BOOK OF PRESENTATIONS

WEFTA 2014

SEAFOOD Science for a changing demand

PRESENTATIONS

SEAFOOD QUALITY REASSURANCE

ILVO
Institute for Agricultural and Fisheries Research

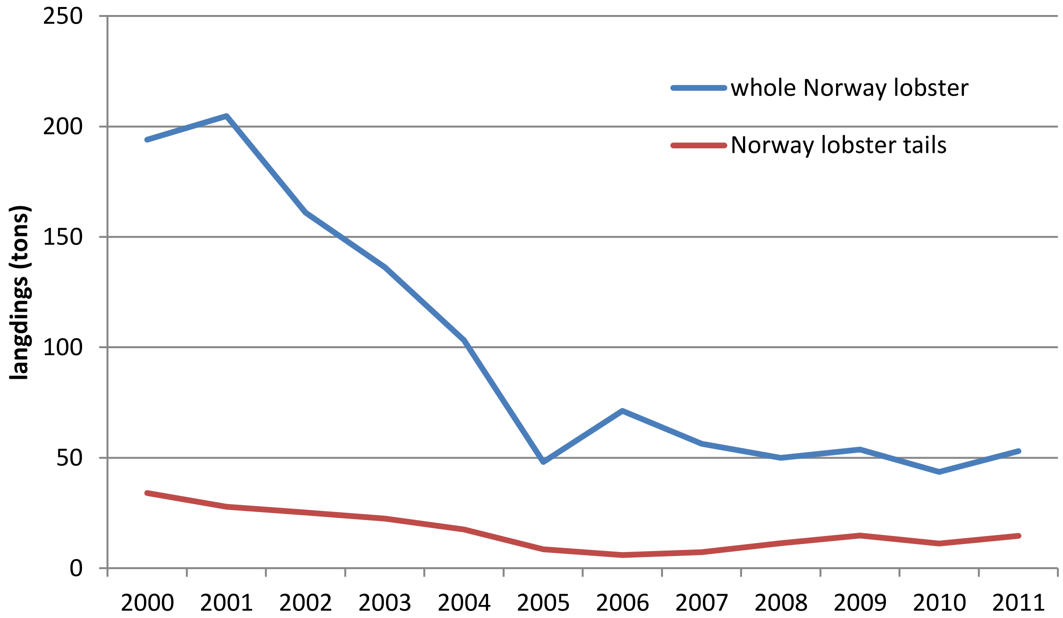
Quality research on Norway lobster *(Nephrops norvegicus)*

Karen Bekaert, Lisa Devriese, Daphné Deloof,
Sara Maes, Johan Robbens

WEFTA 2014 - Bilbao

Background

Oolavis project



Landings of whole Norway lobster and Norway lobster tails in Belgium

Aim of the study

1. Improve the handling conditions onboard of fishery vessels

2. Identify dominant bacteria during storage by PCR-DGGE
   - on whole Norway lobster
   - Norway lobster tails

Optimization of handling conditions onboard of whole Norway lobster

Collection of fresh Norway lobster in the Silverpit

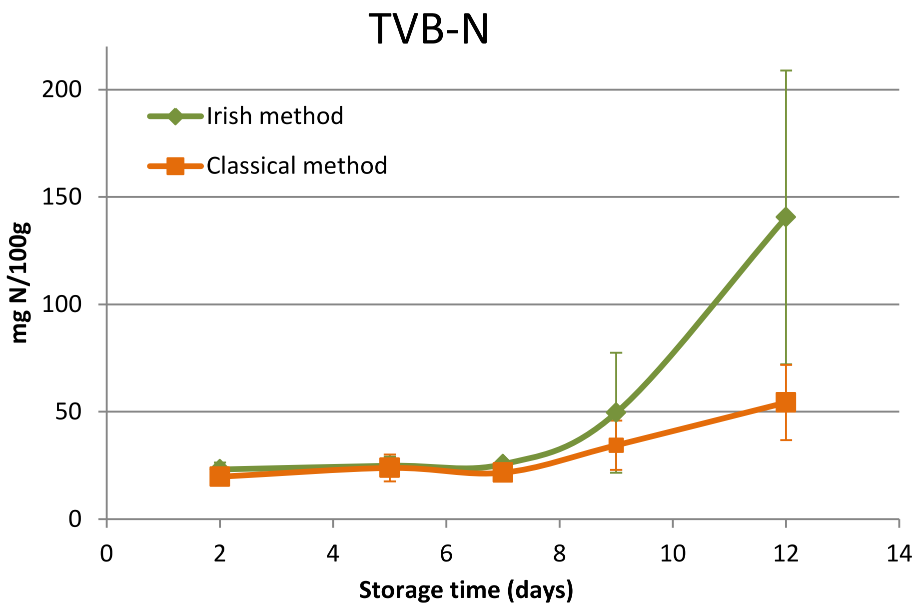
25 kg whole Norway lobster following the classical method

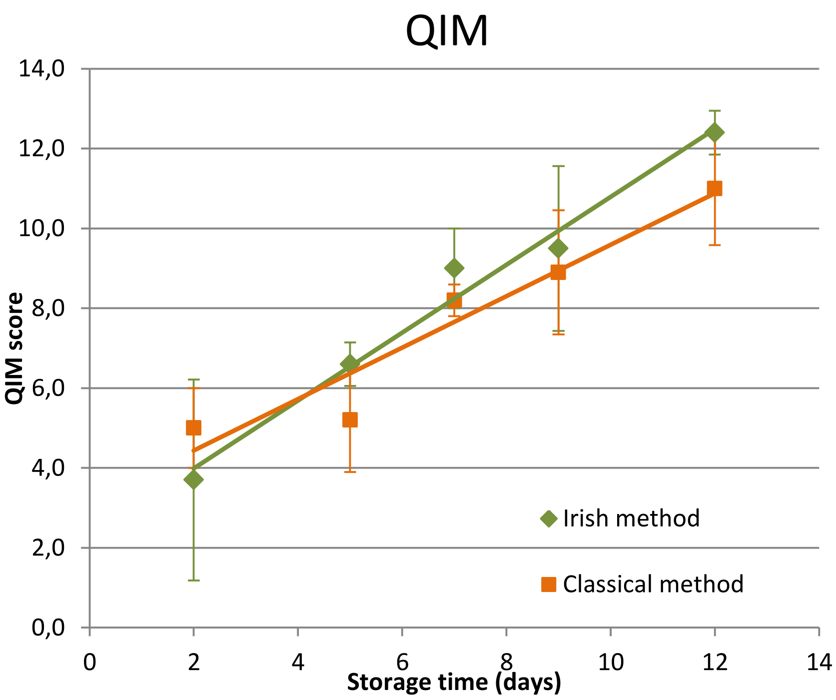
25 kg whole Norway lobster following the Irish method

Storage in ice

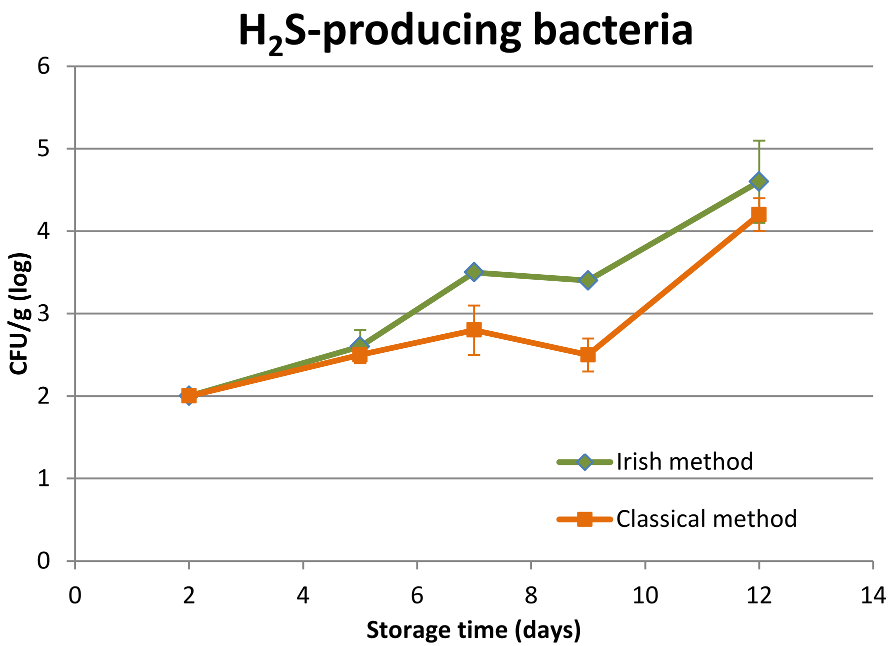
Every 2 days, analysis:
- Chemical (TVB-N)
- Sensory (QIM)
- Microbiological (MA, IA, CFC, VRBGA)

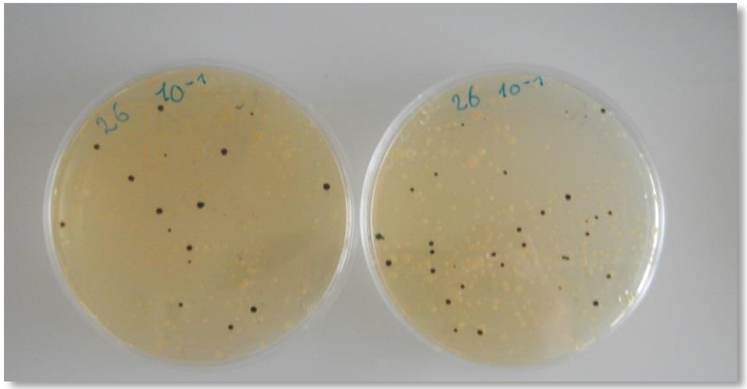
Chemical and sensory results

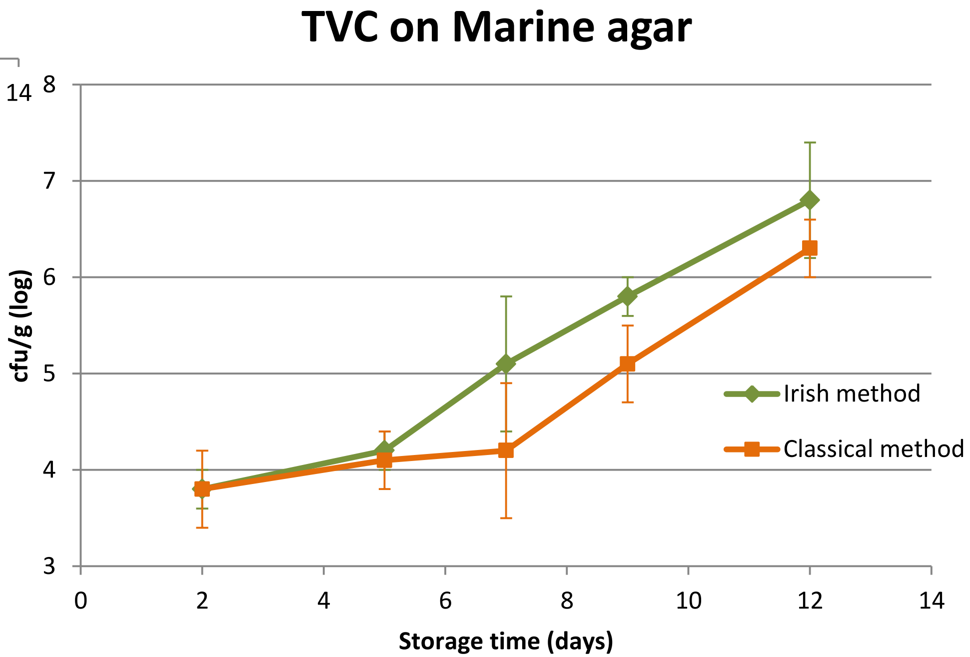




Microbiological results







No significant difference for:

- APC on IA
- *Pseudomonas* agar base
- Enterobacteriaceae

Identification of dominant bacteria

Fresh Norway lobster

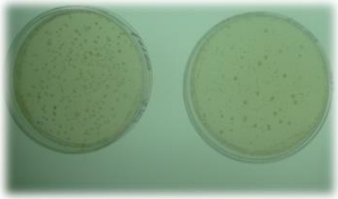
Whole Norway lobster

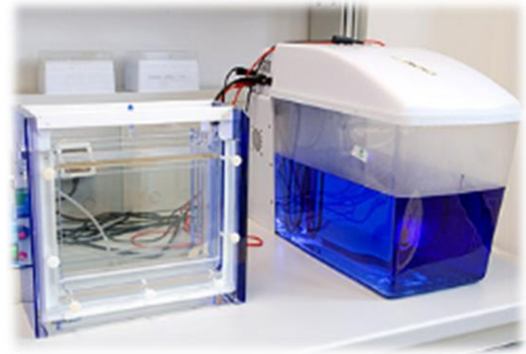
Norway lobster tails

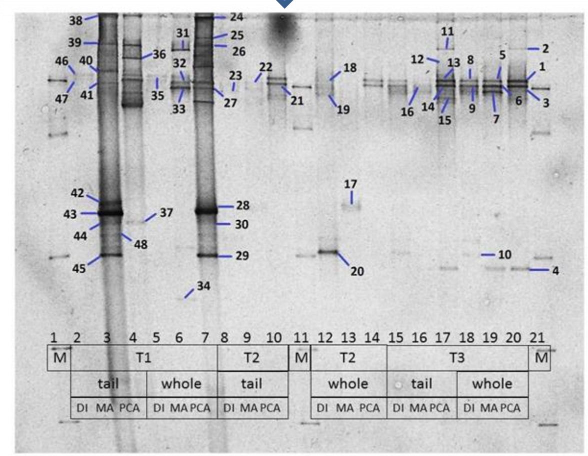
Storage on ice

- Determination of total aerobic count on MA and PCA
- PCR-DGGE analysis of plate swab
- PCR-DGGE analysis direct from matrix

