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(54) Title : PROCESSED FISH MEAT. FISH MEAT MATERIAL PREPARED BY USING THE SAME, AND PROCESS FOR PRODUCING PROCESSED FISH MEAT (54) 発明の名称 加工魚肉及びそれを用いた魚肉食材、及び加工魚肉の製造方法 (57) Abstract A processed fish meat which has a strong thermal binding property and an elasticity, can be freely processed, scarcely suffers from deterioration or outflow of low-molecular-weight nutrients (drips, etc.), and has a high nutritive value with the use of these nutrients in a high yield. The processed fish meat comprises, per 100 parts by weight of a round or chunk of fish meat or fish meat pieces, from 0.2 to 4 parts by weight (on a dry basis) of salts added in the form of a 1.5 to 7 mol solution in water or drips and from 0.1 to 2.7 parts by weight (on a dry basis) of alkaline agents added in the form of a 0.3 to 3 mol solution in water or drips.		

(57) 要約

本発明は、強力な加熱結着性及び弾力性を示し、加工が自在で、変質損失を防ぎドロップ等の低分子栄養成分等の流出をほとんど皆無にすることができるとともにこれらを有効に利用した高歩留りで栄養価の高い加工魚肉の提供を目的とする。

本発明の加工魚肉は、ラウンド又は肉塊状の魚肉若しくは細切状の魚肉100wt部に対し、水若しくはドロップに溶解された1.5~7mol濃度の溶液状で添加された乾燥重量で0.2~4wt部の塩類と、水若しくはドロップに溶解された0.3~3mol濃度の溶液状で添加された乾燥重量で0.1~2.7wt部のアルカリ剤と、が含有されている構成を有している。

情報としての用途のみ

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明 細 書

加工魚肉及びそれを用いた魚肉食材、及び加工魚肉の製造方法

技術分野

本発明はラウンド又は肉塊状の魚肉若しくは細切状の魚肉を加工した加工魚肉及びそれを用いた魚肉食材、及び加工魚肉の製造方法に関する。更に詳しくは、魚肉の解凍中や冷蔵中のドリップの流出を防止するとともに、魚肉塊内に少量の塩類高濃度溶液やアルカリ剤高濃度溶液を含浸させることにより魚肉塊の骨格筋中の細胞膜、筋鞘、コラーゲンや筋原繊維等若しくは脂質や脂肪または脂肪中の細胞膜組織やコラーゲンを塩溶するとともにアルカリ剤高濃度溶液で乳化を促進し、ゲル化能を付加し、更に肉繊維や脂肪の軟化、ゼラチン化、又は魚肉塊の酸化等による変性を防止するとともに、解凍中や冷蔵中のドリップの流出を防止し、更に変性した魚肉塊の味覚や肉色を再生し復元した加工魚肉及びそれを用いた魚肉食材、及び加工魚肉の製造方法に関するものである。

背景技術

近年、魚介類は優れた蛋白食品として見直され、特に健康面から優れた食材として評価を得ている。この魚介類の加工食品としては、かまぼこ等の練製品が広く知られており、その原材料として最近では冷凍スリ身が多く用いられている。

しかしながら魚介類は種類が多く、しかも年齢、性、季節、栄養状態などによる肉質の相違が大きく、特に魚介類の筋肉はおよそ水分を70～80%も有しているため、魚類を加工（冷凍、冷蔵、塩蔵、加熱等）する場合、加工に伴う魚類のドリップの流出等による重量減少、身崩れ、肉質の硬化、酸化等といった品質

の劣化が問題となっていた。

そこで、これら従来の問題点を改良するものとして、種々の加工方法が提案されている。例えば、

1. 特開昭53-50358号公報には、微細肉、植物性蛋白に食塩を加えてペースト化した後、油脂類、熱凝固性素材を不均一に混合して緩慢凍結させる加工食品の製造方法が開示されている。

2. 特開昭54-2368号公報には、カツオ等を NaHCO_3 と NaHPO_4 とのソルビット液に漬け込む工程と塩をまぶす工程を同時または前後して行うことで肉質の軟化や肉色素の安定化をはかる魚肉薫製加工品の製造方法が開示されている。

3. 特開昭55-144844号公報には、骨付魚肉を食塩、重炭酸ナトリウム及びアルカリ性リン酸塩溶液中に魚肉を漬け込み、次いで、水切り後、加圧加熱しその後冷凍する魚類冷凍食品の製造方法が開示されている。

4. 特開昭57-5668号公報には、魚肉に0.3~1.0%炭酸水素ナトリウム、0.3~1.0%ソルビトール溶液、またはその混合溶液に漬け込み、脱水後塩類溶液に漬け込み、次いで、ケーシングして魚肉結着性を高める採肉魚肉ハムの製造方法が開示されている。

5. 特開昭62-19069号公報には、水晒ししたスケトウダラのような軟弱組織を改良するための、食用油や食塩、糖類の混合液に長時間漬け込んだ後緩慢凍結する食用蛋白素材を製造する食用蛋白素材の製造方法が開示されている。

6. 特開平6-165634号公報には、水産物の加工等に伴う品質劣化を最小限に止めることを目的とし、前処理剤として塩化ナトリウム水溶液に無機塩類を溶解し、かつ水溶液全体のpHをアルカリ性に保持するため炭酸ナトリウムを添加したものをを用い、この前処理液に水産物を長時間漬け込み温度を0~20℃に保持した後、ボイル、解凍加工を行う水産物の前処理法が開示されている。

7. 特開昭62-49012号公報には、サメの落とし身を水晒いすることな

く直接糖類、重合リン酸塩（6～12wt部、うち重合リン酸塩0.05～0.4wt部）と2価金属塩類（0.2～1.0wt部）を添加した後、攪拌機で充分攪拌した後、 -40°C で凍結して、処理時の悪臭の発生を防止するサメ肉冷凍落し身の製造方法が開示されている。

8. 特開昭53-145948号公報には、鯨肉を所要の厚みに切断、水洗後これに1～3%の食塩を添加、攪拌混合機で内部組織は損傷させずに肉表面のみ塩溶性蛋白質を溶かし、70mmHgの減圧下で成型し、次いで、 90°C の熱湯中で2時間30分加熱した後、これを適宜の形状に切断して鯨肉塊状缶詰にする製造方法が開示されている。

9. 特開平4-311374号公報には、鮮度の低下した魚、肉質の軟弱な魚に塩化カルシウム、食塩のいずれかの品質改良剤を水晒また予備脱水後に加えて弾力性のある魚肉にする方法が開示されている。

10. 特開昭62-130667号公報には、スリ身の製造工程で播漬時に炭酸ナトリウム（0.04～0.06%）及び／または炭酸水素ナトリウム0.05～0.15%を添加、pHを7.5以下に調整した冷凍スリ身の製造方法が開示されている。

11. 特開平2-295466号公報には、魚肉ねり製品の製造に塩基性カルシウム0.01～0.1wt部を加えてpHを7.3～8.5とし、さらに動植物蛋白0.5～5wt部加えることで弾力性のあるねり製品の製造方法が開示されている。

12. 特開平2-203769号公報には、水晒し時にカルシウム塩、マグネシウム塩、ストロンチウム塩を使用することで蛋白質架橋因子の流出を防ぎ、さらにリン酸塩を加えることでその効果を増加することのできる魚肉ねり製品の製造方法が開示されている。

13. 特開平1-222761号公報には、水晒し工程でリン酸塩（0.2%以下）また重曹溶液中でホモジナイザーで微粉碎し、これを100mmHg減圧

下で20分間水晒しすることでゲル形成能を改善する方法が開示されている。

14. 特開昭54-80456号公報のものは、肉塊状の原料肉を傷つけ処理した後、リン酸塩配合剤、食塩等の添加剤を加え、60cmHg以上の減圧下で攪拌混合する漬け込み操作を行うことで製造歩留りを15~20%向上させるコーンビーフの製造方法が開示されている。

15. 特開昭59-39111号公報には、鶏肉に1~3%食塩を添加し、緩やかに攪拌混合を行うことで、肉塊表面に肉糊状の塩溶性蛋白質を溶出させ、これを減圧下で型中に導入充填し、さらに加熱して凝固させる鶏肉ブロックの製造方法が開示されている。

16. 特開昭62-29953号公報には、水蒸気で加熱したピクル液を畜肉にインジェクションすることにより、低塩、低カロリー、低リン酸の畜肉加工製品を得る畜肉加工品の製造方法が開示されている。

17. 特開平3-180138号公報には、粉碎塩を主体に適量の糖類、結着剤、発色助剤、乳化安定剤、pH調整剤等を加え、体液濃度に近い組成とした多量のピクル溶液に原料肉を10~30時間浸漬する調味肉の製造方法が開示されている。

18. 特開昭58-37826号公報には、肉塊にナトリウム塩を加えて肉塊表面のイオン強度を0.6以上に調整し、肉塊表面にアクトミオシンを溶出させ、-2~-8℃で冷凍した後、3~70kg/cm²の圧力で成型して肉塊同士を接着させる一枚肉塊状の製造方法が開示されている。

19. 特開平2-308774号公報には、肉小塊10~90wt部に食塩等の筋原繊維蛋白質溶解剤を添加してpH6.0~7.3とした肉糊用肉と、残りの肉小塊90~10wt部をpH6.5以下とした混合用肉とを、真空アジター、ラインミル、ラインミキサーを使用して酸素ガスの混入を避けつつ混練する肉小塊の再成型法が開示されている。

しかしながら、上記従来の加工方法では、以下のような問題点を有していた。

1. 特開昭53-50358号公報のものは、微細肉に植物性蛋白と食塩を添加、搗潰してペースト状肉糊を作り、それに脂肪を配合した後、緩慢凍結を5時間～数日間行ってロースハム等の代替品を作るものである。しかしながら、搗潰中に摩擦で品温が上がり品質が劣化し易くなるとともに、品温の上昇を防止するため冷却等を要し作業性が悪いという問題点を有していた。更に、酵素活性によりドリップが出易く、このドリップを肉糊が吸着するために魚肉の結着性が低下し、これを補うため、植物性蛋白等を必要とし肉の旨みを損なうという問題点を有していた。従って、魚肉を100%のみからなるものが出来ないとともに、製造作業も長時間を要しその結果品質的にも衛生的にも種々の問題点を有し更に生産性が低いという問題点を有していた。

2. 特開昭54-2368号公報のものは、カツオ等のように調理後肉が硬く褐変しやすい魚肉を食塩水で血抜き後、塩をまぶして48時間塩漬し、その後重碳酸ソーダ、第二リン酸ソーダ、ソルビット液に漬け込んで肉質の軟化を図るものであるが、食塩を多量に表面にまぶすため塩辛く、更に塩漬け工程等に長時間を要し、水溶性蛋白質など低分子の微量元素が溶解流出するとともに歩留りの低下と生産性に欠けるとともに塩分濃度が高いという問題点を有していた。また、添加物により旨味を損なうとともに、更に塩漬工程等に長時間を要するため生産性に欠けるという問題点を有していた。

3. 特開昭55-144844号公報のものは、骨付魚肉を骨ごと食することができ、カルシウム分の摂取に優れているが、製造時の作業が煩雑で作業性に欠けるとともに、生産性に欠けるという問題点を有していた。更に、加圧加熱工程を有し、栄養素が破壊され魚の栄養をまるごと利用することは出来ないという問題点を有していた。

4. 特開昭57-5668号公報のものは、魚肉ハムの結着性を向上させるのには好適であるが、漬け込み時間が長いので魚肉の品質劣化が生じ易いという問題点を有していた。また品質劣化を抑制するために温度コントロール等の作業が

煩雑で作業性に欠け、生産性に欠けるという問題点を有していた。更に、水溶性蛋白質を始め低分子旨味成分や微量元素等の有効栄養成分が溶解流出するという問題点を有していた。

5. 特開昭62-19069号公報のものは、スケトウダラのような軟弱組織や、ボソボソした食感を有する魚肉を改良するのには好適であるが、脂肪分や低分子蛋白質成分の有効栄養成分が食用油や食塩、糖類の混合液中に浸透圧で流出し、栄養価に欠けるとともに魚肉の結着性に欠け加工性に欠けるという問題点を有していた。

6. 特開平6-165634号公報のものは、水産物加工に伴う品質劣化の抑制には効果があるが、漬け込み作業が長時間を要し生産性に欠けるという問題点があった。更に、長時間の漬け込み時に旨味成分であるドリップ等が処理液中に浸透圧で溶出したり、漬け込み中に品質の劣化が生じるという問題点を有していた。

7. 特開昭62-49012号公報のものは、サメ類のように尿素、トリメチルアミオキサイドを一般魚の約10~20倍含有し、鮮度の低下とともにアンモニア、トリメチルアミン、の悪臭を発するサメには好適であるが、塩ズリ工程を要し、固型の塩類を含有させるので、塩ズリ中に品質が劣化し易く、また、作業が煩雑で生産性に欠けるという問題点を有していた。

8. 特開昭53-145948号公報のものは、水晒しし、脱血後、食塩を添加して攪拌した後、減圧下成型するので生産工程が複雑なため生産性が低く、水晒しで旨味成分が流出し栄養価等に欠けるという問題点を有していた。

9. 特開平4-311374号公報や特開昭62-130667号公報、特開平2-203769号公報のものは、肉質の軟弱な魚の品質を向上させるのには好適であるが、水晒しに塩類を加えて筋原繊維蛋白質の変成部分を除去、また水晒回数や時間を増すことで足の強化を図る際に、水晒しによる低分子栄養成分の流出し旨味に欠けるとともに、製品歩留まりが低下する等の問題点を有していた。

。 10. 特開平2-295446号公報のものは、弾力性、テクスチャー性や香味に優れるが、塩基性カルシウム特に焼成カルシウム添加時の反応時間と弾力性、高pHの場合の保存性に問題点を有していた。

11. 特開平1-222761号公報のものは、血合肉を含む落とし身に5~8倍量の晒し用水（リン酸塩またトリポリ酸塩0.2%また重曹添加）中でホモジナイザーで微細化し、100mmHgで減圧晒しを行う。減圧晒しの終わった時点で脂肪を除去するが、水晒しによる低分子栄養成分の流出、晒し用水中での微細化や減圧晒しなどで歩留まりの低下や複雑な生産工程による生産性の低下などの問題点を有していた。

12. 特開昭54-80456号公報のものは、肉片の筋膜や腱を短く切断した後、添加剤を添加し、減圧状態で攪拌後、3~5℃で48時間漬込みを行い、その後115~118℃で60~90分間蒸煮を行い、処理肉をほぐし、次いで、筋膜、腱、血管を取り除いて製品とするものである。このため作業工程が複雑で作業時間が長いので、生産性に欠けるという問題点を有していた。またコンビーフとして肉色が悪く、さらにリン酸塩、亜硝酸ナトリウム等が添加されているので、安全衛生上好ましくないという問題点を有していた。

13. 特開昭59-39111号公報のものは、肉表面だけの反応で肉の内部まで改質出来ないという問題点を有していた。また作業工程は減圧状態で12~48時間の成型作業と2~3時間の加熱作業を必要とするので複雑な作業工程となり、原価が高く量産性に欠けるという問題点を有していた。

14. 特開昭62-29953号公報や特開平3-180138号公報のものは、食塩濃度が低いため塩溶効果に乏しく、またゲル化乳化作用が極めて緩慢なため、肉の組織改質を行うことができないということがわかった。さらにその製品は弾力性や歯ごたえ等のテクスチャー性に欠けるという問題点を有し、さらに酸化し易く肉色に変色し易いという問題点を有していた。

また、品質にバラツキがあり、さらに肉塊色もよくないという問題点を有していた。また脂肪層を改質することが困難で、脂肪分の多い肉は品質的にバラツキ易く、生産性に欠けるという問題点を有していた。

15. 特開昭58-37826号公報や特開平2-308774号公報のものは、肉塊中に脂肪層があるとアクトミオシンの溶出反応や生化学反応は起こらないので、結着性に欠け、加熱時に身崩れが起こり易いという問題点を有していた。このため脂肪層の多い層肉の全面利用が困難であり、さらに作業性に欠けるという問題点を有していた。

また、これら従来例のものはいずれも顆粒状の添加物をまぶすか、大量の低濃度加工処理溶液にどっぷりと漬け込む加工方法なので、これらの処理方法で初期の目的を達成するためには長時間の作業時間を要し、その間に魚肉の品質低下（軟質化や硬質化、酸化）を起こすとともに歩留りを著しく低下させるという問題点を有していた。このため、食したときに歯ごたえ等のテクスチャーや食味を低下させるという問題点を有していた。また、漬け込みに使用した多量の漬け込み液や魚肉から流出した脂肪分や低分子栄養成分の処理に廃棄設備を要するという問題点を有していた。更に、従来の加工方法では魚肉の自在な加工性を有さず特定の用途向けにしか利用でき難いという問題点を有していた。

発明の開示

本発明は上記従来の問題点を解決するもので、高濃度で少量の塩類及びアルカリ剤等を主として添加し、極めて短時間で処理することにより、電子レンジ等の電気調理器で簡便に調理でき、加熱時に身崩れがなく低分子栄養成分の流出がなく、肉中に旨味が保持され水々しく利用できる。更に、冷蔵中の酸化による肉色の変化が極めて少なく、肉色を鮮やかに発色させることができる。解凍に伴う肉質の変化やドリップの流出を防止できるとともに、冷蔵、冷凍中等の変性を防ぎ

、しかも魚介類の生臭さを消臭することができる。肉組織内において蛋白質、油脂や油脂中のロウ成分をゲル化や乳化改質させて肉を座らせ歯ごたえを向上させ、口当たりがよく、健康指向で低塩分の調理食品や冷凍食品を製造できる。肉質が柔らかく、また、各種結着剤や添加剤を必要とせずに肉や脂肪の混合肉でも生の状態で結着することができる。強力な加熱結着性及び弾力性を示し加工が自在で、変質損失を防ぎドリップ等の低分子栄養成分等の流出をほとんど皆無にすることができるとともにこれらを有効に利用した高歩留りで栄養価の高い加工魚肉を提供すること。及び、それを用いた生食用刺身類、缶詰類、塩干物類、串焼き類等の焼物類その他各種加工食品等に適した魚肉食材を提供すること。及び、高濃度で少量の塩類及びアルカリ剤、その他必要に応じてビタミン剤等を添加し、極めて短時間（1～15分間）の処理により細胞膜、筋原繊維、筋鞘、コラーゲンや脂肪、脂肪中の細胞膜やコラーゲン、また骨格筋や脂肪の組織を弛緩させ或いは組織を塩溶させて毛細網目構造に改質し、細胞レベルから旨味を引き出すことができるとともに、各種調味料等を加え、旨味の複合化を起こすことができ、刺し身等の生食や加熱調理等の各種調理後に食しても噛めは噛むほど旨味が持続して味わえる。また、電子レンジ等の電気調理器で簡単に調理できる等最適な製品で、加熱時に低分子栄養成分の流出がなく肉中に旨味が保持され水々しく利用できる。更に、魚肉冷蔵中の酸化による肉色の変色化を防止するとともに肉色を鮮やかに発色させ、また解凍に伴うドリップの流出や冷蔵、冷凍中等の変性等を防止する。また魚介類の生臭さを消臭又はマスキングさせることができ、肉組織内において蛋白質、油脂や油脂中のロウ成分をゲル化や乳化改質させて肉を座らせ歯ごたえを向上させ、肉組織を細胞レベルで改良することができ、更に加熱調理時等に魚肉の身崩れを防止し、魚肉の軟度を自由に調整することができ、低塩分の鮮魚加工肉や冷凍食品又は調理食品を製造できる加工魚肉を低原価で量産できる加工魚肉の製造法を提供することを目的とする。

この目的を達成するために本発明は、以下の構成からなる。すなわち、

請求項1に記載の加工魚肉は、ラウンド又は肉塊状の魚肉若しくは細切状の魚肉100wt部に、(1) NaCl、KCl、CaCl₂、MgCl₂、の内いずれか1種若しくはこれらの混合物を、水若しくは原料魚肉や他の魚肉のドリップ、又は前記ドリップと水の混合液に溶解し1.5～7.0mol濃度の溶液状で添加された乾燥重量で0.2～4wt部の塩類と、(2) NaHCO₃、Na₂CO₃、KHCO₃、K₂CO₃、NH₄HCO₃、リン酸一ナトリウム、リン酸二ナトリウム、リン酸三ナトリウム、ピロリン酸ナトリウム、ポリリン酸ナトリウム、ピロリン酸カリウム、ヘキサメタリン酸ナトリウム、メタリン酸カリウム、メタリン酸ナトリウム等の内いずれか1種若しくはこれらの混合物を、水若しくは原料魚肉や他の魚肉のドリップ又は前記ドリップと水との混合液に溶解し0.3～3.0mol濃度の溶液状で添加された0.1～2.7wt部のアルカリ剤と、が含有されている構成を有している。

請求項2に記載の加工魚肉は、請求項1において、添加剤として、0.5～1.2wt部のアルコール、0.001～0.2wt部のビタミンE剤、0.006～0.3wt部のビタミンC剤、1～13wt部の糖類、0.2～5wt部の卵白、0.001～4wt部好ましくは0.01～3wt部の酸化防止剤の内いずれか一種以上が含有されている構成を有している。

請求項3に記載の加工魚肉は、請求項1又は2において、前記ラウンド又は肉塊状の魚肉若しくは細切状の魚肉中に原料魚肉のドリップが還元されている構成を有している。

請求項4に記載の魚肉食材は、請求項1乃至3の加工魚肉に、大豆蛋白粉末、デキストリン、カゼインソーダ等の結着補助剤、卵白、レシチン、シュガーエステル等の乳化剤、DHA、EPA、キト酸、カルシウム、ビタミン類、コラーゲン、等の機能剤、アルギン酸ソーダ、クエン酸カルシウム、コーンスターチ、馬鈴薯澱粉、グルコマンナン等の粘着補助剤、ソルビン酸、ソルビン酸カリウム等の保存剤、大豆蛋白繊維等の植物繊維、キチン等の動物繊維、ココナッツ油、コー

ン油、ナタネ油、豚脂、ラード、魚油等の動植物性油脂、グリシン、L-グルタミン酸、L-グルタミン酸ナトリウム、イノシン酸二ナトリウム、グアニル酸二ナトリウム、魚類ペプチタイド、ヒーフパウダー、ビーフエキス、ボークエキス等の調味料、胡椒、ジンジャー、パプリカ、ナツメグ、メース、タイム、オールスパイス、オニオン、ガーリック、コリアンダー、カルモダン、キャラウェイ、セージ、ローレル、マジョラム、クローブ、シナモン等の香辛料等の内1種以上が混合されている構成を有している。

請求項5に記載の加工魚肉の製造方法は、ラウンド又は肉塊状の魚肉若しくは細切状の魚肉100wt部に、1.5～7.0mol濃度の塩類高濃度溶液3～12wt部（乾燥重量で0.2～4wt部の塩類）を魚肉内に含浸し細胞膜、筋原繊維、筋鞘、コラーゲンや脂質、脂肪、脂肪中の細胞膜やコラーゲン等を塩溶させる塩溶工程と、次いで、0.3～3.0mol濃度のアルカリ剤高濃度溶液1～10wt部（乾燥重量で0.1～2.7wt部のアルカリ剤）含浸させるアルカリ含浸工程と、を備えている構成を有している。

請求項6に記載の加工魚肉の製造方法は、ラウンド又は肉塊状の魚肉若しくは細切状の魚肉100wt部に、0.3～3.0mol濃度のアルカリ剤高濃度溶液1～10wt部（乾燥重量で0.1～2.7wt部のアルカリ剤）含浸させるアルカリ含浸工程と、次いで、1.5～7.0mol濃度の塩類高濃度溶液3～12wt部（乾燥重量で0.2～4wt部の塩類）を魚肉内に含浸し細胞膜、筋原繊維、筋鞘、コラーゲンや脂質、脂肪、脂肪中の細胞膜やコラーゲン等を塩溶させる塩溶工程と、を備えている構成を有している。

請求項7に記載の加工魚肉の製造方法は、ラウンド又は肉塊状の魚肉若しくは細切状の魚肉100wt部に、0.3～3.0mol濃度のアルカリ剤高濃度溶液1～10wt部（乾燥重量で0.1～2.7wt部のアルカリ剤）と1.5～7.0mol濃度の塩類高濃度溶液3～12wt部（乾燥重量で0.2～4wt部の塩類）との塩類・アルカリ配合溶液を魚肉内に含浸させる塩類・アルカリ含

浸工程と、を備えている構成を有している。

請求項 8 に記載の加工魚肉の製造方法は、請求項 5 乃至 7 の内いずれか 1 において、糖類、ビタミン類、動植物蛋白粉末、酸化防止剤の 1 種以上を混合した添加剤溶液を魚肉内に含浸させる添加剤溶液含浸工程、を備えていることを特徴とする記載の加工魚肉の製造方法。

請求項 9 に記載の加工魚肉の製造方法は、ラウンド又は肉塊状の魚肉若しくは細切状の魚肉 100 wt 部に、1.5～7.0 mol 濃度の塩類高濃度溶液を 3～12 wt 部（乾燥重量で 0.2～4 wt 部の塩類）を魚肉内に含浸し細胞膜、筋原繊維、筋鞘、コラーゲンや脂質、脂肪、脂肪中の細胞膜やコラーゲン等を塩溶させる塩溶工程と、次いで、0.3～3.0 mol 濃度のアルカリ剤高濃度溶液 1～10 wt 部（乾燥重量で 0.1～2.7 wt 部のアルカリ剤）と糖類、ビタミン類、動植物性蛋白粉末、酸化防止剤の 1 種以上を混合した添加剤溶液との配合溶液を含浸させるアルカリ・添加剤含浸工程と、を備えている構成を有している。

請求項 10 に記載の加工魚肉の製造方法は、ラウンド又は肉塊状の魚肉若しくは細切状の魚肉 100 wt 部に、0.3～3.0 mol 濃度のアルカリ剤高濃度溶液 1～10 wt 部（乾燥重量で 0.1～2.7 wt 部のアルカリ剤）と糖類、ビタミン類、動植物性蛋白粉末、酸化防止剤の 1 種以上を混合した添加剤溶液を含浸させるアルカリ・添加剤含浸工程と、次いで 1.5～7.0 mol 濃度の塩類高濃度溶液を 3～12 wt 部（乾燥重量で 0.2～4 wt 部の塩類）を魚肉内に含浸し細胞膜、筋原繊維、筋鞘、コラーゲンや脂質、脂肪、脂肪中の細胞膜やコラーゲン等を塩溶させる塩溶工程と、を備えている構成を有している。

請求項 11 に記載の加工魚肉の製造方法は、請求項 5 乃至 10 の内いずれか 1 において、塩溶工程又は塩類・アルカリ含浸工程の後又はアルカリ含浸工程若しくは添加剤含浸工程後に、塩類高濃度溶液やアルカリ剤高濃度溶液、添加剤溶液を魚肉内に浸透・分散させる分散吸収工程、を備えている構成を有している。

請求項 12 に記載の加工魚肉の製造方法は、請求項 5 乃至 11 の内いずれか 1 において、塩類高濃度溶液が NaCl 、 KCl 、 CaCl_2 、 MgCl_2 の内いずれか 1 種若しくはこれらの混合物からなり水若しくは原料魚肉や他の魚肉のドリップ又はドリップと水の混合液に溶解された溶液である構成を有している。

請求項 13 に記載の加工魚肉の製造方法は、請求項 5 乃至 11 の内いずれか 1 において、アルカリ剤高濃度溶液が、 NaHCO_3 、 Na_2CO_3 、 KHCO_3 、 K_2CO_3 、 NH_4HCO_3 、リン酸一ナトリウム、リン酸二ナトリウム、リン酸三ナトリウム、ピロリン酸ナトリウム、ポリリン酸ナトリウム、ピロリン酸カリウム、ヘキサメタリン酸ナトリウム、メタリン酸カリウム、メタリン酸ナトリウム等の内、1 種又は 2 種以上の混合物からなり、水若しくは原料魚肉や他の魚肉のドリップ又はドリップと水との混合液に溶解された溶液である構成を有している。

請求項 14 に記載の加工魚肉の製造方法は、請求項 5 乃至 11 の内いずれか 1 において、塩溶工程やアルカリ含浸工程、塩類・アルカリ含浸工程、分散吸収工程が、 20°C 以下好ましくは 10°C 以下の魚肉加工温度下、及び／又は pH が 5 ～ 10、好ましくは 6.5 ～ 8.5 で行われる構成を有している。

請求項 15 に記載の加工魚肉の製造方法は、請求項 5 乃至 11 の内いずれか 1 において、塩溶工程やアルカリ含浸工程、塩類・アルカリ含浸工程が、インジェクションを用い魚肉内に直接注入するインジェクション法、又は魚肉の表面に直接噴霧する噴霧法の内いずれか 1 である構成を有している。

請求項 16 に記載の加工魚肉の製造方法は、請求項 5 乃至 11 の内いずれか 1 において、分散吸収工程が、マッサージ法、バイブレーション法、超音波法、混練処理法の内いずれか 1 である構成を有している。

ここで、魚の種類としては、海産、淡水産等であって、形態の大小を問わずに利用できる。例えば、スケトウダラ、ホキ、白サケ、鯛等の白身魚類、マグロ、カジキ等の赤身魚類、イワシ、サバ、アジ、サンマ等の青身魚類、アザラシ、鯨

