CODEX ALIMENTARIUS
INTERNATIONAL FOOD STANDARDS

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STANDARD FOR SALTED FISH AND DRIED SALTED FISH OF THE GADIDAE FAMILY OF FISHES

CXS 167 - 1989

Adopted in 1989. Revised in 1995, 2005. Amended in2011, 2013, 2016, 2018.

1. SCOPE

This standard applies to salted fish and dried salted fish of the *Gadidae* family which has been fully saturated with salt (heavy salted) or to salted fish which has been preserved by partial saturation to a salt content not less than 12% by weight of the salted fish which may be offered for consumption without further industrial processing.

2. DESCRIPTION

2.1 Product Definition

Salted fish is the product obtained from fish:

(a) of the species belonging to the family *Gadidae*; and

(b) which has been bled, gutted, beheaded, split or filleted, washed, salted.

(c) dried salted fish is salted fish which have been dried.

2.2 Process Definition

The product shall be prepared by one of the salting processes defined in 2.2.1 and one or both of the drying processes defined in 2.2.2 and according to the different types of presentation as defined in 2.3.

2.2.1 *Salting*

(a) Dry Salting (kench curing) is the process of mixing fish with suitable food grade salt and stacking the fish in such a manner that the excess of the resulting brine drains away.

(b) Wet Salting (pickling) is the process whereby fish is mixed with suitable food grade salt and stored in watertight containers under the resultant brine (pickle) which forms by solution of salt in the water extracted from the fish tissue. Brine may be added to the container. The fish is subsequently removed from the container and stacked so that the brine drains away.

(c) Brine Injection is the process for directly injecting brine into the fish flesh and is permitted as a part of the heavy salting process.

2.2.2 *Drying*

(a) Natural Drying - the fish is dried by exposure to the open air; and

(b) Artificial Drying - the fish is dried in mechanically circulated air, the temperature and humidity of which may be controlled.

2.3 Presentation

2.3.1 ***Split fish*** - split and with the major length of the anterior of the backbone removed (about two-thirds).

2.3.2 ***Split fish with entire backbone*** - split with the whole of the backbone not removed.

2.3.3 ***Fillet*** - is cut from the fresh fish, strips of flesh is cut parallel to the central bone of the fish and from which fins, main bones and sometimes belly flap is removed.

2.3.4 ***Other presentation***: any other presentation of the product shall be permitted provided that it

(i) is sufficiently distinctive from the other forms of presentation laid down in this Standard;

(ii) meets all other requirements of this Standard; and

(iii) is adequately described on the label to avoid confusing or misleading the consumer.

2.3.5 ***Individual containers*** shall contain only one form of presentation from only one species of fish.

3. ESSENTIAL COMPOSITION AND QUALITY FACTORS

3.1 Fish

Salted fish shall be prepared from sound and wholesome fish, fit for human consumption.

3.2 Salt

Salt used to produce salted fish shall be clean, free from foreign matter and foreign crystals, show no visible signs of contamination with dirt, oil, bilge or other extraneous materials and comply with the requirements laid down in the *Code of Practice for Fish and Fishery Products* (CXC 52-2003).

3.3 Final Product

Products shall meet the requirements of this standard when lots examined in accordance with Section 9. comply with the provisions set out in Section 8. Products shall be examined by the methods given in Section 7.

4. FOOD ADDITIVES

Preservatives used in accordance with Tables 1 and 2 of the General Standard for Food Additives (CXS 192-1995) in food category 09.2.5 (Smoked, dried, fermented, and/or salted fish and fish products, including mollusks, crustaceans, and echinoderms) and its parent food categories are acceptable for use in foods conforming to this Standard.

5. HYGIENE

It is recommended that the products covered by the provisions of this Standard be prepared and handled in accordance with the appropriate sections of the *General Principles of Food Hygiene* (CXC 1-1969), the*Code of Practice for Fish and Fishery Products* (CXC 52-2003), and other relevant Codex Codes of Hygienic Practice and Codes of Practice.