Methods





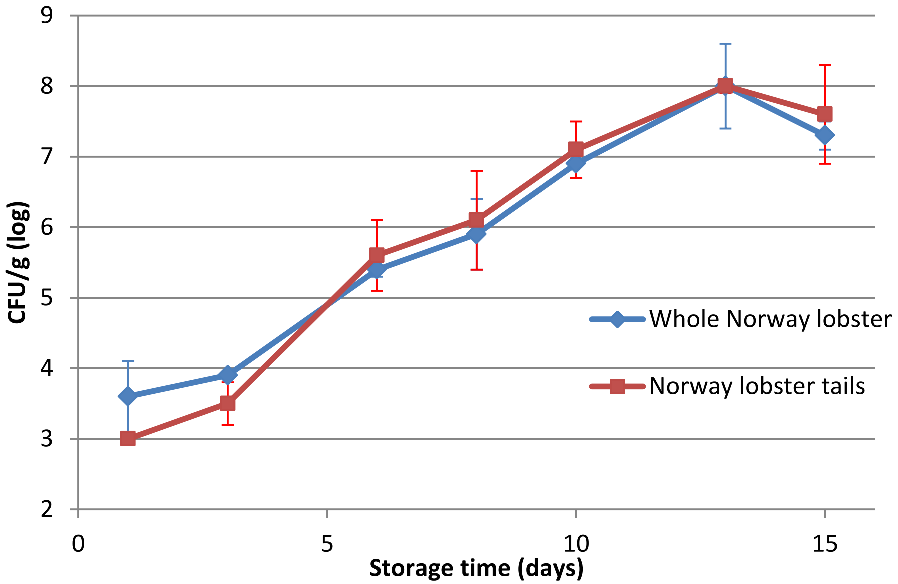


M = Marker, T1 = day 1 of storage,T2 = day 6 of storage, T3 = day 15 of storage, DI= direct DNA from matrix, MA = bulk cell DNA from MA, PCA = bulk cell DNA from PCA

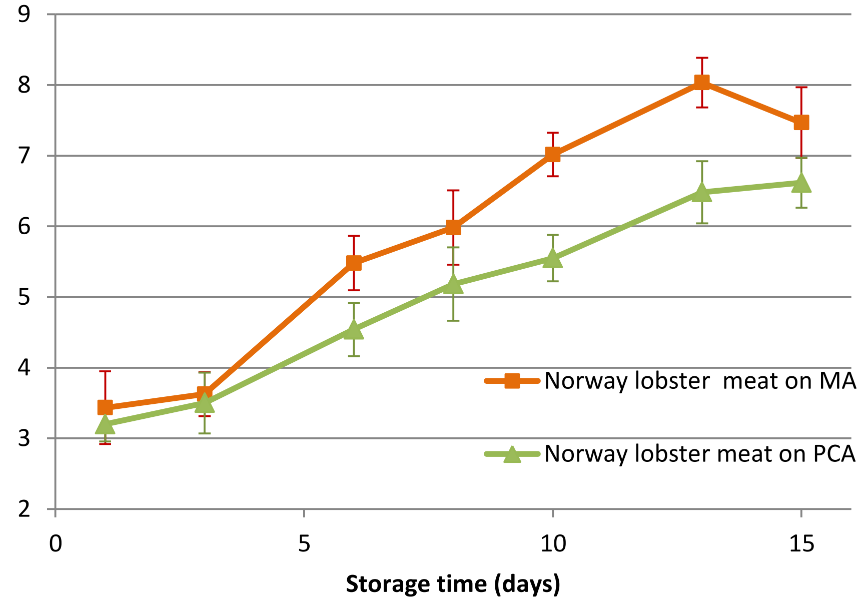
Band n°	Closest relative in BLAST	Similarity (%)
1	*Pseudomonas sp.*	99%
2	*Psychrobacter sp.*	100%
3	*Pseudomonas sp.*	92%
4	*Microbacterium arborescens*	97%
5	*Citrobacter freundii*	96%
6	*Psychrobacter sp.*	98%
7	*Pseudoalteromonas sp.*	98%
8	*Pseudomonas sp.*	100%
9	*Psychrobacter sp.*	100%

Results of total Aerobic Plate Count

Aerobic Plate Count on MA of whole Norway lobster and tails



Aerobic Plate Count on MA and PCA of Norway lobster



Results of identification of bacteria

Storage time on ice	Whole Norway lobster			Norway lobster tails		
	Direct DNA	Bulk cell DNA from MA	Bulk cell DNA from PCA	Direct DNA	Bulk cell DNA from MA	Bulk cell DNA from PCA
0	*Pseudoalteromonas sp.*	*Pseudoalteromonas sp.* *Pseudomonas sp.*	*Pseudoalteromonas sp.* *Shewanella sp.*	*Pseudoalteromonas sp.*	*Pseudoalteromonas sp.* *Psychrobacter sp.* *Vibrio sp.*	*Pseudoalteromonas sp.* *Azotobacter sp.*
6		*Psychrobacter sp.*	*Pseudomonas sp.*	*Pseudoalteromonas sp.* *Allivibrio sp.*	*Pseudoalteromonas sp.*	*Pseudomonas sp.* *Psychrobacter sp.*
15	*Pseudomonas sp.* *Psychrobacter sp.*		*Pseudomonas sp.* *Luteimonas sp.*	*Pseudomonas sp.* *Psychrobacter sp.*	*Pseudoalteromonas sp.* *Psychrobacter sp.*	*Pseudomonas sp.* *Psychrobacter sp.* *Microbacterium sp.*

- Further work into the spoilage potential of these microorganisms
- MAP packaging on board

Conclusions

- Significant differences in microbiological counts between the Irish method and the classical storage method from day 6 of storage
- For short fishing trips: use of the meshed bag is not disadvantageous, but is not applicable to the Belgian situation
- No significant difference between aerobic plate count of whole Norway lobster and Norway lobster tails
- Mainly *Psychrobacter* spp. and *Pseudomonas* spp. are present at the end of the storage period of Norway lobster

Thank you for your attention!

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A novel non-destructive method for the determination of volatile amines from packaged fish

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44th WEFTA Meeting

Bilbao. June 9-11. 2014

azti tecnalia

www.azti.es

WEFTA

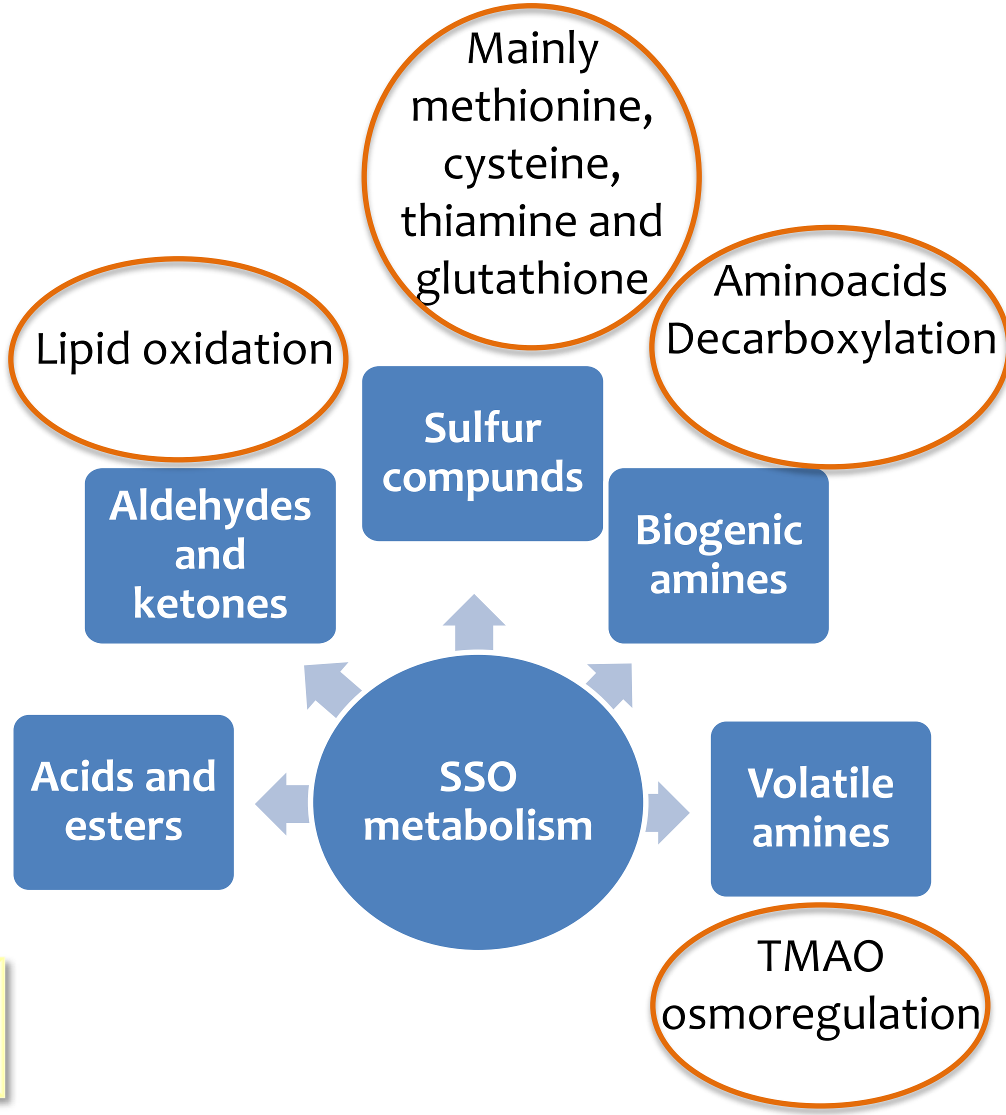
Contents

1. Introduction
    - Fish spoilage
    - Volatile amines
2. Objectives
3. Methodology
4. Results
    - Extraction validation
    - Correlation with fish muscle
    - Applications
        - Shelf life
        - Frozen-thawed samples
5. Conclusions

Fish spoilage

- Very perishable
- Rapid spoilage
- Bacterial activity → <u>SSO</u>→ ***OFF ODDOURS***
  OFF FLAVOURS

Consumer rejection



Volatile amines

TVBN

Total Volatile Base Nitrogen*

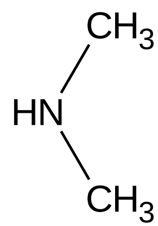
*European EC (EC) No 2074/2005 (20-35mg N / 100g fish)

AMMONIA NH_3

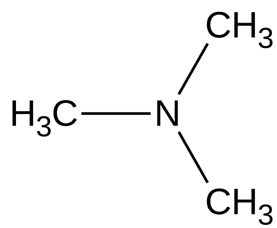
VOLATILE AMINES

Methylamine

Dimethylamine



Trimethylamine



FISHY ODOUR

Increase of TVBN during chilling storage (±4°C) is predominantly due to **TMA**

Objectives

- Development of a **non destructive method** to determine the **TMA, DMA and MA** content in the **headspace of packaged fish.**

- **Correlate** the concentrations of the **headspace with the muscle** of the fish.

