codex alimentarius commission

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

WORLD HEALTH ORGANIZATION

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Agenda Item 5 **CX/FFP 06/28/5-Add.2**

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

Twenty-eighth Session
Beijing, China
18-22 September 2006

PROPOSED DRAFT CODE OF PRACTICE FOR FISH AND FISHERY PRODUCTS
GOVERNMENT COMMENTS AT STEP 3 on Lobsters and Crabs

UNITED STATES

SECTION 13 – PROCESSING OF LOBSTERS AND CRABS

The United States recommends that the draft section of the Code of Practice for Lobster and Crabs be divided into a separate section for lobsters and a separate section for crabs. The primary reason for this recommendation is length. If the document were to remain as a single section covering both lobsters and crabs, we predict that the final version would be at least 35 pages long once all needed technical modifications are made to it.

If the CCFFP is receptive to the idea of a separate section for lobsters and a separate section for crabs, the United States has prepared a draft section for each for the Committee's consideration as substitutes for the current draft. We are hereby submitting them as part of our comments, as an attachment to this letter.

On the other hand, if the CCFFP would prefer to retain lobster and crab as a single section, we have also prepared extensive comments on it, which we are also submitting (below, in this letter). Among other things, these comments include a new sub-section describing the processing of cooked fresh and frozen crab that is missing from the current draft. These product forms cover the majority of processed crabs. This subsection would add another 4 pages to the text. In our view, this additional material supports the desirability of dividing the document into separate sections. Recommended additional language within sentences is highlighted in bold in the comments below for the convenience of the reader. We also recognize that significant renumbering will need to be done with revisions to this draft and those changes may not all be accurately reflected in our comments or in the separate draft sections for lobsters and for crabs.

SECTION 13 – PROCESSING OF LOBSTERS AND CRABS

Introductory paragraphs, 2nd paragraph, revise to read as follows: **"This section applies to lobsters in the genus *Homarus*, rock lobsters, spiny lobsters, and slipper lobsters in the genera *Palinurida*, and *Scyllaridea*, squat lobsters in the genera *Cervimundia* and *Pleuronocedes*, and the Norwegian lobster, *Nephrops norvegicus*."**

Reason: The Standard for Quick Frozen Lobsters includes the Norwegian lobster and was expanded to include the squat lobsters so; the code of practice should also include them. The sentence is simplified from the original by omitting the confusing reference to the family Nephropidae which contains the genera *Homarus* and *Nephrops*.

13.1.2. Hygiene Control Programme, 1st and 2nd bullets, remove brackets

Reason: This is important information that should be retained.

13.2.1 Potential Hazards and Defects Associated with Lobsters and Crabs

Comment: There is a reference here to section 4.1. It was agreed during the 25th Session of the CCFFP (see ALINORM 03/18) that "section 4.1 Potential Hazards Associated with Fish and Shellfish should be transferred from Section 4 to an Annex to Section 5 on HACCP and DAP Analysis, as it was directly related to hazard analysis. The current draft Code of Practice (CAC/RCP 52-2003, Rev. 2-2005) does not reflect this change. There is neither a section 4.1 nor an Annex I to Section 5. The CCFFP should decide how to proceed with this issue. If the Annex is created, the U.S. suggests that much of the information included in the current 13.2.1 could be moved there. We would suggest retaining the information currently drafted on "Parasites", "Bacteria," and "Biotoxins" and revising the information on "Defects" as follows:

Blue discoloration in crab meat. Blue discoloration is a defect in canned crab meat and also, rarely, developing in crab meat several hours after boiling and cooling of the crabs. The blue color appears more often on the surface of the shoulder and other joint meats and in the claw meat. It appears in canned horse hair crab ("kegani") more often than in king crab. It is believed to be a result of copper containing hemocyanin in the blood (hemolymph) and may be avoided by eliminating the blood to the extent practicable in the cooking and canning process.

Black discoloration in lobster meat. Black discoloration is caused by melanin formation most commonly in the ventral tail segment joints. It develops in the integumentary tissues and muscle surfaces, but does not occur in the muscle meat tissue. The use of sulfating agents to prevent this discoloration is a common practice and may result in unacceptable residues. The potential for residues of sulfating agents leads to labeling requirements because these chemicals are common allergens.

Another form of black discoloration caused by fungus infection, particularly of snow crabs, is known as "black mat". While light infections may be physically removed, crabs with heavy infections should be culled as the shells cannot be completely cleaned and because there is tissue penetration of colorless hyphae that can affect the meat quality.

Other Defects. Barnacles and other commensals including marine leeches are common defects in various crab species."

Reason: There is justification in citing certain hazards and defects that are unique to lobsters and crabs. The suggested revision is intended to retain such material as will need to be considered specifically by users of this code. This section currently contains lengthy descriptions of hazards and defects. While the descriptions contain factual material, sometimes in considerable detail, the decision to move such material from codes of practice into a combined Annex I needs to be considered. General descriptions contained within an Annex may be sufficient for the purposes of the codes of practice and may not need to be amplified with additional detail from the present descriptions and examples.

13.2.2 Minimise the Deterioration of Crustaceans – Handling, bullets

Comment: Consideration should be given to separating these points and moving them to the appropriate processing step section narratives.

Figure 13.1 Flow Chart, add a box containing the words **"Application of Additives"** that connects from the box that says "Additives Storage" and points toward the box that says "Tailing."

Reason: Sulfites can be added immediately upon tailing in order to prevent black spots.

Figure 13.1 Flow Chart, add a box containing the word **"Glazing"** between the "Freezing" step and the "Packaging" step. The sections and processing steps should be renumbered accordingly.

Reason: Glazing is a processing step that would occur at this point in the flow diagram and should be included.

13.3.1.1 Live Lobster Reception, *Technical Guidance*, 2nd bullet, add the word **"health"** after "human."

Reason: Editorial, to insert missing word.

13.3.1.1 Live Lobster Reception, *Potential Hazards* and *Technical Guidance*, 5th bullet,

Comment: While plausible and sporadic findings of PSP in *Homarus* lobsters have been reported, the sporadic nature of occurrence and lack of illness data lead us to question whether this issue could be referred for expert consultation rather than be included outright.

13.3.1.2 Live Lobster Holding

- ***Potential Hazards*****,** delete "unlikely" and replace with **"drug residue"**
- ***Technical Guidance*****,** add a bullet to read:
    - **"If drugs are used, appropriate withdrawal times must be followed."**

Reason: Due to use of antibiotics during live lobster holding.

13.3.1.2 Live Lobster Holding, *Technical Guidance*, 3rd bullet, revise to read:

- "to minimize damage**, black discoloration (melanosis)** and mortality losses during…"

Reason:

Black discoloration should be minimized at this step.

13.3.1.2 Live Lobster Holding, *Technical Guidance*, 4th bullet, add the word "that" after "tanks and wells"

Reason: Editorial

13.3.1.2 Live Lobster Holding, *Technical Guidance*, 5th bullet, add the word "whole" after "dead"

Reason: Clarification.

13.3.1.3 Tailing, *Potential Defects*, add **"improper tailing"**

Reason: This is a quality defect reasonably likely to occur at this step.

13.3.1.4 Washing, *Potential Defects*, add **"poor cleaning"**

Reason: This is a quality defect reasonably likely to occur at this step.

13.3.1.5 Washing, *Technical Guidance*, remove brackets

Reason: The language in this sentence describes good practice for washing procedures.

13.3.1.5 Application of Additives to Lobster Tails (Processing Steps 5 & 10), add **"3"** within the parenthetical so the title reads "…(Processing Steps **3,** 5 & 10)"

Reason: Sulfites can be added immediately upon tailing to prevent black spot.

13.3.1.5 Application of Additives to Lobster Tails, *Potential Defects*,

Comment: Clarification is needed on the definition of "physical contamination" so that appropriate technical guidance could be included.

13.3.1.5 Application of Additives to Lobster Tails, *Technical Guidance*, revise 2nd bullet and add two new bullets as follows:

- "Regular checks of the additive levels **should be carried out.**
- **Tails with black spots should be discarded.**
- **Non-approved additives should not be allowed in the processing facility."**

Reason: Technical guidance bullets are needed here to address the potential defects.

13.3.1.6 Chilled Storage

- change the title to **"Chilling,"** remove the reference to "8.1.2 Chilled Storage" and move this processing step to come after the "Weighing/Wrapping" step

-***Potential Defects*****,** add **"decomposition"**

-***Technical Guidance*****, 1st bullet,** change the word "storage" to "chilling"

Technical Guidance**,** add a new bullet to read as follows:

- **"chilling should take place as rapidly as possible to prevent microbiological growth and deterioration."**

Reason: If temperature rises or storage time is too long, decomposition could occur. This section describes the processing step of lowering the product temperature, not chilled storage, and should come after weighing/wrapping in the process flow.

13.3.1.7 De-veining/Trimming/Washing, move this processing step to come after the "Application of Additives to Lobster Tails" step

Reason: Proper processing flow.

13.3.1.7 De-veining/Trimming/Washing, *Potential Defects*,

Comment: Clarification is needed on the definition of "physical contamination" so that appropriate technical guidance could be included.

13.3.1.7 De-veining/Trimming/Washing, *Technical Guidance*, 2nd bullet, change the words "butt end" to "**front end of the tail where the meat is exposed"**

Reason: Clarification.

13.3.1.7 De-veining/Trimming/Washing, *Technical Guidance*, revise last bullet and add a new bullet to read as follows:

- the de-veined or trimmed lobster tails should be washed and well iced or appropriately chilled in clean containers and stored in specially designated and appropriate areas within the processing facility;
- **the de-veining process should be carried out quickly to prevent product spoilage. Tails waiting for de-veining should be kept on ice or refrigerated at 4°C or less."**

Reason: Some of the language in the last bullet was unnecessary and the new bullet includes important technical guidance.

13.3.1.8 Grading, 13.3.1.9 Weighing, and 13.3.1.10 Wrapping and Packaging, combine these steps into one, rename **"Weighing/Wrapping,"** and revise to read as follows:

"13.3.1.7 Weighing/Wrapping (Processing Step 7)
Potential Hazards: Unlikely
Potential Defects: Incorrect net weight, ***inadequate wrapping, inappropriate packaging material***
Technical Guidance:

- *lobster tails should be graded into species, sizes and weights for the relevant market, to assure the economic integrity of the final product;*
- *calibrated balances should be provided for accurate grading;*
- *balances should be calibrated periodically with a standardized mass to ensure accuracy;*
- *packaging material should be clean, sound, durable, sufficient for its intended use and of food grade material;*
- *care should be taken to ensure that the* ***front end of the tail where the meat is exposed*** *is completely wrapped to protect against dehydration;*
- ***weights of finished packages should be monitored at regular intervals to assure that they are the proper net weight."***

Reason: These steps are normally completed at the same time during processing flow. Wrapping is a primary packaging step and should be separated from final packaging.

13.3.1.11 Freezing, *Potential Defects*, change "Unlikely" to **"Poor texture"**

Reason: Poor texture is a potential defect that is reasonable likely to occur at this step.

13.3.1.11 Freezing, *Technical Guidance*, 1st bullet, change to read:

- "air blast, liquid nitrogen, **or other** freezing **methods** should be **rapid** to produce high quality tails **and to ensure that the textural qualities of the product are retained**."

Reason: There are other potential freezing methods in addition to liquid nitrogen and air blast.

(new subsection to follow "Freezing") **13.3.1.x Glazing** to read as follows:

"13.3.1.x Glazing
Potential Hazards: ***Microbiological growth***
Potential Defects: ***Incomplete glaze, foreign matter***
Technical Guidance:

- **glazing is considered complete when the entire surface of the frozen fish product is covered with a suitable protective coating of ice and should be free of exposed areas where dehydration (freezer burn) can occur;**

- **if additives are used the water for glazing, care should be taken to ensure its proper proportions and application with product specifications;**
- **where the labeling of a product is concerned, information on the amount or proportion of glaze applied to a product or a production run should be kept and used in the determination of the net weight which is exclusive of the glaze;**
- **glaze solution should be replaced at regular intervals to ensure that a high bacterial load does not occur and to prevent build up of foreign material;**
- **chilling of glaze water will result in a more uniform application of glaze that will better protect the product;"**

Reason: Frozen lobsters are routinely glazed and should have a section that considers the hazards and defects.

13.3.1.12 Labelling, combine with "Final Packaging" and:

- rename to **"13.3.1.x Final Packaging/Labelling (Processing Step X)**
- ***Potential Defects,*** add **"Subsequent dehydration"**
- add two bullets to read as follows:
  - **"packaging material should be clean, sound, durable, sufficient for its intended use and of food grade material;**
  - **care should be taken to ensure that the front end of the tail where the meat is exposed is completely packaged to prevent against dehydration"**

Reason: The labeling step should be combined with a step called final packaging for proper process flow.

13.3.1.13 Frozen Storage, *Potential Defects,* change "Unlikely" to **"Freezer burn, dehydration"** and add the following bullets under *Technical Guidance*:

- **products should be properly packaged to protect against freezer burn and dehydration;**
- **glaze is recommended as a further measure to ensure against dehydration."**

Reason: Freezer burn needs to be considered as a potential defect.

