



(86) Date de dépôt PCT/PCT Filing Date: 2001/03/23
(87) Date publication PCT/PCT Publication Date: 2002/07/18
(45) Date de délivrance/Issue Date: 2007/03/20
(85) Entrée phase nationale/National Entry: 2003/07/09
(86) N° demande PCT/PCT Application No.: JP 2001/002341
(87) N° publication PCT/PCT Publication No.: 2002/054861
(30) Priorité/Priority: 2001/01/11 (JP2001/3348)

(51) Cl.Int./Int.Cl. *A01K 63/02* (2006.01),
A01K 63/04 (2006.01), *A22C 25/00* (2006.01)
(72) Inventeur/Inventor:
HIRAOKA, KENICHI (DECEASED), JP
(73) Propriétaire/Owner:
JAPAN-TECHNO, INC., JP
(74) Agent: OGILVY RENAULT LLP/S.E.N.C.R.L.,S.R.L.

(54) Titre : PROCÉDE POUR TRAITER LE POISSON FRAIS
(54) Title: METHOD FOR TREATING FRESH FISH

(57) **Abrégé/Abstract:**

The present invention provides a process for treating living fish having an improved meat quality or an elongated period of tasting time, or providing internal organs having an improved quality. According to the present invention, living fish is kept alive in an aqueous alkali solution and then washed with water or neutralized.

Abstract

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5 tasting time, or providing internal organs having an improved quality. According to the present invention, living fish is kept alive in an aqueous alkali solution and then washed with water or neutralized.

Process for Treating Fresh Fish

The present invention relates to a process for treating fresh fish. In particular, the present invention relates to a process for
5 treating fresh fish, which process is capable of improving the quality of fish meat, extending the period of tasting time of fresh fish or obtaining high quality internal organs and the like of fresh fish.

Fresh fish foods made of internal organs such as the
10 internal organs of fish have been available on the market. However, the freshness of fish decreases immediately after its death. In particular, the internal organs of fish start to drip or to be deformed within several hours after its death. Such a phenomenon is considered to be caused by miscellaneous germs
15 originally kept in the fish body. Although the propagation of the germs is inhibited by the resistance of the fish itself to germs while the fish is alive, the resistance is lost and the germs propagate after the death of the fish. It is considered that various kinds of miscellaneous germs are present in the internal organs of
20 fish. After the internal organs have rotted, the membranes covering them are broken and other organs also start to decay.

Therefore, when a fresh product is to be produced from, for example, internal organs of fish, as fresh as possible, fish must be obtained and the internal organs must be removed from them as
25 soon as possible. However, although the time for decay of the internal organs varies depending on the kind of the fish, the rate of decay of the internal organs is generally high even when the fish is fresh. Thus, the amount of the utilizable internal organs is

limited.

Further, the rotting proceeds also in the ovary or milt adjacent to the internal organs. In fish, the ovary or milt is separated from the internal organs only by an extremely thin
5 membrane and, therefore, the germs easily invade into the ovary or milt from the internal organs. Under these conditions, fresh fish immediately after the catch is required for obtaining fresh ovary or milt. The ovaries to be eaten include, for example, roe of salmon and trout (Sujiko) and also those roe wherein eggs are
10 separated from each other (Ikura). The milts to be eaten are available under the name of soft roe.

The object of the present invention is to provide a process for treating fresh fish for producing fresh products having an extended period of tasting time or an increased commercial value
15 from the internal organs of fish, as well as fresh products from adnexa, such as ovaries and milts.

After intensive investigations for attaining the above objective, the inventor has found that fresh internal organs or adnexa of fish can be obtained by treating the miscellaneous germs
20 while the fish is alive. The present invention has been attained on the basis of this finding. The inventor has found that the objective can be attained by keeping living fish in a treating solution, i.e. an aqueous alkali solution, so that the aqueous alkali solution can reach the internal organs and adnexa to previously
25 sterilize or control the miscellaneous germs in the internal organs and adnexa. The aqueous alkali solution is then removed by washing with water or neutralizing the aqueous alkali solution and taking the internal organs etc. from the abdominal cavity of

the fish. The present invention has been attained on the basis of the new finding.

Fish species that can be treated by the present invention is not limited. The process of the present invention can be employed
5 for the treatment of various kinds of fish. Examples of fish, the internal organs of which are particularly usable, include salmon organs and codfish organs. Examples of fish ovaries or eggs which are usable include salmon, trout, herring, mullet (such as striped
10 include salmon, globefish, codfish and herring.