- Determination of the **shelf life of hake and atlantic horse mackerel** with this new methodology

- Use this method **to detect the fraud** of selling **frozen-thawed fish** instead of **fresh fish.**

Derivatization process

Extracts

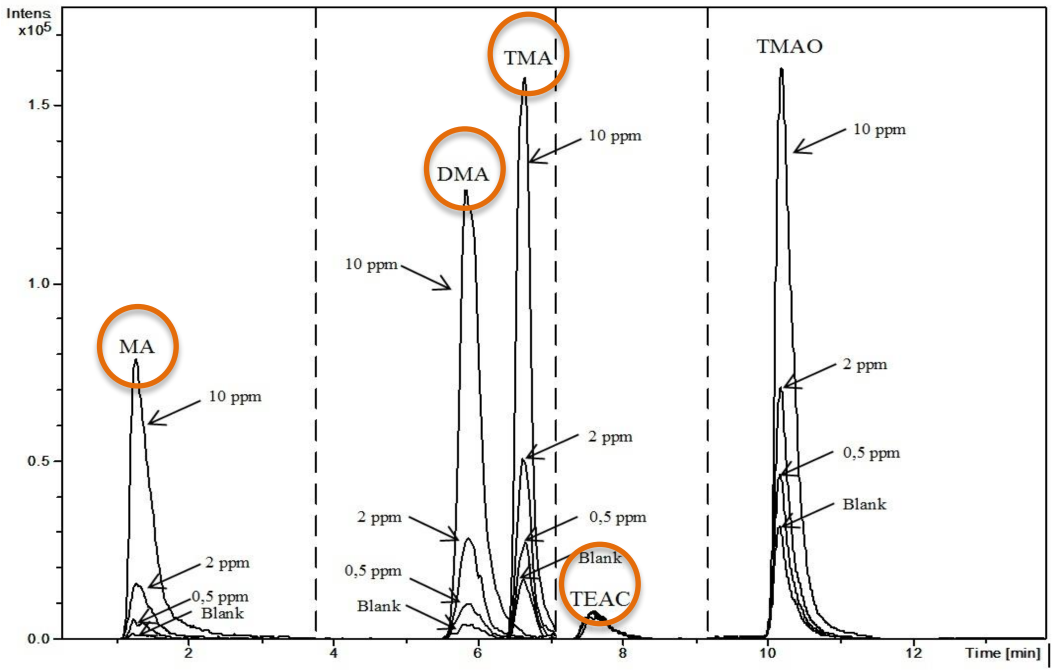
- Fish muscle
- Gas phase

Derivatization

- Sample dilution
- TBBA (tertbutyl bromoacetate)
- TEAC (Tetraethylammonium chloride)
- Conditions:
  - pH: 8
  - Temperature: 60°C
  - Time: 60'
- Stop reaction: formic acid

HPLC-MS

- HILIC column (30°C)
- Mobile phase
  - A: 100% H2O
  - B: 97%ACN:3%H2O
  - 5mM NH4 acetate
- Inj volume: 3uL



Extracts

Muscle

1 g fish

25 mL acetic acid 10mM

homogenization

Centrifugation:

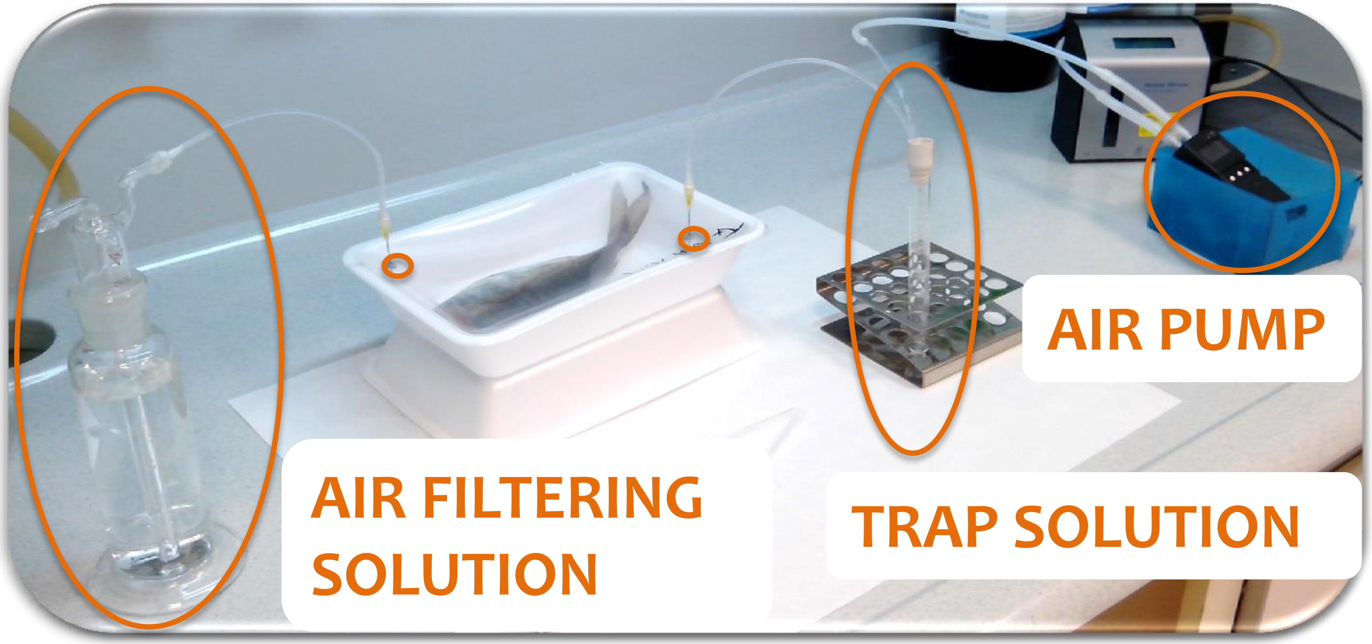
- 10’ at 3500 rpm
- 10’ at 13400 rpm

Headspace

Fish tray

10 mL acetic acid 50mM

Fish packaging and sampling



PACKAGING

- Trays: LINPAC 15-45 PS-EVOH-PET
- Film: LINPAC Lintop 80 (PA/PE)
- No vaccuum
- Sealing temperature: 155°C

FROZEN THAWED SAMPLES

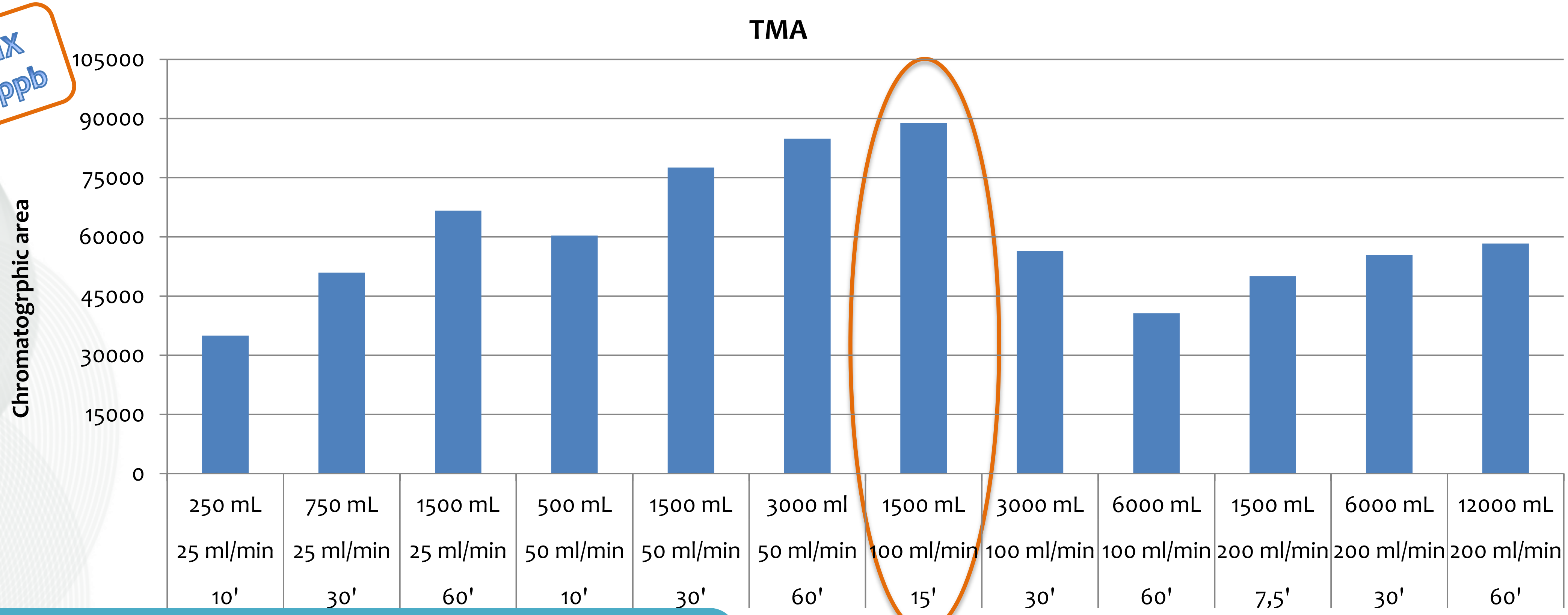
- Package fresh and frozen – thawed fish.
- 15°C during 24h
- Force SSO grow
- Sampling

SAMPLING

- 2' extraction
- 2nd air entry (septum)
- 13' extraction
- pH adjustment and derivatization

Volatile extraction optimization

MIX 25ppb



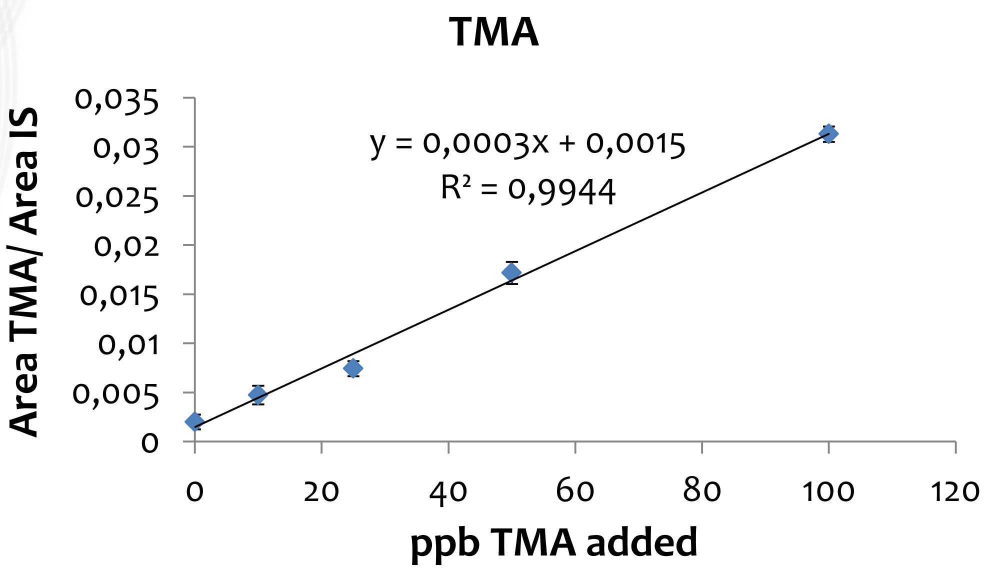
- 1mL 25 ppb MIX + 1 mL NaOH 2M
- 80ºC

- Different optimal conditions
- TMA is the most volatile
- TMA is the most interesting

Time	Flow	Air volume	MA	DMA	TMA
15'	100 ml/min	1500 mL	24803	775434	**88820**
60'	100 ml/min	6000 mL	32634	**1116703**	40629
30'	200 ml/min	6000 mL	**49682**	1054973	55381

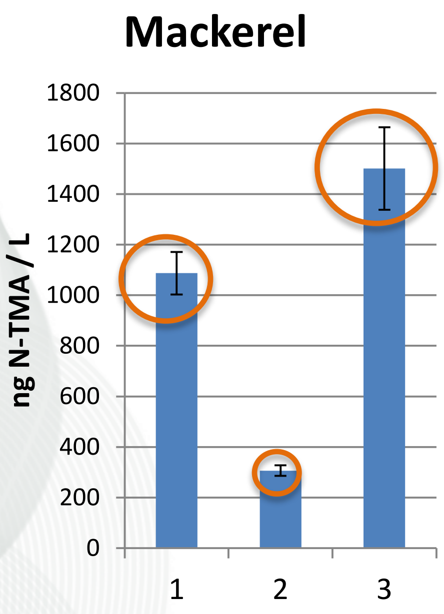
Volatile extraction optimization

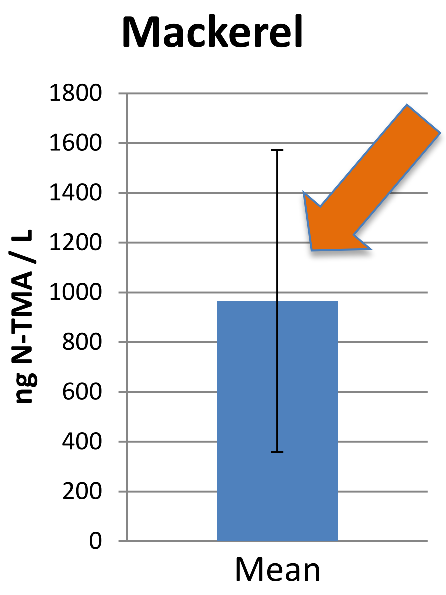
- Linear range: 10-100 ppb
- LOD: 10 ppb. <10ppb= blank
- %recovery
  - MA: ±50%
  - DMA: ±60%
  - TMA: ±75%
  - TMA>DMA>MA→ Volatility
- Repeatability: interday **TMA %RSD: 7.90**

