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Agenda Item 13 **CX/FFP 02/13**

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DISCUSSION PAPER ON FISH CONTENT IN FISH STICKS

DISCUSSION PAPER ON DECLARATION OF "FISH CONTENT" IN FISH STICKS – DEFINITION AND METHOD OF ANALYSIS

(Prepared by the United Kingdom in co-operation with Canada, South Africa, and the USA*)

Background

1. At its last meeting in June 2000, the Codex Committee on Fish and Fishery Products (CCFFP) was updated on the position relating to labelling of fish sticks. The 23rd Commission (1) had returned to Step 6 the Draft Amendment to the Standard for Quick Frozen Fish Sticks and Fish Portions – Breaded or in Batter (Codex Stan 166-1989) on the declaration of fish core for consideration by the Committee on Food Labelling (CCFL) on labelling requirements and the technical aspects for consideration by CCFFP. The CCFL (2) agreed in principle that the declaration of "fish content" should be included in the labelling section and asked the CCFFP to consider a definition of "fish content" and the methodology for its determination, in order to allow for the finalisation of the draft amendment.

2. EC legislation (Directive 2000/13/EC) requires labelling of the percentage of fish ingredient (excluding water and additives) contained in a product, which is not the same as "fish core" as described in Codex Stan 166-1989. The proposal of declaring "fish content" was reconsidered by the CCFFP but concerns remain as to the availability of and unfamiliarity with, suitable methods for the calculation of "fish content" within a product.

3. Following presentation of a discussion paper prepared by the UK at the last CCFFP (3), it was agreed that a Working Group co-ordinated by the UK and including Canada, Germany, Norway, South Africa, and the USA would continue with work on questions related to fish content declaration with a view to proposing a definition and a method of analysis for consideration by the June 2002 meeting of the CCFFP (4).

4. This discussion paper has been prepared by the UK to assist the Committee in making a decision on declaration and definition of "fish content" in coated fish products, and a method of analysis for its determination. Whilst it was not possible to convene any extensive discussions of the Working Group, information received in correspondence from some Working Group members (5) has been incorporated in this paper.

* The views expressed in this paper are not necessarily those of the co-operating countries.

Consumer Perceptions and Understanding

5. The Codex Committee on Food Labelling [(6)] recalled that a proposed draft amendment to the labelling provisions in Codex Stan 166-1989 had been adopted. This amendment proposed a requirement for product labels to include a declaration of the proportion of fish core. It was considered that mandatory declaration of the proportion of the fish core would allow buyers and consumers to make an informed choice about the products they were purchasing. However, it was also suggested (para.34 of Alinorm 99/22) [(6)] that, as the term "fish core" may include other ingredients such as water and additives, designation of the "fish content" might be more appropriate and meaningful.

6. Whilst the regulatory position may be different in other countries, basic food labelling principles are based on the premise that an accurate label declaration of the main food ingredient in a product is of universal importance to buyers and consumers. It provides consumers with vital information when selecting and comparing different products. This approach is consistent with the general view that informative labelling is a more flexible and effective approach to consumer choice than relying solely on compositional standards. For most consumers, the amount of fish in a fish product would be understood as the amount of the raw ingredient without any added ingredients (e.g. as a fresh whole fish) used to make the product. Implementation of the new quantitative ingredient declaration (QUID) requirements in the EU put this philosophy into practice, and it also under discussion in the CCFL.

The case for "fish core" declaration

7. In contrast, other countries, namely outside of the EU, consider that declaration of "fish core" rather than "fish content" is sufficiently informative in describing the nature of the product to consumers. It has been questioned as to whether there is a significant issue from rephrasing the term "fish core" to "fish content". It is argued that coated fish products (e.g. breaded, battered, etc.) are value added products and consumer preferences may not be based purely on the amount of fish flesh present but that their choices will also take into account, amongst other criteria, the product's overall nutritional, sensory and presentational qualities. Some countries are of the view that declaration of "fish" in labelling of coated fish products should relate to the amount of fish flesh present in relation to the coating and not necessarily an expression of a value that excludes water, phosphates and other water retaining additives. It is also argued that the latter information could be found from a nutrition information panel on the label. However, this viewpoint is contrary to that held by CCFL and its recent recommendation that declaration of "fish content" should be included in the labelling section (see para.5 above).

