codex alimentarius commission

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

WORLD HEALTH ORGANIZATION

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Agenda Item 9 **CX/FFP 08/29/7**

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

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Trondheim, Norway, 18 - 23 February 2008

PROPOSED DRAFT STANDARD FOR SMOKED FISH, SMOKED-FLAVOURED FISH AND SMOKED-DRIED FISH
(at Step 3 of the elaboration procedure)

The 28th Session of the Committee on Fish and Fishery Products agreed to establish an electronic working group led by the Netherlands to revise the proposed draft standard for circulation at Step 3 for comments and further discussion by the next session of the Committee. In addition it agreed that the electronic working group would collect and collate data on all other types of products and make recommendations for consideration by the Committee on whether other products should be included in the current proposed draft standard or whether there was a need for the development of a new standard to cover products other than those already covered in the standard (ALINORM 07/30/18, para 121).

The Netherlands together with the electronic working group prepared the Proposed Draft Standard as attached for comments at Step 3 and consideration by the Committee.

In preparing the current draft, the electronic working group noted the proposals made by several delegations at the last session of the Committee to separate the proposed draft standard into parts dealing with traditionally smoked, smoke-flavoured products and smoked-dried fish. However, due to the similarity in 80% of the content for each of these parts, it was agreed by most members of the electronic working group to retain it as one document to enhance its user-friendliness.

The electronic working group further collected and collated data on all other types of smoked products. Following this study, it became clear that a distinction should be made between artificial smoke flavours, and smoke flavours derived from the process which is defined under "smoking" in the process definitions. This has been included in the document.

Governments and international organizations wishing to provide comments should do so in writing, preferably by email, to the Secretary, Codex Alimentarius Commission, Joint FAO/WHO Food Standards Programme – FAO, Viale delle Terme di Caracalla - 00153 Rome, Italy, Fax: +39 (06) 5705 4593, E-mail: codex@fao.org, with a copy to Codex Contact Point, Norwegian Food Control Authority, P.O. Box 8187 Dep. 0034 Oslo, Norway, Fax: +47.74.11.32.01, E-mail: ccffp@mattilsynet.no, **before 15 December 2007**.

PROPOSED DRAFT STANDARD FOR SMOKED FISH, SMOKE-FLAVOURED FISH AND SMOKE-DRIED FISH

(Prepared by an electronic working group led by the Netherlands)

1. SCOPE

This standard applies to smoked, smoke-flavoured and smoke-dried fish prepared from fresh, chilled or frozen raw material. It deals with whole fish, fillets and sliced- and similar products thereof. The standard applies to fish, either for direct consumption, for further processing, or for addition into speciality or minced products where fish constitutes only part of the edible contents.

It does not apply to fish treated with carbon monoxide (filtered, "clear" or 'tasteless' smoke), fish packaged in hermetically sealed containers processed to commercial sterility. Speciality or minced products as such are not included. (e.g., fish-salads).

2. DESCRIPTION

2.1 SMOKED FISH

2.1.1 Product definition

Smoked fish is prepared from fish that has undergone a hot or cold smoking process that renders a product that is generally eaten without further cooking. The smoke must be applied through a traditional smoking process and the end product must have smoked sensory characteristics.

Countries where the products are to be consumed may allow these products in an uneviscerated state or may require evisceration , either before or after processing, since the margin of error in the control of *Clostridium botulinum* is small even when good practices are followed and the consequences are severe.

2.1.2 Process definitions

- **"Smoking"** is the traditional process of treating fish by exposing it to the smoke from burning or smoldering plant materials [or smoke concentrates (liquid smoke) derived from burning or smoldering plant materials]. The traditional process is characterised by an integrated combination of salting, drying, heating and smoking steps in a smoking chamber (kiln).
- **"Hot smoking**" is a smoking process in which pre-salted and pre-dried fish is smoked at an appropriate combination of temperature and time sufficient to cause the complete denaturation of the fish flesh, to kill parasites being present completely and to destruct non-spore forming pathogens of human concern**.**
- **"Cold smoking"** is a smoking process in which fish is treated at an appropriate temperature and time combination sufficient to lower water activity (drying). A cold smoking process will not cause considerable coagulation of the fish flesh.
- "**Salting**" is a process in which fish is salted or pre-salted with salt (sodium chloride) of food grade quality to lower water content in fish flesh to facilitate the smoking process and to enhance flavour by any appropriate salting technology (e.g. dry salting, brining, injection salting).
- **"Drying**" is a process in which the moisture content in the fish flesh is decreased by exposing the fish to circulating air.
- "**Packaging**" is a process in which smoked fish is put in a container, either aerobically or under reduced oxygen conditions, including under vacuum or in a modified atmosphere.
- "**Storage"** is a process in which smoked fish is stored refrigerated or frozen to assure their safety and quality in conformity with Sections 3 and 5.