等の海獣類等の海産魚介類、コイ、フナ、草魚等の淡水魚介類、ウナギ、ハモ、タチ魚、タコ、イカ等の軟体動物類、南極沖アミ、アミ類等の沖アミ類等も利用できる。

魚肉としては捕獲直後のものや冷蔵、冷凍、氷温貯蔵したもの等も利用することができる。特に筋子やイクラ、タラコ等を採卵した後のサケやマス、タラ、脂肪分の少ない赤身魚、その他低利用性の魚種も効率よく利用できるとともに鮮度の低下した魚肉も利用することができる。

魚肉の形態としては、ラウンド（イワシ、サバ、アジ、カツオ、イカ、ホッケ、タイ等）、セミドレス（サケ、マス、マグロ、サメ、ニジマス等）、ドレス（サケ、マス、タラ、エビ等）、バンドレス（サケ、マス、マグロ、オヒョウ等）、チャンク（メカジキ、マグロ等）、フィレー（メカジキ、カレイ、スケトウダラ、マグロ、オヒョウ、シイラ等）、ステーキ（サケ、マス、メカジキ、マグロ、クジラ、ヤヒョウ等）、ブロック（クジラ、スケトウダラ、ホッケ等）、スライス、サイの目、細切肉、挽き肉、落とし身、スティック等が利用される。

魚肉は、肉片の厚みのある方が塩類高濃度溶液やアルカリ剤高濃度溶液の魚肉塊中への含浸作業であるインジェクション作業等が容易に行えとともに、マッサー加工、パイブレーション加工、超音波作業等を容易に行えるので好ましい。また、細切状の魚肉や甲殻類や沖アミ類等の小型のもの、落とし身状のものは、塩類高濃度溶液やアルカリ剤高濃度溶液を噴霧することで均一に含浸させることができる。

塩類高濃度溶液としては、塩類の種類にもよるが1.5～7.0mol濃度、好ましくは2.5～6.0mol濃度の溶液が用いられる。塩類濃度は、魚の種類や魚肉の採取部位にもよるが、一般的に2.5mol濃度より低くなるにつれ筋原繊維等の溶解度を下げ、また、魚肉内においてゲル化の生成が減少する傾向が認められ、特に1.5mol濃度より低くなるとその傾向が顕著になり、又、6.0mol濃度を超えるにつれ塩味が強く肉質が硬くなり、魚肉の旨味が損な

われてくる傾向が認められ、特に7.0 mol濃度を超えるとその傾向が顕著になるので、いずれも好ましくない。2.5~6.0 mol濃度の塩類濃度が魚肉塊中の細胞膜や筋原繊維、筋鞘、コラーゲンや脂質、脂肪、脂肪中の細胞膜やコラーゲン等の溶解度を向上させ魚肉内において肉組織を毛細網目状構造化し、肉蛋白等からアクトミオシンを溶出させ、ゲル化能を付与し結着性を向上させるので好適である。

塩類としては、NaCl, KCl, CaCl₂, MgCl₂の一種若しくはこれらの混合物が用いられる。また、NaClとしては、グルタミン酸ソーダで加工した加工塩等を用いてもよい。塩類高濃度溶液は、これらの塩類を水若しくは原料魚肉や他の魚肉のドリップ又は前記ドリップと水の混合液に溶解し、1.5~7.0 mol濃度の溶液に調整される。

塩類の魚肉への添加量は、乾燥重量で、魚肉100wt部に対し、0.2~4wt部、好ましくは0.3~3wt部より好ましくは0.5~2wt部が添加される。0.5wt部より少なくなるにつれ細胞膜や筋原繊維、筋鞘、コラーゲンや脂質、脂肪、脂肪中の細胞膜やコラーゲンの塩溶度を下げる傾向が認められ、特に0.2wt部未満ではその傾向が著しく、また3wt部を越えるにつれ塩分が強く効きだし、特に4wt部を越えると加工方法や加工食材の種類にもよるが、食品としての適性を損なうという傾向が認められる。また、添加量が少ない程素材の持つ風味を活かしたものが得られ、添加量が多い場合には燻製品や塩干物品として利用するとこれらの保存性を向上させることができる。

アルカリ剤高濃度溶液としては、アルカリ剤の種類にもよるが、0.3~3.0 mol濃度、好ましくは0.7~2.5 mol濃度のものが用いられる。1.5 mol濃度より小さくなるにつれ、肉のpH上昇度が低下しゲル形成能や乳化能が不安定化する傾向が認められ、特に0.5 mol濃度未満になるとその傾向が顕著になり、2.5 mol濃度を越えるにつれpHが上がり過ぎて筋原繊維や筋鞘が過度に変質される傾向があり、その分加工魚肉の変敗が進行し易くなる傾

向が認められ後工程での加工品と品質の維持が困難になり、特に3.0 mol濃度を超えるとその傾向が顕著になるので、いずれも好ましくない。

アルカリ剤としては Na_2CO_3 、 K_2CO_3 、 CaCO_3 、 NaOH 、 KOH 、 $\text{Ca}(\text{OH})_2$ 、 NaHCO_3 、 KHCO_3 、 $\text{Ca}(\text{HCO}_3)_2$ 、 NH_4HCO_3 、リン酸二ナトリウム、リン酸三ナトリウム、ポリリン酸ナトリウム、メタリン酸ナトリウム、ピロリン酸ナトリウム、リン酸一ナトリウム、ピロリン酸カリウム、ヘキサメタリン酸ナトリウム、メタリン酸カリウム、リン酸一カリウム、リン酸二カリウム、トリリン酸ナトリウム、等の内いずれか1種又はこれらの混合物が用いられる。中でも NaHCO_3 や KHCO_3 等は水等への溶解性に多少難があるもののpHの調整等が容易であることと食品衛生上安全であるので好ましい。アルカリ剤高濃度溶液の作製は、これらのアルカリ剤を水若しくは原料魚肉や他の魚肉のドリップ又は前記ドリップと水との混合液に溶解された0.3～3.0 mol濃度の溶液に調整して行われる。

アルカリ剤の添加量は、乾燥重量で、魚肉100wt部に対し、アルカリ強度により異なるが、0.1～2.7wt部、好ましくは0.3～2wt部、更に好ましくは0.4～1.3wt部添加される。尚、pHが上がった場合は乳酸等の弱酸を添加して調整してもよい。0.4wt部未満になるにつれ、熟成が充分に行われ難く、ゲル形成能力が不安定になる傾向が現れだし、特に0.1wt部未満ではその傾向が顕著になり、又1.3wt部を超えるにつれ、肉のpHが上がりすぎ保存性に欠けるようになり、また薬臭が付加されるとともに変性が起き易くなる傾向が現れだし、特に2.7wt部を超えるとその傾向が顕著に現れたので、いずれも好ましくない。

ドリップは新鮮なものや品質管理のされた細菌数の少ないものであればよい。ドリップは単独でそのまま、または他の種類のドリップと混合して用いるか、若しくは水に希釈して用いてもよく、あるいは塩類高濃度溶液やアルカリ剤高濃度溶液中に添加混合してもよい。この際、ドリップ中に水分があるため塩類やアル

カリ剤を溶解する水は減少させるのが好ましい。ドリップ中の低分子栄養成分や旨味を肉中に還元することにより原料肉の持つ風味を活かすことができる。

塩溶工程やアルカリ含浸工程、塩溶・アルカリ含浸工程、塩溶促進・ゲル化能付与・乳化工程は20℃以下、好ましくは10℃以下で行うのが好ましい。10℃以上になるにつれ、魚介類の熟成度にもよるが変敗し易く、日持ちが悪くなる傾向が認められるためである。また、pHは魚肉のpHが5～10、好ましくは6.5～8.5になるようにアルカリ度を調整するのが好ましい。pHが6.5より小さくなるにつれ魚肉の足が弱くなる傾向が認められ、特にpHが5未満ではその傾向が著しく、また、pHが8.5を超えるにつれ原料魚の種類にもよるが、急激な坐りを起こす傾向が認められ、特にpHが10を超えるとその傾向が顕著になるので、いずれも好ましくない。

塩類高濃度溶液やアルカリ剤高濃度溶液の魚肉への含浸は、インジェクション等の注入器等で含浸させる場合は同時に添加してもよいが、塩類高濃度溶液を先に注入し、次いでアルカリ剤高濃度溶液を注入すると、色調を高めることができる。また、魚肉が新鮮な場合や色調を問題としない場合（例えば、魚肉ハンバーグや魚肉コロッケ用等の加工魚肉用）はアルカリ剤高濃度溶液を先に注入すると魚肉内での乳化等により物性を向上させることができる。

含浸方法は魚肉が小型の場合は注射器等でインジェクションするか噴霧法で行い、大型の場合はインジェクション機を用いて行われる。

アルコールとしては、ミリン等の料理酒、日本酒、ワインやウィスキー等の洋酒や中国酒が好適に用いられる。ミリン等の料理酒や日本酒等の酒類を加えることにより加工魚肉にツヤや風味、ソフト感を向上させることができる。

魚肉への添加量としては、魚肉100wt部に対し、0.5～12wt部好ましくは1～8wt部が用いられる。添加量が1wt部未満になるにつれ、微妙な風味がつかなくなる傾向が生じ、特に0.5wt部未満ではその傾向が著しいので好ましくない。また、8wt部を超えるにつれ魚肉の有する風味を損なう傾向

が生じ、特に12wt部を超えるとこの傾向が著しいので好ましくない。

糖類としては、キシリット、ソルビトール、グルコース、オリゴ糖、マルトトラオース、ガラクトース、フルクトース、ラクトース、砂糖、しょ糖、麦芽糖、ブドウ糖の1種又はこれらの混合物又はこれらに、グリセリン、プロピレングリコール、デンプン等を添加したものが利用できる。糖類の添加量としては、魚肉100wt部に対し1~13wt部、好ましくは4~10wt部が用いられる。4wt部より少なくなるにつれ保存中に冷凍変性を受け易くなりまた肉質が低下する傾向が現れ、1wt部より少なくなると魚種によってはその傾向が著しくなるので好ましくない。また10wt部より多くなるにつれ甘味が付く傾向が顕著になり褐変化する傾向が現れ、特に、13wt部を超えるとその傾向が著しいので好ましくない。

ビタミンC剤は、魚肉100wt部に対し0.006~0.3wt部、好ましくは0.02~0.15wt部が用いられる。0.02wt部よりも少なくなるにつれ魚肉が酸化され肉色が低下する傾向が現れ、特に0.006wt部未満になるとその傾向が著しいので好ましくない。また、0.15wt部より多くなるにつれ魚肉の種類や鮮度の程度により魚肉の発色や酸化防止の効果に大きな差異が認められなくなる傾向が現れ、特に0.3wt部を超えるとその傾向が著しいので好ましくない。

ビタミンE剤は魚肉100wt部に対し0.001~0.2wt部、好ましくは0.005~0.08wt部添加することによりビタミンC剤と相まって肉の発色や酸化防止効果を改善し、特に0.005~0.08wt部ではその効果を顕著にすることができる。尚、ビタミンE剤は肉が新鮮な場合は用いずビタミンC剤のみでもよい。

卵白は、魚肉塊100wt部に対し0.2~5wt部好ましくは1.2~4.5wt部が用いられる。この配合割合により長期冷凍保存等行って冷凍変性等した魚肉でも塩類高濃度溶液の塩溶溶解性やアルカリ剤高濃度溶液による乳化やゲ

ル化の補強、促進を行うことができ、特に1. 2~4. 5 wt部ではその作用を高めることができる。

酸化防止剤としては、エリソルビン酸、エチレンジアミン四酢酸カルシウム二ナトリウム、エリソルビン酸ナトリウム、サンカトール（太陽化学（株）製）等が好適に用いられる。配合量は、魚肉塊100 wt部に対し0. 005~4 wt部好ましくは0. 05~3 wt部が用いられる。この範囲で食味を害することなく、かつ肉色の変化を防止できる。

アルコール、ビタミンC剤、ビタミンE剤、糖類、卵白、酸化防止剤等は糖類の一種であるソルビトール溶液や水若しくは原料魚肉や他の魚肉のドリップ又は前記ドリップと水との混合液に溶解して添加剤溶液として用いられる。中でもソルビトール溶液が特に好ましい。顆粒のソルビトールは水等に溶解しにくいので溶液状（70%濃度）のものが塩類高濃度溶液と混合し易く使いやすいためである。これらを添加することにより魚肉の旨味をより多く引き出すことができる。

その他の副資材として、ブイヨンや肉エキス、調味料、香辛料、ラクトアルブミン、血漿粉末等の蛋白添加剤、アクトミオシン、デキストリン、パールミートアクティバTG-B（千葉製粉（株）製）等の結着剤、大豆蛋白粉末、カゼインソーダ、カードラン10, 20, 30（武田薬品（株）製）等の結着補助剤、レシチン、シュガーエステル、グリセリン脂肪酸エステル、脂肪酸エステルプロピレングリコール等の乳化剤、DHA, EPA, キト酸、カルシウム、ビタミン類、コラーゲン等の機能剤、サンプロLX-100（太陽化学（株）製）、サンソフト（太陽化学（株）製）等の乳化剤、アルギン酸ソーダ、クエン酸カルシウム、コーンスターチ、馬鈴薯澱粉、グルコマンナン等の粘着補助剤、ソルビン酸、ソルビン酸カリウム等の保存剤、大豆蛋白繊維等の植物繊維、キチン等の動物繊維、ココナッツ油、コーン油、ナタネ油、豚脂、ラード、魚油等の動植物性油脂等が用いられる。これらは塩類高濃度溶液やアルカリ剤高濃度溶液もしくは添加剤溶液に溶解して用いることができる。

この構成によって、所定量の塩類高濃度溶液とアルカリ剤高濃度溶液の少量を魚肉の内部に略均一に含浸させることにより、魚肉の細胞膜等の高い浸透性を利用してこれらの塩類やアルカリ剤を均一に肉中に分散吸収させ急速な生化学反応を肉中の組織に起こさせることができるものと推定される。

含浸させた少量の塩類高濃度溶液の全量を物理的な手段により分散吸収させると直接魚肉塊中の骨格筋や脂肪層などに作用するため、極めて短時間に塩溶溶解性を促進させるとともに塩類濃度が急速に低下し反応活性を鎮静化し品質を安定化させるものと思われる。

さらに少量のアルカリ剤高濃度溶液も同様にして肉中に物理的な手段により分散吸収させるので、理由は不明であるが、魚肉組織中に次々と生化学反応を生起させ、極めて短時間で筋繊維や筋束を毛細網目状化させ乳化・ゲル化能を付加させるものと思われる。すなわち、少量の塩類、アルカリ剤、ビタミン類、機能剤や調味料等を高濃度溶液状態で魚肉中に含有させ、次いで、バイブレーション等の強制的な分散吸収工程を施すことにより、これら全量を直接魚肉中に吸収させ生化学反応を惹起させると共に、骨格筋中の細胞膜、筋原繊維、筋鞘、筋、脂質、脂肪、コラーゲンなどを弛緩、軟化、分断し、それらを部分的に溶解させるので、ペプチドなどの旨味が肉組織中へ溶解拡散し、それが別途添加された添加剤液や調味料と複合効果を引き出し、また、それらの溶解拡散した滲出物が乳化、ゲル化能を有して周囲の魚肉組織と渾然一体化し肉内部で一種の肉糊現象を表し、水分などを肉組織中に高度に保持させることができるものと推定される。脂肪層では脂肪中の繊維や細胞組織中の血管、神経などに含まれるコラーゲンや脂質を軟化塩溶させ、ゲル化能を有する状態に脂肪層を変質させ脂肪組織を改質させると共にゼラチン化し肉の旨味を際立たせることが出来る。塩類やアルカリ溶液で塩溶させゲル化能付加し乳化させ肉組織を改質しているので、骨格筋等にビタミン類の添加効果を飛躍的に向上させ、肉を活性化させて毛細網目構造状の組織中に反応物や添加剤等を閉じ込め、その結果魚介類肉の保存中の酸化、変色を

防止し透明感のある肉質に変え新鮮さを持続させ、添加物の組み合わせで肉の白度をコントロールすることもできる。

塩類やアルカリ剤を肉組織中に均一に拡散しているの、骨格筋組織等で発生した乳酸が肉組織中に均一に分散したアルカリ剤を中和し魚肉のpHを低下させるので日持ちを著しく向上させ品質の低下を防止することができる。

また、マッサージやバイブレーション、超音波処理を施すことにより塩類高濃度溶液とアルカリ剤高濃度溶液を魚肉中に均一に分散させ毛細網目状化やミクロ的な乳化、ゲル化能を極めて短時間（1～15分間）で促進することができる。塩溶、乳化形成能による肉組織の毛細網目状化により肉の保水性を向上させ、ドロップの生成を防止できるとともに、漁獲直後の生肉等を極めて短時間に熟成させることができる。保水性が向上するので水溶性低分子蛋白質等の旨味成分や各種低分子栄養成分の流出を防止でき、魚肉の有する旨味や栄養価を最大限に引き出し利用することができる。また、塩類高濃度溶液を少量しか用いないので魚肉全体の塩分濃度を抑さえ低塩食品とすることができる。また、この処理により肉を軟化させることができるので硬い低級肉、例えば、マグロの尾部の肉等の硬い肉を柔らかい肉に変えることができる。

塩類やアルカリ剤の濃度を変えることにより肉の結着性や軟度を自由に調節できる。更に、解凍時に生成したドロップを塩類高濃度溶液又はアルカリ剤高濃度溶液中に混入し、魚肉内に還元するので栄養価や旨味を損なうのを防止できる。さらに、アルカリ剤高濃度溶液と塩類高濃度溶液及びビタミン剤の作用で肉の色を向上させ品質を向上させることができ、また、魚臭の生成を防止することできる。

ドロップを生成した魚肉以外の他の種類の魚肉にそのドロップを加えることによりその旨味に他の種類の肉汁の旨味を加重できる。

塩類高濃度溶液やアルカリ剤高濃度溶液中に水溶性の調味料や栄養剤及び機能剤を混入できるので、病人食等、用途に応じた味付けや高栄養価を素材自体に付

加することができる。

魚肉の肉組織が変化し毛細網目状化し、いわゆるゲル形成能を生じ、肉組織を緻密化するので加熱焼成時に肉汁が発生しても、肉が加熱により膨張する時、肉汁を組織内に吸収保持し、肉中の水分含有量が高くなりその結果、膨張率を向上させボリュームのあるソフトな製品が得られる。塩類溶液やアルカリ剤溶液の濃度を調整することにより、魚肉の肉質の硬軟を自在に調節できるので、調理の領域を拡大することができる。また、強い結着性を有するので、肉片と肉片の間がよく結着し、細切肉などが一枚肉となり加熱しても分離してバラバラになることがない。保水性が高いので冷凍によるドリップの流出が防止できるとともに冷蔵及び冷凍時や解凍時の変性を防止できる。また、緩慢冷凍や再冷凍しても肉片と肉片又は細切肉同士の結着性が優れているので、ドリップがなく骨格筋や脂肪層を高品質に安定させることができる。

塩類やアルカリ剤が高濃度で添加されるので、極めて短時間に魚肉中の脂肪層までを塩溶させ乳化、ゲル化、ゼラチン化させ、また繊維蛋白質を1wt%以下の塩類添加で、細胞膜や筋原繊維、筋鞘などを弛緩させ溶解させるが、高濃度溶液が肉組織の蛋白や脂肪に拡散し反応し溶液濃度が次第に低下し短時間で生化学反応を終わらせることができる。その結果骨格筋組織を破壊することなく結着性の乏しい肉が弾力性に優れたソフトな結着性のある肉に改質させることができる。アクトミオシンを溶出させ生肉中の酵素活性を阻害して肉組織の酵素による崩壊を防止するためと推定されるが、生の状態での結着性や強い加熱結着性を付与する自在な加工性を得ることができる。

塩溶効果によるゲル化能効果によりねり製品と同じように魚肉組織を坐らせ歯ごたえのある刺身ができ、缶詰やレトルトなどの高圧力やマイクロ波による加熱による脂肪の溶解や肉中の細胞膜やフィラメントがバラけて分散するのを防止できるとともに加熱中や加熱調理後の身崩れを防止することができる。加熱膨張の際、溜出した肉汁を更に毛細網目状の肉組織に吸収し魚肉中に取り込み保水効果

を高めることができる。また、肉組織の毛細網目状構造化により、ソフトで冷却後も硬くなるのを防ぐことができる。動植物性蛋白粉末などの添加により、肉質の保水性、硬軟の程度、味の微細な調整能力を高めることができる。

発明を実施するための最良の形態

以下本発明の一実施例について、詳細に説明する。

(実施例1)

魚肉として鮮魚のマダイ3匹を用い、これらのウロコや頭、内臓を取り除き、水洗したラウンド肉を2700g用意した。次に、魚肉2700gに対し、食塩を溶解した4.3mol濃度の塩類高濃度溶液135ccを網目状にインジェクションを行った。次いで、電気マッサージ機を用いて5分間バイブレーションを行いながら、塩類高濃度溶液の魚肉組織内へ浸透させ分散吸収化を行い塩溶性を促進した。次いで、NaHCO₃を溶解した1.2mol濃度のアルカリ剤高濃度溶液166ccを魚肉に網目状にインジェクションを行った後、電気マッサージ機で5分間バイブレーションを行いながら、アルカリ剤高濃度溶液の魚肉組織内への分散吸収化を図り魚肉の乳化、ゲル化能を付加する熟成促進を行った。

次いで、得られた試料について、無処理の試料(比較例)と共に組織の変化を顕微鏡で確認した。倍率400倍で確認したところ、比較例のものは細胞膜が明確に確認できたが、本実施例のものは細胞膜が破壊され全体が流れたようになっていた。そこで実施例について、電子顕微鏡で6万倍に拡大して再度観察したところ、筋原繊維間に小泡状のものが入り込み部分的に筋原繊維が切断され、ミクロ的に乳化現象と思われるものが生じていることがわかった。また、Z帯もかなり屈曲し、Z帯間で筋原繊維が膨潤し紡錘状になっているのが確認された。尚、試料はいずれも骨格筋を70ミクロンにスライスしたものをを用いた。

以上のことから明らかなように、毛細網目状構造とした細胞レベルでの生化学

反応で旨味を細胞レベルより引きだし、調味料と複合反応した調味ができるようになり、魚肉に今までにない旨味を作り出すことができることがわかった。従来、魚肉処理の欠点として、凍結解凍後のドリップ発生や、肉組織の崩壊、魚臭の発生、鮮色の低下等が指摘されていたが、本実施例では、細胞レベルで肉質を改質することでこれらの問題点をほとんど解決できることがわかった。

(実施例 2)

実施例 1 で処理されたマダイに、更に、アルコールとしてミリン 35 c c、日本酒 40 c c、アミリッチ GCR (味の素 (株) 製; 以下 GCR という) 4.5 g、ソルビトール 55 g、ビタミン C 剤とビタミン E 剤の混合物 4.5 g を混合溶解した添加剤溶液を魚肉に網目状にインジェクションを行った後、電気マッサージ機にて 5 分間バイブレーションを行いながら、添加剤溶液の分散吸収化と熟成促進を行った。次いで、これを三枚に卸し腹部の骨を取り除いたフィレー肉を用いて、通気性のない合成樹脂製袋に真空包装し、1 ヶ月間の間 -20℃ で冷凍した。1 ヶ月後、冷凍庫から取り出し通水解凍を行った。解凍後、袋からフィレーを取り出したが、弾力性、ツヤ、結着性、鮮やかな色が発色した優れた性状を示し、凍結解凍してもドリップが出ない等の特徴を持っていた。また、刺し身、煮魚、焼魚、フライ、ムニエル等に多目的に利用できることもわかった。更に、解凍後はチルドとしても利用でき今までにない多目的利用を可能にすることがわかった。尚、皮付きのフィレー肉は、必要に応じて 100℃ の熱湯で湯引きし、素早く冷水に入れて冷却して取りだし完全に水切りを行い、次いで、魚肉を連続式凍結フリーザーにて急速凍結し、表面に付着した小氷片をブラッシュで取り除いた後、通気性のない袋に真空包装してもよい。この際、脱酸素剤を入れて包装すると更に日持ちを良くすることがわかった。

(実施例 3)

実施例 2 で処理されたフィレー状の皮付き、湯引き皮付きのマダイから側面や中央の血合肉、骨付き肉を取り除き、刺し身状に細切加工し、これをトレーに入

れて急速冷凍を行い、次に真空包装を行い、10日間経過後、解凍し刺し身としてパネラー5名に官能試験を行った。その結果、テクスチャー等は鮮魚のマダイと変わらない刺し身であり、味は解凍品でありながら鮮魚のものよりも高い評価を得た。

以上のことから、本実施例のものは、実施例1、2と同様に加工後の優れた特徴を有する加工魚肉であり、チルド流通または急速凍結、解凍して業務用、家庭用として利用することができ、また解凍後チルドとして流通販売できることがわかった。

(実施例4)

魚肉として鮮魚のマダイを三枚に卸した皮付きタイから中骨を取り除き、水洗後完全に水切りしたフィレー肉を3000g用意した。次に、フィレー肉3000gに対し、食塩と $MgCl_2$ の9:1混合物を溶解した4.4mol濃度の塩類高濃度溶液150ccを魚肉に網目状にインジェクションを行った後、電気マッサージ機を用いて5分間パイブレーションを行いながら、塩類高濃度溶液の分散吸収化を行い塩溶性を促進した。次いで、フィレー肉3000gに対しトリポリリン酸ソーダを溶解した2.1mol濃度のアルカリ剤高濃度溶液140ccを魚肉に網目状にインジェクションを行った後、電気マッサージ機で5分間パイブレーションを行いながら、アルカリ剤高濃度溶液を分散吸収させアルカリ溶液による魚肉組織の乳化、ゲル化能を付加する熟成促進を終えた。さらに、アルコールとしてミリン50cc、日本酒50ccと、ビタミンC剤とビタミンE剤の混合物5g、GCR5g、ソルビトール液85ccを混合溶解した添加剤溶液を魚肉に網目状にインジェクションを行った後、電気マッサージ機にて10分間パイブレーションを行いながら、添加剤溶液を魚肉内に分散させ吸収させながら熟成促進を行った。次いで、毛細網目構造に改質した魚肉を刺身状に切り、凍結乾燥を行い、吸い物用タイの加工食品を作製した。これを吸い物にして5名のパネリストに配り官能試験を行ったが極めて高い評価を得た。

従来品は硬くて自然感がないが、本実施例によれば生の食感に近い湯戻りのよいタイ吸い物用フリーズドライ加工食品が得られることがわかった。

(実施例5)

頭、内臓を取り除き水洗されたスケトウダラのフィレー状の凍結魚肉を温度管理をしながら解凍を行い十分に脱水を行った3000gの魚肉を用意した。次に、食塩を溶解した4.4mol濃度の塩類高濃度溶液147ccを魚肉に網目状にインジェクションを行った後、電気マッサージ機にて5分間バイブレーションしながら、塩類高濃度溶液を魚肉内に分散し吸収させ塩溶解を促進させた。次いで、 NaHCO_3 を溶解した1.85mol濃度のアルカリ剤高濃度溶液139ccを魚肉に網目状にインジェクションを行った後、電気マッサージ機にて5分間同様にして分散し吸収させ乳化、ゲル化能を促進させた。その後、ソルビール溶液110cc、ミリン48cc、GCR4.5g、蔗糖90g、ビタミンC剤とビタミンE剤の混合物5g、日本酒50cc、卵白28gを溶解した添加剤溶液を魚肉に網目状にインジェクションを行い、電気マッサージ機にて5分間同様にして拡散し吸収させた。次いで、それを急速冷凍を行いトレーに移しフィルムでラップをして -25°C の冷凍庫に1ヵ月保存した。1ヵ月後取り出して解凍を行った。ドリップの発生はほとんど認められなかった。

比較例として本実施例の加工処理を行なわなかった無処理肉1000gのフィレー肉を用い実施例と同様にして急速冷凍を行い1ヵ月後取り出し解凍を行った。多量のドリップの発生が認められ、肉色に変色し身くずれが多少認められた。次いで、本実施例品と比較例品とをフライ料理と煮魚料理にして5名のパネラーに試食させた。実施例品は、柔らかく美味しく食することができたが、比較例品は硬く、しかもフライ料理品は肉の収縮によりコロモと肉が剥がれてしまい、カットした時身崩れを起こした。この傾向は調理品が冷えて時間が経過するにつれてひどくなり、硬くて不味いものになってしまった。

このことから、本実施例のものは、保水性に優れ、ドリップの防止や、加熱冷

却後の歩留り向上、ソフトさの持続、身崩れの防止、細胞レベルの調味を少ない塩分量で行うことができ、今までにない美味しいものが得られることがわかった。また、長期保存で、冷凍変性を生じ塩溶溶解性の低下した原料には卵白1%をソルビトール溶液に溶かして加えることで乳化、ゲル化能の補強・促進を行うことができ、肉質を著しく改質し、魚肉の品質を向上させることがわかった。また、この特質を利用してレトルト品、缶詰に活用でき、従来のレトルト品また缶詰と異なり、肉がソフトで喉越しが良く、テクスチャーに優れた弾力性のある加工魚肉が得られることがわかった。

(実施例6)

冷凍されたスケトウダラのフィレー肉1200gを温度管理をしながら解凍した。次に、 Na_2CO_3 を溶解した2.0mol濃度のアルカリ剤高濃度溶液45ccをフィレー肉に網目状にインジェクションを行った後、電気マッサージ機にて5分間バイブレーションを行いながら分散し吸収させ、次いで、食塩とKClの8:2の混合物を溶解した4.05mol濃度の塩類高濃度溶液62ccを魚肉に網目状にインジェクションを行った後、電気マッサージ機にて5分間バイブレーションを行いながら、塩溶溶解の促進を行った。その後、ミリン20cc、GCR2g、蔗糖18g、ビタミンC剤とビタミンE剤の混合物2.1g、ワイン25ccを混合溶解した添加剤溶液を魚肉に網目状にインジェクションを行った後、電気マッサージ機にて5分間バイブレーションを行いながら、添加剤溶液の分散吸収化と乳化やゲル化能付加及び熟成促進を行った。次いで、得られたフィレー肉を焼魚やムニエル、煮付、唐揚げ用にカットした後、トンネルフリーザーにて急速凍結を行い、通気性のない袋に入れて真空包装し、 -20°C の冷凍庫に保存した。1週間後冷凍庫から取り出し解凍し、焼魚、ムニエル、煮付、鍋物、唐揚げに料理した。いずれもテクスチャーや味に優れたものであった。

