



Agenda Item 3

CX/FFP 15/34/4 Add.1
Original language only

JOINT FAO/WHO FOOD STANDARDS PROGRAMME CODEX COMMITTEE ON FISH AND FISHERY PRODUCTS

Thirty-fourth Session
Ålesund, Norway
19 – 24 October 2015

DRAFT CODE OF PRACTICE FOR PROCESSING OF FISH SAUCE

Comments submitted at Step 6 by the India, United States of America and Vietnam

INDIA

Specific Comments:

Section 1.1 Fish

Potential Hazards:

The text may be modified as under:

Potential hazards: histamine, microbiological contamination biotoxins, chemical contamination (including pesticides, heavy metals and veterinary drug residues), physical contamination.

Rationale: The source of fish might be from aquaculture, though generally prepared from marine fish anchovies. In such cases these contaminants can be a problem.

Technical Guidance:

Bullet 3:

Sub bullet 2: Clean seawater should be used.

The text may be modified as under:

Clean seawater/potable water should be used

Rationale: Fish sauce is made from both marine and fresh water fish species.

1.2 Salt Requirements:

Potential Hazards:

The text may be amended as under:

Potential hazards: chemical, ~~and~~ physical and microbial contamination

Rationale: Salt from different sources as given in section 1.2 is likely to have different hazards.

Section 2: Mixing of Fish and Salt:

Bullet 4: India would like to amend the text as under:

Fish should attain ~~40 percent~~ 20% water phase salt, or water activity below 0.85, within 24 hours of mixing, as measured in the centres of the largest fish.

Rationale: A water activity value of 0.85 corresponds to water phase salt concentration of 20%. The exact relationship need to be determined for specific category of fish intended for fish sauce production. However, when NaCl is used as primary source of binding water, a higher water phase salt concentration of 20% would be required to obtain water activity value of 0.85

Section 8: Blending:

Potential Hazard: microbiological contamination

The text may be modified as under:

Potential Hazards: microbiological contamination, unauthorized food additives.

Potential defects: Ingredient measurement error, ~~unauthorized food additives.~~

Rationale: Since there could be intentional/unintentional use of unauthorized food additives it can be one of the potential hazards. Addition of unauthorized food additives may lead to undesirable characteristics in the final product and pose safety hazard for the consumer. Therefore, addition of indiscriminate use leads to potential hazard (GMP).

Section 9: Filtering:

Potential Hazards:

The text may be amended as under:

Potential Hazards: chemical contamination from a cleaning or disinfection agent and Physical contamination.

Rationale: Physical contaminants like plastic pieces, metal shreds coming from the filtering device can also become potential hazards at this step.

Section 17: Ingredients and additives:**Technical Guidance:**

India would like to add another bullet with the following text:

- Only chemicals approved/ recommended in line with standard for fish sauce STAN 302-2011 should be used.

Rationale: This will help preventing unauthorized usage of additives.

Section 19: Storage of packaging materials:

Potential Hazards:

The text may be modified as under:

Potential hazards: chemical, ~~and~~ physical and microbiological contamination

Rationale: Packaging materials can be contaminated with yeast & moulds, coliforms etc under unhygienic storage conditions.

Technical Guidance:

Bullet 1: Packaging material.....under hygienic conditions.

The text may be modified as under:

- Packaging material should be stored in a dry and clean place under hygienic condition on Pallets.

Rationale: Keeping packaging materials on the floor leads to contamination and infestation.

UNITED STATES OF AMERICA**(i) General Comments**

The revised draft Code of Practice now includes information on the *Clostridium botulinum*, which the draft appears to dismiss as a hazard for small pelagic fish, and provides little guidance on controlling the hazard. The revised draft also refers to Sections 3 and 4 of the *Code of Practice for Fish and Fishery Products* (CAC/RCP 52-2003) for harvest vessel guidance on chilling raw material. However, the draft indicates that salting, rather than chilling, is used on harvest vessels as a more practical control that initiates proper fermentation. Guidance on salting on the harvest vessel should be included in the draft COP because salting is an integral step in fish sauce production, controls key hazards, and is not covered in the *Code of Practice for Fish and Fishery Products*.

(ii) Specific Comments**Introduction (Scope)**

Comment: Revise as follows

This draft *Code of Practice for Processing of Fish Sauce* has been developed primarily to be used as a guideline to improve the processing practices for fish sauce to meet international requirements. The application of GMP, HACCP and DAP for this ~~traditional~~ product should be promoted to ensure consumer

health and safety as well as fish sauce quality. Fish sauce is a translucent, ~~and not turbid,~~ liquid product with salty taste and fish flavour obtained from the fermentation of a mixture of **marine or fresh water** fish and salt ~~at an appropriate ratio,~~ **and the optional addition of brine extracts and other ingredients.** In general, the size of fish used as raw material in fish sauce processing is small, not greater than 12 cm in length. ~~Traditional~~ Fish sauce fermentation relies on endogenous enzymes and indigenous bacteria of raw materials. ~~For non-traditional fermentation~~ ~~Other~~ ingredients or processing aids may be added to assist the fermentation process. Salt is an essential ingredient in fish sauce production in order to ~~control the types of microorganisms~~ **prevent growth of bacterial pathogens** and ~~prevent defective fermentation~~ **other undesirable microbial activity and to select for the types of microorganisms that produce an effective fermentation yielding a high quality, safe fish sauce product.** [The quality characteristics of colour, clarity, aroma (odour) and taste are used to determine the end of the fermentation process.]