13.3.1.14 Additives, Packaging and Label Reception, separate and revise to read as follows:

"13.3.1.13 Packaging and Label Reception (Processing Step 13)

Refer to section 8.5.1 – Reception – Packaging, Labels & Ingredients

Potential Hazards: ***Unlikely***

Potential Defects: ***Contaminated packaging****, incorrect labels.*

Technical Guidance:

- **packaging materials should be examined for signs of contamination;**
- **labels should be examined for accuracy and to adherence to applicable regulations;**

13.3.1.14 Additives Reception (Processing Step 15)

Refer to section 8.5.1 – Reception – Packaging, Labels & Ingredients

Potential Hazards: *Biological, chemical and physical contamination*

Potential Defects: *Contamination, mislabelling*

Technical Guidance:

- **additive shipments should be examined to ensure that they are not contaminated and that the container integrity is sufficient;**
- **additive shipments should be examined to ensure that they are the correct chemical and meet purchase specifications;"**

Reason: The information relevant to these steps is distinct enough that they should be addressed separately in the narrative.

13.3.1.15 Additives, Packaging and Label Storage, revise to read as follows:
"13.3.1.15 Additives, Packaging and Label Storage (Processing Steps 14 and 16)

Refer to Section 8.5.2 – Storage – Packaging, Labels & Ingredients.

POTENTIAL HAZARDS: **UNLIKELY**

POTENTIAL DEFECTS: **CONTAMINATED ADDITIVES OR PACKAGING MATERIAL.**

TECHNICAL GUIDANCE:

- **food additives and packaging material should be protected from dust, dirt and other sources of contaminants;**
- **pests and insects should be excluded from the packaging storage area;"**

Reason: It is unlikely that storage of additives, packaging or labels would create a potential hazard, but the potential defect would be contamination of additive or packaging material. Technical guidance points were needed to clarify this point.

(new section to follow "Additive Storage") **13.3.1.x Distribution and Transport** to read as follows:

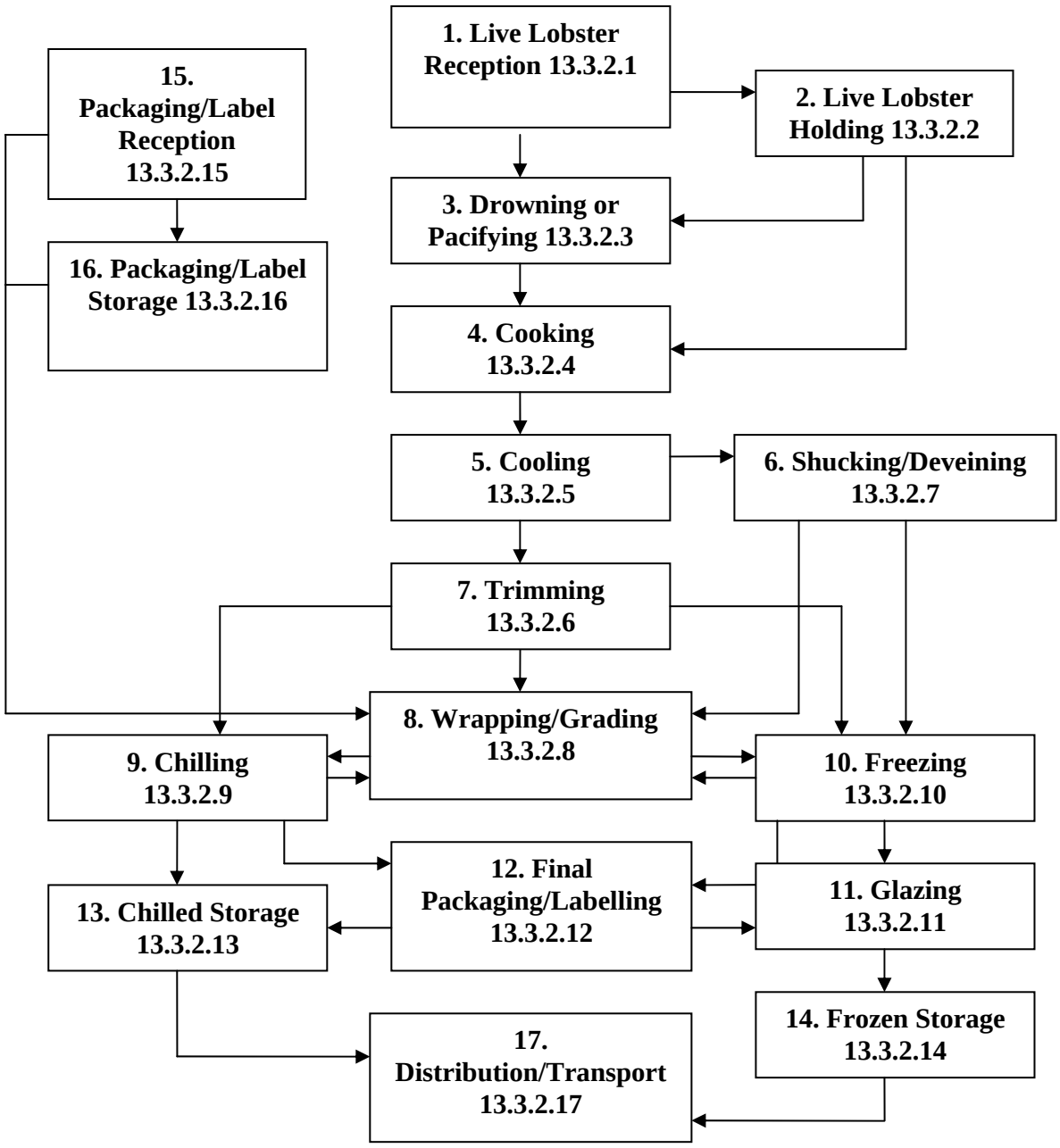
"13.3.1.16 Distribution and Transport (Processing Step 17)
Refer to Section 17 – Recommended Code of Practice for Transport"

Figure 13.2, revise flow chart as offered below and in attachments

Reason: The boxes and arrows in this figure are not clear in the draft printed in ALINORM 05/28/18 so, we are offering a revised flow chart for clarity and to include all processing steps.

This flow chart is for illustrative purposes only. For in-factory HACCP implementation a complete and comprehensive flow chart has to be drawn up for each process.

Figure 13.2 Example of Flow Chart for Processing of Cooked Lobsters
References correspond to relevant sections of the Code



13.3.2.1, add new subsections to read as follows:
"**13.3.2.1 Live Lobster Reception (Processing Step 1)**
Refer to section 13.3.1.1
13.3.2.2 Live Lobster Holding (Processing Step 2)
Refer to section 13.3.1.2"

Reason: These steps appear in the frozen raw lobster tail section, but should be included in this narrative since they appear in the flow diagram, for clarity of process flow.

13.3.2.1 Drowning and Insensibilising (Processing Step 3)
-renumber and rename to **"13.3.2.3 Drowning and Pacifying (Processing Step 3)"**
-1st bullet, italicize "Homarus"

Reason: Editorial and to use a more appropriate term for this processing step.

13.3.2.2 Cooking (Processing Step 4)
- renumber to **"13.3.2.4** Cooking (Processing Step 4)"
- **2nd bullet,** change "has" to "have"

Reason: Editorial

13.3.2.3 Cooling (Processing Step 5),
- renumber to "**13.3.2.5** Cooling (Processing Step 5)"
- ***Potential Hazards*****,** delete "unlikely" and replace with **"microbiological"**
- ***Technical Guidance*****,** add seven bullets to read as follows:
    - **"cooling should be done in cold circulated air, running potable water or clean sea water;**
    - **where lobsters are cooked on a continuous basis, cooling is also best done on a continuous basis;**
    - **cooling should be completed as quickly as possible and every effort should be made to avoid contamination of the product during this period;**
    - **the same water should not be used for cooling more than one batch;**
    - **shell removal should not be performed until the product has adequately cooled;**
    - **care should be taken to ensure that cross contamination of cooked lobsters does not occur, e.g.:**
        - **cooling lobsters in baskets should not be placed on the floor;**
        - **cooling lobsters should be covered or otherwise protected from condensation;**
        - **product contact surfaces should be washed and/or sanitized at regular intervals to avoid bacteriological build up and contamination;**
    - **cooked lobsters should be handled as a ready-to-eat product that has its normal microflora destroyed which can allow pathogens to proliferate."**

Reason: Cross contamination is a common problem when moving product from cooking to cooling areas.

(new section) **13.3.2.8 Wrapping and Grading (Processing Step 8),** new subsection to read as follows:

"13.3.2.8 Wrapping and Grading (Processing Step 8)
Potential Hazards: ***Unlikely***
Potential Defects: ***Incorrect grading, inadequate wrapping, inappropriate packaging material***
Technical Guidance:
- **lobster should be graded into species, sizes and weights for the relevant market, to assure the economic integrity of the final product;**
- **lobster meats should be uniform in size;**
- **calibrated balances should be provided for accurate grading;**
- **balances should be calibrated periodically with a standardized weight to ensure accuracy;**
- **wrapping material should be clean, sound, durable, sufficient for its intended use and of food grade material;**

Reason: In lobster production, meats are wrapped with saran wrap then frozen and glazed as a means to protect the product from dehydration in the frozen state.

13.3.2.6 Chilling, Final Packaging, Labelling (Processing Step 11)
Comment: The subsection on processing of cooked lobsters appears to be missing several processing steps. The U.S. would suggest revising and expanding this subsection into several additional subsections to cover all processing steps to read as follows:

"13.3.2.9 Chilling (Processing Step 9)

Refer to sections 4.2 – Time and Temperature Control.

Potential Hazards: *Unlikely.*
Potential Defects: *Unlikely*
Technical Guidance:

- chilling lobsters in refrigerated sea water is not recommended because excessive salt penetration into the muscle will take place rapidly. However, refrigerated clean water systems can be used for rapid pre-cooling before freezing or storage in ice;
- chilling should take place as rapidly as possible to prevent microbiological growth and deterioration.

13.3.2.10 Freezing (Processing Step 10)

Refer to section 8.3.1 – Freezing Process

Potential Hazards: *Unlikely*

Potential Defects: *Unlikely*

Technical Guidance:

- air blast, liquid nitrogen, or other freezing methods should be rapid to produce high quality whole lobsters and lobster meats to ensure that the textural qualities of the product are retained;
- the freezing and storage of whole uncooked lobsters is not recommended.

13.3.2.11 Glazing (Processing Step 11)

Refer to Section 13.3.1.10 of this document

13.3.2.12 Final Packaging/Labelling (Processing Step 12)

Refer to Section 8.2.3 – Labeling.

Potential Hazards: *Absence of labelling of allergenic additives*

Potential Defects: *Subsequent dehydration, incorrect labelling.*

Technical Guidance:

- packaging material should be clean, sound, durable, sufficient for its intended use and of food grade material;
- care should be taken to ensure that exposed lobster meats are completely wrapped to protect against dehydration.

13.3.2.13 Chilled Storage (Processing Step 13)

Refer to Section 8.1.2 – Chilled Storage

Potential Hazards: *Microbiological growth*

Potential Defects: *Decomposition, foreign matter*

Technical Guidance:

- temperatures in chilled storage should be 4° C or less;
- product should be properly protected to avoid contamination by condensates and splashing water;

13.3.2.14 Frozen Storage (Processing Step 14)

Refer to Section 13.3.1.12 of this document.

13.3.2.15 Packaging/Label Reception (Processing Step 15)

Refer to Section 13.3.1.13 of this document.

13.3.2.16 Packaging/Label Storage (Processing Step 16)

Refer to Section 8.5.2 – Storage – Packaging, Labels & Ingredients.

Potential Hazards: unlikely

Potential Defects: contaminated packaging material.

Technical Guidance:

- packaging material should be protected from dust, dirt and other sources of contaminants;
- Pests and insects should be excluded from the packaging storage area;

13.3.2.17 Distribution and Transport (Process Step 17)

Refer to Section 17 – Recommended Code of Practice for Transport

Figure 13.3, switch processing steps of "Weighing" and "Primary-Packaging/Sealing"

Reason: To reflect proper process flow.

13.3.3.2 – Live Crab Holding (Processing Step 2)
- 1st paragraph (references after subheading), remove brackets

Reason: Poor water quality may affect crab mortality rates.

13.3.3.3 Washing and Drowning or Insensiblising (Processing Step 3), change "Insensibilising" to "Pacifying"

Reason: Editorial and proper word usage.

13.3.3.3 Washing and Drowning or Insensibilising, *Technical Guidance*
- 3rd bullet, add 's' to "specie"
- 4th bullet through 7th bullet, indent from 2nd bullet

Reason: Editorial. Bullet 4-7 are a subset of bullet 2 and should be so indicated by indentation.

13.3.3.4 Cooking (Processing Step 4)
- *Potential Defects*, revise to read ***"Poor texture due to*** *overcooking****, bluing discoloration due to*** *undercooking****"***
- *Technical Guidance*, 4th bullet, revise to read:

- "adequate uniform cooking is essential because too much cooking causes excessive meat shrinkage, moisture loss**,** lower yields **and poor texture. T**oo little cooking makes it difficult to remove the meat from the shell**, may not adequately destroy pathogenic bacteria and may cause blue discoloration**;"

Reason: To properly identify these potential defects and include them under technical guidance.