従来は魚臭、ドリップが多く加熱後は硬くなり、身が収縮したり、また身崩れが激しいため、フライにする時には糊料をつけパン粉にまぶして対処していたが

、テクスチャーや味覚等の品質に欠けていた。本実施例によれば、糊料等を用いずにテクスチャーや味覚等を向上させるとともに、魚肉100%の製品を作ることができ、従来の問題点を解決することができた。また、これにより、焼魚、ムニエル、煮付、唐揚げ用に適した多目的加工冷凍食品が得られることがわかった。

(実施例7)

魚肉としてホキ(鮮魚)の頭、内臓を取り除き水洗した三枚卸しのフィレー状の皮付き魚肉600gを準備した。次に、食塩を溶解した4.0mol濃度の塩類高濃度溶液30ccを魚肉に網目状にインジェクションを行った後、電気マッサージ機にて5分間バイブレーション処理を行い、次いで、 NaHCO_3 を溶解した1.2mol濃度のアルカリ剤高濃度溶液24ccを魚肉に網目状にインジェクションを行い、真空マッサージャーにて5分間低速運転を行いながら、魚肉内へのアルカリ剤高濃度溶液を拡散させ吸収させ、乳化、ゲル化能を促進させた。次に、ソルビトール液17cc、ミリン10cc、GCR1.0g、ビタミンC剤とビタミンE剤の混合物1.0g、消臭剤としてサンフラボンHG(太陽化学(株)製)0.9g、日本酒10ccを溶解した添加剤溶液を魚肉に網目状にインジェクションを行い、真空マッサージャーにて5分間低速運転を行いながら、添加剤溶液の拡散吸収化と熟成促進を行った。得られた試料について、製品テストを行った。その結果を第1表に示した。

製品テストは、本実施例のフィレー状のホキを切身にして、焼成試験及びカラアゲ試験を行った。比較例として、本実施例の加工処理をしなかった他は本実施例と同様にして三枚に卸したフィレー状の切身を準備した。

①焼成試験には温度167℃に設定したホットプレートを使用し、切身の裏表を8分間焼成した。

②カラアゲ試験は温度を180℃に調整した天ブラ油を用い、3分間で油ちょうを行った。

その各歩留りは次の通りであった。(サンプルは各6個とし、歩留りはその平均値をとった)

次に得られた製品について、製品テストを行った。

1. 実施例品

カラアゲの場合、肉質の膨張により肉と皮の間に隙間がなく、加熱縮みがなくソフトでふっくらしていた。また油で揚げたものは表面が狐色で味がよかった。焼成の場合、身割れ形崩れがなく白度に優れ、保水性がよいため時間が経過しても重量減が少なく歯触りがよく美味であった。

2. 比較例品

時間経過とともに水分が蒸発し、製品が硬化して色が黒くなる。また乾燥に伴って白色のものが黒みをおびて硬くなりそれに合わせて味覚が劣ってきた。また身割れがはげしく3個割れていた。

従来は魚臭、ドリップが多く加熱後は硬くなり、身が収縮したりまた身崩れが激しいため、フライ料理にしか利用できず、油で揚げる時は糊料をつけ、パン粉をまぶして対処していたが、旨味やテクスチャーに劣っていた。本実施例では、糊料やパン粉を用いず魚肉のみを用いても旨味やテクスチャーに優れた製品を得ることができ、従来の問題点を解決することができた。また、 NaHCO_3 をアルカリ剤として使用したことにより、その加工食品のpHを低くすることができ、安定した品質を維持することができ、加熱調理済惣菜用食品に好適な加工魚肉が得られることがわかった。

(実施例8)

ホキ(鮮魚)の頭、内臓、皮、骨を取り除き三枚卸しにしたフィレー状肉900gを水切りした後、荒ミンチ(ナショナル製ミートグラインダーMK-GL2機)(10mm)にかけた。得られたミンチ肉をミキサーに入れ、食塩を溶解した4.0mol濃度の塩類高濃度溶液45ccを噴霧機にて噴霧しつつ5分間低速運転を行いながら塩類高濃度溶液をミンチ肉内に含浸させた。次に、 NaHCO_3

。を溶解した1.0mol濃度のアルカリ剤高濃度溶液63ccを噴霧機にて噴霧しつつ、ミキサーを5分間低速運転を行いながらアルカリ剤高濃度溶液を含浸させ、食塩溶液及びアルカリ溶液を拡散吸収させながら塩溶溶解性を促進させるとともに乳化、ゲル化能を付与し結着性を促進させた。次いで、ミリン15cc、日本酒15cc、GCR1.5g、蔗糖27g、ビタミンC剤とビタミンE剤の混合物1.5gを溶解した添加剤溶液を噴霧機にてミンチ肉に噴霧しつつミキサーを5分間低速運転を行いながら添加剤溶液の含浸を行った。次いで、得られたミンチ肉をステーキ状に成形し加熱し製品テストを行った。

従来は、動植物性蛋白粉末をつなぎ剤としてミンチ肉を板状ブロックに加工していたが、自由水や脂肪、油脂によって加熱後は肉がボロつき硬くなり、保水性が悪かった。しかし本実施例によれば、つなぎ剤を用いず魚肉のみで魚肉の持っている蛋白質の塩溶性を高め脂肪を改質し、肉中に脂肪が混在しても優れた加熱結着性を増し、保水性、弾力性、膨張率の向上を図ることができることがわかった。尚、本実施例によれば、多目的に成形利用でき、低利用の魚種を高度に利用することができることもわかった。

(実施例9)

実施例7の実施例品であるホキフィレー切身と実施例8のホキ荒ミンチ肉各々100gに、機能剤としてカルシウム（和田製薬株式会社製、商品名：ワダカルシウム）100mgと、ソルビトール液10cc、ビタミンC、E、B₆、B₁₂を含んだ総合ビタミン剤0.2%を溶解した添加剤溶液を混練し添加剤溶液の原料肉中への拡散吸収化を行った。

一般にホキ、スケトウダラなどは非常に淡白で低カロリーであるが、機能性が低かった。そこで、消費者ニーズに合わせて機能性を高める必要があり、機能剤等を魚肉にふりかけたり、塗布したりしていたが、この機能性を魚肉の細胞レベルまで付加することができず、また、魚肉表面に付着しただけで非常に不安定で十分に機能を発揮することができず、特に加熱時にその機能が破壊される恐れが

あった。本実施例によれば、高濃度溶液中にこれら機能剤を溶解して魚肉組織にインジェクション等で含浸させ分散吸収化を行うので、魚肉中に機能剤を均一に拡散吸収させることにより、極めて短時間で魚肉に機能性を付与することができることがわかった。

(実施例 10)

実施例 9 で処理された加工魚肉を、ステーキ状、スチック状、ハンバーグ状、サイコロ状等自在に成型した。ここで、必要に応じて表面にパン粉、木の実粉末、粉ミルク等のコロモをコートしてもよい。

本実施例によれば、機能剤が魚肉中に均一に分散しているために熱に対して高い安定性を有し機能性を高度に発揮することができるようになった。さらに、魚肉を直接熱に接触することを防止するために適度な薄い糊料をコートし、パン粉、木の実粉末、粉ミルクまたクレープ状やギョウザ皮等を表面に付着することで、薄い肉でも機能剤の熱に対する変性を防止することができ、機能性を高めた多目的チルド冷凍加工食品を実現することがわかった。

(実施例 11)

カジキマグロの頭、内臓を取り除き血抜きをした冷凍原料を温度管理しながら解凍したフィレー状の魚肉 3000g に対し、NaCl と KCl の 1 対 1 混合物の塩類を溶解した 4.5mol 濃度の塩類高濃度溶液 150cc を魚肉に網目状にインジェクションを行った後、電気マッサージ機にて 5 分間バイブレーションを行いながら塩溶性を促進した。次いで、NaHCO₃ を溶解した 1.9mol 濃度のアルカリ剤高濃度溶液 140cc を魚肉に網目状にインジェクションを行った後、電気マッサージ機にて 5 分間バイブレーションを行い、肉中組織を塩溶溶解するとともに、乳化、ゲル化能を付加して、毛細網目構造に改質し、熟成促進を行った。その後、ミリン 50cc、日本酒 50cc、GCR 5.0g、顆粒状のソルビトール 60g、ビタミン C 剤とビタミン E 剤の混合物 5g を溶解した添加剤溶液を魚肉に網目状にインジェクションを行い、電気マッサージ機にて 5

分間パイプレーションを行い、添加剤溶液の拡散吸収化と熟成促進を行った。次いで、試料を刺身に加工した。

次いで、無処理の試料（比較例）とともに組織の変化を光学顕微鏡で400倍に拡大して確認をした。比較例のものは、筋繊維を構成する筋束が集積した骨格筋組織が確認できたが、本実施例のものは筋束が集積した骨格筋組織が、拡散した塩類により周膜、内膜コラーゲン、エラスチン繊維などを溶解され筋束状に各々が置換膨潤していた。

また、筋繊維を横方向に切断した光学顕微鏡写真では、比較例のものは骨格筋の正常組織の巾に氷結晶の跡の白い点や細胞膜の境界が確認できたが、本実施例のものは毛細網目状に改質され、その網目中には溶解した低分子と繊維蛋白と推定されるものが内包され高度に改質されたゲル化状態が確認できた。

そこで実施例品について、電子顕微鏡で6万倍に拡大して再度観察したところ、筋原繊維間に小泡状のものが入り込み、部分的に筋原繊維が切断されていることが判った。また、Z帯もかなり屈曲し、Z帯間で筋原繊維が膨潤し紡錘状になっていることが確認された。なお、試料はいずれも骨格筋を70ミクロンにスライスしたものをを用いた。

以上のことから明らかなように、毛細網目状構造とした細胞レベルでの生化学反応で旨味を細胞レベルより引出し、調味料と複合化させた調味が出来るようになり、魚肉に今までにない旨味を作りだすことが出来た。従来、魚肉の欠点として、冷結解凍後のドリップ発生や酵素活性による肉組織の崩壊、それに伴う魚臭の発生、鮮色の低下等が指摘されていたが、本実施例では動植物蛋白を加えることなく肉の成分を活用して細胞レベルで改質することで、従来解決できなかった品質上の問題点を解決出来ることが判った。しかもこの改質は短時間の処理で十分行えることがわかった。

尚、塩類高濃度溶液やアルカリ剤高濃度溶液等のインジェクション処理は、魚肉の側面、裏表を同時に、又はそれぞれに行ってもよい。

得られた刺身を5名パネリストで官能試験を行った。肉色も鮮やかでテクスチャーに優れた刺身であることがわかった。

従来マグロ類の利用にあたっては、鮮魚においてはブロック状に解体した後、サク状に加工し、これを切り出し、刺身類に利用されてきた。又冷凍原料は半解凍しブロック状に処理した後、サク状に切られ刺身に利用されてきた。いずれも急激な品質の低下を招き、酵素活性により自己消化を起こし、ドリップの流出、魚臭、肉の変色、組織の崩壊が生じ易く、これが利用上の大きな妨げとなり、未だに解決されていなかった。

本実施例ではドリップの流出や魚臭の発生を防ぎ、これらの問題点を解決することができることがわかった。即ち細胞レベルで肉質を改質することができるので、旨味を魚肉より引き出し、調味料と複合した調味ができるようになり、今までにない旨味を作りだすことができた。また、必要により、調味料を使用しない処理法でも同様の効果を得ることができた。尚、処理後はそれらを三枚卸し又は二枚卸しを必要により行い、細切刺身またはブロック、フィレー、サク状でチルド状態で流通してもよいことがわかった。又急速冷凍をして流通後解凍して多目的に利用販売してもよく、更に、鮮魚についても冷凍品と同じような処理を行ってもよいことがわかった。

(実施例12)

実施例11で処理されたブロック状の加工魚肉を缶に詰め、脱気しながら蓋を巻き締めし、これを2気圧、温度120℃で30分間加熱後冷却して缶詰を製造した。これを開缶し肉質をチェックしたところ、魚肉中の水分分離が少なく、肉の弾力、保水性に優れ、歯ごたえがよく、喉越しのよい今までにない缶詰が得られた。また、魚肉は形崩れがなくふっくらとしていて、肉の表面がキメ細かくコロコロとした旨味を肉中に含んだ缶詰食品が得られ、肉が肉汁を吸収してボリュームが出るようになった。

従来のものは魚肉から水分が分離し、缶の中に肉の旨味が大量に流出、肉はバ

ラツキ、弾力がなく喉ごしが悪かったが、本実施例ではこれらの問題点を解決できることがわかった。

(実施例 13)

実施例 11 で処理したブロック状の加工魚肉を刺身状に細切し、それを缶に詰め脱気しながら蓋を締め、これを圧力釜に入れ 2 気圧、120℃で 30 分間加熱殺菌を行い冷却して缶詰を製造した。この結果、実施例 12 と同様の評価が得られた。

(実施例 14)

実施例 11 で処理されたブロック状又はフィレー状の加工魚肉を目的に合わせてサク状にカッティングし、真空包装した。

本実施例では、ドリップなどの流出がなく、変色等の品質低下を予防することができ、切り出し刺し身、フィッシュ・ステーキ、ムニエル、焼魚、煮付け、干物等に利用することができ、何時でも何処でも自由に冷凍庫等からとりだし利用できる簡便な調味新冷凍食品や加熱調理食品が提供できるようになった。尚、サク状肉を急速冷凍を行った後、真空包装すると形崩れしないことがわかった。

(実施例 15)

魚肉としてカジキマグロの頭、内臓を取り除き血抜きした鮮魚をそのまま二枚に卸し皮を取り除いたフィレー肉を用意した。次いで、ミンチ状に前処理した後、魚肉 3000g に対し、食塩を溶解した 4.0mol 濃度の塩類高濃度溶液 150cc を噴霧した後、電気マッサージ機にて 5 分間バイブレーションを行った。次いで、NaHCO₃ を溶解した 1.2mol 濃度のアルカリ剤高濃度溶液 180cc を噴霧した後、電気マッサージ機にて 5 分間バイブレーションを行いながら肉組織を塩溶溶解し、乳化、ゲル化能を付加し毛細網目構造に改質し、熟成促進を行った。その後、ミリン 50cc、日本酒 50cc、GCR 5g、ソルビトール 60g、ビタミン C 剤とビタミン E 剤の混合物 5g を溶解した添加剤溶液を噴霧した後、電気マッサージ機にて 5 分間バイブレーションを行いながら、添

加剤溶液の分散吸収化と熟成促進を行った。冷凍原料は温度管理を充分にしながら解凍し鮮魚と同じような処理を行った。

この加工魚肉を使い、次のような加工食品を製造した。

1. タタキのまま100g単位に真空包装し急速冷凍し、井用、のり巻用の冷凍加工魚肉が得られた。
2. 150gを丸型や楕円型等の成型し、急速冷凍し真空包装し、魚肉ハンバーグに好適な冷凍加工魚肉が得られた。
3. 加工魚肉を棒に80gを付着させた後、80℃で15分間加熱し、その後冷却して真空包装してチルドまたは急速冷凍するか、或いは生冷凍のまま真空包装し、ツクネ用の冷凍加工魚肉を得た。結着性に優れているので、簡単にかつ高歩留りで得ることができた。
4. タタキ1000gに対し、卵黄マヨネーズ100gを混和したものを100g単位で真空包装し、急速冷凍し、ネギトロ風のり巻用やマグロ井用に好適な冷凍加工魚肉が得られた。
5. タタキ1000gに対し、5mm角のチーズ150gを混和した後、ステーキやハンバーグ用に150gに成型するか又は30gのスティック状に成型した後、それらを急速冷凍し、真空包装を行い、それぞれケースに詰めたパック入り冷凍加工魚肉が得られた。
6. 加工魚肉の荒ミンチ200gを100℃で10分間ほぐしながら加熱し、これを缶に詰め、脱気しながら蓋を巻き締めし、これを2気圧、120℃で30分加熱、冷却して缶詰を製造した。これを開缶し肉質をチェックしたところ、肉中の水分分離を肉が吸収して肉の弾力性や、保水性に優れ歯ごたえがよく、型崩れのしないふっくらとした肉の表面がキメ細かくコロコロとした旨味を肉中に含んだ喉越しの良い缶詰を得ることができた。従来品は肉中から水分が分離し缶の中に肉の旨味が大量に流出すると共に、肉はバラツキ、弾力がなく喉越しが悪く、不評であったが、これらの問題点を解決できた。

7. 加工魚肉を中挽きミンチにかけたものに予備加熱しながら肉をほぐし、それにソースを加えてレトルトパウチに詰め、2気圧、120℃にて20分間加熱後冷却してソースを製造した。これを開缶して品質をチェックしたところ、従来のものは肉中の旨味が大量に流出し、肉はフィラメント状にバラつき弾力がなく、肉は硬く喉越しが悪く不評であったが、これらの問題点を解決できた。魚肉の水分分離が少なく肉汁を吸収して肉の弾力性、保水性に優れ歯ごたえが良く、肉片の形崩れがなく、ふっくらとして肉の表面がキメ細かくコロコロとした旨味を肉中に含んだ喉越しの良いソースが得られた。

8. タタキ900gに対し、魚肉と同じ処理を行い荒挽き状にした牛肉150gと調味料を混和し、それをスタッハに入れて羊腸に60gずつ詰めた後、100℃で約2分間ボイルし、半生状態にし、次いで、冷水で冷却した。冷却後は袋詰にし急速冷凍を行い魚肉ウインナーを得た。従来品は、加熱すると魚肉や畜肉が収縮して肉がボロつき、水分が離水し魚臭が強くなるなどの問題があり、そのため数多くの添加剤を使用してきた。本実施例ではこれら従来の問題点を解決し、加熱時に肉が膨張しソフトで弾力性に優れ口当たりの良い荒挽きタイプの畜肉入りのフィッシュウインナーを得た。

9. タタキ900gに対し、魚肉と同じ処理を行った牛肉150gを荒挽き状にして混和し、それを成型器でサイコロ状やステーキ状に目的の形状に合わせて成型する。それを急速冷凍し真空包装をし牛肉入りゲル化能付加した冷凍加工食品を得た。

(実施例16)

1) カジキマグロの頭、内臓を取り除き血抜きをした冷凍原料を温度管理しながら解凍、二枚に卸し皮を取り除き刺身状に細切前処理した魚肉3000gに対し、食塩を溶解した2.8mol濃度の塩類高濃度溶液150ccを細切魚肉に噴霧した後、電気マッサージ機にて5分間のバイブレーションを行いながら塩溶性を促進した。

次いで、 Na_2CO_3 の 1.8 mol 濃度のアルカリ剤高濃度溶液 110 cc を細切魚肉に噴霧し、電気マッサージ機にて 5 分間バイブレーションを行いながら、肉中組織を塩溶溶解を促進するとともに、乳化、ゲル化能を付加し肉組織を毛細網目構造に改質しながら熟成促進を行った。

その後、ミリン 50 cc、日本酒 50 cc、GCR 5 g、ソルビトール 60 g、ビタミン C 剤とビタミン E 剤の混合物 5 g を溶解した添加剤溶液を噴霧機にて添加して電気マッサージ機にて 5 分間バイブレーションを行いながら肉組織へのこれらの添加剤溶液を拡散し吸収化させつつ熟成促進を行った。

次に、これを 100 g の小パックに真空包装、急速冷凍して 1 パック 5 枚入りケースとし、冷凍マグロ刺身を製造加工した。

次いで、この試料を用い製品テストを行った。家庭用冷蔵庫に一昼夜保管した後、解凍し経時変化を確認した。本実施例品は水分を肉中に乳化しているため素早く解凍でき、解凍後は 5～6 時間にわたって刺し身としての品質を損なわないことがわかった。尚、鮮魚はそのまま二枚に卸し皮を取り除くことにより、同じ処理を行うことができることもわかった。

2) 上記 1) で前処理されたカジキマグロ細切肉 50 g とカレールー 150 g を組み合わせ、レトルトパウチに入れ、容器内の空気を脱気しそれを密封シールしたものを 6 組作製した。これを圧力釜で圧力 2 気圧、加熱温度 120℃で 20 分間加圧、加熱、殺菌を行いレトルト魚肉小片入りカレーを作製した。

3) 上記 1) で前処理されたカジキマグロ細切肉 50 g とカレールー 150 g を組み合わせ、缶詰容器に入れ容器中の空気を脱気しながら蓋締めをし、圧力 2 気圧、加熱温度 120℃で 30 分間加圧、加熱、殺菌して魚肉小片入りカレー缶詰を作製した。

4) 上記 1) で前処理されたカジキマグロ細切肉 50 g とカレールー 150 g を組み合わせ、これをプラスチック気密性容器に入れて空気を脱気し、窒素ガスを注入し密封シールしたものを 6 組作製した。次いで、マイクロウエーブ照射下

、圧力2気圧、加熱温度120℃で20分間、加圧、加熱、殺菌して気密性容器入り魚肉片入りカレーを作製した。

5) 比較例として、実施例と同一の原料を用い実施例の加工処理を行わなかったカジキマグロ細切肉300gを準備し、細切肉50gとカレールー150gを組み合わせ、レトルトパウチに入れ、容器内の空気を脱気し、それを密封シールしたもの6組をつかった。これを圧力釜で圧力2気圧、加熱温度120℃で20分間加圧、加熱、殺菌を行いレトルト魚肉小片入りカレーを作製した。

6) 比較例として、実施例と同一の原料を用い実施例の加工処理を行わなかったカジキマグロ細切肉300gを準備し、カジキマグロ細切肉50gとカレールー150gを組み合わせ、缶詰容器に入れ容器中の空気を脱気しながら蓋締めをし、圧力2気圧、加熱温度120℃で30分間加圧、加熱、殺菌して魚肉小片入りカレー缶詰を作製した。

7) 比較例として、実施例と同一の原料を用い実施例の加工処理を行わなかったカジキマグロ細切肉300gを準備し、細切肉50gとカレールー150gを組み合わせ、これをプラスチック気密性容器に入れて空気を脱気し、窒素ガスを注入し密封シール6組を作った。これをマイクロウェーブ照射下、圧力2気圧、加熱温度120℃で20分間加圧、加熱、殺菌をして気密性容器入り魚肉小片入りカレーを作製した。

上記実験例2)及び比較例5)で得られたレトルト製品及び、実験例3)及び比較例6)で得られた缶詰品と、上記実験例4)及び比較例7)で得られたマイクロウェーブ処理製品について、同一条件下で焼成歩留比較試験を行った。その結果を第2表に示す。

この第2表から明らかなように、

実施例品：肉がふっくらでソフトになり、溶解物の流出も少なくボリュームが出て肉に弾力があり、色もよく旨味に優れ、従来にない優れたレトルト製品が得られた。マイクロ波処理品は歩留りがやや低下するが、食感はレトルトとほとん

ど変わらなかった。

比較例品：歩留りが悪く肉繊維中の蛋白や細胞膜、筋鞘、コラーゲンなどが高圧、高熱により肉組織から溶解流出し、魚肉がボロボロになっていた。また、肉が硬く保水性が著しく劣り味がなく、肉色も悪く収縮していた。マイクロ波処理品は特に歩留りに劣っていた。

(実施例 17)

魚肉として一般に利用され難い胴回りの大きいアナゴを背開きし、骨抜きした二枚卸しのフィレー肉を、水洗した後完全に水切りを行い、採肉機（2mm）にかけて落とし身を作製した。得られた落とし身 3000g に対し食塩を溶解し 5.4mol 濃度の塩類高濃度溶液 150cc を、落とし身に噴霧機にて均一に噴霧しながら、5 分間低速混練機にて混練を行い塩類溶液の分散吸収化を行った。次いで、 NaHCO_3 を溶解した 2.0mol 濃度のアルカリ剤高濃度溶液 140cc を落とし身に噴霧機にて均一に噴霧しながら、5 分間低速混練機にて混練を行いながらアルカリ剤溶液の魚肉への分散吸収化を行った。次いで、ミリン 100cc、日本酒 50cc、調味料としてグルタミン酸ソーダ 5g、蔗糖 40g、グルコース 20g、ビタミン C 剤とビタミン E 剤の混合物 3g を溶解した添加剤溶液を噴霧機で均一に噴霧し、5 分間低速混練機にて混練を行いながら分散吸収化を行い、荒挽き状ミンチ調味肉を製造した。次いで、皮部を凍結し、その後、冷凍粉碎を行い、スケトウダラの未処理肉 20% を配合した。次に、この混合肉 3000g をサイレントカッターに入れ、食塩を溶解した 5.4mol 濃度の塩類高濃度溶液 150cc を添加して 5 分間混練を行い分散吸収化を行った。次いで、 NaHCO_3 を溶解した 2.0mol 濃度のアルカリ剤高濃度溶液 140cc を混合して、5 分間混練を行い分散吸収化を行った。その後、ミリン 100cc、日本酒 50cc、調味料としてグルタミン酸ソーダ 5g、蔗糖 40g、グルコース 20g、ビタミン C 剤とビタミン E 剤の混合物 3g を溶解した添加剤溶液を添加して 5 分間混練し、分散吸収化を行い、調味ねり状肉を作った。次に、調

味ねり状肉を魚肉ポンプノズルから上下加熱方式のトンネル型連続加熱炉に投入後、テフロンコートしたスチールベルト上に板状に押し出した。次に、切断面がカバ焼状に加熱された調味ねり状肉の上にアナゴを荒挽きミンチにかけた調味肉を別の魚肉ポンプノズルから板状に押し出し積層しながら、カバ焼き状に焼成してカバ焼状アナゴ加工調理食品を製造した。

本実施例のカバ焼状アナゴ加工品は、積層断面がアナゴのカバ焼き風の焼き色付きのもので通常のカバ焼用アナゴよりも風味とテクスチャーに優れたカバ焼アナゴであった。このことから本実施例によれば、身崩れのない弾力性のある乳化、ゲル化した大アナゴを活用した成型自在性に優れた加工調味された焼きアナゴ魚肉を製造できることもわかった。

(実施例 18)

ウナギを背開きし、骨抜きした二枚卸しのフィレー肉を、水洗後、完全に水切りを行ったフィレー肉 3000 g を準備した。フィレー肉 3000 g に対し食塩を溶解した 4.3 mol 濃度の塩類高濃度溶液 150 cc を魚肉に均一に噴霧を行ない塩類溶液を含浸吸収させた後、5 分間ミキサーで低速運転を行い混練しながら、塩類溶液の分散吸収化を行った。次いで、 NaHCO_3 を溶解した 1.6 mol 濃度のアルカリ剤高濃度溶液 140 cc を魚肉に均一に噴霧を行ないアルカリ溶液を含浸させた後、5 分間ミキサーで低速運転にて混練を行ないアルカリ溶液を分散吸収させ乳化、ゲル化能を付与した。その後、ミリン 100 cc, 日本酒 50 cc, 調味料としてグルタミン酸ソーダ 5 g, 蔗糖 40 g, グルコース 20 g, ビタミン C 剤とビタミン E 剤の混合物 3 g, ソルビトール液 70 cc を溶解した添加剤溶液を魚肉に均一に噴霧を行った後、5 分間ミキサーで低速運転にて混練し分散吸収化処理を行った。次いで、トンネル型連続加熱炉（上下加熱方式）にて加熱した。その後蒲焼を冷却してパックし、急速冷凍を行ない、パック詰ウナギのカバ焼を作製した。

本実施例によれば、急速冷凍して解凍後長時間経ても、ソフトで弾力性に優れ

歩留りアップした旨味に優れた焼き色の良い流通適性に優れたウナギのカバ焼きを製造できることがわかった。

(実施例 19)

魚肉塊として多獲性青身魚の 1 種であるサバの冷凍原料を温度管理しながら解凍しドレス状に処理したドレス状肉 3000 g を準備した。次に、ドレス状肉 3000 g に対し、上質塩を溶解した 5.5 mol 濃度の塩類高濃度溶液 150 cc にビタミン C 剤及びビタミン E 剤の混合物 5 g を溶解し、これを魚肉に網目状にインジェクションを行った後、超音波にて 5 分間処理を行いながら塩溶性溶解を促進した。次いで、 NaHCO_3 を溶解した 1.2 mol 濃度のアルカリ剤高濃度溶液 200 cc を上記魚肉に網目状にインジェクションを行った後、超音波にて 10 分間処理を行いながら、肉組織を塩溶溶解しゲル化、乳化し毛細網目構造に改質しながら熟成促進を行った。その後、ミリン 50 cc, GCR 5 g, ビタミン C 剤とビタミン E 剤の混合物 5 g, 日本酒 50 cc を混合溶解した添加剤溶液を魚肉に網目状にインジェクションを行った後、超音波にて 5 分間処理を行いながら、添加調味剤の混合と熟成促進を行った。

得られた実施例品と本実施例の処理を行わなかった比較例品を冷蔵庫で +5℃ で保存試験を行った。比較例品は 5 日で悪臭を放ち、粘性のある肉汁が出た。一方実施例品は 10 日経っても腐敗せず、14 日でも十分に鮮度を保ち品質の維持が出来、肉中に高い乳酸が認められ、pH が低下し、品質が安定した塩干物の製造ができた。アジ、サンマ等の魚介類にこれを試みたが、個体差はあっても同様な結果を得た。