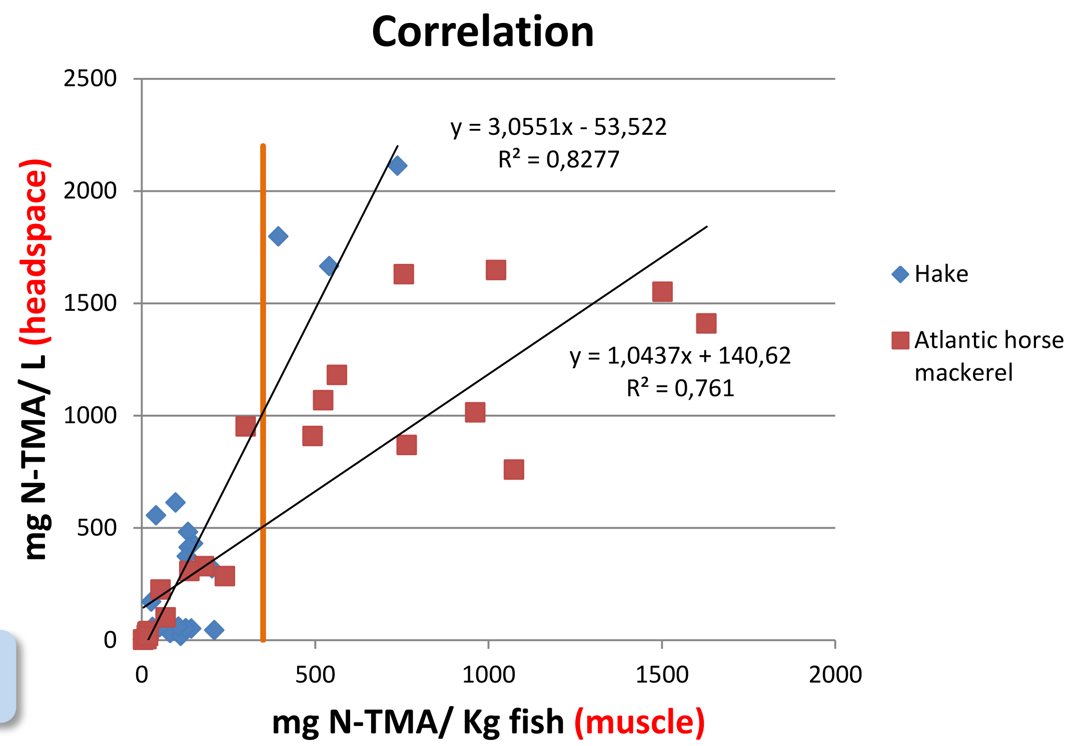


	%Recovery		
	MA	*DMA*	*TMA*
mean Day 1	30.3	45.6	75.1
SD Day 1	10.1	13.8	15.7
mean Day 2	48.8	73.2	74.7
SD Day 2	17.1	24.1	21.2
mean Day 3	44.8	64.4	74.6
SD Day 3	8.6	17.8	11.2
mean Day 4	67.2	61.3	87.1
SD Day 4	27.0	23.2	7.3
Interday mean	47.8	61.1	77.9
interday SD	15.2	11.5	6.2

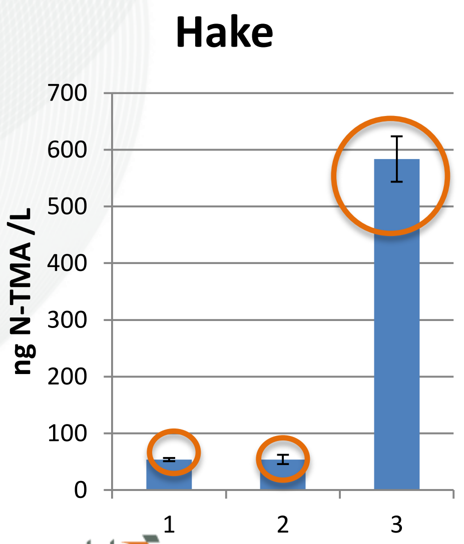
Correlation with fish muscle

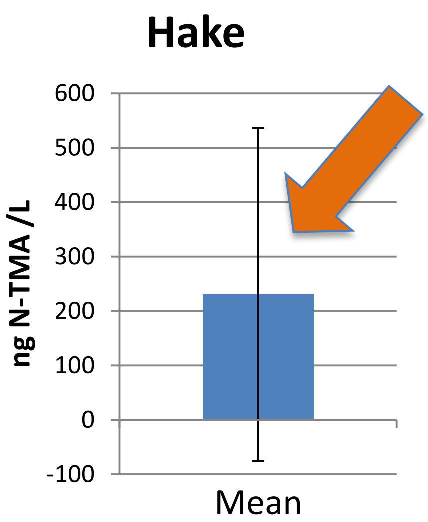






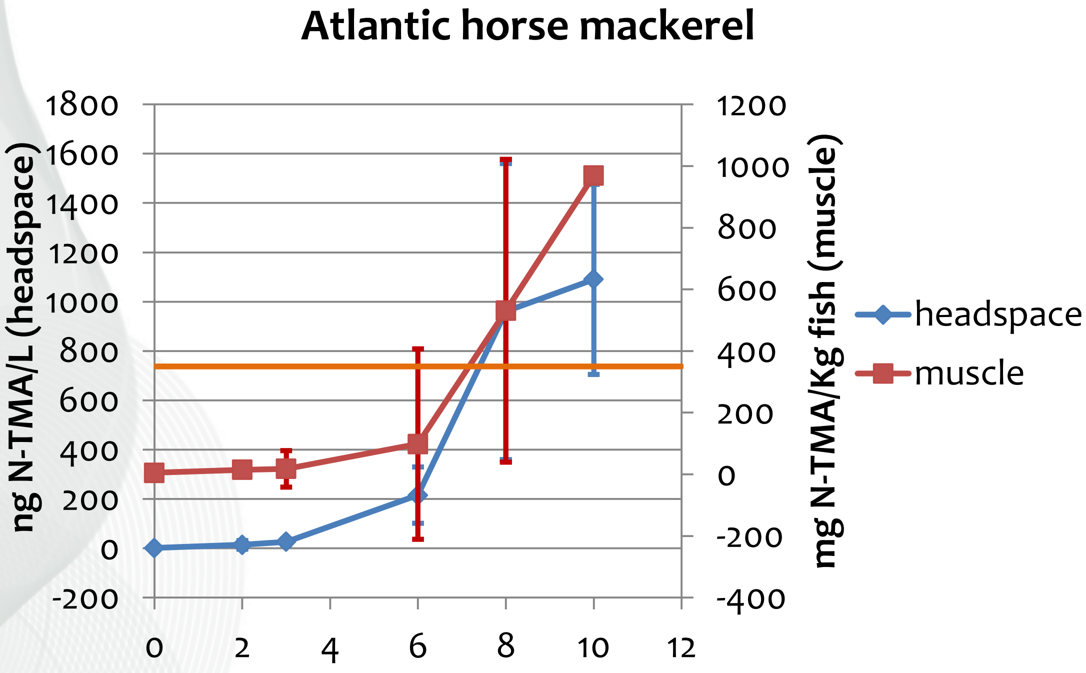
Intersample variability > intrasample variability

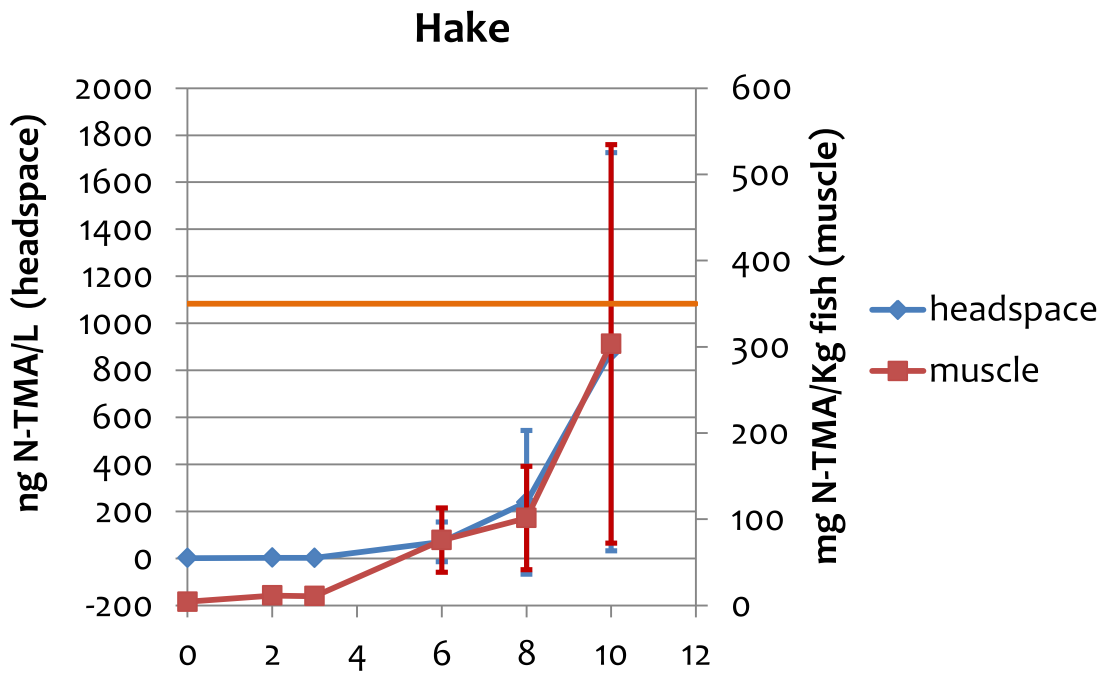




- **Mackerel**
  - **Muscle> 350 mg N-TMA/Kg**
  - **Gas phase> 500 ng N-TMA/L**
- **Hake**
  - **Muscle>350 mg N-TMA/Kg**
  - **Gas phase> 1000 ng N-TMA/L**

Shelf life





Atlantic horse mackerel

- 3 samples in triplicate
- Day 8: **> TVBN limit** (350mg N/ Kg fish)
- Muscle: mean 530mg N-TMA/Kg fish
- Gas phase: **960 ng N-TMA /L air**
- Day 6: high content of TMA

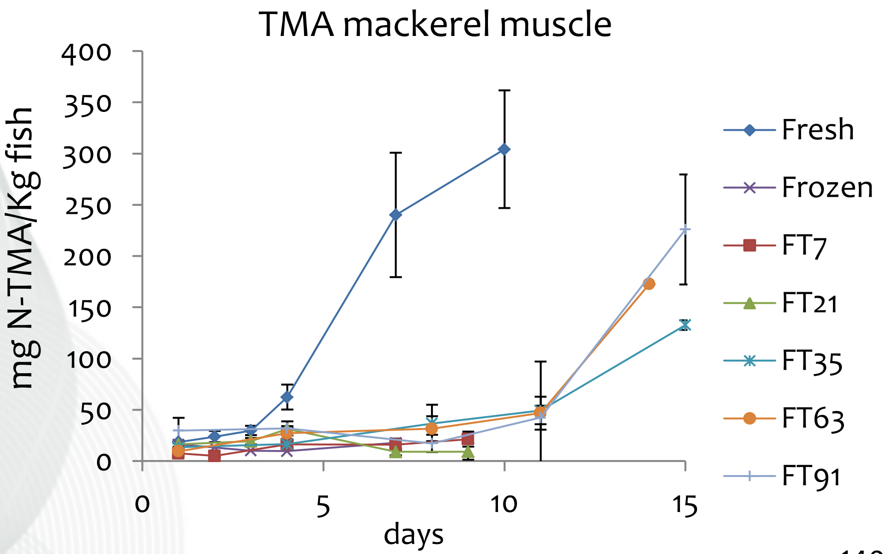
SAMPLE REJECTION

Hake

- 3 samples in triplicate
- Day 10: **≈ TVBN limit** (350mg N/Kg fish)
- Muscle: mean 303 mg N-TMA/Kg fish
- Gas phase: **879 ng N-TMA /L air**

SAMPLE REJECTION

Frozen-thawed samples

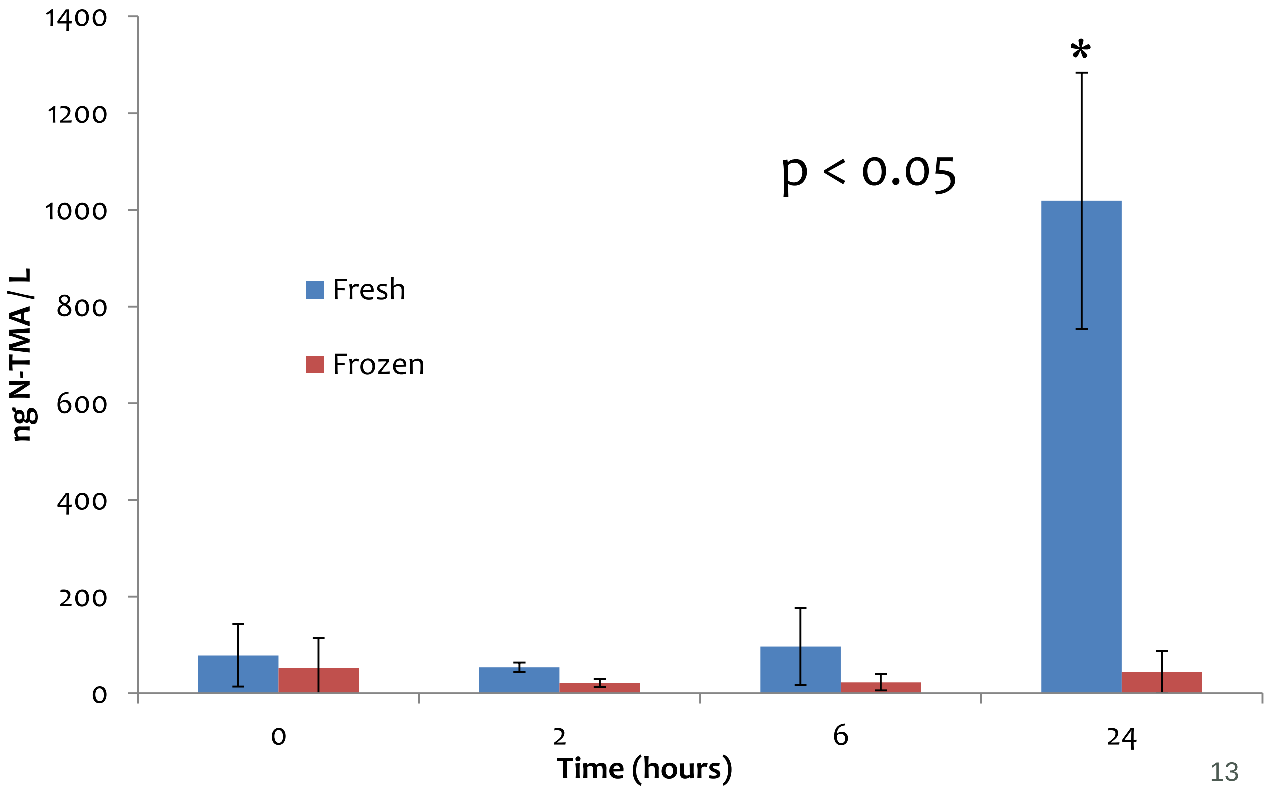


TMA in Frozen-thawed fish

- Inhibited
- SSO metabolism
    - Thermal adaptation
- 7 days frozen storage→ effect in muscle