13.3.3.4 Cooking (Processing Step 4), *Technical Guidance*, add a bullet to read as follows:

- **"cook time and temperature must be sufficient to kill trematode parasites;"**

Reason: Trematodes are known to exist in some crabs and can cause human illness. Their larval forms can be resistant to heat.

13.3.3.5 Cooling (Processing Step 5), ***Technical Guidance*, 1st bullet,** revise to read as follows:

- "cooling should be done in cold circulated air, running potable water**, refrigerated brine,** or clean sea water;"

Reason: Refrigerated brine is often used at the cooling step and should be included.

13.3.3.5 Cooling (Processing Step 5), *Technical Guidance*, add two bullets to read as follows:

- **"cooling in chill room must avoid cross contamination with raw product;**
- **shell removal or sectioning should not be performed until the product has adequately cooled;"**

Reason: These technical bullets help reduce the chance of microbiological contamination.

13.3.3.6 Sectioning/Meat Extraction (Processing Step 6), *Potential Hazards*, delete "presence of shell fragments"

Reason: The next subsection is shell fragment removal.

13.3.3.6 Sectioning/Meat Extraction, *Potential Defects*, add "presence of gills and viscera or foreign material"

Reason: These are likely defects that could occur at this step in the process.

13.3.3.7 Shell Fragments Removing (Processing Step 7), ***Potential Defects*,** add "presence of viscera, foreign material"

Reason: These are likely defects that could occur at this step in the process.

(proposed) **13.3.3.8 Weighing (Processing Step 8)**

Comment: This processing step is identified in the flow diagram, but there is no text in the narrative section. The flow diagram refers to subsection 13.3.1.9, but the information contained therein is slightly different than what should be presented in this subsection. The information pertaining to "weighing" should be complete in both sections of this draft. Therefore, the U.S. would suggest expanding this subsection to read as follows:

"13.3.3.8 Weighing (Processing Step 8)
Potential Hazards: ***Survival of* Clostridium botulinum *spores***
Potential Defects: ***Underweight cans***
Technical Guidance:

- ***net weight of the crab contents should not exceed the critical parameters specified in the scheduled process as incomplete heat penetration due to overweight cans could affect heat penetration;***
- ***care should be taken to ensure that minimum net weights on the label declaration are met;***

13.3.3.8 Primary-Packaging/Sealing/Final Packaging/Labelling (Processing Steps 8 and 12), renumber and rename this subsection to **"13.3.3.9 Primary-Packaging/Sealing (Processing Step 9)"**

Reason: Processing steps 8 and 12 are distinct on the flow diagram and have different potential hazards and defects so, should be two separate subsections within the narrative. See proposed new subsection 13.3.3.12 Final Packaging/Labeling (Processing Step 12) below.

(renumber) **13.3.3.10 Cooling** to **13.3.3.11 Cooling**

(proposed) **13.3.3.12 Final Packaging/Labeling (Processing Step 12)**, new subsection to read as follows:

13.3.3.12 Final Packaging/Labelling (Processing Step 12)

Refer to Section 8.2.3 "Labelling"

Potential Hazards: *Unlikely*
Potential Defects: *Incorrect labelling, dehydration*
Technical Guidance:

- packaging material should be clean, sound, durable, sufficient for its intended use and of food grade material;
- the operation, maintenance, regular inspection and adjustment of sealing machines should received particular care;
- the sealing operation should be conducted by qualified personnel specially trained;
- packaging integrity of the finished product should be inspected at regular intervals by an appropriately trained personnel to verify the effectiveness of the seal and the proper operation of the packaging machine;

(proposed) 13.3.3.14 Packaging and Label Reception, new subsection to read as follows:

"13.3.3.14 Packaging and Label Reception (Processing Step 14)
Refer to Section 13.3.1.13 of this document."

Reason: Since this step is in the flow diagram it should have corresponding technical guidance for clarity of process flow.

(proposed) 13.3.3.15 Packaging and Label Storage (Processing Step 15), new section to read as follows:

"13.3.3.15 Packaging and Label Storage (Processing Step 15)
Refer to Section 13.3.2.16 of this document."

Reason: Gives corresponding technical guidance to this step listed in the flow diagram.

(proposed) 13.3.3.16 Distribution/Transport (Processing Step 16)

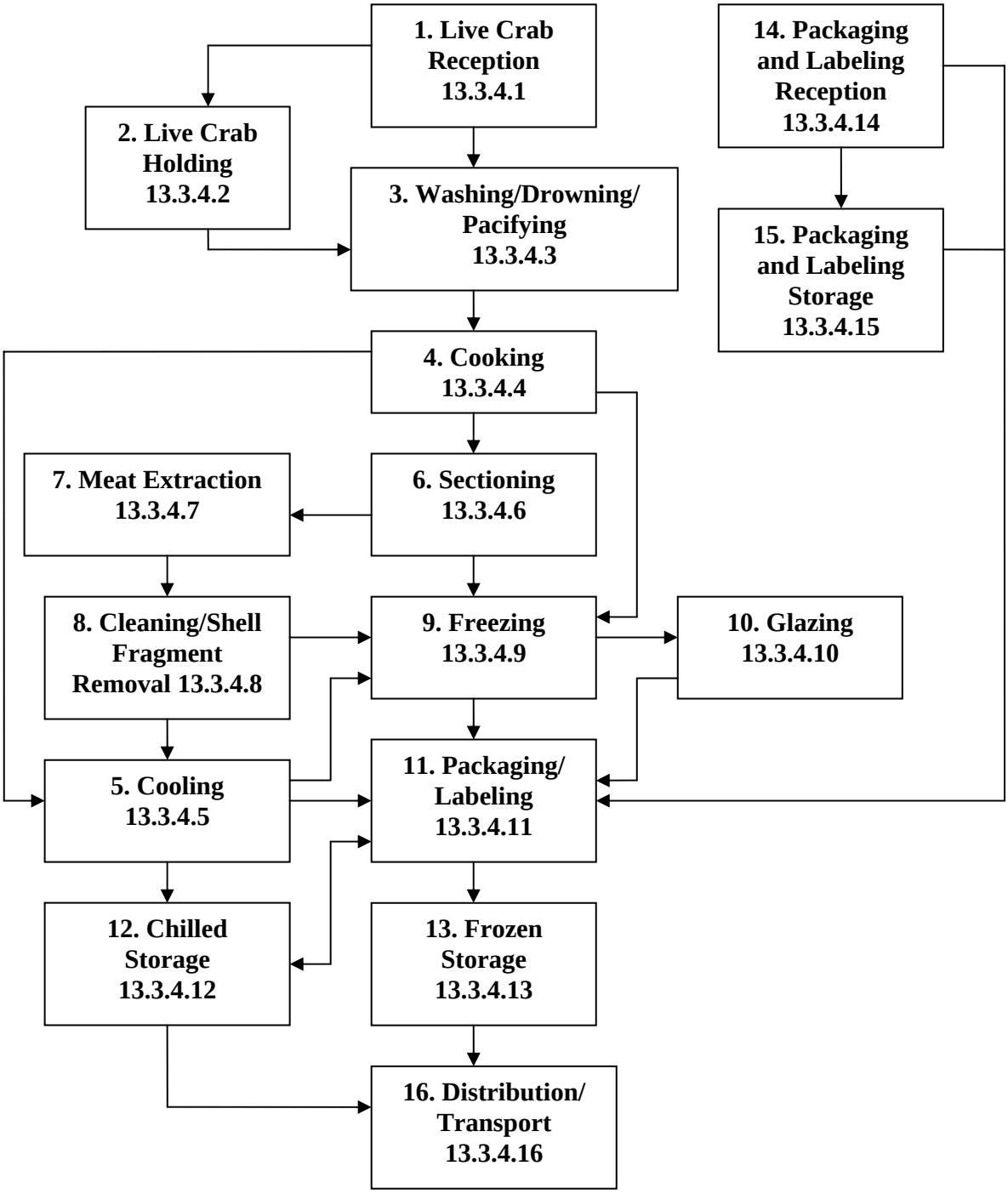
13.3.3.16 Distribution/Transport (Processing Step 16)

Refer to Section 17 – Recommended Code of Practice for Transport

Comment: The United States recommends adding the following processing flow chart and narrative sub-section covering the processing of fresh and frozen cooked crab:

This flow chart is for illustrative purposes only. For in-factory HACCP implementation a complete and comprehensive flow chart has to be drawn up for each process.

Figure 13.4 Example of flow chart for Chilled and Frozen Cooked Crab



13.3.4 Chilled and Frozen Cooked Crab

13.3.4.1 Live Crab Reception (Processing Step 1)

Refer to section 13.3.3.1 of this document.

13.3.4.2 Live Crab Holding (Processing Step 2)

Refer to Section 13.3.3.2 of this document.

13.3.4.3 Washing and Drowning or Pacifying (Processing Step 3)

Refer to Section 13.3.3.3 of this document.

13.3.4.4 Cooking (Processing Step 4)

Refer to Section 13.3.3.4 of this document.

13.3.4.5 Cooling (Processing Step 5)

Potential Hazards: *Microbiological contamination*

Potential Defects: *unlikely*

Technical Guidance:

- cooling should be done in cold circulated air, running potable water, refrigerated brine, or clean sea water;
- where crabs are cooked on a continuous basis, cooling is also best done on a continuous basis;
- cooling should be completed as quickly as possible and every effort should be made to avoid contamination of the product during this period;
- cooling in chill room must avoid cross contamination with raw
- the same water should not be used for cooling more than one batch;
- in some species, the body cavity contains a considerable amount of water, so that adequate drainage, in an area set aside for the purpose, is desirable;
- shell removal or sectioning should not be performed until the product has adequately cooled;
- Care should be taken to ensure that crosscontamination of cooked crabs does not occur e.g.
  - Cooling crabs in baskets should not be placed on the floor;
  - Cooling crab should be covered or otherwise protected from condensations;
  - Product contact surfaces should be washed and/or sanitized at regular intervals to avoid bacterial build up and contamination;
- Cooked crabs should be handled as a ready-to-eat product that has its normal microflora destroyed which can allow pathogens to proliferate.

13.3.4.6 Sectioning (Processing Step 6)

Potential Hazards: *Recontamination with pathogenic micro-organisms, microbiological growth, microbial toxin development.*

Potential Defects: *Presence of gills and viscera*

Technical Guidance:

- after butchering, any remaining viscera and gills should be removed by brushing and washing. Proper cleaning at this stage is strongly recommended since it eliminates the risk of foreign material being included in the finished product;
- it is recommended that different staff be involved in operations with cooked and uncooked crabs, to avoid cross-contamination;

13.3.4.7 Meat Extraction (Processing Step 7)

Potential Hazards: *Recontamination with pathogenic micro-organisms, microbiological growth, microbial toxin development.*

Potential Defects: *Presence of gills, viscera or foreign material*

Technical Guidance:

- it is recommended that different staff be involved in operations with cooked and uncooked crabs, to avoid cross-contamination;
- picking or shaking operations should be carefully controlled to prevent contamination from bacteria and/or foreign materials;
- it is recommended that all types of meat are picked, packaged and either chilled [(internal temperature of 4.5ºC/40ºF or less) or frozen within two hours];
- depending on the vessel or processing facility product flow pattern and where a prescribed critical limit for staging time and temperature regime has been established for the control of

hazards, the crab meat should be appropriately chilled in clean containers and stored in specially designated and appropriate areas within the processing facility;

- because of the possibilities of microbiological contamination, continuous mechanical processing is preferable to hand picking or shaking of white meat by batch processing;
- claws, leg tips and shell parts containing recoverable meat should be continuously separated, rapidly and efficiently, from waste material during the picking operation and should be kept chilled and free from contamination;

13.3.4.8 Shell Fragments Removing/Cleaning (Processing Step 8)

Refer to Section 13.3.3.7 of this document.

13.3.4.9 Freezing (Processing Step 9)

Refer to section 8.3.1 – Freezing Process

Potential Hazards: *Unlikely*

Potential Defects: *Poor texture.*

Technical Guidance:

- adequate commercial freezing equipment should be used to quickly freeze the product and minimize the crystallization of moisture in the flesh (e.g. cryogenic, blast or brine freezing systems);
- brine media in brine freezing systems should be replaced regularly to prevent the build up of dirt and foreign matter;

13.3.4.10 Glazing (Processing Step 10)

Refer to section 13.3.1.10 of this document.

13.3.4.11 Packaging/Labelling (Processing Step 11)

Refer to Section 13.3.3.12 of this document.

13.3.4.12 Chilled Storage (Processing Step 12)

Refer to Section 13.3.2.13 of this document.

13.3.4.13 Frozen Storage (Processing Step 13)

Refer to Section 13.3.1.12 of this document.

13.3.4.14 Packaging and Labelling Reception (Processing Step 14)

Refer to Section 13.3.1.13 of this document.

13.3.4.15 Packaging/Labelling Storage (Processing Step 15)

Refer to Section 13.3.2.16 of this document.