(実施例 20)

内臓、ウロコを取り除いたアジを背開きにし、完全に水切りをしたアジの開き 3000 g に対し、食塩を溶解した 4.5 mol 濃度の塩類高濃度溶液 150 cc をアジ魚肉に噴霧し、電気マッサージ機で 5 分間パイブレーションを行いながら、肉中に塩溶性溶解を促進した。次いで、 NaHCO_3 を溶解した 2.0 mol

1 濃度のアルカリ剤高濃度溶液 140 cc を上記魚肉に噴霧し、電気マッサージ機で5分間バイブレーションを行いながら、肉の組織を塩溶溶解し、乳化・ゲル化能を付加して毛細網目構造に改質し、熟成促進を行った。その後、ミリン 50 cc, GCR 5 g, ビタミンC剤とビタミンE剤の混合物 5 g, 日本酒 50 cc を混合溶解した添加剤溶液を魚肉に噴霧した後、電気マッサージ機にて5分間バイブレーションを行い、添加剤の均一含浸と熟成促進処理を短時間行い、直ちに冷風乾燥機に入れ8時間乾燥し、アジの開きを得た。

従来のは流通、販売の過程で乾燥が進行し油焼けの現象が生じ、食味がだんだん悪くなり硬くなったが、本実施例のものは、噴霧した塩類高濃度溶液、アルカリ剤高濃度溶液が魚肉中にすべて吸収されることにより、肉の組織を塩溶溶解し、乳化・ゲル化能付加により毛細網目構造に改質し、熟成促進処理を短時間行うことで、ふっくらと弾力のある保水性の高い細胞レベルの旨味が引き出せ、しかも流通過程での油焼け等の品質劣化が少なく歩留りの高いしなやかで、ビタミンC剤とビタミンE剤の混合物の細胞レベルでの反応により耐酸化性の強い、開きアジの加工魚肉を作製することができた。

従来、天日乾燥した開きは表面色及び味ともに優れているが、経時変化で油焼け等の劣化を生じていたが、本実施例品は油焼けが起こり難く日持ちが従来品に比べ2倍以上よいことがわかった。

(実施例 21)

実施例 19 のサバと同じように処理されたドレス状のアジ、サンマ、サバの魚肉の裏表を遠赤外線魚肉の中心温度が 95℃ になるように 7～15 分間焼き上げた。その後、冷風冷却機で魚肉の中心温度が 15℃ 前後になるまで冷却した。次いで、この処理肉を衛生管理に充分注意しながら真空包装を行い保存し 14 日間の経時変化を調べた。

従来のは経時変化で身崩れや肉が硬化し、魚臭が強くなる傾向があったが、本実施例のものは身崩れもなく肉がソフトで保水性が高く弾力があり、調味は

細胞レベルまで行われており、調味料と魚肉が本来持っているアミノ酸などと複合反応で大変美味しく味わいのある調味済み焼魚ができる加熱調理済みの加工魚肉を製造できることがわかった。また、これは冷凍又はチルドで流通させることも可能なことがわかった。

(実施例 22)

腹開きされたフィレー状の白サケ 3000 g に食塩を溶解した 4.3 mol 濃度の塩類高濃度溶液 150 cc を魚肉に網目状にインジェクションを行った後、電気マッサージ機で 5 分間バイブレーションを行いながら、塩溶溶解性を促進した。次いで、 NaHCO_3 を溶解した 2.0 mol 濃度のアルカリ剤高濃度溶液 140 cc を魚肉に網目状にインジェクションを行った後、電気マッサージ機にて 5 分間バイブレーションを行いながら、肉中組織を塩溶溶解し、乳化・ゲル化能を付与し、熟成促進処理を行い、毛細網目構造に改質した。次いでミリン 50 cc、日本酒 50 cc、GCR 5 g、ビタミン C 剤とビタミン E 剤の混合物 5 g を溶解した添加剤溶液を魚肉に網目状にインジェクションを行った後、電気マッサージ機にて 5 分間バイブレーションを行いながら、添加剤溶液の分散吸収化と熟成促進処理を短時間行ない調味した塩サケを製造した。

従来塩サケは、塩を直接まぶしたり、食塩水に長時間浸漬させて製造されていた。塩をまぶした場合は過度な塩分摂取になり、健康上問題になっていた。また浸漬による方法では浸漬に長時間を要するとともに魚肉の低分子の旨味が浸透圧によって流出し味が劣化する上に塩分含有量が高くなっていた。更に、低塩塩サケでは、家庭用冷蔵庫（5℃）で 1 週間もすると腐敗現象が生じるという問題点を有していた。

これに対し、本実施例では、魚肉に対し 1% 前後の塩分使用ではあるが、アルカリ剤を併用することにより筋肉繊維を弛緩させ塩溶溶解度を高め乳化・ゲル化能を付加させているためと推定されるが、日持ちがよく、15 日間経過しても何ら腐敗現象が起こらなかった。この詳しい原因は不明であるが、多分魚肉の乳酸

が細胞レベルから溶解流出し、pHを急激に低下させると同時にドリップが全く生じないため細菌の増殖を防止できることや、腐敗し易い低分子旨味成分が骨格筋中に十分に乳化、ゲル化状態で分散して毛細網目状に改質された筋肉繊維中に保持されているためではないかと思われる。

(実施例23)

チルドの銀鮭を入手し、三枚におろしてフィレーとした。この銀鮭フィレ300gずつでA～Gの7個の試料を作製した。

各試料に対し第3表に示すI液を網目状にインジェクションし、電機マッサージ機で3分間バイブレーションを行いながら熟成促進を行った。次いでII液を網目状にインジェクションし、電機マッサージ機で6分間バイブレーションを行いながら、塩溶解、乳化、ゲル化能付与の促進を行った。処理後は冷蔵庫に24時間保管した後、冷凍し、真空包装して冷凍庫で保管した。無処理の比較例Gについても同じく冷凍し、真空包装をして冷凍庫に保管した。尚、第3表に示す()内のwt部は原料魚肉100wt部に対する乾燥重量を示す。

実験例AとD、BとE、CとFは薬品の配合は同じであるが、I液、II液が逆になっており、インジェクションの順番が違っている。

7日間冷凍保管した後に解凍し半分を刺し身とし、残り半分を焼成し、試料を得た。次いで、10人のパネラーにて刺し身の(1)色彩、(2)カット後の形状保持性、(3)ドリップの発生状況、(4)弾力性、(5)食味の官能試験を行った。また、焼成品について、(6)外観、(7)食味の官能試験を行った。官能試験は10点法(70点満点)にて評価した。その結果を第3表に示した。

この第3表から明らかなように、本実施例の試料A～Fは、70点満点中、いずれも60点以上を得ており、比較例の36.7点に比べ格段の改質がなされたといえる。試料A～Cと試料D～Fを比べれば若干食塩を先に注入した方が良い結果がでているが、僅かでありいずれが良いか結論は出せなかった。試料BとEが比較的の良い結果が出ていることから、食塩、重曹共に余り多く添加しなくて

も良い結果が得られている。

刺し身の色、形状保持性、ドリップの発生について観察した結果、比較例が黄色味を帯びた赤色であったのに対して本実施例はいずれも透明感のある赤味となりベニ鮭の色に似ていた。又比較例の身は柔らかくダラッとして、刺し身にカットした後は切り身を皿の上に立てることは出来なかったが、実施例は一切れ、一切れを皿の上に立てることが出来、非常に弾力性のある刺し身となっていた。更にドリップについては実施例では殆ど発生せず、カット面に水分が光る程度であった。また室温放置7時間経過しても上記観察結果には変化は見られなかった。これに対し、比較例はドリップの発生が見られた。

(実施例24)

カツオの魚体の大きなものを準備し、頭、内臓を取り除き皮つき3枚おろしとし、カツオのフィレー900gを用意した。このカツオ900gに対し食塩を溶解した4.0mol濃度の溶液45ccを網目状にインジェクションし、5分間電気マッサージ機にてバイブレーションしながら塩溶溶解の熟成促進を行った。

次いで、 NaHCO_3 を溶解した2.0mol濃度の溶液42ccを網目状にインジェクションし、5分間電気マッサージ機にてバイブレーションしながら塩溶溶解、ゲル化乳化能付加の熟成促進を行った。

更に、ミリン15cc、料理酒15cc、蔗糖12g、ビタミンC剤とビタミンE剤との混合物1.5gを混合溶解した溶液を上記処理したカツオのフィレーに網目状にインジェクションし、電気マッサージ機にて5分間バイブレーションしながら添加物の均一含浸熟成促進を行った。

(1) 上記処理にて得られたカツオのフィレー半身を血合いの部分の中骨をカットして取り除き、皮を剥いて刺し身用サクとした。背の部分を冷凍し、真空包装して冷凍庫にて保管した。腹の部分はそのまま刺し身として食味試験を行った。その結果、このカツオのトロは柔らかく口の中でトロケルような美味しさを有していることがわかった。又冷凍し保管してあった冷凍サクを1カ月後解凍した

が、ドリップも出ず、また、食味試験も行ったが冷凍前と同じように食べることができた。

(2) 上記処理カツオのフィレの残りの半身を血合いの部分の中骨をカットして取り除き、皮が付いたまま串を刺して、ガスコンロで全面を30秒焼き、直ちに氷水にて冷却してカツオのタタキを得た。背の部分を冷凍し、真空包装して冷凍庫に保管した。腹の部分はタタキとして食味試験を行ったが、タレなしで、そのまま食べても美味しく食べられることがわかった。又冷凍し保管してあった冷凍タタキを1カ月後解凍し、食味試験を行ったが冷凍前と同じく美味しく食べることができた。このことから冷凍カツオタタキとして流通できることがわかった。

(実施例25)

モンゴウイカの鮮魚を入手し、足、胴を分離し、内臓を除去して身を開いた。このモンゴウイカの両面にある皮を約10mm間隔に1.0φの針で刺し孔を開け、更に約20mm幅にカットしたもの300gを真空ミキサーに入れた。NaClを水に溶解した6.0mol濃度の溶液11.6gとNaHCO₃を水に溶解した1.0mol濃度の溶液25.8gを混ぜ合わせ、更にミリン5g、GCR1gを加えた溶液を準備した。真空ミキサーを70mmHgまで減圧した状態で低速運転させ、準備した溶液を噴霧して添加し分散吸収させ、1分経過後常圧にもどして運転を停止し、処理を終了した。

処理したモンゴウイカは冷蔵庫にて3日間保管した後、取り出し、半分を真空包装し冷凍した。残り半分は焼成と天麩羅にして10人のパネラーにて評価したがいずれも柔らかく、美味であると評価が得られた。冷凍した処理品は1ヶ月後解凍し、焼成と天麩羅にして10人のパネラーにて評価したが略鮮魚と同じ評価であった。なお、解凍品はドリップも出ず、天麩羅に揚げる時も油の飛び跳ねも観察されなかった。

また、この処理は身を開き、刺し孔を開けたモンゴウイカの両面に溶液を噴霧

しても同様な効果が得られることもわかった。

(実施例 26)

冷凍ブラックタイガー（エビ）の頭を取ったもの（殻付き）を入手し、温度を管理しながら解凍した。この頭を取ったブラックタイガー 600 g を真空ミキサーに入れた。

NaCl を水に溶解した 6.0 mol 濃度の溶液 23.2 g と NaHCO₃ を水に溶解した 1.0 mol 濃度の溶液 51.6 g を混ぜ合わせ、更にミリン 10 g、GCR 2 g を加えた溶液を準備した。真空ミキサーを 70 mmHg まで減圧した状態で低速運転させ、準備した溶液を噴霧して添加し分散吸収させ、1 分経過後定圧にもどして運転を停止し、処理を終了した。

処理したブラックタイガーは冷蔵庫にて 1 日冷蔵保管した後、取り出し、半分を真空包装し冷凍した。残り半分は一部をそのままボイルして 10 人のパネラーが評価した。また一部は殻を剥ぎ開いて天麩羅にして 10 人のパネラーが評価を行った。評価の結果はいずれも柔らかく、美味であるとの評価を得られた。また冷凍した処理品は 1 ヶ月後解凍し、同じくボイル品と天麩羅にして 10 人のパネラーにて評価したが冷凍しないものと同じ評価であった。特にボイルしたエビ特有の臭いが消失していることがわかった。またこの処理は殻を剥いてボイルしたエビを処理しても同じ効果が得られる事もわかった。

産業上の利用可能性

以上のように本発明によれば、

(1) 高濃度で少量の塩類及びアルカリ剤等を主として魚介類肉に添加し、極めて短時間（1～15 分間）で処理し、骨格筋や脂肪層を細胞レベルの生化学処理で魚介類の肉組織を根本的に改質することができ、添加物の種類や使用量を低減させソフトで各種結着剤を使わなくても結着性に優れ、特に脂肪層や肉を強く圧着しなくても強い加熱結着性を示し、一枚肉になりフォークやナイフで切って

もバラけず優れた弾力性を示し、加工が自在で、変質損失を防ぎドリップ等の低分子栄養成分等を有効に利用した高歩留りで栄養価の高い魚肉のみからなる加工魚肉を実現できるものである。

(2) 高濃度で少量の塩類及びアルカリ剤、ビタミン剤を含有した溶液を添加し、極めて短時間の処理により細胞膜、筋原繊維、筋鞘、コラーゲンや脂質、脂肪、脂肪中の細胞膜やコラーゲン、また骨格筋や脂肪の組織を弛緩させ、或いは肉組織を塩溶させて毛細網目構造に改質するため、細胞レベルから旨味を引き出すことができるとともに、生食や調理後食べると噛めば噛むほど旨味が持続して味わうことができ、更に、各種調味料を加え、旨味の複合化により従来にない旨味を付与することができる。電子レンジ等の電気調理器で簡便に調理できる等最適な製品づくりができ、加熱時の水分の流出が少なく肉中に旨味が保持され水々しく利用できる魚肉食材を実現できるものである。

(3) 魚肉冷蔵中の酸化による肉色の変色化を防止するとともに肉色を鮮やかに発色させ、また解凍に伴うドリップの流出や冷蔵、冷凍中等の変性等を防止する。また魚介類の生臭さを消臭させることができ、組織の蛋白質、油脂や油脂中のロウ成分をゲル化や乳化改質させて肉を坐らせ歯ごたえを向上させ、肉組織を改良する等、口当たりよく弾力性のある魚肉に処理するとともに、加熱や利用時に肉の身崩れを防止し、魚肉の軟度を自由に調整することができる。

更に冷凍食品でありながらチルド食品より優れた高品質のものが製造でき、加工後急速冷凍を行い販売時に解凍してチルド状態で販売ができ、又それを家庭で再冷凍しても何ら品質に問題がなく処理加工品は保存性に優れているため流通適性に優れた新冷凍食品を高い生産性で量産性に優れた加工魚肉の製造方法を実現できるものである。

第 1 表

ホ キ

サンプル	生肉	焼成品歩留 (平均値) (%)			カラアゲ品歩留 (平均値) (%)		
		直後	2時 間後	20時 間後	直後	2時 間後	20時 間後
実施例	300g 50g×6枚	89.8	84.2	80.9	90.7	87.9	83.7
比較例	300g 50g×6枚	82.6	71.1	67.3	76.9	69.2	66.3

第 2 表

カジキマグロ

サンプル	生肉	レトルト及び缶詰		マイクロウェーブ	
		加熱後	歩留	加熱後	歩留
実施例	300g 50g×6枚	240.0 g	80.0 %	216.0 g	72.0 %
比較例	300g 50g×6枚	199.5 g	66.5 %	157.5 g	52.5 %

第 3 表

区分	I 液	II 液
A	6.0 mol 濃度の NaCl 溶液 11.6 g (食塩 1.0 wt部)	1.0 mol 濃度の NaHCO ₃ 溶液 25.8 g (重曹 0.67 wt部)
B	4.0 mol 濃度の NaCl 溶液 10.6 g (食塩 0.67 wt部)	0.75 mol 濃度の NaHCO ₃ 溶液 25.3 g (重曹 0.5 wt部)
C	2.0 mol 濃度の NaCl 溶液 9.6 g (食塩 0.33 wt部)	0.5 mol 濃度の NaHCO ₃ 溶液 24.8 g (重曹 0.33 wt部)
D	1.0 mol 濃度の NaHCO ₃ 溶液 25.8 g	6.0 mol 濃度の NaCl 溶液 11.6 g
E	0.75 mol 濃度の NaHCO ₃ 溶液 25.3 g	4.0 mol 濃度の NaCl 溶液 10.6 g
F	0.5 mol 濃度の NaHCO ₃ 溶液 24.8 g	2.0 mol 濃度の NaCl 溶液 9.6 g
G	無 添 加	無 添 加

第 4 表

	A	B	C	D	E	F	G
(1) 色 彩	9.6	9.9	9.6	9.7	10.0	9.7	7.2
(2) 形状保持状態	9.5	10.0	9.3	9.2	9.4	9.2	4.5
(3) ドリップの発生	9.8	9.8	9.5	9.8	9.5	9.3	4.3
(4) 弾 力 性	8.8	9.1	8.5	8.4	8.7	8.3	4.7
(5) 食 味	9.0	9.5	9.3	9.3	9.4	9.4	5.8
(6) 焼成品 外観	7.9	8.0	7.7	7.7	7.7	7.7	6.2
(7) 焼成品 食味	9.0	10.0	9.2	9.2	9.7	9.0	4.0
合 計	63.6	66.3	63.1	63.3	64.4	62.6	36.7

請求の範囲

1. ラウンド又は肉塊状の魚肉若しくは細切状の魚肉100wt部に、(1) NaCl 、 KCl 、 CaCl_2 、 MgCl_2 、の内いずれか1種若しくはこれらの混合物を水若しくは原料魚肉や他の魚肉のドリップ、又は前記ドリップと水との混合液に溶解し、 $0.5 \sim 7.0 \text{ mol}$ 濃度の溶液状で添加された乾燥重量で0.2～4wt部の塩類と、(2) NaHCO_3 、 Na_2CO_3 、 KHCO_3 、 K_2CO_3 、 NH_4HCO_3 、リン酸一ナトリウム、リン酸二ナトリウム、リン酸三ナトリウム、ピロリン酸ナトリウム、ポリリン酸ナトリウム、ピロリン酸カリウム、ヘキサメタリン酸ナトリウム、メタリン酸カリウム、メタリン酸ナトリウム等の内いずれか1種若しくはこれらの混合物を、水若しくは原料魚肉や他の魚肉のドリップ又は前記ドリップと水との混合液に溶解し、 $0.3 \sim 3.0 \text{ mol}$ 濃度の溶液状で添加された乾燥重量で0.1～2.7wt部のアルカリ剤と、が含有されていることを特徴とする加工魚肉。

2. 添加剤として、0.5～12wt部のアルコール、0.001～0.2wt部のビタミンE剤、0.006～0.3wt部のビタミンC剤、1～13wt部の糖類、0.2～5wt部の卵白、0.001～4wt部好ましくは0.01～3wt部の酸化防止剤の内いずれか一種以上が含有されていることを特徴とする請求項1に記載の加工魚肉。

3. 前記ラウンド又は肉塊状の魚肉若しくは細切状の魚肉中に原料魚肉のドリップが還元されていることを特徴とする請求項1又は2の内いずれか1に記載の加工魚肉。

4. 請求項1乃至3の加工魚肉に、大豆蛋白粉末、デキストリン、カゼインソーダ等の結着補助剤、卵白、レシチン、シュガーエステル等の乳化剤、DHA、EPA、キト酸、カルシウム、ビタミン類、コラーゲン等の機能剤、アルギン酸ソーダ、クエン酸カルシウム、コーンスターチ、馬鈴薯澱粉、グルコマンナン等



の粘着補助剤、ソルビシ酸、ソルビン酸カリウム等の保存剤、大豆蛋白繊維等の植物繊維、キチン等の動物繊維、ココナッツ油、コーン油、ナタネ油、豚脂、ラード、魚油等の動植物性油脂、グリシン、L-グルタミン酸、L-グルタミン酸ナトリウム、イノシン酸二ナトリウム、グアニル酸二ナトリウム、魚類ペプチタイド、ヒーフパウダー、ビーフエキス、ポークエキス等の調味料、胡椒、ジンジャー、パプリカ、ナツメグ、メース、タイム、オールスパイス、オニオン、ガーリック、コリアンダー、カルモダン、キャラウェイ、セージ、ローレル、マジョラム、クローブ、シナモン等の香辛料等の内1種以上が混合されていることを特徴とする魚肉食材。

5. ラウンド又は肉塊状の魚肉若しくは細切状の魚肉100wt部に、1.5～7.0mol濃度の塩類高濃度溶液3～12wt部（乾燥重量で0.2～4wt部の塩類）を前記魚肉内に含浸し細胞膜、筋原繊維、筋鞘、コラーゲンや脂質、脂肪、脂肪中の細胞膜やコラーゲン等を塩溶させる塩溶工程と、次いで、0.5～3.0mol濃度のアルカリ剤高濃度溶液1～10wt部（乾燥重量で0.1～2.7wt部のアルカリ剤）含浸させるアルカリ含浸工程と、を備えていることを特徴とする加工魚肉の製造方法。

6. ラウンド又は肉塊状の魚肉若しくは細切状の魚肉100wt部に、0.5～3.0mol濃度のアルカリ剤高濃度溶液1～10wt部（乾燥重量で0.1～2.7wt部のアルカリ剤）含浸させるアルカリ含浸工程と、次いで、1.5～7.0mol濃度の塩類高濃度溶液3～12wt部（乾燥重量で0.2～4wt部の塩類）を前記魚肉内に含浸し細胞膜、筋原繊維、筋鞘、コラーゲンや脂質、脂肪、脂肪中の細胞膜やコラーゲン等を塩溶させる塩溶工程と、を備えていることを特徴とする加工魚肉の製造方法。

7. ラウンド又は肉塊状の魚肉若しくは細切状の魚肉100wt部に、0.5～3.0mol濃度のアルカリ剤高濃度溶液1～10wt部（乾燥重量で0.1～2.7wt部のアルカリ剤）と1.5～7.0mol濃度の塩類高濃度溶液3



～12wt部（乾燥重量で0.2～4wt部の塩類）との塩類・アルカリ配合溶液を前記魚肉内に含浸させる塩類・アルカリ含浸工程、を備えていることを特徴とする加工魚肉の製造方法。

8. ビタミン類、動植物蛋白粉末、酸化防止剤、糖類の1種以上を混合した添加剤溶液を魚肉内に含浸させる添加剤溶液含浸工程、を備えていることを特徴とする請求項5乃至7の内いずれか1に記載の加工魚肉の製造方法。

9. ラウンド又は肉塊状の魚肉若しくは細切状の魚肉100wt部に、1.5～7.0mol濃度の塩類高濃度溶液を3～12wt部（乾燥重量で0.2～4wt部の塩類）を前記魚肉内に含浸し細胞膜、筋原繊維、筋鞘、コラーゲンや脂質、脂肪、脂肪中の細胞膜やコラーゲン等を塩溶させる塩溶工程と、次いで、0.5～3.0mol濃度のアルカリ剤高濃度溶液1～10wt部（乾燥重量で0.1～2.7wt部のアルカリ剤）と糖類、ビタミン類、動植物性蛋白粉末、酸化防止剤の1種以上を混合した添加剤溶液との配合溶液を含浸させるアルカリ・添加剤含浸工程と、を備えていることを特徴とする加工魚肉の製造方法。

10. ラウンド又は肉塊状の魚肉若しくは細切状の魚肉100wt部に、0.5～3.0mol濃度のアルカリ剤高濃度溶液1～10wt部（乾燥重量で0.1～2.7wt部のアルカリ剤）と、糖類、ビタミン類、動植物性蛋白粉末、酸化防止剤の1種以上を混合した添加剤溶液を含浸させるアルカリ・添加剤含浸工程と、次いで1.5～7.0mol濃度の塩類高濃度溶液を3～12wt部（乾燥重量で0.2～4wt部の塩類）を前記魚肉内に含浸し細胞膜、筋原繊維、筋鞘、コラーゲンや脂質、脂肪、脂肪中の細胞膜やコラーゲン等を塩溶させる塩溶工程と、を備えていることを特徴とする加工魚肉の製造方法。

11. 前記塩溶工程又は前記塩類・アルカリ含浸工程の後又はアルカリ含浸工程若しくは添加剤含浸工程後に、塩類高濃度溶液やアルカリ剤高濃度溶液、添加剤溶液を魚肉内に浸透・分散させ吸収させる分散吸収工程、を備えていることを特徴とする請求項5乃至10の内いずれか1に記載の加工魚肉の製造方法。



12. 前記塩類高濃度溶液が NaCl 、 KCl 、 CaCl_2 、 MgCl_2 の内いずれか1種若しくはこれらの混合物からなり水若しくは原料魚肉や他の魚肉のドリップ又は前記ドリップと水の混合液に溶解された溶液であることを特徴とする請求項5乃至11の内いずれか1に記載の加工魚肉の製造方法。

13. 前記アルカリ剤高濃度溶液が、 NaHCO_3 、 Na_2CO_3 、 KHCO_3 、 K_2CO_3 、 NH_4HCO_3 、リン酸一ナトリウム、リン酸二ナトリウム、リン酸三ナトリウム、ピロリン酸ナトリウム、ポリリン酸ナトリウム、ピロリン酸カリウム、ヘキサメタリン酸ナトリウム、メタリン酸カリウム、メタリン酸ナトリウム等の内、1種又は2種以上の混合物からなり、水若しくは原料魚肉や他の魚肉のドリップ又は前記ドリップと水との混合液に溶解された溶液であることを特徴とする請求項5乃至11の内いずれか1に記載の加工魚肉の製造方法。

14. 前記塩溶工程や前記アルカリ含浸工程、前記塩類・アルカリ含浸工程、前記分散吸収工程が、 20°C 以下好ましくは 10°C 以下の魚肉加工温度下、及び/又は pH が5～10、好ましくは6.5～8.5で行われることを特徴とする請求項5乃至11の内いずれか1に記載の加工魚肉の製造方法。

15. 前記塩溶工程や前記アルカリ含浸工程、前記塩類・アルカリ含浸工程が、インジェクターを用い魚肉内に直接注入するインジェクション法、又は魚肉の表面に直接噴霧する噴霧法の内いずれか1であることを特徴とする請求項5乃至11の内いずれか1に記載の加工魚肉の製造方法。

16. 前記分散吸収工程が、マッサージ法、バイブレーション法、超音波法、混練処理法の内いずれか1であることを特徴とする請求項5乃至11の内いずれか1に記載の加工魚肉の製造方法。



TITLE OF THE INVENTION

PROCESSED FISH FLESH, FISH FLESH MATERIAL USED THE
SAME AND METHOD OF PREPARING PROCESSED FISH FLESH

Technical Field

This invention relates to a processed fish flesh having round or meat block-like fish flesh or fine cut fish flesh processed, a fish flesh material used the same and a method of preparing processed fish flesh. More particularly, this invention relates to a processed fish flesh, a fish flesh material used the same and a method of preparing processed fish flesh in which drips of fish flesh are prevented from being discharged during thawing or refrigerating operation, the cell membranes in skeletal muscles, the perimysium, collagen or the myofibril of fish flesh block or lipid or fat or cell membranes tissue or collagen in fat are solved with salt by impregnating a small amount of high concentration solution of salt or high concentration solution of alkali in the fish flesh block, emulsification is promoted with high concentration solution of alkali, gelation capability is added, denaturation caused by softening flesh fiber or fat, gelatin formation or oxidation of fish flesh block or the like is prevented, the drips during thawing or refrigerating operation are prevented from being discharged, taste or flesh color of the denatured fish flesh is reproduced and recovered.

Background Art

In recent years, the fishery products have been improved as superior protein foods and in particular they have been evaluated as superior food materials in view of health of a person. As the processed foods of the fishery product, a fish-paste product such as boiled fish paste has been widely known and frozen ground fish has been frequently used as its raw material.

However, due to the fact that there were many kinds of fishery products, flesh tastes were substantially different from each other in view of age, sex, seasons and nutritive conditions or the like and in particular, the muscles of the fishery products contained 70 to 80% moisture therein, deteriorations in quality such as reduction in weight, flesh collapse, hardening or oxidation of flesh tissue or the like caused by discharging of drips of the fishery product in the case that the fishery products were processed (frozen, refrigerated, stored with salt and heating or the like) have become a problem.

In view of this fact, as means for improving these prior art problems, various kinds of processing methods have been proposed.

1. In the gazette of Japanese Patent Laid-Open No. Sho 53-50358 is disclosed a processed food manufacturing method in which salt is added to fine flesh and plant albumin to form paste and then oil and fat and heat solidifying raw material are non-uniformly mixed from each other and they are gradually frozen.

2. In the gazette of Japanese Patent Laid-Open No. Sho 54-2368 is disclosed a smoked and processed fish flesh product in which a step for getting a bonito pickled in sorbitol liquid of NaHCO_3 and NaHPO_4 and a step for sprinkling with salt are concurrently carried out or almost simultaneously to soften the flesh quality or stabilize flesh pigment tissue.

3. In the gazette of Japanese Patent Laid-Open No. Sho 55-144844 is disclosed a fishery frozen food manufacturing method in which a fish flesh with bones is pickled in solution of salt, sodium bicarbonate, alkaline phosphate, dehydrated and the flesh is pressurized, heated and then frozen.

