هيئة التقييس لدول مجلس التعاون لدول الخليج العربية
GCC STANDARDIZATION ORGANIZATION (GSO)

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الاسماك المدخنة والاسماك المدخنة المنكهة والاسماك المدخنة المجففة
Smoked Fish, Smoke-Flavoured Fish and Smoke-Dried Fish

ICS : 67.120.30

هذه الوثيقة مشروع لائحة فنية خليجية تم توزيعها لإبداء الرأي والملحوظات بشأنها، لذلك فإنها عرضة للتغيير والتبديل، ولا يجوز الرجوع إليها كلائحة فنية خليجية إلا بعد اعتمادها من الهيئة.

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تقديم

هيئة التقييس لدول مجلس التعاون لدول الخليج العربية هيئة إقليمية تضم في عضويتها الأجهزة للوطنية للمواصفات والمقاييس في دول الخليج العربية، ومن مهام الهيئة إعداد المواصفات القياسية بواسطة لجان فنية متخصصة.

قرر مجلس ادارة هيئة التقييس لدول مجلس التعاون لدول الخليج العربية في اجتماعه رقم .... الذي عقد بتاريخ .../.../... هـ، الموافق ... / ... / ... م اعتماد اللائحة الفنية الخليجية رقم ٢٧٠ / ... الاسماك المدخنة والاسماك المدخنة المنكهة والاسماك المدخنة المجففة / Smoked Fish, Smoke-Flavoured Fish and Smoke-Dried Fish التي تم دراستها واعدادها ضمن برنامج عمل اللجنة الفنية رقم (٥) " قطاع مواصفات المنتجات الغذائية والزراعية " ، المدرجة في خطة سلطنة عمان.

Smoked Fish, Smoke-Flavoured Fish and Smoke-Dried Fish

1. Scope

This gulf 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 fordirect consumption, for further processing, or for addition into specialty or mincedproducts where fish constitutes only part of the edible contents.

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

2. Complementary Standards

2.1 GSO 9: Labeling of prepackaged foodstuffs.
2.2 GSO 20: Methods for the Determination of Contaminating Metallic Elements in Foodstuffs.
2.3 GSO 21: Hygienic Regulations for Food Plants and their Personnel.
2.4 GSO 149: Un-bottled drinking water.
2.5 GSO 150: Expiration dates for food products - Part 2: Voluntary expiration dates.
2.6 GSO/CAC 193: General Standard for Contaminants and Toxins in Food and Feed.
2.7 GSO 323: General Requirements for Transportation and Storage of Chilled and Frozen Foods.
2.8 GSO 380: Chilled Fish.
2.9 GSO 382, 383: Maximum allowable limits of pesticides residue in agricultural and food products – 1st and 2nd parts.
2.10 GSO 384: Ice for human consumption.
2.11 GSO 589: Method of physical and chemical test of fish, shell fish and their products
2.12 GSO 655: Method of microbiological examination for meat, fish, and shell fish
2.13 GSO 839: Food Packages - Part 1: General Requirements
2.14 GSO 988: Limits of Radiation Levels Permitted in Foodstuffs- Part 1.
2.15 GSO 998 Method for detecting limits of Radiation Levels Permitted in agricultureand food products - Part 1: “Gamma Spectrometry Analysis - Caesium-134, Caesium-137”.
2.16 GSO 1016: Microbiological Criteria of Food Product- Part 1.
2.17 GSO 1026: Code of Hygienic Practice for Preparation, Transportation, Handling and Storing of Fish.
2.18 GSO 1694: General principles of food hygiene.
2.19 GSO 1881: Methods of sampling fish, shell fish, and their products.

2.20 GSO 1861: Fish Products - Determination of Histamine - Reference Method.
2.21 GSO 2500 " Additives Permitted for Use in Food Stuffs "

2.22 GSO 2481 " Maximum Residues Limits (Mrls) of Veterinary Drugs In Food ".

3. Definition

3.1 SMOKED FISH

3.1.1 Product definition
Smoked fish is prepared from fish that has undergone a hot or cold smoking process. The smoke must be applied through one of the smoking processes defined
in Section 3.1.2 and the end product must have smoked sensory characteristics.
Spices and other optional ingredients may be used.

3.1.2 Process definitions for Smoked fish

3.1.2.1 Smoking:

is a process of treating fish by exposing it to smoke from smoldering wood or plant materials. This process is usually characterized by an integrated combination
of salting, drying, heating and smoking steps in a smoking chamber.

3.1.2.2 Smoking by regenerated smoke:

is a process of treating fish by exposing it to smoke which is regenerated by atomizing smoke condensate in a smoking chamber under the time and temperature conditions similar to those for hot or cold smoking.