This Code will address the general processing steps and technical guidance to be employed by fish sauce manufacturers, which could vary from country to country. Potential hazards and defects at each processing step starting from reception harvest of raw material and ending with final product distribution will also be identified. In addition, each processing step will include technical guidance for controlling the identified hazards and defects that help ensure consumer safety and product quality. Nevertheless, consistent with HACCP principles, each processor should conduct a hazard analysis of its own operations and product to ensure all hazards are identified and properly controlled.

Rationale:

- “Not turbid” has the same meaning as “translucent.”
- “Marine or fresh water fish” is moved here from the Hazard subsection because it belongs with the product description rather than with the hazards description.
- The “appropriate ratio” is secondary and discussed later in the document.
- Many fish sauce products contain substantial added water in the form of brine extracts, and also may contain sweeteners, and colors.
- The differentiation of two kinds of fish sauce (“traditional” and “non-traditional”) is not needed and was not included in the previous draft. In addition, other ingredients (such as berries) may be traditionally used to assist fermentation.
- The primary importance of salt is the prevention of undesirable microbial multiplication and to create a selective environment for desirable microbial activity.
- The last sentence is placed in brackets because determining the end of the fermentation process (a quality step) should be included in the guidelines, or removed from the introduction. Also, chemical measurements could be used (i.e., free amino acids.) (See comment for Step 3)
- The second paragraph is moved here from the Defects subsection because it is about the scope of the document and not about defects.
- The last sentence is added because the guidance does not substitute for conducting a hazard analysis and determining appropriate hazards and controls for specific processing practices.
- The starting point for identification of potential hazard is changed from “reception” to “harvest” because harvest vessel hazards are discussed in the Hazards section, and we recommend including a section on salting on the harvest vessel. Harvest activities are critical to ensure the safe manufacture of fish sauce.

Hazards

Comment: Revise as follows:

~~Fish sauce is the product obtained from the fermentation of a mixture of fish and salt. The raw material used in the fermentation to make fish sauce could be both freshwater and~~ **Some** marine fish, such as mackerel, sardines or anchovies. ~~Anchovies are one of the fish type most preferably used to make high quality fish sauce with the characteristic aroma and reddish brown colour. However, the use of those mentioned marine fish might pose a risk of histamine~~ **scombrotoxin formation.** ~~Some marine~~ **All** fish might **may** be contaminated by bacteria **with undesirable microorganisms**, especially **including pathogens such as Clostridium botulinum,** which depend on their type, size and harvest area. ~~Pelagic and small marine fish would have a slight chance of contamination. In fish sauce producing process~~ **production**, it is therefore necessary to have Code of Practices for **establish and implement** ~~controlling~~ **of** raw material quality on the harvest vessel in compliance with Sections 3 and 4 of ~~the~~ **Code of Practice for Fish and Fishery Products** in place.

Harvest vessel quality control of fish could be achieved either by controlling fish temperature or by delaying fish decomposition. Practically, salt is commonly used to maintain fish quality and freshness for delaying the decomposition after the harvest rather than temperature control. The reason is if the fish temperature is too low, the salt will be slowly absorbed and resulted in the extension of fermentation period.

Icing or refrigeration shortly after death of the fish is a common means of preventing undesirable microbial growth and activity on harvest vessels and prior to achieving adequate salt penetration and concentration in the fish at the processing facility. However, immediate salting of fish on board the harvest vessel (attaining Water Phase Salt \geq 20% within the appropriate time) may be used as an alternative to icing or refrigeration for the control of microbiological contamination and decomposition, and to start the fermentation process.

In fish sauce processing, a **large amount of salt are is used in fish sauce processing**; Fish sauce therefore has the salt content higher than 20% (Water Phase Salt $>$ 10% which could inhibit and delay the growth of bacteria **concentrations of 20% or higher should be achieved and maintained throughout the fermentation to prevent growth and activity of undesirable microorganisms, including pathogens.**

Rationale:

