990 farmed salmon amounted to 28 percent of the world production (Alaska Seafood Marketing Institute [ASMI] 1991). This indicates that the growth in farmed fish has increased the consumption of salmon. Currently, most farmed fish are marketed fresh, which reduces inventory costs. More importantly, freshness appeals to consumers. The 1991 ASMI report shows that quality, freshness, and consistency of supply are the *most important* factors in attracting users to farmed salmon. Until ocean ranching of chinook, sockeye, and coho becomes a major element in overall "wild" salmon production, Alaskan fish producers can control only quality, one attribute of which is freshness. Producers of farmed salmon can control supply as well as biological factors such as weight, flesh color, flesh firmness, and oil content.

C. The characteristics of quality

Each species of salmon has its own distinctive quality attributes. Quality is what buyers consider desirable in a product, a set of characteristics that makes eating the product an enjoyable experience. For salmon, these characteristics include appearance, flavor, odor, texture, and freshness. (As the word *freshness* is used here, it is a function of time and temperature and does not differentiate between frozen and unfrozen fish.) Freshness is given primary emphasis by marketers of farmed salmon. For the most part, harvesters and processors of wild salmon do not pay enough heed to freshness. Neither the U.S. Food and Drug Administration nor the Alaska

and Western Alaska. However, fishermen operating in these areas had little experience in producing fish for the frozen market, so the product quality did not meet market needs.

A second major source of pressure on Alaska's salmon markets is the recent rapid expansion in production of farmed salmon. From 1985 through 1990 the world supply of farmed salmon increased from 102 million pounds to 621 million pounds. In contrast, between 1982 and 1990 Alaska's production of fresh and frozen salmon has averaged 323 million pounds annually. (See figure 1 on page 3). Most farmed salmon are sold fresh, and limited amounts are frozen, so it is obvious that Alaska no longer controls the salmon market; instead, the market controls the Alaska salmon industry.

A very recent trend in salmon farming will put even greater pressure on wild salmon markets. In 1990 and 1991 Norway froze large amounts of salmon to ease the glut of fresh salmon on the world market. Salmon farmers in Chile freeze about half of their total production. In 1990 Chilean exports of frozen farmed salmon to Japan accounted for 7% of Japan's salmon imports, according to a forthcoming paper by J. L. Anderson and Y. Kusakabe.

A. The problem

Bad attitudes that persist among some members of the fishing sector are a major cause of poor product quality. Such attitudes stem from short seasons, fierce competition for fish, and limited vessel capacity for fish and machinery. These conditions produce a general feeling that the first and foremost job is to maximize the harvest and that care of the product is secondary. This feeling leads to rough handling; poor or no chilling; and in some cases, dirty, unsanitary holding conditions. These practices must change if the Alaska salmon industry is to regain control of the salmon market.

Despite bad attitudes among some in the fishing sector, during the past 25 years all segments of the Alaska salmon industry have made good progress in improving product quality. For example, fish pughs are no longer commonly used, dry scow tendering is almost a thing of the past, and a large percentage of the purse seine fleet uses

(Continued on page 4)

Department of Environmental Conservation inspects for freshness. Both agencies ensure only that minimum standards are met. Their main concerns are that the product is wholesome (free from decomposition, adulteration, and contamination) and was not handled and processed under conditions wherein it may have become contaminated or adulterated.

A voluntary seafood inspection program has been administered for many years by the National Marine Fisheries Service for the U.S. Department of Commerce (USDC). The USDC inspection certifies only that salmon is processed under sanitary conditions and meets a company's own definition of standards as stated on its packages. In the North American scientific community, most seafood technology research has been devoted to understanding bacterial spoilage, chemical measurements of spoilage, and methods of extending the shelf life of fish. No wonder we pay so little attention to the overall quality and freshness of our seafood. In contrast, much research in Japan and Europe is devoted to methods for measuring freshness, and both physical and chemical methods have been developed. In Japan the chemical score for freshness often is displayed on a product at the retail level. This chemical score is a measure of chemical changes in fish flesh which occur before significant bacterial growth takes place. These methods are little used in North America. Our lack of concern for freshness is an attitude which must change if Pacific wild salmon from North America are to compete successfully with farm reared fish.

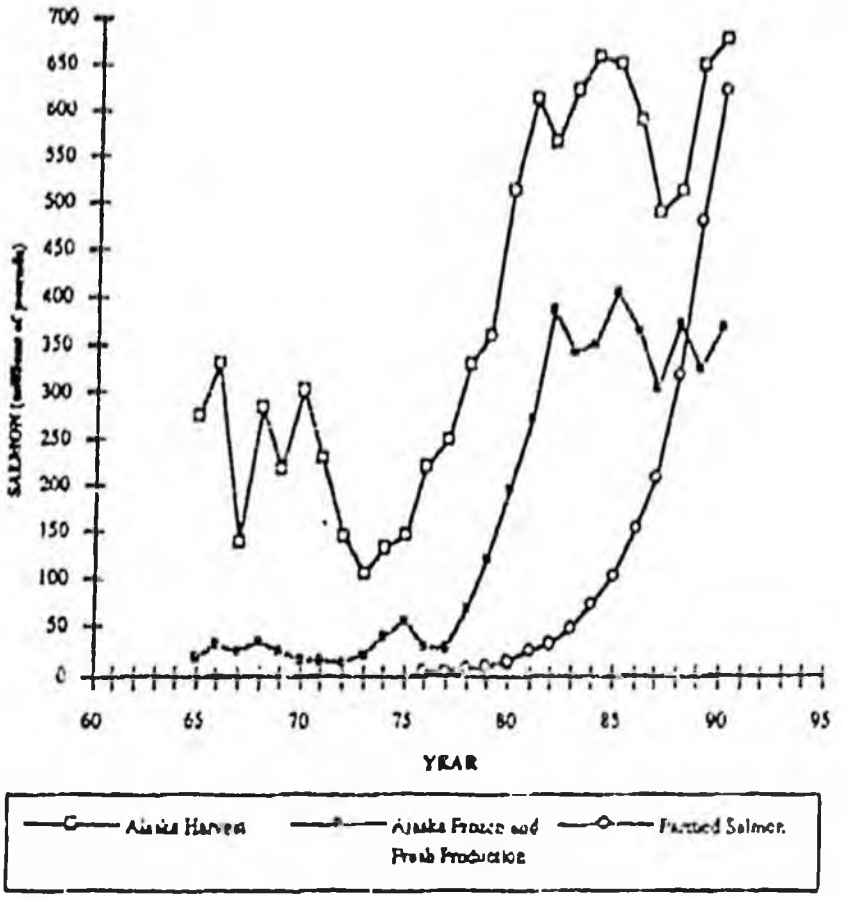

Figure 1. Comparison of total Alaska salmon harvest, world production of farmed salmon, and Alaska's fresh and frozen salmon production. Alaska's canned salmon production is the difference between the total Alaska salmon harvest and the total Alaska production of fresh and frozen salmon. All figures are in round weight. Sources: Alaska Department of Fish and Game statistical leaflets, Alaska Seafood Marketing Institute, National Food Processors Association, and Alaska Fisheries Entry Commission.

VIII. General Recommendations

The following recommendations apply to all vessels harvesting and/or transporting fresh salmon.

A. Holds

1. All vessels must have watertight holds that prevent any contamination from the engine room, bilges, and shaft alley.

2. Holds must be lined with a nonporous material such as glass-reinforced plastic (fiberglass); aluminum; or coated steel.

3. Holds must be adequately insulated to reduce incoming heat. The engine room bulkhead should have an "R" factor of 50, and other surfaces, including the shaft alley, should have an "R" factor of 33.

4. All angles and corners must be faired because the hold cannot have sharp obstructions.

5. There must be a sump and a sump pump at the lowest part of the hold.

6. Fuel lines and hydraulic lines that pass through the hold must be shielded to prevent heat loss and contamination from spillage.

7. Hatch combings and covers must be adequate to prevent leakage of water and contaminants from the deck into the hold.

8. Setnet and other skiff fisheries must hold and transport fish in light-colored totes.

B. Chilling

1. All fishing vessels must chill their fish at the time of catch, using ice, chilled sea water, refrigerated sea water, or its equivalent.
2. Salmon must be chilled to a core temperature of at least 35°F (1.67°C) within 24 hours of harvest.

IV. Conclusions

The Alaska fishing industry faces a difficult struggle to regain lost markets. Neither its competitors nor the marketplace will be swayed by advertising or promotion. Consumers must see a significant improvement in the quality of wild salmon from Alaska and, to a lesser extent, from Canada and the Pacific Northwest before they will return to the use of wild salmon for top of the market items.

The most important change needed is *a change in attitude* in the industry; firstly, a recognition of the need for improved quality, and secondly, a willingness to move away from the concept that the most important job is to maximize production and to accept the idea that the job is to produce a high-quality food. If these changes take place, the industry will be well on its way to better serving the consumer.

