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(54) Titre : AGENTS DE CONSERVATION DE CRUSTACES ET METHODE DE CONSERVATION DE CRUSTACES
(54) Title: PRESERVATIVES FOR CRUSTACEANS AND PRESERVATION METHOD OF CRUSTACEANS

(57) **Abrégé/Abstract:**

The present invention provides a hygienically safe preservative for crustaceans in place of conventional sulfite compounds used for preserving the crustaceans, wherein the preservative is able to prevent the appearance, color and flavor from being deteriorated while it can suppress unpleasant taste and unpleasant odor from generating by taking advantage of organic materials known as foods and food additives. The preservative for the crustaceans contains a first component comprising an effective amount of ascorbic compounds, organic polybasic acid compounds in an amount less than equivalent to the content of the first component, and a second component comprising at least a compound selected from amino acid compounds in an amount less than equivalent to the content of the first component, and the content of the second component is less than equivalent to the content of the first component. The crustaceans in a live state, in a raw state of an apparent death but not losing their vital reactions or in a frozen state capable of resuming their vital reactions after defrosting are subjected to preservative treatment by allowing them to contact a preservative treatment liquid for the crustaceans, and the treated crustaceans are preserved by chilling or freezing.



ABSTRACT OF THE DISCLOSURE

The present invention provides a hygienically safe preservative for crustaceans in place of conventional sulfite compounds used for preserving the crustaceans, wherein the preservative is able to prevent the appearance, color and flavor from being deteriorated while it can suppress unpleasant taste and unpleasant odor from generating by taking advantage of organic materials known as foods and food additives.

The preservative for the crustaceans contains a first component comprising an effective amount of ascorbic compounds, organic polybasic acid compounds in an amount less than equivalent to the content of the first component, and a second component comprising at least a compound selected from amino acid compounds in an amount less than equivalent to the content of the first component, and the content of the second component is less than equivalent to the content of the first component. The crustaceans in a live state, in a raw state of an apparent death but not losing their vital reactions or in a frozen state capable of resuming their vital reactions after defrosting are subjected to preservative treatment by allowing them to contact a preservative treatment liquid for the crustaceans, and the treated crustaceans are preserved by chilling or freezing.

PRESERVATIVES FOR CRUSTACEANS AND PRESERVATION METHOD OF CRUSTACEANS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to preservatives for crustaceans used for preserving raw crustaceans without deteriorating the quality thereof.

2. Description of the Related Art

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Among fishery products, crustaceans such as shrimps and crabs are known to stop, once captured and landed, their vital reactions at first and are stiffened immediately after death, followed by deterioration by oxidation of tissues to advance discoloration of whiskers and shells and softening of muscles, finally to putrefaction. Accordingly, these fishery products have been usually stored frozen for blocking such deterioration from advancing. However, since deterioration of tissues of shrimps, especially deep-water shrimps, promptly advances after defrosting even when the shrimps, in particular deep-water shrimps, have been stored frozen, it has been recommended to cook as soon as possible after defrosting, or to process into preserved foods.

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Alternatively, raw shrimps are chilled without freezing, and are cooked before deterioration advances so severely, in addition to chilled storage after defrosting the frozen shrimps. However, since deterioration of the

tissue of the shrimp advances during cooking and storage at room temperature, sulfite compounds including sulfur dioxide have been approved to use for shrimps and crabs as preservatives for preventing commercial values from decreasing. These sulfite compounds have antioxidative ability, and are able to suppress deterioration such as black discoloration of heads, whiskers and legs of shrimps or delustering of a part of the shell due to whitening. Therefore, it has been supposed that most of the frozen

10 shrimps and chilled shrimps sold in the market have been subjected to deterioration-preventive processing with preservatives containing sulfite compounds such as sulfite salts or pyrosulfite salts.

An example of the most frequently used preservatives containing the sulfite compound is an aqueous solution containing about 2% of sodium pyrosulfite and about 1% of erythorbic acid, in which a small amount of phosphate salts such as sodium tripolyphosphate and sodium polyphosphate are further added. Otherwise, an aqueous solution of

20 above-mentioned preservatives blended with 2 to 3% of dextrin is also used. The aqueous solution of conventional preservatives was stored in a relatively small volume of an immersion tank, and shrimps swimming in a fish preserve after capture are scooped, sorted on a conveyer and sent to the immersion tank. The shrimps are scooped again after a short period of the immersion step to send them to a chilling step or freezing step, and chilled products or

frozen products were shipped.

10 While the sulfite compound is known to be a potent reducing material, it is approved to use as a bleaching agent and an antioxidant besides the use as a food additive for preservation of foods. Although an approved residual concentration in the shrimps and the like is 0.10 g/kg as converted into the concentration of sulfur dioxide since a small amount of it is considered to be harmless to the health, the sulfite compound itself is not a chemical desirable as a food additive. Moreover, shells and muscles of the shrimps processed with preservatives containing the sulfite compound may be bleached with the loss of luster, while other drawbacks such as unpleasant odor and unpleasant taste such as bitter taste in the food may occur.

20 The amount of the sulfite compound attached to the frozen shrimp may be determined, for example, by a simplified method for measuring the concentration of the sulfite ion in a leaching solution comprising the steps of immersing the shrimp in distilled water in a weight 5-fold of the weight of the shrimp for 5 minutes at a temperature of 15°C or less, dipping a sulfite ion test paper (trade name: QUANTOFIX Sulphite, manufactured by NACHERY NAGEL, GmbH) in this leaching solution, and comparing the color tone of the colored test paper with a sample color 20 seconds after dipping.

Accordingly, the inventors of the present invention have developed a preservative composition for shrimps

having excellent performance for preventing black discoloration while the composition gives a good color of the meat and is hygienically safe by using organic materials known as foods and food additives in place of conventionally used sulfite compounds. The inventors have found a preservative for the shrimps containing an effective concentration of an ascorbic acid compound and a reducing sugar compound in an amount 0.1 to 1 fold of the amount of the ascorbic acid compound. This composition was submitted to patent application as Japanese Patent Application Laid-Open No. 2004-236756.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide a hygienically safe preservative for crustaceans by using organic materials as safe food additives without using any sulfite compounds, wherein the preservative is able to prevent the appearance, color and flavor of the crustaceans including shrimps and crabs from being deteriorated while it suppresses unpleasant taste and odor from being generated. These conventional preservatives were insufficient for the crustaceans.

The present invention provides a preservative for crustaceans containing a first component comprising an

effective amount of an ascorbic acid compound; and a second component comprising at least one compound selected from organic polybasic acid compounds in an amount less than equivalent to the content of the first component, and amino acid compounds in an amount less than equivalent to the content of the first component, wherein the content of the second component is less than equivalent to the content of the first component. The preservative is preferably water soluble.

The present invention also provides a preservative for crustaceans in a live state containing:

- 10 a first component comprising at least one ascorbic acid compound selected from ascorbic acid, erythorbic acid, salt thereof and an ester thereof; and
- a second component comprising at least one compound selected from:
- (1) at least one organic polybasic acid compound selected from malic acid, succinic acid, citric acid, tartaric acid and salts thereof; and
- (2) at least one amino acid compound selected from lysine and glycine, either of which is in an amount of 0.05 to 0.5 fold of the amount of said first component; and
- the amount of said second component being in an amount less than 0.5 fold of the amount of the first component.

- 20 The present invention also provides a method for preserving crustaceans comprising the steps of:

 treating the crustaceans in a live state, in a raw state of an apparent death but not losing their vital reactions or in a frozen state for resuming the vital reactions after defrosting by allowing the crustaceans to contact a preservative treatment liquid for the crustaceans; and preserving the treated crustaceans by chilling or freezing,

 the preservative for crustaceans containing a first component comprising an

effective amount of ascorbic compounds, and a second component comprising at least a compound selected from organic polybasic acid compounds in an amount less than equivalent to the content of the first component and amino acid compounds in an amount less than equivalent to the content of the first component, the content of the second component being less than equivalent to the content of the first component.

The present invention also provides a method for preserving crustaceans in a live state comprising the steps of:

10 treating the crustaceans in a live state, in a raw state of an apparent death but not losing their vital reactions or in a frozen state for resuming the vital reactions after defrosting by allowing the crustaceans to contact a preservative treatment liquid for the crustaceans; and preserving the treated crustaceans by chilling or freezing, said preservative treatment liquid for the crustaceans containing:

a first component comprising at least one ascorbic acid compound selected from ascorbic acid, erythorbic acid, salt thereof and an ester thereof; and

a second component comprising at least one compound selected from:

(1) at least one of organic polybasic acid compound selected from malic acid, succinic acid, citric acid, tartaric acid and salts thereof; and

20 (2) at least one amino acid compound selected from lysine and glycine, either of which is in an amount of 0.05 to 0.5 fold of the amount of said first component; and

the amount of said second component being in an amount less than 0.5 fold of the first component.