3.1.2.3 Smoke Condensates:

are products obtained by controlled thermal degradation of wood in a limited supply of oxygen(pyrolysis), subsequent condensation of the resultant smoke vapours, and fractionation of the resulting liquid products.

3.1.2.4 Hot smoking:

is a process in which fish is smoked at an appropriate combination of temperatureand time sufficient to cause the complete coagulation of the proteins in the fishflesh. Hot smoking is generally sufficient to kill parasites, to destroy nonsporulated bacterial pathogens and to injure spores of human health concern.

3.1.2.5 Cold smoking:

is a process of treating fish with smoke using a time/temperature combination that will not cause significant coagulation of the proteins in the fish flesh but that will cause some reduction of the water activity.

3.1.2.6 Salting:
is a process of treating fish with salt of food grade quality to lower water activity in fish flesh and to enhance flavour by any appropriate salting technology (e.g. dry salting, brining, injection salting).

3.1.2.7 Drying:
is a process in which the moisture content in the fish is decreased to appropriate required characteristics under controlled hygienic conditions.

3.1.2.8 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.

3.1.2.9 Storage:

is a process in which smoked fish is kept refrigerated or frozen to assure product quality and safety.

3.2 SMOKE FLAVOURED FISH

3.2.1 Product definition
Smoke-flavoured fish is prepared from fish that has been treated with smoke flavours, without undergoing a smoking process as described in Section 3.1. The end product must have a smoked taste. Spices and other optional ingredients may be used.

3.2.2 Process definition for Smoke-flavoured fish

3.2.2.1 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).

3.2.2.2 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, soaking).

3.3 SMOKE-DRIED FISH

3.3.1 Product definition

Smoke-dried fish is prepared from fish that has undergone a combined smoking and drying process and may include a salting process. 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-dried sensory characteristics. Spices and other optional ingredients may be used.

3.3.2 Process definition for Smoke-dried fish

3.3.2.1 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 and to achieve a water activity of 0.75 or less (10% moisture content or less), as necessary to control bacterial pathogens and fungal spoilage.

3.3.2.2 Drying:
is a process in which the moisture content in the fish is decreased to appropriate required characteristics under controlled hygienic conditions.

3.3.2.3 Salting:
is a process of treating fish with salt of food grade quality to lower water activity in fish flesh and to enhance flavour by any appropriate salting technology (e.g. dry salting, brining, injection salting).

3.3.2.4 Packaging:
is a process in which smoke-dried fish is put in a container to avoid contamination and prevent rehydration.

3.3.2.5 Storag**e:**
is a process in which smoke-dried fish is typically kept at ambient temperature in a way to assure its safety and quality in conformity with Sections 3 and 6.

3.3.2.6 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.

3.4 DEFINITION OF DEFECTIVES

3.4.1 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 recognized without magnification or is present at a level determined by any

method including magnification that indicates non-compliance with good manufacturing practice.

3.4.2 PARASITES

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

3.4.3 ODOUR, FLAVOUR AND TEXTURE

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

4. REQUIREMENTS

4.1 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.

4.2 All ingredients used shall be of food grade quality and conform to all applicable GSO standards referenced in item 2.4, item 2.8 and 2.10.

4.3 Wood or other plant material used for the generation of smoke or smokecondensates 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 be handled in a way to avoid

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4.4 The product of susceptible species shall not contain more than 10 mg of histamineper 100g fish flesh based on the average of the sample unit tested and all productsin this Standard shall be free from persistent and objectionable odours andflavours characteristic of decomposition

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4.5 The Contaminants and Toxins content of the products shall not exceed the limitsaccording to the GSO standard mentioned in (2.6).

4.6 Smoking of fish should be done in a manner that minimizes the formation of polycyclic aromatic hydrocarbons (PAH). This can be achieved by following theCode of Practice for the Reduction of Contamination of Food with PolycyclicHydrocarbons (PAH).

4.7 The products covered by the provisions of this Standard shall be prepared, handled, transport and storage in accordance with the appropriate sections of theGSO standard referenced in item 2.2, item 2.3, item 2.18, item 2.17 and item 2.7.

4.8 Microbiological content of the products shall not exceed the limits according to the GSO standard mentioned in (2.16).

4.9 Products covered by this Standard shall not contain living parasites and particular attention needs to be paid to cold smoked or smoke-flavoured products, which should be frozen before or after smoking if a parasite hazard is present (see Annex1).

4.10 The ready to eat products shall comply with microbiological criteria for Listeria monocytogenes in ready-to-eat foods which was elaborated in the Annex II of the Guidelines on the Application of General Principles of Food Hygiene to the Control of Listeria monocytogenes in Ready to Eat Foods.