Practical Implications of the Change from "Fish Core" to "Fish Content", as related to Consumer Information

8. Manufacturers determine the amount of fish present in a food product on a recipe basis by weighing the fish ingredient as a proportion of the total weight of ingredients. Problems arise when the amount of fish ingredient needs to be checked in the finished product. In the case of coated fish products, such as fish sticks, the fish ingredient is often difficult to determine accurately in the proportion to the other ingredients. Accordingly, the internationally accepted method of measuring fish in coated fish products is by the removal of the coating and weighing of the fish core (often perceived as pure fish) as in the method currently specified in Codex Stan 166-1989.

9. However, the "fish core" of many products such as those to which Codex Standard 166-1989 applies, may not be a true indication of the "real fish" content of a product since the core is frequently derived from fish blocks, which may contain other ingredients or added water. These blocks are made and sold on an international basis and, although a "fish content" is sometimes declared, buyers often have little control over the actual fish content of blocks purchased on global commodity markets.

10. In practical terms, therefore, declaration of "fish content" (which excludes water, salts, polyphosphates etc.) instead of "fish core" would be more appropriate as it is more meaningful and informative to consumers; this would tell consumers that the fish ingredient in the product was actually only fish without any added ingredients. Another advantage of declaring fish content would be to establish and

foster good manufacturing practice in the preparation of fish blocks and other raw materials in keeping extraneous water uptake to the fish ingredients to a minimum. If this approach is to be adopted, methodology (e.g. chemical or other suitable alternatives) will need to be developed for determination of "fish content".

Definition of "Fish Content"

11. In the UK, the term "fish content" means the amount of fish ingredient used in a product. "Fish ingredient" means fish prepared in accordance with good manufacturing practice (GMP) and used in a product. The term "fish" means the edible portion of any fish including molluscs and crustacea, and their naturally associated bones or shells, but excludes surimi and similar fish-derived proteins. [7]

12. Other countries may have different definitions to that above and the Committee needs to decide whether this is an appropriate definition.

Measurement of fish core / fish content

Measurement of "Fish Core"

13. Some countries, namely Canada and the USA, have adopted the AOAC Official Method 996.15 Fish Flesh Content (FF) in Frozen Coated Fish Products [8]. This methodology was accepted by the CCFFP in 1998 (Alinorm 01/23, Appendix IV, B). Both Canada and the USA strongly support the continued use of this method as they consider it to be adequate and suitable for the estimation of fish flesh content in coated (breaded and battered, etc.) fish products [5]. It is based on a gravimetric determination and has sufficient supportive data for species involved to be applied to all coated fish without having any limitation to species and is "acceptable as a reasonable and fair measure of the amount of fish in these products". However, this method only measures "fish core" and not the "fish content" *per se*. It ignores the possible abuse that might occur because fish and shellfish readily absorb and retain water especially with the use of water retaining additives such as polyphosphates. Although water is necessary for good hygienic practice in the washing and preparation of fish ingredients, the uptake of water should be kept to a minimum.

Measurement of "Fish Content"

14. The general approach to determine or verify the quantity of fish within coated fish products is by in-factory inspection of records and procedures, though this may be more difficult with imported product or frozen fish blocks prepared on board a factory vessel. However, proof that fish content is not as declared on the label is usually achieved by retrospective chemical analysis. In addition, to determine whether a factory inspection is necessary, some form of screening or monitoring is normally carried out based on end product analysis. Manufacturers also need to monitor the fish content of the frozen fish blocks used in preparation of coated fish products for their own control and their declaration of fish content. Until research is successful in developing other methods, for example the development of reliable and quantitative DNA analyses, the nitrogen content of the fish flesh is used as the only realistic marker for determining fish content.