The crustaceans, treated by permitting them to contact the preservative solution using the preservative solution for the crustaceans of the present invention and stored by being frozen or chilled, exhibit an effect for suppressing the crustaceans from being deteriorated comparable to the

effect obtained by using sulfite compounds with respect to the occurrence of black discoloration and whitening of heads, whiskers and legs even under a severe condition of leaving in an environment at near room temperature after defrosting. In addition, bleaching of red luster peculiar to the crustaceans, which is inevitable by using the sulfite compound, as well as deterioration of taste and generation of unpleasant odor, may be prevented by using the preservative of the present invention, and an effect for enhancing the quality as a food may be expected. Furthermore, white spots on the shell of deep-water shrimps that lower commercial values may be also efficiently suppressed from being generated.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

At least one compound selected from L-ascorbic acid, stereoisomers of L-ascorbic acid such as D-ascorbic acid referred to erythorbic acid, salts thereof and esters thereof may be used as the ascorbic acid compound of the first component in the preservative for crustaceans of the present invention. Each of these compounds may be used alone, or a plurality of them may be used in combination. It is particularly preferable to use compounds appropriately select from the compounds comprising commercially available L-ascorbic acid and salts of L-ascorbic acid. However, such ascorbic acid and salts thereof are not restricted to those according to

formulations such as Japanese pharmacopoeia, and natural products suitable for edible uses, for examples juices from plant origin, may be used.

10 While one of the second components in the preservative for the crustaceans is an amino acid compound, lysine and glycine are preferable as the amino acid compound used in the present invention. While these amino acid compounds do not exhibit an action for suppressing deterioration of the crustaceans by itself alone, the compound enhances the action of the ascorbic acid compound for preventing deterioration of the crustaceans, in particular the action for suppressing deterioration of appearance, color and flavor of the crustaceans, by using the amino acid compound in an amount 0.5 fold, for example in the range from 0.01 to 0.4 fold. of the amount of the ascorbic acid compound as the first component. The amino acid compound further exhibits an effect for preventing unpleasant taste and flavor from being generated.

20 When the amount of use of the amino acid compound is smaller than the amount in the above-mentioned range, the effect for suppressing deterioration of flavor and generation of unpleasant taste and odor is weak, while the action of the ascorbic acid compound for preventing deterioration is inhibited while the taste of the amino acid is added to the crustacean's own taste to arise another unpleasant taste when the amount of use of the amino acid is larger than the above-mentioned range.

Accordingly, the use of the amino acid compound in an amount near the upper limit should be avoided.

The other of the second component in the preservative for the crustaceans of the present invention is an organic polybasic acid compound, and a compound selected from malic acid, succinic acid, tartaric acid and citric acid, and salts thereof is preferable. The organic polybasic acid compound may be any one that is soluble in water and suitable for edible uses, and natural products, for example plant juices and extracts are available. Salts thereof such as sodium and potassium salts are also preferably used. While the organic polybasic acid compound has little actions for suppressing deterioration of the crustaceans by itself alone as the amino acid compound is, the action of the ascorbic acid compound for preventing deterioration, particularly the action of the ascorbic acid compound for preventing deterioration of the appearance of the crustacean, or for preventing generation of black discoloration, white spots and whitening and for preventing decolorization and for suppressing unpleasant odor of the food, is enhanced by using the organic polybasic acid compound in a small amount of one-fold, particularly in an amount of 0.05 to 0.5 fold, of the amount of use of the ascorbic acid compound as the first component, although the amount is different depending on the kind of the crustaceans.

When the amount of use of the organic polybasic acid

compound is smaller than the above-mentioned range, the effect for suppressing deterioration of flavor and generation of unpleasant odor is weak. When the amount of use is larger than the above-mentioned range, on the other hand, the action of the ascorbic acid compound for preventing deterioration may be inhibited while different unpleasant taste may be sensed due to the taste of the organic polybasic acid compound in addition to the crustacean's own taste. Therefore, excess use of the organic polybasic acid compound should be avoided as in the case of the amino acid compound.

The preservative for the crustaceans of the present invention may comprise various components for adding various functions to the preservative other than the above-mentioned basic components. While examples of such additional functional components include: a reducing sugar compound used in the preservative of the shrimp disclosed in Japanese Patent Application Publication No. 2004-236756 by the inventors, wherein the reducing sugar compound effective for prevention of black decolorization, improvement of the color and prevention of the unpleasant taste of the shrimp is added in an amount 0.1 to 1 fold of the amount the ascorbic acid compound; or a thickening agent appropriately added for improving the frozen state of the shrimp. However, appropriate functional components may be added so long as the component is not opposed to the object of the present invention, or the compound does not

violate the conditions for utilizing the materials suitable for use in the food.

For preserving the crustaceans using the preservative for the crustaceans of the present invention, a preservative treatment liquid suitable for immersing the crustaceans should be prepared. While the concentration of the principal agent of the preservative in the preservative treatment liquid, or the concentration of the ascorbic acid compound as the first component is different depending on the kind and freshness of the crustaceans, the concentration in the aqueous solution is preferably in the range from 1 to 1.5%. However, when the preservation environment of the crustaceans subjected to preservative treatment is assumed to be cool or chilled, the concentration of the ascorbic acid compound in the preservative treatment liquid is preferably in the range from 2 to 3%. Accordingly, the concentration of auxiliary agent, or the concentration of the amino acid compound or organic polybasic acid compound as the second component, in the treatment liquid is desirably adjusted so that the concentration is within the range less than 0.5 fold, or less than one-fold, of the concentration of the ascorbic acid compound. However, when the amino acid compound and organic polybasic acid compound as the second components are used together, it is recommended that the concentration of each compound is adjusted so as to be the lower concentration within the above-mentioned concentration

range.

10 It is essential that the crustaceans treated with the preservative for the crustaceans of the present invention are alive at the time of preservative treatment. In other words, the effect of the preservative for the crustaceans of the present invention cannot be obtained unless the crustaceans exhibit vital reactions. Accordingly, it is preferable that live crustaceans immediately after capture, or crustaceans stored under a well-controlled environment are subjected to immersion treatment or shower treatment for a period within the range from 0.1 to 5 minutes immediately after being scooped from the preserve. However, a certain effect for preventing deterioration may be obtained, although not sufficient, by subjecting raw crustaceans in an apparent death state without losing vital reactions to the immersion treatment, or by subjecting rapidly frozen crustaceans that are able to resume vital reaction after defrosting to the immersion treatment immediately after defrosting.

20 The crustaceans subjected to the immersion treatment with the preservative for the crustaceans of the present invention may be frozen immediately after the treatment when the object is long term storage, and the outside of the shell of the crustaceans is desirably frozen, or is covered with glazes. Deterioration of the quality of the crustaceans stored in dark in the above-mentioned condition may be almost perfectly ignored. Accordingly, the

crustaceans are desirably placed in a refrigerator even when they are stored for a short period of time, since deterioration of the quality of the crustaceans after the preservative treatment is dependent on the storage environment after defrosting the crustaceans, particularly on the oxidative substances in the atmosphere, storage temperature and illumination.

10 While the preservative for the crustaceans of the present invention do not particularly restrict the kind of the crustaceans to be subjected to the preservative treatment, the preservative of the present invention can be favorably used for deep-water shrimps as the preservative for the crustaceans that is able to suppress drawbacks on the quality of the deep-water shrimp of the preservative for the shrimp using the sulfite compound, since crucial evaluation items are no unpleasant odor and taste for the deep-water shrimp in which flavor is especially important.

Example 1

20 Deep-water shrimps living at 300 to 400 m below the sea surface were captured with a trawl net, and were stored in a tank filled with sea water at 0 to 5°C. Two ascorbic acid compounds of L-ascorbic acid (ASCA) and erythorbic acid (ETBA) and four amino acid compounds of lysine (LYS), glycine (GLY), arginine (ARG) and sodium glutamate (GLUN) were dissolved in 1% brine at the concentrations shown in Table 1 to prepare preservative treatment liquids having different concentrations to one another. Live deep-water

shrimps were subjected to the preservative treatment using each preservative treatment liquid, deterioration of the quality of respective treated shrimps was tested in order to elucidate the relation between the compounded composition of the preservative treatment liquid and preservative performance for the shrimp.

(Preservative treatment method of shrimp)

10 The deep-water shrimps in the tank were scooped to drain excess water, and were immersed in the preservative treatment liquid in the treatment tank at 4 to 15°C for 1 minute. The deep-water shrimps were scooped again, sealed in a plastic bag with evacuation, and were rapidly frozen in a freezing chamber at -18°C and stored.

(Method for measuring deterioration of shrimp)

20 Ten deep-water shrimps stored in the freezing chamber at least for 16 hours were defrosted in running water (city water) at 15 to 20°C, the deep-water shrimps reached at a temperature of 20°C were aligned on kitchen paper laid on a rectangular tray. The shrimps were left in a room under illumination of a white fluorescent lamp at 21 to 24°C for about 10 hours as a time-dependent acceleration test of deterioration, and the shrimps with shells were observed with respect to black decolorization, generation of white spots and decrease of the color. Then, the meat of the shrimp was tasted to simultaneously investigate unpleasant taste and unpleasant odor, if any. These test items were independently evaluated by five test panelists based on the

following evaluation criteria, marked scores were averaged and the averaged values were rounded. These values are shown in the preservation score column in Table 1 together with total scores.

10 The evaluation criteria such as the state of black decolorization, the degree of residual flavor in the meat, and the presence of unpleasant taste and unpleasant odor were as follows, and were evaluated in five steps from points 4 to point 0. Accordingly, the total score is 6 points or more when all the test items were evaluated as point 2 or more, which shows that shrimp foods heaving no evident defects are obtained. The food showing an item with a score of 1 is evaluated to be out of the specification, and an item of point zero shows that the food cannot be sold as a commercial product.

Point 4: maintains a quality comparable to or not inferior to the quality of live shrimps;

Point 3: the quality is approximately identical to the quality of the live shrimps immediately after defrosting;

20 Point 2: the quality is identical to the quality of the shrimps after defrosting commercially available frozen products;

Point 1: the quality is evidently defective; and

Point 0: not suitable as a food.