Forcing metabolism

- 15°C
- Spoilage acceleration
- 24h→ significant differences



Conclusions and future work

Conclusions:

- Good correlation between muscle and headspace despite the high intersample variability.
- Development of a non destructive method.
- Detection of the fraud of selling frozen-thawed fish instead of fresh fish

Future work:

- Test the influence of the MAP in the determination of the volatile amines in gas phase.
- Test the minimum days necesary in frozen storage to determine the fraud as well as the minimum time necesary to force the SSO metabolism at 15ºC.
- Develop new sensors to make online detection systems and avoid the use of HPLC.

Acknowledgements

Basque Country Government

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Thanks for your attention

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Effect of growth season, filleting and rigor-status on water holding capacity, dry matter and drip loss from farmed Atlantic salmon

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Nofima, Email: bjorn.tore.rotabakk@nofima.no

Summary

- Background
- Materials and methods
- Results
- Conclusion

Background

The majority of Norwegian farmed salmon is sold and shipped as head on gutted (HOG). Only 15-20 % of farmed salmon in Norway is sold as pre-rigor filleted. It is with the Norwegian government's desire to arrange for increased added value in the salmon industry through increased processing (www.regjeringen.no). By supplying the market with fillet instead of whole fish, major economic and environmental gains are attained through less transport and reduced packaging consumption.

As a part of this plan, it is vital to gain knowledge about the quality and the behaviour of pre-rigor filleted salmon, and especially drip loss as this has a direct impact on the economy of pre-rigor filleting.

Materials and methods

- A full factorial design with 3 design factors:
  - Rigor status (pre or post-rigor) at filleting
  - Whole versus fillet
  - Growth season (spring or autumn)
- Responses
  - Water holding capacity
  - Drip loss
  - pH

Drip loss

- 10 fish were filleted by machine, and both fillets were dried off, weighed and packaged in EPS with ice for 14 days
- The fillets were dried off and weighed at both day 7 and day 14 to quantify the drip loss during storage
- The fillets were not in direct contact with the ice
- This was done on both pre- and post-rigor fish, and in the spring and the autumn

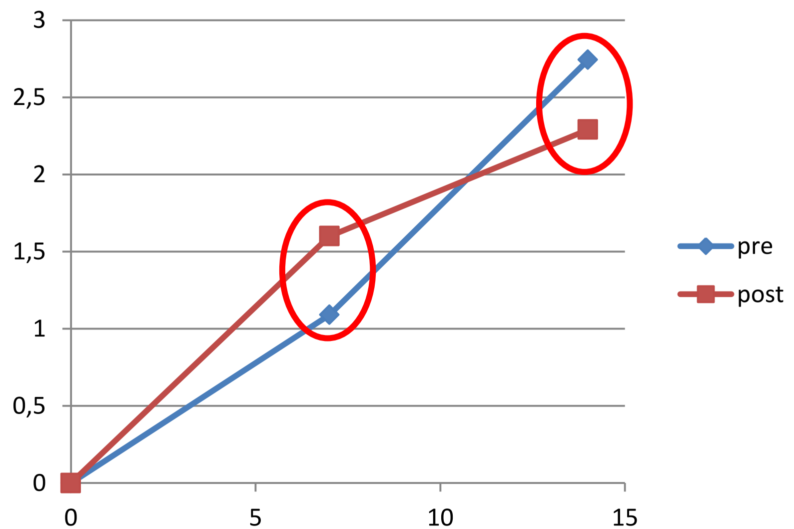
Water holding capacity

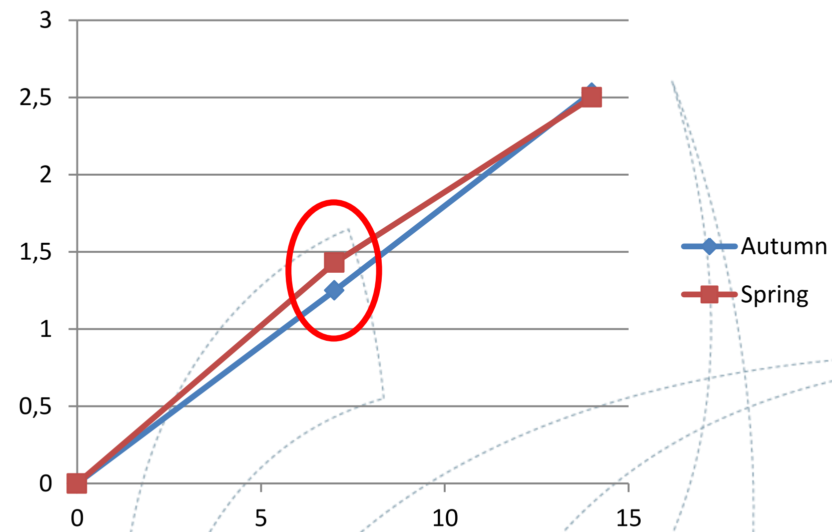
- First measured on the whole fish, then on the fillet
- Measured both on pre-rigor and post-rigor fish, both in the spring and in the autumn
- 528 G for 15 min at 4 °C
- 3 WHC and 6 dry matter on each fish/fillet

Nofima

Drip loss

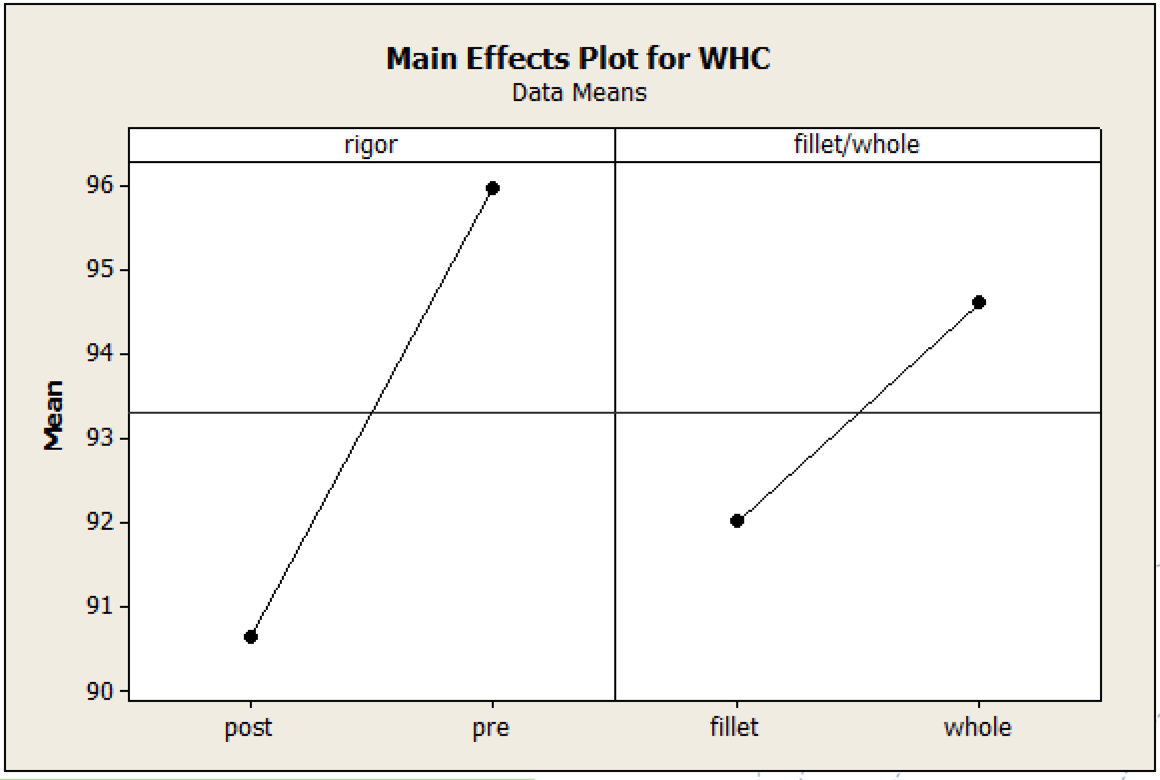
- Rigor status had a significant effect on drip loss on both day 7 and day 14 after filleting.
- No effect of season on drip loss (P>0.186) on day 14.





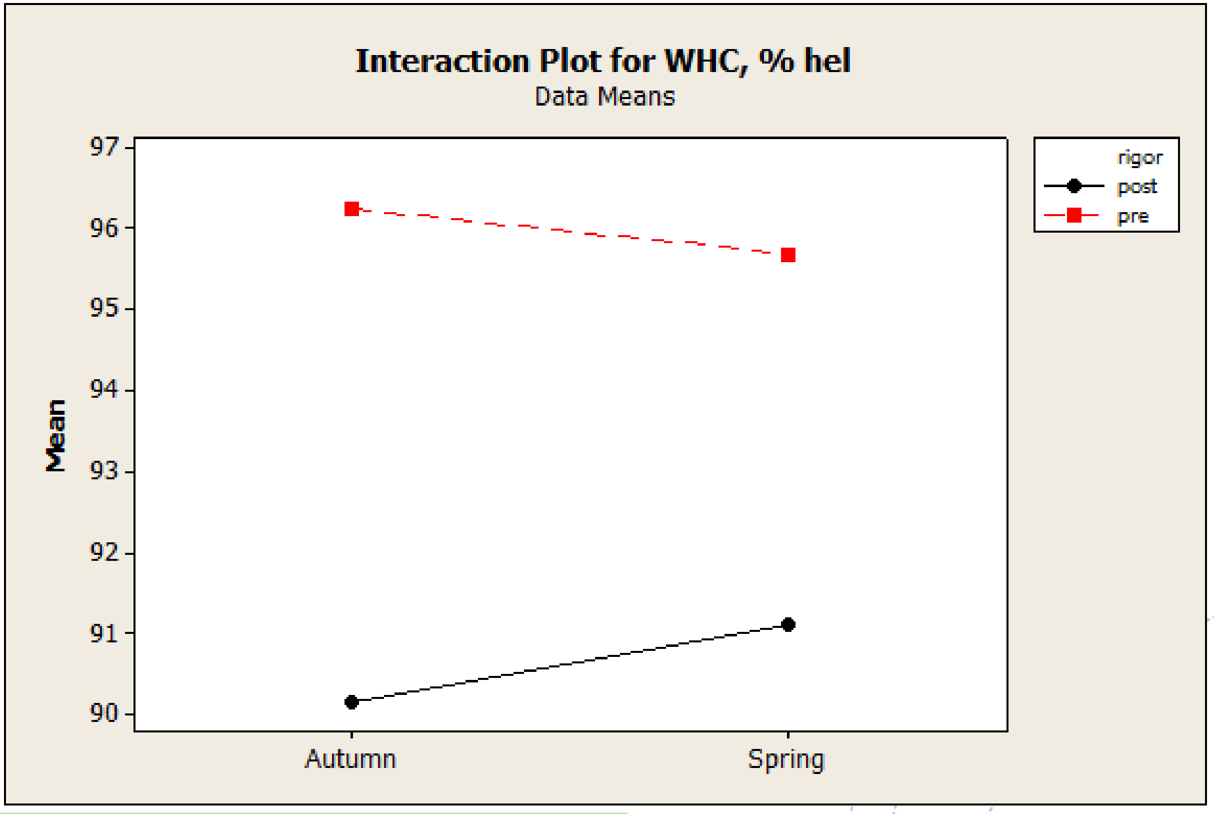
WHC

- pH was a significant covariate to WHC (P=0.041)
- Both rigor status and fillet vs whole fish had a significant impact on WHC