With proper care and handling, up to 90% of net caught sockeye and coho salmon should provide sides of the quality shown in photograph 16.[5]

The State of Alaska has a responsibility for and a vested interest in promoting salmon quality, in a broad sense to protect the State's economy, and in a narrower sense to maximize income to the state treasury.

Salmon products from Alaska often will be judged by the product of lowest quality–that is, by the lowest common denominator. Therefore, the State should implement as regulations either the general recommendations given above or similar requirements. The hold recommendations that appear above should be enforced no later than the 1993 fishing season, and the chilling recommendations should be enforced no later than the 1995 season.

Remember, salmon is a fine food:

Handle with care.

Keep it cold,

keep it clean,

keep it moving to the consumer.

[1] Because there are so many genetically separate populations within a species of salmon, the intrinsic quality of fish of the same species varies greatly. All major buyers of Alaska salmon are well aware of that fact. For example, Yukon king salmon are renowned for their high oil content, bright flesh color, and thick belly walls. In 1991 Yukon fishermen received an average of $4.10 per pound for gillnet caught fish. Cook Inlet kings are large but do not enjoy a good reputation because they have low oil content, relatively poor skin color, and thin belly walls. The average price for Cook Inlet king salmon in 1991 was $1.15 per pound. Fish buyers also recognize the differences in handling practices and other extrinsic quality factors in salmon produced in different regions.

[2] This is generally true between 32°F (0°C) and 68°F (20°C); however, each enzyme has a specific temperature at which it is most active. Most enzymes which break down protein are denatured at high temperatures.

[3] Because laboratory experiments usually are conducted under ideal handling conditions in which the fish receive little abuse, published shelf life times usually are longer than those listed here. Laboratory experiments usually do not reflect the "real world" in which a large quantity of product must be handled in a short time.

[4] Some fishermen don't want to use chlorine, because they believe it will cause corrosion. However, it has been demonstrated in food plants that the regular use of chlorine on equipment will reduce corrosion by killing bacteria that produce acid to break down protein.

[5] Prince William Sound fishermen instituted a voluntary quality and education program in 1980 and 1981. As a result, the quantity of exported number one sockeye salmon suitable for the manufacture of lox increased from a previous level of 70% to between 80% and 90% (interviews with the president and staff of Sanyo Food Co., Hokkaido, Japan, 1984 and 1986).

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HB

543

FISCAL NOTE

STATE OF ALASKA
1992 LEGISLATIVE SESSION

BILL NO. CSHB 543 (Res)

Revision Date: April 22, 1992 **Department Affected:** Environmental Conservation

Title: An Act relating to standards for grading finfish fisheries products. **BRU:** Environmental Health

Component: Seafood Industry

Sponsor: Representative Choquette

Requestor: (H) Resources **COMPONENT SERIAL NO.** 0649

EXPENDITURES/REVENUES: (Thousands of Dollars)

OPERATING	FY 93	FY 94	FY 95	FY 96	FY 97	FY 98
PERSONAL SERVICES	0.0	0.0	0.0	0.0	0.0	0.0
TRAVEL	0.0	0.0	0.0	0.0	0.0	0.0
CONTRACTUAL	0.0	0.0	0.0	0.0	0.0	0.0
SUPPLIES	0.0	0.0	0.0	0.0	0.0	0.0
EQUIPMENT	0.0	0.0	0.0	0.0	0.0	0.0
LAND & STRUCTURES	0.0	0.0	0.0	0.0	0.0	0.0
GRANTS, CLAIMS	0.0	0.0	0.0	0.0	0.0	0.0
MISCELLANEOUS	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL OPERATING	0.0	0.0	0.0	0.0	0.0	0.0
CAPITAL	0.0	0.0	0.0	0.0	0.0	0.0
REVENUE FUND SOURCE:	0.0	0.0	0.0	0.0	0.0	0.0

FUNDING: (Thousands of Dollars)

GENERAL FUND	0.0	0.0	0.0	0.0	0.0	0.0
FEDERAL FUNDS	0.0	0.0	0.0	0.0	0.0	0.0
OTHER FUND SOURCE:	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0

POSITIONS:

FULL-TIME	0.0	0.0	0.0	0.0	0.0	0.0
PART-TIME	0.0	0.0	0.0	0.0	0.0	0.0
TEMPORARY	0.0	0.0	0.0	0.0	0.0	0.0

Estimate of current year impact:

ANALYSIS: (Attach a separate page if necessary.)

Prepared By: Kit Ballentine, Acting Director **Phone:** 465-5280

Division: Environmental Health **Date:**

Approved by Commissioner: Signed Maria for John Sandor

Agency: Environmental Conservation **Date:** 4/23/92

Distribution (by preparer): Leg. Fin., Legislative Sponsor, Requestor, OMB/DER, Gov. Legis. Ofc., & Impacted Agency(ies).

Rev 10/7/91

FISCAL NOTE

STATE OF ALASKA
1992 LEGISLATIVE SESSION

BILL NO. HB 543

Revision Date: 3/25/92

Department Affected: Fish and Game

Title: Relating to standards for grading fisheries products

BRU: Commercial Fisheries

Component: Commercial Fisheries

Sponsor: Representative Choquette

Requestor: House Resources

COMPONENT SERIAL NO. | | 4 | 5 | 9 |

Expenditures/Revenues: (Thousands of Dollars)

OPERATING	FY 93	FY 94	FY 95	FY 96	FY 97	FY 98
PERSONAL SERVICES	0	0	0	0	0	0
TRAVEL	0	0	0	0	0	0
CONTRACTUAL	0	0	0	0	0	0
SUPPLIES	0	0	0	0	0	0
EQUIPMENT	0	0	0	0	0	0
LAND & STRUCTURES	0	0	0	0	0	0
GRANTS, CLAIMS	0	0	0	0	0	0
MISCELLANEOUS	0	0	0	0	0	0
TOTAL OPERATING	0.0	0.0	0.0	0.0	0.0	0.0
CAPITAL	0	0	0	0	0	0
REVENUE FUND SOURCE:	0	0	0	0	0	0

FUNDING: (Thousands of Dollars)

GENERAL FUND	0	0	0	0	0	0
FEDERAL FUNDS	0	0	0	0	0	0
OTHER FUND SOURCE:	0	0	0	0	0	0
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0

POSITIONS:

FULL-TIME	0	0	0	0	0	0
PART-TIME	0	0	0	0	0	0
TEMPORARY	0	0	0	0		0

Estimate of current year impact: None

ANALYSIS: (Attach a separate page if necessary.)

Prepared By: Geron Bruce G.B. Phone: 465-4100

Division: Commissioner's Office Date: 3/24/92

Approved by Commissioner: Don Somerville

Agency: Department of Fish and Game Date: 3/25/92

Distribution (by preparer): Leg. Fin., Legislative Sponsor, Requestor, OMB/DBR, Gov. Legis. OSC., & Impacted Agency(ies).

Rev 10/7/91

FISCAL NOTE

STATE OF ALASKA
1992 LEGISLATIVE SESSION

BILL NO. HB543

Revision Date: _____ **Department Affected:** Environmental Conservation

Title: An Act Relating to standards for grading finfish fisheries products. **BRU:** Environmental Health

Component: Seafood Industry

Sponsor: Repres. Choquette

Requestor: _____ **COMPONENT SERIAL NO.** 1 4 4

EXPENDITURES/REVENUES: (Thousands of Dollars)

OPERATING	FY 93	FY 94	FY 95	FY 96	FY 97	FY 98
PERSONAL SERVICES	0.0	0.0	0.0	0.0	0.0	0.0
TRAVEL	0.0	0.0	0.0	0.0	0.0	0.0
CONTRACTUAL	0.0	0.0	0.0	0.0	0.0	0.0
SUPPLIES	0.0	0.0	0.0	0.0	0.0	0.0
EQUIPMENT	0.0	0.0	0.0	0.0	0.0	0.0
LAND & STRUCTURES	0.0	0.0	0.0	0.0	0.0	0.0
GRANTS, CLAIMS	0.0	0.0	0.0	0.0	0.0	0.0
MISCELLANEOUS	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL OPERATING	0.0	0.0	0.0	0.0	0.0	0.0
CAPITAL	0.0	0.0	0.0	0.0	0.0	0.0
REVENUE FUND SOURCE:	0.0	0.0	0.0	0.0	0.0	0.0

FUNDING: (Thousands of Dollars)

GENERAL FUND	0.0	0.0	0.0	0.0	0.0	0.0
FEDERAL FUNDS	0.0	0.0	0.0	0.0	0.0	0.0
OTHER FUND SOURCE:	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0

POSITIONS:

FULL-TIME	0.0	0.0	0.0	0.0	0.0	0.0
PART-TIME	0.0	0.0	0.0	0.0	0.0	0.0
TEMPORARY	0.0	0.0	0.0	0.0	0.0	0.0

Estimate of current year impact: 0.0

ANALYSIS: (Attach a separate page if necessary.)