The products should comply with any microbiological criteria established in accordance with the *Principles and Guidelines for the Establishment and Application of Microbiological Criteria Related to Foods* (CXG 21-1997).

6. LABELLING

In addition to the provisions of the *General Standard for the Labelling of Prepackaged Foods* (CXS 1-1985), the following specific provisions apply:

6.1 Name of the Food

The name of the food to be declared on the label shall be "salted fish", "wet salted fish" or "salted fillet" "dried salted fish" or "klippfish" or other designations according to the law, custom or practice in the country in which the product is to be distributed. In addition, there shall appear on the label in conjunction with the name of the product, the name of the species of fish from which the product is derived.

For forms of presentation other than those described in 2.3.1 "split fish", the form of presentation shall be declared in conjunction with the name of the product in accordance with sub-section 2.3.2 as appropriate. If the product is produced in accordance with sub-section 2.3.3, the label shall contain in close proximity to the name of the food, such additional words or phrases that will avoid misleading or confusing the consumer.

The term "klippfish" can only be used for dried salted fish which has been prepared from fish which has reached 95% salt saturation prior to drying.

The term "wet salted fish" can only be used for fish fully saturated with salt.

6.2 Labelling of Non-Retail Containers

Information specified above shall be given either on the container or in accompanying documents, except that the name of the food, lot identification, and the name and address of the manufacturer or packer shall always appear on the container.

However, lot identification, and the name and address may be replaced by an identification mark, provided that such a mark is clearly identifiable with the accompanying documents.

7. SAMPLING, EXAMINATION AND ANALYSES

7.1 Sampling

(i) Sampling of lots for examination of the product shall be in accordance with an appropiate sampling plan with an AQL of 6.5. A sample unit shall be the primary container or where the product is in bulk, the individual fish is the sample unit.

(ii) Sampling for net weight shall be carried out in accordance with the *General Guidelines on Sampling*(CXG 50-2004).

7.2 Sensory and Physical Examination

Samples taken for sensory and physical examination shall be assessed by persons trained in such examination and in accordance with procedures elaborated in Annex A and in accordance with *Guidelines for the Sensory Evaluation ofFish and Shellfish in Laboratories* (CXG 31 - 1999).

7.3 Determination of Net Weight

The net weight (excluding packaging material and excess salt) of each sample unit in the sample lot shall be determined.

7.4 Preparation of Fish Sample

1. Before preparing of a sub-sample adhering salt crystals should be removed by brushing from the surface of the sample without using water.
2. The preparation of fish samples for the determination of salt content, and water content in order to calculate the % salt saturation of the fish should be carried out according to AOAC 937.07. The analysis should be on the edible portion of the fish.
3. Determination should be performed at least in duplicate.

7.5 Determination of Salt Content

1. Principle

The salt is extracted by water from the preweighed sample. After the precipitation of the proteins, the chloride concentration is determined by titration of an aliquot of the solution with a standardized silver nitrate solution (Mohr method) and calculated as sodium chloride.

2. Equipment and chemicals

- Brush
- Sharp knife or saw
- Balance, accurate to □0.01 g
- Calibrated volumetric flasks, 250 ml
- Erlenmeyer flasks
- Electric homoginizer
- Magnetic stirrer
- Folded paper filter, quick running
- Pipettes
- Funnel
- Burette
- Potassium hexacyano ferrate (II), K4Fe(CN)6·3H2O, 15% w/v (aq)
- Zinc sulphate, ZnSO4·6H2O, 30% w/v (aq)
- Sodium hydroxide, NaOH, 0.1 N, 0.41% w/v (aq)
- Silver nitrate, AgNO3, 0.1 N, 1.6987% w/v (aq), standardized
- Potassium chromate, K2CrO4 5% w/v (aq)
- Phenolphthalein, 1% in ethanol
- Distilled or deionized water

3. Procedure

(i) Five gram of homogenized subsample is weighted into a 250 ml volumetric flask and vigorously shaken with approximately 100 ml water.

(ii) Five millilitre of potassium hexacyano-ferrate solution and 5 ml of zinc sulphate solution are added, the flask is shaken.