In addition to the evaluation by ranking of the above-mentioned deterioration state, the shrimps were totally evaluated as foods in five steps of "quite excellent",

"excellent", "good", "moderate" and "not good" with reference to the above-mentioned total score with correction for the importance of each test item, and the results are listed in the column of the total evaluation in the table.

Two kinds of commercially available comparative preservatives mainly comprising the sulfite compound - namely commercially available preservative A (CMPA) with a blend composition comprising 17.5% of sodium pyrophosphate, 12% of erythorbic acid, 7.5% of sodium polyphosphate and 3% of sodium alginate and 60% of dextrin, and commercially available preservative B (CMP B) with a blend composition comprising 67% of sodium pyrophosphate, 15% of erythorbic acid, 12% of a mixture of sodium phosphate, 3.5% of sodium citrate and 2.5% of sodium glutamate - were prepared. Each of the preservatives was dissolved in 1% brine in recommended concentrations of 4 g/dl and 1 g/dl to prepare reference solutions of the preservative treatment solution. The deep-water shrimps were immersed in this preservative treatment solution as in the example of the present invention, and were preserved by freezing. The frozen deep-water shrimps were defrosted by the same method as described above, and were subjected to deterioration tests to evaluate with respect to each test item. The scores are also listed in Table 1.

[TABLE 1]

Composition of Preservative and Preservation Effect for
Deep-water shrimp (Deterioration Acceleration Test: 21 to
24°C, 10 hours) [A]

Test No.	Composition of Preservative treatment liquid				Results of Evaluation of States after Preservation			Total Score	Total Evaluation
	First Component g/dL		Second Component g/dL	First/Second Ratio	Appearance and Color	Residual Flavor	Unpleasant Taste and Unpleasant Odor		
1*	-		-	-	0	1	0	1	not good
2*	ASCA	3.0	-	0	2	2	1	5	good
3*	ASCA	2.5	-	0	2	2	2	6	good
4*	ASCA	2.0	-	0	2	2	2	6	good
5*	ASCA	1.5	-	0	1	1	2	4	moderate
6*	ASCA	1.0	-	0	1	1	1	3	moderate
7	ASCA	2.5	LYS 0.01	0.004	2	2	2	6	good
8	ASCA	2.5	LYS 0.03	0.012	2	2	2	6	good
9	ASCA	2.5	LYS 0.1	0.04	3	2	3	8	excellent
10	ASCA	2.5	LYS 0.5	0.20	3	3	2	8	excellent
11	ASCA	2.0	LYS 1.0	0.50	2	2	2	6	good
12	ASCA	2.0	LYS 1.5	0.75	2	1	1	4	moderate
13*	-		LYS 2.0	-	0	0	1	1	not good
14	ASCA	2.5	GLY 0.01	0.004	2	2	2	6	good
15	ASCA	2.5	GLY 0.03	0.012	2	2	3	7	excellent
16	ASCA	2.5	GLY 0.1	0.04	3	3	3	9	quite excellent
17	ASCA	2.5	GLY 0.5	0.20	3	3	2	8	excellent
18	ASCA	2.0	GLY 1.0	0.50	3	2	2	7	excellent
19	ASCA	2.0	GLY 1.5	0.75	2	2	1	5	good
20*	-		GLY 2.0	-	0	0	0	0	not good
21*	ETBA	3.0	-	0	2	0	0	2	not good
22*	ETBA	2.5	-	0	2	1	0	3	moderate
23*	ETBA	2.0	-	0	2	1	1	4	moderate
24*	ETBA	1.5	-	0	1	1	1	3	moderate
25*	ETBA	1.0	-	0	1	1	1	3	moderate
26	ETBA	2.5	GLY 0.01	0.004	2	2	1	5	good
27	ETBA	2.5	GLY 0.03	0.012	2	2	2	6	good
28	ETBA	2.5	GLY 0.1	0.04	3	3	2	8	excellent
29	ETBA	2.5	GLY 0.5	0.20	3	2	2	7	excellent
30	ETBA	2.0	GLY 1.0	0.50	2	2	2	6	good
31	ETBA	2.0	GLY 1.5	0.75	2	1	1	4	moderate
32	ASCA	2.5	ARG 0.03	0.012	2	2	1	5	good
33	ASCA	2.5	ARG 0.1	0.04	1	2	1	4	moderate
34	ASCA	2.5	ARG 0.5	0.20	1	1	1	3	moderate
35	ASCA	2.5	ARG 1.0	0.40	1	1	0	2	not good
36*	-		ARG 2.0	-	0	0	0	0	not good
37	ASCA	2.5	GLUN 0.03	0.012	1	1	1	3	moderate
38	ASCA	2.5	GLUN 0.1	0.04	1	1	1	3	moderate
39	ASCA	2.5	GLUN 0.5	0.20	1	1	0	2	not good
40	ASCA	2.5	GLUN 1.0	0.40	1	1	0	2	not good
41*	-		GLUN 2.0	-	0	0	0	0	not good
42*	CMPA	4.0	-	-	4	1	0	5	good

43*	CMPB	1.0	.	.	4	1	0	5	good
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1) *: Comparative Example and Reference Example

2) Abbreviations

ASCA: L-ascorbic acid, ETBA: erythorbic acid, LYS: lysine, GLY: glycine, ARG: arginine, GLUN: sodium glutamate, CMPA: commercially available preservative A, CMPB: commercially available preservative B

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The results in Table 1 show that the deep-water shrimps, which were defrosted after immersing in reference preservative treatment liquids prepared by using commercially available preservative A (CMPA) and commercially available preservative B (CMPB) that are conventional preservatives containing the sulfite compound in which erythorbic acid among the ascorbic acid compounds and sodium pyrosulfite were used together, exhibit an effect for maintaining excellent appearance with respect to prevention of black decolorization and preservation of the color as compared with the deterioration state (the data in Test Example No. 1) after 10 hours' live deep-water shrimps not subjected to preservative treatment. However, flavor of the live deep-water shrimps is impaired while the quality as the food is not substantially retained due to occurrence of unpleasant taste and unpleasant odor (see the data in Test Nos. 42 and 43). In addition, the effect of L-ascorbic acid as a representative of the ascorbic acid compounds is inferior to conventional preservative

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treatment liquids containing the sulfite compounds with respect to prevention of black decolorization and preservation of the color when L-ascorbic acid is used alone in the preservative treatment liquid, while deterioration of the quality cannot be suppressed since unpleasant taste is sensed in place of bitter taste when the concentration of L-ascorbic acid exceeds a range of from about 2.0 to about 2.5 g/dl, although the concentration in this range causes little problem (see the data in Test Nos. 2 to 6).

10

It was also found that, while deterioration of the quality of the deep-water shrimps is accelerated by using the amino acid compound alone (see the data in test Nos. 1, 13, 20, 36 and 41), above-mentioned deterioration of the quality of the deep-water shrimps when the ascorbic acid compound is used alone is remarkably improved by using a small amount of the amino acid compounds, particularly lysine (LYS) and glycine (GLY), in combination with the ascorbic acid compound, that the concentration of the ascorbic acid compound may be in the range from about 2.0 to about 2.5 g/dl, and that L-ascorbic acid (ASCA) shows more excellent effect than erythorbic acid (see the data in Test Nos. 14 to 19 and 26 to 31).

20

It was also shown that the effect of the concomitant use of lysine (LYS) and glycine (GLY) is manifested at a concentration of the amino acid concentration of 0.03 g/dl in the liquid, or at a concentration 0.01 fold or more of

the concentration of the ascorbic acid compound. While the effective concentration of the amino acid compound is up to 0.4 fold of the concentration of the ascorbic acid compound, adding more amino acid compound is rather harmful (see the data in Test Nos. 7 to 12 and 14 to 19). Amino acids other than lysine (LYS) and glycine (GLY) showed almost no effect for preventing deterioration of the quality of the deep-water shrimps.

Example 2

10 L-ascorbic acid (ASCA) was selected as the ascorbic acid compound as in Example 1, and malic acid (MALA), sodium malate (MALN), succinic acid (SUCA), sodium succinate (SUCN), citric acid (CITA), sodium citrate (CITN), tartaric acid (TARA) and sodium tartarate (TARN) were selected as the organic polybasic acid compounds. The compounds were combined according to the formulations in Table 2, and preservative treatment liquids were prepared as described above. Each preservative treatment liquid was added to the live deep-water shrimps for preservative

20 treatment, and the treated shrimps were subjected to the acceleration test of deterioration of the quality. The relation between the blend composition of the preservative treatment liquid and preservative performance against the shrimps were totally evaluation as in Example 1. The results are shown in Table 2.