Nitrogen / Protein content of fish

15. The nitrogen content in fish flesh is distributed mainly within the muscle tissue proteins and to a much lesser extent in other nitrogen-containing substances (non-protein nitrogen) [9, 10 & 11]. However, although nitrogen levels vary between different species of fish and also within species due to different fishing grounds, fish size, time of year, sex or spawning cycles, it has been demonstrated that most finfish muscle tissue contains about 18-22% protein, with an average of about 18.5% in freshly harvested fish. US proximate data for cod, salmon, white mackerel and red mackerel showed these species contained about 19-24% protein [12]. South African hake (fillet fish) showed variation of 16.9-19.4% protein in a 1980 study whilst hake fillets showed a variation of 15.9-19.7% protein in a 1997 study [5]. US data showed that for minced fish products, the portion of fish where the flesh was removed could have an effect on the nitrogen/protein values, for example fillets were 16% protein, mince from cleaned frames was 15.4%, belly flaps 17.3%, and skin on fillets 16.7% [13].

16. Table 1 illustrates the natural range of nitrogen found in various white fish species. In some species there is some evidence of a significant seasonal variation in nitrogen but generally, nitrogen depletion is associated with increased water in the muscle as a result of processing.

Variations in nitrogen content of fish due to processing

17. The very nature of the wet processing of fish is such that changes can take place at virtually all stages of processing which alter the chemical composition of the fish, i.e. degree of water absorption and loss of soluble nitrogen is inevitable. Although merely storing fish on ice can reduce the nitrogen content of fish, the principal processing variables which have an effect on nitrogen or water contents are: icing, washing and freezing. In general, the further along the processing chain, as the fish is subjected to more and more washings and has had skin and bones removed, the more vulnerable it is to changes in soluble nitrogen and water contents.

18. Good manufacturing practices (GMP) can be achieved by ensuring processing stages are controlled to minimise the addition of excess water to the fish or the unnecessary alteration of the nitrogen content. An example of fish block manufacture is illustrated in Figure 1, and the processes involving washing, freezing and filleting provide the most vulnerable stages at which the fish may absorb excess water without adequate GMP controls.

Chemical Methods

19. The standard method of chemically determined nitrogen content is very precise and robust; most of the variability originates from in the raw material itself as explained above. The use of conversion or nitrogen factors (i.e. nitrogen content applied to fish ingredient) to calculate the fish content gives an approximation of amounts present. The factors aim to take into consideration any inevitable nitrogen loss or water gain during normal processing (such as stages outlined in Figure 1). The calculated fish content (see Annex A) is therefore reasonably accurate provided the handling, storing and processing has been conducted in accordance with GMP.

20. The variability of nitrogen content in white fish, to which Codex Stand 166-1989 relates, is also much less than in other types of fish, such as shellfish, and so a reasonably close approximation of fish can be deduced.

UK experience

21. In the light of the implementation of QUID rules and a need to give consumers better information, a Code of Practice [7] on the Declaration of Fish Content in Fish Products was published by UK food industry organisations with enforcement authorities. The determination of nitrogen has been used as the indicator of fish content (see Annex A (i)), based on the Kjeldahl method, using ISO chemical methods [14] (or equivalent) and calculated according to the Stubbs and More procedure [15] using a pre-determined factor to express the nitrogen in terms of fish content (see Annex A (ii)).

22. This Code acknowledges that for enforcement purposes, the best available procedure for verification of a final product declaration of fish content is the use of chemical analysis, followed by in-factory investigation if there is reasonable doubt that the declaration is correct. The approach encourages in-factory and in-processing 'self-regulating' methods by endorsing the application of good operating practices at all stages of the processing and manufacturing of fish products, following the recognised standards of good hygiene and GMP. It is recognised that following such procedures should help to ensure that products are not debased unnecessarily in relation to composition, quality, form or texture, lessening the need for large-scale in-factory investigations by enforcement authorities.