(iii) Water is added to the graduation mark.

(iv) After shaking again and allowing to stand for precipitation, the flask content is filtered through a folded paper filter.

(v) An aliquot of the clear filtrate is transferred into an Erlenmeyer flask and two drops ofphenolphthalein are added. Sodium hydroxide is added dropwise until the aliquot takes on a faint red colour. The aliquot then diluted with water to approximately 100 ml.

(vi) After addition of approximately 1 ml potassium chromate solution, the diluted aliquot is titrated under constant stirring, with silver nitrate solution. Endpoint is indicated by a faint, but distinct, change in colour. This faint reddish-brown colour should persist after brisk shaking.

To recognize the colour change, it is advisable to carry out the titration against a white background.

(vii) Blank titration of reagents used should be done.

(viii) Endpoint determination can also be made by using instruments like potentiometer or colorimeter.

4. Calculation of results

In the equation of the calculation of results the following symbols are used:

A= volume of aliquot (ml)

C= concentration of silver nitrate solution in N

V= volume of silver nitrate solution in ml used to reach endpoint and corrected for blank value

W= sample weight (g)

The salt content in the sample is calculated by using the equation:

Salt concentration (%) = (V x C x 58.45 x 250 x 100) / (A x W x 1000)

Results should be reported with one figure after the decimal point.

5. Reference method

As reference method a method should be used which includes the complete ashing of the sample in a muffle furnace at 550°C before chloride determination according to the method described above (leaving out steps (ii) and (iv)).

6. Comments

By using the given equation all chloride determined is calculated as sodium chloride. However it is impossible to estimate sodium by this methodology, because other chlorides of the alkali and earth alkali elements are present which form the counterparts of chlorides.

The presence of natural halogens other than chloride in fish and salt is negligible.

A step, in which proteins are precipitated (ii), is essential to avoid misleading results.

7.6 Determination of Water Content

i) Determination of % salt saturation as required by the standard, should be in accordance to AOAC 950.46.B (Airdrying (a))

ii) Determination of water content in the whole fish, when needed in the commercial trade of klippfish and wet salted fish, the method of sampling the fish should be carried out according to the "Determination of Water Content in Whole Fish by Cross Section Method" defined in Annex B.

8. DEFINITION OF DEFECTIVES

8.1 The sample unit shall be considered defective when it exhibits any of the properties defined below.

8.1.1 ***Foreign Matter***

The presence in the sample unit of any matter which has not been derived from Gadidae fish, does not pose a threat to human health, and is readily recognized without magnification or is present at a level determined by any method including magnification that indicates non-compliance with good manufacturing and sanitation practices.

8.1.2 ***Odour***

A fish affected by persistent and distinct objectionable odours indicative of decomposition (such as sour, putrid, etc.) or contamination by foreign substances (such as fuel oil, cleaning compounds, etc.).

8.1.3 ***Pink***

Any visible evidence of red halophilic bacteria.

8.1.4 ***Appearance***

Textural breakdown of the flesh which is characterized by extensive cracks on more than 2/3 of the surface area or which has been mutilated, torn or broken through to the extent that the split fish is divided into two or more pieces but still held together by skin.

8.2 The sample unit shall be considered defective when 30% or more of the fish in the sample unit are affected by any of the following defects.

8.2.1 ***Halophilic Mould (dun)***

A fish showing an aggregate area of pronounced halophilic mould clusters on more than 1/3 of the total surface area of the face side.

8.2.2 ***Liver Stains***

A pronounced yellow or yellowish orange discoloration caused by the presence of liver and affecting more than 1/4 of the total surface area of the face of the fish.

8.2.3 ***Intense Bruising***

Any fish showing more than 1/2 of the face of the fish with intense bruising.

8.2.4 ***Severe Burning***

A fish with more than 1/2 of the back (skin side) tacky or sticky due to overheating during drying.