4.11 Toxins of Clostridium botulinum are not allowed in smoked fish, smokeflavoured fish and smoke-dried fish products. The formation of Clostridium botulinum toxin can be controlled through an application of a combination of science-based options such as packaging type, storage temperature, and water activity, e.g. by use of salt in the water phase. Examples are shown in the Table in Annex 2, which addresses these control options. The products in an un eviscerated state or may require evisceration, either before or after processing, in such a way as to minimize the risk of Clostridium botulinum

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4.12 The product shall not contain histamine that exceeds 20 mg/100g fish flesh in any sample unit tested. This applies only to susceptible species (e.g. Scombridae,Clupeidae, Engraulidae, Coryphaenidae, Pomatomidae, Scomberesocidae).

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

4.14 Additives used shall comply with what mentioned in Gulf Standard stated in Item (2.15).:

4.15 No additives are permitted in smoke – dried fish.

4.16 The pesticides residue of the products shall not exceed the limits according to the GSO standard mentioned in (2.9).

4.17 The radiation levels of the products shall not exceed the limits according to the GSO standard mentioned in (2.14).

4.18 The used packages shall comply with the GSO standard mentioned in (2.13).

5. LABELLING

Without prejudice to the provisions of the Gulf standards referenced in item 2.1, the following specific provisions apply:

5.1 The name of the food must be "smoked X" if treated by the processesdescribed in paragraph 3.1, "smoke flavoured X" if treated by the processes described in paragraph 3.2,"smoke-dried X" if treated by the processes described in paragraph 3.3, X being the common or usual name of the species of fish shall not mislead the consumer.

5.2 The use of regenerated smoke must be indicated on the label.

5.3 The label shall declare storage and handling instructions appropriate for the product.

5.4 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, the name and address of the manufacturer or packer may be replaced by an identification mark (e.g. plant approval number) provided that such a mark is clearly identifiable with the accompanying documents.

5.5 The expiration date shall be according to the GSO standard in (2.5).

6. SAMPLING, EXAMINATION AND ANALYSIS

6.1 SAMPLING

The samples should be taken according to the gulf standard mentioned in item (2.19).

6.2 SENSORY AND PHYSICAL EXAMINATION

Samples taken for sensory and physical examination shall be assessed by persons trained in such examination and in accordance with gulf standard contained in item (2.11).

6.3 DETERMINATION OF HISTAMINE

The detection of histamine in the sample shall be in accordance with the Gulf Standard in item 2.20.

6.4 DETERMINATION OF NET WEIGHT

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

6.5 TEMPERATURES FOR THAWING

Frozen samples of final products shall be thawed at refrigeration temperatures to maintain quality and safety.

6.6 DETERMINATION OF LISTERIA MONOCYTOGENES

The microbiological criteria for products in which growth of L. monocytogenes will not occur are based on the use of the ISO11290-2 method. Other methods that provide equivalent sensitivity, reproducibility, and reliability can be employed if they have been appropriately validated (e.g. based on ISO16140). The microbiological criteria for products in which growth of L. monocytogenes can occur are based on the use of ISO 11290-1 method. Other methods that provide equivalent sensitivity, reproducibility, and reliability can be employed if they have been appropriately validated (e.g. based on ISO 16140).

6.7 DETERMINATION OF CLOSTRIDIUM BOTULINUM

AOAC 977.26 for the detection of C. botulinum and its toxins in foods or other scientifically equivalent validated method. This method is not routinely performed on the product, but may be used when there is a suspicion of the presence of toxins.

6.8 DETERMINATION OF WATER PHASE SALT

The percentage salt (NaCl) in the aqueous phase can be determined by the following calculation:

$$\% \text{ salt aqueous phase} = \frac{\%\text{salt} \times 100}{\%\text{water} + \%\text{ salt}}$$

% Moisture: AOAC, 952.08, Sec. 35.1.13, Solids (Total) in Seafood
% Salt: AOAC, 937.09, Sec. 35.1.18, Salt (Sodium Chloride) in Seafood

6.9 DETERMINATION OF WATER ACTIVITY

Water activity is determined by NMKL 168, 2001 | ISO 21807:2004

6.10 DETERMINATION OF THE VIABILITY OF PARASITES

Methods used for extracting and testing the viability of parasites could include the method set out in Annex I or other validated methods for parasites acceptable to the competent authority having jurisdiction.

6.11 DETERMINATION OF VISIBLE PARASITES

The entire sample unit is examined for the presence of parasites 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.