[TABLE 2]

Composition of Preservative and Preservation Effect for
Deep-water shrimp (Deterioration Acceleration Test: 21 to
24°C, 10 hours) [B]

Test No.	Composition of Preservative treatment liquid					Results of Evaluation of States after Preservation			Total Score	Total Evaluation
	First Component g/dL		Second Component g/dL		First/Second Ratio	Appearance and Color	Residual Flavor	Unpleasant Taste and Unpleasant Odor		
1*	-		-		-	0	1	0	1	not good
2*	ASCA	3.0	-		0	2	2	1	5	good
3*	ASCA	2.5	-		0	2	2	2	6	good
4*	ASCA	2.0	-		0	2	2	2	6	good
5*	ASCA	1.5	-		0	1	1	2	4	moderate
6*	ASCA	1.0	-		0	1	1	1	3	moderate
44	ASCA	2.5	MALN	0.1	0.04	3	2	2	7	excellent
45	ASCA	2.5	MALN	0.5	0.20	3	3	3	9	quite excellent
46	ASCA	2.0	MALN	1.0	0.50	3	2	2	7	excellent
47	ASCA	2.0	MALN	1.5	0.75	2	2	1	5	good
48*	-		MALN	2.0	-	0	0	0	0	not good
49	ASCA	2.5	MALN	0.1	0.04	2	2	2	6	good
50	ASCA	2.5	MALN	0.5	0.20	2	2	2	6	good
51	ASCA	2.0	MALN	1.0	0.50	2	2	2	6	good
52	ASCA	2.0	MALN	1.5	0.75	1	2	1	4	moderate
53*	-		MALN	2.0	-	0	0	1	1	not good
54	ASCA	2.5	SUCN	0.1	0.04	2	2	2	6	good
55	ASCA	2.5	SUCN	0.5	0.20	3	2	3	8	excellent
56	ASCA	2.0	SUCN	1.0	0.50	3	2	2	7	excellent
57	ASCA	2.0	SUCN	1.5	0.75	3	2	1	6	good
58*	-		SUCN	2.0	-	0	0	0	0	not good
59	ASCA	2.5	SUCA	0.1	0.04	2	2	1	5	good
60	ASCA	2.5	SUCA	0.5	0.20	2	2	2	6	good
61	ASCA	2.0	SUCA	1.0	0.50	2	2	1	5	good
62	ASCA	2.0	SUCA	1.5	0.75	1	1	1	3	moderate
63*	-		SUCA	2.0	-	0	0	0	0	not good
64	ASCA	2.5	CITN	0.1	0.04	3	2	2	7	excellent
65	ASCA	2.5	CITN	0.5	0.20	3	3	3	9	quite excellent
66	ASCA	2.0	CITN	1.0	0.50	3	2	2	7	excellent
67	ASCA	2.0	CITN	1.5	0.75	3	1	1	5	good
68*	-		CITN	2.0	-	1	0	0	1	not good
69	ASCA	2.5	CITA	0.1	0.04	3	2	1	6	good
70	ASCA	2.5	CITA	0.5	0.20	2	2	2	6	good
71	ASCA	2.0	CITA	1.0	0.50	2	2	2	6	good
72	ASCA	2.0	CITA	1.5	0.75	2	1	1	4	moderate
73*	-		CITA	2.0	-	0	0	0	0	not good
74	ASCA	2.5	TARN	0.1	0.04	3	2	1	6	good
75	ASCA	2.5	TARN	0.5	0.20	3	2	2	7	excellent
76	ASCA	2.0	TARN	1.0	0.50	3	2	2	7	excellent
77	ASCA	2.0	TARN	1.5	0.75	3	1	1	5	good

78*	-		TARN	2.0	-	0	0	0	0	not good
79	ASCA	2.5	TARA	0.1	0.04	2	2	1	5	good
80	ASCA	2.5	TARA	0.5	0.20	2	2	1	5	good
81	ASCA	2.0	TARA	1.0	0.50	2	2	2	6	good
82	ASCA	2.0	TARA	1.5	0.75	2	1	1	4	moderate
83*	-		TARA	2.0	-	0	0	0	0	not good

1) *: Comparative Example and Reference Example

2) Abbreviations

ASCA: L-ascorbic acid, MALN: sodium malate, MALA: malic acid, SUCN: sodium succinate, SUGA: succinic acid, CITN: sodium citrate, CITA: citric acid, TARN: sodium tartarate, TARA: tartaric acid

10

The results in Table 2 show that the preservative treatment liquid comprising the L-ascorbic acid as a representative of the ascorbic acid compound blended with the organic polybasic acid compound is able to efficiently compensate a defect of the preservative treatment liquid using only the ascorbic acid compound that improvement of the appearance and color of the deep-water shrimps is insufficient, particularly generation of white spots. While a favorable concentration of the organic polybasic acid compound is at least 0.1 g/dl, or 0.05 fold of the concentration of the ascorbic acid compound, it was shown that a concentration of exceeding 0.5 fold tends to suppress the deterioration preventive action of the ascorbic acid compound, and that the organic polybasic acid compounds such as malic acid (MALA), succinic acid (SUCA), citric acid (CITA) and tartaric acid (TARA) are effective for enhancing the deterioration preventive action of the

20

ascorbic acid compound to the deep-water shrimps, even when the acid compound is a free acid or neutral salt.

Example 3

10 Banamei shrimps of South America origin frequently cultivated in warm climate region were stored in a tank filled with sea water diluted to 1/3 of original sea water at 25 to 28°C. Two ascorbic acid compounds of L-ascorbic acid (ASCA) and erythorbic acid (ETBA), and three amino acid compounds of lysine (LYS), glycine (GLY) and arginine (ARG) were used, and these compounds were dissolved in 1% brine by the same method as in Example 1 so that the concentration (g/dl) of each compound is as shown in Table 3 to prepare respective preservative treatment liquids having different concentrations. The preservative treatment liquids having the concentrations shown in Table 3 were prepared using the above-mentioned preservative treatment liquids, and commercially available preservative A (CMPA) and preservative B (CMPB). The live Banamei shrimps were subjected to preservative treatment for
20 immersing the shrimps in the above-mentioned preservative treatment liquids at about 25°C for 1 minute as in Example 1, and were stored after rapid freezing in a freezing chamber at -18°C immediately after the treatment.

The frozen Banamei shrimps, treated with the preservatives for the crustaceans in which amino acids are blended and with reference preservatives and stored for 16 hours or more, were defrosted in running water by the same

method as used in Example 1. The shrimps were subjected to deterioration accelerating tests at 21 to 24°C for about 10 hours, and the relation between the blend composition of the preservative treatment liquid and preservative performance for the shrimp was investigated. The results of the test as well as the results of total evaluation are shown in Table 3 together.

[TABLE 3]

10 Composition of Preservative and Preservation Effect for Banamei Shrimp (Deterioration Acceleration Test: 21 to 24°C, 10 hours) [A]

Test No.	Composition of Preservative treatment liquid			Results of Evaluation of States after Preservation			Total Score	Total Evaluation
	First Component g/dL	Second Component g/dL	First/Second Ratio	Appearance and Color	Residual Flavor	Unpleasant Taste and Unpleasant Odor		
101*	-	-	-	0	1	0	1	not good
102*	ASCA 3.0	-	0	3	0	1	4	moderate
103*	ASCA 2.5	-	0	3	0	1	4	moderate
104*	ASCA 2.0	-	0	2	1	1	4	moderate
105*	ASCA 1.5	-	0	1	1	1	3	moderate
106*	ASCA 1.0	-	0	1	1	0	2	not good
107	ASCA 2.0	LYS 0.10	0.05	3	1	1	5	good
108	ASCA 2.0	LYS 0.20	0.10	3	2	1	6	good
109	ASCA 2.0	LYS 0.50	0.25	3	2	2	7	excellent
110	ASCA 2.0	LYS 1.00	0.50	3	1	1	5	good
111	ASCA 2.0	LYS 1.50	0.75	3	0	1	4	moderate
112*	-	LYS 2.00	-	0	0	1	1	not good
113	ASCA 2.0	GLY 0.10	0.05	3	1	1	5	good
114	ASCA 2.0	GLY 0.20	0.10	3	2	2	7	excellent
115	ASCA 2.0	GLY 0.50	0.25	3	3	2	8	excellent
116	ASCA 2.0	GLY 1.00	0.50	3	2	1	6	good
117	ASCA 2.0	GLY 1.50	0.75	3	1	1	5	good
118*	-	GLY 2.00	-	0	1	0	1	moderate
119*	ETBA 3.0	-	0	3	0	0	3	moderate
120*	ETBA 2.5	-	0	3	0	0	3	moderate
121*	ETBA 2.0	-	0	2	1	0	3	moderate
122*	ETBA 1.5	-	0	1	1	0	2	not good
123*	ETBA 1.0	-	0	1	0	0	1	not good
124	ETBA 2.0	GLY 0.10	0.05	3	1	0	4	moderate
125	ETBA 2.0	GLY 0.20	0.10	3	1	1	5	good
126	ETBA 2.0	GLY 0.50	0.25	3	1	1	5	good
127	ETBA 2.0	GLY 1.00	0.50	3	1	0	4	moderate
128	ETBA 2.0	GLY 1.50	0.75	3	1	0	4	moderate
129	ASCA 2.0	ARG 0.10	0.05	2	1	1	4	moderate
130	ASCA 2.0	ARG 0.20	0.10	2	1	1	4	moderate
131	ASCA 2.0	ARG 0.50	0.25	2	1	0	3	moderate
132	ASCA 2.0	ARG 1.00	0.50	2	0	0	2	not good
133	ASCA 2.0	ARG 1.50	0.75	2	0	0	2	not good
134*	-	ARG 2.00	-	0	0	0	0	not good
135*	CMPA 4.0	-	-	3	1	0	4	moderate
136*	CMPB 1.0	-	-	3	1	0	4	moderate

1) *: Comparative Example and Reference Example

2) Abbreviations

ASCA: L-ascorbic acid, ETBA: erythorbic acid, LYS: lysine, GLY: glycine, ARG: arginine, CMPA: commercially available preservative A, CMPB: commercially available preservative B

The results in Table 3 show that, while an improvement effect for the appearance of the Banamei shrimps, in particular for black decolorization, is manifested and deterioration of taste and unpleasant odor are suppressed by the preservative treatment liquid with a concentration of L-ascorbic acid as a representative of the ascorbic acid compounds of 2 g/dl or more (see the data in test Nos. 101 to 106), the quality as a food is substantially impaired by impairing the flavor of the shrimp and generating
10 unpleasant taste and unpleasant odor by subjecting the shrimps to the preservative treatment using commercially available preservative A (CMPA) and commercially available preservative B (CMPB) as preservatives containing the sulfite compound, although an effect for maintaining excellent appearance with respect to prevention of black decolorization and preservation of the color is manifested (see the data in Test Nos. 135 and 136).