UK applied nitrogen factors

23. The UK has recently researched some interim nitrogen factors [7], largely based on collected 'real' industry data, to be applied in the determination of fish content. These interim factors have been derived by reducing the nitrogen factor for freshly harvested fish by an element which accords with the effects of GMP and gives rise to the nitrogen factor commonly found in raw fish purchased by consumers. They are thought

therefore to be reasonably indicative of the nitrogen level of the fish ingredient after it has been prepared by GMP and just prior to any further processing. These suggested nitrogen factors are shown in Table 2. It is however, intended by industry and enforcement authorities, that the factors will be reviewed periodically and revised in the light of experience, prevailing conditions, emerging technology, improvements in GMP or other factors to ensure their continuing appropriateness.

24. The interim figures in Table 2 are predominantly based on data from UK fisheries and similar figures would need to be developed to account for different fishery stocks and species of fish from other geographic locations worldwide. Other countries may have data that could be used to develop a more comprehensive database. Canada, South Africa, and the USA have all proposed additional species of importance for international data as listed below Table 2 [(5)]. However, data on nitrogen factors for these, and other species of fish of commercial importance for international trade, remains open to debate and, as yet, to be determined.

25. It seems that the checking of fish content of the fish ingredient into mixing bowl by nitrogen content, may be a unique but well-established practice in the UK. In view of the difficulty in selecting appropriate nitrogen factors, it is acknowledged that many countries may have dismissed their use as too variable to be reliably used as indicators of fish content. However, when seen as a means of monitoring fish content coupled with further investigation, they have proved an invaluable tool in establishing good manufacturing and labelling practice.

Conclusions

26. Consumers of fish products are better informed if the y know the actual fish content of a product which also makes it easier to make direct comparisons with other similar products. It has been argued (and, subsequently, agreed by CCFL [(6)]) that this is best achieved by a "fish content" declaration rather than a "fish core" declaration, which can include other ingredients in addition to fish e.g. water, polyphosphates, etc.

27. Fish blocks used in the manufacture of fish sticks (fish fingers) are traded on a world market basis, which makes it difficult for processors to determine whether they have been produced in accordance with good manufacturing practice with regard to their fish content.

28. Currently, the most practical way of determining the fish content in fish blocks or products is through the use of chemical methods based on the measurement of their nitrogen content. Using appropriate nitrogen conversion factors it is possible to take account of inevitable changes in nitrogen levels that will occur during the normal processing of the fish. The interim figures in Table 2 are predominantly based on data from North Sea fish and similar figures will need to be developed, on an international basis, to take account of different fishery stocks and other types of fish important for international trade.

29. The determination of fish content by chemical analysis should be carried out alongside a programme of in-factory inspection to verify that nitrogen factors used are appropriate and that production complies with GMP, particularly during icing, freezing and washing operations.

Proposals

30. It is proposed that, in line with CCFL recommendations [(2,6)] , Codex Stan 166-1989 should be amended to include a requirement to declare <u>fish content</u> on fish product labels should be agreed at the present CCFFP meeting. Consideration will be needed for subsequent similar amendments in other Codex standards as appropriate (e.g. Codex Standard for Quick Frozen Blocks of Fish Fillet, Minced Fish Flesh and Mixtures of Fillets and Minced Fish Flesh (Codex Stan 165-1989)).

<u>Definition of "Fish Content"</u>

31. The Committee is, therefore, invited to agree a definition of "fish content" possibly using the explanation above as a basis (paragraph 11).

Proposed Methodology

32. Chemical analysis based on nitrogen content should be considered as an acceptable method for the determination of the "fish content" in coated fish products coupled with in-factory inspection of records and processes if necessary or appropriate.