Separate analysis attached.

Prepared By: Kit Ballentine, Acting Director **Phone:** 465-5280

Division: Environmental Health **Date:** _____

Approved by Commissioner: _____

Agency: Environmental Conservation **Date:** 3/25/92

Distribution (by preparer): Leg. Fin., Legislative Sponsor, Requestor, OMB/OSR, Gov. Legis. Ofc., & Impacted Agency(ies).

Rev 10/7/91

HB 543 Packet

Zero Fiscal Note, ADEC

Federal grading standards, regulations

Canadian grading standards for Canned, and for Frozen and Evicerated

Alaska Seafood Marketing Institute Premium Quality Standards for Net Caught and Troll Caught Salmon.

CORRECTION

THIS DOCUMENT
HAS BEEN REPHOTOGRAPHED
TO ASSURE LEGIBILITY

FISCAL NOTE

STATE OF ALASKA
1992 LEGISLATIVE SESSION

BILL NO. HB543

Revision Date: _____ **Department Affected:** Environmental Conservation

Title: An Act Relating to standards for grading finfish fisheries products. **BRU:** Environmental Health

Component: Seafood Industry

Sponsor: Repres. Choquette

Requestor: _____ **COMPONENT SERIAL NO.** 1 4 4

EXPENDITURES/REVENUES: (Thousands of Dollars)

OPERATING	FY 93	FY 94	FY 95	FY 96	FY 97	FY 98
PERSONAL SERVICES	0.0	0.0	0.0	0.0	0.0	0.0
TRAVEL	0.0	0.0	0.0	0.0	0.0	0.0
CONTRACTUAL	0.0	0.0	0.0	0.0	0.0	0.0
SUPPLIES	0.0	0.0	0.0	0.0	0.0	0.0
EQUIPMENT	0.0	0.0	0.0	0.0	0.0	0.0
LAND & STRUCTURES	0.0	0.0	0.0	0.0	0.0	0.0
GRANTS, CLAIMS	0.0	0.0	0.0	0.0	0.0	0.0
MISCELLANEOUS	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL OPERATING	0.0	0.0	0.0	0.0	0.0	0.0
CAPITAL	0.0	0.0	0.0	0.0	0.0	0.0
REVENUE FUND SOURCE:	0.0	0.0	0.0	0.0	0.0	0.0

FUNDING: (Thousands of Dollars)

GENERAL FUND	0.0	0.0	0.0	0.0	0.0	0.0
FEDERAL FUNDS	0.0	0.0	0.0	0.0	0.0	0.0
OTHER FUND SOURCE:	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0

POSITIONS:

FULL-TIME	0.0	0.0	0.0	0.0	0.0	0.0
PART-TIME	0.0	0.0	0.0	0.0	0.0	0.0
TEMPORARY	0.0	0.0	0.0	0.0	0.0	0.0

Estimate of current year impact: 0.0

ANALYSIS: (Attach a separate page if necessary.)

Separate analysis attached.

Prepared By: Kit Ballentine, Acting Director **Phone:** 465-5280

Division: Environmental Health **Date:** _____

Approved by Commissioner: _____

Agency: _____ **Date:** 3/25/92

Distribution (by preparer): Leg. Fin., Legislative Sponsor, Requestor, OMB/DBR, Gov. Legis. Ofc., & Impacted Agency(ies).

Rev 10/7/91

ANALYSIS OF BILL/PROGRAM EFFECTS
HB543
FINFISH GRADING STANDARDS

Development of minimum quality grading standards for Alaskan finfish products could afford a market advantage for these products. With the proposed amendments and recognition that inspectional services would be provided on a fee for service basis, the Department supports this legislation.

Multiple grading standards exist in the industry at the present time. Many of these are market driven and may vary substantially from any minimum quality standard which might be adopted. Due to this feature of the marketplace and industry, the Department would propose that minimum grading standard criteria be developed jointly with the industry, other agencies and DEC. Participation in the quality program would be on a voluntary, fee for service basis. If a processor chose to participate in the program, the facility's products could display the mark of inspection. Uninspected product would remain ungraded and could not bear a seal of inspection.

The Department would propose a phased in approach to implementation of grading standards. Phase I would consist of convening a task force composed of industry and governmental representatives whose goal would be to define the elements of a minimum quality grading program. Task force members would meet on a regular basis via teleconference. Phase II would consist of actual implementation of the standards through a fee for service inspection program.

The impact of such a program is difficult to assess until the level of processor interest is evaluated and defined. Costs to the program would be borne by the processor requesting certification under the grading program, resulting in no cost to the Department. However, additional staff would be required to conduct inspections without disruption to the existing seafood inspection program.

HB 543 Packet

Zero Fiscal Note, ADEC

Federal grading standards, regulations

Canadian grading standards for Canned, and for Frozen and Evicerated

Alaska Seafood Marketing Institute Premium Quality Standards for Net Caught and Troll Caught Salmon.

FISCAL NOTE

STATE OF ALASKA
1992 LEGISLATIVE SESSION

BILL NO. HB543

Revision Date: _____ Department Affected: Environmental Conservation

Title: An Act Relating to standards for grading finfish fisheries products. BRU: Environmental Health

Component: Seafood Industry

Sponsor: Repres. Choquette

Requestor: _____ COMPONENT SERIAL NO. [ ][1.][4][9]

EXPENDITURES/REVENUES: (Thousands of Dollars)

OPERATING	FY 93	FY 94	FY 95	FY 96	FY 97	FY 98
PERSONAL SERVICES	0.0	0.0	0.0	0.0	0.0	0.0
TRAVEL	0.0	0.0	0.0	0.0	0.0	0.0
CONTRACTUAL	0.0	0.0	0.0	0.0	0.0	0.0
SUPPLIES	0.0	0.0	0.0	0.0	0.0	0.0
EQUIPMENT	0.0	0.0	0.0	0.0	0.0	0.0
LAND & STRUCTURES	0.0	0.0	0.0	0.0	0.0	0.0
GRANTS, CLAIMS	0.0	0.0	0.0	0.0	0.0	0.0
MISCELLANEOUS	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL OPERATING	0.0	0.0	0.0	0.0	0.0	0.0
CAPITAL	0.0	0.0	0.0	0.0	0.0	0.0
REVENUE FUND SOURCE:	0.0	0.0	0.0	0.0	0.0	0.0

FUNDING: (Thousands of Dollars)

GENERAL FUND	0.0	0.0	0.0	0.0	0.0	0.0
FEDERAL FUNDS	0.0	0.0	0.0	0.0	0.0	0.0
OTHER FUND SOURCE:	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0

POSITIONS:

FULL-TIME	0.0	0.0	0.0	0.0	0.0	0.0
PART-TIME	0.0	0.0	0.0	0.0	0.0	0.0
TEMPORARY	0.0	0.0	0.0	0.0	0.0	0.0

Estimate of current year impact: 0.0

ANALYSIS: (Attach a separate page if necessary.)

Separate analysis attached.

Prepared By: Kit Ballentine, Acting Director Phone: 465-5280

Division: Environmental Health Date: _____

Approved by Commissioner: _____

Agency: _____ Date: 3/25/92

Distribution (by preparer): Leg. Fin., Legislative Sponsor, Requestor, OMB/DBR, Gov. Legis. Ofc., & Impacted Agency(ies).

Rev 10/7/91

ANALYSIS OF BILL/PROGRAM EFFECTS
HB543
FINFISH GRADING STANDARDS

Development of minimum quality grading standards for Alaskan finfish products could afford a market advantage for these products. With the proposed amendments and recognition that inspectional services would be provided on a fee for service basis, the Department supports this legislation.

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The impact of such a program is difficult to assess until the level of processor interest is evaluated and defined. Costs to the program would be borne by the processor requesting certification under the grading program, resulting in no cost to the Department. However, additional staff would be required to conduct inspections without disruption to the existing seafood inspection program.

conspicuous manner with the word "RETAINED." Such lot(s) of product shall be held for reinspection or testing. Final disposition of the lot(s) shall be determined by NMFS and the removal of the "RETAINED" identification shall be performed by the inspector.

[36 FR 21041, Nov. 3, 1971]

§ 260.104 Personnel.

The establishment management shall be responsible for taking all precautions to assure the following:

(a) *Disease control.* No person affected by disease in a communicable form, or while a carrier of such disease, or while affected with boils, sores, infected wounds, or other abnormal sources of microbiological contamination, shall work in a food plant in any capacity in which there is a reasonable possibility of food ingredients becoming contaminated by such person, or of disease being transmitted by such person to other individuals.

(b) *Cleanliness.* All persons, while working in direct contact with food preparation, food ingredients, or surfaces coming into contact therewith shall:

(1) Wear clean outer garments, maintain a high degree of personal cleanliness, and conform to hygenic practices while on duty, to the extent necessary to prevent contamination of food products.