On the other hand, when the amino acid compounds that accelerate deterioration of the shrimps by using alone, or
20 lysine (LYS) or glycine (GLY), in a small amount relative to L-ascorbic acid is used together, the effect for improving the appearance and color is further increased (see the data in Test Nos. 112 and 118), while generation of unpleasant taste and unpleasant odor is suppressed and decrease of flavor is prevented (see the data in Test Nos. 107 to 111 and 113 to 117). However, it was found that

arginine (ARG) is scarcely effective and the proportion of blending of the amino acid compound does not preferably exceed 0.5 fold of the concentration of L-ascorbic acid. While erythorbic acid (ETBA) shows an effect no less than the effect of L-ascorbic acid (ASCA) with respect to the improvement of the appearance and color of the shrimps, the effect of erythorbic acid (ETBA) cannot be equal to the effect of L-ascorbic acid with respect to the effect for improving flavor and unpleasant odor (see the data in Test
10 Nos. 113 to 117 and 124 to 128).

Example 4

L-ascorbic acid (ASCA) was selected as the ascorbic acid compound, and malic acid (MALA), sodium malate (MALN), succinic acid (AUCA), sodium succinate (SUCN), citric acid (CITA), sodium citrate (CITN), tartaric acid (TARA) and sodium tartarate (TARN) were selected as the organic polybasic acid compounds as in Example 3, and preservative treatment liquids were prepared by combining them according to the formulation shown in Table 4. The live Banamei
20 shrimps were subjected to preservative treatment by the same method as in Example 3, and respective treated shrimps were tested for deterioration of the quality. The relation between the blend composition of the preservative treatment liquid and preservative performance was also investigated as in Example 3, and the results were shown in Table 4 together with the results of total evaluation.

[TABLE 4]

Composition of Preservative and Preservation Effect for
Banamei Shrimp (Deterioration Acceleration Test: 21 to 24°C,
10 hours) [B]

Test No.	Composition of Preservative treatment liquid				Results of Evaluation of States after Preservation			Total Score	Total Evaluation
	First Component g/dL		Second Component g/dL	First/Second Ratio	Appearance and Color	Residual Flavor	Unpleasant Taste and Unpleasant Odor		
101*	-	-	-	-	0	1	0	1	not good
102*	ASCA	3.0	-	0	3	0	1	4	moderate
103*	ASCA	2.5	-	0	3	0	1	4	moderate
104*	ASCA	2.0	-	0	2	1	1	4	moderate
105*	ASCA	1.5	-	0	1	1	1	3	moderate
106*	ASCA	1.0	-	0	1	1	0	2	not good
137	ASCA	2.0	MALN 0.10	0.05	3	2	1	5	good
138	ASCA	2.0	MALN 0.20	0.10	3	2	1	6	good
139	ASCA	2.0	MALN 0.50	0.25	3	3	2	8	excellent
140	ASCA	2.0	MALN 1.00	0.50	3	2	2	7	excellent
141	ASCA	2.0	MALN 1.50	0.75	3	1	1	5	good
142*	-	-	MALN 2.00	-	0	1	0	1	not good
143	ASCA	2.0	MALA 0.10	0.05	2	2	2	6	good
144	ASCA	2.0	MALA 0.20	0.10	2	2	2	6	good
145	ASCA	2.0	MALA 0.50	0.25	2	1	1	4	moderate
146	ASCA	2.0	MALA 1.00	0.50	2	1	1	4	moderate
147	ASCA	2.0	MALA 1.50	0.75	2	1	1	4	moderate
148*	-	-	MALA 2.00	-	0	0	0	0	not good
149	ASCA	2.0	SUCN 0.10	0.05	3	1	1	5	good
150	ASCA	2.0	SUCN 0.20	0.10	3	2	2	7	excellent
151	ASCA	2.0	SUCN 0.50	0.25	3	2	2	7	excellent
152	ASCA	2.0	SUCN 1.00	0.50	3	1	2	6	good
153	ASCA	2.0	SUCN 1.50	0.75	2	1	1	4	moderate
154*	-	-	SUCN 2.00	-	0	0	0	0	not good
155	ASCA	2.0	SUCA 0.10	0.05	2	1	1	4	moderate
156	ASCA	2.0	SUCA 0.20	0.10	3	2	1	6	good
157	ASCA	2.0	SUCA 0.50	0.25	3	2	2	7	excellent
158	ASCA	2.0	SUCA 1.00	0.50	2	2	1	5	good
159	ASCA	2.0	SUCA 1.50	0.75	2	1	1	4	moderate
160*	-	-	SUCA 2.00	-	0	0	0	0	not good
161	ASCA	2.0	CITN 0.10	0.05	2	2	1	5	good
162	ASCA	2.0	CITN 0.20	0.10	3	2	1	6	good
163	ASCA	2.0	CITN 0.50	0.25	3	2	2	7	excellent
164	ASCA	2.0	CITN 1.00	0.50	3	1	2	6	good
165	ASCA	2.0	CITN 1.50	0.75	2	1	2	5	good
166*	-	-	CITN 2.00	-	0	0	1	1	not good
167	ASCA	2.0	CITA 0.10	0.05	2	1	1	4	moderate
168	ASCA	2.0	CITA 0.20	0.10	2	2	1	5	good
169	ASCA	2.0	CITA 0.50	0.25	2	2	2	6	good
170	ASCA	2.0	CITA 1.00	0.50	2	2	2	6	good
171	ASCA	2.0	CITA 1.50	0.75	2	1	2	5	good
172*	-	-	CITA 2.00	-	0	0	0	0	not good
173	ASCA	2.0	TARN 0.10	0.05	2	2	1	5	good
174	ASCA	2.0	TARN 0.50	0.25	3	2	2	7	excellent
175	ASCA	2.0	TARN 1.00	0.50	3	2	1	6	good
176*	-	-	TARN 2.00	-	0	0	0	0	not good
177	ASCA	2.0	TARA 0.10	0.05	2	1	1	4	moderate

178	ASCA	2.0	TARA	0.50	0.25	2	2	2	6	good
179	ASCA	2.0	TARA	1.00	0.50	2	1	1	4	moderate
180*	-		TARA	2.00	-	0	0	0	0	not good

1) *: Comparative Example and Reference Example

2) Abbreviations

ASCA: L-ascorbic acid, MALA: malic acid, MALN: sodium malate, SUCA: succinic acid, SUCN: sodium succinate, CITA: citric acid, CITN: sodium citrate, TARA: tartaric acid, TARN: sodium tartarate

10

The results in Table 4 show that the preservative treatment liquid prepared by blending L-ascorbic acid as a representative of the L-ascorbic acid compound with a organic polybasic acid compound prevents generation of black decolorization and white spots by compensating the defect of the preservative treatment liquid, while deterioration of flavor of the shrimps is prevented by suppressing generation of unpleasant taste and unpleasant odor. The concentration of the organic polybasic acid compound for manifesting the action is preferably 0.1 g/dl or more, or 0.05 fold or more of the concentration of the ascorbic acid compound. A concentration exceeding 0.5 fold is not preferable since the deterioration preventing action of the ascorbic acid compound tends to be suppressed.

20

Example 5

Snow crabs captured offshore of the Japan sea were stored in a tank filled with sea water at 0 to 5°C. Two ascorbic acid compounds of L-ascorbic acid (ASCA) and

erythorbic acid (ETBA), and three amino acid compounds of lysine (LYS), glycine (GLy) and arginine (ARG) were dissolved in 1% brine so as to be the concentrations, respectively, shown in Table 5 as in Example 3 to prepare the preservative treatment liquids having different concentration to one another. The live snow crabs were subjected to preservative treatment by immersing in the preservative treatment liquid at about 4 to 15°C for 3 minutes as in Example 1 using each above-mentioned preservative treatment liquid and preservative treatment liquids adjusted to the concentrations shown in Table 5 using commercially available preservative treatment liquid A (CMPA) and commercially available preservative treatment liquid B (CMPB). The crabs were rapidly frozen immediately thereafter in a freezing chamber at -18°C, and stored frozen.

The frozen snow crabs, treated with the preservative for the crustaceans and reference preservative and stored for 16 hours or more, were defrosted by the same method as in Example 1, and subjected to deterioration acceleration tests at 21 to 24°C for about 10 hours. The relation between the blend composition of the preservative treatment liquid and preservative performance was investigated, and the results are shown in TABLE 5 together with the results of total evaluation.