- The first sentence repeats the introduction, and is a description of the product rather than a description of a hazard.
- 'Marine' or 'freshwater' fish is moved up to the product description in the introduction.
- Mackerel, sardines and anchovies definitely pose a risk of histamine if the hazard is not controlled.
- The discussion of the preference for anchovies for quality (odor and color) appears to promote fish sauce made from anchovies; however, any fish species can be used to make quality fish sauce. In addition, this sentence is not related to hazards.
- Freshwater fish are also contaminated with *C. botulinum*, and it should be presumed that all fish may be contaminated. *C. botulinum* has been isolated from herring which are pelagic fish. There is little evidence to suggest that certain species or areas can be declared free of *C. botulinum* spores.
- It is important to have "temperature controls" in place, not just "codes of practice".
- The second paragraph indicates that salt, more often than temperature, is used to control *C. botulinum* toxin and scombrototoxin formation on harvest vessels; and that salt is used to promote proper fermentation. If a salting step in fish sauce production occurs on the harvest vessel, then guidance on this step is needed, just like guidance on shucking and storage of scallops on board the harvest vessel is included in the scallop code of practice. Sections 3 and 4 of *Code of Practice for Fish and Fishery Products* do not include guidance on salting on the harvest vessel. The guidance included in the draft on this important step is not adequate, and is elaborated in proposed Section 19(bis).
- If the salt content is 20% by weight, then the water phase salt is over 20%. In pure water the percentage salt by weight equals the water phase salt, and any reduction in moisture due to fish content increases the water phase salt further. The important point is that WPS \geq 20% is needed to inhibit pathogens, including *Staphylococcus aureus*.
- Other changes editorial.

Defects

Comment: Edit as follows:

The oOdour and taste of fish sauce depends on the free amino acids generated from the fermentation process, and the optional addition of extracts that contain water with fewer amino acids. The level of free amino acids **generated from the fermentation process** varies according to type of fish used in the fermentation, ratio of fish to salt, **temperatures during the fermentation,** and **the appropriate fermentation time.** Hence, the controls of these factors, **and proper blending of brine extracts and other ingredients,** are necessary in order to obtain fish sauce products with desirable odour and taste.

~~This Code will address the general processing steps and technical guidance to be employed by fish sauce manufacturers which could vary from country to country. Potential hazards and defects at each processing step starting from reception of raw material and ending with final product distribution will also be identified. In addition, each processing step will include technical guidance for controlling the identified hazards and defects that help ensure consumer safety and product quality.~~

Rationale:

- Editorial

- Many fish sauce brands are a blend of the fermentation liquid (pure liquefied fish and salt) with secondary brine extracts of the fish remnant. The brine is used to extract remaining available amino acids and other flavors from the fish. If brine extracts are used, substantial water is added (e.g., 40% or more). Mixing in extracts fundamentally changes the free amino acid content and flavor/odor as directly as the fermentation factors.
- The last paragraph is about scope and not about defects and belongs at the beginning where the scope is discussed. The scope should be before the Hazards and Defects sections.

Flowchart, Step 4

Comment: Edit as follows:

4. First ~~s~~Separation (**fermentation**)

Rationale:

- The term “first” is inappropriate because there may be only one separation if producing high grade fish sauce without added extractions.
- The term “fermentation” is added to differentiate this separation from the optional separation of water extracts from fish residue.

Flowchart, Step 6, 7, and 17.

Comment: Mark these steps as optional, and Edit box 7 as follows:

7. Separation (**extraction**)*

Rationale:

- To differentiate from the fermentation separation in Step 4.
- Fermentation separations occur only once. Extraction separations should be clearly differentiated from fermentation extractions because they are not a fermentation process.
- The Extraction and Separation (extraction) steps should be marked as optional because some fish sauce brands do not include added water. Similarly, other ingredients and additives may not be used.

Flowchart, Step 7 footnote

Comment: Edit footnotes as follows:

~~*could be separated more than 2 times~~ **Brine extractions of fish residue may be done one or more times**

---- Dashed lines indicate an optional step

Rationale:

- “Extraction” more accurately explains the process because they are multiple extractions, not multiple separations of the same extraction.
- Since water extractions are optional, the box and lines should be dashed, and the footnote should indicate how optional steps are depicted.

Flowchart

Comment: Include another option for a heating step arrow between steps 1 and 2.

Rationale: If harvest vessel control records are inadequate, then heating may be used to deactivate potential preformed *Clostridium botulinum* toxin. Heating may occur directly after Reception, where the hazard is introduced. Fermentation aids may be used after heating to assure that appropriate microbial fauna are present for the fermentation process.

Flowchart

Comment: Add optional step for salting on the harvest vessel with an arrow to “1. Reception of raw materials” as follows:

19 (bis): Salting on harvest vessel

Rationale:

- Salting occurs on the harvest vessel to control pathogens, decomposition, and to begin proper fermentation.

- See comment for Hazards
- See comment for Step 19 (bis).

1. Reception of raw materials

1.1 Fish

Potential hazards

Comment: Edit as follows:

Potential hazards: **scombrotoxin (histamine)**, microbiological contamination (**including production of *Clostridium botulinum* toxin**), biotoxins, chemical contamination (including pesticides), physical contamination, heavy metals

Rationale:

- Following the usage in the FAO/WHO Histamine Expert Report, scombrotoxin fish poisoning is the hazard, and histamine is the most appropriate target biogenic amine for monitoring the risk. Also, the “scombrotoxin” term is appropriately used throughout the *COP for Fish and Fishery Products* to describe the hazard.
- It may not be recognized that botulinum toxin is a potential hazard in the raw material, and therefore it should be specifically listed.