(2) Wash and sanitize their hands thoroughly to prevent contamination by undesirable microorganisms before starting work, after each absence from the work station, and at any other time when the hands may have become soiled or contaminated.

(3) Remove all insecure jewelry and, when food is being manipulated by hand, remove from hands any jewelry that cannot be adequately sanitized.

(4) If gloves are used in food handling, maintain them in an intact, clean, and sanitary condition. Such gloves shall be of an impermeable material except where their usage would be inappropriate or incompatible with the work involved.

(5) Wear hair nets, caps, masks, or other effective hair restraints. Other persons that may incidentally enter the processing areas shall comply with this requirement.

(6) Not store clothing or other personal belongings, eat food, drink beverages, chew gum, or use tobacco in any form in areas where food or food ingredients are exposed or in areas used for washing equipment or utensils.

(7) Take any other necessary precautions to prevent contamination of foods with microorganisms or foreign substances including, but not limited to perspiration, hair, cosmetics, tobacco, chemicals, and medicants.

(c) *Education and training.* Personnel responsible for identifying sanitation failures or food contamination should have a background of education or experience, or a combination thereof, to provide a level of competency necessary for production of clean wholesome food. Food handlers and supervisors should receive appropriate training in proper food-handling techniques and food-protection principles and should be cognizant of the danger of poor personal hygiene and unsanitary practices, and other vectors of contamination.

[36 FR 21041, Nov. 3, 1971]

LABELING REQUIREMENTS

§§ 260.200—260.201 [Reserved]

PART 261—UNITED STATES STANDARDS FOR GRADES OF WHOLE OR DRESSED FISH

Subpart A—United States Standards for Grades of Whole or Dressed Fish

Sec.

Subpart B—United States Standards for Grades of Frozen Headless Dressed Whiting

Sec.

AUTHORITY: 7 U.S.C. 1621-1630.

SOURCE: 42 FR 52750, Sept. 30, 1977, unless otherwise noted.

Subpart A—United States Standards for Grades of Whole or Dressed Fish

§ 261.101 Scope and product description.

This standard shall apply to whole or dressed fish, whether fresh or frozen, of any species suitable for use as human food and processed and maintained in accordance with good manufacturing practices.

§ 261.102 Product forms.

(a) *Types.* (1) Fresh.

(2) Frozen solid packs; glazed or unglazed.

(3) Frozen individually; glazed or unglazed.

(b) *Styles.* (1) Whole.

(2) Dressed-eviscerated.

(3) Head-on or headless.

(4) With or without fins.

(5) Skin-on scaled or unscaled; semi-skinned (epidermis removed) or skinless.

(6) Other (as specified).

§ 261.103 Grades—quality factors.

(a) *U.S. Grade A.* Whole or dressed fish shall:

(1) Possess good flavor and odor and;

(2) Comply with the limits for defects for U.S. Grade A quality in accordance with § 261.104.

(b) *U.S. Grade B.* Whole or dressed fish shall:

(1) Possess reasonably good flavor and odor and;

(2) Comply with the limits for defects for U.S. Grade B quality in accordance with § 261.104.

(c) *Substandard.* Whole or dressed fish does not possess reasonably good flavor and odor and/or exceeds the limits for defects for U.S. Grade B quality in accordance with § 261.104.

§ 261.104 Determination of grade.

(a) *Procedures for grade determination.* The grade shall be determined by sampling in accordance with the sampling plan described in paragraph (b) of this section evaluating odor and flavor in accordance with paragraph (c) of this section examining for defects in accordance with paragraphs (d), (e) and (f) of this section and using the results to assign a grade as described in paragraph (g) of this section.

(b) *Sampling.* The sampling rate of specific lots for all inspections, other than for military procurement, shall be in accordance with the sampling plans contained in Part p60 of this chapter except that the sample unit is ten (10) fish for fish weighing up to 10 pounds. Fish weighing over ten (10) up to fifty (50) pounds—the sample unit shall be five (5) fish. For fish weighing over fifty (50) pounds, the sample unit shall be a minimum of three (3).

(c) *Evaluation of flavor and odor.* (1) Evaluation of the odor on each of the raw fish in the sample unit shall be carried out as follows:

(i) For the examination of small units, break the flesh or thawed sample either with the thumbs or by cutting with a knife in several places. Hold the cut or broken flesh close to the nose for evaluation.

(ii) For the examination of large units, a core may be used. Drill a hole into the hard frozen fish with a high-speed quarter inch drill. As soon as the drill is withdrawn, the hole and drillings are smelled.

(2) If the results of the raw odor evaluation indicate the existence of any off-odors, the sample shall be cooked by any of the methods set forth below to verify the flavor and odor.

(i) *Boil in bag method.* Insert the sample into a boilable film-type pouch; fold the open end of the pouch over a suspension bar and clamp in place to provide a loose seal after evacuating the air by immersing the pouch into boiling water. Cook the contents for 20 minutes (until the internal temperature of the product reaches 160 degrees F.).

(ii) *Steam method.* Wrap the sample in a single layer of aluminum foil, and place on a wire rack suspended over boiling water in a covered container. Steam the packaged product for 20 minutes.

(iii) *Bake method.* Package the product as previously described. Place the packaged product on a flat cookie sheet or shallow flat-bottom pan of sufficient size so that the packages can be evenly spread on the sheet or pan. Place the pan and frozen contents in a properly ventilated oven preheated to 400 degrees F. for 20 minutes.

(3) The amount of material to be cooked shall be based on the results of the raw odor evaluation. A minimum of 25 percent of the sample except that not less than 3 sample units shall be used.

(d) *Examination for physical defects.* Each of the fish in the sample will be examined for defects using the list of defect definitions, and the defects noted and categorized as minor, major, and serious in accordance with Table 1.

(e) *Definitions of defects in whole or dressed fish.* (1) "Abnormal condition" means that the normal physical and/or chemical structure of the fish flesh has been sufficiently changed so that the usability and/or desirability of the fish is adversely affected. It includes, but is not limited to, the following examples:

(i) Jellied—refers to the abnormal condition wherein a fish is partly or wholly characterized by a gelatinous, glossy, translucent appearance.

(ii) Milky—refers to the abnormal condition wherein a fish is partly or wholly characterized by a milky-white, excessively mushy, pasty, or fluidized appearance.

(iii) Chalky—refers to an abnormal condition wherein a fish is partly or wholly characterized by a dry, chalky, granular appearance, and fibrous structure.

(A) Moderate—refers to a condition that is distinctly noticeable but does not seriously affect the appearance, desirability and/or the eating quality of the product.

(B) Excessive—refers to a condition which is both distinctly noticeable and seriously objectionable.

(2) "Appearance defects" shall refer to the overall general appearance of the fish (consistency of the flesh, odor, eyes, gills, and skin) and presence of excessive blood or drip and appearance of the package.

(iii) *Bake method.* Package the product as previously described. Place the packaged product on a flat cookie sheet or shallow flat-bottom pan of sufficient size so that the packages can be evenly spread on the sheet or pan. Place the pan and frozen contents in a properly ventilated oven preheated to 400 degrees F. for 20 minutes.

(3) The amount of material to be cooked shall be based on the results of the raw odor evaluation. A minimum of 25 percent of the sample except that not less than 3 sample units shall be used.

(d) *Examination for physical defects.* Each of the fish in the sample will be examined for defects using the list of defect definitions, and the defects noted and categorized as minor, major, and serious in accordance with Table 1.

(e) *Definitions of defects in whole or dressed fish.* (1) "Abnormal condition" means that the normal physical and/or chemical structure of the fish flesh has been sufficiently changed so that the usability and/or desirability of the fish is adversely affected. It includes, but is not limited to, the following examples:

(i) Jellied—refers to the abnormal condition wherein a fish is partly or wholly characterized by a gelatinous, glossy, translucent appearance.

(ii) Milky—refers to the abnormal condition wherein a fish is partly or wholly characterized by a milky-white, excessively mushy, pasty, or fluidized appearance.

(iii) Chalky—refers to an abnormal condition wherein a fish is partly or wholly characterized by a dry, chalky, granular appearance, and fibrous structure.

(A) Moderate—refers to a condition that is distinctly noticeable but does not seriously affect the appearance, desirability and/or the eating quality of the product.

(B) Excessive—refers to a condition which is both distinctly noticeable and seriously objectionable.

(2) "Appearance defects" shall refer to the overall general appearance of the fish (consistency of the flesh, odor, eyes, gills, and skin) and presence of excessive blood or drip and appearance of the package.

(i) Slight—refers to an appearance defect that is slightly noticeable but does not seriously affect the appearance, desirability, and/or eating quality of the fish.

(ii) Moderate—refers to an appearance, defect that is conspicuously noticeable but does not seriously affect the appearance, desirability, and/or eating quality of the fish.