In the present invention, fresh fish are desirably treated on a boat immediately after catching. Preferably, the fish are kept alive by immediately placing them in a live well containing an aqueous alkali solution or a mixture of seawater and the aqueous
15 alkali solution on the boat. It is also desirable to extract the internal organs and adnexa from the abdominal cavity of each living fish.

Examples of suitable alkalis include calcium oxide, sodium hydroxide, potassium hydroxide, calcium hydroxide, disodium
20 hydrogenphosphate, sodium phosphate, dipotassium hydrogenphosphate, potassium phosphate, diammonium hydrogenphosphate, sodium polyphosphate, potassium polyphosphate, calcium phosphate, magnesium carbonate, ammonium carbonate, sodium carbonate, potassium carbonate,
25 calcium carbonate, sodium hydrogencarbonate and potassium hydrogencarbonate. These alkalis are useful either alone or in the form of a mixture of them. The readily available alkalis include, for example, calcium carbonate and sodium carbonate.

The aqueous alkali solution is usable as it is or it may be added to salt water.

The concentration of the alkali in the aqueous alkali solution is preferably 0.01 to 5 % by mass, particularly preferably
5 0.1 to 2 % by mass. For keeping the fish alive for a long period of time, it is desirable to keep the concentration of the aqueous alkali solution low.

When the aqueous alkali solution is to be added to salt water, the concentration of the alkali in the aqueous alkali
10 solution is preferably 0.01 to 5 % by mass, particularly preferably 0.1 to 2 % by mass.

In the event that the concentration of the alkali in the aqueous alkali solution added to salt water is high, the fish can live in the mixture for an extended period.

15 As for attaining the concentration of salt in salt water, seawater is sufficient or a salt concentration almost equal to that of seawater. The suitable salt concentration is, for example, about 1 to 6 % by mass.

The pH of the aqueous alkali solution or seawater
20 containing this solution is at least higher than the pH of the seawater. It is, for example, not lower than 8.0, particularly preferably not lower than 8.2. For rapid treatment, a high pH value is desirable. To ensure that the fish live, the upper limit of pH value is approximately 11. A preferred pH value is in the
25 range of 8.5 to 13.0, particularly 9.5 to 12.0.

The period for treatment with the aqueous alkali solution usually varies depending on the treatment temperature. For effective protection against decay, the treatment time is at least 5

minutes. As for the upper limit of the period, it is desirable to continue the treatment until the internal organs or the like are taken out from the living fish.

The suitable treatment temperature is the ordinary
5 temperature for fish, typically 0 to 10°C, preferably 0 to 5°C.

The living fish thus treated with the alkali is then washed with water to remove the aqueous alkali solution or may be neutralized.

The fish can be washed with water by letting the fish swim
10 in water (such as tap water) or in salt water or by immersing the fish therein. The concentration of the salt water is, for example, 1 to 6 %, preferably 1 to 4 %. The treatment with salt water is preferred after the death of the fish because the internal organs and eggs in the fish become firm.

15 The neutralization treatment can be conducted by, for example, immersing the fish in an acidic solution.

The acidic solutions suitable include, for example, aqueous solutions of inorganic acids such as hydrochloric acid, sulfuric acid and nitric acid and organic acids such as acetic acid, sulfonic acid
20 and citric acid. Preferred acids are, for example, acetic acid and citric acid.

The pH of the acidic solution for the immersion is, for example, 4.0 to 6.8, preferably 5.5 to 6.5.

The neutralization can be carried out in the acidic salt
25 water. In such a case, the concentration of the salt water is, for example, 1 to 16 % by mass, preferably 1 to 4 % by mass. The neutralization temperature is preferably, for example, in the range

of about 4 to 25°C.

The neutralization time, which is variable depending on the alkali treatment time, is usually 10 minutes to 2 hours, preferably 30 minutes to 1 hour. After the neutralization, the pH of water on the surface of the living fish body may be in a weak acidic range.

After the washing with water or a neutralization treatment to remove the aqueous alkali solution, the internal organs such as entrails and stomach, ovary, eggs or milt are removed from the living fish as soon as possible. These internal organs can be used as they are or, if necessary, they may be processed depending on the purpose. For example, entrails are preserved in salt to obtain foods such as Chu pickled in salt and Mefun preserved in salt. Ovaries and eggs are usable as they are or in the form of Sujiko or Ikura. If necessary, those raw products can be further processed with seasonings, etc.