13.3.4.16 Distribution/Transport (Processing Step 16)

Refer to Section 17 – Recommended Code of Practice for Transport

Reason: Fresh and frozen cooked crab represents the largest commodity of product forms for all crabs. The hazards and defects of cooked crabs should be covered by this Code of Practice because of it economic importance and overall possible impact on food safety.

PROCESSING OF LOBSTERS AND CRABS presented as two separate sections

SECTION XX - PROCESSING OF CRABS

In the context of recognising controls at individual processing steps, this section provides examples of potential hazards and defects and describes technological guidelines, which can be used to develop control measures and corrective action. At a particular step only the hazards and defects, which are likely to be introduced or controlled at that step, are listed. It should be recognised that in preparing a HACCP and/or DAP plan it is essential to consult Section 5 which provides guidance for the application of the principles of HACCP and DAP analysis. However, within the scope of this Code of Practice it is not possible to give details of critical limits, monitoring, record keeping and verification for each of the steps since these are specific to particular hazards and defects.

This section applies, generally, to commercial crabs of the *Cancer* species, king crab related species (*Lithodes* and *Paralithodes*), swimming crabs (Portunidae), *Geryon* species and snow crab species (e.g. *Chionoectes* and *Opilio*) as well as other species of marine and freshwater crabs which are similar in physical structure to the above mentioned.

XX.1 GENERAL – ADDITION TO PRE-REQUISITE PROGRAMME

In addition to the pre-requisite programme outlined in Section 3 of this document, the processing facility operators are encouraged to evaluate the design and construction of their facility and the maintenance and sanitation of their operation, specific to the processing of lobsters and crabs. Consideration should be given to the following:

xx.1.1 Design and Construction of Equipment and Utensils

- in batch systems the inactivation tank, cooker and cooling tank should be located adjacent to each other and may be provided with an overhead hoist or gantry provided to transfer baskets from one to the other;
- cookers should be designed to provide constant and adequate supply of heat so that all crustaceans could be given the same time/temperature exposure during the cooking operation;
- a chamber of adequate length, through which an open link conveyor passes and which is equipped with spray nozzles so that the crabs are sprayed from all sides, may be used for the purpose.

xx.1.2 Hygiene Control Programme

- [When in-factory chlorination of water is used, the minimum residual content of free chlorine should be maintained at the effective level for the use intended.]
- [Chlorinating system should not be relied upon to solve all hygiene problems].
- water, which has been in contact with crustaceans, should not be re-used unless reconditioned to avoid taint problems;
- if it is unavoidable for the same workers to handle the raw as well as the cooked, stringent precautions should be taken to prevent contamination of the cooked product by micro-organisms from raw material;

xx.2 General Considerations for the Handling of Crabs

Refer to Section 4 – General Considerations for the Handling of Fresh Fish and Shellfish of the Proposed Draft Code of Practice for Fish and Fishery Product (ALINORM 01/18 – APPENDIX V)

xx.2.1. Potential Hazards and Defects Associated with Crabs

Refer also to Section 4.1 Potential Hazards Associated with Fresh Fish and Shellfish and Section 5.3.3.1 Identification of Hazards and Defects

xx.2.1.1. Potential Hazards

Parasites

A trematode belonging to the genus *Paragonimus* is the very common oriental lung fluke. Humans are infected by eating raw or inadequately cooked crabs or crayfish. The adult parasite lives in cysts in the lungs, but it also has a tendency to migrate to other sites such as liver, spleen and brain. A chronic pulmonary disease ensues when the worms develop in the lungs.

Bacteria

Staphylococcus aureus in an aerobic or facultatively anaerobic gram positive spherical micro-organism. It is coagulase-positive and ferments glucose. Some strains can produce enterotoxins.

Staphylococcus is not found in the normal microflora on fish. The natural habitat for this organism is the skin and mucous membranes of animal and man. The presence of *Staphylococcus* on fish is an indication of post-harvest contamination due to poor personal hygiene. The organism is a poor competitor and will not multiply in fish. However, in fish or shellfish products, where the normal flora is reduced or eliminated (i.e. cooked peeled shrimp or crab meat), the presence of *staphylococci* indicates a potential for food poisoning.

Although the data are limited, surveys suggest that cooked fish and other seafood may also be contaminated with *Listeria monocytogenes*.

Chemical Hazards

Biotoxins

The US reports PSP and ASP toxin in dungeness crabs, tanner crabs and red rock crabs.

xx.2.1.2 Potential Defects

Blue discoloration. Blue discoloration is a defect in canned crab meat and also, rarely, developing in crab meat several hours after boiling and cooling of the crabs. The blue color appears more often on the surface of the shoulder and other joint meats and in the claw meat. It appears in canned horse hair crab ("kegani") more often than in king crab. It is believed to be a result of copper containing hemocyanin in the blood (hemolymph) and may be avoided by eliminating the blood to the extent practicable in the cooking and canning process.

Another form of discoloration caused by fungus infection, particularly of snow crabs, is known as "black mat". While light infections may be physically removed, crabs with heavy infections should be culled as the shells cannot be completely cleaned and because there is tissue penetration of colorless hyphae that can affect the meat quality.
Other defects. Barnacles and other commensals including marine leeches are common defects in various crab species.

xx.2.2 Minimise the Deterioration of Crustaceans - Handling

Refer also to Section 4.3 – Minimise the Deterioration of Fish – Handling of the Proposed Draft Code of Practice for Fish and Fishery Product (ALINORM 01/18 – APPENDIX V)

- it is generally known that under similar conditions, the quality of crustaceans deteriorate more rapidly than fish and therefore care in maintaining the crustaceans live prior to processing is strongly recommended;
- since crustacean legs and other appendages can be easily broken and the damage can cause the risk of infection and weakening of the crustacean, care should be taken to handle live crustaceans at all times;
- tanks and wells for pounding live crustaceans should be so placed and constructed as to ensure survival of the crustaceans;
- time is one of the most effective methods in controlling crab product processing. It is strongly recommended that all operations in crab product processing be achieved as rapidly as possible;
- [good quality of crab butchered sections can be maintained by immediate cooking and chilling or freezing;]
- live crustaceans should be carefully packed in clean tanks, wells, crates, open-weave bag, or in boxes covered with wet sacking and held at as low a temperature as practicable, as required of varying species;
- holding tanks are regarded as a better method of storage for long-term handling than well storage;
- the use of clean Hessian or jute bags, for transport, is preferred. Bags made of woven synthetic material should not be used;
- where bags open weave are used for transport, precautions should be taken to avoid suffocation of crustaceans due to slime or mud;
- care also should be taken to maintain the necessary humidity in holding the crustaceans live in bags for transport;
- species, which mutilate each other, should have the claws banded as soon as possible after catching;
- if it is not possible to keep crustaceans alive until the time of processing, crabs should be butchered. Sections should be carefully separated and cleaned before freezing or cooling down to the temperature of melting ice, which should be done as rapidly as possible.

xx.2.3 Processing Operations –Crabs

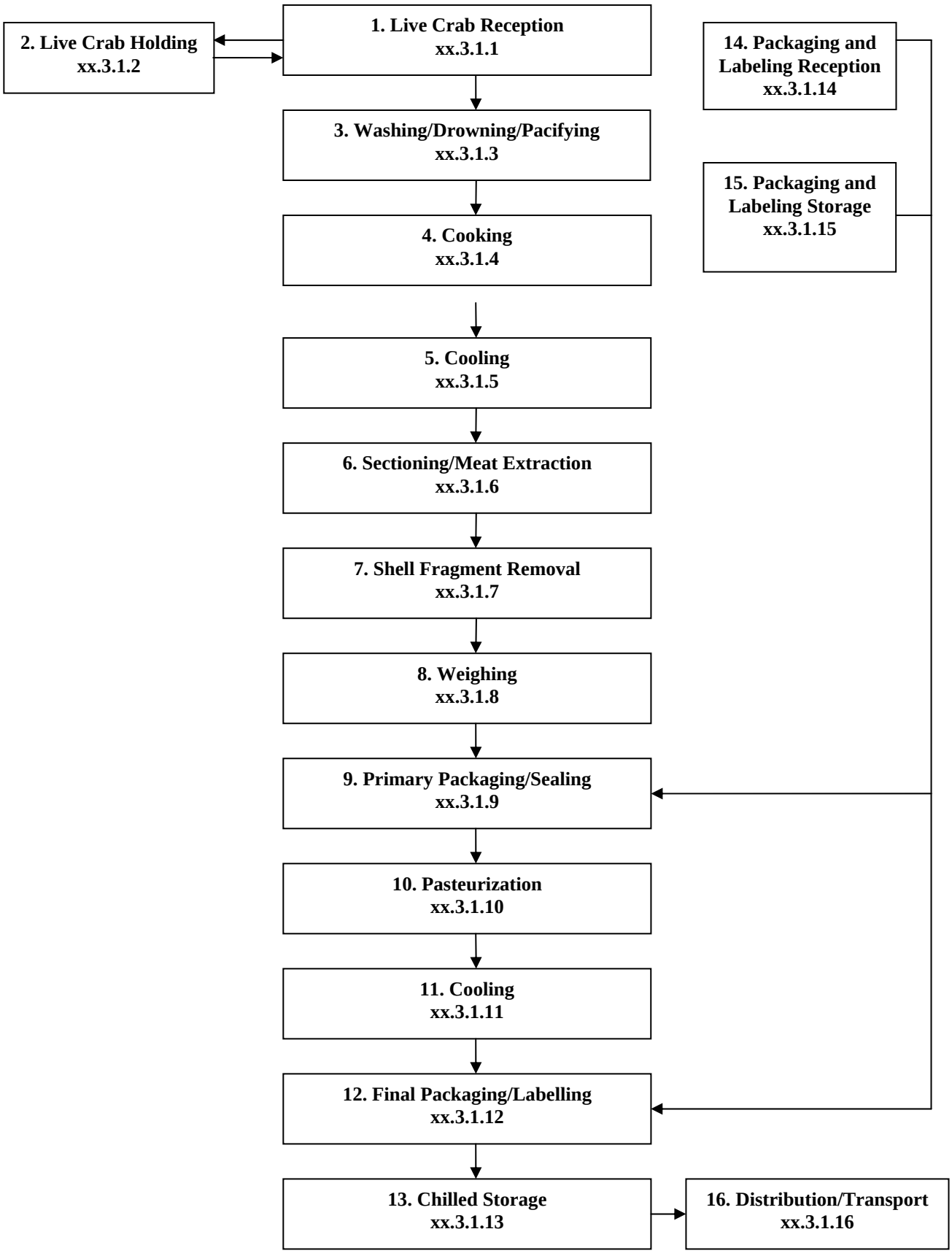
Once a processing facility has established a pre-requisite programme (section 3) the principles of HACCP (Section 5) can be applied to each individual process within that facility.

This section provides two examples of products derived from crabs. Special consideration was given to elaborate on products which involve heat treatment because of their potential impact on food safety (such as post processing handling). The products and their respective flow diagrams are as follows: Chilled and Frozen Cooked Crabs (Figure 13. 3)

and Chilled Pasteurized Crab Meat (Fig. 13.4). To provide an appreciation for other products of crabs, a reference has been included in Appendix A and B.

This flow chart is for illustrative purposes only. For in-factory HACCP implementation a complete and comprehensive flow chart has to be drawn up for each process

FIGURE xx.1 Example of a flow chart for the processing of pasteurized crabmeat



xx.3.1 Chilled Pasteurized Crab Meat

xx.3.1.1 Live Crab Reception (Processing Step 1)

Refer also to section 13.3.1.1 of this document.