(iii) Excessive—refers to an appearance defect that is conspicuously noticeable and that does seriously affect the appearance, desirability, and/or eating quality of the fish.

(3) "Discoloration" refers to any color not characteristic of the species used.

(i) Slight—refers to the area affected by discoloration of significant intensity involving up to 10 percent of the total area.

(ii) Moderate—refers to the area affected by discoloration of significant intensity involving over 10 percent and up to 50 percent of the total area.

(iii) Excessive—refers to the area affected by discoloration of significant intensity involving 50 percent or more of the total area.

(4) "Dehydration" refers to loss of moisture from fish surfaces during frozen storage. For skin-on fish, dehydration shall be evaluated by degree of dullness and shrinkage.

(i) Slight dehydration—is surface color masking affecting more than 3 percent of the area which can be readily removed by scraping with a blunt instrument.

(ii) Moderate dehydration—is deep color masking penetrating the flesh, affecting less than 3 percent of the area, and requiring a knife or other sharp instrument to remove.

(iii) Excessive dehydration—is deep color masking penetrating the flesh, affecting more than 3 percent of the area, and requiring a knife or other sharp instrument to remove.

(5) "Surface defects" shall refer to the following where applicable:

(i) Scales. An occurrence of attached or loose scales in any sample unit (where applicable).

(ii) Blood spot. An accumulation of coagulated opaque, masses of blood on a fish.

(iii) Fins or pieces of fin. An occurrence or absence of attached or loose fins or pieces of fin in any sample unit (where applicable). Dorsal spine shall be removed (where applicable).

(iv) Skin. The presence of the dark or light inner layers of skin for skinless. For semiskinned, reference is to the presence of the dark outside layers.

(v) Bruises. An accumulation of damaged portions of fish muscle, red and opaque in appearance (on a fish).

(vi) Damage to protective coating refers to voids in ice glaze or tears in covering membrane, also to breaks or splits in the skin which are readily discernible and not normally part of the processing.

(6) "Cutting and trimming defects" refers to the following:

(i) Body cavity cuts—refers to misplaced cuts made during evisceration.

(ii) Improper heading (as specified)—refers to the presence of pieces of gills, gill cover, pectoral fins (spine), or collarbone after the fish have been headed. No ragged cuts should be evident after heading.

(iii) Evisceration defects—refers to inadequate cleaning of the belly cavity of the fish. All viscera, kidney (where applicable), spawn, and blood should be removed.

(A) Slight degree of improper evisceration and improper heading refers to a condition that is scarcely noticeable but does not affect the appearance, desirability, and/or eating quality of the fish.

(B) Moderate degree of improper evisceration and improper heading refers to a condition that is conspicuously noticeable but does not seriously affect the appearance, desirability, and/or eating quality of the fish.

(C) Excessive degree of improper evisceration refers to a condition that is conspicuously noticeable and that seriously affect the appearance, desirability, and/or eating quality of the fish.

(iv) Improper washing—inadequate removal of slime, blood, and bits of viscera from the surface of the fish and from the body cavity.

(v) Belly burn—an enzymatic action on the flesh causing a burned or discolored appearance.

(7) "Texture defects" texture of the cooked fish; not characteristic of the species.

(i) Slight—fairly firm, only slightly tough or rubbery, does not form a fibrous mass in the mouth, moist but not mushy.

(ii) Moderate—moderately tough or rubbery, has noticeable tendency to form a fibrous mass in the mouth, moist but not mushy.

(iii) Excessive—excessively tough or rubbery, has marked tendency to form a fibrous mass in the mouth, or is very dry or very mushy.

(f) *Categorization of physical defects.*

TABLE I

Physical defects		Categories		
Types	Degree	Minor	Major	Serious
Abnormal condition	Moderate		201	
	Excessive			301
Appearance defects	Slight	102		
	Moderate		202	
	Excessive			302
Discoloration	Slight	103		
	Moderate		203	
	Excessive			303
Dehydration	Slight—more than 3 percent area affected and easily removed.	104		
	Moderate—less than 3 percent area affected but difficult to remove.		204	
	Excessive—greater than 3 percent area affected			304
Surface defects	Slight—3 to 10 percent area affected	105		
	Moderate—greater than 10 percent area affected		205	
Cutting and trimming defects	Body cavity cuts	106		
	Improper heading			
	Slight	107		

National Marine Fisheries Service/NOA

TABLE I—

Physical defects	
Types	De
	Moderate
	Evisceration defects:
	Slight
	Moderate
	Excessive
	Improper washing
	Belly burn
Texture defects	Slight
	Moderate
	Excessive

NOTE: The code numbers shown in the above table are l
keyed to the nature and severity of the defect. They are not s

(g) *Grade assignment.* (1) Each fish in a sample unit will be assigned the grade into which it falls in accordance with the limits for defects, summarized as follows:

Flavor and odor		Maximum number of physical defects permitted		
		Minor	Major	Serious
Grade A	Good	3	0	
Grade B	Reasonably good.	5	1	

(2) Upon determination of grade of each fish in each sample unit, the sample will be designated a grade as follows:

(i) *Grade A.*

Number of subsample units (fish)	Min. No. grade A fish	Max. No. grade B fish	Max. No substand are
10 (up to 10 lb)	8	2	
5 (10 to 50 lb)	4	1	
3 (over 50 lb)	3	0	

(ii) *Grade B.*

Number of subsample units (fish)	Minimum number of grade B fish	Maximu number substan are
10 (up to 10 lb)	8	
5 (10 to 50 lb)	4	
3 (over 50 lb)	3	

(iii) *Substandard.* Any fish not meeting the minimum requirements for Grade B quality.

(3) Upon determination of the grade for each sample unit a lot of whole

TABLE I—Continued

Physical defects		Categories		
Types	Degree	Minor	Major	Serious
	Moderate		206	
	Evisceration defects:			
	Slight	108		
	Moderate		207	
	Excessive			305
	Improper washing	109		
	Belly burn		208	
Texture defects	Slight	110		
	Moderate		209	
	Excessive			306

NOTE: The code numbers shown in the above table are for identification of defects for recording purposes only and are keyed to the nature and severity of the defect. They are not scores.

(g) *Grade assignment.* (1) Each fish in a sample unit will be assigned the grade into which it falls in accordance with the limits for defects, summarized as follows:

Flavor and odor		Maximum number of physical defects permitted		
		Minor	Major	Serious
Grade A	Good	3	0	
Grade B	Reasonably good.	5	1	

(2) Upon determination of grade of each fish in each sample unit, the sample will be designated a grade as follows:

(i) *Grade A.*

Number of subsample units (fish)	Min. No. grade A fish	Max. No. grade B fish	Max. No. substandard
10 (up to 10 lb)	8	2	0
5 (10 to 50 lb)	4	1	0
3 (over 50 lb)	3	0	0

(ii) *Grade B.*

Number of subsample units (fish)	Minimum number of grade B fish	Maximum number of substandard
10 (up to 10 lb)	8	2
5 (10 to 50 lb)	4	1
3 (over 50 lb)	3	0

(iii) *Substandard.* Any fish not meeting the minimum requirements for Grade B quality.

(3) Upon determination of the grade for each sample unit a lot of whole or dressed fish shall be assigned that grade in which:

(i) For physical defects, the number of sample units in the next lower grade does not exceed the acceptance number for deviants prescribed in § 260.61 of the sampling plan, Table II, of Title 50; and

(ii) Not more than 5 percent of the fish in the sample (total fish examined per lot) are in the next lower grade for odor and/or flavor.

NOTE: Sampling for inspection for military procurement shall be in accordance with MIL-STD-105. Lot size shall be expressed in terms of pounds. The sample size shall be in accordance with Inspection Level S-3. Acceptable Quality Levels shall be expressed in terms of defects per hundred units. The AQL's shall be 6.5 for minor and 1.0 for major.

[42 FR 52750, Sept. 30, 1977, as amended at 51 FR 34990, Oct. 1, 1986]

§ 261.105 Hygiene.

Whole or dressed fish shall be processed and maintained in accordance with the applicable requirements of the regulations contained in §§ 260.96 to 260.103 of this chapter and of the good manufacturing practice regulations contained in 21 CFR part 110.

[42 FR 52750, Sept. 30, 1977, as amended at 51 FR 34990, Oct. 1, 1986]

Subpart B—United States Standards for Grades of Frozen Headless Dressed Whiting

§ 261.151 Description of the product.

The product described in this part consists of clean, wholesome whiting (silver hake) *Merluccius bilinearis, Merluccius albidus;* completely and cleanly headed and adequately eviscerated. The fish are packaged and frozen in accordance with good commercial practice and are maintained at temperatures necessary for the preservation of the product.

§ 261.152 Grades of frozen headless dressed whiting.

(a) "U.S. Grade A" is the quality of frozen headless dressed whiting that (1) possess a good flavor and odor and that (2) for those factors that are rated in accordance with scoring system outlined in this part, have a total score of 85 to 100 points.