The following Examples will further specifically illustrate the present invention.

Example 1

An alkaline treating solution having the following composition was prepared:

Sodium acetate (buffer)	38 % by mass
Calcium oxide (alkali)	30 % by mass
Glucose (penetrant)	32 % by mass

10 g of the alkaline treating solution was dissolved in water to produce an aqueous alkali solution having a calcium oxide content of 0.15 % by mass and a pH of 11, which was to be used as a live well.

Salmon caught in the Pacific Ocean were immediately put in the live well. The living salmon were conveyed to a harbor 2 hours after. Immediately after the unloading, the salmon were put in a water tank containing 4°C water. After letting the salmon swim therein for 1 hour, the ventral side of each salmon was cut, and the internal organs were removed and washed with water for a short period. The internal organs thus obtained had the original vivid color. Even when the internal organs were stroked with fingers, the membranes thereof were not broken. The internal organs thus obtained were salted to produce Chu pickled in salt.

Comparative Example 1

The same procedure as observed in Example 1 was repeated except that the treatment with the aqueous alkali solution and washing with water were omitted. It was noted that the internal organs of the salmon had started to decay when they were removed from the ventral side of the salmon. As compared with the internal organs obtained in Example 1, the color of the internal organs in this case was less vivid and drip was observed. When the internal organs were stroked with fingers, the membranes were easily broken. Accordingly, the internal organs thus treated were unacceptable for vending in the market.

25 Example 2

Salmon caught in Hokkaido in September were immediately put in a live well containing the same aqueous alkali solution as that used in Example 1. The living salmon were kept therein for

2 hours. The salmon were then put in a water tank containing water at a temperature of 4°C. After letting the salmon swim therein for 1 hour, the ventral side of each salmon was cut, and the ovary was removed. The ovary was washed with water for a short period of time to remove blood and mucus therefrom. The ovaries obtained had a vivid color. The ovaries were arranged on a drainboard to drain them, then immersed in a saturated salt water for 15 minutes and piled up on a tray. A weight was placed thereon, and they were kept in a refrigerator at 8°C for 5 days. Salted salmon Sujiko having a salt concentration of 4 to 5 % was thus obtained.

The salmon Sujiko thus obtained kept the original vivid color and had a period of tasting time of 20 days at 5°C in a refrigerator. During this period, the membrane of each egg of the salted Sujiko remained intact and no dripping was observed. While the period of tasting time of the salmon Sujiko produced without the treatment was 14 days, that of the present invention was remarkably extended.

When the fresh salmon Sujiko was treated by the process of the present invention and the subsequent steps including the immersion in the saturated salt water were omitted, the obtained salmon Sujiko could be kept from the spoilage for about 5 days, while those not treated by the process of the present invention could be kept from the spoilage for at most about 3 days.

According to the present invention, the period of tasting time of the internal organs and adnexa such as ovaries can be remarkably extended by immersing living fish in an aqueous alkali solution. In particular, the treatment of the internal organs such

as guts to produce the foods is facilitated by controlling the decay.

Although embodiments of the invention have been described above, it is not limited thereto, and it will be apparent to persons skilled in the art that numerous modifications and variations from
5 part of the present invention insofar as they do not depart from the spirit, nature and scope of the claimed and described invention.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A process for obtaining internal organs or adnexa from fresh
5 fish, comprising the steps of:
 - keeping living fish alive in an aqueous alkali solution at a pH
of 8.5 to 13.0;
 - washing said living fish with water or neutralizing said
living fish; and
 - 10 removing said internal organs or adnexa from said fish,
wherein said aqueous alkali solution is prepared by
dissolving an alkali compound in water, said alkali compound
selected from the group consisting of calcium oxide, sodium
hydroxide, potassium hydroxide, calcium hydroxide, magnesium
15 carbonate, ammonium carbonate, sodium carbonate, potassium
carbonate, calcium carbonate, sodium hydrogencarbonate and
potassium hydrogencarbonate.
2. The process according to claim 1, wherein said living fish is
20 selected from the group consisting of salmon, trout, herring, codfish,
mullet, flying fish and globefish.
3. The process according to claim 1, wherein said aqueous alkali
solution has a pH of 9.5 to 12.0.