1.1 Fish

Technical Guidance

Comment: Revise 1st bullet as follows:

- For fish or parts of fish, ~~Raw materials~~ **receiving specifications** ~~could~~ **controls should** include the following characteristics **where applicable to the identified hazards and defects**:

~~For the control of microbiological contamination~~ **pathogens, scombrotoxin fish poisoning, and decomposition** ~~histamine~~:

- As appropriate, harvest vessel, transportation and storage records documenting that the fish were rapidly chilled **to ≤ 3.3 °C shortly after death (e.g., removal from the fishing net)** and maintained at **3.3 °C** or below;

- As appropriate, harvest vessel and transportation records documenting that the fish were adequately salted to achieve the target water activity, **or water phase salt**, within the target time;

- Histamine analysis

- ~~Organoleptic characteristics, such as (e.g., appearance, odour, texture)~~ **and chemical criteria (e.g., total volatile basic nitrogen (TVB-N))**;

- ~~Chemical~~ **contaminant criteria, such as** indicators of decomposition and/or contamination, for example, total volatile basic nitrogen (TVBN), histamine, heavy metals, pesticide residues, **and** nitrates;

- ~~microbiological~~ **Natural biotoxin** criteria (to prevent the processing of raw material containing ~~microbiological toxins~~ **e.g., domoic acid, ciguatera toxin**) for fish with risk;

- ~~Veterinary drug residues~~ **criteria** (when the raw fish material is from aquaculture)

- ~~Foreign matter~~.

Rationale:

- To use HACCP terminology consistent with the *Code of Practice for Fish and Fishery Products*.
- The “specification” format for technical guidance appears uncertain and this ambiguity may increase public risk because processors may consider these items of secondary importance. Specifications are documents, not technical guidance. The recommended controls should be clearly included.
- The technical guidance for the hazards listed is contained in a single sentence of specifications that “could” be included. This is changed to “should include” as in the previous draft, and split into separate sentences.
- The controls for scombrotoxin fish poisoning and microbiological contamination (*Clostridium botulinum*) are more clearly delineated.

- If cooling is used to control *C. botulinum* growth and toxin formation in uneviscerated fish, the proper temperature limit is 3.3 °C
- “Chemical contaminants” are different from “decomposition” and should be listed separately.
- The term “natural toxin” or “biotoxin” (rather than “microbiological”) more accurately describes the hazard this bullet was intended to cover. Examples of natural toxins found in fish should be included.
- All the guidelines in this step are intended to prevent the processing of unacceptable material.

1.1 Fish

Technical Guidance

Comment: Revise 3rd bullet as follows:

- **To control the *Clostridium botulinum* hazard, in addition to the chilling or salting controls above, uneviscerated fish greater than 12 cm in length that required have not been gutted on the harvest vessel, should be gutted**ing on arrival at the processing facility.
 - **Fish** should be gutted efficiently, without undue delay and with care to avoid contamination.
 - Gutting is considered complete when the intestinal tract and internal organs have been removed.
 - Clean seawater **or potable water** should be used.
 - **For any size raw material, if harvest vessel and transport controls for *Clostridium botulinum* toxin formation are not adequately applied and documented, then the raw material or final product should be heated to deactivate potential *C. botulinum* toxin.**

Rationale:

- The guidance should indicate when and why evisceration is required.
- The revision provides appropriate guidance for control of *C. botulinum*.
- Clean seawater is often not available when gutting in a shore-based facility.
- To explain that harvest vessel controls are the primary control for pre-formed toxin, not evisceration.

1.1 Fish

Technical Guidance

Comment: Revise 4th bullet as follows:

- Fish should be rejected if **there is evidence that they may** ~~it is known to~~ contain harmful, decomposed or extraneous substances unable to be reduced or eliminated to an acceptable level by normal procedures of sorting or preparation.

Rationale: Under HACCP principles, fish may be rejected if control documentation or other evidence indicates that fish were handled under unsanitary or unsafe conditions that may cause contamination, it is not necessary to ‘know’ they are contaminated.

1.1 Fish

Technical Guidance

Comment: Revise 5th bullet as follows:

- Information about the harvesting area **and the identity of the harvest vessel** should be recorded, **and receiving records retained for trace-back purposes.**

Rationale:

- The harvest vessel identity is important for corrections.
- It should be indicated why this information should be recorded.
- The harvest vessel records should be retained for investigation of any problems.

1.1 Fish

Technical Guidance

Comment: Add two new bullets as follows:

- **Histamine verification sampling should be periodically performed using a sample size large enough and an acceptance level low enough (e.g., < 15 mg histamine/ kg) to provide some assurance (other than documentary records) that harvest vessel cooling and/or salting controls are effective.**
- **If not received salted, the iced or refrigerated product received should remain chilled (≤ 3.3 °C) until appropriate processing is performed to ensure $\geq 20\%$ WPS is achieved in the starting material.**

Rationale:

- Guidance is needed on monitoring histamine as a hazard.
- This step helps validate adequacy of histamine controls implemented during harvest and transportation.
- Guidance is needed on cooling at reception.

