



**ANFACO**

Ciencia y Tecnología Marina  
y Alimentaria · CYTMA

**Studies on moisture levels in clipfish (cod & saithe)  
and methodologies applied by customs Authorities.  
(CLIPTURE)  
FHF: 901638**

*Clipfish industry meeting – 1st September, 2020.*

*Rodrigo G. Reboredo*

## Objectives

- To get the descriptive statistics for moisture contents in the main size classes of clipfish (cod & saithe).
- To document non conformities and variation in test results due to size, species and between companies.
- To compare differences in moisture evaluation derived from the application of the Annex B of CODEX STAN 167/1989 vs. present Brazilian Methodology. Discussion of the consequences.
- To document the longitudinal variation in moisture content in a split clipfish piece.
- To define a new sampling procedure that could be easier, avoids misunderstandings and show similar results as the cross-sectional method from CODEX STAN 167/1989 –Annex B.

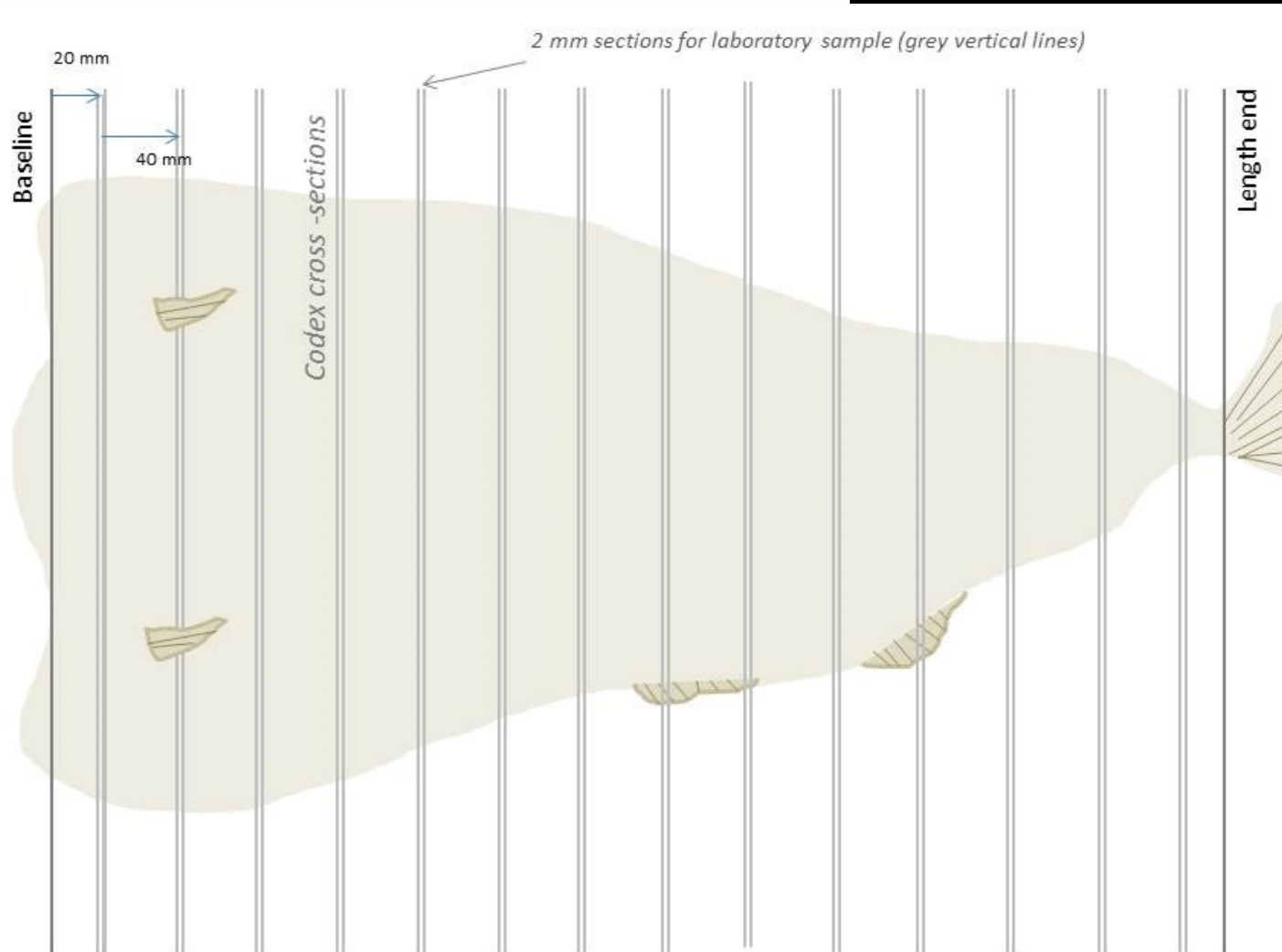
## Sampling

- 6 Norwegian companies as suppliers (300 kg).
- Dried salted cod and saithe.
- Three size classes for each of the species:  
Cod (8/10, 7/9, 10/12) – Saithe (7/9, 10/12, 16/20).
- 4 samples x 5 companies = 20 samples / size class.
- Samples from companies were requested to be selected from different production lots.

Preservation: 2 - 3,5 C,  
Mean RH (%)= 60,5%  
Up to 3 months storage.