[TABLE 5]

Composition of Preservative and Preservation Effect for
Snow Crab (Deterioration Acceleration Test: 21 to 24°C, 10
hours) [A]

Test No.	Composition of Preservative treatment liquid					Results of Evaluation of States after Preservation			Total Score	Total Evaluation
	First Component g/dL		Second Component g/dL		First/Second Ratio	Appearance and Color	Residual Flavor	Unpleasant Taste and Unpleasant Odor		
201*	-		-		-	0	1	0	1	not good
202*	ASCA	3.0	-		0	3	0	1	4	moderate
203*	ASCA	2.5	-		0	3	0	1	4	moderate
204*	ASCA	2.0	-		0	2	1	1	4	moderate
205*	ASCA	1.5	-		0	1	1	1	3	moderate
206*	ASCA	1.0	-		0	1	1	0	2	not good
207	ASCA	2.0	LYS	0.10	0.05	3	1	1	5	good
208	ASCA	2.0	LYS	0.20	0.10	3	2	1	6	good
209	ASCA	2.0	LYS	0.50	0.25	3	2	2	7	excellent
210	ASCA	2.0	LYS	1.00	0.50	3	1	1	5	good
211	ASCA	2.0	LYS	1.50	0.75	3	1	0	4	moderate
212*	-		LYS	2.00	-	0	0	1	1	not good
213	ASCA	2.0	GLY	0.10	0.05	3	1	1	5	good
214	ASCA	2.0	GLY	0.20	0.10	3	3	2	8	excellent
215	ASCA	2.0	GLY	0.50	0.25	3	3	3	9	quite excellent
216	ASCA	2.0	GLY	1.00	0.50	3	2	1	6	good
217	ASCA	2.0	GLY	1.50	0.75	3	2	1	6	good
218*	-		GLY	2.00	-	0	1	1	2	not good
219*	ETBA	3.0	-		0	2	1	0	3	moderate
220*	ETBA	2.5	-		0	2	1	0	3	moderate
221*	ETBA	2.0	-		0	2	1	1	4	moderate
222*	ETBA	1.5	-		0	1	1	1	3	moderate
223*	ETBA	1.0	-		0	1	0	0	1	not good
224	ETBA	2.0	GLY	0.10	0.05	3	1	0	4	moderate
225	ETBA	2.0	GLY	0.20	0.10	3	1	0	4	moderate
226	ETBA	2.0	GLY	0.50	0.25	3	1	1	5	good
227	ETBA	2.0	GLY	1.00	0.50	3	1	1	5	good
228	ETBA	2.0	GLY	1.50	0.75	3	1	0	4	moderate
229	ASCA	2.0	ARG	0.10	0.05	2	1	0	3	moderate
230	ASCA	2.0	ARG	0.20	0.10	2	1	0	3	moderate
231	ASCA	2.0	ARG	0.50	0.25	1	1	1	3	moderate
232	ASCA	2.0	ARG	1.00	0.50	1	0	1	2	not good
234	ASCA	2.0	ARG	1.50	0.75	1	0	0	1	not good
235*	-		ARG	2.00	-	0	0	0	0	not good
236*	CMPA	4.0	-	-	-	3	0	0	3	moderate
237*	CMPB	1.0	-	-	-	3	0	0	3	moderate

1) *: Comparative Example and Reference Example

2) Abbreviations

ASCA: L-ascorbic acid, ETBA: erythorbic acid, LYS: lysine, GLY: glycine, ARG: arginine, CMPA: commercially available preservation liquid A, CMPB: commercially

available preservation liquid B

10 The results in Table 5 show that an effect for improving the appearance, particularly an effect for improving black decolorization, of the snow crabs is manifested by using the preservative treatment liquid with a concentration of L-ascorbic acid, a representative of the ascorbic acid compound, of 2 g/dl or more while deterioration of the taste and unpleasant odor are suppressed (see the data in Test Nos. 201 to 206). However, the quality as a food is substantially impaired by impairing flavor of the crabs while unpleasant taste and unpleasant odor are generated when the crabs are subjected to the preservative treatment using commercially available preservation liquid A (CMPA) and commercially available preservation liquid B (CMPB) as conventional preservatives containing the sulfite compounds (see the data in Test Nos. 236 and 237), although excellent appearance is maintained with respect to prevention of black decolorization and preservation of the color.

20

On the other hand, when a small amount of the amino acid compounds, lysine (LYS) and glycine (GLY), that accelerate deterioration of the crabs when used alone are used in combination with L-ascorbic acid, the effect for improving the appearance and color is largely emphasized while generation of unpleasant taste and unpleasant odor is suppressed and decrease of flavor is prevented (see the

data in Test Nos. 207 to 212 and 213 to 217). The proportion of blending of the amino acid compound is preferably one-fold or less of the concentration of L-ascorbic acid. While erythorbic acid (ETBA) exhibits an effect not inferior to the effect of L-ascorbic acid (ASCA) with respect to the appearance and color, the former is not comparable to the latter with respect to the effect for improving flavor and unpleasant odor.

Example 6

10 L-ascorbic acid (ASCA) as the ascorbic acid compound and malic acid (MALA), sodium malate (MALN), succinic acid (SUCA), sodium succinate (SUCN), citric acid (CITA), sodium citrate (CITN), tartaric acid (TARA) and sodium tartarate (TARN) as the organic polybasic acid compounds were selected as the organic polybasic acid compounds, and the preservative treatment liquids were prepared by the same above-mentioned methods by combining them according to the formulations shown in Table 6. The live snow crabs were subjected to preservative treatment using these

20 preservative treatment liquids as in Example 5. The treated crabs were subjected to the quality deterioration test as in Example 3. The relation between the blend composition of the preservative treatment liquid and preservative performance against the crabs was investigated, and the results are shown in Table 6 together with the results of other evaluations.

[TABLE 6]

Composition of Preservative and Preservation Effect for
Snow Crab (Deterioration Acceleration Test: 21 to 24°C, 10
hours) [B]

Test No.	Composition of Preservative treatment liquid				Results of Evaluation of States after Preservation			Total Score	Total Evaluation	
	First Component g/dL		Second Component g/dL		First/Seco nd Ratio	Appeara nce and Color	Residua l Flavor			Unpleasant Taste and Unpleasant Odor
201*	-		-		-	0	1	0	1	not good
202*	ASCA	3.0	-		0	3	0	1	4	moderate
203*	ASCA	2.5	-		0	3	0	1	4	moderate
204*	ASCA	2.0	-		0	2	1	1	4	moderate
205*	ASCA	1.5	-		0	1	1	1	3	moderate
206*	ASCA	1.0	-		0	1	1	0	2	not good
238	ASCA	2.0	MALN	0.10	0.05	2	1	1	4	moderate
239	ASCA	2.0	MALN	0.20	0.10	3	2	1	6	good
240	ASCA	2.0	MALN	0.50	0.25	3	2	2	7	excellent
241	ASCA	2.0	MALN	1.00	0.50	3	2	1	6	good
242	ASCA	2.0	MALN	1.50	0.75	3	1	1	5	good
243*	-		MALN	2.00	-	0	1	0	1	not good
244	ASCA	2.0	MALA	0.10	0.05	2	1	1	4	moderate
245	ASCA	2.0	MALA	0.20	0.10	3	1	1	5	good
246	ASCA	2.0	MALA	0.50	0.25	3	2	1	6	good
247	ASCA	2.0	MALA	1.00	0.50	2	2	2	6	good
248	ASCA	2.0	MALA	1.50	0.75	2	1	1	4	moderate
249*	-		MALA	2.00	-	0	1	0	1	not good
250	ASCA	2.0	SUCN	0.10	0.05	2	1	0	3	moderate
251	ASCA	2.0	SUCN	0.20	0.10	3	2	1	6	good
252	ASCA	2.0	SUCN	0.50	0.25	3	2	1	6	good
253	ASCA	2.0	SUCN	1.00	0.50	3	2	2	7	excellent
254	ASCA	2.0	SUCN	1.50	0.75	2	2	1	5	good
255*	-		SUCN	2.00	-	0	1	0	1	not good
256	ASCA	2.0	SUCA	0.10	0.05	2	1	1	4	moderate
257	ASCA	2.0	SUCA	0.20	0.10	3	2	1	6	good
258	ASCA	2.0	SUCA	0.50	0.25	3	2	1	6	good
259	ASCA	2.0	SUCA	1.00	0.50	2	2	2	6	good
260	ASCA	2.0	SUCA	1.50	0.75	2	1	1	4	moderate
261*	-		SUCA	2.00	-	0	1	0	1	not good
262	ASCA	2.0	CITN	0.10	0.05	3	1	1	5	good
263	ASCA	2.0	CITN	0.20	0.10	3	2	1	6	good
264	ASCA	2.0	CITN	0.50	0.25	3	2	2	7	excellent
265	ASCA	2.0	CITN	1.00	0.50	3	2	2	7	excellent
266	ASCA	2.0	CITN	1.50	0.75	3	1	1	5	good
267*	-		CITN	2.00	-	0	1	0	1	not good
268	ASCA	2.0	CITA	0.10	0.05	3	1	1	5	good
269	ASCA	2.0	CITA	0.20	0.10	3	2	1	6	good
270	ASCA	2.0	CITA	0.50	0.25	2	2	2	6	good
271	ASCA	2.0	CITA	1.00	0.50	2	2	2	6	good
272	ASCA	2.0	CITA	1.50	0.75	2	2	1	5	good
273*	-		CITA	2.00	-	0	1	0	1	not good
274	ASCA	2.0	TARN	0.10	0.05	2	1	1	4	moderate
275	ASCA	2.0	TARN	0.50	0.25	3	2	1	6	good
276	ASCA	2.0	TARN	1.00	0.50	3	2	2	7	excellent
277*	-		TARN	2.00	-	0	1	0	1	not good
278	ASCA	2.0	TARA	0.10	0.05	2	1	1	4	moderate

279	ASCA	2.0	TARA	0.50	0.25	2	1	1	4	moderate
280	ASCA	2.0	TARA	1.00	0.50	3	1	1	5	good
281*	-		TARA	2.00	-	0	1	0	1	not good

1) *: Comparative Example and Reference Example

2) Abbreviations

ASCA: L-ascorbic acid, MALA: malic acid, MALN: sodium malate, SUCA: succinic acid, SUCN: sodium succinate, CITA: citric acid, CITN: sodium citrate, TARA: tartaric acid, TARN: sodium tartarate

10 The results in Table 6 show that the preservative treatment liquids prepared by blending L-ascorbic acid as a representative of the ascorbic acid compound, and malic acid (MALA), sodium malate (MALN), succinic acid (SUCA), sodium succinate (SUCN), citric acid (CITA), sodium citrate (CITN), tartaric acid (TARA) and sodium tartarate (TARN) as the organic polybasic acid compounds have an effect for preventing generation of black decolorization and white spots by compensating the defects of the preservative treatment liquid using only the ascorbic acid compound,

20 while the preservative treatment liquids have an effect for preventing deterioration of flavor of the crabs by suppressing generation of unpleasant taste and unpleasant odor. The concentration of the organic polybasic acid compound for manifesting the action is preferably 0.1 g/dl or more, or 0.05 fold or more of the concentration of the ascorbic acid compound. Since the deterioration preventing action tends to be suppressed when the concentration

exceeds 0.5 fold, the concentration is preferably less than one-fold of the ascorbic acid compound.