1.2 Salt requirements

Comment: Revise section as follows:

1.2 Salt requirements

Potential hazards: chemical and physical contamination

Potential defects: incorrect composition

Technical guidance:

- Salt used should be food grade as indicated in the *Standard for Food Grade Salt* (CODEX STAN 150-1985).
- The composition of salt differs according to the origin. **[Mine salt and solar salt of marine origin contain several other salts such as calcium sulphate, magnesium sulphate and chloride as impurities.] [Solar salt may be stored at least 2 months before using to obtain a good taste of fish sauce.]**
- Salt used should be inspected to ensure that it is clean, not **previously** used ~~before~~, free from foreign matter and foreign crystals, and shows no visible sign of contamination with dirt, oil, bilge or other extraneous materials.
- The size of the salt granules used should be carefully considered. Medium size salt crystals should **be** used. ~~Use clean salt without contaminants.~~ If **the crystal** ~~small~~ size salt is used **is too small**, the outer skin of fish will rapidly lose moisture and salt burn can occur which will prevent salt penetration into the fish. Consequently, ~~inner~~ **the inside** of fish can **become** spoiled **decomposed**. ~~In case of~~ **If the crystal size is** too large salt crystal, it **salt** can slowly penetrate **too slowly**, ~~thus~~ **and** fish might **become** spoiled **decomposed** before **the** preservation effect of salt occurs.

Rationale:

- COP guidelines are generally not named “requirements”.
- 2nd Bullet – Lines placed in brackets:
 - It should be clarified if the “impurities” discussed are unacceptable or acceptable.
 - It should be clarified why the salt should be stored, and include any special conditions of storage (e.g., bags, air, moisture). What if the salt is stored at the vendor’s warehouse before purchase?
- Other changes editorial. The sentence on contamination is repetitive.

2. Mixing fish with salt

Technical Guidance

Comment: Revise 4th bullet as follows:

Fish should attain ~~40 percent~~ **20%** water phase salt, or **≤ 0.85** water activity ~~below 0.85, within 24 hours of mixing, as measured~~ in the centres of the largest fish **within the appropriate time period for the target pathogen and ambient temperature**. In order to control growth of *C. botulinum* and *S. aureus* the cumulative time to attain 20% WPS in raw material should be about 12 hours when ambient temperature is less than 70 °C, and less time if the temperature is over 70 °C.

Rationale: The figures in this bullet are derived from example targets included in a previous U.S. comment. It has come to our attention that these examples were inaccurate. In product with 20% salt by weight, water

phase salt will exceed 20%, which is also the target WPS to control *S. aureus*. In order to control growth of *C. botulinum* and *S. aureus* the cumulative time to attain 20% WPS in raw material should be about 12 hours when ambient temperature is less than 70 °C, and less time if the temperature is over 70 °C.

2. Mixing fish with salt

Technical Guidance

Comment: Add new bullet as follows:

- **Refer to Section 11 for further information about salting fish**

Rationale: To inform readers about the Salted Fish Section that contains other applicable information about salting.

3. Fermenting

Comment: Revise section as follows:

3. Fermenting

Potential hazards: **scombrotoxin (histamine), microbiological, physical and chemical contamination (including heavy metals)**

Potential defects: **undesirable odour and taste, incomplete fermentation**

Technical Guidance:

- Care should be taken to ensure the cleanliness of the fermentation area and tanks.
- **Fermentation tanks should be constructed to be easily cleaned and sanitized between uses.**
- Fermenting tanks should be made from non-hazardous material and be able to prevent product contamination, **such as by being resistant to rust and corrosion due to salt that may cause heavy metal contamination.**
- Fermentation period, **at ambient, or controlled, temperature,** should typically ranges from 6-18 months to achieve good quality of fish sauce from natural fermentation in a tropical zone. When fermentation aids are used, the period ~~can be varied~~ **may be shorter.**
- **Percent Water Phase Salt, and/or Water Activity, should be monitored during fermentation to control pathogen growth and toxin formation (e.g., *Clostridium botulinum* and *Staphylococcus aureus*), and scombrotoxin formation.**
- **Colour, clarity, aroma (odour) and taste criteria, along with chemical criteria may be monitored to determine the end of the fermentation process.**

Rationale:

- If WPS or water activity is not controlled, *C. botulinum* and *S. aureus* toxin formation can occur, and histamine can be produced. This could occur if the process is not carefully monitored and fresh water leakage lowers the salt content.
- It is known that galvanized steel lids used in fish sauce production may corrode in a high salt environment introducing heavy metals into the product, and that cement tanks may not be properly constructed for easy cleaning and sanitizing.
- Fermentations do not need to be conducted at ambient temperatures as implied by listing “in a tropical zone”. Controlled temperatures are preferred for uniform quality and product safety.
- “Should range from 6-18 months” is restrictive. Is this to say that a processor that goes beyond 18 months is not producing acceptable quality or safe fish sauce?
- Fermentations using processing aids such as enzymes and/or bacterial cultures may reduce time, but are not likely to increase time.
- Monitoring the end of the fermentation process is mentioned in the Introduction; therefore, should be discussed in the detailed guidance (see comment for Introduction.)