COD	Size	Sampl.	SAITHE	Size	Sampl.
Comp. A	7/9	4	Comp. A	7-9	4
	8/10	4		10-12	4
	10/12	4		16-20	4
Comp. B	7/9	4	Comp. B	7-9	4
	8/10	4		10-12	4
	10/12	4		16-20	4
Comp. C	7/9	4	Comp. C	7-9	4
	8/10	4		10-12	4
	10/12	4		16-20	4
Comp. D	7/9	4	Comp. F	7-9	4
	8/10	4		10-12	4
	10/12	4		16-20	4
Comp. E	7/9	4	Comp. D	7-9	4
	8/10	4		10-12	4
	10/12	4		16-20	4
		60			60

# Codex Stan Cross-section method.



***Include bone & Skin. No mechanical grinding.***

## Sample preparation CODEX



*Sample identification*



*Brush surface salt*



*Length measurement*



*Sections cutting*



*Cross sections ( 2 mm? )*



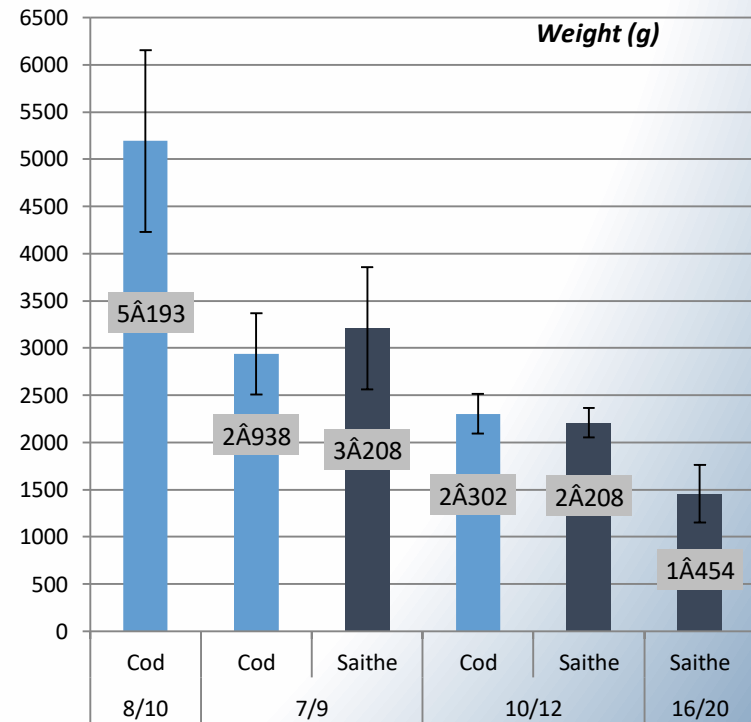
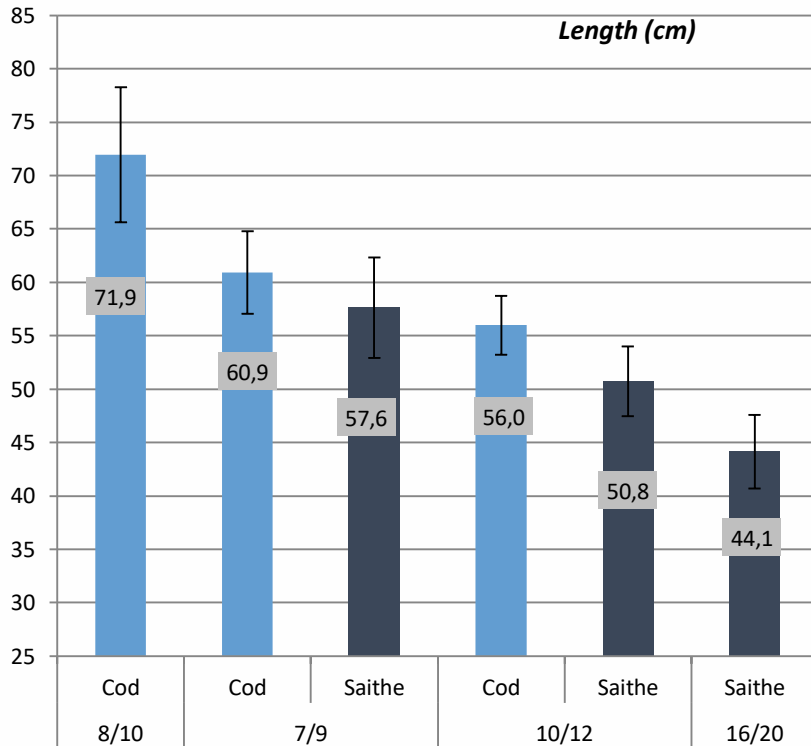
*Weighing*



*Codex laboratory sample*

- Difficult, high cost. **2 technicians spent 100 min to process 8 samples.**
- Mechanical band- saw required ¿Available at laboratories?
- Imprecise cuts (**2 mm is not realistic in practice**). Affects laboratory sample.
- 18-20 g of the laboratory sample go into the plate . 20 h – 103 C until constant weight.