2.2 SMOKE FLAVOURED FISH

2.2.1 Product definition

Smoke flavoured fish is prepared from fish that has been treated with smoke flavours, without undergoing a smoking process in a smoking chamber (kiln). The fish can be eaten without further

processing. The smoke flavour can be applied to the fish through dipping, spraying, injecting or any other technology. The end product must have smoke sensory characteristics.

Countries where the products are to be consumed may allow these products in an uneviscerated state or may require evisceration, either before or after processing, since the margin of error in the control of *Clostridium botulinum* is small even when good practices are followed and the consequences are severe. The product is either intended for direct human consumption or for further processing.

2.2.2 Process definition

- **Smoke flavours** are either smoke condensates or artificial flavour blends prepared by mixing chemically-defined substances in known amounts or any combination of both (smoke-preparations).
- "**Smoke flavouring**" is a process in which fish or fish preparations are treated with smoke flavour. The smoke flavour can be applied by any technology (e.g. dipping, spraying, injecting).
- "**Packaging**" is a process in which smoke-flavoured fish is put in a container, either aerobically or under reduced oxygen conditions, including under vacuum or in a modified atmosphere.
- "**Storage"** is a process in which smoke-flavoured fish is stored refrigerated or frozen to assure their safety and quality in conformity with Sections 3 and 5.

2.3 SMOKE-DRIED FISH

2.3.1 Product definition

Smoke-dried fish is prepared from fish that has undergone a combined smoke-drying process that renders a product that needs further processing, for instance cooking, before it can be consumed. The fish is smoke-dried for flavour and preservation purposes. The smoke must be applied through a smoke-drying process traditional for the respective country or an industrial smoke-drying process and the end product must have smoke sensory characteristics.

Countries where the products are to be consumed may allow these products in an uneviscerated state or may require evisceration, either before or after processing

2.3.2 Process definition

- "**Smoke drying**" is a process in which fish is treated by combined smoking and drying steps to such an extent that the final product can be stored and transported without refrigeration.
- "**Drying**" is a process in which the moisture content in the fish flesh is decreased by exposing the fish to circulating air, mechanical dryers or natural conditions using sun and wind energy.
- "**Salting**" is a process in which fish is salted or pre-salted with salt (sodium chloride) of food grade quality to lower water content in fish flesh to facilitate the smoking process and to enhance flavour by any appropriate salting technology (e.g. dry salting, brining, injection salting).
- "**Packaging"** Smoke-dried fish should be packed in a way to avoid contamination.
- "**Storage"** Smoke-dried fish is typically stored at ambient temperature in a way to assure its safety and quality in conformity with Sections 3 and 5.

2.4 Presentation

Any presentation of the product shall be permitted provided that it meets all requirements of this standard, and it is adequately described on the label to avoid confusing or misleading the consumer.

3. ESSENTIAL COMPOSITION AND QUALITY FACTORS

3.1 The raw material

Smoked fish, smoke-flavoured fish and smoke-dried fish shall be prepared from sound and wholesome fish, which may be fresh, chilled or frozen, and of a quality to be sold for human consumption after appropriate preparation.

3.2 Ingredients

All ingredients used shall be of food grade quality and conform with all applicable Codex standards.

3.3 Wood or other plant material for generation of smoke

Wood or other plant material used for the generation of smoke or smoke-concentrates must not contain toxic substances either naturally or through contamination, or after having been treated with chemicals, paint or impregnating materials. In addition, wood or other plant material must not exhibit any signs of visible contamination and be free from visible microbiological or fungal growth.

3.4 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.

3.5 Decomposition

The product shall not contain more than 10 m. of histamine per 100g. fish flesh based on the average of the sample unit tested.

4. FOOD ADDITIVES

[All additives used shall be of food grade quality and conform to all applicable Codex standards. Food additives to be allowed in smoked fish to be elaborated.]

5. HYGIENE AND HANDLING

5.1 The products covered by the provisions of this standard shall be prepared and handled in accordance with the appropriate sections of the recommended International Code of Practice – General Principles of Food Hygiene (CAC/RCP 1-1969) and other relevant Codex texts such as codes of practice and codes of hygienic practice, such as the Code of Practice for Fish and Fishery Products (CAC/RCP 52-2003).