4. First separation

Comment: Edit section as follows:

4. First ~~s~~**Separation (after fermentation)**

Potential hazards: unlikely

Potential defects: incorrect separation (e.g. objectionable matter, turbidity)

Technical Guidance:

- All utensils should be clean **and sanitized**
- Liquid and solid (fish residue) should be completely separated.
- ~~First~~ **The** extract (liquid) should be translucent, **not turbid**. ~~Solution~~

Rationale:

- See comment for Flow Chart Step 4.
- The terminology confuses liquid from the fermentation with brine “extracts” that do not involve fermentation.
- The term “extract” should be reserved for water extracts.
- The term “not turbid” is used in the Introduction, and is appropriate here, where turbidity is listed as a defect.

5. Brine preparation

Comment: Edit section as follows

5. Brine preparation (**optional step**)

Potential hazards: unlikely

Potential defects: undesirable odour and taste

Technical Guidance:

- Brine **used for brine extractions of**, preferably saturated, added to fish residues should be prepared from potable water and food grade salt for succeeding extraction, **and should be saturated**.

Rationale:

- Optional because fish sauce may be made without added water.
- Editorial changes.
- The term “succeeding” should not be used because this is not fermentation (see comment for Step 6.)

6. Succeeding extraction

Comment: Revise section as follows (and change step name in flow chart):

6. ~~Succeeding~~ **Brine** extraction (**optional step**)

Potential hazards: unlikely **scombrotoxin (histamine), microbiological contamination, chemical contamination**

Potential defects: undesirable odour and taste

Technical Guidance:

- ~~Succeeding~~ **Following fermentation**, brine extractions of the fish residues could be carried on as long as desirable extracts are obtained **according to a standard operating procedure**.
- **Percent Water Phase Salt, and/or Water Activity, should be monitored during extractions in order to control pathogen growth and toxin formation (e.g., *Clostridium botulinum* and *Staphylococcus aureus*), and scombrotoxin formation.**

Rationale:

- This step is optional. See comments for Flow Chart and Step 5.
- An established procedure should be used for multiple extractions.
- The term “brine extraction” is more descriptive and accurate. The previous process was fermentation. Therefore, the application of water and salt to the fermentation residue should not be called a “succeeding extraction” because the extraction is a completely different process from fermentation.

- Microbiological contamination and scombrotoxin production are hazards that could occur if the salt content is not properly controlled.
- Chemical contamination is possible, as in the Fermenting Step.

7. Separation

Comment: Edit section as follows:

7. Separation **(after brine extraction) (optional step)**

Refer to Step 4: First Separation **(after fermentation)**

Rationale:

- For clarity, to distinguish from Step 4.
- Adding brine extracts to fish sauce is optional.

8. Blending

Comment: Revise section as follows (and change step name in flow chart):

8. ~~Blending~~ **Mixing of Ingredients**

*Potential hazards: microbiological contamination, **scombrotoxin (histamine), Clostridium botulinum toxin, unsafe unauthorized additives, unlabeled allergens***

Potential defects: Ingredient measurement errors, unauthorized food additives

Technical Guidance:

- Total Nitrogen (TN) of fermentation **and** extract batches should be analyzed before blending **mixing**. Total nitrogen and amino acid nitrogen content in the final product must be in compliance with the *Standard for Fish Sauce* (CODEX STAN 302-2011).
- To achieve good quality fish sauce, ingredients should meet the required characteristics and appropriated concentrations.
- All utensils should be clean **and sanitized**.
- Food additives and levels used need to be in compliance with the *Standard for Fish Sauce* (CODEX STAN 302-2011). Food additives used need to be identified with names and identification numbers which comply to Class Names and the International Numbering System for Food Additives (CAC/GL 36-1989).
- Before mixing, chemical properties, **and** essential quality factors should be monitored, and the results should be recorded.
- **Water phase salt or water activity should be determined after mixing to assure that $\geq 20\%$ Water Phase Salt or 0.85 Water Activity is maintained after addition of other ingredients.**
- **Histamine levels in different batches should be analyzed before mixing. The histamine level in each batch should be in compliance with CODEX STAN 302-211 Standard for Fish Sauce. If high histamine levels are found in a batch, appropriate corrective action for the batch should be taken and the cause should be determined and corrected. Fermentation and extract batches should not be blended in order to dilute elevated histamine in batches of sauce that were not properly controlled to prevent histamine formation.**
- **If preventive controls for Clostridium botulinum toxin formation are not implemented at an earlier step, then the final product (or raw material) should be boiled to destroy any Clostridium botulinum toxin.**
- **Any allergenic ingredients should be properly labelled.**

Rationale:

- Mixing of brine extracts into fermented fish to adjust the flavor and extend the product while meeting the amino acid specification is not a necessary step, and should be marked “optional.”
- “Mixing of ingredients” more accurately describes this step because other ingredients and additives, in addition to extracts, may be added during this step.
- “Fermentation” batches are different from “extract” batches (see earlier comments.)