## Length and weight data.



## Moisture contents (Codex).

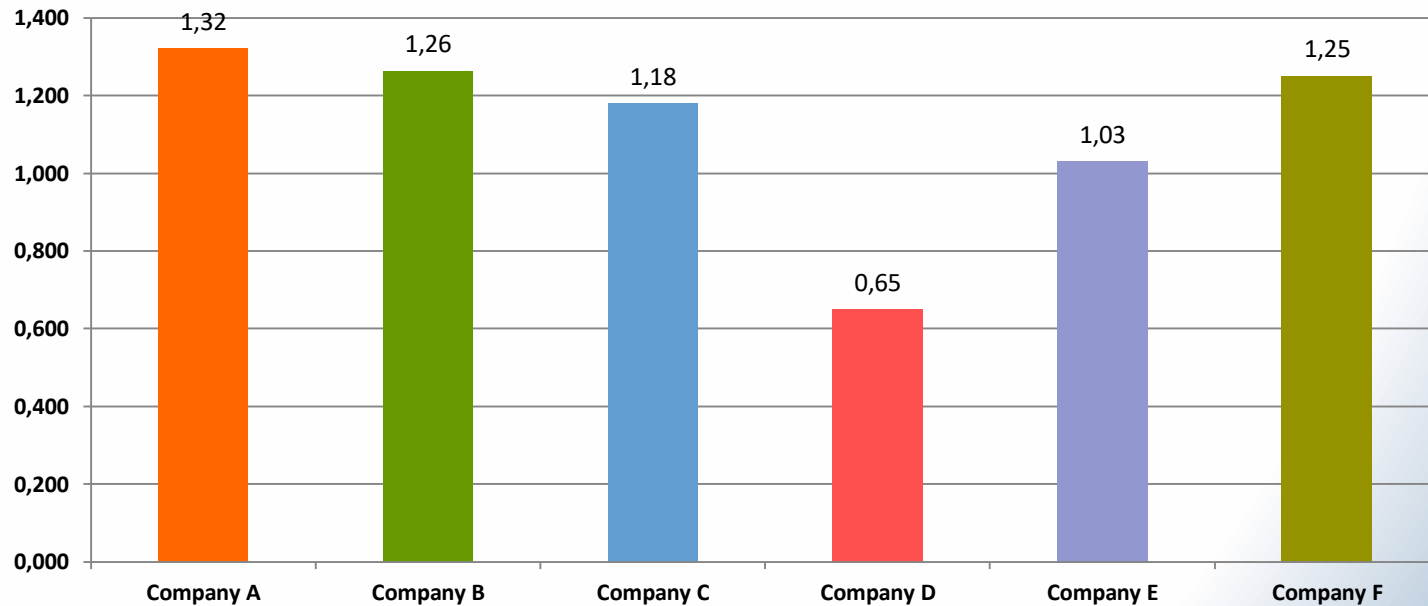
		N	Moisture Mean (g/100g)	Moisture SD (g/100g)	Number of samples not complying with the Brazilian regulation	% of samples beyond the 53% limit (estimated statistically)	Statistical method.
8/10	Cod	20	<b>52,5</b>	1,3	7 (35%)	<b>35%</b>	<i>T-test</i>
7/9	Cod	20	<b>51,0*</b>	1,1	0 (0%)	<b>4,2%</b>	<i>T-test</i>
10/12	Cod	20	<b>50,7*</b>	1,3	2 (10 %)	<b>4,8%</b>	<i>T-test</i>
7/9	Saithe	20	<b>50,5*</b>	1,6	1 (5%)	<b>7,2%</b>	<i>T-test</i>
10/12	Saithe	20	<b>49,5**</b>	1,6	0 (0%)	<b>2,0%</b>	<i>T-test</i>
16/20	Saithe	20	<b>49,8**</b>	1,8	1 (5%)	<b>4,0%</b>	<i>T-test</i>

\* No statistical differences found between groups in the mean results.

\*\* No statistical differences found between groups in the mean results.