(b) "U.S. Grade B" is the quality of frozen headless dressed whiting that (1) possess at least reasonably good flavor and odor and that (2) rate a total score of not less than 70 points for those factors of quality that are rated in accordance with the scoring system outlined in this part.

(c) "Substandard" or "Utility" is the quality of frozen headless dressed whiting that meet the requirements of § 261.151 but that otherwise fail to meet the requirements of "U.S. Grade B."

§ 261.161 Determination of the grade.

In a plant under USDC Contract Inspection the grade is determined by examining the product for factors 1 to 10 in the thawed state and factor 11 in the cooked state. For lot inspection, examination of the product for factors 1, 2 and 3 is carried out in the frozen state and 4 to 10 in the thawed state. Factor 11 is examined in the cooked state.

(a) *Factors rated by score points.* Points are deducted for variations in the quality of each factor in accordance with the schedule in Table 1. The total of points deducted is subtracted from 100 to obtain the score. The maximum score is 100 the minimum score is 0.

(b) *Factors not rated by score points.* The factor of "flavor and odor" is evaluated organoleptically by smelling and tasting after the product has been cooked in accordance with § 261.171.

(1) Good flavor and odor (essential requirements for a U.S. Grade A product) means that the cooked product has the typical flavor and odor of the species and is free from rancidity, bitterness, staleness, and off-flavors and off-odors of any kind.

(2) Reasonably good flavor and odor (minimum requirements of a U.S. Grade B product) means that the cooked product is lacking in good flavor and odor but is free from objectionable off-flavors and off-odors of any kind.

TABLE 1—SCHEDULE OF POINT DEDUCTIONS PER SAMPLE

(See footnotes at end of table.)

Factors scored	Method of determining score	Deduct
	FROZEN STATE (LOT INSPECTION ONLY)	
1 Arrangement of product[1]	Small degree: 10 percent of fish twisted or bellies and backs not facing the same direction	2
	Large degree: More than 10 percent of fish twisted, void present or some fish cross packed	5
2 Condition of packaging (overall assessment)	Poor: Packaging material has been soaked, softened or deteriorated	2
3 Dehydration	Small degree: Slight dehydration of the exposed surfaces	2
	Large degree: Deep dehydration of the exposed surfaces	5

TABLE 1—SCHEDULE OF POINT

(See foot

Factors scored	
4 Minimum size: Fish 2 oz. or over are of acceptable size.	Number of fish: Over 0—not Over 0.5—n Over 1.0—n Over 2.0
5 Uniformity. Weight ratio of fish remaining. The 10 percent largest fish divided by the 10 percent smallest fish.	Weight ratio 1 Over 2.0—n Over 2.4—n Over 2.8—n Over 3.2—n Over 3.6
6 Heading[1]	Small degree: Moderate degr
7 Evisceration (overall assessment)	Small degree: Moderate degr Large degree:
8 Scaling[1]	Small degree: Large degree:
9 Color of the exposed surfaces (overall assessment).	Small degree: Large degree:
10 Bruises and split or broken skin	Presence of bru Over 0—not Over 0.5—no Over 1.0—no Over 1.5—no Over 2.0
11 Texture (overall assessment)	Small degree: Large degree:

[1] 10 percent of fish refers to 10 percent by count rounded

[42 FR 52750, Sept. 30, 1977, as amended at

§ 261.171 Definitions and methods of analysis.

(a) *Selection of the sample unit.* The sample unit consists of the primary container and its entire contents. The whiting are examined according to Table 1. Definitions of factors for point deductions are as follows:

(b) *Examination of sample, frozen state.* When this product is examined under USDC Contract Inspection, the samples are examined for factors 1, 2 and 3 in Table 1 in the thawed state. When the product is lot inspected, the samples are examined for factors 1, 2 and 3 in Table 1 in the frozen state.

(1) *"Arrangement of product"* refers to the packing of the product in a symmetrical manner, bellies or backs all facing in the same direction, fish neatly dovetailed.

TABLE 1—SCHEDULE OF POINT DEDUCTIONS PER SAMPLE—Continued

(See footnotes at end of table.)

Factors scored	Method of determining score	Deduct
	THAWED STATE	
4. Minimum size: Fish 2 oz. or over are of acceptable size.	Number of fish less than 2 oz. per lb:	
	Over 0—not over 0.5	5
	Over 0.5—not over 1.0	10
	Over 1.0—not over 2.0	20
	Over 2.0	30
5. Uniformity: Weight ratio of fish remaining. The 10 percent largest fish divided by the 10 percent smallest fish.	Weight ratio 10 percent smallest and 10 percent largest:	
	Over 2.0—not over 2.4	2
	Over 2.4—not over 2.8	5
	Over 2.8—not over 3.2	10
	Over 3.2—not over 3.6	20
	Over 3.6	30
6. Heading[1]	Small degree: 10 percent of fish carelessly cut	5
	Moderate degree: Over 10 percent of fish carelessly cut	15
7. Evisceration (overall assessment)	Small degree: Slight evidence of viscera	2
	Moderate degree: Moderate amounts of ripen, viscera, etc	10
	Large degree: Large amounts of viscera, ripen, etc	30
8. Scaling[1]	Small degree: 10 percent of fish not well scaled	2
	Large degree: Over 10 percent of fish not well scaled	5
9. Color of the exposed surfaces (overall assessment)	Small degree: Minor darkening, oxidized	2
	Large degree: Objectionably dark, brown, etc	5
10. Bruises and split or broken fish	Presence of bruises and/or broken or split fish per pound:	
	Over 0—not over 0.5	1
	Over 0.5—not over 1.0	2
	Over 1.0—not over 1.5	4
	Over 1.5—not over 2.0	7
	Over 2.0	10
11. Texture (overall assessment)	Small degree: Moderately dry, tough, mushy, rubbery, watery, stringy	5
	Large degree: Excessively dry, tough, mushy, rubbery, watery, stringy	15

[1] 10 percent of fish refers to 10 percent by count rounded to nearest whole fish.

[42 FR 52750, Sept. 30, 1977, as amended at 51 FR 34990, Oct. 1, 1986]

§ 261.171 Definitions and methods of analysis.

(a) *Selection of the sample unit.* The sample unit consists of the primary container and its entire contents. The whiting are examined according to Table 1. Definitions of factors for point deductions are as follows:

(b) *Examination of sample, frozen state.* When this product is examined under USDC Contract Inspection, the samples are examined for factors 1, 2, and 3 in Table 1 in the thawed state. When the product is lot inspected, the samples are examined for factors 1, 2, and 3 in Table 1 in the frozen state.

(1) *"Arrangement of product"* refers to the packing of the product in a symmetrical manner, bellies or backs all facing in the same direction, fish neatly dovetailed.

(2) *"Condition of the packaging material"* refers to the condition of the cardboard or other packaging material of the primary container. If the fish is allowed to stand after packing and prior to freezing moisture from the fish will soak into the packaging material and cause deterioration of that material.

(3) *"Dehydration"* refers to the presence of dehydrated (water-removed) tissue on the exposed surfaces of the whiting. Slight dehydration is surface dehydration which is not color-masking. Deep dehydration is color-masking and cannot be removed by scraping with a fingernail.

(c) *Examination of sample, thawed state.* Thawed state means the state of the product after being thawed. Thawing the sample is best accomplished by enclosing the sample in a film type

bag and immersing in an agitated water bath held at 68° F., ±2° F. Allow the product to remain immersed until thawed. Alternatively when the facilities are lacking for water thawing, the sample may be thawed by slacking it out at a temperature between 30° to 40° F. on an aluminum tray from 2 hours for a 1½-pound sample to 8 hours for a 10-pound sample.

(1) *"Minimum size"* refers to the size of the individual fish in the sample. Fish 2 ounces or over are considered acceptable. Smaller fish cannot be cooked uniformly with acceptable size fish. Separate the fish of unacceptable size, divide their number by the weight of the sample in pounds, and apply to Table 1. Example—four fish of unacceptable size in a 5-pound package is ⅘=0.8, a 10 point deduction.

(2) *"Uniformity."* From the fish remaining, select by count 10 percent (minimum of one fish) of the largest and 10 percent (minimum of one fish) of the smallest and divide the largest weight by the smallest weight to get a weight ratio.

(3) *"Heading"* refers to the condition of the fish after they have been headed. The fish should be cleanly headed behind the gills and pectoral fins. No gills, gill bones, or pectoral fins should remain after the fish have been headed.

(4) *"Evisceration"* refers to the cleaning of the belly cavities of the fish. All spawn, viscera, and belly strings should be removed.

(5) *"Scaling"* refers to the satisfactory removal of scales from the fish.

(6) *"Color of the cut surfaces"* refers to the color of the cut surfaces of the fish after heading and other processing.