4. In the gazette of Japanese Patent Laid-Open No. Sho 57-5668 is disclosed a fish flesh ham manufacturing method in which a fish flesh is pickled in solution of sodium hydrogencarbonate of 0.3 to 1.0% and sorbitol of 0.3 to 1.0% or their mixed solution, dehydrated, and after this dehydration, the flesh is pickled in salt solution, and processed with casing to improve a fish flesh binding state.

5. In the gazette of Japanese Patent Laid-Open No. Sho 62-19069 is disclosed an edible protein raw material manufacturing method in which soft tissue of a walleye pollack bleached with water is pickled in mixture liquid of edible oil or salt or saccharide for a longer hour so as to improve its state, and gradually frozen.

6. In the gazette of Japanese Patent Laid-Open No. Hei 6-165634 is disclosed a processed marine product pre-processing method in which inorganic salt is dissolved in aqueous solution of sodium chloride acting as pre-processing agent, sodium carbonate is added to keep a value of pH of entire aqueous solution in alkaline state, the marine product is pickled in the pre-processing liquid for a longer hour and kept at 0 to 20°C, boiled and thawed in order to keep deterioration in quality caused by processing of the marine product at a minimum value.

7. In the gazette of Japanese Patent Laid-Open No. Sho 62-49012 is disclosed a shark flesh frozen cut tissue manufacturing method in which the shark cut tissue is added directly with saccharide, polymerization phosphate (6 to 12 weight parts, polymerization phosphate of 0.05 to 0.4 weight parts and dimetallic salt (0.2 to 1.0 weight parts) without bleaching with water, then sufficiently agitated by an agitating machine, frozen at -40°C and occurrence of bad odor during processing is prevented.

8. In the gazette of Japanese Patent Laid-Open No. Sho 53-145948 is disclosed a manufacturing method in which a whale flesh is cut into a desired thickness, washed with water, salt of 1 to 3% is added to the flesh, salt soluble protein only at the surface of the flesh is dissolved by an agitating and mixing machine without damaging its inner tissue, the flesh is molded under a reduced pressure of 70 mmHg, then heated in hot water of 90 °C for 2 hours and 30

minutes, the flesh is cut into a proper shape and canned with whale blocks.

9. In the gazette of Japanese Patent Laid-Open No. Hei 4-311374 is disclosed a method in which fish with deteriorated freshness and fish with soft flesh tissue are added with quality improving agent of calcium chloride or salt after its bleaching with water or its preliminary dehydration so as to make a resilient fish flesh.

10. In the gazette of Japanese Patent Laid-Open No. Sho 62-130667 is disclosed a frozen ground flesh in which sodium carbonate (0.04 to 0.06%) and/or sodium hydrogencarbonate 0.05 to 0.15% is added during pickling at the ground flesh manufacturing stage and its value of pH is adjusted to 7.5 or less.

11. In the gazette of Japanese Patent Laid-Open No. Hei 2-295466 is disclosed a resilient paste product manufacturing method in which basic calcium of 0.01 to 0.1 weight parts is added to get a value of pH of 7.3 to 8.5 and animal and plant proteins of 0.5 to 5 weight parts is added during manufacturing of fish paste product.

12. In the gazette of Japanese Patent Laid-Open No. Hei 2-203769 is disclosed a fish paste product manufacturing method in which calcium salt, magnesium salt and strontium salt are applied during bleaching with water to prevent a flowing-out of a protein cross-linking factor and adding of phosphate enables its to be increased.

13. In the gazette of Japanese Patent Laid-Open No. Hei 1-222761 is disclosed a method in which a fish flesh is

finely divided into powder by a homogenizer in phosphate (0.2 % or less) or sodium bicarbonate solution at the stage of bleaching with water, the flesh is bleached with water for 20 minutes under a reduced pressure by 100 mmHg so as to improve a gelation forming capability.

14. In the gazette of Japanese Patent Laid-Open No. Sho 54-80456 is disclosed a corn beef manufacturing method in which a raw material meat of block form is scarred, thereafter phosphate compounding agent and adding agent such as salt are added, the meat is agitated and mixed under a reduced pressure of 60 cmHg or more to perform a pickling operation, and a manufacturing yield is improved by 15 to 20 %.

15. In the gazette of Japanese Patent Laid-Open No. Sho 59-39111 is disclosed a chicken block manufacturing method in which salt of 1 to 3 % is added to a chicken, a gradual agitation and mixing is applied to the chicken, salt soluble protein of meat-paste like form is dissolved out at the surface of the meat block, the meat is fed into a mold under a reduced pressure and filled in it, the meat is further heated and solidified.

16. In the gazette of Japanese Patent Laid-Open No. Sho 62-29953 is disclosed a meat processed product manufacturing method in which pickle liquid heated with water vapour is injected into meat to get meat processed product having a low salt amount, low calorie and low phosphoric acid.

17. In the gazette of Japanese Patent Laid-Open No. Hei 3-180138 is disclosed a seasoned meat manufacturing method in which proper amounts of saccharide, binding agent, coloring auxiliary agent, emulsion stabilizer agent, pH adjusting agent or the like as well as a major substance of ground salt and a raw material meat is immersed for 10 to 30 hours in a large amount of pickle solution having a composition of which concentration is approximately equal to that of body liquid.

18. In the gazette of Japanese Patent Laid-Open No. Sho 58-37826 is disclosed a sheet-of-meat block manufacturing method in which sodium salt is added to a meat block, ion intensity at the surface of the meat block is adjusted to 0.6 or more, actomyosin is dissolved at the surface of the meat block, frozen at -2 to -8°C, thereafter molded under a pressure of 3 to 70 kg/cm² and the meat blocks are contacted from each other.

19. In the gazette of Japanese Patent Laid-Open No. Hei 2-308774 is disclosed a method of reforming small pieces of meat in which paste meat having the myofibril protein dissolution agent such as salt added to small pieces of meat with 10 to 90 weight parts to have a pH value of 6.0 to 7.3 and mixture meat having residual small pieces of meat with 90 to 10 weight parts to have a pH value of 6.5 or less are kneaded to each other under application of a vacuum agitator, a line mill and a liner mixer while avoiding mixing of oxygen gas.

However, each of the aforesaid prior art processing methods had the following problems.

(1) The method disclosed in Japanese Patent Laid-Open No. Sho 53-50358 is operated such that plant protein and salt are added to fine meat, crushed to each other to make paste-like meat, fat is blended with the paste and thereafter a gradual freezing is carried out for 5 hours to several days to make an alternative product for roast ham and the like. However, this method had a problem that a product temperature was increased due to friction during crushing operation, its quality could easily be deteriorated, and a cooling operation or the like was required to prevent the product temperature from being increased and its poor working characteristic was resulted. In addition, this method had a problem that a bonding feature of fish flesh was reduced due to an easy discharging of drip under activation of enzyme, the bonding characteristic of the fish flesh was reduced due to adsorption of drip with flesh paste, plant protein was required to accommodate for it to deteriorate taste of the flesh. Accordingly, this method had a problem that the fish flesh could not be made of full fish, manufacturing also required longer hours, various problems were found in view of quality as well as sanitation and further it had a low productivity.

(2) The method disclosed in Japanese Patent Laid-Open No. Sho 54-2368 had a problem that blood of fish flesh such as a bonito which was easily hardened and changed in color

to charcoal after cooking was removed with salt water, salt was sprinkled over it for pickling it for 48 hours, then the flesh was pickled in bicarbonate soda, secondary phosphate soda and sorbitol liquid to soften the tissue quality, although a large amount of salt were sprinkled over the surface of the tissue, resulting in that the tissue was bitter, a salt pickling stage required longer hours, fine elements of low molecular weight such as water soluble protein was dissolved and discharged out, its yield was reduced, a poor productivity occurred and a concentration of salt was high. In addition, it had a problem that its taste was deteriorated and a pickling stage required longer hours, resulting in that its productivity was poor.

(3) Although the method disclosed in Japanese Patent Laid-Open No. Sho 55-144844 enabled fish flesh to be eaten together with bones and showed a superior taking of calcium, it had a problem that its working during manufacturing was troublesome, showed a poor workability and had a poor productivity. In addition, this method had a problem that it had pressurizing and heating stages, nutritious substances were damaged and nutrition of fish could not be fully utilized.

(4) Although the method disclosed in Japanese Patent Laid-Open No. Sho 57-5668 was preferable for improving binding feature of fish flesh ham, it had a problem that quality of fish flesh might easily be deteriorated due to a long pickling time. In addition, it had a problem that a

temperature controlling operation was troublesome due to restriction on deterioration of quality and it had a poor productivity. In addition, it had a problem that water soluble protein as well as taste substance of low molecule or effective nutritious substance and the like were dissolved and discharged out.

(5) Although the method disclosed in Japanese Patent Laid-Open No. Sho 62-19069 was preferable to improve fish flesh such as a walleye pollack having soft tissue or dry and crumbling taste, it had a problem that effective nutritious substances such as fat or low molecular protein substance were discharged into mixture liquid of edible oil or salt or saccharide by an osmotic pressure, the fish flesh was lack in nutritious value and lack in binding feature, and also its processing characteristic was lack.

(6) Although the method disclosed in Japanese Patent Laid-Open No. Hei 6-165634 had an effect to restrict deterioration in quality associated with a processing of marine products, it had a problem that its pickling operation required a longer time and was lack in productivity. In addition, it had a problem that drip of taste substances or the like was dissolved into the processing liquid during a pickling of longer time by osmotic pressure or deterioration in quality was generated during pickling operation.

(7) Although the method disclosed in Japanese Patent Laid-Open No. Sho 62-49012 was preferable for processing sharks containing urea, trimetylamoxide of about 10 to 20

times of that of normal fish and producing bad odor of ammonia and trimethylamine as a degree of freshness of sharks was decreased, it had a problem that quality might easily be deteriorated during rubbing with salt due to requiring of a step of rubbing with salt and inclusion of solid salt, and further its work was troublesome and lacked in productivity.

(8) The method disclosed in Japanese Patent Laid-Open No. Sho 53-145948 had a problem that after the flesh was bleached with water and its blood was removed, salt was added to the flesh and they were agitated, molded under a reduced pressure, it showed a low productivity due to complex production step, its taste substance was flowed out and then the flesh was lack in its nutritious value and the like.

(9) Although the methods disclosed in Japanese Patent Laid-Open Nos. Hei 4-311374, Sho 62-130667 and Hei 2-203769 were preferable for improving quality of fish having soft flesh tissue, they had a problem that when denatured portions of the myofibril protein were removed by adding salt during bleaching with water or strengthening of tissue was improved by increasing the number of times of bleaching with water or processing time, nutritious substance of low molecule was discharged out under the bleaching with water to cause its taste to be lack and also a product yield was decreased.

(10) Although the method disclosed in Japanese Patent Laid-Open No. Hei 2-295446 showed superior resiliency,

texture or odor and the like, it had a problem in view of reaction time and resiliency when basic calcium, in particular, burned calcium was added, and its preservation under a high pH value.

(11) The method disclosed in Japanese Patent Laid-Open No. Hei 1-222761 is carried out such that a cut tissue is divided into fine pieces by a homogenizer in bleaching water (added with phosphate or tripoti acid chloride of 0.2 % or sodium bicarbonate) and a pressure reduced bleaching at 100 mmHg is performed. Although fat were removed upon completion of the pressure reduced bleaching operation, this method had a problem of reduction in yield or reduction in productivity caused by complex production steps due to discharging of low molecular nutritious substance caused by bleaching with water, fine piece formation within the bleaching water or reduced pressure bleaching.

(12) The method disclosed in Japanese Patent Laid-Open No. Sho 54-80456 is carried out such that after the muscle membrane or the tendon of flesh pieces is cut into short pieces, additive agent is added to the pieces, the pieces are agitated under a reduced pressure condition, then they are pickled for 48 hours at 3 to 5°C, boiled with vapour for 60 to 90 minutes at 115 to 118°C, the processed flesh is untangled, the muscle membrane, tendon and blood vessel are removed to produce a product. Thus, this method had a problem of lack in productivity due to a complex working steps and longer working hours. In addition, it had a

problem that the flesh showed a bad color as a corn beef and it was not preferable in view of safety and sanitation due to adding of phosphate, sodium nitrite and the like.

(13) The method disclosed in Japanese Patent Laid-Open No. Sho 59-39111 had a problem that the reaction was performed only at the surface of the flesh and quality of inner part in the flesh could not be improved. In addition, it had a problem that the processing step became a complex processing step due to requiring a molding operation of 12 to 48 hours under the pressure reduced state and a heating operation of 2 to 3 hours, its cost was highly expensive and it was lack in mass productivity.

(14) It was found that the method disclosed in Japanese Patent Laid-Open No. Sho 62-29953 or Hei 3-180138 showed that an effect of salt solution was poor due to a low concentration of salt and a flesh tissue quality improvement could not be carried out due to a quite slow gelation and emulsification. In addition, this method had a problem that the product was lack in texture such as resiliency or resistance to the teeth and further it had a problem that the flesh was easily oxidized and its color was easily faded. In addition, it had another problem that its quality was dispersed and a flesh block had bad color. Further, it had a problem that it was difficult to improve a layer of fat, flesh having a large amount of fat was easily dispersed in quality and had a poor productivity.

(15) The method disclosed in Japanese Patent Laid-Open No. Sho 58-37826 or Hei 2-308774 had a problem that it had

a poor binding characteristic and the flesh was easily collapsed during heating operation due to the fact that elution reaction or bio-chemical reaction of actomyosin was not generated under the presence of the layer of fat in the flesh block. Due to this fact, there was a problem that a full utilization of waste flesh having a large amount of layers of fat was difficult and its workability was lack.

In addition, all these prior arts were processing methods in which the granular additives were sprinkled or the flesh was fully dipped in a large volume of processing and treating solution of low concentration, so that these methods had a problem that it required a longer hour working time to attain the intended object through these processing methods, reduction in quality of fish flesh (softening or hardening, oxidation) was produced and the yield was remarkably reduced. Due to this fact, these prior art methods had a problem that the texture or taste such as resistance to the teeth when the fish flesh was eaten was reduced. In addition, they had a problem that they required a wasting facility for processing a large amount of pickling liquid used for the pickling operation or fat or low molecular nutritious substances discharged out of fish flesh. Further, the prior art processing methods had a problem that they had no universal processing of fish flesh, but they could be utilized only in the specified application.

DISCLOSURE OF INVENTION

The present invention solves the aforesaid prior art problems, wherein the fish flesh can be easily cooked by an electrical cooking device such as a micro-wave oven or the like, no flesh collapsing occurs during heating operation, low molecular nutritious substance is not discharged out, taste is kept in the flesh and the flesh can be utilized in a quite fresh state by a method in which a small amount of salt and alkaline agent of high concentration are mainly added and the fish flesh is processed in a quite short time. In addition, a changing in flesh color caused by oxidation during its refrigeration is quite less and so the flesh color can be vividly realized. Changing in flesh quality or discharging of drip caused by a thawing operation can be prevented, denaturation of the flesh during refrigeration and freezing can be prevented, and a fish-like smell of the marine products can be deodored. It is possible to manufacture a cooked food or a frozen food in which protein, fat or wax-like component in fat in the flesh tissue are changed into gelation or emulsion in their quality, the flesh is stabilized to improve a resistance to the teeth, agreeable to the taste and directed to the healthy condition. The flesh quality can be made soft and the flesh or flesh with fat can be combined under their raw state without requiring various kinds of binding agents or additive agents. The present invention has as its objects to provide a processed fish flesh of high yield and high nutritious value in which a powerful heating and binding characteristic as well as resiliency are indicated, its

processing can be easily carried out, a denaturation loss can be prevented, a discharging of low molecular nutritious substance or the like such as drip can be almost null and these effects are effectively utilized; to provide fish flesh materials which are suitable for sliced raw fish for an uncooked eating, canned foods, salty dried foods, roastings such as spit-roastings and other various kinds of processed foods; to provide a fish flesh in which a small amount of salt of high concentration, alkaline agent and vitamin agents or the like as required are added, cell membranes, myofibril, perymisium, collagen, lipid, fat, cell membranes and collagen in fat, or tissues of skeletal muscles or fat are relaxed by a processing of quite short period of time (1 to 15 minutes) or dissolved with salt to be changed into a structure of fine net state and taste can be pulled out of the cellular level and concurrently various kinds of seasoning materials and the like can be added to make a complex taste, the taste can be more continuously enjoyed the more the flesh is chewed even eating it after various kinds of cooking such as uncooked eating of sliced raw fish or heating and cooking are carried out; to provide the most preferable product which can be cooked conveniently with an electrical cooking device such as a micro-wave oven or the like, a low molecular nutritious substance is not discharged during a heating operation, taste can be kept in the flesh and the flesh can be vividly utilized; to prevent as fading in color of flesh caused by oxidation of fish flesh during its

refrigeration, realize a vivid color of flesh and prevent discharging of drip caused by thawing or denaturation of the flesh during its refrigeration and freezing or the like; to provide a method of preparing processed fish flesh capable of making the processed fish flesh in mass-production at a low cost in which a fish-like smell of the marine product can be deodored or processed in masking, protein, oil and fat, and wax-like substances in fat in the tissue of flesh are improved through gelation or emulsion to stabilize the flesh, a resistance to the teeth can be improved, the flesh tissue can be improved at the cellular level, flesh collapsing can be prevented during heating and cooking or the like, adjust a degree of softness of the fish flesh can be freely adjusted and a fresh processed fish flesh of low salt or frozen foods or cooked foods can be manufactured.

In order to attain the objects described above, the present invention comprises the following configuration.

The processed fish flesh in Claim 1 has a configuration in which 100 weight parts of a round or block-like fish flesh or fine cut pieces of fish flesh contains (1) salts of 0.2 to 4 weight parts with a dried weight in which either one kind of NaCl, KCl, CaCl₂ and MgCl₂ or mixture of these elements is dissolved in water or drip of raw material fish fleshs or other fish fleshs, or mixture liquid of the drip and water and added in a solution state in 1.5 to 7.0 mol concentration, and (2) alkaline agents of 0.1 to 2.7 weight parts in which either

one of NaHCO_3 , Na_2CO_3 , KHCO_3 , K_2CO_3 , NH_4HCO_3 , monosodium phosphate, disodium phosphate, trisodium phosphate, sodium pyrophosphate, sodium polyphosphate, potassium pyrophosphate, sodium hexametaphosphate, potassium metaphosphate and sodium metaphosphate or mixture of these elements is dissolved in water or drip of raw fish flesh or other fish flesh or mixture liquid of the drip and water and added in solution of 0.3 to 3.0 mol concentration.

The processed fish flesh described in Claim 2 has a configuration in which, as additive agent in Claim 1, one kind of or more of alcohols of 0.5 to 12 weight parts, vitamin E of 0.001 to 0.2 weight parts, vitamin C of 0.006 to 0.3 weight parts, saccharide of 1 to 13 weight parts, albumen of 0.2 to 5 weight parts and antioxidant of 0.001 to 4 weight parts, preferably 0.01 to 3 weight parts are contained.

The processed fish flesh in Claim 3 has a configuration wherein, as described in Claim 1 or 2, the drip of raw material fish flesh is reduced into the round or block-like fish flesh or fine cut fish flesh.

The processed fish flesh in Claim 4 has a configuration wherein the processed fish flesh of Claims 1 to 3 is mixed with at least one kind of:
bond reinforcing agents such as soybean protein powder, dextrin and casein soda and the like;
emulsifying agents such as albumen, lecithin, sugar ester and the like;

functional agents such as DHA, EPA, chitosan, calcium, vitamins, collagen and the like;
adhesion reinforcing agents such as sodium alginate, calcium citrate, corn starch, potato starch powder, glucomannan and the like;
preservation agents such as sorbic acid, potassium sorbate and the like;
plant fibers such as soy bean protein fiber and the like, animal fibers such as chitin and the like,
animal and plant fat such as cocoanut oil, corn oil, rape oil, lard and fish oil and the like,
seasoning such as glycine, L-glutamic acid, sodium L-glutamate, sodium inosinate, disodium guanylate, fish peptide, beef powder, beef extract, pork extract and the like; and
spices such as pepper, ginger, paprika, nutmeg, mace, thyme, allspice, onion, garlic, coriandar, cardamom, caraway, sage, laurel, marjoram, clove, cinnamon and the like.

The method of preparing processed fish flesh in Claim 5 has a configuration which comprises a salt dissolution step wherein 3 to 12 weight parts of high concentration solution of salt in 1.5 to 7.0 mol concentration (salt of 0.2 to 4 weight parts in its dry weight) is immersed in 100 weight parts of fish flesh of round or block-like fish flesh or fine cut fish flesh, and cell membranes, myofibril, perimysium, collagen, lipid, fat, and cell membranes and collagen in fat and the like are dissolved in

salt; and then an alkaline impregnation step for impregnating high concentration solution of alkali of 1 to 10 weight parts (alkaline agent of 0.1 to 2.7 weight parts in its dry weight) in 0.3 to 3.0 mol concentration.

The method of preparing processed fish flesh in Claim 6 has a configuration which comprises an alkaline impregnation step for impregnating high concentration solution of alkali of 1 to 10 weight parts (alkaline agent of 0.1 to 2.7 weight parts in its dry weight) in 0.3 to 3.0 mol concentration to 100 weight parts of round or block-like fish flesh or fine cut fish flesh; and then a salt dissolution step in which 3 to 12 weight parts of high concentration solution of salt in 1.5 to 7.0 mol concentration (salt of 0.2 to 4 weight parts in its dry weight) is impregnated in the fish flesh, and cell membranes, the myofibril, the perimysium, collagen or lipid, fat, and cell membranes and collagen in fat are dissolved in salt.

The method of preparing processed fish flesh in Claim 7 has a configuration which comprises a salt and an alkaline impregnation step for impregnating salt and alkaline blended solution containing high concentration solution of alkali of 1 to 10 weight parts (alkaline agent of 0.1 to 2.7 weight parts in its dry weight) in 0.3 to 3.0 mol concentration and salt agent high concentration solution of 3 to 12 weight parts (salt of 0.2 to 4 weight parts in its dry weight) in 1.5 to 7.0 mol concentration to

100 weight parts of round or block-like fish flesh or fine cut fish flesh.

The method of preparing processed fish flesh described in Claim 8 is characterized in that the additive agent solution impregnating step for impregnating in the fish flesh the additive agent solution having at least one of saccharide, vitamins, animal and plant proteins powder and antioxidant in any one of Claims 5 to 7.

The method of preparing processed fish flesh described in Claim 9 has a configuration which comprises a salt dissolution step in which 3 to 12 weight parts of high concentration solution in salt in 1.5 to 7.0 mol concentration (salt of 0.2 to 4 weight parts in its dry weight) is impregnated in the fish flesh, and cell membranes, myofibril, perimysium, collagen, lipid, fat, cell membranes and collagen in fat and the like are dissolved in salt in 1.5 to 7.0 mol concentration to 100 weight parts of round or block-like fish flesh or fine cut fish flesh; and an alkaline and additive agent impregnation step for impregnating blended solution containing high concentration solution of alkali of 1 to 10 weight parts (alkaline agent of 0.1 to 2.7 weight parts in its dry weight) in 0.3 to 3.0 mol concentration and additive agent solution which blends with at least one of saccharide, vitamins, animal and plant proteins powder and antioxidant.

The method of preparing processed fish flesh described in Claim 10 has a configuration which comprises an alkaline and additive agent impregnation step for impregnating

additive agent solution mixed with high concentration solution of alkali of 1 to 10 weight parts (alkaline agent of 0.1 to 2.7 weight parts in its dry weight) in 0.3 to 3.0 mol concentration and at least one of saccharide, vitamins, animal and plant proteins powder and antioxidant in 100 weight parts of round or block-like fish flesh or fine cut fish flesh; then a salt dissolution step in which 3 to 12 weight parts of high concentration solution of salt in 1.5 to 7.0 mol concentration (salt of 0.2 to 4 weight parts in its dry weight) is impregnated in the fish flesh, and cell membranes, myofibril, perimysium, collagen, lipid, fat, cell membranes and collagen and the like in fat are dissolved in salt.

The method of preparing processed fish flesh described in Claim 11 has a configuration which comprises a dispersion and absorption step for impregnating and dispersing in the fish flesh high concentration solution of salt or high concentration solution of alkali, additive agent solution after the salt impregnation step or salt and alkaline impregnation step or after the alkaline impregnation step or additive agent impregnation step in any one of Claims 5 to 10.

The method of preparing processed fish flesh described in Claim 12 has a configuration wherein the high concentration solution of salt in any one of Claims 5 to 11 is solution composed of one of NaCl, KCl, CaCl₂ and MgCl₂ or mixture of these elements and dissolved in water or drip

of raw material fish flesh or other fish flesh or mixture liquid of drip and material.

The method of preparing processed fish flesh described in Claim 13 has a configuration wherein high concentration solution of alkali in any one of Claims 5 to 11 is solution composed of mixture of either one or two or more of NaHCO_3 , Na_2CO_3 , KHCO_3 , K_2CO_3 , NH_4HCO_3 , monosodium phosphate, disodium phosphate, trisodium phosphate, sodium pyrophosphate, sodium polyphosphate, potassium pyrophosphate, sodium hexametaphosphate, potassium metaphosphate and sodium metaphosphate and dissolved in water or drip of raw fish flesh or other fish flesh or mixture liquid of the drip and water.

The method of preparing processed fish flesh described in Claim 14 has a configuration wherein the salt dissolution step or alkaline impregnation step, salt and alkali impregnating step and dispersion and absorption step in any one of Claims 5 to 11 are carried out under a fish flesh processing temperature of 20°C or less, preferably 10°C or less and/or under a pH value of 5 to 10, preferably 6.5 to 8.5.

The method of preparing processed fish flesh described in Claim 15 has a configuration wherein the salt dissolution step or alkaline impregnation step, salt and alkaline impregnating step in any one of Claims 5 to 11 are one of an injection process for directly feeding into the fish flesh through injection or an atomization process for

performing a direct atomization against the surface of the fish flesh.

The method of preparing processed fish flesh described in Claim 16 has a configuration wherein the dispersion and absorbing step in any one of Claims 5 to 11 is any one of a massage process, a vibration process, a ultrasonic wave process and a kneading process.

As the kind of fishes described herein are of marine and freshwater fishes and they may be utilized whatever sizes and shapes may be applied. For example, white flesh fishes such as walleye pollacks, Hokis. silver salmons, sea breams or the like; red flesh fishes such as tunas, swordfishes or the the like; blue skin fishes such as sardins, mackerels, horse mackerels, and mackerel pikes or the like; marine fishes such as marine animals of seals, whales or the like; fresh water fishes such as carps, crucians, duckweed fishes or the like; mollusks such as eels, pike congers, hairtails, octpuses, cuttlefishes or the like; krills such as the Antarctic krills, mysids or the like may be utilized.

As fish fleshs, fishes just after being caught, or refrigerated fishes, frozen fishes and fishes stored at icy temperature or the like may be utilized. In particular, salmons, trout, codfish after their salmon roe, or trout roe, or cod roe are removed, or red flesh fishes having less fat or other kinds of fishes of low utilization level may also be utilized, and concurrently fish fleshs of

which freshness degree is deteriorated may also be utilized.

As the forms of fish fleshs, there may be provided round (sardins, mackerels, horse mackerels, oceanic bonitos, cuttlefishes, an Atka mackerel, sea breams), semi-dress (salmons, trout, tunas, sharks, rainbow trout or the like), dress (salmons, trout, codfish, shrimp or the like), pan-dress (salmons, trout, tunas, halibuts or the like), chank (broadbill, tunas or the like), fillet (broadbill, a flatfish, a walleye pollack, tunas, halibuts, a dorado or the like), steak (salmons, trout, broadbill, tunas, whales, halibuts or the like), block (whales, a walleye pollack, an Atka mackerel or the like), slices, small cubes, fine cut meats, ground meats, cut pieces, and sticks or the like.

The fish fleshs having thick flesh pieces are preferable due to the fact that injection operation of impregnating work for impregnating high concentration solution of salt or high concentration solution of alkali into fish flesh blocks can be easily carried out and also a massage work, a vibration work and a ultrasonic wave work or the like can be easily carried out. In addition, small-sized fleshs such as fine cut fish fleshs or crustaceans or krills and fleshs cut pieces can be uniformly impregnated through atomization of high concentration solution of salt or high concentration solution of alkali.

Although a concentration is differed in reference to the type of salt, as high concentration solution of salt, solution having 1.5 to 7.0 mol concentration, preferably

2.5 to 6.0 mol concentration is used. Although a salt concentration is differed in reference to a sampling location in the fish flesh as well as the type of fish, it is acknowledged that in general, a degree of dissolution of the myofibril is decreased as the concentration becomes lower than 2.5 mol concentration and a production of gelatin in the fish flesh is apt to be decreased, and in particular if the value is lower than 1.5 mol concentration, its tendency becomes remarkable and in turn as the value exceeds 6.0 mol concentration, salty taste becomes high and flesh quality becomes hard, resulting in that taste of the flesh is deteriorated and particularly if the value exceeds 7.0 mol concentration, its tendency becomes remarkable, so that both of them are not preferable. This is preferable due to the fact that the salt concentration of 2.5 to 6.0 mol concentration improves a degree of dissolution of cell membranes or myofibril, perimysium, collagen in the fish flesh or lipid, fat, cell membranes or collagen in fat, changes the tissue in the fish flesh into a fine net-like structure, dissolved actomyosin from the flesh protein, applies a gelation capability and improves its binding characteristics.

As the salts, one of NaCl, KCl, CaCl₂ and MgCl₂ or mixtures of these elements is used. In addition, as NaCl, processed salt or the like processed with soda gultamate may be used. The salt high concentration solution is made such that these salts are dissolved in water or drip of raw material fish flesh or other fish flesh or mixture liquid

of the drip and water and then the solution is adjusted to solution in 1.5 to 7.0 mol concentration.