*Are these non-compliance rates acceptable by exporting companies?*

## Moisture contents internal variability at the companies.



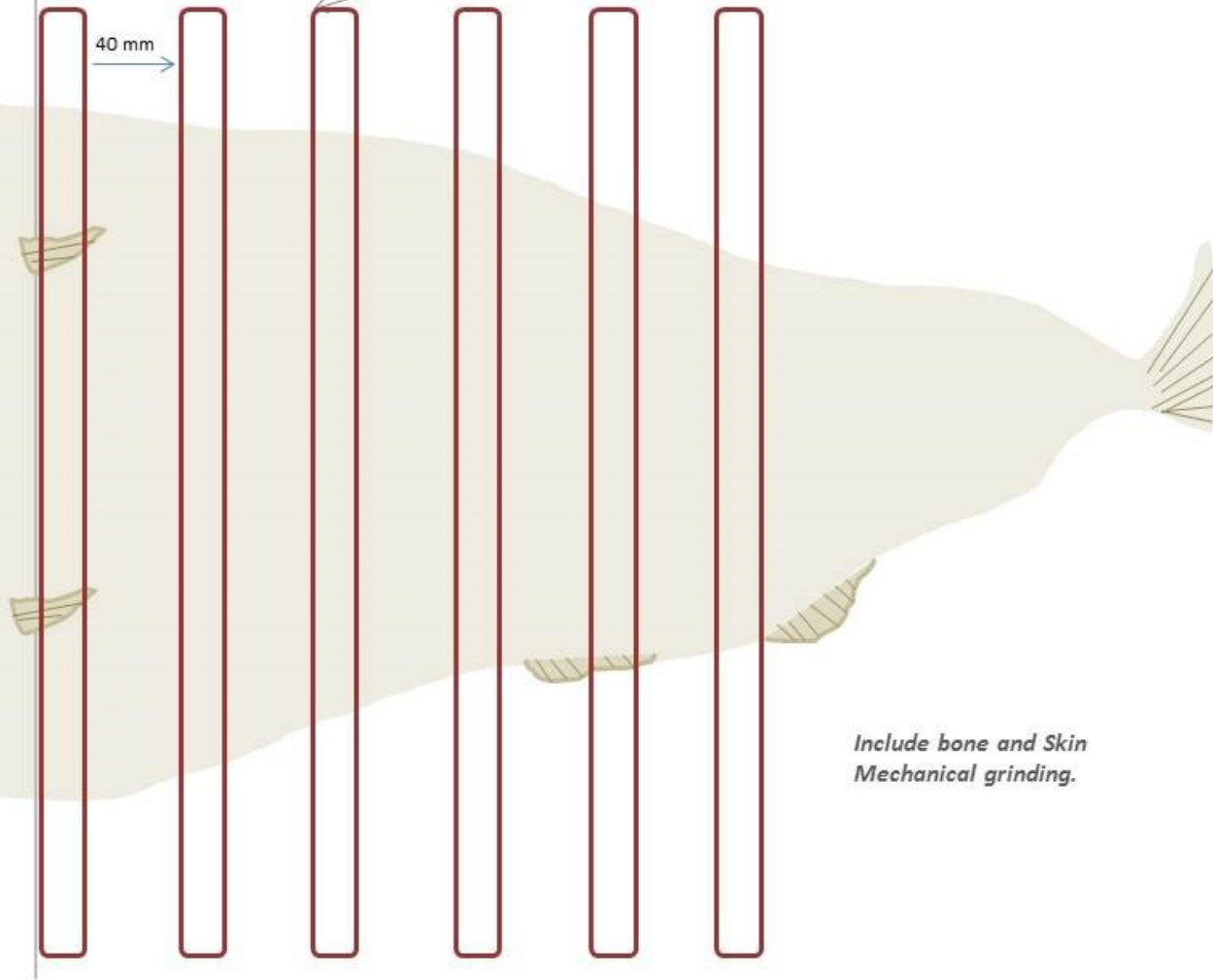
*Low variance between production lots.*



# Portuguese Decreto-Lei 25-2005.

Portugal

20 mm sections for laboratory sample from pectoral to anal fins.



**MINISTÉRIO DA AGRICULTURA, PASCAS  
E FLORESTAS**

**Decreto-Lei n.º 25/2005**  
de 28 de Janeiro

O actual regime aplicável à comercialização do bacalhau e espécies afins, salgados, verdes e secos, previsto pela Portaria n.º 355/87, de 29 de Abril, encontra-se, hoje, desadequado face à evolução do mercado dos produtos alimentares, onde a qualidade e a informação ao consumidor são cada vez mais importantes.

Deste modo, é necessário definir novas normas de comercialização para o bacalhau e espécies afins, salgados, verdes e secos, tendo em conta designadamente a evolução dos processos tecnológicos de fabrico, as alterações verificadas no mercado destes produtos, as modificações introduzidas nas denominações comerciais das espécies autorizadas a serem comercializadas como bacalhau, ou apenas como afins do bacalhau, bem como a informação a fornecer ao consumidor.

Este diploma insere-se nos objectivos do Governo em termos de política alimentar, visando sobretudo alcançar elevados padrões de qualidade, assegurar a defesa dos legítimos interesses e direitos do consumidor, garantir a livre concorrência e transparência dos mercados e prevenir, ao mesmo tempo, práticas comerciais condenáveis, como a fraude e a especulação.

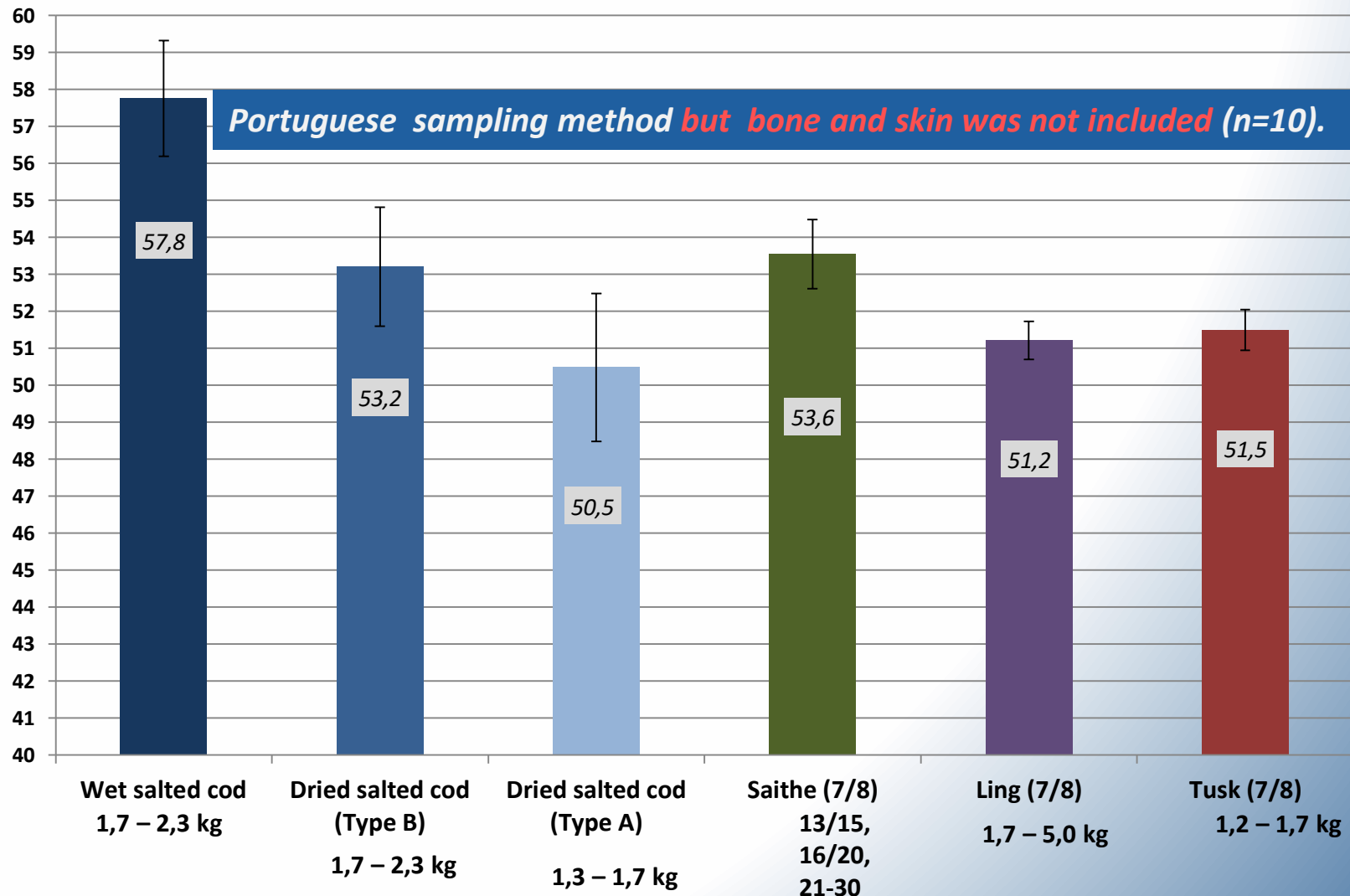
Neste sentido são estabelecidos vários princípios e regras de actuação, umas constituindo a consolidação das matérias já em vigor e outras inovadoras, com destaque para a definição e caracterização dos diferentes tipos de produtos.