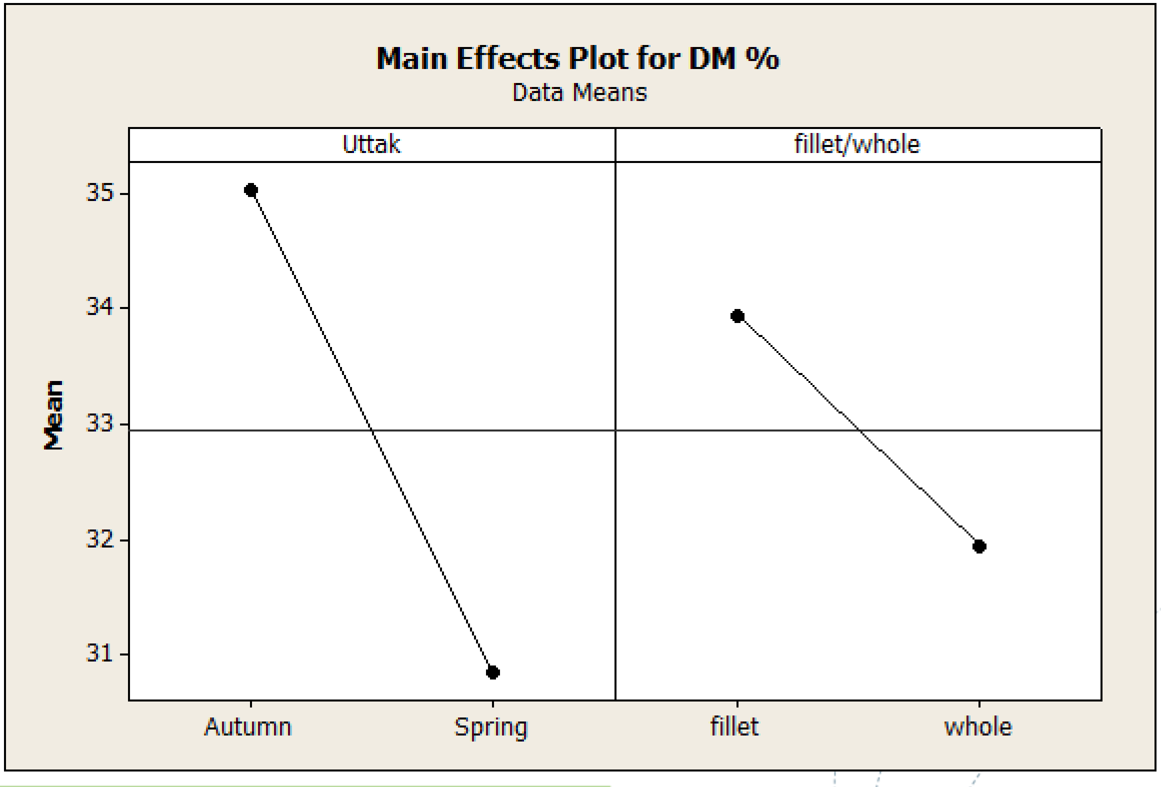
WHC

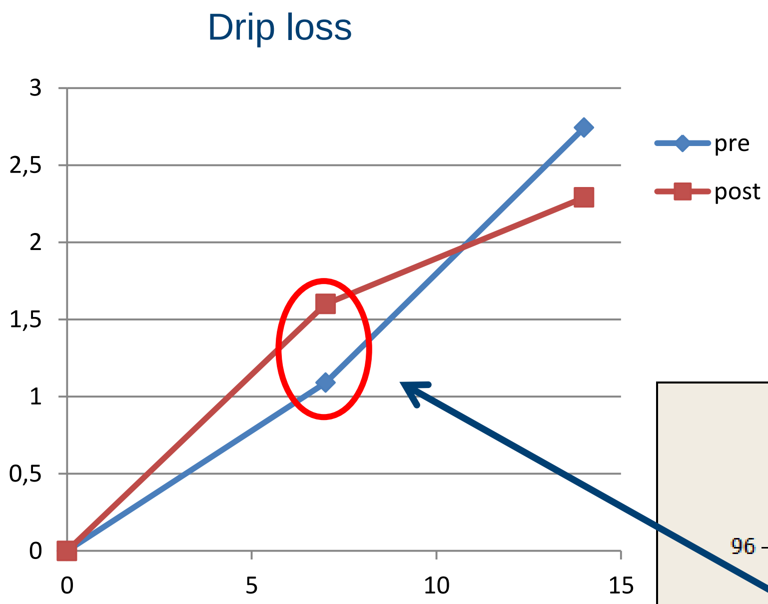
- In addition, a significant interaction between rigor and time of year was detected



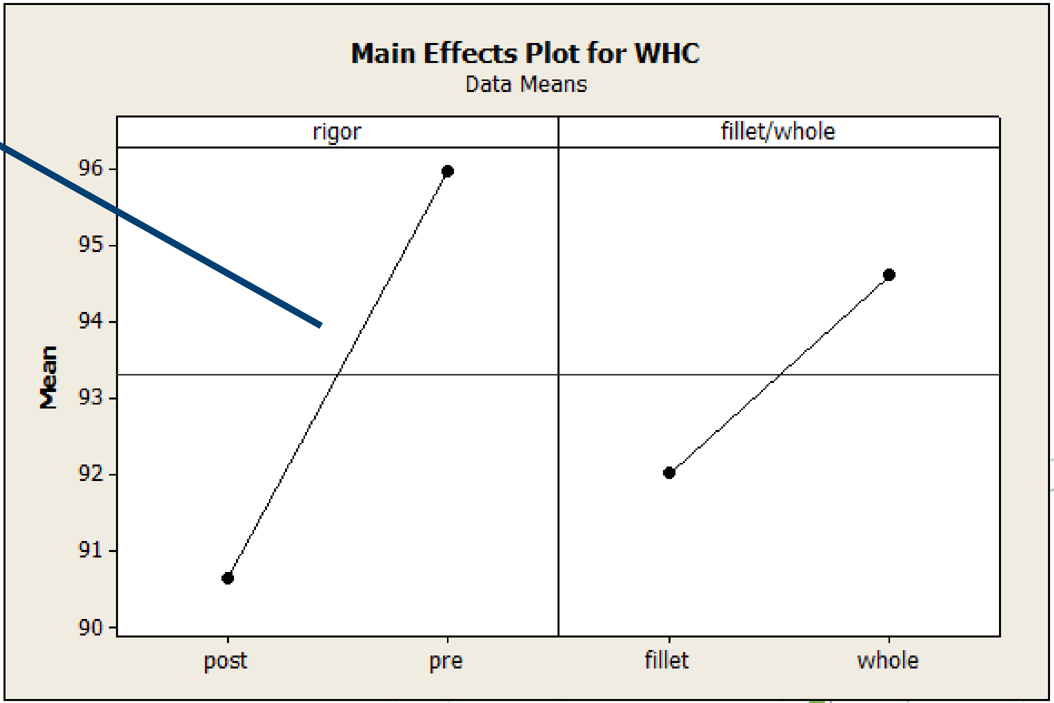
Dry matter

- No significant effect of rigor status on the dry matter (P=0.929)
- Both season and fillet vs whole had a significant impact (p<0.001)





Drip loss
3
2,5
2
1,5
1
0,5
0
0
5
10
15
pre
post



Main Effects Plot for WHC
Data Means
rigor
fillet/whole
Mean
96
95
94
93
92
91
90
post
pre
fillet
whole

Conclusion

- Rigor status has a significant impact on drip loss during storage
- Both rigor status and fillet vs whole fish had a significant impact on WHC, In addition, a significant interaction between rigor and time of year was detected
- Both season and fillet vs whole had a significant impact on the amount of dry matter

Thank you for your attention!

Any questions?

Sensitive and advanced technique (NMR) as a tool for identification of quality changes in marine rest raw materials

Rasa Slizyte[1], *Elena Shumilina*[2], *Revilija Mozuraityte*[1] *and Alexander Dikiy*[2]

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44th WEFTA meeting, 9-11 June, 2014, Bilbao

SEVENTH FRAMEWORK PROGRAMME

NTNU

Norwegian University of Science and Technology

SINTEF

Outliner

- APROPOS
- Why fish rest raw materials?
- Why NMR?
- Results from some tests

Added value from high protein & high oil industrial by-products

APROPOS

2012-3014

KBBE.2011.3.4-01
BioWASTE – Novel biotechnical approaches for transforming industrial and/or municipal biowaste into bioproducts – SICA

- 8 reserach institutes and universities
- 9 SMEs
- From 4 EU member countries (Finland, Germany, Spain, Lithuania)
- From ICPC's Kenya, India and Uganda
- From Norway and Canada