- If the water phase salt is not controlled, pathogens can grow and toxins develop in finished sauce.
- Guidance should be incorporated on appropriate histamine controls, one of the main hazards in fish sauce. High histamine batches should be discarded and not diluted with low histamine batches in order to meet the maximum allowed histamine (400 ppm) in the final product.
- Boiling may be used to destroy botulinum toxin if previous control is not adequate.

10. Storage

Comment: Edit section as follows:

10. Storage

Potential hazards: **microbiological contamination, scombrotoxin (histamine), physical and chemical contamination, heavy metals**

Potential defects: ~~unlikely~~ **foreign matter**

Technical Guidance:

- The storage tanks with lid should be clean, resistant to rust and salt, **free of heavy metal contaminants (lead, mercury, etc.); and** located in an appropriated area.
- The product should be ~~stored properly and~~ kept from any source of contamination.
- **The salinity of the product should be maintained to control microbial growth and toxin formation (e.g., botulinum toxin, scombrotoxin.)**
- The batches, or lots, in storage should be identified for trace back purposes.

Rationale:

- Heavy metal contamination is a hazard from metal fermentation containers.
- Without maintaining salinity, pathogens may grow.

11. Filling in containers

Comment: Edit section title as follows:

11. Filling in containers

Rationale: Editorial

12. Capping

Comment: Revise section as follows

12. Capping

Potential hazards: unlikely

Potential defects: loose plastic matter, broken caps, foreign matter, **leaking containers**

Technical Guidance:

- Caps should be checked before capping.
- [After capping foreign matter should be checked.]
- **After capping containers should be checked for proper seal and leakage**

Rationale:

- Should check that caps are functioning correctly.
- The bracketed sentence is not clear. What does it mean?

13. Labeling/packaging

Comment: Revise section as follows:

13. Labelling/packaging

Potential hazards: ~~unlikely~~ **Incorrect allergen labelling**

Potential defects: incorrect labelling

Technical Guidance:

- Refer to Section 8.2.3
- **A 'best before date' should be included on the label because oxidation reactions can occur even in an unopened container. Instructions on how to store fish sauce after opening should be included on the label in order to maintain product quality. For example, the color can turn darker brown to black, sensory characteristics can change, and sediments and salt crystals may form at the bottom of container. It is recommended to conduct research on shelf-life under various storage conditions.**
- **If the ingredients include one or more allergens, the labels should be checked to assure that the proper label is used with the allergenic ingredient(s) displayed.**

Rationale:

- To include guidance about fish sauce sensitivity to storage time.
- Incorrect allergen labelling is a potential hazard.

15. Application of fermentation aids

Potential defects

Comment: Add "**improper fermentation, undesirable flavor/odor**" as defects.

Rationale: If the fermentation aid is not active, fermentation may not proceed normally, and could affect the flavor and odor of the final product.

16. Heating

Comment: Revise section as follows:

16. Heating

Potential hazards: microbiological contamination

Potential defects: over heating

Technical Guidance:

- Adequate temperature and time combination should be applied.
- **Heating may be applied to control bacterial growth and increase shelf life.**
- **If it is determined at the Reception Step that the raw material or final product should be heated to deactivate potential *Clostridium botulinum* toxin, then the product should be boiled for a minimum of 10 minutes.**

Rationale: To provide needed information about heating. See comments for reception step

17. Ingredients and additives

Comment: Indicate 'optional' in flow chart and edit section as follows:

17. Ingredients [and additives] **(reception and storage) (optional step)**

Potential hazards: chemical, physical and microbiological contamination

*Potential defects: depends on ingredient, **loss of quality characteristics***

Technical guidance:

- **Refer to Sections 8.5.1 and 8.5.2**
- ~~Ingredients and additives should be stored appropriately in terms of temperature and humidity.~~
- Ingredients and additives should be stored in a dry and clean place under hygienic conditions.
- ~~Ingredients and additives should be properly protected and segregated to prevent cross-contamination.~~
- ~~Defective ingredients and additives should not be used.~~

Rationale:

- To clarify that this section refers to the reception and storage of ingredients, rather than their application.
- Some fish sauce manufacturers may not add additional ingredients and additives; therefore this step should be optional.

- Section 8.5.1 contains information on ingredient reception.
- Section 8.5.2 contains information on ingredient storage, including the three guidance bullets crossed out above. It also lists “loss of quality characteristics” as a potential defect.
- “Additives” is placed in brackets because additives are ingredients.

18. Packaging materials, and 19. Storage of packaging materials

Comment: Combine these two sections and revise as follows (also revise flow chart):

18. Packaging materials (**reception and storage**)

Potential hazards: chemical and physical contamination

*Potential defects: unlikely **misdescription, loss of packaging integrity***

Technical guidance:

• **Refer to Sections 8.5.1 and 8.5.2**

- Labels should be verified to ensure that all information declared meets, where applicable, the *General Standard for the Labelling of Prepackaged Foods* (CODEX STAN 1-1985) and labelling provisions of the *Standard for Fish Sauce* (CODEX STAN 302-2011) ~~and/or other relevant national legislative requirements.~~
- Packaging materials should be examined to ensure that they are intact and not contaminated.