Neste âmbito, as entidades fiscalizadoras passam a dispor das condições necessárias ao exercício da sua actividade, uma vez que o presente diploma define métodos para a determinação do teor de sal, expresso em cloreto de sódio, e do teor de humidade do bacalhau salgado, verde, semi-seco ou seco, e das espécies afins salgadas, verdes, semi-secas e secas.

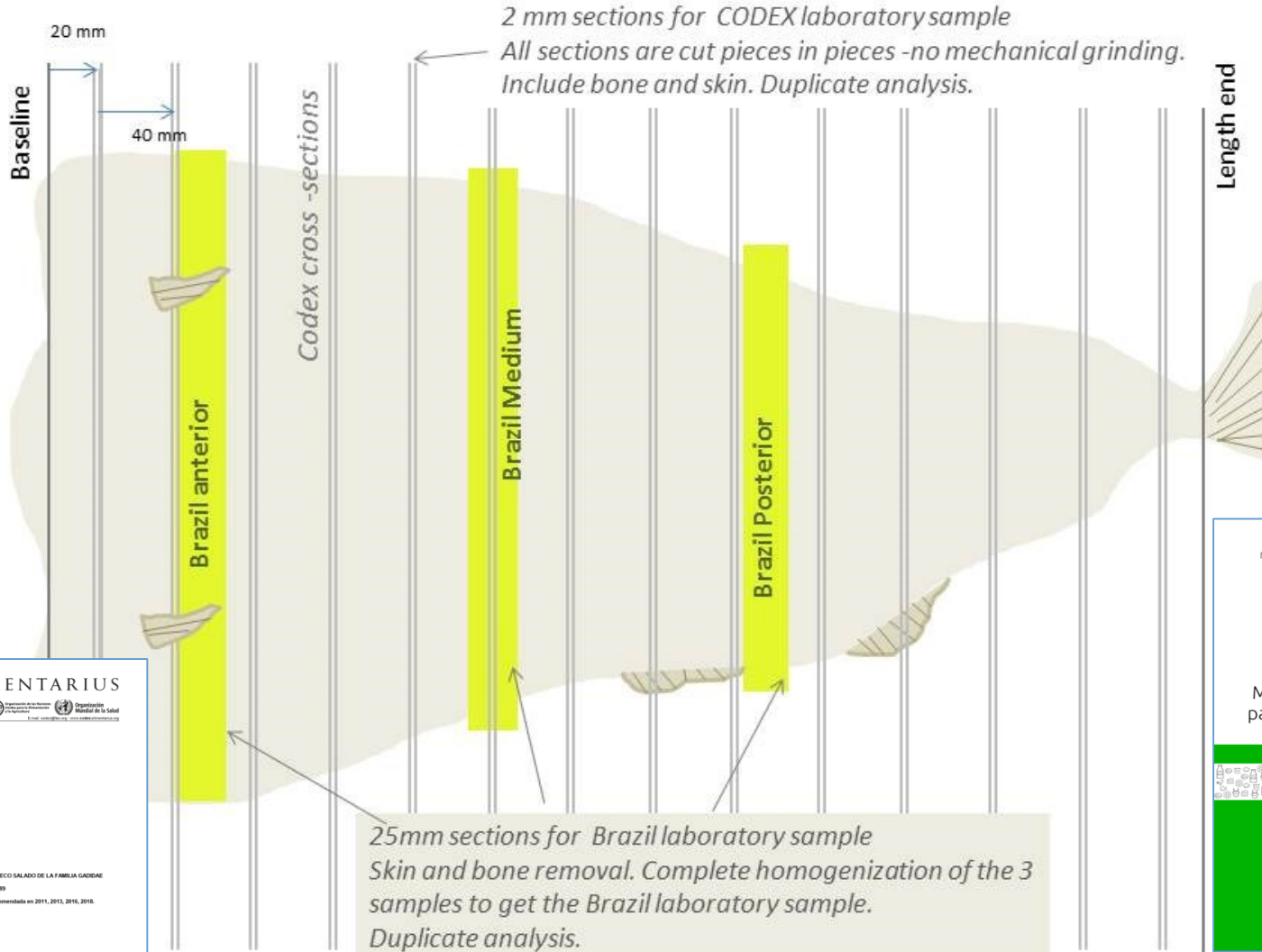
Além disso, considera-se a possibilidade de, em alternativa àqueles métodos e a pedido do operador, serem utilizados, em qualquer das determinações, os métodos

*Include bone and Skin  
Mechanical grinding.*

## Moisture contents from project FHF - 901307 .



# Sample selection for Brazil vs. Codex method comparison.



**CODEX ALIMENTARIUS**  
NORMAS INTERNACIONALES DE LOS ALIMENTOS

Ministerio de Agricultura, Pecuaria y Abastecimento  
Ministerio de la Salud

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**NORMA PARA PESCADO SALADO Y PESCADO SECO SALADO DE LA FAMILIA GADINAE**  
CXS 167-1999  
Adoptada en 1999. Revisada en 1996, 2005. Enmendada en 2011, 2013, 2016, 2016.