(7) *"Bruises and broken or split skin"* refers to bruises over one-half square inch in area and splits or breaks in the skin more than one-half inch in length which are not part of the processing.

(d) *Examination of sample, cooked state.* Cooked state means the state of the sample after being cooked. Cooking the sample is best accomplished by inserting the sample into a film type bag and submerging it into boiling water for from 18-20 minutes. A minimum of three fish per sample unit shall be cooked.

(1) *"Texture defects"* refers to the absence of normal textural properties of the cooked fish flesh, which are tenderness, firmness, and moistness without excess water. Texture defects are dryness, softness, toughness, and rubberyness.

(e) *General definitions.* (1) *Small* (overall assessment) refers to a condition that is noticeable but is only slightly objectionable.

(2) *Moderate* (overall assessment) refers to a condition that is distinctly noticeable but is not seriously objectionable.

(3) *Large* (overall assessment) refers to a condition which is both distinctly noticeable and seriously objectionable.

§ 261.175 Tolerances for certification of officially drawn samples.

The sample rate and grades of specific lots shall be certified in accordance with part 260 subpart A of this chapter. (Regulations Governing Processed Fishery Products).

PART 262—UNITED STATES STANDARDS FOR GRADES OF FISH STEAKS

Subpart A—[Reserved]

Subpart B—United States Standards for Grades of Frozen Halibut Steaks

Sec.
262.151 Product description.
262.152 Styles of frozen halibut steaks.
262.153 Grades of frozen halibut steaks.
262.156 Recommended dimensions.
262.161 Ascertaining the grade.
262.171 Definitions and methods of analysis.
262.175 Tolerances for certification of officially drawn samples.

Score Sheet

262.181 Score sheet for frozen halibut steaks.

Subpart C—United States Standards for Grades of Frozen Salmon Steaks

262.201 Product description.
262.202 Styles.
262.203 Grades.
262.206 Recommended dimensions.

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262.211 Ascertaining the grade.
262.221 Definitions.
262.225 Tolerances for certification cially drawn samples.
262.231 Score sheet for frozen steaks.

Authority: 7 U.S.C. 1621-1630.

Source: 42 FR 52753, Sept. 30 unless otherwise noted.

Subpart A—[Reserved]

Subpart B—United States Sta for Grades of Frozen H Steaks

§ 262.151 Product description.

Frozen halibut steaks are wholesome units of frozen ra flesh with normally associate and bone and are 2 ounces or n weight. Each steak has two p surfaces and is derived from w subdivided halibut slices of u thickness which result from sa cutting perpendicular to the length, or backbone, of a who but. The steaks are prepare either frozen or unfrozen halibu poglossus spp.) and are process frozen in accordance with goo mercial practice and are mainta temperatures necessary for the vation of the product.

§ 262.152 Styles of frozen halibut

(a) *Style I, random weight pa* individual steaks are of random and neither the weight nor th of weights are specified.

(b) *Style II, uniform weight tion pack.* All steaks in the pac in the lot are of a specified w range of weights.

§ 262.153 Grades of frozen halibu

(a) "U.S. Grade A" is the qu frozen halibut steaks which good flavor and odor, and t those factors which are rate cordance with the scoring syst lined in the following secti total score is not less than 85 p

(b) "U.S. Grade B" is the qu frozen halibut steaks which p least reasonably good flavor a and that for those factors w rated in accordance with the

PREMIUM QUALITY NET-CAUGHT SALMON PILOT PROJECT

ALASKA SEAFOOD MARKETING INSTITUTE

PREMIUM QUALITY GRADING CRITERIA FOR NET-CAUGHT KETA SALMON

The following conditions must be met in order for Pacific salmon of the species *Oncorhynchus keta*, (Keta salmon) to be considered for inclusion in the Alaska Seafood Marketing Institute's 19?? Net-Caught Premium Quality Pilot Project. The interrelationship of all quality factors listed must be considered when evaluating fish.

Characteristics

A. External Surface:

1. Skin color:	Typical of ocean-run fish. Split salmon or salmon sides may show darker skin color if the flesh color meets these grade standards. In no case can the skin color be darker than Keta salmon "D" on the ASMI Color Evaluation Guide for Pacific Salmon.
2. Net marks:	No indentation nor softening of the flesh and no skin perforation.
3. Cuts, seal bites, scars, bruises, punctures:	None permitted.
4. Scales:	Scale adherence reasonably uniform; No more than 15% scale loss permitted. No more than 10% missing in one area.
5. Ectoparasites:	Practically free from ectoparasites. (So called hydrogen bubbles noted on the exterior skin of the salmon).

B. Belly Cavity: (H/G salmon only).

1. Rib bones:	None protruding.
2. Belly burn:	None permitted.
3. Knife cuts:	None permitted.

PREMIUM QUALITY GRADING CRITERIA FOR NET-CAUGHT KETA SALMON

4.	Cleaning:	Thorough; Free of residual blood and viscera (kidney, heart and gill removed).
5.	Bruises:	The split Keta salmon will have no bruises larger than 3/8 of an inch in diameter.
6.	Flesh color:	Typical of ocean-run fish.

C. Flesh Quality:

1.	Texture:	Resilient; No noticeable softness.
2.	Odor:	Sea-fresh; Characteristic of species; No abnormal odor.

D. Frozen Characteristics:

1.	Glaze or protective membrane:	Complete.
2.	Dehydration or freezer burn:	None permitted.
3.	Body distortion:	Minimal.
4.	Caudal fin: (H/G salmon only)	Intact.
5.	Workmanship:	Poor head cuts, knife cuts in belly cavity not permitted.

ASMI guideline

ALASKA SEAFOOD MARKETING INSTITUTE
PREMIUM QUALITY PILOT TEST PROGRAM 1986

PREMIUM QUALITY GRADING CRITERIA FOR KING[5] AND COHO SALMON

The following conditions must be met in order for Pacific salmon of the species *Oncorhynchus tshawtscha* and *O. kisutch* to be considered for inclusion in the Alaska Seafood Marketing Institute's 1986 Premium Quality Pilot Program. The interrelationship of all quality factors listed must be considered when evaluating fish.

CHARACTERISTICS

A. External Surface:

1. Skin color.	Typical of ocean-run fish.
2. Net marks.	None permitted.
3. Cuts, seal bites, scars, bruises, punctures.	None permitted.
4. Scales.	Scale adherence reasonably uniform; No more than 15% scale loss permitted.

B. Belly Cavity:

1. Rib bones.	None protruding.
2. Belly burn.	None permitted.
3. Knife cuts.	None permitted.
4. Cleaning.	Thorough; Free of residual blood and viscera (kidney, heart and gill removed).
5. Bruises.	No visible internal bruises permitted.
6. Flesh color.	Typical of ocean-run fish.[5]

5. White King salmon is not included in this test.

Premium Quality Grading Criteria.

C. Flesh Quality:

1. Texture.	Resilient; No noticeable softness.
2. Odor.	Sea-fresh; Characteristic of species; No abnormal odor.

D. Frozen Characteristics:

1. Glaze or protective membrane.	Complete.
2. Dehydration or freezer burn.	None permitted.
3. Body distortion.	Minimal.
4. Caudal fin.	Intact.
5. Workmanship.	Poor head cuts, knife cuts in belly cavity not permitted.

MARCH 24, 1986

CANNED PACIFIC SALMON

GRADE STANDARD

DEPARTMENT OF FISHERIES & OCEANS
INSPECTION DIVISION
PACIFIC REGION

MARCH 24, 1986

TABLE OF CONTENTS

1.0 INTRODUCTION

The Fish Inspection Regulations provide the authority for the grading of canned Pacific salmon. This document defines "Acceptable Grade" (other than "Grade B") and "Grade B" canned salmon and defines acceptability of canned salmon with respect to wholesomeness. In addition, the criteria and methods for determining the grade of canned Pacific salmon are explained.

2.0 SCOPE

This standard shall identify canned and/or heat-processed Pacific salmon in hermetically sealed containers using current good manufacturing practices and prepared from the species shown in Table I.

TABLE I

SPECIES OF PACIFIC SALMON

COLUMN I	COLUMN II
1. Oncorhynchus nerka	Sockeye Salmon Red Sockeye Salmon Red Salmon
2. Oncorhynchus tschawytscha	Spring Salmon King Salmon Chinook Salmon
3. Oncorhynchus kisutch	Coho Salmon Medium Red Coho Salmon
4. Oncorhynchus gorbuscha	Pink Salmon
5. Oncorhynchus keta	Chum Salmon Keta Salmon
6. Salmo gairdnerii	Steelhead Salmon Deep Sea Trout
7. Salmo salar	Salmon Atlantic Salmon

2.1 It is not the intention for the standard to cover integrity defects including rust and corrosion, chemical and microbiological contamination, the application of additives, underweight conditions or labelling requirements. Applicable legislation and administrative guidelines made under the Fish Inspection Regulations, the Food and Drug Regulations, the Consumer and Corporate Affairs Labelling and Weights and Measures Regulations will regulate these aspects of the product. Other codes of practice which are used for interpreting current good manufacturing practice include:
(i) the International Code of Practice for Low Acid Canned Food, CAC/RCP 23-1979.
(ii) Metal Container Defects Identification and Classification Manual: document prepared by the Department of Fisheries and Oceans, Canada.