9. LOT ACCEPTANCE

A lot shall be considered as meeting the requirements of this standard when:

(i) the total number of defectives as classified according to Section 8 does not exceed the acceptance number (c) of an appropriate sampling plan with an AQL of 6.5;

(ii) the average net weight of all sample units is not less than the declared weight, provided no individual container is less than 95% of the declared weight; and

(iii) the total number of sample units not meeting the form of presentation as defined in Section 2.3 does not exceed the acceptance number (c) of an appropriate sampling plan with an AQL of 6.5;

(iv) the Food Additives, Hygiene and Labelling requirements of Sections 4, 5 and 6 are met.

ANNEX A

SENSORY AND PHYSICAL EXAMINATION

1. Examine every fish in the sample in its entirety.
2. Examine the product for the form of presentation.
3. Examine the fish for foreign matter, pink conditions, halophilic mould, liver stains, intense bruising, severe burning and texture.
4. Assess odour in accordance with the *Guidelines for the Sensory Evaluation of Fish and Shellfish in Laboratories* (CXG 31-1999).

ANNEX B

DETERMINATION OF WATER CONTENT IN WHOLE FISH BY CROSS SECTION METHOD

1 PRINCIPLE

The fish is cut in sections as described in method. The sections are cut in smaller bits to a collectedsample. The water content of the collected sample is determined by drying. Examinations and experience have shown that the water content of this collected sample is closed to the “true” water content of the fish.

2 EQUIPMENT

- Soft brush
- Basins (steel, glass, porcelain)
- Scissors
- Band saw
- Knife
- Weight, 1 g precision
- Oven. 103-105°C
- Desiccator

3 PREPARATION OF SAMPLE

Salt particles on the surface of the fish are brushed away.

The weight of the fish is determined to 1 g accuracy.

The length of the fish is measured as the distance between the cleft in the tail and a line drawn between the tips of the earbones.

4 PROCEDURE

(i) The sampling of the fish is described in the enclosed figure.

A) Wet salted fish is sliced in sections by knife

B) Salted and dried salted fish is sliced in sections by band saw.

1) A section of 20mm measured from a line drawn between the earbones, dotted line onfigure, is cut.

2) The next cut is a 40 mm section.

3) A 2 mm section is cut from the front part of the 40 mm section and collected (see 7.Comments).

4) The next cut is a new cut of a 40 mm section.

5) A 2 mm section is cut from the front part of the 40 mm section and collected.

6) The entire fish is cut in 40 mm sections from which are cut 2 mm sections (see enclosedfigure).

7) All sections of 2mm, marked II, IV, VI, VIII in the figure, even numbers, are collected toa collected sample.

(ii) The 2mm sections in the collected sample are cut with scissors in smaller pieces directly in taredbasins just after the fish is cut.

(iii) The basins containing the sample are weighted.

(iv) The basins containing the samples are put in the oven at 103-105°C for drying to constant weight (18 hours over night).

(v) The basins are taken from the oven to a desiccator and cooled.

(vi) The basins are weighted.

5. CALCULATION OF RESULTS

In the equation of the calculation of results the following symbols are used:

W1 = Weight of fish and basins before drying, g.

W2 = Weight of fish and basins after drying, g.

Ws = Weight of tared basins, g

The water content in the fish is calculated by using the equation:

Water content, g/100g = 100*(W1-W2)/ (W1 – Ws)

The result is reported to the nearest gram, together with the length and the weight of the analysed fish.

6. CONTROL ANALYSIS OF WHOLE FISH.

The determination of water content in whole fish by cross section method appears to give the closest result compared to water content determined by the drying of the whole fish (ALINORM 03/18, Appendix IX)

7. COMMENTS

Each sampled fish should be packed and sealed in a plastic bag before analysis. The samples should be stored under chilled or refrigerated conditions from the time of sampling to the time of analysis.

The analysis must be performed as soon as possible after the fish has been sampled.