Ministério da Agricultura, Pecuária e Abastecimento

**Manual de Métodos Oficiais  
para Análise de Alimentos de  
Origem Animal**

2146  
Brasília, 2019

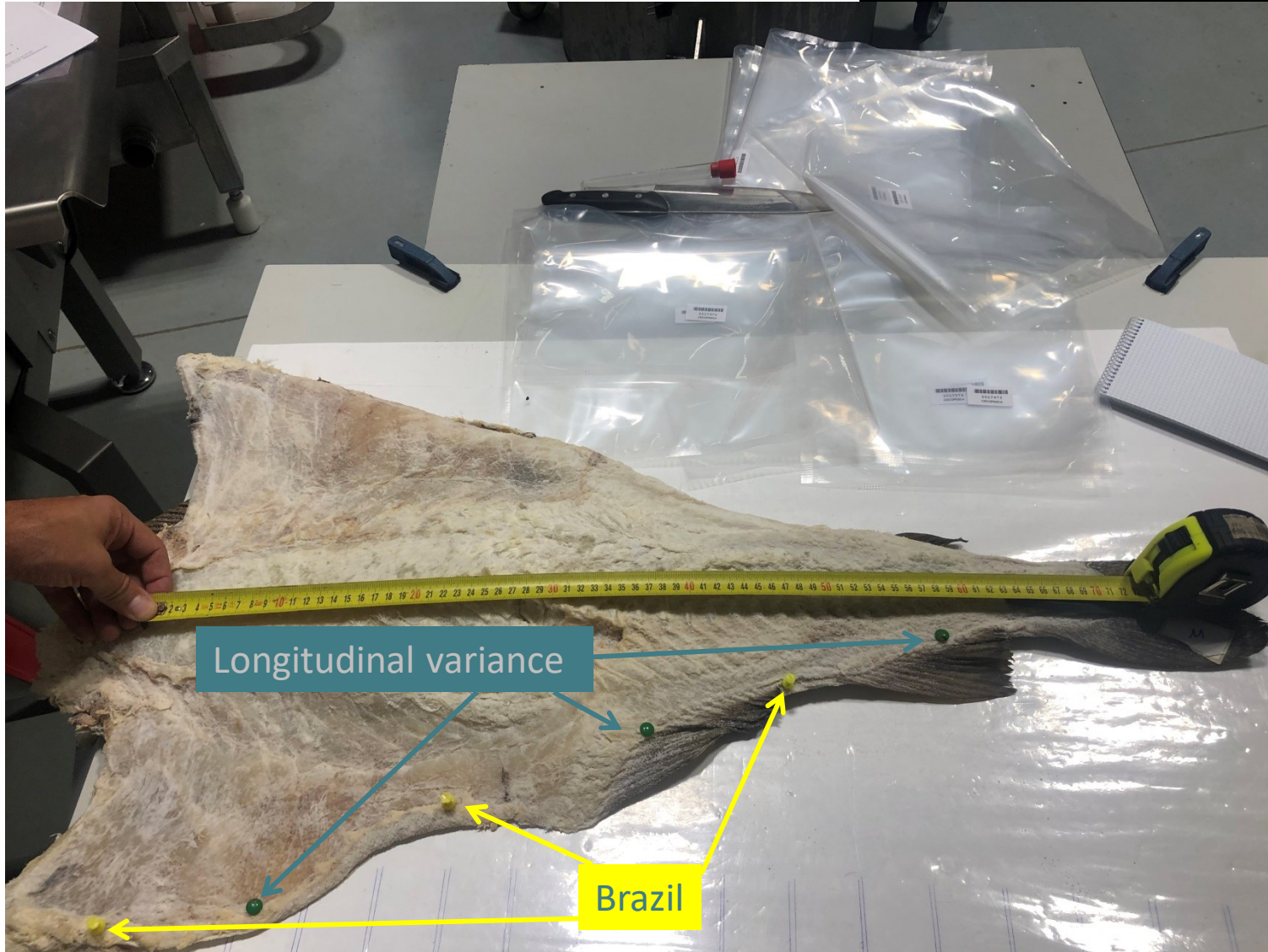
## Sample selection for longitudinal variance.

Include bone & Skin

No mechanical grinding. Hand-cut in small pieces.