Example 7

L-ascorbic acid (ASCA) was selected as the ascorbic acid compound, lysine (LYS) and glycine (GLY) were selected as the amino acid compounds, and malic acid (MALA), sodium malate (MALN), sodium succinate (SUCN) and sodium citrate (CITN) were selected as the organic polybasic acid compounds. An invert sugar (INVS) as a reducing sugar compound used in combination with the ascorbic acid compound and dextrin (DEX) as an inert polysaccharide were also added as other additives that are used in the preservative for the shrimps disclosed in Japanese Patent Application Publication No. 2004-236756 as a prior application of the present invention to produce powder compositions having the blend compositions as shown in Table 7, or the preservatives for the crustaceans APN1 to APN10.

[TABLE 7]

Composition of Preservative for Crustaceans of the Present Invention

Symbol of Preservative	Blend Composition of Preservative (% by weight)									
	First Component	Second Component						Others		Total
		Amino Acid Compound		Organic Polybasic Acid Compound				Sugars		
		ASCA	LYS	GLY	MALN	MALA	SUCN	CITN	INVS	
APN 1	70.0	10.0				12.5		7.5		100
APN 2	62.0		7.0	10.0				10.5	10.0	100
APN 3	70.0		10.0			10.0		10.0		100
APN 4	66.7		13.5				13.3	6.5		100
APN 5	66.7	10.0		13.3				10.0		100
APN 6	60.0	8.0	14.0				14.0		4.0	100
APN 7	60.0		15.0			12.0		8.0	5.0	100
APN 8	70.0	2.0		15.0				13.0		100
APN 9	62.0	3.0				12.0			23.0	100
APN 10	64.0		7.0	6.0			3.0	20.0		100

1) Abbreviations

ASCA: L-ascorbic acid, LYS: lysine, GLY: glycine, MALN: sodium malate, MALA: malic acid, SUCN: sodium succinate, CITN: sodium citrate, INVS: invert sugar, DEX: dextrin

Example 8

Five preservatives as shown in Table 8 were selected from the preservatives for the crustaceans of the present invention produced in Example 7. The preservatives were dissolved in 1% brine so that the concentrations (g/dl) are adjusted as shown in Table 8 to prepare the preservative treatment liquids for the deep-water shrimps. Commercially available preservative A (CMPA) and commercially available preservative B (CMPB) comprising the sulfite compound as a principal ingredient were prepared as reference preservative treatment liquids by dissolving them at the concentrations of 4 g/dl and 1 g/dl as recommended

concentrations. The live deep-water shrimps were rapidly frozen after subjecting the live deep-water shrimps to preservative treatment at 4 to 10°C by the same method as in Example 1 using the above-mentioned preservative treatment liquids. The treated shrimps were subjected to deterioration acceleration tests by the same above-mentioned methods, and were evaluated as described above. The relation between the composition of the preservative treatment liquid and preservative performance of the shrimps was investigated, and the results are shown in Table 8.

[TABLE 8]

Preservative performance of the Preservative for Crustaceans against Deep-water shrimps (room temperature, 10 hours)

Test No.	Symbol of Preservative	Concentration of Preservative treatment liquid			Results of Evaluation of Configuration after Preservation			Total Score	Total Evaluation
		Preservative g/dL	ASCA g/dL	SULF g/dL	Appearance and Color	Residual Flavor	Unpleasant Taste and Unpleasant Odor		
301	APN 1	3.00	2.10	-	3	3	3	9	quite excellent
302	APN 2	3.50	2.17	-	3	4	3	10	quite excellent
303	APN 3	3.00	2.10	-	3	3	3	9	quite excellent
304	APN 5	3.00	2.00	-	3	3	3	9	quite excellent
305	APN 6	3.20	1.92	-	3	3	3	9	quite excellent
306*	CMPA*	4.00	-	0.70	4	1	0	5	moderate
307*	CMPB*	1.00	-	0.67	4	1	0	5	moderate

1) * Reference Example

2) Abbreviations

ASCA: L-ascorbic acid, SULF: sulfite compound, CMPA commercially available preservative A, CMPB commercially available preservative B

The results in Table 8 show that the live deep-water shrimps subjected to preservative treatment using commercially available preservative A (CMPA) and commercially available preservative B (CMPB) as references, in which sodium pyrosulfite (PSFN) and sodium polyphosphate (PPFN) as well as erythorbic acid (ETBA) and dextrin (DEX) were blended, had unnaturally beautiful appearance, and deterioration of the quality of the meat seemed to be suppressed. However, flavor of the meat rapidly decreases and unpleasant taste such as bitter taste as well as unpleasant odor appears. On the other hand, the appearance of the deep-water shrimps subjected to preservative treatment with the preservative for the crustaceans of the present invention is like that of the natural deep-water shrimps with shells and not so remarkably beautiful. However, no changes were found in the color, taste and flavor of the shrimps, and decrease of flavor was slow.

Example 9

Five preservatives were selected from the preservatives for the crustaceans of the present invention produced in Example 7, and preservative treatment liquids for the Banamei shrimp were prepared by dissolving the preservatives in 1% brine so as to be the concentrations (g/dl) shown in Table 9. Commercially available preservative A (CMPA) and commercially available preservative B (CMPB) mainly comprising the sulfite

compound as reference preservatives were dissolved in 1% brine at recommended concentrations of 4 g/dl and 1 g/dl to prepare reference preservative treatment liquids. The live Banamei shrimps were subjected to the preservative treatment at about 25°C for 1 minute by the same method as in Example 3 using these preservative treatment liquids, followed by rapid freezing. The treated shrimps were subjected to the deterioration accelerating treatment by the same above-mentioned method. The treated shrimps were evaluated for the relation between the composition of the preservative treatment liquid and preservative performance against the shrimps. The results of evaluation are shown in Table 9.

[TABLE 9]

Preservative performance of the Preservative for Crustaceans against Banamei Shrimps (room temperature, 10 hours)

Test No.	Symbol of Preservative	Concentration of Preservative treatment liquid			Results of Evaluation of Configuration after Preservation			Total Score	Total Evaluation
		Preservative g/dL	ASCA g/dL	SULF g/dL	Appearance and Color	Residual Flavor	Unpleasant Taste and Unpleasant Odor		
308	APN 2	3.00	1.86	-	3	3	2	8	excellent
309	APN 4	3.50	2.33	-	3	2	2	7	excellent
310	APN 6	3.33	2.00	-	3	2	2	7	excellent
311	APN 8	3.00	2.10	-	3	3	2	8	excellent
312	APN 10	4.00	2.56	-	3	3	2	8	excellent
313*	CMPA*	4.00	-	0.70	3	1	0	4	moderate
314*	CMPB*	1.00	-	0.67	3	1	0	4	moderate

1) * Reference Example

2) Abbreviations

ASCA: L-ascorbic acid, SULF: sulfite compound, CMPA:

commercially available preservative A, CMPB: commercially available preservative B

10 The results in Table 9 show that, although the live Banamei shrimps subjected to preservative treatment using the commercially available preservative A (CMPA) and commercially available preservative B (CMPB) as reference preservatives seem to have no deterioration in the appearance with few deterioration of the quality of the meat, flavor of the meat is promptly decreased and unpleasant taste such as bitter taste is sensed while unpleasant odor is generated. On the other hand, the live Banamei shrimps with shells subjected to preservative treatment with the preservative for the crustaceans of the present invention has an appearance similar to that of the live natural shrimps, and deterioration is scarcely observed. No changes of quality are found in the color and flavor of the meat of the shrimps, and decreased of taste was slow.

20 Example 10

Five preservatives were selected as shown in Table 10 from the preservatives for the crustaceans of the present invention produced in Example 7, and preservative treatment liquids for the snow crabs were prepared by dissolving the preservatives in 1% brine so as to be the concentrations (g/dl) shown in Table 10. Reference preservative treatment liquids were prepared by dissolving commercially available

preservative A (CMPA) and commercially available preservative B (CMPB) as reference preservatives in 1% brine so as to be recommended concentrations of 4 g/dl and 1 g/dl. The live snow crabs were subjected to preservative treatment at about 10°C for 3 minutes by the same method as in Example 5 followed by rapid freezing. The treated snow crabs were subjected to the deterioration accelerating test by the same above-mentioned method, and preservative performance against the snow crabs was evaluated as described above. The results are shown in Table 10.