5.2 The products shall comply with any microbiological criteria established in accordance with the Principles for the Establishment and Application of Microbiological Criteria in Foods (CAC/RCP 21-1997).

5.3. Polycyclic Aromatic Hydrocarbons (PAH)

Benzo(a)Pyrene is widely accepted as indicator for the level of Polycyclic Aromatic Hydrocarbons. No sample unit of smoked fish and smoke-flavoured fish shall contain a level of Benzo(a)Pyrene level that exceeds 5 microgram /kg fish muscle in the end product. For smoke-dried fish this level applies only to the final ready to eat product.

5.4 Parasites

Smoked fish and smoke-flavoured products, shall not contain living parasites (e.g. larvae of nematodes) and particular attention needs to be paid to cold smoked products. Viability of nematodes and cestodes and trematodes shall be examined according to Annex 1. If living parasites are confirmed, products must not be placed on the market for human consumption before they are treated in conformity with the methods laid down in Annex 2.

5.5 *Listeria monocytogenes*

This section has to be elaborated.

[The issue of *L. monocytogenes* in foods is addressed by Codex in a separate document titled "Guidelines on the Application of General Principles of Food Hygiene to the Control of *Listeria monocytogenes* in Ready-to-Eat Foods" (CAC/GL61-2007)]

5.6 *Clostridium botulinum*

Toxins of *Clostridium botulinum* are not allowed in smoked fish-, smoke-flavoured fish- and smoke-dried fish products. The formation of *Clostridium botulinum* toxin can be controlled through an application of science-based options involving packaging type, storage temperature, and the use of salt in the water phase. The table shown in Annex 3 addresses these control options.

5.7 Histamine

No sample unit shall contain histamine that exceeds 20 mg /100g fish muscle.

5.8 Other Substances

The products shall not contain any other substance in amounts, which may present a hazard to health in accordance with standards established by the Codex Alimentarius Commission, and the final product shall be free from any foreign material that poses a threat to human health.

6. LABELLING

In addition to the provisions of the Codex General Standard for the Labelling of Prepackaged Foods CODEX STAN 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 only contain the word "smoked", if processed according to 2.1, contain the word “smoke-flavoured” if processed according to 2.2 or “smoke-dried” if processed according to 2.3.
In addition to these specified labelling designations, common, usual or trade names of the fish species shall be used in accordance with the law and custom of the country in which the food is sold in a manner not to mislead the consumer. Any reference to the origin of the fish as opposed to the place of processing shall not mislead the consumer.

6.2 Storage Instructions

The label shall declare storage instructions appropriate for the product.

6.3 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 product, lot identification, and the name and address of the manufacturer or packer, as well as storage instructions, shall appear on the container.
However, lot identification, and the name and address of the manufacturer or packer may be replaced by an identification mark provided that such a mark is clearly identifiable with the accompanying documents.

7. SAMPLING, EXAMINATION AND ANALYSIS

7.1 Sampling

Sampling of lots for examination of the product for quality shall be in accordance with the General Guidelines on Sampling (CAC/GL 50-2004).

A sample unit is the individually packed product or a 1 kg portion from bulk containers.

The sampling of lots for microbial and parasitical analysis will be in accordance with the principles in the guidelines for sampling under development by CCMAS.

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 Sections 7.4 through 7.7 and the "Guidelines for the Sensory Evaluation of Fish and Shellfish in Laboratories (CAC/GL 31-1999)."

7.3 Determination of Histamine

AOAC 977.13 (most recent edition) or other scientifically equivalent validated method.

7.4 Determination of Dead Parasites

The entire sample unit is examined non-destructively by the naked eye for the presence of dead parasites.

(See Annex 4).

7.5 Determination of Gelatinous Conditions

The determination of parasite activity, gelatinised parts of the flesh, can be performed according to the AOAC Methods- "Moisture in Meat and Meat Products, Preparation of Sample Procedure"; 883.18 and "Moisture in Meat" (Method A); 950.46; AOAC 1990.

7.6 Determination of Net Weight

The net weight is determined as the weight of the product, exclusive of packaging material, interleaving material, etc.

7.7 Temperatures for Thawing

Frozen final products shall be thawed at temperatures low enough to maintain quality and safety.

8. DEFINITION OF DEFECTIVES

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

8.1 Foreign Matter

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

8.2 Parasites

The presence of two or more parasites per kg of the sample unit detected by the method described in 7.4 with a capsular diameter greater than 3 mm or a parasite not encapsulated and greater than 10 mm in length.