## Sample preparation for method & anatomical comparison



## Sample preparation for method & anatomical comparison

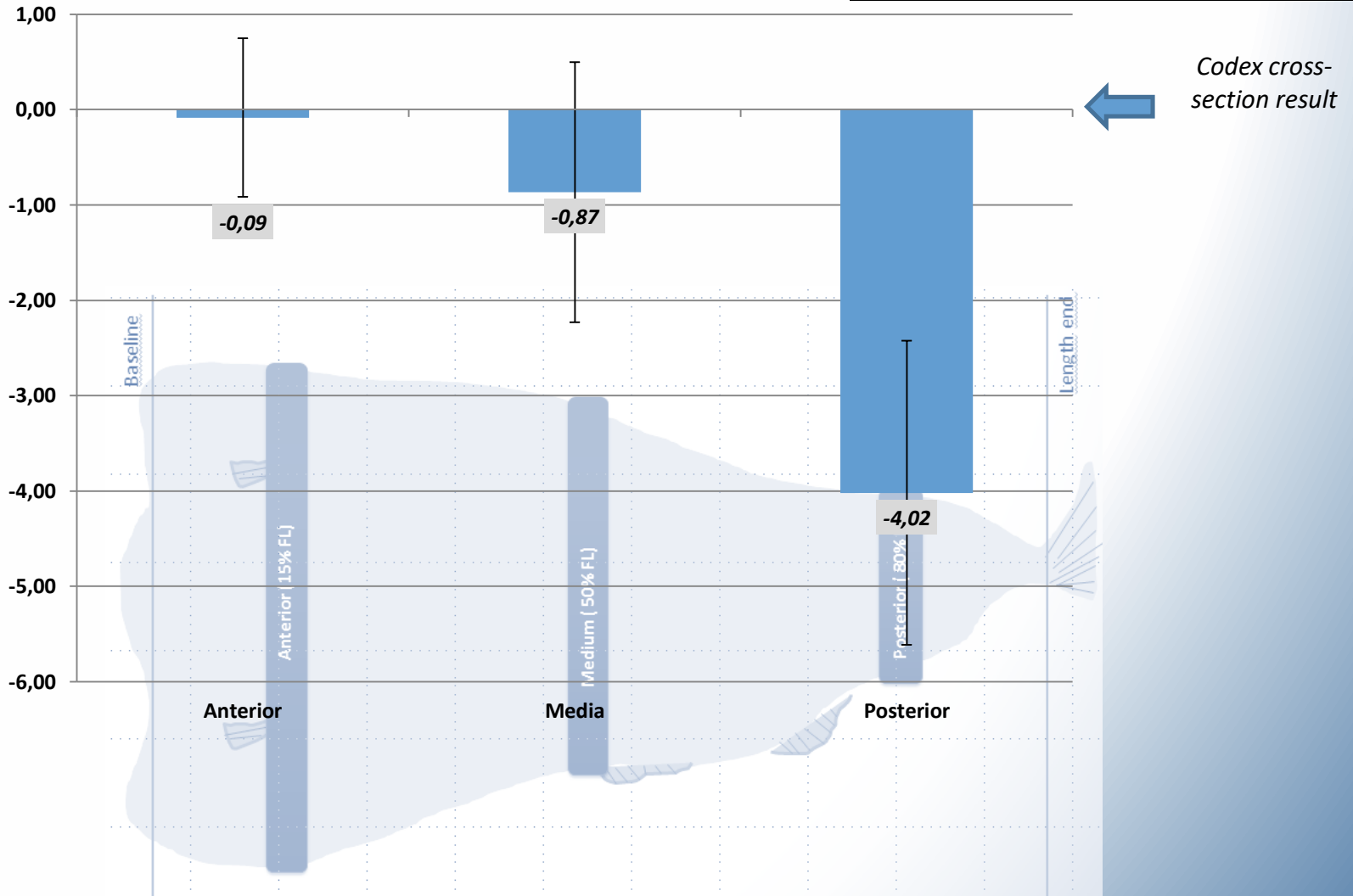
- 7 samples from each fish ( 2 Codex replicates, 2 Brazil method replicates, 3 sections (anterior, medium, posterior)).



- 20 samples from 5 suppliers. Duplicate analysis for method comparison.

COD	Size class	Codex Stan 169 - 1989				Analysis Brasil
		Analysis	Anterior	Media	Posterior	Mix
<b>Company 1</b>	<b>8/10</b>	4 x 2	4	4	4	4 x 2
<b>Company 2</b>	<b>8/10</b>	4 x 2	4	4	4	4 x 2
<b>Company 3</b>	<b>8/10</b>	4 x 2	4	4	4	4 x 2
<b>Company 4</b>	<b>8/10</b>	4 x 2	4	4	4	4 x 2
<b>Company 5</b>	<b>8/10</b>	4 x 2	4	4	4	4 x 2
		40	20	20	20	40

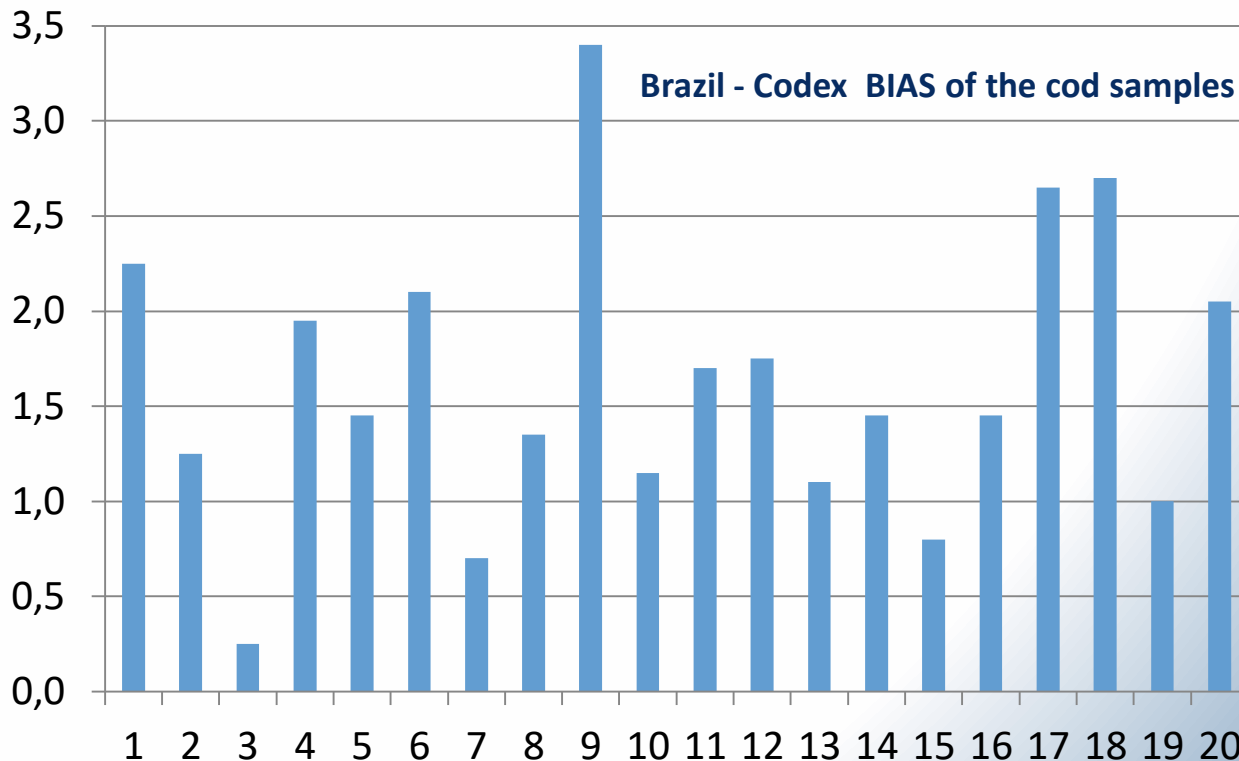
# Moisture content variation in the fish length (Cod 8-10).