Potential Hazards: *Phycotoxins (PSP and ASP),*

Potential Defects: *Reception of weak or injured crab, crab mortality, ecto-parasites, black shell.*

Technical Guidance:

- live crabs should be inspected upon receipt to ensure that they are alive, which can be demonstrated by active leg movement.
- training in species identification and communication in product specification should be provided to crab handlers and appropriate personnel to ensure a safe source of incoming crabs. Of special consideration are the reception and sorting crabs species at poses a risk of PSP and ASP toxins and parasites as well as defects, such as ecto-parasites and black shell;
- in factories which process crabs, any dead crabs should be discarded. Where sections are processed, any defective or deteriorated parts should be removed from the lot and disposed off in a proper manner;
- weak crabs should be processed immediately.

xx.3.1.2 Live Crab Holding (Processing Step 2)

Refer also to Section 6.1.2– Growing Water Quality and Section 13.3.1.2 – Live Lobster Holding

Potential Hazards: *Unlikely*

Potential Defects: *Crab Mortality*

Technical Guidance:

- live crabs should be stored in circulated sea water, at temperatures of their natural environment or slightly lower, depending on the species. Some species (e.g. *Ucides cordatus cordatus*) can be stored, during short periods, in tanks, without water;
- dead crabs should not be processed and should be rejected and disposed in a proper manner.

xx.3.1.3 Washing and Drowning or Pacifying (Processing Step 3)

Potential Hazards: *Unlikely*

Potential Defects: *Loss of Legs and claws, deterioration*

Technical Guidance:

- crabs should be washed in plenty of running potable water, or clean sea water, [or chlorinated water], to remove all impurities. For some species, scrubbing by brush may be necessary. These methods can be combined;
- crabs which are to be processed whole for fresh and frozen products should be pacified or killed just prior to cooking to prevent legs and claws loss. This may be accomplished by the following methods:

  --cooling the crabs for [twenty minutes or until two hours] at 0ºC or lower, depending of the species;

  --immersion of the crabs in potable water or clean sea water which is approximately 10-15ºC warmer than the natural environment of the species;

  --piercing of the two nerve centres by means of a stainless steel skewer or rod. A rod is inserted through one of the eyes and through the vent;

  --stunning the crabs by passing a weak electric current through seawater or freshwater in which the crabs are immersed;

  --since spoilage in dead crabs takes place very rapidly and any delay prior to cooking may reduce the meat quality, crabs that are rendered insensible or killed should be cooked immediately;

xx.3.1.4 Cooking (Processing Step 4)

Potential Hazards: *Survival of pathogenic micro-organisms due to insufficient cook, parasite (Paragonimus westermani).*

Potential Defects: *Poor texture due to overcooking, bluing discoloration due to undercooking.*

Technical Guidance:

- where the final product is to be marketed as cooked crabs in the shell or the shucked meat should be chilled to a temperature approaching 4° C. or less and either passed into the distribution chain or processed within 18 hours;
- in most cases the cooking of crabs in boiling water is preferred to steaming. Steaming has a tendency to dry the meat, resulting in the flesh adhering to the shell. Cooking utilizing continuous conveyors is recommended;
- Cooking should be carried out by appropriately trained personnel who has acquired the necessary skills to monitor and ensure that all crabs are given the same time/temperature exposure during the operation;
- adequate uniform cooking is essential because too much cooking causes excessive meat shrinkage, moisture loss, lower yields and poor texture. Too little cooking makes it difficult to remove the meat from the shell, may not adequately destroy pathogenic bacteria and may cause blue discoloration;
- cook time and temperatures must be sufficient to kill trematode parasites;
- it is difficult to specify cooking times and temperatures generally due to differences in size, structure and physiology of the different species of crabs. Considering these reasons, time and temperature should be previously determined for cooking operation to assure the accomplishment of the microbiological levels of pathogenic bacteria. In general, a minimum meat temperature of 82 to 93ºC (180 to 200ºF) should be achieved.
- [The following represents some general practices presently used in the industry for various crab species:

  Blue crab (whole crab):
  - steam retorted for 10 min after reaching 121ºC retort temperature and
  - boiling or steaming for a minimum of 15 min at 100ºC.

  King crab section:
  - one-stage cook - 22-25 min in seawater at 100ºC;
  - two-stage cook - 10 min at 71-75ºC followed by meat removal and a second cook for about 10 min at 100ºC in brine and
  - "green cook or partial cook" for canning where sections are blanched for 10-15 min at 100ºC.

  Snow crab and *Geryon* sections:
  - one-stage cook - 7-15 min at 100ºC depending on the size of the crab and
  - two-stage cook - 4 -5 min in water at 71-82ºC followed by meat removal and a second cook of 3-5 min in steam (100ºC) .

  Cancer species:
  - butchered sections - 10-15 min in water or steam at 100ºC and
  - whole crabs - inactivation followed by boiling or steaming 100ºC for 15-25 min depending on size.]

xx.3.1.5 Cooling (Processing Step 5)

Potential Hazards: *Microbiological contamination*

Potential Defects: *unlikely*

Technical Guidance:

- cooling should be done in cold circulated air, running potable water, refrigerated brine, or clean sea water;
- where crabs are cooked on a continuous basis, cooling is also best done on a continuous basis;
- cooling should be completed as quickly as possible and every effort should be made to avoid contamination of the product during this period;

- cooling in chill room must avoid cross contamination with raw product;
- the same water should not be used for cooling more than one batch;
- in some species, the body cavity contains a considerable amount of water, so that adequate drainage, in an area set aside for the purpose, is desirable;
- shell removal or sectioning should not be performed until the product has adequately cooled;

xx.3.1.6 Sectioning/Meat Extraction (Processing Step 6)

Potential Hazards: *Recontamination with pathogenic micro-organisms, microbiological growth, microbial toxin development.*

Potential Defects: *Presence of gills and viscera or foreign material*

Technical Guidance:

- after butchering, any remaining viscera and gills should be removed by brushing and washing. Proper cleaning at this stage is strongly recommended since it eliminates the risk of foreign material being included in the finished product;
- it is recommended that different staff be involved in operations with cooked and uncooked crabs, to avoid cross-contamination;
- picking or shaking operations should be carefully controlled to prevent contamination from bacteria and/or foreign materials;
- it is recommended that all types of meat are picked, packaged and either chilled [(internal temperature of 4.5ºC/40ºF or less) or frozen within two hours];
- depending on the vessel or processing facility product flow pattern and where a prescribed critical limit for staging time and temperature regime has been established for the control of hazards, the crab meat should be appropriately chilled in clean containers and stored in specially designated and appropriate areas within the processing facility;
- because of the possibilities of microbiological contamination, continuous mechanical processing is preferable to hand picking or shaking of white meat by batch processing;
- claws, leg tips and shell parts containing recoverable meat should be continuously separated, rapidly and efficiently, from waste material during the picking operation and should be kept chilled and free from contamination;
- meat recovery operation materials should be carried out continuously;

xx.3.1.7 Shell Fragments Removing (Processing Step 7)

Potential Hazards: *Presence of shell fragments, microbial toxin development*

Potential Defects: *Presence of viscera, foreign material*

Technical Guidance:

- particular care should be taken to ensure that shell fragments, viscera and foreign material are removed from crab meat since they are very objectionable to consumers and in some circumstances they may be dangerous;
- to minimize time delays, the design of the meat extraction and shell fragment removal line should be continuous to permit a uniform flow without stoppages or slow-downs and removal of waste.
- depending on the vessel or processing facility product flow pattern and where a prescribed critical limit for staging time and temperature regime has been established for the control of hazards, the crab meat should be appropriately chilled in clean containers and stored in specially designated and appropriate areas within the processing facility.
- the use of an ultraviolet light could improve the detection of shell fragments in crab meat. If the ultraviolet light is used it should be in compliance with the requirements of the official authorities having jurisdiction;

xx.3.1.8 Weighing (Processing Step 8)

Potential Hazards: *Survival of* Clostridium botulinum *spores*

Potential Defects: *Underweight cans.*

Technical Guidance:

- net weight of the crab contents should not exceed the critical parameters specified in the scheduled process as incomplete heat penetration due to overweight cans could affect heat penetration;
- care should be taken to ensure that minimum net weights on the label declaration are met;

xx.3.1.9 Primary-Packaging/Sealing (Processing Step 9)

Refer to Section 8.2.3 "Labelling" (NOTE: check that this is standard wording)

Refer to Section 16.4.7 – Packing in Containers (Filling, Sealing and Coding)

Potential Hazards: *Subsequent microbiological contamination due to a bad sealing*

Potential Defects: *Incorrect labelling*

Technical Guidance:

- packaging material should be clean, sound, durable, sufficient for its intended use and of food grade material;
- the operation, maintenance, regular inspection and adjustment of sealing machines should receive particular care;
- the sealing operation should be conducted by qualified personnel specially trained;
- packaging integrity of the finished product should be inspected at regular intervals by appropriately trained personnel to verify the effectiveness of the seal and the proper operation of the packaging machine;

xx.3.1.10 Pasteurisation (Processing Step 10)

Potential Hazards: *Survival of pathogens*

Potential Defects: *Deterioration*

Technical Guidance:

- pasteurising of product should be carried out by appropriately trained personnel who have acquired the necessary skills to monitor and ensure that all packages are given the same time/temperature exposure during the operation;
- pasteurisation should be carried out in hermetically sealed containers;
- crab meat should be pasteurised immediately after picking and packaging;
- to prevent any possible deterioration of the product the crab meat should be pasteurised immediately. It is preferable that the meat be at a temperature of approximately 18ºC (64.4ºF) when the containers are hermetically sealed to provide a slight vacuum after chilled storage temperatures;
- a time and temperature regime for the pasteurisation of different crab products should be established and should take into consideration the pasteurisation equipment and capacity, the physical properties of the crab and packaging container including their thermal conductivity, thickness, shape and temperature, to ensure that adequate heat penetration has been achieved for all containers in the lot;
- each container of crab meat should be exposed to a minimum processing temperature of 85ºC (185ºF) of at least 1 min at the geometric centre of the container;
- the water bath should be preheated to a temperature of 90ºC (194ºF) before the loaded basket is put into it. Special concern should be given to proper water circulation within the bath and around each individual container being pasteurised. Hot water bath temperature should remain constant until processing is completed;
- [Proper pasteurisation procedures for blue crab usually require a cooking time of 110 to 115 min when 401 flat cans are used.];
- once proper times and temperatures are established, they must be adhered to closely and pasteurisation processes should be standardized by accurate thermocouple measuring equipment. It is recommended that new equipment be standardized after installation and re-standardize on an annual basis or when difficulties are experienced;

- calibration and appropriate maintenance of temperature recording equipment should be performed on a regular basis to ensure accuracy;

xx.3.1.11 Cooling (Processing Step 11)

Potential Hazards: *Microbiological recontamination due to a bad sealing, poor/rough handling and contaminated water, formation of* Clostridium botulinum *toxin.*

Potential Defects: *Unlikely*

Technical Guidance:

- the pasteurized container of meat should be immediately cooled after processing.
- cooling is best accomplished in an ice water bath. The size of the cooling bath should exceed the size of the pasteurizing water bath to allow for an excess of ice, which is needed if the water is to be kept below 8ºC (46.4ºF) and a maximum cooling rate is to be realised. No water agitation is required since adequate convection currents are created by differences between bath and product temperatures;
- the water used at the cooling operation should be [chlorinated] in order to avoid recontamination of the product;
- the product should be removed from the ice bath when the temperature has been reduced to below 3.0ºC (38ºF) with subsequent transfer to chilled storage as quickly as possible;
- crates used to hold container in chilled storage should allow free passage of air currents in order to complete the cooling cycle;
- the processing facility should implement a traffic control system that will ensure that the unpasteurised product cannot be mixed with any pasteurized product.

xx.3.1.12 Final Packaging/Labelling (Processing Step 12)

Refer to Section 8.2.3 “Labelling”

Potential Hazards: *Unlikely*

Potential Defects: *Incorrect labelling, dehydration*

Technical Guidance:

- packaging material should be clean, sound, durable, sufficient for its intended use and of food grade material;
- the operation, maintenance, regular inspection and adjustment of sealing machines should received particular care;
- the sealing operation should be conducted by qualified personnel specially trained;
- packaging integrity of the finished product should be inspected at regular intervals by an appropriately trained personnel to verify the effectiveness of the seal and the proper operation of the packaging machine;

xx.3.1.13 Chilled Storage (Processing Step 13)

Potential Hazards: *Formation of Clostridium botulinum Toxin.*

Potential Defects: *Unlikely*

Technical Guidance:

- the pasteurized crab meat should be moved to the chilled storage facility without undue delay;
- the pasteurized product is perishable and unless it is kept chilled at a minimum temperature of below 3ºC (38ºF), there is a possibility that *Clostridium botulinum* may grow and produce toxins;
- the chillroom should be equipped with a calibrated indicating thermometer. Fitting of a recording thermometer is strongly recommended;

xx.3.1.14 Packaging and Labelling Reception (Processing Step 14)

Refer to Section 8.5.1 Reception – Packaging, Labels & Ingredients and Section

Potential Hazards: *Unlikely*

Potential Defects: *Contaminated packaging material*

Technical Guidance:

- packaging material should be inspected for signs of contamination;.
- labels should be examined for accuracy and to adherence to applicable regulations;

xx.3.1.15 Packaging/Labelling Storage (Processing Step 15)

Refer to Section 8.5.2 Storage – Packaging, Labels & Ingredients

Potential Hazards: *Unlikely*

Potential Defects: *Contaminated packaging material.*

Technical Guidance:

- packaging material should be protected from dust, dirt and other sources of contaminants;
- Pests and insects should be excluded from the packaging storage area;

xx.3.1.16 Distribution/Transport (Processing Step 16)