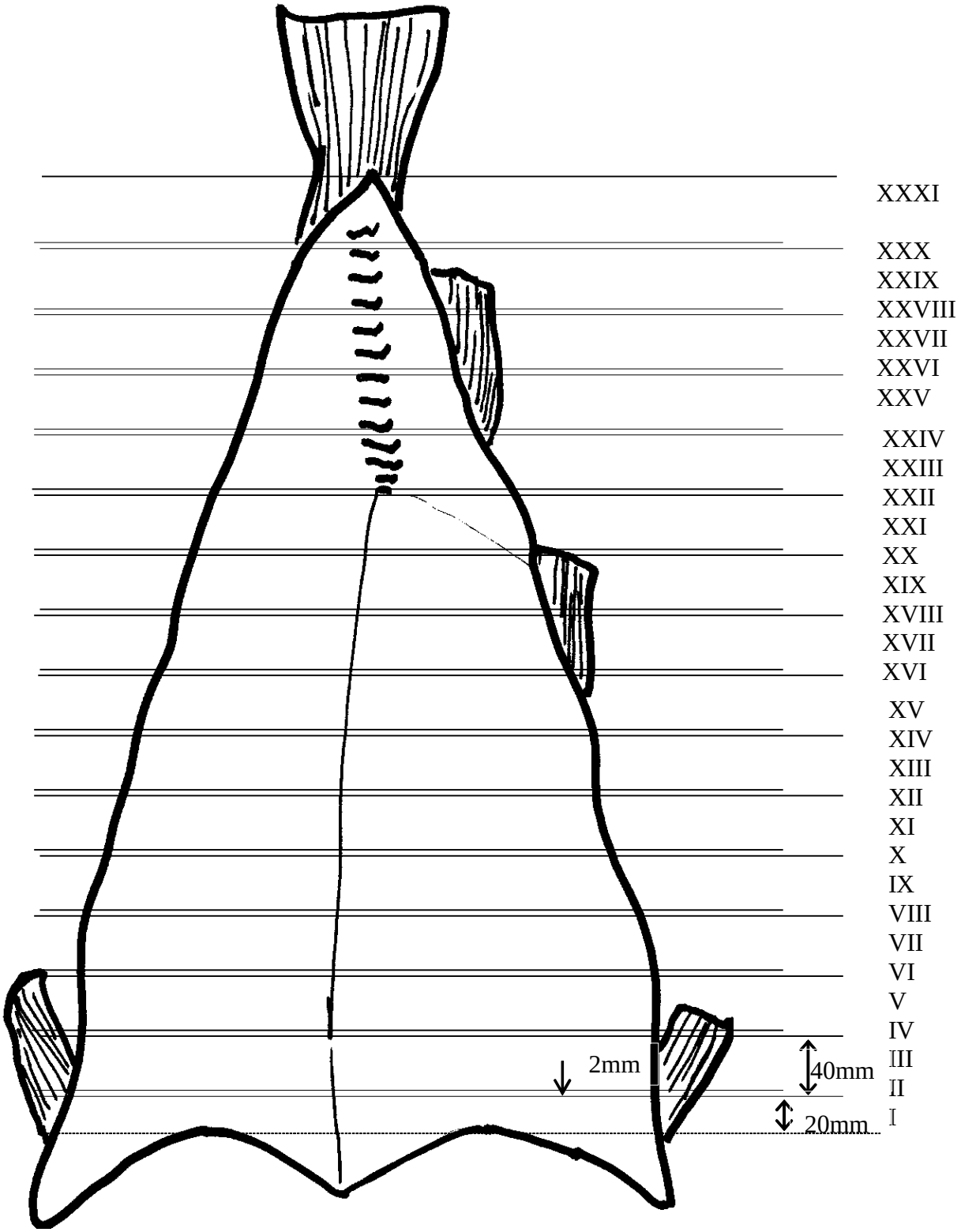
It might be difficult to cut sections of 2 mm when the fish has a water content above 50% but the section must be close to 2 mm.

To minimise the loss of water from the 2mm sections it is important to weight the collected sample immediately after the fish is cut in sections.

Determination should be performed at least in duplicate.

FIGURE

Sampling procedure.



All sections labelled by even numbers, II, IV, VI, VIII etc. are collected to constitute one sample.