MARCH 24, 1986

3.0 SAMPLING

Sampling of lots for examination of the product shall be in accordance with the FAO/WHO Codex Alimentarius Sampling Plans for pre-packaged foods (AQL 6.5) (CAC/RM42-1969). These sampling plans are outlined in Appendix H.

4.0 SIZE OF SAMPLE UNIT

The sample unit shall consist of a can or pouch of salmon and the contents thereof.

5.0 EXAMINATION FOR DEFECTS

The sample unit will be examined for defects described in Appendix A, B, C, D.

6.0 SCORING

The scoring mechanism as outlined in Appendix E shall be used to evaluate samples.

7.0 GRADING OF A LOT

The grading criteria outlined in Appendix G shall be used to determine the grade of a lot of canned Pacific salmon.

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APPENDIX A

DEFINITION OF DEFECTS

APPEARANCE

1.1 CURD - the heat induced coagulation of protein. It is noted as a defect when the curd exceeds 15 mm in diameter.

1.2 BRUISING - discolouration caused by a knock or blow while the fish is alive.

1.3 CLEANING - parts of viscera and/or blood along the backbone.

1.4 CROSS PACK - a piece of the fish is packed horizontally in the can or loose skin appears on top of the contents of the can.

1.5 UNTRIMMED FINS - parts of head, tails or fins.

1.6 WATERMARKED - red, brown, orange, dull grey skin not characteristic of normal skin colour.
blanched flesh - abnormal, pale colour.

1.7 BELLY-BURN - reddened flesh, usually associated with sour odours of decomposition and normally found in the belly cavity.

1.8 GREY DISCOLOURATION - discolouration of the surface of the flesh associated with surface oxidation (normally associated with minced salmon).

1.9 PUGH MARK - a blood spot in the flesh arising from the use of a pugh.

1.10 HARD BONE - may be indicative of under-processing
- bone does not readily crush when placed between the thumb and index finger.

1.11 TOP APPEARANCE - (ragged, loose, cross-packing)
- the top appearance of the can after opening may exhibit an uneven or ragged appearance, may contain loose fish material or may exhibit cross-packing

1.12 MIXED COLOURS IN A SINGLE CAN - can consists of fish with two or more distinct pieces of flesh of different colour (usually associated with patch pieces used in the can).

APPENDIX A COND''T

1.13 MIXED SPECIES IN A SINGLE CAN - can containing flesh of two or more species of fish.

1.14 RATING CLASSIFICATION OF APPEARANCE DEFECTS

TABLE II

	Defect	Rating	Code
1.	TOP APPEARANCE (Ragged, Loose, Cross-Packing)	1	A
2.	POOR CLEANING (Blood and/or Viscera on Backbone, Untrimmed Fins)	1-3	C
3.	BRUISING (Blood Spots, Push Marks)	1-3	B
4.	CURD	1	K
5.	WATERMARKING	1	W
6.	BELLY-BURN	1-3	Y

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APPENDIX A COND'T

		Organoleptic Rating	Code
2.0	ODOUR DEFECTS		
2.1	DECOMPOSED - persistent distinct and uncharacteristic odours characterized by:	1-9	D
2.1.1	fruity (aldehyde odours similar to pineapple or other fruits);		
2.1.2	vegetable odours - (e.g. turnip and cabbage-like but not associated with packing medium);		
2.1.3	sour, yeasty fermented odours;		
2.1.4	ammonia odours, hydrogen sulphide odours;		
2.1.5	other pungent odours such as putrid or faecal.		
2.2	RANCID - odour characterized by the distinct or readily detectable persistent odour of oxidized oil. (This may be characterized by a pungent sensation in the nasal passage).	1-6	R
2.3	LATE - persistent, distinct and uncharacteristic odours of advanced sexual maturity (late-run fish).	1-6	L
2.4	OVERHEATING - distinct and persistent odours that are burnt or acrid, e.g. as associated with excess scorch, stackburn or reprocessing.	*1-3	O
2.5	NON-SPECIFIC UNIDENTIFIABLE ODOUR - Non-characteristic odour. Not associated with decomposition, rancidity, late or overheating.	1-3	N
2.6	CONTAMINATION - odours resulting from contamination by solvents, soaps, fuel oil, grease etc. that are organoleptically detectable.	N/A	Remarks
3.0	FLAVOUR DEFECTS		
3.1	DECOMPOSITION - persistent, distinct and uncharacteristic flavours characterized by:	1-9	D
	a. Sweet, fruity flavours b. Vegetable flavours c. Putrid, sour, or faecal flavours		
3.2	RANCID - characterized by distinct flavours present individually or in combination as follows:	1-6	R
	a. Bitter, sour, metallic flavours (detected at the sides and back of the tongue leaving a lingering after taste).		

*NOTE: for 4 lb salmon pack, the organoleptic rating is 1 or 3

APPENDIX A COND'T

	FLAVOUR DEFECTS COND'T	Orgonoleptic Rating	Code
3.3	ABNORMAL - distinct and persistent flavours that are burnt or acrid, i.e. associated with excess scorching, stackburn or reprocessing.	*1-3	O
3.4	LATE - persistent, distinct and uncharacteristic flavours of advanced sexual maturity (late-run fish).	1-6	L
3.5	CONTAMINATION - flavours resulting from contamination by solvents, soaps, fuel oil, grease, etc.	N/A	Remarks
4.0	MISCELLANEOUS DEFECTS		
4.1	FOREIGN MATERIAL Assessed by AQL System Depending on Aesthetic/Health Hazard Classification	N/A	Remarks
4.2	SULPHIDING - (Assessed by AQL System) - Light $< 16\ mm^2$ - moderate $> 16\ mm^2 \leq 50\ mm^2$ - excessive $> 50\ mm^2$ (and/or on product) - reject level	N/A	Remarks
4.3	MIXED COLOURS - assessed by AQL System (Appendix H)	N/A	H
4.4	MIXED SPECIES - assessed by AQL System (Appendix H)	N/A	P
4.5	GREY DISCOLOURATION - assessed by AQL System (Appendix H)	N/A	G
4.6	HARD BONE - as this may indicate a potential health hazard situation, other factors such as processing time and temperature data must be reviewed before a decision can be made with regard to the acceptability of the lot.	N/A	Remarks

NOTE; N/A = Not Applicable

*NOTE: for 4 lb salmon pack, the organoleptic rating is 1 or 3

APPENDIX B

1.0 MEASUREMENT OF TEXTURE ("TEXTOMETER" METHOD)

1.1 The texture or firmness score of each sample can is related to the "Canned Salmon Textometer" reading of the can as shown in Table II. The "Canned Salmon Textometer", a six-pronged device, measures the texture or resilience of the fish flesh by averaging the maximum strain exerted on the prongs by the flesh during the test.

TABLE III

Texture Reading of Individual Cans and Corresponding Score

Sockeye	Coho Blueback	Pink	Chum	Spring	Steelhead	Rating	Score
22-23	21-22	19-20	22-23	17	19-20	1 - Slightly soft	1
20-21	19-20	17-18	20-21	16	17-18	2 -	
18-19	16-18	15-16	18-19	15	15-16	3 - Moderately soft	2
15-17	13-15	12-14	15-17	14	12-14	4 -	
12-14	10-12	9-11	12-14	13	9-11	5 -	
9-11	7-9	6-8	9-11	12	6-8	6 - Excessively soft	3
0-8	0-6	0-5	0-8	0-11	0-5	7 -	

APPENDIX B COND'T

	SENSORY EVALUATION OF TEXTURE	Rating
1.2.1	Breakdown of muscle structure characterized by muscle fibres no longer being detectable resulting in the presence of small particles and/or a granular, gritty or pasty texture exceeding 5% of the drained content.	1
1.2.2	Breakdown of muscle structure characterized by muscle fibres no longer being detectable resulting in the presence of small particles and/or a granular, gritty or pasty texture exceeding 10% of the drained content.	2
1.2.3	Breakdown of muscle structure characterized by muscle fibres no longer being detectable resulting in the presence of small particles and/or a granular, gritty or pasty texture exceeding 20% of the drained content.	3

APPENDIX C

2.0 MEASUREMENT OF OIL VOLUME

2.1 The drained liquid from a 12 can sample (3 cans for the 4 pound salmon can) is collected into a graduated cylinder and allowed to stand for five minutes. The volume of oil is then measured in milliliters (top layer).

2.2. The score is obtained by matching the volume of oil with the species of fish in Table VI, Appendix E.