Refer to Section 17 – Recommended Code of Practice for Transport

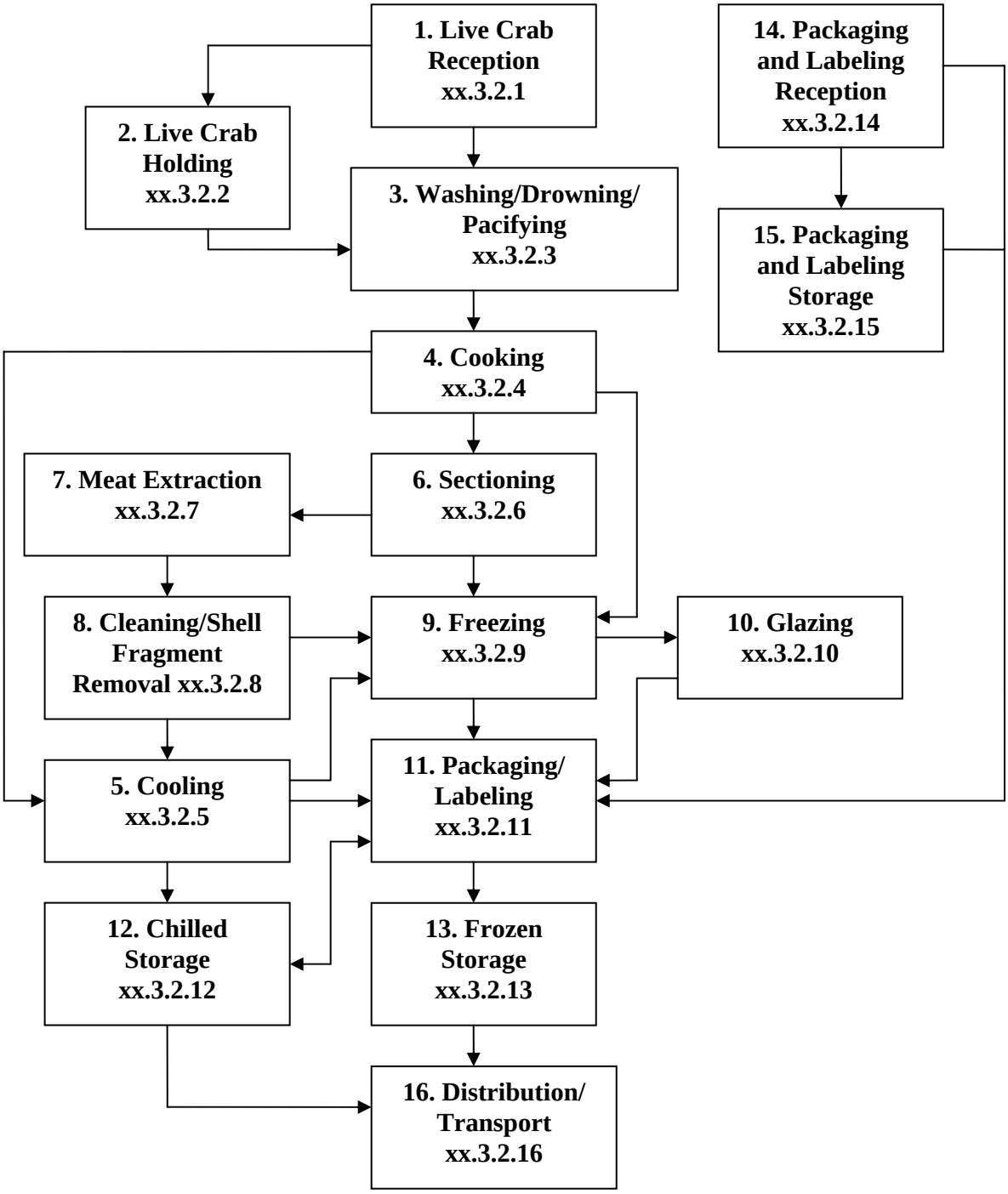
Potential Hazards: *Microbiological growth*

Potential Defects: *Thawed frozen products*

Technical Guidance:

This flow chart is for illustrative purposes only. For in-factory HACCP implementation a complete and comprehensive flow chart has to be drawn up for each process.

Figure xx.2 Example of flow chart for Chilled and Frozen Cooked Crab



xx.3.2 Chilled and Frozen Cooked Crab

xx.3.2.1 Live Crab Reception (Processing Step 1)

Refer to section xx.3.1.1 of this document.

xx.3.2.2 Live Crab Holding (Processing Step 2)

Refer also to Section xx.3.1.2 of this document.

xx.3.2.3 Washing and Drowning or Pacifying (Processing Step 3)

Refer to Section xx.3.1.3 of this document.

xx.3.2.4 Cooking (Processing Step 4)

Refer to Section xx.3.1.4 of this document.

xx.3.2.5 Cooling (Processing Step 5)

Potential Hazards: *Microbiological contamination*

Potential Defects: *unlikely*

Technical Guidance:

- cooling should be done in cold circulated air, running potable water, refrigerated brine, or clean sea water;
- where crabs are cooked on a continuous basis, cooling is also best done on a continuous basis;
- cooling should be completed as quickly as possible and every effort should be made to avoid contamination of the product during this period;
- cooling in chill room must avoid cross contamination with raw
- the same water should not be used for cooling more than one batch;
- in some species, the body cavity contains a considerable amount of water, so that adequate drainage, in an area set aside for the purpose, is desirable;
- shell removal or sectioning should not be performed until the product has adequately cooled;
- Care should be taken to ensure that crosscontamination of cooked crabs does not occur e.g.
  - Cooling crabs in baskets should not be placed on the floor;
  - Cooling crab should be covered or otherwise protected from condensations;
  - Product contact surfaces should be washed and/or sanitized at regular intervals to avoid bacterial build up and contamination;
- Cooked crabs should be handled as a ready-to-eat product that has its normal microflora destroyed which can allow pathogens to proliferate.

xx.3.2.6 Sectioning (Processing Step 6)

Potential Hazards: *Recontamination with pathogenic micro-organisms, microbiological growth, microbial toxin development.*

Potential Defects: *Presence of gills and viscera*

Technical Guidance:

- after butchering, any remaining viscera and gills should be removed by brushing and washing. Proper cleaning at this stage is strongly recommended since it eliminates the risk of foreign material being included in the finished product;
- it is recommended that different staff be involved in operations with cooked and uncooked crabs, to avoid cross-contamination;

xx.3.2.7 Meat Extraction (Processing Step 7)

Potential Hazards: *Recontamination with pathogenic micro-organisms, microbiological growth, microbial toxin development.*

Potential Defects: *Presence of gills, viscera or foreign material*

Technical Guidance:

- it is recommended that different staff be involved in operations with cooked and uncooked crabs, to avoid cross-contamination;
- picking or shaking operations should be carefully controlled to prevent contamination from bacteria and/or foreign materials;
- it is recommended that all types of meat are picked, packaged and either chilled [(internal temperature of 4.5ºC/40ºF or less) or frozen within two hours];
- depending on the vessel or processing facility product flow pattern and where a prescribed critical limit for staging time and temperature regime has been established for the control of

hazards, the crab meat should be appropriately chilled in clean containers and stored in specially designated and appropriate areas within the processing facility;

- because of the possibilities of microbiological contamination, continuous mechanical processing is preferable to hand picking or shaking of white meat by batch processing;
- claws, leg tips and shell parts containing recoverable meat should be continuously separated, rapidly and efficiently, from waste material during the picking operation and should be kept chilled and free from contamination;

xx.3.2.8 Shell Fragments Removing/Cleaning (Processing Step 8)

Refer to Section xx.3.1.7 of this document.

xx.3.2.9 Freezing (Processing Step 9)

Refer to section 8.3.1 – Freezing Process

Potential Hazards: *Unlikely*

Potential Defects: *Poor texture.*

Technical Guidance:

- adequate commercial freezing equipment should be used to quickly freeze the product and minimize the crystallization of moisture in the flesh (e.g. cryogenic, blast or brine freezing systems);
- brine media in brine freezing systems should be replaced regularly to prevent the build up of dirt and foreign matter;

xx.3.2.10 Glazing (Processing Step 10)

Refer to section 8.3.2 – Glazing

Potential Hazards: *Unlikely*

Potential Defects: *Incomplete glaze, foreign material.*

Technical Guidance:

- glaze water should be replaced regularly to prevent build-up of foreign material;
- chilling of glaze water will result in a more uniform application of glaze that will better protect the product;

xx.3.2.11 Packaging/Labelling (Processing Step 11)

Refer to Section xx.3.1.12 of this document

xx.3.2.12 Chilled Storage (Processing Step 12)

Refer to Section 8.1.2 – Chilled Storage.

Potential Hazards: *Microbiological Growth*

Potential Defects: *Decomposition, foreign matter*

Technical Guidance:

- temperatures in chilled storage should be 4° C. or less;
- product should be properly protected to avoid contamination by condensates and splashing water;

xx.3.2.13 Frozen Storage (Processing Step 13)

Refer to Section 8.1.3 – Frozen Storage.

Potential Hazards: *Unlikely*

Potential Defects: *Freezer burn, dehydration*

Technical Guidance:

- product should be properly packaged to protect against freezer burn and dehydration;
- glazing is recommended as a further measure to ensure against dehydration;

xx.3.2.14 Packaging/Labelling Reception (Processing Step 14)

Refer to Section xx.3.1.14 of this document.

xx.3.2.15 Packaging/Labelling Storage (Processing Step 15)

Refer to Section xx.3.1.15 of this document.

xx.3.2.16 Distribution/Transport (Processing Step 16)

Refer to Section 17 – Recommended Code of Practice for Transport

SECTION 13 - PROCESSING OF LOBSTERS

In the context of recognising controls at individual processing steps, this section provides examples of potential hazards and defects and describes technological guidelines, which can be used to develop control measures and corrective action. At a particular step only the hazards and defects, which are likely to be introduced or controlled at that step, are listed. It should be recognised that in preparing a HACCP and/or DAP plan it is essential to consult Section 5 which provides guidance for the application of the principles of HACCP and DAP analysis. However, within the scope of this Code of Practice it is not possible to give details of critical limits, monitoring, record keeping and verification for each of the steps since these are specific to particular hazards and defects.

This section applies to lobsters **in the genus *Homarus*, and to rock lobsters, spiny lobsters, and slipper lobsters in the genera *Palinurida*, and *Scyllaridea*, and to squat lobsters in the genera *Cervimundia* and *Pleuronocedes*, and the Norwegian lobster, *Nephrops norvegicus*.**

13.1 GENERAL – ADDITION TO PRE-REQUISITE PROGRAMME

In addition to the pre-requisite programme outlined in Section 3 of this document, the processing facility operators are encouraged to evaluate the design and construction of their facility and the maintenance and sanitation of their operation, specific to the processing of lobsters. Consideration should be given to the following:

13.1.1 Design and Construction of Equipment and Utensils

- in batch systems the inactivation tank, cooker and cooling tank should be located adjacent to each other and may be provided with an overhead hoist or gantry provided to transfer baskets from one to the other;
- cookers should be designed to provide constant and adequate supply of heat so that all crustaceans could be given the same time/temperature exposure during the cooking operation;
- a chamber of adequate length, through which an open link conveyor passes and which is equipped with spray nozzles so that the lobsters are sprayed from all sides, may be used for the purpose.

13.1.2 Hygiene Control Programme

- When in-factory chlorination of water is used, the minimum residual content of free chlorine should be maintained at the effective level for the use intended.
- Chlorinating system should not be relied upon to solve all hygiene problems.
- water, which has been in contact with crustaceans, should not be re-used unless reconditioned to avoid taint problems;
- if it is unavoidable for the same workers to handle the raw as well as the cooked, stringent precautions should be taken to prevent contamination of the cooked product by micro-organisms from raw material;

13.2 General Considerations for the Handling of Lobsters

Refer to Section 4 – General Considerations for the Handling of Fresh Fish and Shellfish of the Proposed Draft Code of Practice for Fish and Fishery Product (ALINORM 01/18 – APPENDIX V)

13.2.1. Potential Hazards and Defects Associated with Lobsters

Refer also to Section 4.1 Potential Hazards Associated with Fresh Fish and Shellfish and Section 5.3.3.1 Identification of Hazards and Defects

13.2.1.1 Potential Hazards

Bacteria

Staphylococcus aureus in an aerobic or facultatively anaerobic gram positive spherical micro-organism. It is coagulase-positive and ferments glucose. Some strains can produce enterotoxins.

Staphylococcus is not found in the normal microflora on fish. The natural habitat for this organism is the skin and mucous membranes of animal and man. The presence of Staphylococcus on fish is an indication of post-harvest contamination due to poor personal hygiene. The organism is a poor competitor and will not multiply in fish. However, in fish or shellfish products, where the normal flora is reduced or eliminated (i.e. cooked peeled shrimp or crab meat), the presence of staphylococci indicates a potential for food poisoning.

Although the data are limited, surveys suggest that cooked fish and other seafood may also be contaminated with Lysteria monocytogenes.

Chemical Hazards

Biotoxins

PSP toxin has been identified in the viscera of lobster (*Homarus* spp.).

13.2.1.2 Potential Defects

Black discoloration. Black discoloration is caused by melanin formation most commonly in the ventral tail segment joints. It develops in the integumentary tissues and muscle surfaces, but does not occur in the muscle meat tissue. The use of sulfating agents to prevent this discoloration is a common practice and may result in unacceptable residues. The potential for residues of sulfating agents leads to labeling requirements because these chemicals are common allergens.