Amount of salts added to the fish flesh is set such that 0.2 to 4 weight parts, preferably 0.3 to 3 weight parts and more preferably 0.5 to 2 weight parts in dry weight to 100 weight parts of fish flesh. It is acknowledged that, as the value is decreased lower than 0.5 weight parts, the dissolution degree of salt for cell membranes or the myofibril, perimysium, or lipid, fat, cell membranes or collagen in fat is decreased, and in particular, it is acknowledged that there is a tendency that the value is remarkably decreased under a value of lower than 0.2 weight parts, salt may act forcedly as the value exceeds 3 weight parts and in particular, as the value exceeds 4 weight parts, adaptability as food is damaged depending on a processing method or the type of processing food material. In addition, as the adding amount of salt is decreased, product realizing flavour and taste of raw material can be obtained and in turn in the case that the adding amount of salt is increased, a preservation of the raw material can be improved under utilization of a form of smoked product or dried product with salt.

High concentration solution of alkali is dependent on the type of alkaline agent and the solution having 0.3 to 3.0 mol concentration, preferably 0.7 to 2.5 mol concentration is used. It is acknowledged that as the concentration is decreased lower than 1.5 mol concentration, there is a tendency that an increasing

degree of pH of the flesh is decreased, a gelation forming capability or emulsion forming capability becomes unstable, and in particular if the value is lower than 0.5 mol concentration, its tendency becomes remarkable and as the value exceeds 2.5 mol concentration, the value of pH is apt to be increased too much and this causes the myofibril or perimysium to be excessively denaturated, and correspondingly there is a tendency that denaturation of fish flesh may easily be promoted, the processed product and its quality are hardly maintained and in particular, if the value exceeds 3.0 mol concentration, its tendency becomes remarkable, so that both of them are not preferable.

As the alkaline agents, either one of Na_2CO_3 , K_2CO_3 , CaCO_3 , NaOH , KOH , $\text{Ca}(\text{OH})_2$, NaHCO_3 , KHCO_3 , $\text{Ca}(\text{HCO}_3)_2$, NH_4HCO_3 , disodium phosphate, trisodium phosphate, sodium polyphosphate, sodium metaphosphate, sodium pyrophosphate, monosodium phosphate, potassium pyrophosphate, sodium hexametaphosphate, potassium metaphosphate, monopotassium phosphate, dipotassium phosphate, and sodium triphosphate or mixture of these elements is used. In particular, although NaHCO_3 or KHCO_3 or the like is slightly hard to be dissolved in water and the like, this material is preferable due to the fact that adjustment for its pH value or the like can be easily carried out and it is safe in food sanitation. High concentration solution of alkali is produced such that the solution is adjusted to get 0.3 to 3.0 mol concentration solution in which these alkaline

agents are dissolved in water or drips of raw material fish flesh or other fish flesh or mixture liquid of the drips and water.

Although an adding amount of alkaline agent is dependent upon an intensity of alkali, it is 0.1 to 2.7 weight parts, preferably 0.3 to 2 weight parts and more preferably 0.4 to 1.3 weight parts in respect to 100 weight parts of fish flesh in dry weight. In addition, in the case that the value of pH is increased, weak acid such as lactic acid may be added to adjust its value. As this adding value becomes lower than 0.4 weight parts, maturing is not performed sufficiently and gelation forming capability is apt to become unstable; in particular, under a value lower than 0.1 weight parts, its tendency becomes remarkable; as the value exceeds 1.3 weight parts, the pH value in fish flesh is increased too much, resulting in that its preservation is deteriorated, chemical odor is added to the flesh and its denaturation may easily be generated; and in particular, as the value exceeds 2.7 weight parts, its tendency starts to appear remarkably, so that all these values are not preferable.

Any type of drips may be applied if they are fresh drips or drips with controlled quality or drips having a less number of bacteria. The drips may be simply applied as they are or they may be used while being mixed with other kinds of drips or diluted with water or they may be added to and mixed with high concentration solution of salt or high concentration solution of alkali. In this case, drips

contain a certain amount of water, so that it is preferable to decrease an amount of water for dissolving salt or alkaline agents. It is possible to utilize flavor and taste of raw material flesh by returning low molecular nutritious substance or taste contained in the drips back into the flesh.

It is preferable that the salt dissolution step or alkaline impregnating step, the salt dissolution and alkaline impregnating step, the salt dissolution promoting, gelation capability applying and emulsion step are carried out in 20°C or less and preferably 10°C or less. Although the state of a marine product is dependent upon its degree of maturity, a reason for that temperature consists in an acknowledgement that the flesh may easily be denatured as the temperature becomes 10°C or more and its daily preservation is apt to be decreased. And as to the value of pH, it is preferable that an alkaline degree is adjusted to cause a pH value of flesh fish to show 5 to 10, preferably 6.5 to 8.5. It is confirmed that the fish flesh becomes weak as the value of pH is lower than 6.5, and in particular, in the case that the value of pH is 5 or lower, its tendency becomes remarkable. In addition, as the value of pH exceeds 8.5, it is confirmed that, although the value is dependent upon the type of raw material fish, a rapid stabilizing of the fish flesh is produced and in the case that the value of pH exceeds 10, its tendency becomes remarkable, so that both of them are not preferable.

In the case that salt high concentration solution or alkaline agent high concentration solution is impregnated into the fish flesh through a pouring device of injection or the like, they may be concurrently added. If high concentration solution of salt is poured first, then high concentration solution of alkali is poured, a color tone of the fish flesh can be improved. In addition, in the case that the fish flesh is fresh or its color tone is not a problem at all (for example, the fish flesh is used for a processed fish flesh such as a fish flesh hamburger or a fish flesh croquette), a first pouring of high concentration solution of alkali into the fish flesh enables its physical properties to be improved through emulsion formation in the fish flesh or the like.

The impregnating method is carried out with an injector for performing injection or with an atomizing method for a small-sized fish flesh and in turn in the case that the fish flesh is large in size, the impregnating method is carried out with an injection machine.

As alcohols, cooking sake such as sweet sake (called as "Mirin"), Japanese sake or foreign liquors such as wine or whisky or Chinese sake are preferably used. Adding of cooking sake such as sweet sake or liquors such as Japanese sake enables the processed fish flesh to improve its luster or flavor or a soft-touch feeling.

As an adding amount of alcohols to the fish flesh, 0.5 to 12 weight parts of alcohols, preferably 1 to 8 weight parts of alcohols is used for 100 weight parts of the fish

flesh. As the adding amount becomes 1 weight parts or lower, there occurs a tendency that a minute flavor is not generated and in particular, in the case that the value is 0.5 weight parts or lower, that tendency is remarkable, so that it is not preferable. In addition, as the value exceeds 8 weight parts, a tendency in which the flavor contained in the fish flesh is deteriorated and in particular, when the value exceeds 12 weight parts, this tendency becomes remarkable, so that this is not preferable.

As saccharide, it is possible to utilize substance in which glycerin, propyleneglycol, starch or the like are added to one of xylite, sorbitol, glucose, oligosaccharide, melt-tetra-ose, galactose, fructose, lactose, sugar, cane sugar, malt sugar, grape sugar or mixtures of these substances. As an adding amount of saccharide, 1 to 13 weight parts, preferably 4 to 10 weight parts of saccharide is used for 100 weight parts of fish flesh. As the value is decreased lower than 4 weight parts, the fish flesh is easily denatured in freezing during its storing state and flesh quality is apt to be deteriorated, and in turn if the value is lower than 1 weight parts, this tendency becomes remarkable for a certain kind of fish, so that the lower value is not preferable. In turn, as the value is increased more than 10 weight parts, sweet taste is apt to be remarkably added to the fish flesh and its color is changed into charcoal color and in particular, if the value exceeds

13 weight parts, its tendency becomes remarkable, so that this higher value is not preferable.

As vitamin C, 0.006 to 0.3 weight parts, preferably 0.02 to 0.15 weight parts of vitamin C is used for 100 weight parts of the fish flesh. As the value becomes lower than 0.02 weight parts, the fish flesh is apt to be oxidized to deteriorate its color, and in particular, when the value is lower than 0.006 weight parts, this tendency becomes remarkable, so that this lower value is not preferable. In addition, as the value is increased more than 0.15 weight parts, there appears a tendency that a substantial difference is not acknowledged in coloring effect of the fish flesh or antioxidation effect in response to the type of fish flesh or a degree of freshness and in particular, as the value exceeds 0.3 weight parts, its tendency becomes remarkable, so that this increased value is not preferable.

As vitamin E, 0.001 to 0.2 weight parts, preferably 0.005 to 0.08 weight parts of vitamin E is added for 100 weight parts of the fish flesh to enable coloring of fish flesh or antioxidation effect for the fish flesh to be improved together with vitamin C, and in particular, the effect can be made remarkable under the value of 0.005 to 0.08 weight parts. In the case that the fish flesh is fresh, vitamin E may not be used, but only vitamin C may be sufficient.

As albumen, 0.2 to 5 weight parts, preferably 1.2 to 4.5 weight parts is applied for 100 weight parts of fish

flesh. Due to this blending rate, even for the fish flesh which was denatured in freezing operation after preservation in frozen state for a long period of time, it is possible to reinforce and promote a salt dissolution characteristic of high concentration solution of salt or emulsion forming or gelation with high concentration solution of alkali and then in particular, the action can be improved more under a value of 1.2 to 4.5 weight parts.

As antioxidant agent, erysorbic acid, disodium ethylenediaminetetraacetic acid calcium, sodium erysorbic acid, Sankatohru (a trade mark of Taiyoh Kagaku Co., Ltd.) are preferably applied. As a blending amount of the antioxidant agent, 0.005 to 4 weight parts, preferably 0.05 to 3 weight parts of the antioxidant agent is used for 100 weight parts of the fish flesh. Within this range, the taste of the fish flesh may not be deteriorated and the color of the fish flesh can be prevented from being changed.

Alcohols, vitamin C, vitamin E, saccharide, albumen and antioxidant agent or the like are dissolved in sorbitol solution which is a certain kind of saccharide or water or a drip of raw material fish flesh or drips of other fish flesh or mixture liquid of the aforesaid drip and water and used as additive agent solution. In particular, sorbitol solution is preferable. Since particulate sorbitol is hardly dissolved in water or the like, solution type sorbitol (70 % concentration) may easily be mixed with high

concentration solution of salt and used. Taste of the fish flesh can be extracted more by adding these substances.

As other sub-elements, there may be utilized protein additive agents such as bouillon, meat extract, seasoning agent, spice, lactoalbumin and blood plasma powder or the like; binding agents such as actomyosin, dextrin, Pearl-Meat-Activa TG-B (a trademark of Chiba Seifun Co., Ltd.); binding auxiliary agents such as soy bean protein powder, casein soda, Cardrun 10, 20, 30 (a trademark of Takeda Pharmaceutical Co., Ltd.); emulsifiers such as lecithin, sugar ester, glycerin fatty acid ester, and fatty acid ester propylene glycol; functional agents such as DHA, EPA, chitosan, calcium, vitamins, and collagen; emulsifiers such as Sanpro LX-100 (a trademark of Taiyo Kagaku Co., Ltd.), Sansoft (a trademark of Taiyo Kagaku Co., Ltd.); tackifier auxiliary agents such as soda alginate, calcium citrate, corn starch, white potato starch, glucomannan; preservation agents such as sorbic acid, potassium sorbitol; plant fiber such as soy bean protein fiber; animal-fiber such as chitin; and animal and plant fat such as coconut oil, corn oil, rape oil, fat of pig, lard, fish oil. These substances can be dissolved in high concentration solution of salt or high concentration solution of alkali or additive agent solution and used.

With such an arrangement as above, it is assumed that a predetermined amount of high concentration solution of salt and a small amount of high concentration solution of alkali are substantially uniformly impregnated in a fish

flesh, a high impregnating feature of the cell membranes of the fish flesh is utilized to cause these salt and alkaline agents to be uniformly dispersed and absorbed in the flesh and then a rapid biochemical reaction can be produced within the tissue of the flesh.

It is assumed that if a total amount of the small amount of impregnated high concentration solution of salt is dispersed and absorbed by a physical means, this may act directly against the skeletal muscles or a layer of fat in the fish flesh or the like, so that the salt dissolution is promoted within a quite short period of time, a salt concentration is decreased rapidly to cause its reaction activity to be stabilized and further its quality is stabilized.

Further, it is assumed that since a small amount of high concentration solution of alkali is also dispersed and absorbed in the flesh in the same manner by the physical means, although its reason is not apparent, the biochemical reaction is produced continuously in the fish flesh tissue to cause the myofibril or bundle of muscles to be changed into fine net-like tissue in a quite short period of time and then emulsifying and gelation capability are added. That is, it is assumed that a small amount of salt, alkaline agent, vitamins, functional agents or seasoning agents are included in the fish flesh under a state of the high concentration solution, then they are applied with a forced dispersion and absorption step such as vibration, thereby all these total amounts are absorbed directly into

the fish flesh to cause a biochemical reaction to be generated therein, cell membranes, the myofibril, the perimysium, the muscles, lipid, fat, collagen in the skeletal muscles are relaxed, softened and dispersed and further they are partially dissolved, resulting in that taste substance such as peptide is dissolved and dispersed into the flesh tissue, the substance takes out a complex effect together with other added additive agents or seasoning agents, wherein these dissolved, dispersed and blurred substances have emulsifying and gelation capabilities, they are uniformly combined with the surrounding fish flesh tissue, a certain type of tissue paste formation is generated within the flesh and moisture or the like can be held highly in the flesh tissue. It is possible that collagen or lipid contained in fibers in fat or blood vessel, nerve in the cellular tissue is softened and dissolved in salt at the layer of fat, the layer of fat is denatured into a state having a gelation capability, the fat tissue is denatured and gelatinized and at the same time the taste of the flesh is made remarkable. The flesh tissue is dissolved in salt or alkaline solution, applied with gelation capability, emulsified and its quality is improved, so that an effect of adding vitamin to the skeletal muscles or the like can be remarkably improved, the flesh can be activated to enclose reaction materials or additive agents or the like in the tissue of fine net-like structure, resulting in that oxidation or color fading during preservation of the marine product flesh can be

prevented, the flesh can be changed to have a transparent outer appearance, its freshness can be continued and a degree of whiteness of the flesh can be controlled under a combination of additive substances.

Since the salts or alkaline agents are uniformly dispersed in the flesh tissue, the lactic acid generated in the skeletal muscle tissues neutralizes the alkaline agents uniformly dispersed in the flesh tissue to cause a pH value of the fish flesh to be reduced, resulting in that its daily preservation can be remarkably improved and reduction in quality can be prevented.

In addition, high concentration solution of salt and high concentration solution of alkali can be uniformly dispersed by applying massage or vibration or ultrasonic wave processing and then fine net-like structure formation or micro-sized emulsifying operation and gelation capability application can be promoted within a quite short period of time (1 to 15 minutes). A moisture holding state of flesh can be improved by performing the fine net-like formation of flesh tissue with salt dissolution and emulsifying capability, drip formation can be prevented and raw flesh or the like just after catching the fish product can be matured in a quite short period of time. Since the moisture holding characteristic is improved, it is possible to prevent the taste substance such as water-soluble low molecular protein or various kinds of low molecular nutritious substances from being flowed out and the taste substance or nutritious value included in the fish flesh

can be extracted as much as possible and utilized. In addition, only a small amount of high concentration solution of salt is utilized, so that an entire salt concentration in the fish flesh can be restricted to make a low salt contained food. Further, since the flesh can be softened by this processing, a hard low class flesh, for example, a hard flesh such as a flesh of tail part of tuna can be changed into a soft flesh.

Concentration of salt or alkaline agent is changed to enable a binding characteristic or a degree of softness of the flesh to be freely adjusted. In addition, since the drip generated during thawing is mixed in high concentration solution of salt or high concentration solution of alkali and returned back into the fish flesh, it is possible to prevent the nutritious value or taste in the fish flesh from being deteriorated. In addition, it is possible to improve color of the fish flesh and to improve quality under an action of high concentration solution of alkali, high concentration solution of salt and vitamins and further to prevent fish smell from being generated.

The drip is added to other kinds of fish flesh except the fish flesh generated the drip to enable the taste of other kinds of flesh dew to be added to the taste.

Since water-soluble seasoning agent or nutritious agents or functional agents can be mixed in high concentration solution of salt or high concentration solution of alkali, it is possible to add taste or high

nutritious value corresponding to application such as meal for a sick person to the raw material itself.

Since the flesh tissue of the fish flesh is changed to form a fine net-like structure, a so-called gelation forming capability, so as to make a minute flesh tissue, even if flesh dew is generated during heating and roasting operation, the flesh dew is absorbed and held in the tissue when the flesh is expanded through its heating, an amount of inclusion of moisture in the flesh is increased, resulting in that a rate of expansion is improved to get a soft product having a certain volume. Concentration of salt solution or alkali solution is adjusted to enable a hardness or a softness of the fish flesh tissue to be freely adjusted, so that a range of application of cooking can be expanded. In addition, it has a high binding characteristic, so that an interface part between the fleshs may be well connected, several fine cut flesh pieces or the like become one sheet of flesh and even if the flesh is heated, the flesh is not separated into dispersed state. Since the flesh has a high degree of holding water, the flowing-out of the drip caused by freezing operation can be prevented and at the same time its denaturation can be prevented during its refrigeration, freezing or thawing, respectively. In addition, even if a gradual freezing or a re-freezing is carried out, the flesh pieces or several fine cut flesh pieces have a superior binding characteristic, so that no drip occurs and the

skeletal muscles or layer of fat can be stabilized at high quality.

Since salts or alkaline agents are added under a high concentration, the layer of fat in the fish flesh is dissolved in salt in a quite short period of time to form emulsion, gelation, gelatin and in addition, the fiber protein, i.e. the cell membranes or the myofibril, the perimysium or the like are loosed and dissolved through adding of salt of 1 weight % or less, although high concentrated solution can be dispersed into the protein or fat in the flesh tissue, reacted there to cause the solution concentration to be gradually decreased and a biochemical reaction can be finished in a short period of time. As a result, it is possible to cause a flesh with quality of a poor binding characteristic to be changed into a flesh having a superior resiliency and soft binding characteristic without damaging the skeletal muscle tissue. Although it is assumed that a reason for it may consist in the fact that actomyosin is dissolved and enzyme activity in the raw flesh is prohibited to prevent decay of the flesh tissue, it is possible to get a universal processing characteristic applying a binding feature or a high heating binding feature under a raw flesh state.

It is possible to stabilize the fish flesh tissue in the same manner as that of a paste product under a gelation effect with the salt dissolution effect, to produce a sliced raw fish flesh having a resistance against the teeth, to prevent fat from being dissolved or cell

membranes or filaments in the flesh from being untied and dispersed under a high pressure or a heating with microwave for a canned or retort food and at the same time to prevent a decay of fish flesh during heating or after heating cooking operation. When the flesh is heated and expanded, it is possible to absorb the discharged flesh dew into the fine net-like flesh tissue and to improve a moisture holding effect. In addition, it is possible to keep the flesh tissue soft and to prevent the flesh tissue from being hardened also after its cooling due to the fine net-like structure of the flesh tissue. It is possible to increase a moisture holding characteristic of flesh tissue, a degree of hardness or softness and a fine taste adjusting capability.

BEST MODE FOR CARRYING OUT THE INVENTION

Examples of the present invention will be described in detail as follows.

(Example 1)

As fish flesh, three fresh red sea breams were prepared, their scales or heads or internal organs were removed and 2700 g of round fleshes bleached with water was prepared. Then, high concentration solution of salt of 135 cc in 4.3 mol concentration having salt dissolved therein was injected against the fish flesh of 2700 g in a net-like manner. Then, the high concentration solution of salt was impregnated into the fish flesh tissue while applying vibration for five minutes with an electric massage machine

so as to perform a dispersion and absorption of the flesh and to promote its salt dissolution characteristic. Then, high concentration solution of alkali of 166 cc in 1.2 mol concentration having NaHCO_3 dissolved therein was injected against the fish flesh in a net-like form, thereafter an aging was promoted in which high concentration solution of alkali was dispersed and absorbed into the fish flesh tissue to apply emulsion formation and gelation capability of the fish flesh while vibration was being applied to the fish flesh for 5 minutes with an electric massage machine.

Then, the obtained sample was confirmed together with a non-processed sample (comparison example) for their variation in tissue by a microscope. Confirmation of them with a magnification rate of 400 times showed that the cell membranes in the comparison example could be confirmed, but the flesh of the present example showed that the cell membranes was broken and the entire membrane was flowed. Then, the example of the present invention was observed again with an electronic microscope under a magnification rate of 60,000 times, and it was confirmed that small bubbles were entered in the myofibrils, the myofibrils were partially cut and an emulsifying phenomenon in view of micro-size was produced there. In addition, it was confirmed that Z-bands were substantially bent, the myofibrils were bulged between the Z-bands to form a spindle shape. As the sample, the skeletal muscles sliced into 70 μm were used.

As apparent from the foregoing, it was made apparent that taste could be taken out from a cellular level under a bio-chemical reaction produced in a cellular level having a fine net-like structure, seasoning could be carried out under a complex reaction with seasoning materials and the fish flesh could have a taste not found yet in the past. As the disadvantages of the fish flesh processing operation in the prior art, it was pointed out that the processing had an occurrence of drip after freezing and thawing or decay of the flesh tissue, occurrence of fish smell and fading of the fresh color and the like. However, it was made apparent in the example of the present invention that almost of all these problems could be dissolved by improving flesh quality at a cellular level.

(Example 2)

Additive agent solution having sweet sake of 35 cc, Japanese sake of 40 cc as alcohols, Ami-rich GCR (made by Ajinomoto Co., Ltd: hereinafter called as "GCR") of 4.5g, sorbitol of 55g, mixtures of vitamin C and vitamin E of 4.5g mixed and dissolved was injected in a net-like manner against fish flesh of a red sea bream processed in the example 1, thereafter the additive agent solution was dispersed and absorbed in the flesh while vibration was being applied for 5 minutes with an electric massage machine to promote its aging. Then, its fillet flesh was cut into three pieces, their berry bones were removed, the pieces were vacuum packaged in an impermeable synthetic resin bag and frozen at -20°C for one month. After one

month, the pieces were taken out of a freezer and water was poured into them to thaw them. After thawing, fillets were taken out of the bag, they showed superior natures in resiliency, luster, binding characteristic and fresh coloring and even if the fillets were thawed, they showed no drip at all. It was made apparent that they could be utilized in many applications such as sliced raw fish, boiled fish, burned fish, fried fish and meuniere or the like. In addition, it was made apparent that after thawing, they could be utilized as chilled ones and enabled them to be utilized in many applications. The fillet flesh with skin may be set in hot water of 100°C as required, the flesh may be set rapidly in cold water, cooled, taken out, moisture content of the flesh may be completely removed, then the fish flesh may be rapidly thawed with a continuous freezer, small ice pieces adhered to the surface of the flesh may be removed with a brush, thereafter the flesh may be vacuum packaged in an impermeable bag. At this time, it was made apparent that if deoxidation agent was set in the bag and packaged in it, the flesh could be kept good for a longer time.

(Example 3)

Both side surfaces or central bloody colored flesh and flesh with bones were removed from the fillet skinned hot water processed sea bream which was treated in the example 2, the bream was cut into a sliced raw fish-form, the sliced bream was set in a tray, rapidly frozen, then vacuum packaged, thawed after 10 days and applied for an

organoleptic test with five panelists. As a result, they evaluated that the sliced bream had the same texture as that of a fresh sea bream and its taste was better than that of the fresh bream even if the sliced bream was a thawed product.

With the foregoing above, it has been made apparent that the product in the present example is a processed fish flesh having a superior feature after processing in the same manner as that of the examples 1 and 2, the product can be placed in a chilled channel distribution system or rapidly frozen and thawed to be utilized for professional business or home-use application and after thawing, the bream can be set in a distribution channel and sold in a market as a chilled product.

(Example 4)

Internal bones were removed from the red sea bream of fresh fish which was cut into three pieces, the pieces were washed with water and fillet flesh of 3000g from which water was completely removed was prepared. Then, after high concentration solution of salt of 150 cc in 4.4 mol concentration in which mixtures with salt and $MgCl_2$ in a ratio of 9 : 1 were dissolved was injected against fillet flesh of 3000g in a net-like form, the high concentration solution of salt was dispersed and absorbed while vibration was being applied to the flesh for five minutes with an electric massage machine so as to promote a salt dissolution process. Then, after high concentration solution of alkali in 2.1 mol concentration of 140 cc

having soda tripolyphosphate dissolved was injected against fillet flesh of 3000g in a net-like form, high concentration solution of alkali was dispersed and absorbed while vibration was being applied for five minutes with an electric massage machine so as to finish a promotion of aging to add emulsification and gelation capability for the fish flesh tissue. In addition, after additive agent solution having sweet sake of 50 cc, Japanese sake of 50 cc as alcohols, mixtures of vitamin C and vitamin E of 5g, GCR of 5g and sorbitol liquid of 85 cc mixed and dissolved therein was injected against the fish flesh in a net-like form, its aging was promoted while vibration was being applied for ten minutes with an electric massage machine, the additive agent solution was being dispersed and absorbed into the fish flesh. Then, the fish flesh of which quality was improved into a fine net-like structure was cut into a sliced raw fish, frozen and dried to make a processed food of red sea bream for a soup. The food was distributed to five panelists in its soup form and its organoleptic test was carried out, resulting that a quite high evaluation was obtained.

Although the prior art product is hard and has no natural taste, it has been made apparent that the examples of the present invention enabled the frozen dry product for soup of red sea bream which is approximate to a texture of raw fish and easily returned back to its state in hot water.

(Example 5)

Fillet-like frozen fish flesh of a walleye pollack of which head and internal organs were removed and washed with water was thawed while its temperature was being monitored and then a fish flesh of 3000g of which moisture was sufficiently removed was prepared. Then, after high concentration solution of salt of 147 cc in 4.4 mol concentration having salt dissolved therein was injected against the fish flesh in a net-like form, the high concentration solution of salt was dispersed and absorbed in the fish flesh while vibration was given to the fish flesh for five minutes with an electric massage machine so as to promote a salt dissolution. Then, after high concentration solution of alkali of 139 cc in 1.85 mol concentration having NaHCO_3 dissolved was injected against the fish flesh in a net-like form, the solution was similarly dispersed and absorbed for five minutes with an electric massage machine so as to promote emulsifying and gelation capability. After this operation, the additive agent solution having sorbitol solution of 110 cc, sweet sake of 48 cc, GCR of 4.5g, cane sugar of 90g, mixture of 5g of vitamin C and vitamin E, Japanese sake of 50 cc and albumen of 28g dissolved therein was injected against the fish flesh in a net-like form, the solution was similarly dispersed and absorbed for five minutes with an electric massage machine. Then, the fish flesh was rapidly frozen, transferred to a tray, wrapped with a film and preserved for one month within a freezer kept at -25°C After one

month, the flesh was taken out of the freezer and thawed. Occurrence of drip was scarcely acknowledged.

As a comparison example, non-processed fillet flesh of 1000g in which the processing treatment of the preferred example was not carried out was similarly rapidly frozen, the flesh was taken out after one month and the flesh was thawed. Occurrence of a large amount of drip was acknowledged, fading of flesh color was produced and a decay of flesh was slightly acknowledged. Then, the product of the present example and the product of comparison were changed into a fried cook and a boiled fish cook and they were eaten by five panelists as trial. The product of the present example was soft and they could eat them deliciously. However, the product of comparison was hard and the fried cook showed a peeled-of state of cover and flesh due to shrinkage of the flesh inside the cover and the flesh was decayed when it was cut. This tendency became hard as the cooked product was cooled and time elapsed, the product was hard and was not delicious.

Due to this fact, it was found that the product of the present example had a superior moisture preservation, could prevent drip or improve yield after heating and cooling, keep a softness, improve a decay of flesh and adjust texture in a cellular level with a small amount of salt and further attain the delicious product which could not be attained yet. In addition, it was found that it was possible to reinforce or promote emulsification and gelation capability by dissolving albumen of 1 % in

sorbitol solution and adding it to the raw material in which denaturation by freezing was generated and a salt dissolution was reduced due to its longer period preservation, to improve flesh quality remarkably and increase quality of fish flesh. In addition, it was found that the product of the present example could be utilized as a retort food or in a canned food under utilization of this characteristic, the flesh was soft and showed a better passing at the throat differing from that of the prior art retort or canned food and then the processed fish flesh having a superior texture and a certain resiliency could be obtained.

(Example 6)

Fillet flesh of frozen walleye pollack of 1200g was thawed while its temperature was being monitored. Then, after high concentration solution of alkali of 45 cc in 2.0 mol concentration having Na_2CO_3 dissolved therein was injected against the fillet flesh in a net-like form, the solution was dispersed and absorbed into the flesh while vibration was being applied to it for five minutes with an electric massage machine, then after high concentration solution of salt in 4.05 mol concentration of 62 cc having a mixture of salt and KCl dissolved in a ratio of 8 : 2 was injected against the fish flesh in a net-like form, the salt dissolution was promoted while vibration was being applied for five minutes with an electric massage machine. Then, after the additive agent solution having sweet sake of 20 cc, GCR of 2g, cane sugar of 18g, mixture of vitamin

C and vitamin E of 2.1g and wine of 25 cc mixed and dissolved from each other was injected against the fish flesh in a net-like form, dispersion and absorption of the additive agent solution or adding of emulsification capability and aging promotion were carried out while vibration was being applied to it for five minutes with an electric massage machine. Then, after the obtained fillet flesh was cut for a cooking of roasted fish or meuniere, boiled fish, and fried fish without any cover, a rapid freezing was applied to it with a tunnel freezer, put into an impermeable bag, vacuum packaged there and preserved in a freezer at -20°C. The flesh was taken out of the freezer after one week, thawed and cooked into a roasted fish, meuniere, boiled fish, pot-boiled fish, fried fish without any cover. All these cooks were superior in texture or taste.