8.3 Odour and Flavour

A sample unit affected by persistent and distinct objectionable odours or flavours indicative for decomposition, or rancidity, burning sensation or other sensorial impressions not characteristic of the product.

8.4 [Flesh Abnormalities

A sample unit affected by excessive gelatinous conditions of the flesh together with greater then 85% moisture found in any individual fish or sample unit with pasty texture resulting from parasitic infestation affecting more then 5% of the sample unit by weight.]

9. LOT ACCEPTANCE

A lot will 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 (AQL-5.6) in the Codex General Guidelines on Sampling (CAC/GL 50-2004);

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

(iii) The Food Additives, Hygiene and Handling and Labelling requirements of Sections 4, 5 and 6 are met.

ANNEX 1

VIABILITY TEST FOR PARASITES

1. Nematodes

Principle:

Nematodes are isolated from fish fillets by digestion, transferred into 0.5 % Pepsin digestion solution and inspected visually for viability. Digestion conditions correspond to conditions found in the digestive tracts of mammals and guarantee the survival of nematodes.

Equipment: Stacked sieves (diameter: 14 cm or larger, mesh size: 0.5 mm)

Magnetic stirrer with thermostated heating plate-
Normal laboratory equipment

Chemicals: Pepsin 2000 FIP-U / g

Hydrochloric acid

Solution: A: 0.5 % (w/v) Pepsin in 0.063 M HCl

Procedure:

Fillets of approximately 200 g are manually shredded and placed in a 2 l beaker containing 1 l Pepsin solution A. The mixture is heated on a magnet stirrer to 37 °C for 1- 2 h under continuous slow stirring. If the flesh is not dissolved, the solution is poured through a sieve, washed with water and the remaining flesh is quantitatively replaced in the beaker. 700 ml digestion solution A is added and the mixture stirred again under gentle heating (max. 37°C) until there are no large pieces of flesh left.

The digestion solution is decanted through a sieve and the content of the sieve rinsed with water.

Nematodes are carefully transferred by means of small forceps into Petri dishes containing fresh Pepsin solution A. The dishes are placed on a candling dish, and care has to be taken not to exceed 37 °C.

Viable nematodes show visible movements or spontaneous reactions when gently probed with dissecting needles. A single relaxation of coiled nematodes, which sometimes occurs, is not a clear sign of viability.

Nematodes must show spontaneous movement.

Attention:

When checking for viable nematodes in salted or sugar salted products, reanimation time of nematodes can last up to two hours and more.

Remarks:

Several other methods exist for the determination of viability of nematodes (e.g. ref. 2, 3).

The described method has been chosen because it is easy to perform and combines isolation of nematodes and viability test within one step.

2. Trematodes

Approved methods to be elaborated

3. Cestodes

Approved methods to be elaborated

References:

1. Anon.: Vorläufiger Probenahmeplan, Untersuchungsgang und Beurteilungsvorschlag für die amtliche Überprüfung der Erfüllung der Vorschriften des § 2 Abs. 5 der Fisch-VO. Bundesgesundheitsblatt 12, 486-487 (1988).

2. Leinemann, M. and Karl, H.: Untersuchungen zur Differenzierung lebender und toter Nematodenlarven (Anisakis sp.) in Heringen und Heringserzeugnissen. Archiv Lebensmittelhygiene 39, 147 – 150 (1988).

3. Priebe, K., Jendrusch, H. and Haustedt, U.: Problematik und Experimentaluntersuchungen zum

Erlöschen der Einbohrpotenz von Anisakis Larven des Herings bei der Herstellung von Kaltmarinaden.

Archiv Lebensmittelhygiene 24, 217 – 222 (1973).

ANNEX 2

Procedures sufficient to kill nematodes

Where freezing is required as a Critical Control Point to kill parasites, the fish must be frozen either before or after the cold smoking to sufficiently kill the living parasites. This process must be performed at a minimum of -20º C for 24 hours or a minimum of -35º C for 15 hours in the thermal centre of the product. However, some studies from certain countries have demonstrated that 24 hrs is not sufficient to kill parasites[1] [2]. As a result, in those cases, a different holding time reference is used. Freezing the product at -35ºC or below for a period of not less than 15 hours or at -20ºC for a period of not less than 168 hours (7 days)" [3] [4] will be sufficient to kill these parasites.

[1] Bier, J. 1976. Experimental Anasakiasis: Cultivation and Temperature Tolerance Determinations. J. Milk Food Technol. 39:132-137.