13.2.2 Minimise the Deterioration of Crustaceans - Handling

Refer also to Section 4.3 – Minimise the Deterioration of Fish – Handling of the Proposed Draft Code of Practice for Fish and Fishery Product (ALINORM 01/18 – APPENDIX V)

- it is generally known that under similar conditions, the quality of crustaceans deteriorate more rapidly than fish and therefore care in maintaining the crustaceans live prior to processing is strongly recommended;
- since crustacean legs and other appendages can be easily broken and the damage can cause the risk of infection and weakening of the crustacean, care should be taken to handle live crustaceans at all times;
- tanks and wells for pounding live crustaceans should be so placed and constructed as to ensure survival of the crustaceans;
- live crustaceans should be carefully packed in clean tanks, wells, crates, open-weave bag, or in boxes covered with wet sacking and held at as low a temperature as practicable, as required of varying species;
- holding tanks are regarded as a better method of storage for long-term handling than well storage;
- the use of clean Hessian or jute bags, for transport, is preferred. Bags made of woven synthetic material should not be used;
- where bags open weave are used for transport, precautions should be taken to avoid suffocation of crustaceans due to slime or mud;
- care also should be taken to maintain the necessary humidity in holding the crustaceans live in bags for transport;
- species, which mutilate each other, should have the claws banded as soon as possible after catching;
- if it is not possible to keep crustaceans alive until the time of processing, lobsters should be killed. Tails should be carefully separated and cleaned before freezing or cooling down to the temperature of melting ice, which should be done as rapidly as possible.

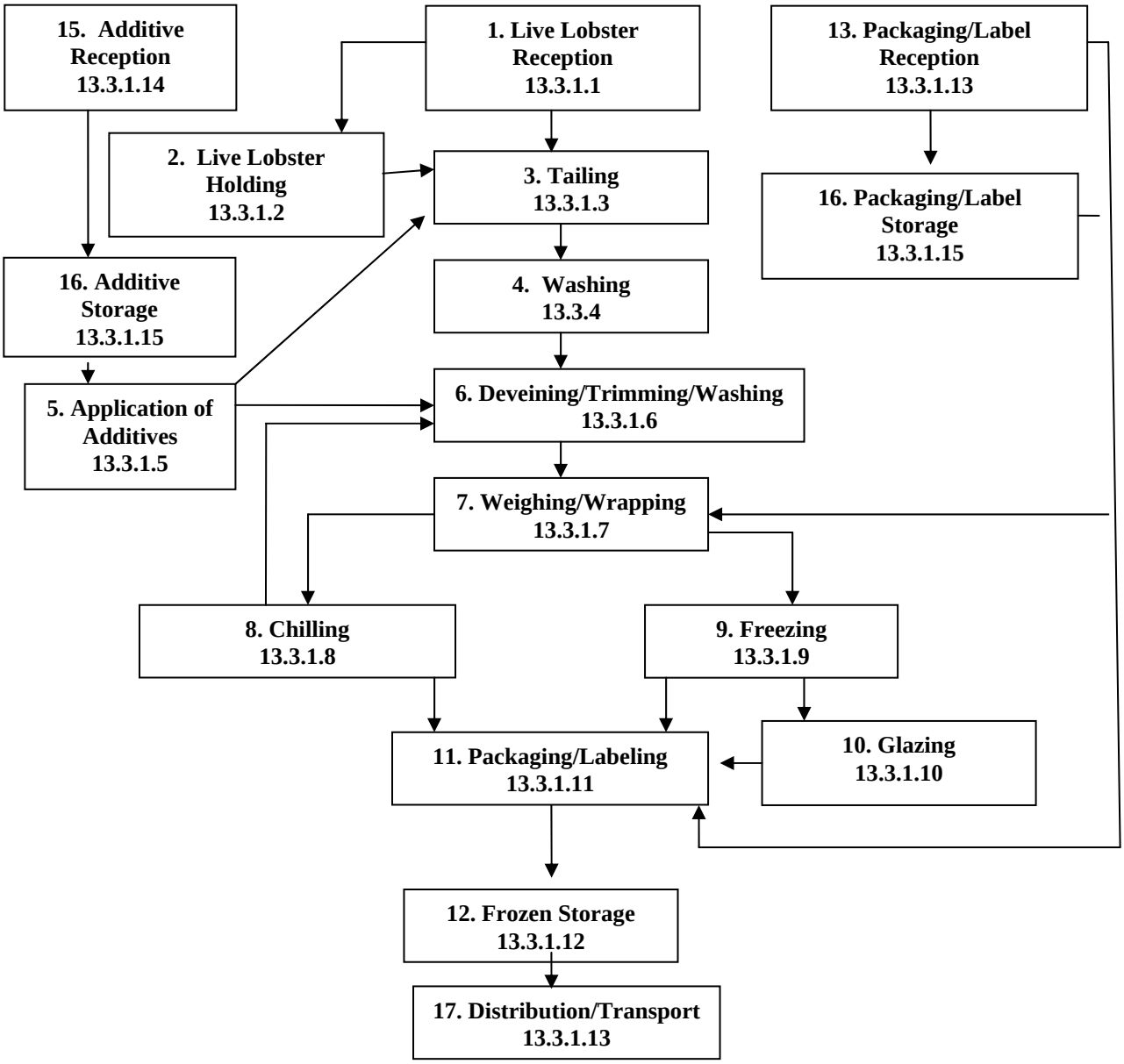
13.3 Processing Operations – Lobsters

Once a processing facility has established a pre-requisite programme (section 3) the principles of HACCP (Section 5) can be applied to each individual process within that facility.

This section provides two examples of products derived from lobsters. Special consideration was given to elaborate on products which involve heat treatment because of their potential impact on food safety (such as post processing handling). The products and their respective flow diagrams are as follows: Frozen Raw Lobster Tails (Fig. 13.1), Chilled Cooked Whole Lobster/Chilled Cooked Lobster Meat (Fig. 13.2), To provide an appreciation for other products of lobsters, a reference has been included in Appendix A and B.

This flow chart is for illustrative purposes only. For in-factory HACCP implementation a complete and comprehensive flow chart has to be drawn up for each process

Figure 13.1 Example of flow chart for frozen raw lobster processing



13.3.1 Frozen Raw Lobster Tail

13.3.1.1 Live Lobster Reception (Processing Step 1)

Potential Hazards: *Phycotoxins (PSP Homarus spp only).*

Potential Defects: *Reception of weak or injured lobsters, lobster mortality*

Technical Guidance:

- live lobsters should be inspected upon receipt to ensure that they are alive, which can be demonstrated by active leg movement and the tail of lobsters being curled light by underneath the body when the lobster is picked up;
- lobsters which are dead or may pose a hazard to human health should not be processed, should be rejected and disposed of in a proper manner;
- weak lobsters should be processed immediately;

- since lobster legs and other appendages can be easily broken and the damage can cause to risk of infection and weakening of the lobsters, care in handling should be applied to live lobsters at all times. The necessary skills should be acquired by lobster handlers;
- training in species identification and communication in product specification should be provided to lobster handlers and appropriate personnel to ensure a safe source of incoming lobsters. Of special consideration are the reception and sorting of lobster species that poses a risk of PSP toxin;
- lobsters should be rejected if they are known to contain harmful or extraneous substances and/or defects which will not be eliminated or reduced to an acceptable level by normal procedures of sorting or preparation. An appropriate assessment should be carried out to determine the reason(s) for loss of control and the HACCP or DAP plan should be modified where necessary.

13.3.1.2 Live Lobster Holding (Processing Step 2)

Refer also to Section 13.2.2 – Minimise the Deterioration of Crustaceans – Handling, of this document. Refer also to "Section 6.1.2 – Growing Water Quality".

Potential Hazards: *Drug residue*

Potential Defects: *Lobster mortality*

Technical Guidance:

- all live lobsters should be processed as soon as possible;
- storage time should be monitored where appropriate and should be as short as practical;
- to minimise damage, black discoloration (melanosis) and mortality losses during captivity, especially for the moulting stage of lobsters, over-crowding should be avoided and this can be achieved by controlling the stocking density;
- for short-term storage, live lobsters should be held in suitable containers and in land-based tanks and wells that should be supplied with running sea water;
- dead whole lobsters should not be processed and should be rejected and disposed in a proper manner. An appropriate assessment should be carried out to determine the reason(s) for loss of control and the DAP plan should be modified where necessary.
- If drugs are used, appropriate withdrawal times must be followed.

13.3.1.3 Tailing (Processing Step 3)

Potential Hazards: *Microbiological contamination*

Potential Defects *Improper tailing*

Technical Guidance:

- when lobsters are not landed alive, the tail and cephalothorax should be separated immediately after catching. This practice is strongly recommended as they are brought on board. Tails should be carefully separated and cleaned before freezing or cooling down to the temperature of melting ice, which should be done as rapidly as possible;
- tailing should be carried out as rapidly as possible;

13.3.1.4 Washing (Processing Step 4)

Refer also to section 8.1.5 – Washing and Gutting.

Potential Hazards: *Unlikely*

Potential Defects: *Poor cleaning*

Technical Guidance:

- lobster tails should be washed in plenty of running potable water, or clean sea water, or chlorinated water, to remove all impurities;

13.3.1.5 Application of Additives to Lobster Tails (Processing Step 5)

Potential Hazards: *The use of non-approved additives; incorrect application of Sulphites[1].*

Potential Defects: *Physical contamination, black spots due to inadequate application of Sulphites[7], incorrect application of Phosphates[7].*

Technical Guidance:

- Mixing and application of appropriate additives should be carried out by trained operators;
- Regular checks of the additive levels should be carried out.
- Tails with black spots should be discarded.
- Non-approved additives should not be allowed in the processing facility.

13.3.1.6 De-veining/Trimming/Washing (Processing Step 6)

Refer to Section 8.1.5 – Washing and Gutting of the Proposed Draft Code of Practice for Fish and Fishery Product (ALINORM 01/18 – APPENDIX V)

Potential Hazards: *Microbiological contamination*

Potential Defects: *Incomplete de-veining, decomposition, dark membrane attached to the shell, physical contamination*

Technical Guidance:

- the intestine should be removed immediately and consideration should be given to use methods such as ejection by water pressure, vacuum, or physical removal by appropriate utensils (such as scissors, knives or extractors);
- skills should be acquired by lobster handlers with particular attention being given to the removal of membrane and blood from the front end of the tail where the meat is exposed;
- an adequate supply of clean water, potable water [or chlorinated water] should be available for the washing of de-veined and trimmed lobster tails to ensure that no remnants of the gut or its contents remain;
- the de-veined or trimmed lobster tails should be washed and well iced or appropriately chilled in clean containers and stored in specially designated and appropriate areas within the processing facility;
- the de-veining process should be carried out quickly to prevent product spoilage. Tails waiting for de-veining should be kept on ice or refrigerated at 4ºC or less.

13.3.1.7 Weighing /Wrapping (Processing Step 7)

Potential Hazards: *Unlikely*

Potential Defects: *Incorrect net weight, inadequate wrapping, inappropriate packaging material*

Technical Guidance:

- lobster tails should be graded into species, sizes and weights for the relevant market, to assure the economic integrity of the final product;
- calibrated balances should be provided for accurate grading;
- balances should be calibrated periodically with a standardized weight to ensure accuracy;
- packaging material should be clean, sound, durable, sufficient for its intended use and of food grade material;
- care should be taken to ensure that the front end of tail where the meat is exposed is completely wrapped to protect against dehydration;
- weights of finished packages should be monitored at regular intervals to assure that they are the proper net weight.

13.3.1.8 Chilling (Processing Step 8)

Refer to sections 4.2 – Time and Temperature Control.

Potential Hazards: *Unlikely.*

[1] List of additive names for "sulphites"and "phosphates"can be found in the Codex Standard for Quick Frozen Lobsters (Codex Stan. 95-1981. Rev. 1-1995)

Potential Defects: *Decomposition*

Technical Guidance:

- for lobster tails, chilling in refrigerated sea water is not recommended because excessive salt penetration into the muscle will take place rapidly. However, refrigerated clean water systems can be used for rapid pre-cooling before freezing or storage in ice;
- chilling should take place as rapidly as possible to prevent microbiological growth and deterioration.

13.3.1.9 Freezing (Processing Step 9)

Refer to section 8.3.1 – Freezing Process

Potential Hazards: *Unlikely*

Potential Defects: *Poor texture*

Technical Guidance:

- air blast, liquid nitrogen, or other freezing methods should be rapid to produce high quality tails and to ensure that the textural qualities of the product are retained;
- the freezing and storage of whole uncooked lobsters is not recommended.

13.3.1.10 Glazing (Processing Step 10)

Refer to Section 8.3.2 – Glazing

Potential Hazards: *Microbiological growth*

Potential Defects: *Incomplete glaze, foreign matter*

Technical Guidance:

- glazing is considered complete when the entire surface of the frozen fish product is covered with a suitable protective coating of ice and should be free of exposed areas where dehydration (freezer burn) can occur;
- if additives are used the water for glazing, care should be taken to ensure its proper proportions and application with product specifications;
- where the labeling of a product is concerned, information on the amount or proportion of glaze applied to a product or a production run should be kept and used in the determination of the net weight which is exclusive of the glaze;
- glaze water should be replaced regularly to ensure that a high bacterial load does not occur and to prevent build-up of foreign material;
- chilling of glaze water will result in a more uniform application of glaze that will better protect the product;

13.3.1.11 Final Packaging/Labelling (Processing Step 11)

Refer to Section 8.2.3 – Labeling.

Potential Hazards: *Absence of labelling of allergenic additives*

Potential Defects: *Subsequent dehydration, incorrect labelling.*

Technical Guidance:

- packaging material should be clean, sound, durable, sufficient for its intended use and of food grade material;
- care should be taken to ensure that the front end of tail where the meat is exposed is completely wrapped to protect against dehydration.
- where sulphites were used in the process, care should be taken to ensure that this additive is properly declared on the label.