In the prior art cooking, since there were much amount of fish smell and a large amount of drip, the fish flesh became hard, fish flesh was shrinked or flesh was remarkably decayed after heating, paste substances were applied to the flesh and sprinkled with bread powder for its fried cook. However, its texture or quality in taste was poor. According to the present example, it was possible to improve texture or taste without using any paste or the like, to make a product with a full 100% fish flesh and to resolve the disadvantages of the prior art. In addition, with the foregoing, it has been found apparent that multi-

purpose processed frozen foods suitable for roasted fish, meuniere, broiled fish and fried fish without cover.

(Example 7)

As fish flesh, fillet-like fish flesh with skin of 600g of Hoki (fresh fish) of which head and internal organs were removed, bleached with water and cut into three pieces was prepared. Then, after high concentration solution of salt of 30 cc in 4.0 mol concentration having salt dissolved therein was injected against the fillet flesh in a net-like form, vibration was applied to it for five minutes with an electric massage machine, then high concentration solution of alkali of 24 cc in 1.2 mol concentration having NaHCO_3 was injected against the fish flesh in a net-like form, high concentration solution of alkali was dispersed and absorbed into the fish flesh while a low speed operation of the vacuum massage machine was being carried out for five minutes so as to promote emulsification and gelation capability. Then, after the additive agent solution having sorbitol liquid of 17 cc, sweet sake of 10 cc, GCR of 1.0g, mixture of vitamin C and vitamin E of 1.0g, Sun-frabon HG acting as deodorant (made by Taiyo Kagaku Co., Ltd.) of 0.9g and Japanese sake of 10 cc dissolved therein was injected against the fish flesh in a net-like form so as to attain dispersion and absorption of the additive agent solution and aging promotion while a low speed operation of an electric massage machine was being carried out for five minutes. A product test was

carried out for the obtained sample. The test results were indicated in Table 1.

As for the product test, a roasting test and a fried test without any cover were carried out with the fillet Hoki of the present example being cut. As for the comparison example, fillet cut flesh cut into three pieces was prepared in the same manner as that of the present example except the condition in which the processing treatment of the present example was not applied.

(1) As for the roasting test, a hot plate set at a temperature of 167°C was used, and both front and rear surfaces of the flesh were roasted for eight minutes.

(2) As for the fried test without any cover, Tempura oil of which temperature was adjusted to 180°C was applied and oil adjustment was carried out in three minutes.

Each of the yields was as follows. (Each of the samples had six pieces and its yield was applied in its average value.)

Then, a product test was carried out for each of the obtained products.

1. Product of the example:

In case of the fried product without any cover, there was no clearance between the flesh and the cover due to expansion of the flesh, no heating shrinkage of the flesh was present and a soft and bulged state was kept. In addition, the product fried with oil had a light brown in color at its surfaces and showed a nice taste. As for roasting, no crack in flesh as well as no decay in shape of

the flesh was made, it had a superior degree of whiteness, had a superior moisture preservation, resulting in that its reduction in weight was less even after a time elapsed, it showed a better resistance against the teeth and delicious taste.

2. Product of the comparison example

As time elapsed, moisture contained in the product was evaporated, the product was hardened and its color was changed into black. As the product was gradually dried, the white-colored product was changed into black-colored product and correspondingly its taste was deteriorated. In addition, the flesh was remarkably cracked and three pieces of products were cracked.

In the prior art cooking, since there were much amount of fish smell and a large amount of drip, the fish flesh became hard, fish flesh was shrunk or flesh was remarkably decayed after heating, the flesh could be utilized only for the fried cook, paste substances were applied to the flesh for its fried cook and sprinkled with bread powder. However, its taste or texture was poor. In the product of the present example, even if the paste or bread powder was not used and only fish flesh was applied, the product having a superior taste or texture could be obtained and the problems in the prior art could be resolved. It was made apparent that NaHCO_3 was used as alkali, a value of pH of the processed food could be reduced, a stable quality could be maintained and a

processed fish flesh suitable for heated and cooked daily dish could be attained.

(Example 8)

Fillet-like flesh of 900g of a Hoki (fresh fish) of which head, internal organs, skins and bones were removed and cut into three pieces were bleached with water, then roughly minced by a grinder [a meat grinder, model MK-GL2, made by Matsushita Electric Industrial Co., Ltd. (10 mm)]. Processed minced flesh was put into a mixer, high concentration solution of salt of 45 cc in 4.0 mol concentration having salt dissolved therein was atomized against the flesh by an atomizing machine and further high concentration solution of salt was impregnated into the minced flesh while a low speed operation of the atomizing machine was being carried out for five minutes. Then, high concentration solution of alkali of 63 cc in a 1.0 mol concentration having NaHCO_3 was impregnated into the flesh while the solution was being atomized by an atomizing machine and also a low speed operation of the mixer was being carried out, the salt dissolution was promoted while the salt solution and alkali solution were being dispersed and absorbed, emulsifying and gelation capability were applied to promote a binding characteristic. Then, the additive agent solution having sweet sake of 15 cc, Japanese sake of 15 cc, GCR of 1.5g, cane sugar of 27g and mixture of vitamin C and vitamin E of 1.5g mixed and dissolved from each other was impregnated into the minced flesh while the solution was being injected against it by

an atomizing machine and also while a low speed operation of a mixer was being carried out for five minutes. Then, the produced minced flesh was formed into a steak shape, heated and a product test was carried out.

Although in the prior art, the minced flesh was processed into a sheet-like block with the animal and plant proteins powder being applied as a binder, presence of free water or fat, fat caused the flesh to be easily separated and hard after heating and its moisture preservation was poor. However, according to the present example, it was made apparent that it was possible to increase a salt dissolution characteristic of protein contained in the fish flesh only with the fish flesh without using any binding agent to improve fat, to increase a superior heating binding characteristic even if fat was mixed in the flesh and further to improve a moisture preservation characteristic, a resiliency and a rate of expansion. Further, in accordance with the present example, it was made apparent that the flesh could be molded into and utilized for multi-purposes and the fishes of low utilization type could be highly utilized.

(Example 9)

Additive agent solution having calcium of 100mg (made by Wada Pharmaceutical Co., Ltd.: a product name: Wada calcium) acting as a functional agent, sorbitol liquid of 10 cc, vitamin complex of 0.2 % containing vitamins C, E, B₆, B₁₂ dissolved therein was mixed and kneaded to each of 100g of Hoki filet cut piece of the product of the present

example 7 and a Hoki rough minced flesh of the present example 8 and then the additive agent solution was dispersed and absorbed into the raw material of flesh.

In general, although a Hoki and a walleye pollack and the like had lightness in taste and low calorie, their functional characteristic was low. In view of this fact, it was necessary to increase a functional characteristic in compliance with a need of consumers and so functional agents were sprinkled over or coated on the fish flesh. The functional characteristic could not be added to the cellular level, the agents were merely adhered to the surface of the fish flesh, were quite unstable, resulting in that the function could not be sufficiently realized, and in particular, its function might be damaged during heating operation. According to the present example, it was made apparent that since these functional agents were dissolved in high concentrated solution, impregnated into the fish flesh tissue by injection or the like, their dispersion and absorption were carried out, resulting in that the functional agents were uniformly dispersed and absorbed in the fish flesh to enable a functional characteristic to be given to the fish flesh in a quite short period of time.

(Example 10)

Processed fish flesh treated in the example 9 was freely molded into a steak form, a stick form, a hamburger form, and a dice shape or the like. In this case, a cover

made of bread powder, seed powder and powder milk or the like may be coated on the surface of the fish flesh.

According to the present example, since the functional agents were uniformly distributed in the fish flesh, the fish flesh had a high stability against heat and the functional characteristic could be highly realized. In addition, it was made apparent that a proper thin paste was coated to prevent the fish flesh from being directly contacted with heat, bread powder, seed powder, powder milk, or a crape or a dumpling skin or the like were adhered to the surface of the fish flesh to enable even a thin flesh to prevent a denaturation of the functional agents against heat, resulting in that the chilled frozen processed food for multi-purpose having an improved function could be realized.

(Example 11)

After high concentration solution of salt of 150 cc in 4.5 mol concentration having salt of mixture of NaCl and KCl dissolved in ratio of 1 : 1 was injected against the fish flesh of a swordfish in a net-like form for a thawed fillet fish flesh of 3000g while frozen raw material with its head and internal organs being removed and blood being removed as well was being monitored for its temperature, its salt dissolution characteristic was promoted while a vibration was being given to the flesh for five minutes with an electric massage machine. Then, after high concentration solution of alkali of 140 cc in 1.9 mol concentration having NaHCO_3 dissolved therein was injected

against the fish flesh in a net-like form, vibration was given to the fish flesh for five minutes with an electric massage machine, the flesh tissue was dissolved in salt and concurrently, emulsification and gelation capability were given to it so as to improve it into fine net-like structure and then its aging was promoted. After this operation, the additive agent solution having sweet sake of 50 cc, Japanese sake of 50 cc, GCR of 5.0g, granular sorbitol of 60g, mixture of 5g of vitamin C and vitamin E dissolved therein was injected against the fish flesh in a net-like form, vibration was given to it for five minutes with an electric massage machine and then the dispersion and absorption of the additive agent solution were carried out to promote the aging. Then, the sample was processed into a sliced raw fish form.

Then, variation of tissue was confirmed together with the non-processed sample (comparison example) under its magnification of 400 times by an optical microscope. It was confirmed that the sample of comparison showed a skeletal muscle tissue having muscle bundle of myofibrils, although the sample of the present embodiment showed that peripheral membranes, internal membrane collagen, elastin fibers or the like were dissolved with dispersed salt and each of them was replaced and bulged into muscle bundles.

In addition, it was confirmed by a photograph taken by an optical microscope for showing the myofibrils cut in a lateral direction that the comparison example could acknowledge white spots of ice crystal in a width of normal

tissue in the skeletal muscles and an interface between the cell membranes, although the sample of the present example could acknowledge a gelation state in which it was improved into a fine net-like structure, the substances which were assumed to be dissolved low molecules and fibrous protein were contained in the net and their quality were highly improved.

In view of the above, the sample of the present example was magnified again by an electronic microscope to observe it, resulting in that it was revealed that small bubble-like substances entered between the myofibrils and the myofibrils were partially cut. In addition, it was confirmed that the Z-bands were also remarkably bent, the myofibrils were bulged out between the Z-bands to form a spindle shape. As the samples, skeletal muscles sliced into 70 μm were used.

As apparent from the foregoing, it was possible to extract taste from a cellular level under a bio-chemical reaction with the fine-net like structure being applied, to perform a seasoning complexed with the seasoning agents and to produce the taste not found yet in the fish flesh of the prior art. As the disadvantages of the prior art fish flesh, occurrence of drip after freezing or thawing, a decay of flesh tissue caused by activation of enzyme, occurrence of fish smell and fading of fresh color or the like were pointed out, although it was made apparent in the present example that the problems in quality which could not be resolved in the prior art can be resolved by

improving quality at a cellular level under utilization of the flesh substances without adding any animal and plant proteins. Further, it was made apparent that this improvement in quality can be sufficiently produced in a short period of time.

Injection of high concentration solution of salt or high concentration solution of alkali may be carried out concurrently or separately for side surfaces, front surface and rear surface of the fish flesh.

Obtained sliced flesh was tested for their organoleptic test by five panelists. It was made apparent that the sliced flesh was superior in color and texture as well.

The prior art utilization of tunas or the like was carried out such that the tuna was decomposed into blocks in its fresh state, the decomposed blocks were further processed into rectangular forms, the rectangular forms were cut out and utilized as sliced fish flesh. Frozen raw material was semi-thawed and processed into blocks, thereafter cut into rectangular forms and utilized as a sliced raw fish flesh. Both of them produced rapid reduction in quality, generated a self-digestion with activation of enzyme, flowing-out of drip, fish smell, decoloring of flesh and decay of tissue could easily be produced, resulting in that they became a substantial prohibition in utilization and they have not been resolved yet.

In the present example, it has been made apparent that flowing-out of the drip or occurrence of fish smell can be prevented and these problems can be resolved. That is, the flesh quality can be improved at a cellular level, the taste can be extracted from the fish flesh, a seasoning taste complexed with seasoning agents can be carried out, resulting in that a taste not found in the prior art could be attained. As desired, similar effect could be attained even by a method in which the seasoning agents are not used. It has been made apparent that after processing, the flesh might be cut into three pieces or two pieces and they might be set in a distribution channel under chilled state in the forms of fine-sliced shape, or block, fillet, rectangular shape. It has been made apparent that the flesh may be rapidly frozen and after being set in a distribution channel, the flesh may be thawed and utilized for multi-purpose application and further as for the fresh fish, this may be similarly processed in the same manner as that for the frozen product.

(Example 12)

Block-like processed fish flesh treated in the example 11 was filled in a can, its lid was wound and fastened while air was being removed from within the can, heated under 2 atmospheric pressure, at a temperature of 120°C and for 30 minutes, thereafter the flesh was cooled to make a canned food. This canned food was opened to check the flesh quality, resulting in that it became possible to get a canned food not found yet in the prior art in which

moisture separation in the fish flesh was less, the flesh had a superior resiliency and a superior moisture preservation, a well resistance against the teeth and a better feeling in passage at the throat. In addition, the fish flesh had no decay in shape, but had a soft and bulged form, the surface of the flesh was minute in texture, resulting in that the canned food containing rolling taste in the flesh could be attained, the flesh absorbed its dew to provide its weight.

Although the prior art flesh showed that moisture was separated from the fish flesh, a large amount of taste in the flesh in the can were discharged out, the flesh had no dispersed state, no resiliency and bad feeling in passage at the throat, it has been made apparent that the present example can solve these problems.

(Example 13)

Block-shaped processed fish flesh treated in Example 11 was cut into a sliced form, the sliced pieces were canned in a can, its lid was fastened while air was being removed inside the can, the can was put into a pressure vessel, heated for 30 minutes under 2 atmospheric pressure, at 120°C, sterilized, cooled and the canned food was made. As a result, an evaluation which is similar to that of Example 12 could be obtained.

(Example 14)

Block-shaped or fillet-shaped processed fish flesh treated in the example 11 was cut into rectangular pieces in compliance with its purpose and vacuum packaged.

In this example, it became possible to provide a convenient cooked frozen food or a heated cooked food in which drip or the like are not produced, deterioration in quality such as color fading can be prevented, the food can be utilized as cut and sliced pieces, fish steak, meuniere, roasted fish, broiled fish and dried fish, the food can be taken out of a refrigerator at any time and at any place, and utilized. In addition, it became apparent that the rectangular fish flesh is not decayed in their shape through vacuum packaging after they are rapidly frozen.

(Example 15)

As a fish flesh, a fresh fish of a walleye pollack with its head and internal organs as well as blood removed was cut into two pieces as it was and a fillet flesh with skin removed was prepared. Then, after the fillet flesh was pretreated into mince form, high concentration solution of salt of 150 cc in 4.0 mol concentration having salt dissolved therein was injected against fish flesh of 3000g, and vibration was given to the flesh for five minutes by an electric massage machine. Then, after high concentration solution of alkali of 180 cc in 1.2 mol concentration having NaHCO_3 was atomized against the flesh, the flesh tissue was dissolved in salt while vibration was being applied for five minutes by an electric massage machine, emulsification and gelation capability were added to improve its quality into fine net-like texture and aging was promoted. Then, after additive agent solution having sweet sake of 50 cc, Japanese sake of 50 cc, GCR of 5g,

sorbitol of 60g, and mixture of 5g of vitamin C and vitamin E dissolved therein was injected against the flesh, the additive agent solution was dispersed and absorbed while vibration was being given for five minutes by an electric massage machine, and aging was promoted. Frozen raw material was thawed while its temperature was being sufficiently monitored, and processed in the same manner as that of fresh fish.

This processed fish flesh was applied to make the following processed foods.

(1) The fish flesh was vacuum packaged in a unit of 100g in its minced state, rapidly frozen to get frozen processed fish flesh for a bowl rice and a rice wound with sea weed.

(2) The fish flesh of 150g was molded into a round shape or an ellipse shape, rapidly frozen, vacuum packaged to get a frozen processed fish flesh suitable for a fish flesh hamburger.

(3) After the processed fish flesh of 80g was adhered to a round bar, the flesh was heated for 15 minutes at 80°C, the flesh was cooled, vacuum packaged, chilled or rapidly frozen or vacuum packaged while its raw frozen state was being kept to get a frozen processed fish flesh for a Tsukune. Due to its superior binding characteristic, this product could be obtained easily and in a high yield.

(4) Material having egg mayonnaise of 100g mixed against minced fish flesh of 1000g was vacuum packaged in a unit of 100g, rapidly frozen to get a frozen processed fish

flesh suitable for a rice round with sea weed of a Negitoro or a rice bowl with tuna.

(5) After 5 mm square cheese of 150g was mixed with minced fish flesh of 1000g, the mixed material was molded into a block of 150g for a steak or a hamburger or a stick of 30g, they were rapidly frozen and vacuum packaged to get a packed frozen processed fish flesh.

(6) Rough minced processed fish flesh of 200g was heated for 10 minutes at 100°C while being separated, the flesh was canned in a can, its lid was fastened around it while air was being removed, the canned food was heated for 30 minutes under 2 atmospheric pressure and at 120°C, cooled to make a canned product. Upon opening of the can to check a quality of fish flesh, it became possible to make a canned food in which the flesh itself absorbs separated moisture in the flesh, keeps its superior resiliency or moisture preservation, has a better resistance to the teeth, no decay in shape, a soft and bulged fine texture of a surface of the flesh, a rolling taste in the flesh and a superior comfortable feeling in passage at the throat. Although the prior art product was not well adapted in a market due to moisture separation in the flesh, discharging of a large amount of taste of flesh in the can, separated fish flesh in the can, no resiliency of the flesh and bad feeling in passage at the throat, the present invention could resolve these problems.

(7) Processed fish flesh minced in middle level was separated while being heated in advance, sauce was added to

the separated flesh, the flesh was set in a retort pouch, heated for 20 minutes under 2 atmospheric pressure, 120°C, then cooled to make sauce. Upon opening of this canned product to check a quality of it, although the prior art product was not well adapted in a market due to discharging of a large amount of taste of flesh in the can, a filament-like separation of fish flesh in the can, no resiliency of the flesh and bad feeling in passage at the throat, the present invention could resolve these problems. Thus, it became possible to get sauce in which the flesh itself has a less amount of separated moisture in the flesh, absorbs flesh dew, keeps its superior resiliency or moisture preservation, has a better resistance to the teeth, no decay in shape, a soft and bulged fine texture of a surface of the flesh, a rolling taste in the flesh and a superior comfortable feeling in passage at the throat.

(8) Minced fish flesh of 900g was processed in the same manner as that of fish flesh, rough-minced beef meat of 150g and seasoning agents were mixed to each other, they were set in a stuffer, each block of 60g was charged in a sheep gutter, then boiled for about two minutes at 100°C, they were set semi-raw state, and cooled with cold water. After cooling, they were packaged in bags, rapidly frozen to get a fish flesh wiener. The prior art product had problems that heating causes fish flesh or meat to be shrinked, the flesh is apt to be separated, moisture content is separated and fish smell is increased. Due to this fact, many kinds of additive agents were used in the

prior art product. In the present example, these prior art problems are overcome, and there is provided a rough minced type fish weiner with beef meat in which the flesh is bulged during heating, the flesh is soft and has a superior resiliency as well as a better resistance to the teeth.

(9) Beef meat of 150g processed in the same manner as that of the fish flesh is roughly minced and mixed with crushed fish flesh of 900g and they are molded by a molding device into a dice shape or a steak shape in compliance with its target shape. The flesh was rapidly frozen and vacuum packaged to get a frozen processed food with beef meat having a gelation capability.

(Example 16)

(1) After high concentration solution of salt of 150 cc in 2.8 mol concentration having salt dissolved therein was injected against the fine cut fish flesh of 3000g of frozen raw material of a walleye pollack with head, internal organs and blood being removed which was thawed with its temperature being monitored, cut into two pieces, had skins removed and sliced into fine pieces, its salt dissolution was promoted while a vibration was being applied for 5 minutes by an electric massage machine.

Then, high concentration solution of alkali of 110 cc in 1.8 mol concentration of Na_2CO_3 was injected against the flesh while a vibration was being given to it for 5 minutes by an electric massage machine, salt dissolution of flesh tissue was promoted, emulsifying and gelation capability

were added to the flesh tissue to change it into a fine net-like texture and then an aging was promoted.

After this operation, additive agent solution having sweet sake of 50 cc, Japanese sake of 50 cc, GCR of 5g, sorbitol of 60g, mixture of 5g of vitamin C and vitamin E dissolved therein is added to the flesh by an atomizer machine, these additive agent solutions were dispersed and absorbed into the flesh tissue while a vibration was being given to the flesh for 5 minutes by an electric massage machine and its aging was promoted.

Then, the flesh was vacuum packaged in a package of 100g, rapidly frozen to make a case of 5 sheets in one pack to make and process frozen tuna sliced pieces.

Subsequently, a product test was carried out with this sample. After the sample was held for one day in a home-use refrigerator, the sample was thawed and its aging variation was confirmed. It was made apparent that the product of the present example has emulsified moisture in the flesh, the product can be thawed rapidly and quality as sliced pieces is not damaged for 5 to 6 hours after thawing due to the fact that the moisture is emulsified in the flesh. It was also made apparent that the fresh fish can be processed in the same manner by cutting the fresh fish into two pieces and removing the skin from it.

(2) A swordfish cut flesh of 50g pre-processed in the above (1) and a curry roux of 150g were combined, the combined product was set in a retort pouch, air in a container was removed and the container was sealingly

closed. Six sets of these containers were prepared. They were applied with pressure, heat and sterilization at a pressure of 2 atmospheric pressure, heating temperature of 120°C for 20 minutes to make a curry having retort small fish flesh pieces.

(3) A swordfish cut flesh of 50g pre-processed in the above (1) and a curry roux of 150g were combined, the combined product was set in a can container, its lid was fastened while air in the container was being removed, the flesh product was applied with pressure, heat and sterilization at a pressure of 2 atmospheric pressure, heating temperature of 120°C for 30 minutes to make a canned curry having small fish flesh pieces.

(4) A swordfish cut flesh of 50g pre-processed in the above (1) and a curry roux of 150g were combined, the combined product was set in a plastic air-tight container, air was removed, nitrogen gas was poured into the container and the container was air-tightly sealed. Six sets of the containers were made. Then, the flesh product was applied with micro-wave radiation, pressure, heat and sterilization at a pressure of 2 atmospheric pressure, heating temperature of 120°C for 20 minutes to make a curry having small fish flesh pieces set in an air-tight container.

(5) As a comparison example, the same raw material as that of the example was applied, a swordfish sliced cut flesh of 300g not processed with that of the example was prepared, the fine cut flesh of 50g and curry roux of 150g were combined, they were set in a retort pouch, air in a

container was removed and air-tightly sealed. Six sets of the container were made. The products were applied with pressure, heat, sterilization within a pressurizing kettle at 2 atmospheric pressure, heating temperature of 120°C and for 20 minutes to make a retort curry having small fish flesh pieces.

(6) As a comparison example, the same raw material as that of the example was applied, a swordfish sliced cut flesh of 300g not processed with that of the example was prepared, the fine cut swordfish flesh of 50g and curry roux of 150g were combined, they were set in a can container, its lid was fastened while air in the container was being removed and the products were applied with pressure, heat, sterilization at 2 atmospheric pressure, heating temperature of 120°C and for 30 minutes to make a canned curry having small fish flesh pieces.

(7) As a comparison example, the same raw material as that of the example was applied, a swordfish sliced cut flesh of 300g not processed with that of the example was prepared, the fine cut swordfish flesh of 50g and curry roux of 150g were combined, they were set in a plastic air-tight container, air was removed from the container and nitrogen gas was poured into the container. Six air-tight sealed units were made. The products were radiated with micro-wave, applied with pressure, heat, sterilization at 2 atmospheric pressure, heating temperature of 120°C and for 20 minutes to make a curry having small fish flesh pieces stored in an air-tight container.

Roasting yield comparison test was carried under the same condition for the retort products obtained by the aforesaid experimental example (2) and the comparison example (5), the canned products obtained by the experimental example (3) and the comparison example (6) and the micro-wave processed products obtained by the aforesaid experimental example (4) and the comparison example (7), respectively. The test results are indicated in Table 2.

As apparent from Table 2, the following results were attained.

Products of the example: It was possible to get a retort product not found in the prior art in which its flesh was soft and bulged, no flowing-out of dissolved substance occurred, the flesh had a resiliency, a nice color and a superior taste. Although the micro-wave processed product showed a slight reduction in yield, its taste was substantially the same as that of the retort product.

Products of comparison example: Their yield was poor, protein or cell membranes, perimysium, collagen or the like in the flesh fibers were dissolved and flowed out of the flesh tissue due to high pressure and hot heat and the fish flesh was completely separated. In addition, the flesh was hard, its moisture preservation was remarkably deteriorated, had no taste, its color was faded and the flesh was shrinked. The micro-wave processed product was in particular deteriorated in its yield.

(Example 17)

As a fish flesh, fillet flesh of a sea eel having a larger barrel which was hardly utilized in general was opened at its back, its bones were removed and the flesh was cut into two pieces, and then the cut pieces were bleached with water, the moisture content in the flesh was completely removed, and it was set in a flesh taking machine (2 mm) to make a scrambled flesh. Mixing and kneading of the flesh were carried out by a low speed kneader for 5 minutes while high concentration solution of salt of 150 cc in 5.4 mol concentration having salt dissolved therein was being applied uniformly to the obtained scrambled flesh of 3000g with an atomizing machine so as to disperse and absorb the salt solution. Then, mixing and kneading of the flesh were carried out by a low speed kneader for 5 minutes while high concentration solution of alkali of 140 cc in 2.0 mol concentration having NaHCO_3 dissolved therein was being applied uniformly to the obtained scrambled flesh of 3000g with an atomizing machine so as to disperse and absorb the alkali solution. Subsequently, additive agent solution having sweet sake of 100 cc, Japanese sake of 50 cc, soda glutamate of 5g acting as seasoning agent, cane sugar of 40g, glucose of 20g, a mixture of 3g of vitamin C and vitamin E dissolved therein was uniformly atomized against the flesh, dispersion and absorption of the solution into the flesh while mixing and kneading were being carried out against the flesh for 5 minutes with a low speed kneader to make a flesh having rough minced taste. Then, the skin part was

frozen, frozen skin was crushed and non-processed flesh of walleye pollack of 20% was blended. Then, this mixed flesh of 3000g was set in a silent cutter, high concentration solution of salt in 5.4 mol concentration of 150 cc having salt dissolved was added, mixing and kneading were carried out for 5 minutes to perform dispersion and absorption of the solution. Then, high concentration solution of alkali in 2.0 mol concentration of 140 cc having NaHCO_3 was mixed in it, mixing and kneading were carried out for 5 minutes to perform dispersion and absorption. After this operation, additive agent solution having sweet sake of 100 cc, Japanese sake of 50 cc, soda glutamate of 5g acting as seasoning agent, cane sugar of 40g, glucose of 20g, a mixture of 3g of vitamin C and vitamin E dissolved therein was added, and mixing and kneading were carried out for 5 minutes, dispersion and absorption of the solution into the flesh were performed to make a seasoned paste flesh. Then, the seasoned paste flesh was fed out in a sheet form from a fish flesh pump nozzle to a vertical heating tunnel type continuous heating furnace, and pushed onto a steel belt coated with Teflon. Then, the tasted and rough minced flesh of sea eel was fed out of another fish flesh pump nozzle in a sheet form onto a tasted paste flesh heated in a full-opened state at its cut plane and piled up, the flesh was roasted into the full-opened state to manufacture a full-opened roasted sea eel processed and cooked food.

The full-opened roasted sea eel processed product of the present example was a full-opened roasted sea eel in

which its piled-up layer section has a roasting color similar to that of the full-opened roasting of sea eel, has more superior taste and texture than those of a normal full-opened roasted sea eel. In view of this fact, it was also made apparent that according to the present example, it was possible to make a processed, tasted and roasted sea eel flesh having a superior free-molding feature with utilization of a large-sized sea eel having no decay in shape, having a resiliency, and emulsification as well as gelation formation.

(Example 18)

Fillet flesh in which an eel was opened at its back, its bones were removed and the eel was cut into two pieces was bleached with water, then moisture content in the flesh was completely removed and this fillet flesh of 3000g was prepared. High concentration solution of salt in 4.3 mol concentration of 150 cc having salt dissolved was injected uniformly against the fillet flesh of 3000g, the salt solution was impregnated and absorbed in the flesh, thereafter the dispersion and absorption of the salt solution were performed while a low speed operation of a mixer i.e. mixing and kneading, were being carried out for 5 minutes. Then, high concentration solution of alkali in 1.6 mol concentration of 140 cc having NaHCO_3 was uniformly injected against the fish flesh to impregnate alkali solution, thereafter mixing and kneading were performed for 5 minutes with a mixer to perform dispersion and absorption and emulsifying and gelation capability were given. After

this operation, additive agent solution having sweet sake of 100 cc, Japanese sake of 50 cc, soda glutamate of 5g acting as seasoning agent, cane sugar of 40g, glucose of 20g, a mixture of 3g of vitamin C and vitamin E dissolved therein was uniformly atomized against the fish flesh, thereafter mixing and kneading were performed by a low speed operation of a mixer for 5 minutes and dispersion and absorption of the solution into the flesh were performed. Then, the flesh was heated by a tunnel type continuous heating furnace (a vertical heating type). After this operation, the full-opened flesh was packed in a package, a rapid freezing was performed to make a full-opened packed eel.