- Budget: 3.9 million €

- Website: http://www.euapropos.eu/

Rest raw materials: 2013, Norway

854 000 t

Farmed fish

600 000t
69%
utilised

Lipids
108 500 t

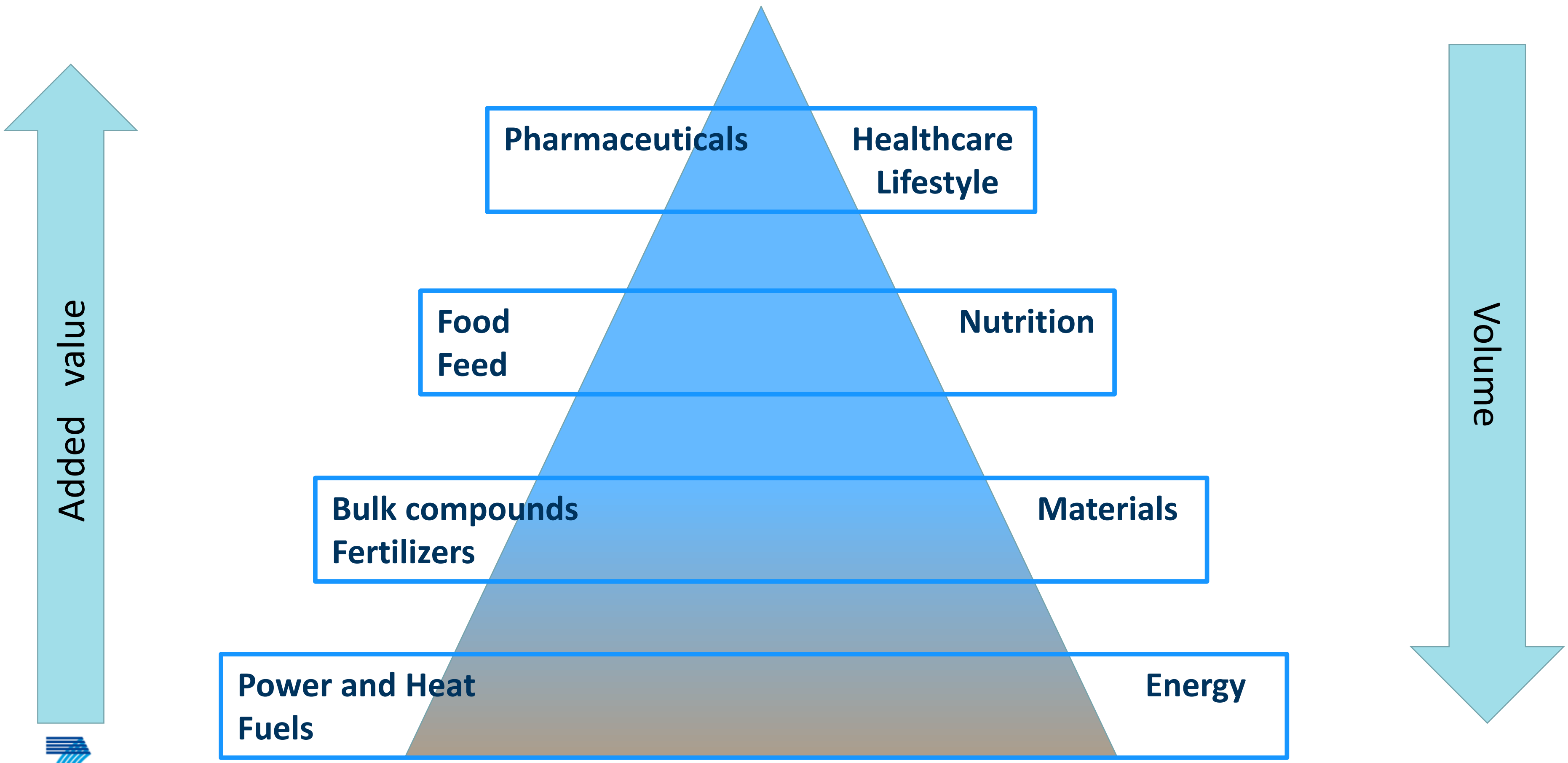
~~w-3 lipids~~
16 300 t

~ 178 million people

Proteins
126 500t

~ 5,3 million people

Utilisation of fish rest raw materials
Value pyramid



APROPOS

Quality

Processing

Storage

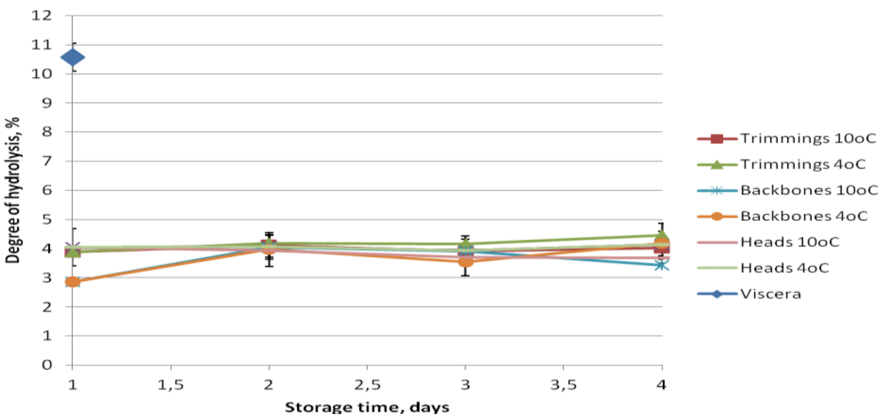
SEVENTH FRAMEWORK PROGRAMME

Chemical and microbial quality changes: salmon rest raw materials

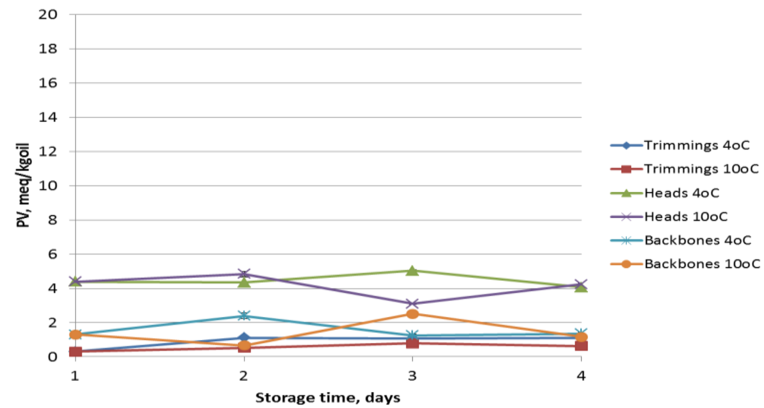
- Microbial and chemical quality
  - Rest raw material
    - Trimming
    - Heads
    - Backbones
    - Viscera
  - Storage temperature
    - 4°C
    - 10°C
  - Storage time
    - 0- 4 days

Chemical and microbial quality of salmon rest raw material – stability study: results

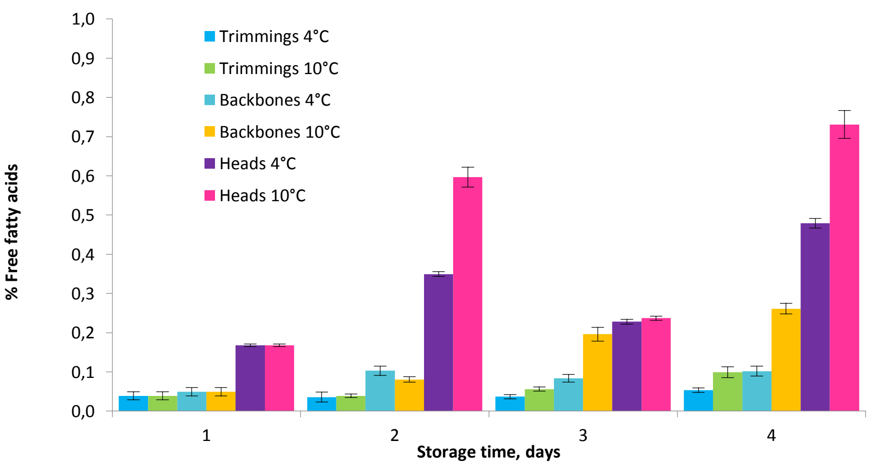
Degradation of proteins – degree of hydrolysis



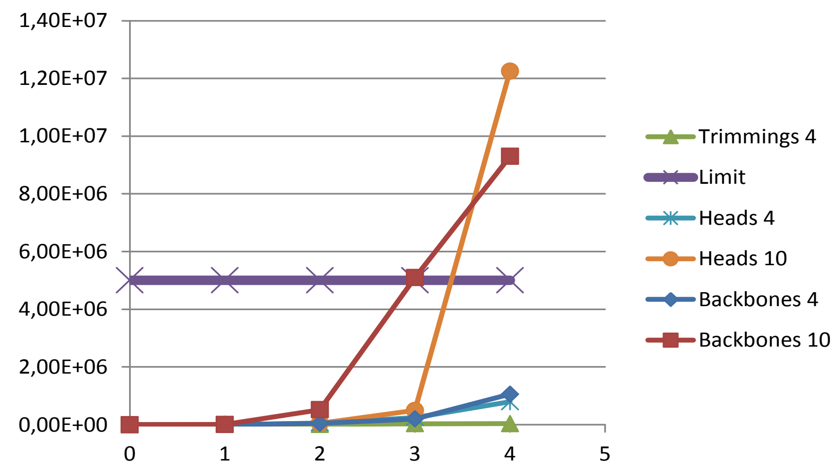
Oxidation of oil – peroxide value



Lypolysis of oil –amount of free fatty acids

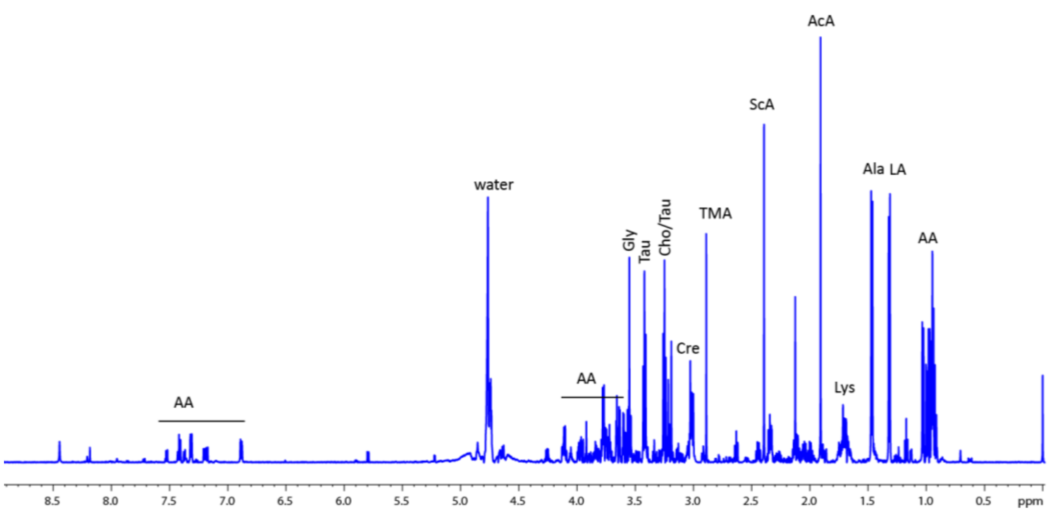


Microbial quality



Sensitive and advanced technique (NMR) as a tool for identification of quality changes in marine raw materials

- ***NMR analysis:***
  - *TCA extracts*
  - For all samples set of 1D ^{1}H and 2D TOCSY and HSQC experiments were acquired using 600MHz Bruker spectrometer
  - The whole 1H NMR spectra of rest raw materials' metabolites



NMR: Metabolites could be found: some examples

Essential amino acids
Isoleucine (Ile)
Leucine (Leu)
Valine (Val)
Threonine (Thr)
Lysine (Lys)
Methionine (Met)
Phenylalanine (Phe)
Proline*
Arginine*
Non-essential amino acids
Alanine (Ala)
Glutamate (Glu)
Glutamine (Gln)
Glycine (Gly)
Aspartate (Asp)
β-Alanine
Taurine
Creatine/ phosphocreatine (Crt/P-Crt)
GABA

Organic acids
Acetate
Lactic acid
Succinic acid
Formic acid
Carbohydrates
α-D-glucose (αGlc)
Nucleotides
Inosine (Ino)
Hypoxanthine (Hx)
Others
Trimethylamine (TMA)
Trimethylamine oxide (TMAO)
Putrescine
Choline
Ethanol (EtOH)
2,3-butanediol
Uracil
Tyramine
Cadaverine
Ethanolamine

Chemical quality and stability studied with NMR

- Chemical quality and stability
  - Storage temperature
    - 0°C
    - 4°C
    - 10°C
  - Storage time
    - 0- 10 days
  - Rest raw material
    - Whole heads: WH
    - Minced heads: MH
    - Backbones
    - Viscera
    - Muscle

Temperature
Time
Mincing

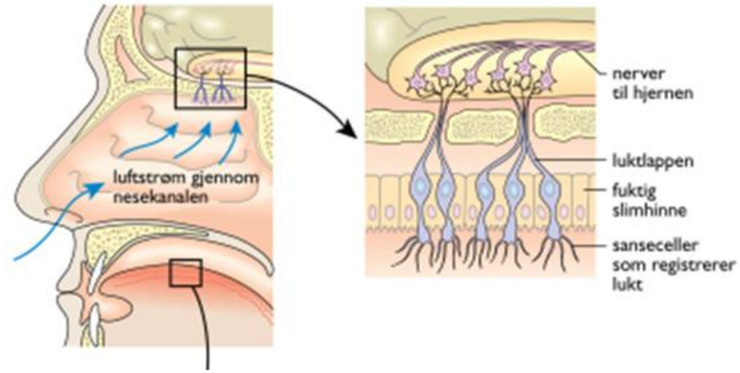
Smell and taste

Molecules which smell must be volatile :

glucose (MW 160) does not smell.

ethanol (C_2, MW 46) smells little

penthanol (C_5, MW 88) smells

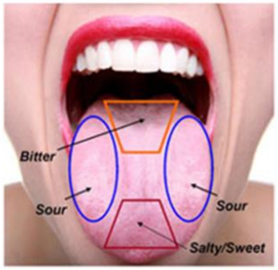


Molecules which give taste must be small:

Fatty acids< C_{12}, MW 200

Polysaccharide < trisacharide, MW~ 500

Peptide < 5-30 as MW 600 - 3600



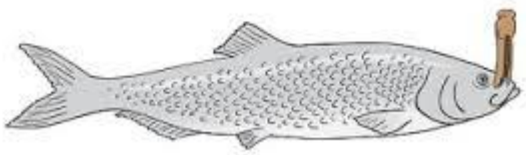
Four Original Taste Sensations
Primary locations on the tongue

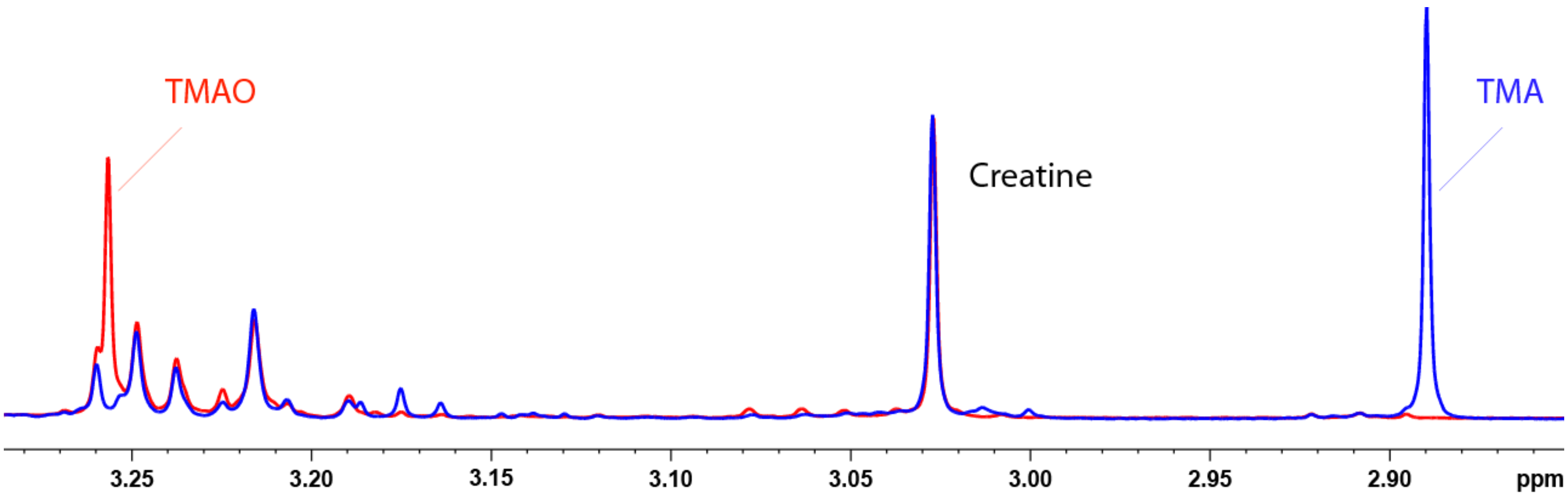
Marine proteins and lipids are big molecules

Freshness of rest raw material: TMAO and TMA

Minced heads day 0

Minced heads day 3 (10°C)