13.3.1.12 Frozen Storage (Processing Step 12)

Refer to Section 8.1.3 – Frozen Storage

Potential Hazards: Unlikely

Potential Defects: Freezer burn, dehydration.

Technical Guidance:

- products should be properly packaged to protect against freezer burn and dehydration;
- glaze is recommended as a further measure to ensure against dehydration;

13.3.1.13 Packaging and Label Reception (Processing Step 13)

Refer to section 8.5.1 – Reception – Packaging, Labels & Ingredients

Potential Hazards: *Unlikely*
Potential Defects: *Contaminated packaging, incorrect labels.*
Technical Guidance:

- packaging materials should be examined for signs of contamination;
- labels should be examined for accuracy and to adherence to applicable regulations;

13.3.1.14 Additives Reception (Processing Step 15)

Refer to section 8.5.1 – Reception – Packaging, Labels & Ingredients

Potential Hazards: *Biological, chemical and physical contamination*
Potential Defects: *Contamination, mislabelling*
Technical Guidance:

- Additive shipments should be examined to ensure that they are not contaminated and that the container integrity is sufficient;
- Additive shipments should be examined to ensure that they are the correct chemical and meet purchase specifications;

13.3.1.15 Additives, Packaging and Label Storage (Processing Steps 14 and 16)

Refer to Section 8.5.2 – Storage – Packaging, Labels & Ingredients.

Potential Hazards: Unlikely
Potential Defects: Contaminated additives or packaging material.
Technical Guidance:

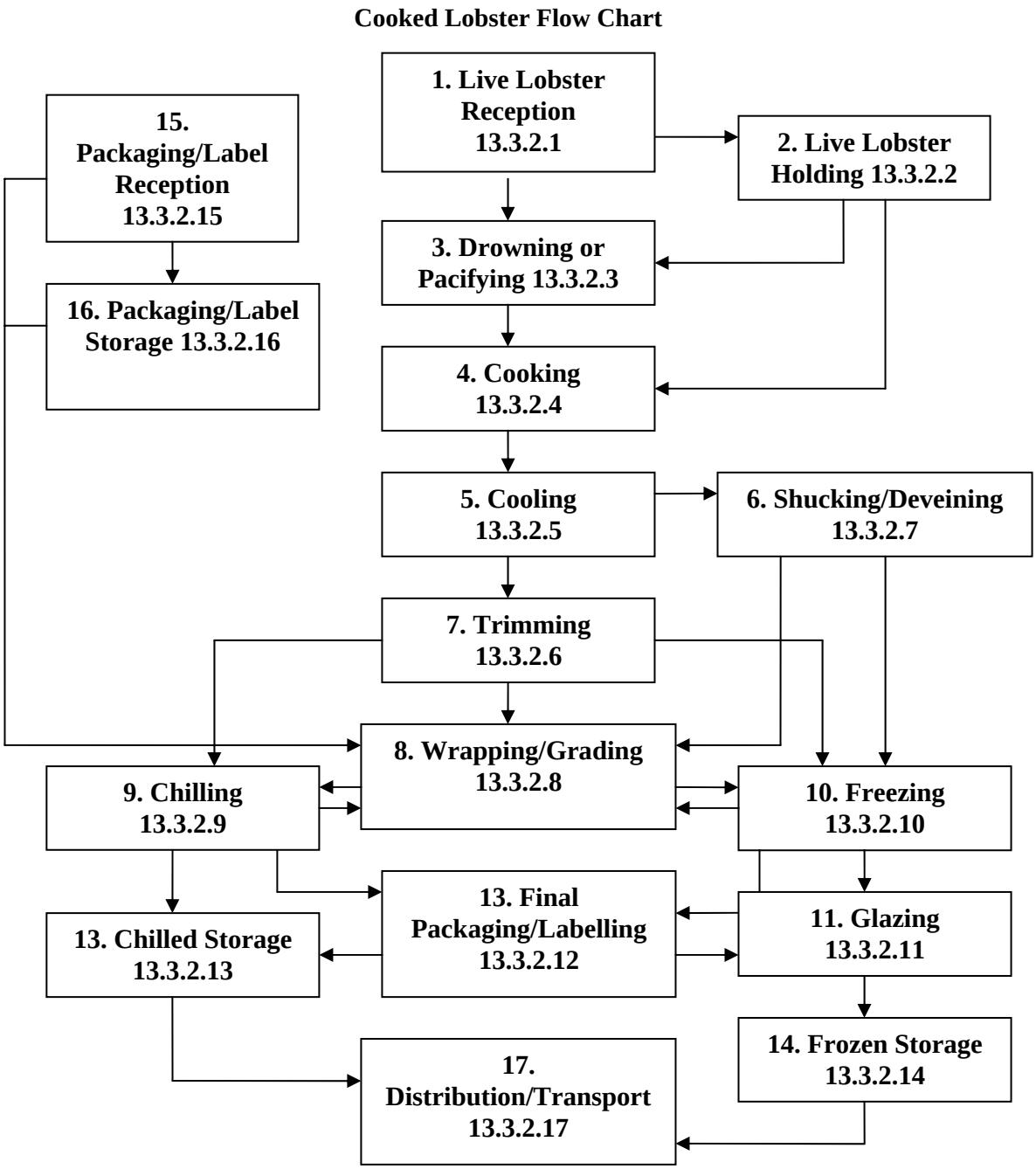
- food additives and packaging material should be protected from dust, dirt and other sources of contaminants;
- pests and insects should be excluded from the packaging storage area;

13.3.1.16 Distribution and Transport (Process Step 17)

Refer to Section 17 – Recommended Code of Practice for Transport

This flow chart is for illustrative purpose only. For in-factory HACCP implementation a complete and comprehensive flow chart has to be drawn up for each process

Figure 13.2 Example of Flow Chart for Processing of Cooked Lobsters



13.3.2 Chilled and Frozen Cooked Whole Lobster and Cooked Lobster Meat

This section is designed with additional operation steps pertaining specifically to Cooked Whole Lobster and Cooked Lobster Meat.

13.3.2.1 Live Lobster Reception (Processing Step 1)

Refer to Subsection 13.3.1.1 of this document.

13.3.2.2 Live Lobster Holding (Processing Step 2)

Refer to subsection 13.3.1.4 of this document

13.3.2.3 Drowning or Pacifying (Processing Step 3)

Potential Hazards: *Unlikely*

Potential Defects: *Unlikely*

Technical Guidance:

- some species (not *Homarus*) are prepared for cooking by drowning suffocation in clean water with a low oxygen content or by immersing in chilled clean water;
- another possible process is an electric shock (pulse) in potable water, clean water or brine.

13.3.2.4 Cooking (Processing Step 4)

Potential Hazards: *Survival of pathogenic micro-organisms due to insufficient cooking*

Potential Defects: *Over / undercooking*

Technical Guidance:

- a cooking schedule for boiling or steaming should be designed which takes into consideration the appropriate parameters which can affect the cook such as time/temperature and size of the lobster;
- cooking should be carried out by appropriately trained personnel who have acquired the necessary skills to monitor and ensure that all lobsters are given the same time/temperature exposure and adequate heat penetration during the operation ;
- each cooker should be equipped with a suitable thermometer to show the cooking operation temperature. Fitting of a recording thermometer is strongly recommended. A simple device to indicate time of cooking should be supplied.
- lobsters should be cooked according to size until the shell is uniformly orange-red in colour, and depending on the product, until the meat can be easily removed from the shell. Overcooking causes the meat to shrink excessively, lower yields and undercooking makes it difficult to remove the meat from the shell;

13.3.2.5 Cooling (Processing Step 5)

Potential Hazards: *Microbiological*

Potential Defects: *Unlikely*

Technical Guidance:

- cooling times should be kept as short as possible and every effort should be made to avoid contamination of the product during this period;
- cooling should be done in a proper manner, immediately after cooking, to end it uniformly throughout the batch and to avoid holding at temperatures which would encourage the growth of bacteria;
- cooling should be done in cold circulated air, running potable water or clean sea water;
- where lobsters are cooked on a continuous basis, cooling is also best done on a continuous basis;
- cooling should be completed as quickly as possible and every effort should be made to avoid contamination of the product during this period;
- the same water should not be used for cooling more than one batch;
- shell removal should not be performed until the product has adequately cooled;
- Care should be taken to ensure that cross contamination of cooked lobsters does not occur e.g.
  - Cooling lobsters in baskets should not be placed on the floor;
  - Cooling lobsters should be covered or otherwise protected from condensations;
  - Product contact surfaces should be washed and/or sanitized at regular intervals to avoid bacterial build up and contamination;
- Cooked lobsters should be handled as a ready-to-eat product that has its normal microflora destroyed which can allow pathogens to proliferate.

13.3.2.6 Trimming (Processing Step 7)

Potential Hazards: *Microbiological contamination*

Potential Defects: *Unlikely*

Technical Guidance:

- an adequate supply of clean sea water, potable water or [chlorinated water] should be available to remove adhering coagulate protein. Spray washing on a conveyor is sometimes sufficient but it may be necessary to brush by hand. These methods can be combined;
- all surfaces and brushes should be frequently cleaned during operation in order to minimise the microbial activity of contact surface and utensils;

13.3.2.7 Shucking, De-veining and Washing (Processing Step 6)

Potential Hazards: *Microbiological recontamination during shucking and de-veining, microbial proliferation, microbial toxin development*

Potential Defects: *Presence of shell fragments*

Technical Guidance:

- the shucking and de-veining of cooked lobsters should be done quickly and carefully, in order to provide an attractive product and prevent cross-contamination of cooked product with raw crustacean or any questionable material;
- depending on the vessel or processing facility product flow pattern and where a prescribed critical limit for staging time and temperature regime has been established for the control of hazards, the shucked or de-veined cooked lobster should be washed and appropriately chilled in clean containers and stored in specially designated and appropriate areas within the processing facility;
- lobster meat should be thoroughly washed on all surfaces in cold potable water, clean sea water or [chlorinated water];

13.3.2.8 Wrapping/Grading (Processing Step 8)

Potential Hazards: *Unlikely*

Potential Defects: *Incorrect grading, inadequate wrapping, inappropriate packaging material*

Technical Guidance:

- lobster should be graded into species, sizes and weights for the relevant market, to assure the economic integrity of the final product;
- lobster meats should be uniform in size;
- calibrated balances should be provided for accurate grading;
- balances should be calibrated periodically with a standardized weight to ensure accuracy;
- wrapping material should be clean, sound, durable, sufficient for its intended use and of food grade material;

13.3.2.9 Chilling (Processing Step 9)

Refer to sections 4.2 – Time and Temperature Control.

Potential Hazards: *Unlikely.*

Potential Defects: *Unlikely*

Technical Guidance:

- chilling lobsters in refrigerated sea water is not recommended because excessive salt penetration into the muscle will take place rapidly. However, refrigerated clean water systems can be used for rapid pre-cooling before freezing or storage in ice;
- chilling should take place as rapidly as possible to prevent microbiological growth and deterioration.

13.3.2.10 Freezing (Processing Step 10)

Refer to section 8.3.1 – Freezing Process

Potential Hazards: *Unlikely*

Potential Defects: *Unlikely*

Technical Guidance:

- air blast, liquid nitrogen, or other freezing methods should be rapid to produce high quality whole lobsters and lobster meats to ensure that the textural qualities of the product are retained;
- the freezing and storage of whole uncooked lobsters is not recommended.

13.3.2.11 Glazing (Processing Step 11)

Refer to Section 13.3.1.10 of this document

13.3.2.12 Final Packaging/Labelling (Processing Step 12)

Refer to Section 8.2.3 – Labeling.

Potential Hazards: *Absence of labelling of allergenic additives*

Potential Defects: *Subsequent dehydration, incorrect labelling.*

Technical Guidance:

- packaging material should be clean, sound, durable, sufficient for its intended use and of food grade material;
- care should be taken to ensure that exposed lobster meats are completely wrapped to protect against dehydration.

13.3.2.13 Chilled Storage (Processing Step 13)

Refer to Section 8.1.2 – Chilled Storage

Potential Hazards: *Microbiological growth*

Potential Defects: *Decomposition, foreign matter*

Technical Guidance:

- temperatures in chilled storage should be 4° C or less;
- product should be properly protected to avoid contamination by condensates and splashing water;

13.3.2.14 Frozen Storage (Processing Step 14)

Refer to Section 13.3.1.12 of this document.

13.3.2.15 Packaging/Label Reception (Processing Step 15)

Refer to Section 13.3.1.13 of this document.

13.3.2.16 Packaging/Label Storage (Processing Step 16)

Refer to Section 8.5.2 – Storage – Packaging, Labels & Ingredients.

Potential Hazards: Unlikely

Potential Defects: Contaminated Packaging Material.

Technical Guidance:

- packaging material should be protected from dust, dirt and other sources of contaminants;
- Pests and insects should be excluded from the packaging storage area;

13.3.2.17 Distribution and Transport (Process Step 17)

Refer to Section 17 – Recommended Code of Practice for Transport