According to the present example, it was made apparent that even if the flesh was rapidly frozen and a long period of time elapsed after its thawing, it was possible to make a full-opened roasted eel which was soft, had a superior resiliency, an increased yield, a superior taste, a nice roasting color and showed a superior adaptability for distribution channel.

(Example 19)

Dress-like processed frozen raw material of a mackerel which is a kind of blue-backed fish of high caught volume of 3000g was prepared while its temperature was being monitored. Then, mixture of 5g of vitamin C and vitamin E dissolved in high concentration solution of salt in 5.5 mol concentration of 150 cc having high-class salt dissolved was dissolved in respect to the dressed flesh of 3000g, the

solution was injected against the flesh in a net-like form, thereafter the salt dissolution was promoted while the processing was performed for 5 minutes with ultrasonic wave processing. Then, high concentration solution of alkali in 1.2 mol concentration of 200 cc having NaHCO_3 dissolved therein was injected against the fish flesh in a net-like form, thereafter the flesh tissue was dissolved in salt while a processing was being applied for 10 minutes with a ultrasonic wave, gelation and emulsification were attained and an aging was promoted while the tissue was being changed into a fine net-like texture. Then, additive agent solution having sweet sake of 50 cc, GCR of 5g, a mixture of 5g of vitamin C and vitamin E, and Japanese sake of 50 cc mixed and dissolved therein was injected against the fish flesh in a net-like form, thereafter a mixing of additive seasoning agent and an aging were performed while a processing was being carried out for 5 minutes with an ultrasonic wave.

The produced product of the present example and the product of comparison where no processing of the present example were preserved in a refrigerator at 5°C and a preservation test was performed. The product of comparison produced bad odor and sticky flesh dew. In turn, the product of the present example did not produce any decay even after elapsing of 10 days, it kept a sufficient freshness even at 14 days, its quality could be maintained, a high lactic acid was acknowledged in the flesh, a value of pH was decreased, and a salty product having a stable

quality could be manufactured. This processing method was applied to marine products such as a horse mackerel, a mackerel pike or the like, even a certain difference was acknowledged in individual products, a similar effect could be attained.

(Example 20)

High concentration solution of salt of in 4.5 mol concentration of 150 cc having salt dissolved therein was atomized against the horse mackerel of 3000g in which internal organs and scales were removed and its back was opened, and the salt dissolution was promoted in the flesh while a vibration was being given for 5 minutes with an electric massage machine. Then, high concentration solution of alkali in 2.0 mol concentration of 140 cc having NaHCO_3 dissolved therein was atomized against the aforesaid fish flesh, the flesh tissue was dissolved in salt while a vibration was being applied for 5 minutes with an electric massage machine, emulsifying and gelation were given to improve it into a fine net-like texture and then an aging was promoted. Then, additive agent solution having sweet sake of 50 cc, GCR of 5g, a mixture of 5g of vitamin C and vitamin E, and Japanese sake of 50 cc mixed and dissolved therein was atomized against the fish flesh, a vibration was given to the flesh for 5 minutes with an electric massage machine, a uniform impregnation of the additive agent and an aging promoting operation were carried out in a short period of time, they were set at once in a cold air

drying machine, dried for 8 hours to get an opened mackerel.

Although the prior art product advanced its drying state during passing through a distribution channel and a selling route, produced an oil roasted state and its taste was gradually deteriorated and became hard, the product of the present example could make a processed opened mackerel in which the flesh tissue is dissolved in salt, improves by itself into a fine net-like texture through adding of emulsifying and gelation capability by absorbing all atomized high concentration solution of salt and high concentration solution of alkali in the fish flesh, the soft and resilient taste of cellular level in high moisture preservation is pulled out by performing the aging promoting operation in a short period of time, resulting in that deterioration in quality such as oil roasted state during its passing in a distribution channel was less, a high yield was attained, a flexible and high anti-oxidation characteristic is attained under a reaction at a cellular level of the mixture of vitamin C and vitamin E.

Although the opened mackerel dried under natural sun light was superior in view of both surface color and taste, this product generated a deterioration of oil roasted state after aging and it was made apparent that the product of the present example hardly produced an oil roasted state and had a longer preservation time than that of the prior art by two times or more.

(Example 21)

Both front and rear surfaces of the fish flesh such as dressed horse mackerel, mackerel pike and mackerel processed in the same manner as that of the mackerel of the example 19 were roasted with a far infrared ray for 7 to 15 minutes in such a way that a central part temperature of the fish flesh became 95°C. After this operation, the fish flesh was cooled down by a cold air cooling machine until a central temperature of the fish flesh became about 15°C. Then, the processed flesh was vacuum packaged while paying a sufficient attention to its sanitary control and an aging variation in 14 days was checked.

Although the prior art product had a decay in shape of flesh or hardened flesh and an increased fish smell, it was made apparent that the product of the present embodiment could be made such that its flesh did not show any decay, its flesh was soft, had a high moisture preservation, a high resiliency, its taste seasoning was performed down to a cellular level, and a cooked roasted fish having a quite delicious taste under a complex reaction with amino acid contained in the fish flesh together with seasoning agent. In addition, it was made apparent that the product of the present example could be distributed in a freezing system or in a chilled system.

(Example 22)

After high concentration solution of salt in 4.3 mol of 150 cc having salt dissolved was injected in a net-like form to a fish flesh of fillet white salmon having an opened berry of 3000g, a salt dissolution characteristic

was promoted while a vibration was being given to the flesh for 5 minutes with an electric massage machine. Then, after high concentration solution of alkali of 140 cc in 2.0 mol concentration having NaHCO_3 was injected against the fish flesh in a net-like form, flesh tissue was dissolved in salt while a vibration was being given to the flesh for 5 minutes with an electric massage machine, emulsifying and gelation capability were given to the flesh and aging promotion operation was performed so as to improve it into a fine net-like texture. Then, after additive agent solution having sweet sake of 50 cc, Japanese sake of 50 cc, GCR of 5g, a mixture of 5g of vitamin C and vitamin E dissolved therein was injected against the fish flesh in net-like form, dispersion and absorption of the additive agent solution as well as aging promotion were performed in a short period of time while a vibration was being given to the flesh for 5 minutes with an electric massage machine to make a tasted salted salmon.

The prior art salted salmon was manufactured by directly sprinkling salt and immersing the salmon in salt water for a long period of time. In the case that salt was sprinkled over the salmon, excessive taking of salt was resulted in deteriorating a human health. In addition, in accordance with the immersion method, the immersion required a long period of time, taste of low molecule in the fish flesh was discharged out due to an osmotic pressure and the flesh was deteriorated, and concurrently an amount of inclusion of salt was increased. In addition,

in case that the salmon with low salt was applied, it had a problem that a putrefaction phenomenon was produced within one week while it was being left in a home-use refrigerator (5°C).

To the contrary, salt of about 1 % in respect to the fish flesh was used in the product of the present example, although it was assumed that the myofibril was relaxed, salt dissolution degree was increased and emulsifying and gelation capability were added together with alkali agent, it showed a longer preservation and no putrefaction was produced even after 15 days elapsed. Although a detailed reason for this phenomenon is vague, it may be assumed that lactic acid in the fish flesh is dissolved and discharged to make a rapid reduction of a pH value and concurrently drip is not produced at all, resulting in that a progression of bacteria can be prevented, low molecular taste substance which may easily be decayed is dispersed sufficiently within the skeletal muscles under emulsification and gelation formation, and held in the myofibrils improved in fine net-like form.

(Example 23)

Chilled silver salmon was got, cut into three pieces and changed into a fillet state. Seven samples of A to G were made in 300g of the silver salmon.

I-liquid indicated in Table 3 was injected in a net-like form against each of the samples and its aging was promoted while a vibration was being given against the sample for 3 minutes with an electric massage machine.

Then, II-liquid was injected against the sample in a net-like form, salt dissolution, emulsifying and gelation capability were promoted while a vibration was being given to the sample for 6 minutes with an electric massage machine. After processing, the samples were stored in the refrigerator for 24 hours, the samples were frozen, vacuum packaged and then stored in a freezer. The comparison example G not processed was similarly frozen, vacuum packaged and stored in a freezer. A weight parts in () in Table 3 indicates a dry weight in respect to 100 weight parts of the frozen fish flesh.

Although the experimental examples A, D; B, E; C, F are the same to each other in a chemical product blending ratio, I-liquid and II-liquid are reversed and order of injection for them is made different.

After the fish was frozen and stored for 7 days, thawed, its half part was sliced into pieces, remaining half part was roasted to get a sample. Then, ten panelists performed organoleptic test for (1) color, (2) shape holding state after cut, (3) drip occurrence, (4) resiliency, (5) taste of the sliced piece. As for the roasted product, they performed organoleptic test for (6) outer appearance, and (7) taste. In the organoleptic test, 10-point (a full point of 70) process was applied for evaluation. The test results were indicated in Table 3.

As apparent from Table 3, it can be said that the samples A to F of the present example got 60 points or more in full point of 70 and so a substantial improvement was

made as compared with 36.7 point in the comparison example. Comparison between the samples A to C and the samples D to F showed that a slight better result was indicated if a first pouring of salt was performed, and this result was a slight one, so that no conclusion was made about which sample was good. Due to the fact that the samples B and E have a relative better result, even though salt and sodium bicarbonate are not added much, superior results can be attained.

As a result of observation of color, shape holding characteristic and occurrence of drip in the sliced fish flesh, the comparison product showed a yellowish red color and the products of the present example showed a transparent red color which is similar to a color of rainbow salmon. Although flesh of the comparison example was soft and relaxed and after being sliced into pieces, the cut flesh could not be set vertical on a tray, the product of the present example could be stood up one by one on a tray and the sliced flesh pieces were quite resilient. Further, as to the drip, it was scarcely produced in the product of the present embodiment, and it was produced in such a degree as one in which moisture sparkled at the cut plane. Even after being left at a room temperature and elapsed for 7 hours, no change was acknowledged in the aforesaid results of observation. To the contrary, occurrence of drip was acknowledged in the sample of comparison.

(Example 24)

A large-sized bonito was prepared, its head and internal organs were removed, this flesh was cut into three pieces with skin and a fillet of bonito of 900g was prepared. Solution in 4.0 mol concentration of 45 cc having salt dissolved therein was injected against this bonito of 900g in a net-like form and an aging of the salt dissolution was promoted while a vibration was being given for 5 minutes to the flesh with an electric massage machine.

Then, solution in 2.0 mol concentration of 42 cc having NaHCO_3 dissolved therein was injected against the flesh in a net-like form, a salt dissolution and aging promotion of gelation and emulsifying capability were performed while a vibration was being given to the flesh for 5 minutes with an electric massage machine.

In addition, solution having sweet sake of 15 cc, cooking sake of 15 cc, cane sugar of 12g, mixture of 1.5g of vitamin C and vitamin E mixed and dissolved therein was injected against the aforesaid processed fillet of bonito in a net-like form, and uniform impregnating and aging of the additive substance were promoted while a vibration was being given to the flesh for 5 minutes with an electric massage machine.

(1) Middle bones of the central bloody part of the semi-fillet of bonito got by the aforesaid processing were removed, skin was peeled off and the flesh was sliced into rectangular pieces. Back part was frozen, vacuum packaged and stored in a refrigerator. Berry part was applied for a

sliced piece as it was and taste test was performed. As a result, it was made apparent that a Toro of the bonito was soft and had a taste of melting-like touch in the mouth. The frozen rectangular piece stored in its frozen state was thawed after one month, no drip was generated and also although a taste test was carried out, the flesh could be eaten.

(2) Middle bones in the central bloody flesh in remained half fillet flesh of the aforesaid bonito were cut and removed, the flesh was pierced with a stick together with its skin, an entire surface was roasted for 30 seconds with a gas cooking device, then the flesh was cooled with ice and water at once to get a cut and crushed bonito. The back part was frozen, vacuum packaged and stored in a freezer. Although the berry part was cut and crushed and a taste test was performed for the berry part, it was made apparent that the flesh could be eaten deliciously without any taste seasoning as it was. In addition, the frozen cut and crushed flesh stored was thawed after one month, a taste test was performed and the flesh could be eaten deliciously in the same degree as that before freezing. In view of this fact, it was made apparent that the flesh could be set in a commercial distribution channel as frozen cut and crushed bonito.

(Example 25)

A fresh Mongoh cuttlefish was got, its legs and berry were separated from each other, its internal organs were removed and a body flesh was opened. Skins at both surfaces

of this Mongoh cuttlefish were pierced with needles of 1.00 in a spaced apart distance of about 10 mm, holes were opened, 300g of the flesh cut into one with a width size of about 20 mm was set in a vacuum mixer. Solution in 6.0 mol concentration of 11.6g having NaCl dissolved in water was mixed with solution in 1.0 mol concentration of 25.8g having NaHCO₃ dissolved in water, further solution having sweet sake of 5g and GCR of 1g was prepared. The vacuum mixer was rotated at a low speed rotation while its pressure was being reduced to 70 mmHg, prepared solution was atomized, added, dispersed and absorbed in the flesh, and after elapsing of one minute, the pressure was returned back to its normal pressure, the operation was terminated and the processing was completed.

The processed Mongoh cuttlefish was stored in a refrigerator for 3 days, taken out, the half of it was vacuum packaged and frozen. The remained half flesh was roasted and cooked as Tempura, ten panelists evaluated the flesh, and all these panelists evaluated that the flesh was soft and delicious. The frozen processed product was thawed after one month, roasted and cooked as Tempura, ten panelists evaluated the product, resulting in that they showed a substantial same evaluation as that of the fresh fish. The thawed product did not produce any drip and no splashing of oil did not be observed even in the case that the flesh was fried in Tempura.

It was also made apparent that a similar effect could be obtained even in the case that the flesh body was

opened, solution was atomized at both surfaces of the Mongoh cuttlefish having pierced holes opened therein.

(Example 26)

Frozen Black Tigers (shrimp) with heads being removed (with shells) were taken and they were thawed while their temperatures were being monitored. 600g of the Black Tigers with their heads removed were put in the vacuum mixer.

Solution in 6.0 mol concentration of 23.2g having NaCl dissolved in water was mixed with solution in 1.0 mol of 51.6g having NaHCO₃ dissolved in water, and further sweet sake of 10g and GCR of 2g were added to prepare solution. The vacuum mixer was rotated at a low speed while its pressure was being reduced to 70 mmHg, the prepared solution was atomized, added, dispersed and absorbed, after elapsing one minute, the pressure was recovered to the normal pressure, the operation was terminated and the processing was completed.

The processed Black Tigers were stored in a refrigerator for one day, taken out, the half of them was vacuum packaged and frozen. Some of the remained half flesh were boiled, and ten panelists evaluated the flesh. Some of the flesh were peeled off shells, opened and cooked as Tempura and ten panellists evaluated the flesh. All these panelists evaluated that the flesh was soft and delicious. The frozen processed product was thawed after one month, similarly boiled and cooked in Tempura and the ten panelists evaluated them and showed the same evaluation as that for the non-frozen flesh. In particular, it was made

apparent that specific smell of the boiled shrimp was diminished. It was also made apparent that a similar effect could be obtained in this process even in the case that the shrimps with shells being peeled off and boiled were processed.

[Industrial Applicability]

As described above, according to the present invention, the following effects can be attained.

(1) It is possible to realize the processed fish flesh composed of only high nutritious fish flesh having a high yield in which a small amount of high concentrated salt and alkali or the like is mainly added to marine products, they are processed in a quite short period of time (1 to 15 minutes), the skeletal muscles or layers of fat can be improved by a bio-chemical processing for the flesh tissue of the marine product, the number of type of or an amount of use of additive agents can be reduced, the flesh is soft and shows a superior binding characteristic without using various kinds of binding agents, a high heat binding characteristic is indicated without applying a forced pressing against the layer of fat or flesh, the flesh becomes a sheet of flesh, even if the flesh is cut with a fork or a knife, the flesh is not separated, but it shows a superior resiliency, its processing can be freely attained, a denaturation loss is prevented, a low molecular nutritious substance such as drip is effectively utilized.

(2) Solution containing a small amount of high concentrated salt and alkali, vitamins is added, cell

membranes, myofibrils, perimysium, collagen or lipid, fat, cell membranes or collagen in fat, or skeletal muscles or fat tissues are relaxed or the flesh tissues are dissolved in salt to improve it into fine net-like texture, so that taste can be pulled from a cellular level, the taste can be enjoyed more continuously the more the flesh is bitten after eating raw fish state or after cooking it, and various seasoning agents can be added and the taste not found in the prior art product can be given under a complex formation of taste. The most preferable product can be cooked conveniently by an electrical cooking device such as a micro-wave oven, it is possible to realize the fish flesh material in which a small amount of moisture is produced during heating, taste can be kept in the flesh and vividly be utilized.

(3) A flesh color fading caused by oxidation during refrigerating of fish flesh is prevented, flesh color is vividly generated, drip caused by the thawing is prevented from being flowed out, its denaturation during refrigeration and freezing or the like is prevented. In addition, fish smell of the marine product can be diminished, protein in the tissue, fat, wax substance in fat are improved in gelation or emulsification process, the flesh is stabilized, resistance against the teeth is improved, flesh tissue is improved, the flesh is processed into flexible fish flesh well adapted in biting at a mouth, decay in the shape of the flesh can be prevented during

heating or its utilization time and a degree of softness of the fish flesh can be freely adjusted.

In addition, it is possible to realize a method for manufacturing a processed fish flesh in which even if the frozen food, it can be manufactured as one having a more superior high quality than that of chilled food, a rapid freezing is carried out after processing, thawed at the time of selling, the food can be sold in its chilled state, even if the product is frozen again at a home, no problem occurs in its quality, its processed product is superior in preservation, resulting in that a new type of frozen food suitable for a characteristic in distribution system can be manufactured in high productivity and in mass production.

Table 1

HOKI

Sample	Raw fish	Burned product yield (average value) (%)			Non-coat fried food yield (average value) (%)		
		just after cooking	after 2 hours	after 20 hours	just after cooking	after 2 hours	after 20 hours
Example	300g 50g x 6 pcs	89.8	84.2	80.9	90.7	87.9	83.7
Compa- rison example	300g 50g x 6 pcs	82.6	71.1	67.3	76.9	69.2	66.3

Table 2

SPEAFISH TUNA

Sample	Raw fish	Retort and canned foods		Micro- wave processed foods	
		after heating	yield	after heating	yield
Example	300g 50g x 6 pcs	240.0g	80.0%	216.0g	72.0%
Compa- rison example	300g 50g x 6 pcs	199.5g	66.5%	157.5g	52.5%

Table 3

Class	I liquid	II liquid
A	11.6g of NaCl solution in 6.0 mol concentration (salt of 1.0 weight parts)	25.8g of NaHCO ₃ solution in 1.0 mol concentration (sodium bicarbonate 0.67 weight parts)
B	10.6g of NaCl solution in 4.0 mol concentration (salt of 0.67 weight parts)	25.3g of NaHCO ₃ solution in 0.75 mol concentration (sodium bicarbonate 0.5 weight parts)
C	9.6g of NaCl solution in 2.0 mol concentration (salt of 0.33 weight parts)	24.8g of NaHCO ₃ solution in 0.5 mol concentration (sodium bicarbonate 0.33 weight parts)
D	25.8g of NaHCO ₃ solution in 1.0 mol concentration	11.6g of NaCl solution in 6.0 mol concentration
E	25.3g of NaHCO ₃ solution in 0.75 mol concentration	10.6g of NaCl solution in 4.0 mol concentration
F	24.8g of NaHCO ₃ solution in 0.5 mol concentration	9.6g of NaCl solution in 2.0 mol concentration
G	Non additive	Non additive

Table 4

	A	B	C	D	E	F	G
(1)Color	9.6	9.9	9.6	9.7	10.0	9.7	7.2
(2)Shape holding state	9.5	10.0	9.3	9.2	9.4	9.2	4.5
(3)Occurrence of drip	9.8	9.8	9.5	9.8	9.5	9.3	4.3
(4)Resiliency	8.8	9.1	8.5	8.4	8.7	8.3	4.7
(5)Taste	9.0	9.5	9.3	9.3	9.4	9.4	5.8
(6)Outer appearance of burned foods	7.9	8.0	7.7	7.7	7.7	7.7	6.2
(7)Taste of burned foods	9.0	10.0	9.2	9.2	9.7	9.0	4.0
Total	63.6	66.3	63.1	63.3	64.4	62.6	36.7

C L A I M S

1. A processed fish flesh having a configuration in which 100 weight parts of a round or block-like fish flesh or fine cut pieces of fish flesh contains (1) salts of 0.2 to 4 weight parts with a dried weight in which either one kind of NaCl, KCl, CaCl₂ and MgCl₂ or mixture of these elements is dissolved in water or drip of raw material fish fleshs or other fish fleshs, or mixture liquid of the drip and water and added in a solution state in 1.5 to 7.0 mol concentration, and (2) alkaline agents of 0.1 to 2.7 weight parts in which either one of NaHCO₃, Na₂CO₃, KHCO₃, K₂CO₃, NH₄HCO₃, monosodium phosphate, disodium phosphate, trisodium phosphate, sodium pyrophosphate, sodium polyphosphate, potassium pyrophosphate, sodium hexametaphosphate, potassium metaphosphate and sodium metaphosphate or mixture of these elements is dissolved in water or drip of raw fish flesh or other fish fleshs or mixture liquid of the drip and water and added in solution of 0.3 to 3.0 mol concentration.

2. A processed fish flesh having according to Claim 1, wherein one kind of or more of alcohols of 0.5 to 12 weight parts, vitamin E of 0.001 to 0.2 weight parts, vitamin C of 0.006 to 0.3 weight parts, saccharide of 1 to 13 weight parts, albumen of 0.2 to 5 weight parts and antioxidant of 0.001 to 4 weight parts, preferably 0.01 to 3 weight parts are contained.



3. A processed fish flesh according to any one of Claims 1 to 2, the drip of raw material fish flesh is reduced into the round or block-like fish flesh or fine cut fish flesh.

4. A processed fish flesh having a configuration wherein the processed fish flesh of Claims 1 to 3 is mixed with at least one kind of:

bond reinforcing agents such as soybean protein powder, dextrin and casein soda and the like;

emulsifying agents such as alubmen, lecithin, sugar ester and the like;

functional agents such as DHA, EPA, chitosan, calcium, vitamins, collagen and the like;

adhesion reinforcing agents such as sodium alginate, calcium citrate, corn starch, potato starch powder, glucomannan and the like;

preservation agents such as sorbic acid, potassium sorbate and the like;

plant fibers such as soy bean protein fiber and the like,

animal fibers such as chitin and the like,

animal and plant fat such as coconut oil, corn oil, rape oil, lard and fish oil and the like,

seasoning such as glycine, L-glutamic acid, sodium L-glutamate, disodium inosinate, disodium guanylate, fish peptide, beef powder, beef extract, pork extract and the like; and



spices such as pepper, ginger, paprika, nutmeg, mace, thyme, allspice, onion, garlic, coriandar, cardamom, caraway, sage, laurel, marjoram, clove, cinnamon and the like.

5. A method of preparing processed fish flesh which comprises a salt dissolution step wherein 3 to 12 weight parts of high concentration solution of salt in 1.5 to 7.0 mol concentration (salt of 0.2 to 4 weight parts in its dry weight) is immersed in 100 weight parts of fish flesh of round or block-like fish flesh or fine cut fish flesh, and cell membranes, the myofibril, perimysium, collagen, lipid, fat, and cell membranes and collagen in fat and the like are dissolved in salt; and then an alkaline impregnation step for impregnating high concentration solution of alkali of 1 to 10 weight parts (alkaline agent of 0.1 to 2.7 weight parts in its dry weight) in 0.5 to 3.0 mol concentration.

6. A method of preparing processed fish flesh which comprises an alkaline impregnation step for impregnating high concentration solution of alkali of 1 to 10 weight parts (alkaline agent of 0.1 to 2.7 weight parts in its dry weight) in 0.5 to 3.0 mol concentration to 100 weight parts of round or block-like fish flesh or fine cut fish flesh; and then a salt dissolution step in which 3 to 12 weight parts of high concentration solution of salt in 1.5 to 7.0 mol concentration (salt of 0.2 to 4 weight parts in its dry



weight) is impregnated in the fish flesh, and cell membranes, the myofibril, the perimysium, collagen or lipid, fat, and cell membranes and collagen in fat are dissolved in salt.

7. A method of preparing processed fish flesh which comprises a salt and an alkaline impregnation step for impregnating salt and alkaline blended solution containing high concentration solution of alkali of 1 to 10 weight parts (alkaline agent of 0.1 to 2.7 weight parts in its dry weight) in 0.5 to 3.0 mol concentration and salt agent high concentration solution of 3 to 12 weight parts (salt of 0.2 to 4 weight parts in its dry weight) in 1.5 to 7.0 mol concentration to 100 weight parts of round or block-like fish flesh or fine cut fish flesh.

8. A method of preparing processed fish flesh according to any one of claims 5 to 7, having the additive agent solution impregnating step for impregnating in the fish flesh the additive agent solution having at least one of saccharide, vitamins, animal and plant proteins powder and antioxidant.

9. A method of preparing processed fish flesh which comprises a salt dissolution step in which 3 to 12 weight parts of high concentration solution in salt in 1.5 to 7.0 mol concentration (salt of 0.2 to 4 weight parts in its dry weight) is impregnated in the fish flesh, and cell



membranes, myofibril, perimysium, collagen, lipid, fat, cell membranes collagen in fat and the like are dissolved in salt in 1.5 to 7.0 mol concentration to 100 weight parts of round or block-like fish flesh or fine cut fish flesh; and an alkaline and additive agent impregnation step for impregnating blended solution containing high concentration solution of alkali of 1 to 10 weight parts (alkaline agent of 0.1 to 2.7 weight parts in its dry weight) in 0.5 to 3.0 mol concentration and additive agent solution which blends with and at least one of saccharide, vitamins, animal and plant proteins powder and antioxidant.

10. A method of preparing processed fish flesh which comprises an alkaline and additive agent impregnation step for impregnating additive agent solution mixed with high concentration solution of alkali of 1 to 10 weight parts (alkaline agent of 0.1 to 2.7 weight parts in its dry weight) in 0.5 to 3.0 mol concentration and at least one of saccharide, vitamins, animal and plant proteins powder and antioxidant in 100 weight parts of round or block-like fish flesh or fine cut fish flesh; then a salt dissolution step in which 3 to 12 weight parts of high concentration solution of salt in 1.5 to 7.0 mol concentration (salt of 0.2 to 4 weight parts in its dry weight) is impregnated in the fish flesh, and cell membranes, myofibril, perimysium, collagen, lipid, fat, cell membranes and collagen in fat and the like are dissolved in salt.



11. A method of preparing processed fish flesh according to any one of Claims 5 to 10, which comprises a dispersion and absorption step for impregnating and dispersing in the fish flesh high concentration solution of salt or high concentration solution of alkali, additive agent solution after the salt impregnation step or salt and alkaline impregnation step or after the alkaline impregnation step or additive agent impregnation step.

12. A method of preparing processed fish flesh according to any one of Claims 5 to 11, wherein the high concentration solution of salt is solution composed of one of NaCl, KCl, CaCl₂ and MgCl₂ or mixture of these elements and dissolved in water or drip of raw material fish flesh or other fish flesh or mixture liquid of drip and material.

13. A method of preparing processed fish flesh according to any one of Claims 5 to 11, wherein high concentration solution of alkali is solution composed of mixture of either one or two or more of NaHCO₃, Na₂CO₃, KHCO₃, K₂CO₃, NH₄HCO₃, monosodium phosphate, disodium phosphate, trisodium phosphate, sodium pyrophosphate, sodium polyphosphate, potassium pyrophosphate, sodium hexametaphosphate, potassium metaphosphate and sodium metaphosphate and dissolved in water or drip of raw fish flesh or other fish flesh or mixture liquid of the drip and water.



14. A method of preparing processed fish flesh according to any one of Claims 5 to 11, wherein the salt dissolution step or alkaline impregnation step, salt and alkali impregnating step and dispersion and absorption step are carried out under a fish flesh processing temperature of 20°C or less, preferably 10°C or less and/or under a pH value of 5 to 10, preferably 6.5 to 8.5.

15. A method of preparing processed fish flesh according to any one of Claims 5 to 11, wherein the salt dissolution step or alkaline impregnation step, salt and alkaline impregnating step are one of an injection process for directly feeding into the fish flesh through injection or an atomization process for performing a direct atomization against the surface of the fish flesh.

16. A method of preparing processed fish flesh according to any one of Claims 5 to 11, wherein the dispersion and absorbing step is any one of a massage process, a vibration process, a ultrasonic wave process and a kneading process.



A B S T R A C T

The present invention has, as its object, a processed fish flesh having a high yield and a high nutritious value, showing a powerful heat binding characteristic and a resiliency, having a versatile processing, preventing a denaturation loss, capable of eliminating almost of all flowing-out of drip such as a low molecular nutritious substance and utilizing these features effectively. The processed fish flesh of the present invention has a configuration including salt of 0.2 to 4 weight parts in its dry weight added in a form of solution in 1.5 to 7 mol concentration dissolved in water or drip, and alkali agent of 0.1 to 2.7 weight parts in its dry weight added in a form of solution in 0.3 to 3 mol concentration dissolved in water or drip.