33. If the chemical approach is accepted, existing data on nitrogen content of fish species worldwide will form a useful basis of discussion in taking the approach forward. Where no such data exists, it is proposed that the nitrogen content of fish species of global commercial importance be collated to determine variabilities. This will enable establishment of common nitrogen factors for fish species from specific regions, for example cod from regions such as East Coast of Canada. Collaborative studies would be needed to validate the method against nitrogen content of different fish species at different seasons on an international basis (i.e. for fish species important commercially for international trade).

34. In order to be able to meet the proposed revision, it is recommended that the proposed draft Codex Code of Practice for Fish and Fishery Products is amended to include reference to the GMP requirements necessary for minimising the loss of nitrogen and excessive uptake of water during fish processing.

Other alternative options

35. The issue of alternative methods to the chemical approach for the measurement of fish content in fish products also remains open to debate.

Table 1: **Range of nitrogen content in various white fish species taken from the sea**

SPECIES	No of samples	Mean N (%)	Range
Cod	295 182	2.871 2.906	2.21-3.20 2.64-3.29
Coley/Saithe	95 256	2.923 2.926	2.52-3.27 2.54-3.32
European Hake	183	2.871	2.52-3.28
South African Hake [5] (fish / fillets from sea)	-	-	2.41-3.18
Haddock	361	2.962	2.52-3.31
Ling	271	3.020	2.70-3.36
Plaice	182	2.665	1.91-3.19
Whiting	365	2.912	2.35-3.35

Table 2: **Interim Nitrogen factors to be used for white fish as an ingredient (i.e. after GMP)**

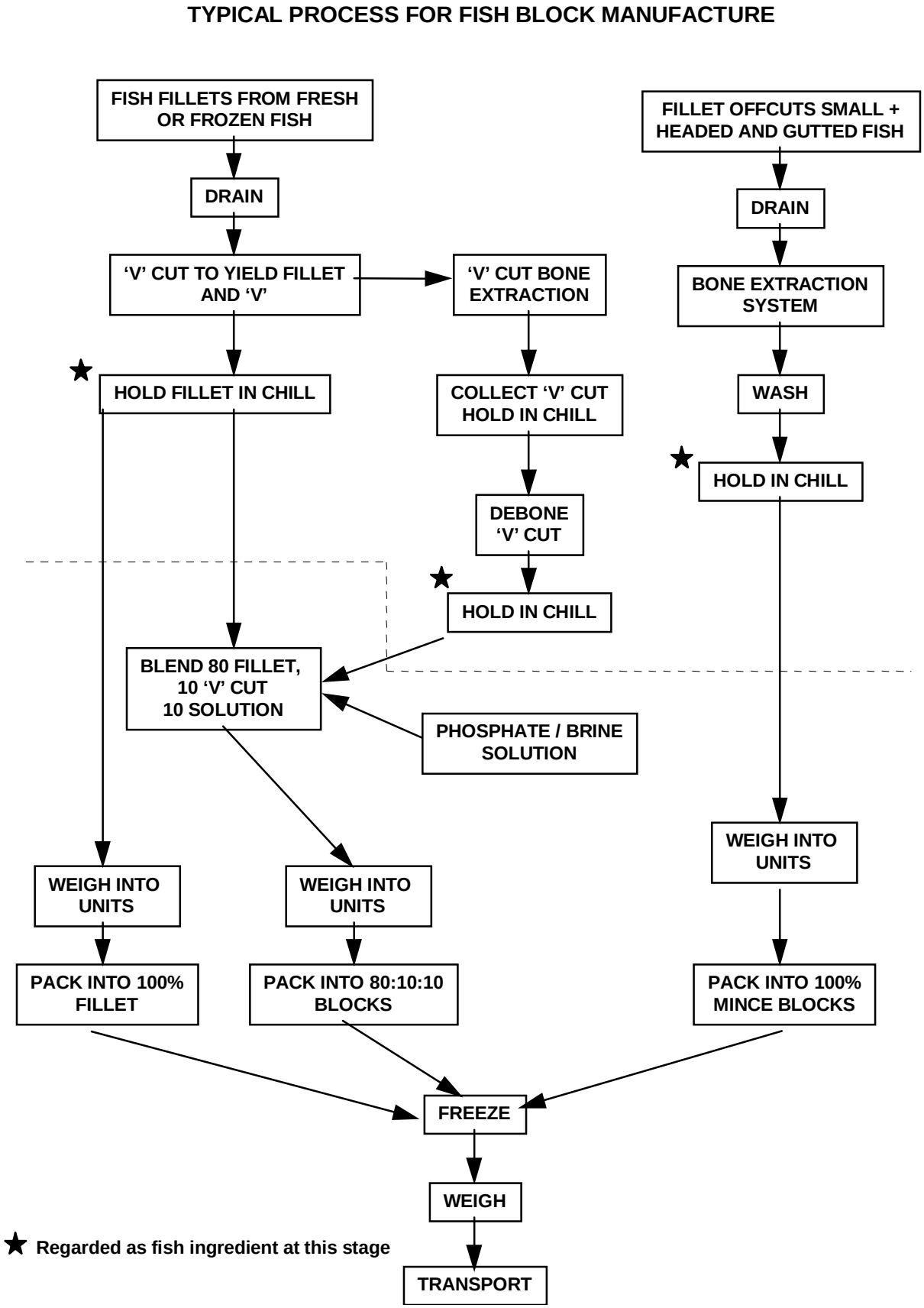
SPECIES	Nitrogen %
White fish:	
Cod	2.66
Minced Cod	2.61
Coley/Saithe	2.69
European Hake	2.64
Haddock	2.72
Ling	2.78
Plaice	2.46
Alaskan Pollack	2.59
Whiting	2.68
White fish mean	2.65