[2] Deardoff, T.L. et al. 1984. Behavior and Viability of Third-Stage Larvae of Terranova sp. (Type HA) and Anasakis simplex (Type I) Under Coolant Conditions. J. of Food Prot. 47:49-52.

[3] Health and Welfare Canada (1992) (in consultation with Canadian Restaurant and Food Service Association, Fisheries Council of Canada, and Fisheries and Oceans Canada). Code of practice for the preparation of raw, marinated, and partially cooked fin fish.

[4] USFDA - Centre for Food Safety & Applied Nutrition (June 2001), Fish and Fisheries Products Hazards and Controls Guidance, Chapter 5 Parasites, 3rd Edition.

ANNEX 3

Control and Prevention of *Clostridium botulinum* Toxin Formation

Countries where these products are to be consumed can be expected to make their science-based risk management choices within this framework, i.e., select some options and exclude others, based on conditions within the country (e.g., nature and enforcement of refrigeration and shelf life controls; transportation times and conditions; variability in amount of salt in the aqueous phase that could occur despite best efforts to achieve a required percentage, etc.), and the level of protection that the country chooses for itself for this particular risk.
This table does not apply to smoke-dried fish, because the risk is not present in this product.

Storage Temp	**Packaging**	**Aqueous Phase Salt***	**Comments**
[(0°C to 3°C)]	Any	No minimum aqueous phase salt is needed.	Temperature monitoring required on each package
[(>3°C to 5°C)]	Aerobically Packaged	No minimum aqueous phase salt is needed. Nonetheless, where there is a reasonable possibility of severe time/temperature abuse, the country where the product is being consumed might choose a aqueous phase salt barrier of at least 3% to 3.5% as a precautionary measure.	Storage temperature is for the control of pathogens generally and for quality. In air-packaged products, aerobic spoilage organisms provide sensory signs of spoilage before the formation of toxin by *C. botulinum.* However, even in air packaging it is possible for anaerobic micro-environments to exist and toxin may form if the product is subject to severe time/temperature abuse. For that reason, the country where the product is consumed may still require aqueous phase salt as a barrier to growth of non-proteolytic strains of *C. botulinum* if there are concerns about the ability of transporters, retailers or consumers to maintain time/temperature control.
Frozen (< or = -18°C)	Reduced Oxygen (including vacuum packaging and modified atmosphere Packaging**)	No minimum aqueous phase salt is needed for safety.	*C. botulinum* toxin cannot form when product is frozen. Because toxin production can occur after thawing, labelling information about the need to keep frozen, to thaw under refrigeration, and to use the product immediately after thawing is important.
[(>3°C to 5°C)]	Reduced Oxygen (including vacuum packaging and modified atmosphere packaging)	Aqueous phase salt at minimum level of between 3% & 3.5% may be selected by the country where the product is to be consumed.	Aqueous phase salt at a minimum level of between 3 and 3.5% (aqueous phase salt) in combination with chilling will significantly delay (or prevent) toxin formation.
[>5°C to 10°C]	Reduced Oxygen	5% Aqueous Phase Salt	Non-proteolytic (*C. botulinum*) are controlled under these conditions.

*As an alternative to aqueous phase salt, time/temperature controls alone may be used. *C. botulinum* cannot grow and produce toxin at or below 3ºC. Other time/temperature combinations exist that similarly control the formation of toxin (Skinner,G.E. and Larkin,J.W. (1998). Conservative prediction of time to *Clostridium botulinum* toxin formation for use with time-temperature indicators to ensure the safety of foods. *Journal of Food Protection* **61**, 1154-1160). Where enforcement of shelf life as well as consumer acceptance of shelf life are norms, the country may select a system that relies on the combination of existing storage temperature conditions (i.e. during transport, retail storage, and consumer storage) and shelf life limitations.

However, in countries where consumer acceptance and regulatory enforcement of shelf life are not norms, continuous monitoring, such as that provided by time/temperature integrators on consumer packages, may be selected as a control by the country where the product will be consumed. The necessity for time/temperature integrators exists because, unlike freezing, temperature control through refrigeration is not a visual condition and cannot be determined without an additional monitoring control.

**As new technologies are developed, e.g. modified atmosphere with high oxygen, new controls may be defined.

ANNEX 4

Determination of the presence of visible parasites

The entire sample unit is examined non-destructively by placing appropriate portions of the thawed (if necessary) sample unit on a 5 mm thick acryl sheet with 45% translucency and candled with a light source giving 1500 lux 30 cm above the sheet.