6.12 The detection of limits of Radiation Levels shall be assessed by the Gulf Standard mentioned in item 2.15.

6.13 The samples' microbiologic examination methods shall be in accordance with the Gulf Standard in item 2.12

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7. LOT ACCEPTANCE

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

7.1 The total number of defectives does not exceed the acceptance number (c) of an appropriate sampling plan (AQL-6.5) in the General Guidelines on Sampling (CAC/GL 50-2004);

7.2 The average net weight of all sample units is not less than the declared weight, provided there is no unreasonable short age in any container and no individual container is less than 95% of the declared weight; and

7.3. The essential composition and quality factors, food additives, contaminants, hygiene and handling and labelling requirements are met. For histamine no sample unit shall exceed 20 mg/100 g of fish flesh as per the sampling plan chosen.

ANNEX 1

Procedures sufficient to kill parasites

A method that is acceptable to the competent authority having jurisdiction shall be used to kill parasites.

Where freezing is required to kill parasites (i.e., cold smoked fish and smoke-flavoured fish) the fish must be frozen either before or after processing to a temperature time combination sufficient to kill the living parasites.

Examples of freezing processes that may be sufficient to kill some or all parasites are:

•Freezing at -20oC at the thermal centre of the product for 24 hours (for Anisakis species and Pseudoterranova decipiens only) [1];

•Freezing at -35oC at the thermal centre of the product for 15 hours (all parasites);

•Freezing at -20oC at the thermal centre of the product for 168 hours (7 days) (all parasites).

[1] 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

Temperature-abuse has a direct impact on the safety and shelf-life of the products. Time/temperature integrators may be a useful tool to determine if the products have been temperature-abused.

ANNEX 2

Examples of combinations of product attributes that minimize the likelihood of Clostridium botulinum toxin formation

Countries where the products are to be consumed can be expected to make their sciencebased risk management choices with the assistance of this framework, e.g. 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.). This table applies to smoked fish and smoke-flavoured fish where the smoke flavour is provided by smoke condensates. If the smoke flavour is imparted by artificial flavour blends, then 5% aqueous phase salt would be required in order to provide complete protection at temperatures between 3° C and 10° C, or 10% aqueous phase salt would be required at any temperature over 10° C. This table does not apply to smoke-dried fish because the required water activity of 0.75 or below (moisture content level of 10% or less) inhibits the growth of all foodborne pathogens so that refrigeration is not required.

As an alternative to aqueous phase salt, certain time/temperature parameters can minimize the likelihood that C. botulinum will grow in the product. C. botulinum cannot grow and produce toxin at or below 3oC or below a water activity of 0.94. Other time/temperature combinations exist that similarly control the formation of toxin.[1] 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.

Product Temperature During Storage	Packaging	Aqueous Phase Salt (NaCl)	Comments
Below 3ºC	Any packaging	Not applicable.	*C. botulinum* toxin cannot form below 3° C. Temperature monitoring is needed to ensure that the temperature does not exceed 3ºC.
≥3oC to 5ºC	Aerobically Packaged	No minimum water activity is needed. Nonetheless, where there is a possibility of severe time/ temperature abuse,the country where the product is being consumed might choose an aqueous phase saltbarrier of at least 3% to 3.5% (w/w) as an additional barrier.	When these products are packaged aerobically, 5ºC is the maximum recommended storage temperature for the control of pathogens generally and for quality. The aerobic packaging does not necessarily prevent growth and toxin formation of *C. botulinum*. In air-packaged products, aerobic spoilage organisms provide sensory signs of spoilage before the formation of toxin by *C. botulinum*. In addition 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 should still require aqueous phase salt as a barrier to growth of nonproteolytic strains of *C. botulinum* if there are concerns about the ability of transporters, retailers or consumers to maintain time/temperature control.
Frozen (< or = - 18ºC)	Any packaging	Not applicable.	*C. botulinum* toxin cannot form when product is frozen. In the absence of adequate aqueous phase salt, toxin production can occur after thawing so, labelling information about the need for the consumer to keep the product frozen, to thaw it under refrigeration, and to use it immediately after thawing, is important.
(≥3ºC to 5ºC)	Reduced Oxygen (including vacuum packaging + modified atmosphere packaging)	Aqueous phase salt at minimum level of between 3% & 3.5% (w/w) may be selected by the country where the product is to be consumed.	Aqueous phase salt at a minimum level of between 3 and3.5% (w/w) (aqueous phase salt) in combination with refrigeration will significantly delay (or prevent) toxin formation. For that reason, the country where the product is consumed should still require the higher aqueous phase salt as a barrier to growth of non-proteolytic strains of C. botulinum if there are concerns about temperature abuse of the product.

References:
- Codex Alimentarius Commission, Smoked Fish, Smoke-Flavoured Fish and Smoke-Dried Fish, CODEX STAN 311-201