## Brazil vs. Codex method comparison (Cod 8/10).

The Brazilian methodology leads to more precise results ( $\pm 0,58$ ) than Codex method ( $\pm 1,10$ ).

**In average, the Brazilian method gives a  $1,63 \pm 0,76$  g/100g higher moisture content than CODEX method.**

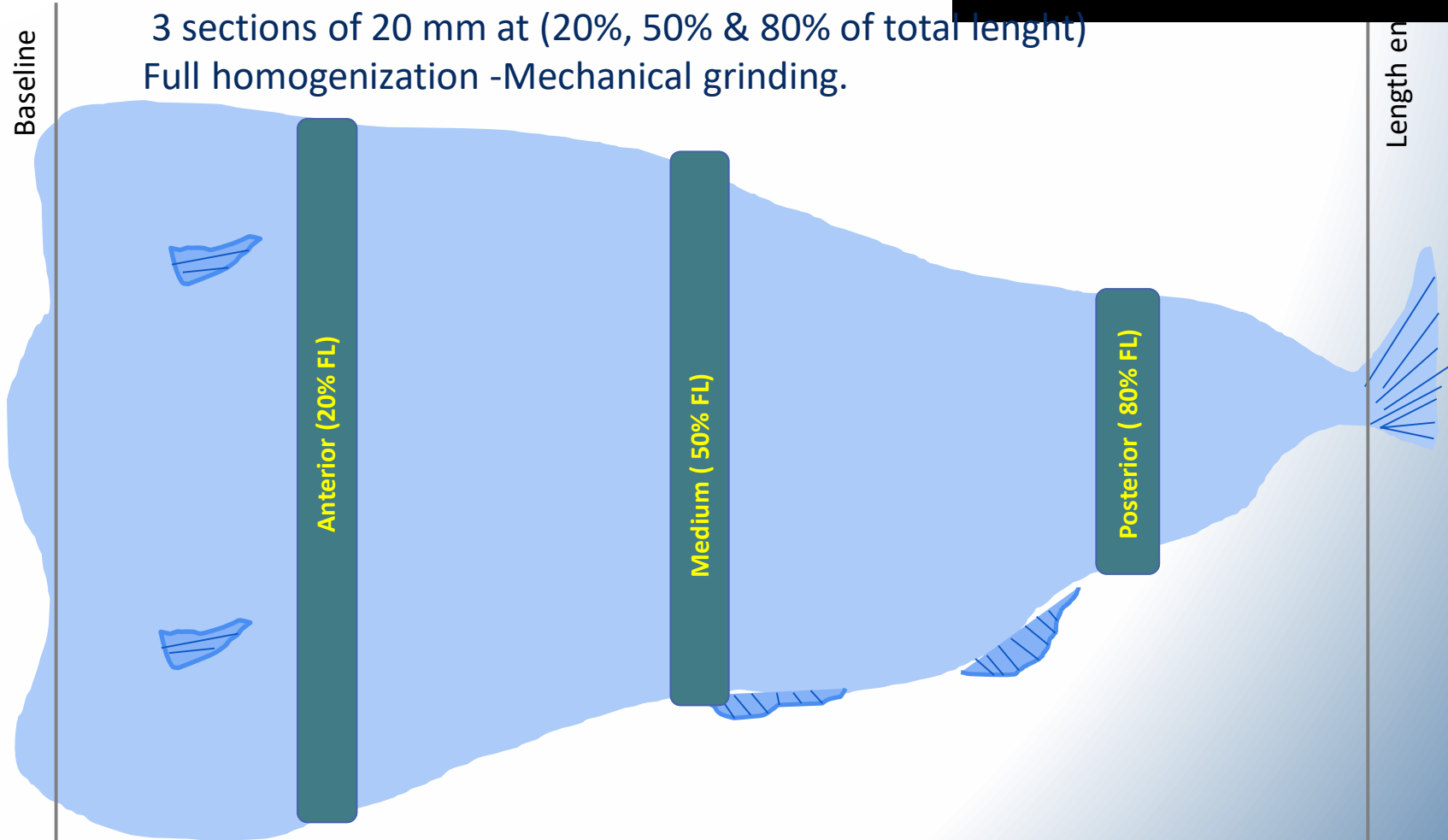


The implementation of Brazilian method would greatly increase the previous non-compliance rates.



## Suggested methodology change.

3 sections of 20 mm at (20%, 50% & 80% of total length)  
Full homogenization -Mechanical grinding.



**Inclusion of bone & skin** would best reflect the moisture content of the product, but may cause higher variability in the result.

## Take-home remarks.

- Codex method is costly and imprecise. The use of sections at defined positions can get the same result as the cross-section methodology and make the analysis easier and more accessible.
- Codex results reflect that **mean** moisture contents are below 53% for all groups, but non-compliance rates (*Brazil*) of production may not be assumable by exporters especially for the 8/10 size class.
- Low internal variability between lots. Moderate variance in between companies' production.
- Longitudinal variance in moisture contents was found, specially for the posterior section (related to product thickness).
- The brazilian method is easier to implement and more precise since only the edible fraction is used. Sections are certainly skewed to the front part of the fish (excludes tail).
- The Brazilian method gives significantly higher moisture contents than Codex method (**Mean Bias: +1,6 g/100g**). **This should be taken into account by authorities.**
- A modification of the reference method is suggested.

**Thank you for your attention.**

**Any questions?**