~~19. Storage of packaging materials~~

~~*Potential hazards: chemical and physical contamination*~~

~~*Potential defects: unlikely*~~

~~*Technical guidance:*~~

- Packaging materials should be stored in a dry and clean place under hygienic conditions.
- ~~• Packaging materials should be properly protected and segregated to prevent cross-contamination.~~
- ~~• Defective ingredients and packaging materials should not be used.~~

Rationale:

- Reference to CODEX STAN 1-1985 and CODEX STAN 302-2011 is sufficient.
- These steps should be combined for simplicity, as they are for the Ingredients (reception and storage) step.
- Sections 8.5.1 and 8.5.2 already cover packaging material reception and storage, and should be cited.
- The last two bullets are crossed out because they are included in Section 8.5.2.

Step 19 (bis)

Comment: Include new step as follows:

19 (bis). Salting on harvest Vessel (optional)

Potential hazards: Scombrotxin (histamine), Microbiological, chemical and physical contamination

Potential defects: Decomposition

Technical guidance:

- **Refer to Step 2**
- **If fish less than 12 cm are intended to be salted rather than chilled on the harvest vessel in order to control pathogen growth, they should be layered with salt shortly after death (e.g., removal from fishing net.)**
- **The vessel salting process should be validated to attain $\geq 20\%$ Water Phase Salt or ≤ 0.85 Water Activity in the centers of the largest fish within the appropriate time period for the target pathogen and ambient temperature.**
- **Adequate salt should be on board the vessel for the size of the fish catch**

- **Records should be kept of the critical times, weights/volumes, temperatures and/or other criteria used for the validated salting procedure.**
- **The containers and lids for holding fish and salt should be in good condition, cleaned and sanitized, and appropriate for the purpose of holding fish, salt, and resultant liquid in a sanitary manner.**

Rationale:

- See general comments.
- The Introduction to the proposed draft indicates that the salt fermentation process fundamental to fish sauce production begins on the harvest vessel. This step should be included in the fish sauce code of practice, since it is not covered elsewhere. This is analogous to including scallop shucking on the harvest vessel for the draft Scallop COP.

VIETNAM

The second paragraph of first page

Hazards

The raw material used in the fermentation to make fish sauce could be both freshwater and marine fish such as ~~mackerel, sardines or anchovies~~ **small pelagic fish**.

1.Reception of raw materials

Fish

Technical guidance

First bullet :

- chemical indicators of decomposition and/or contamination, for example, total volatile basic-nitrogen (TVBN), histamine, heavy metals, ~~pesticide residues, nitrates~~;
- veterinary drug residues , **pesticide residues** (when the raw fish material is from aquaculture);

1. Mixing of fish and salt

Technical guidance

Last bullet: Salt burn should be avoided by using right ~~type~~ **size** of salt.

4. First separation

Technical guidance:

First bullet : All utensils should be clean **and of non hazardous material**.

5. Brine preparation

Potential defects : undesirable ~~odour~~ and taste.

6. Succeeding extraction

Technical guidance

Succeeding brine extraction **times** of the fish residues could be carried on as long as desirable extracts are obtained **and fulfilling the final characteristics of the product (CODEX STAN 302-2011)**.

8. Blending

Potential hazards : microbiological contamination, **incorrect pH**".

11. Filling in containers

Technical guidance

Suggestion: add a new bullet point : "**Filling machines should be regularly checked to prevent failure in the filling of container**".

13. Labelling/packaging

Technical guidance

Suggesion: To add the reference (**CAC/RCP 52-2013**) after the first bullet.

14. Transportation/distribution

Suggestion: To add “**and storage**” to the step 14 as following “Transportation/distribution **and storage**”.

Technical guidance

To add the reference (**CAC/RCP 52-2013**) after the third bullet.

15. Application of fermentation aids

Technical guidance

Suggestion: To add the reference **CAC/GL 75-2010 (Guidelines on substances used as processing aids)** after the first bullet.

16. Heating

To add (**optional**) next the step 16. Heating

Potential hazards: ~~microbiological contamination,~~ **unlikely pathogenic contamination.**

17. Ingredients and additives

Technical guidance

Suggestion :

To rewrite the first bullet as following : “Ingredients and additives should be stored **in a clean place** appropriately in terms of temperature, ~~and~~ humidity **and hygienic conditions.**”

To delete the second bullet : ~~Ingredients and additives should be stored in a dry and clean place under hygienic conditions.~~

18. Packaging materials

Technical guidance

First bullet: ~~Labels should be verified to ensure that all information declared meets, where applicable, the General standard for the Labelling of Prepackaged Foods (Codex Stan 1-1985) and labeling provisions of the Standard for Fish sauce (Codex Stan 302-2011) and/or other relevant national legislative requirements.~~

Suggestion : move the strikethrough text of first bullet to step **13. Labelling/packaging.**

Flow chart

Suggestion

- To add “optional” next the step **16. Heating** and step 17. **Ingredients and additives**
- A star “*” should added after step 5; step 6 and step 7 in the flow chard

To replace the word “~~separated~~” with the word “**repeated**” at the footnote.