Additional species important for international trade proposed by Canada, South Africa and the USA but for which there are no nitrogen factors at present:

- Pacific Salmon, Atlantic Salmon, Halibut, Sole, Pacific Cod, Pacific Tomcod, Pacific Whiting, Yellowfin Sole, and American Catfish

- South African Hake (Merluccius capensis and Merluccius paradoxus)

Figure 1: Showing processing stages for fish block manufacture



Annex A

(i) Calculation of fish content by processor

The fish content of a fish product can be calculated on one of the following two bases:

Either

- As a percentage total of the weight of the in-going raw ingredients used during the preparation of the food i.e. at the point of their incorporation into a recipe (commonly called the 'mixing bowl stage').

Or

- As an initial raw ingredient percentage of the final product weight. For products such as fish sticks (fish fingers) which include a frying stage as part of the processing, this basis is more appropriate. During the frying process, loss of water and uptake of oil occurs and this may alter the apparent weight of the initial raw ingredients e.g. as moisture is driven off.

The fish content of a fish finger (fish stick) is calculated by using the following equation:

$$\% \text{ Fish Content } = \frac{\text{Weight of ingoing fish}}{\text{Weight of final product}} \times 100$$

For most products therefore, the fish ingredient weight is that of the raw ingredient. Any figure placed or declared on a product label would be a typical quantity reflecting the producer's normal manufacturing variations, in accordance with good manufacturing practice.

(ii) Checking of fish content by chemical analysis

The percentage fish content, corrected for the non-meat nitrogen contributed by the carbohydrate coating, is calculated as follows:

$$\textbf{\% fish} = \frac{\textbf{(\% total nitrogen - \% non-meat nitrogen) X 100}}{\textbf{N factor*}}$$

* appropriate N (nitrogen) factor

The non-meat nitrogen is calculated as follows:

% non-meat nitrogen = % carbohydrate X 0.02

Where the carbohydrate is calculated by difference:

% carbohydrate = 100 – (%water + %fat + %protein + %ash)

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