[TABLE 10]

Preservative performance of the Preservative for Crustaceans against Snow Crabs (room temperature, 10 hours)

Test No.	Symbol of Preservative	Concentration of Preservative treatment liquid			Results of Evaluation of Configuration after Preservation			Total Score	Total Evaluation
		Preservative g/dL	ASCA g/dL	SULF g/dL	Appearance and Color	Residual Flavor	Unpleasant Taste and Unpleasant Odor		
315	APN 1	3.00	2.10	-	2	3	2	7	excellent
316	APN 5	3.00	2.00	-	2	3	3	8	excellent
317	APN 8	3.00	2.10	-	2	3	2	7	excellent
318	APN 9	3.50	2.48	-	2	3	3	8	excellent
319	APN 10	3.00	1.92	-	2	3	3	8	excellent
320*	CMPA*	4.00	-	0.70	3	0	0	3	moderate
321*	CMPB*	1.00	-	0.67	3	0	0	3	moderate

1) * Reference Example

2) Abbreviations

ASCA: L-ascorbic acid, SULF: sulfite compound, CMPA: commercially available preservative A, CMPB; commercially available preservative B

The results in Table 10 show that, although little

deterioration of the appearance is observed in the live snow crabs subjected to preservative treatment using commercially available preservative A (CMPA) and commercially available preservative B (CMPB) as reference preservatives, flavor of the meat rapidly decreases while unpleasant taste such as bitter taste as well as unpleasant odor is sensed. On the other hand, the appearance of the live snow crabs with the shell subjected to preservative treatment with the preservative for the crustaceans of the present invention is almost the same as that of the live natural crabs with almost no deterioration. Little quality changes were observed in the taste and flavor of the meat of the crabs, and decrease of flavor was slow.

Example 11

Five preservatives were selected as shown in Table 11 from the preservatives for the crustaceans of the present invention produced in Example 7, and preservative treatment liquids for Japanese tiger prawns were prepared by dissolving the preservatives in 1% brine so as to be the concentrations (g/dl) shown in Table 11. Reference preservative treatment liquids were prepared by dissolving commercially available preservative A (CMPA) and commercially available preservative B (CMPB) as reference preservatives in 1% brine so as to be recommended concentrations of 4 g/dl and 1 g/dl.

The live Japanese tiger prawns were stored in a tank filled with sea water diluted 1/3 at about 20°C, and the

shrimps were scooped and immersed in the preservative treatment liquids for the Japanese tiger prawns in the tank at about 20°C. The shrimps subjected to preservative treatment at about for 1 minute followed by rapid freezing. The treated shrimps were subjected to the deterioration accelerating test by the same above-mentioned method, and preservative performance against shrimps was evaluated as described above. The results are shown in Table 11.

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[TABLE 11]

Preservative performance of the Preservative for Crustaceans against Penaeid Shrimps (room temperature, 10 hours)

Test No.	Symbol of Preservative	Concentration of Preservative treatment liquid			Results of Evaluation of Configuration after Preservation			Total Score	Total Evaluation
		Preservative g/dL	ASCA g/dL	SULF g/dL	Appearance and Color	Residual Flavor	Unpleasant Taste and Unpleasant Odor		
322	APN 2	3.50	2.17	-	3	3	3	9	quite excellent
323	APN 4	3.50	1.67	-	2	3	3	8	excellent
324	APN 6	3.00	1.80	-	2	3	3	8	excellent
325	APN 9	3.50	2.17	-	3	2	3	8	excellent
326	APN 10	4.00	2.56	-	3	2	3	8	excellent
327*	CMPA*	4.00	-	0.70	3	1	0	4	moderate
328*	CMPB*	1.00	-	0.67	3	1	0	4	moderate

20

1) * Reference Example

2) Abbreviations

ASCA: L-ascorbic acid, SULF: sulfite compound, CMPA: commercially available preservative A, CMPB; commercially available preservative B

The results in Table 11 show that, although little

deterioration of the appearance is observed in the live Japanese tiger prawns subjected to preservative treatment using commercially available preservative A (CMPA) and commercially available preservative B (CMPB) as reference preservatives, flavor of the meat rapidly decreases while unpleasant taste such as bitter taste as well as unpleasant odor is sensed. On the other hand, the appearance of the live Japanese tiger prawns subjected to preservative treatment with the preservative for the crustaceans of the present invention is almost the same as that of the live natural crabs with almost no deterioration. Little quality changes were observed in the taste and flavor of the shrimps, and decrease of flavor was slow.

Example 12

Five preservatives were selected as shown in Table 12 from the preservatives for the crustaceans of the present invention produced in Example 7, and preservative treatment liquids for mantis shrimps were prepared by dissolving the preservatives in 1% brine so as to be the concentrations (g/dl) shown in Table 12. Reference preservative treatment liquids were prepared by dissolving commercially available preservative A (CMPA) and commercially available preservative B (CMPB) as reference preservatives in 1% brine so as to be recommended concentrations of 4 g/dl and 1 g/dl.

The live mantis shrimps were stored in a tank filled

with sea water at about 20°C, and the shrimps were scooped and immersed in the preservative treatment liquids for the mantis shrimps in the tank at about 20°C. The shrimps subjected to preservative treatment at about for 1 minute followed by rapid freezing. The treated mantis shrimps were subjected to the deterioration accelerating test by the same above-mentioned method, and was evaluated as described above. The relation between the blend composition of the preservative treatment liquid and preservative performance against mantis shrimps was investigated. The results are shown in Table 12.

[TABLE 12]

Preservative performance of the Preservative for Crustaceans against Mantis Shrimp (room temperature, 10 hours)

Test No.	Symbol of Preservative	Concentration of Preservative treatment liquid			Results of Evaluation of Configuration after Preservation			Total Score	Total Evaluation
		Preservative g/dL	ASCA g/dL	SULF g/dL	Appearance and Color	Residual Flavor	Unpleasant Taste and Unpleasant Odor		
329	APN 2	3.00	1.86	-	3	3	2	8	excellent
330	APN 3	3.00	2.10	-	3	2	3	8	excellent
331	APN 4	3.00	1.80	-	3	3	3	9	quite excellent
332	APN 7	3.00	1.80	-	3	3	2	8	excellent
333	APN 8	2.80	1.96	-	3	2	3	8	excellent
334*	CMPA*	4.00	-	0.70	2	1	0	3	moderate
335*	CMPB*	1.00	-	0.67	2	1	0	3	moderate

1) * Reference Example

2) Abbreviations

ASCA: L-ascorbic acid, SULF: sulfite compound, CMPA: commercially available preservative A, CMPB; commercially available preservative B

The results in Table 12 show that deterioration of the appearance advances, flavor of the meat decreases and unpleasant taste such as bitter taste is sensed while unpleasant odor is generated in the live mantis shrimps subjected to preservative treatment using commercially available preservative A (CMPA) and commercially available preservative B (CMPB) as reference preservatives. On the other hand, deterioration of the appearance of the live mantis shrimps subjected to preservative treatment with the preservative for the crustaceans of the present invention is not so advanced and qualitative changes of the taste and flavor are small with slow advance of the decrease of the flavor in the mantis shrimps subjected to the preservative treatment with the preservative for the crustaceans of the present invention.

The preservative for the crustaceans of the present invention comprises known materials as food additives or foods, and is a chemical prepared by blending an ascorbic acid compound with small quantities of compounds selected from amino acid compounds and organic polybasic acid compounds. The preservative is able to use for freeze storage of various live crustaceans without deteriorating the quality of the crustaceans as foods. The frozen crustaceans obtained by subjecting to preservative treatment using the preservative for the crustaceans of the present invention is able to suppress black decolorization and white spots from appearing at a part of the shells

during storage after defrosting, while the use of the sulfite compound that may be anxious on hygiene may be eliminated by avoiding the use of the preservative that is defective in impairment of the flavor of the crustaceans.

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WHAT IS CLAIMED IS:

1. A preservative for crustaceans in a live state containing:
 - a first component comprising at least one ascorbic acid compound selected from ascorbic acid, erythorbic acid, salt thereof and an ester thereof; and
 - a second component comprising at least one compound selected from:
 - (1) at least one organic polybasic acid compound selected from malic acid, succinic acid, citric acid, tartaric acid and salts thereof; and
 - (2) at least one amino acid compound selected from lysine and glycine,

10 either of which is in an amount of 0.05 to 0.5 fold of the amount of said first component; and

the amount of said second component being in an amount less than 0.5 fold of the amount of the first component.
2. The preservative for crustaceans in a live state according to claim 1, containing 0.1 to 1 fold of a reducing compound of the amount of the ascorbic acid compound.
3. The preservative for crustaceans in a live state according to claim 1 or 2, wherein the formulation is water soluble.
4. A method for preserving crustaceans in a live state comprising the

20 steps of:

 - treating the crustaceans in a live state, in a raw state of an apparent death but not losing their vital reactions or in a frozen state for resuming the vital reactions after defrosting by allowing the crustaceans to contact a preservative treatment liquid for the crustaceans; and preserving the treated crustaceans by chilling or freezing, said preservative treatment liquid for the crustaceans containing:
 - a first component comprising at least one ascorbic acid compound selected from ascorbic acid, erythorbic acid, salt thereof and an ester thereof; and

a second component comprising at least one compound selected from:

- (1) at least one of organic polybasic acid compound selected from malic acid, succinic acid, citric acid, tartaric acid and salts thereof; and
- (2) at least one amino acid compound selected from lysine and glycine, either of which is in an amount of 0.05 to 0.5 fold of the amount of said first component; and

the amount of said second component being in an amount less than 0.5 fold of the first component.