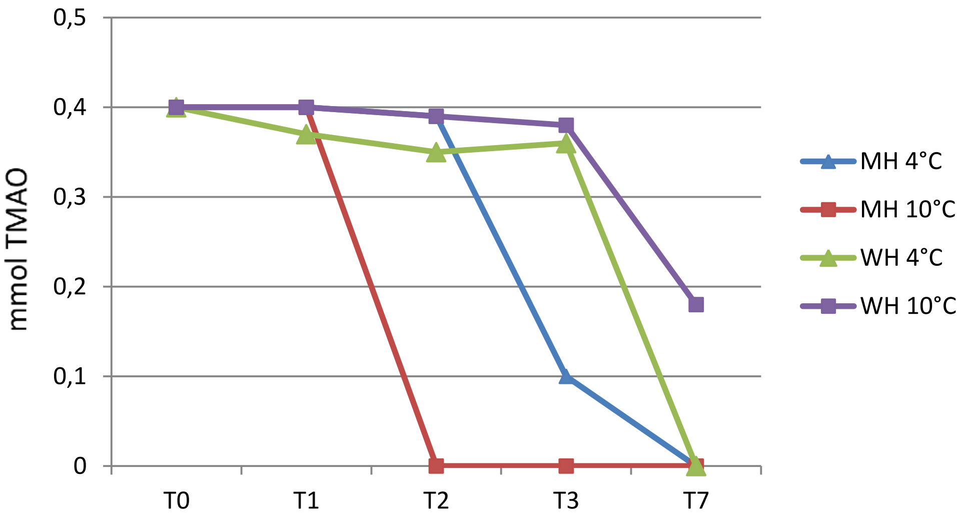


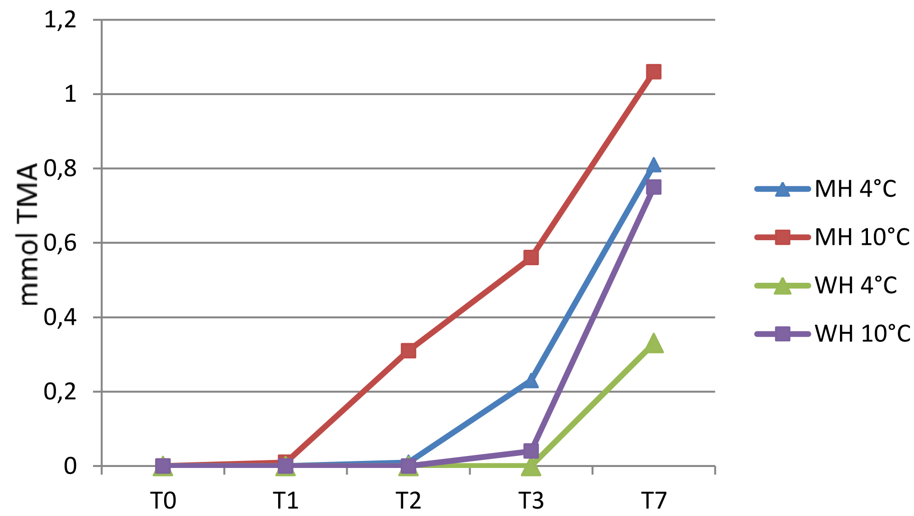


^{1}H NMR spectra of Atlantic salmon (*Salmo salar*) minced heads - TCA extract at T_0 and T_3

SEVENTH FRAMEWORK PROGRAMME

Freshness of rest raw material: TMAO and TMA

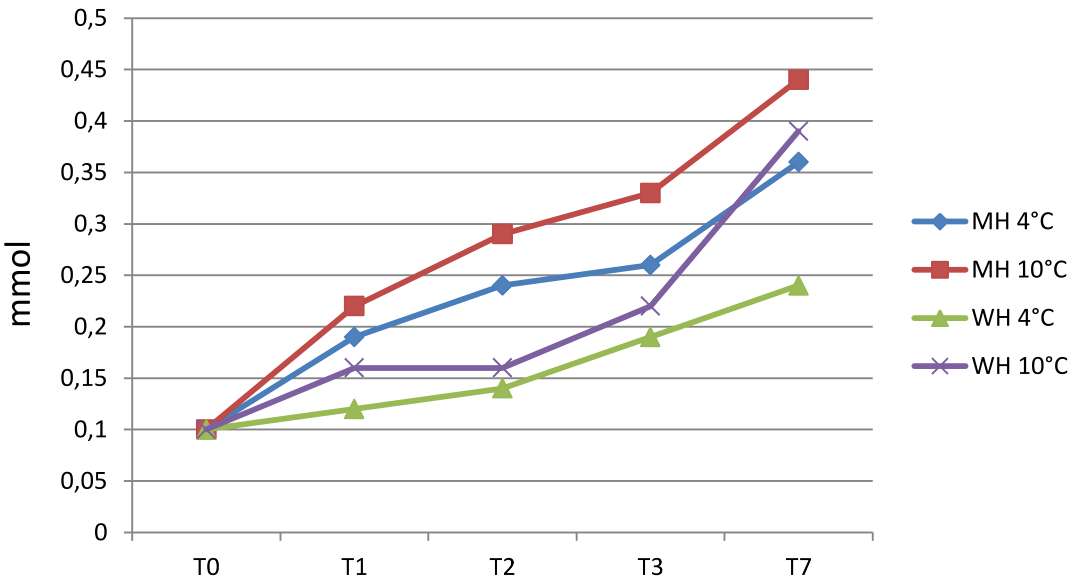


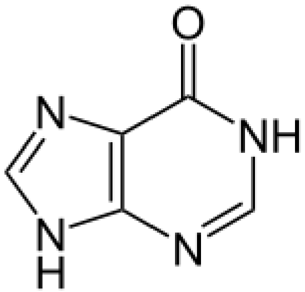


- ***Mincing:***
  - critical for decomposition of TMAO
  - very slow and not temperature dependent until 3 day of storage for whole heads
- ***Temperature:*** TMAO decomposes faster at higher temperature
- ***Time:*** right storage do not give any indication of decomposition during 3 days

Conclusion: to prevent undesirable odour heads need to be kept whole

Hypoxanthine:
singlets at 8,18ppm; 8,20ppm (NMR spectra)





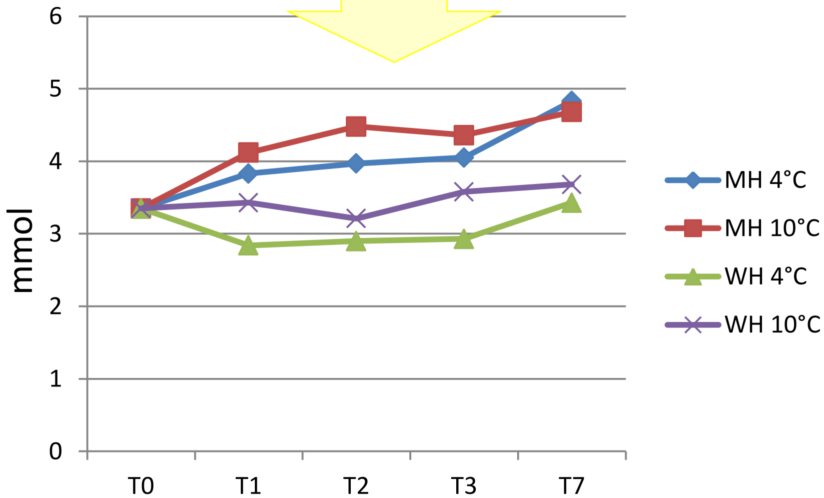
- Products of ATP degradation
- Gives bitter off flavor

- ***Mincing:*** *hypoxanthine forms faster in minced heads*
- ***Temperature:*** *lower temperature slows down formation of* hypoxanthine
- ***Time:*** amount of hypoxanthine increase with time

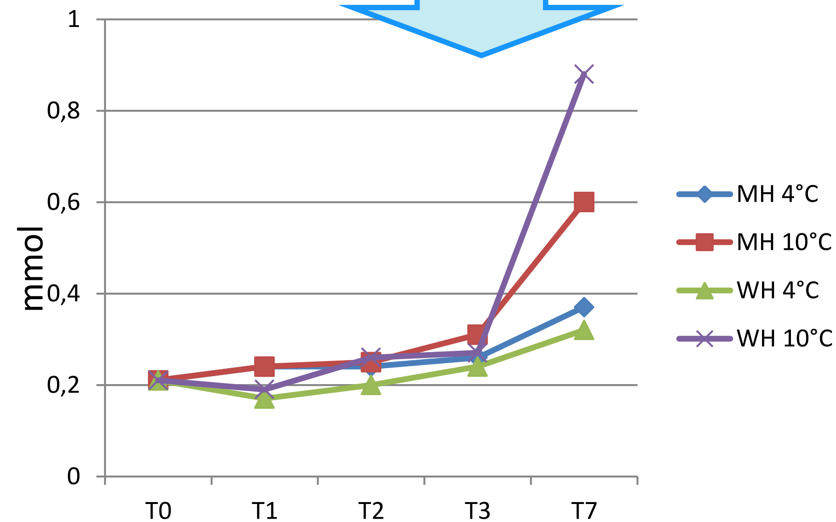
<u>Conclusion:</u> to prevent undesirable odor heads need to be kept whole and cold

Amino acids and taste

Gly, Ala, Thr
sweet taste

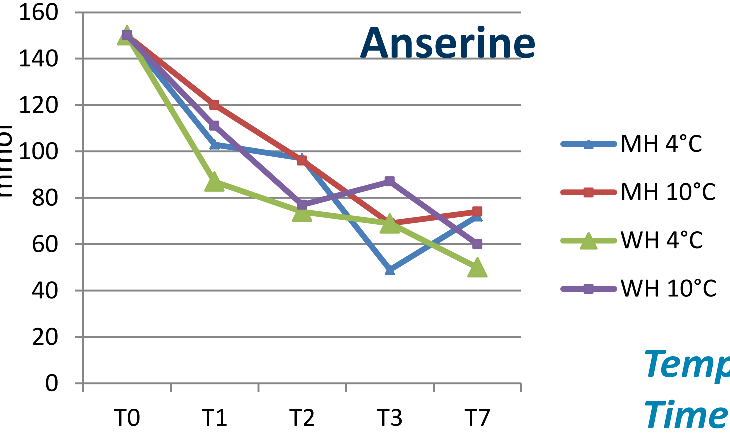


Leu, Val and Ile
bitter taste



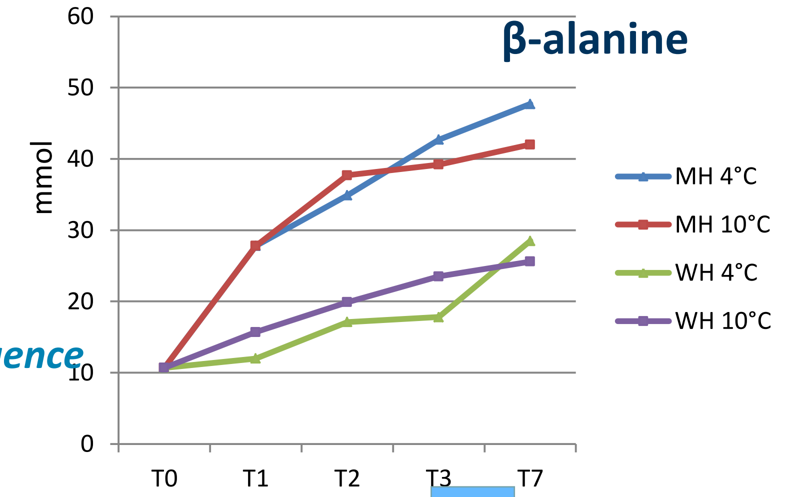
- ***Temperature: sweet aa releases easier at higher temperature***
- ***Time:***
  - **during first 3 days little changes occurs**
  - **significant increase for bitter aa with storage**
- ***Mincing: initiates faster release of sweet aa***

Bioactive compounds

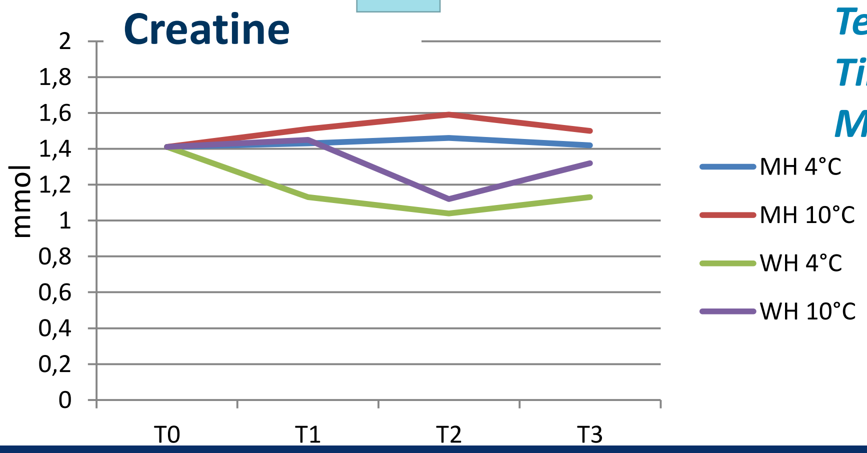


Temperature: do not influence
Time: decrease
Mincing: do not influence

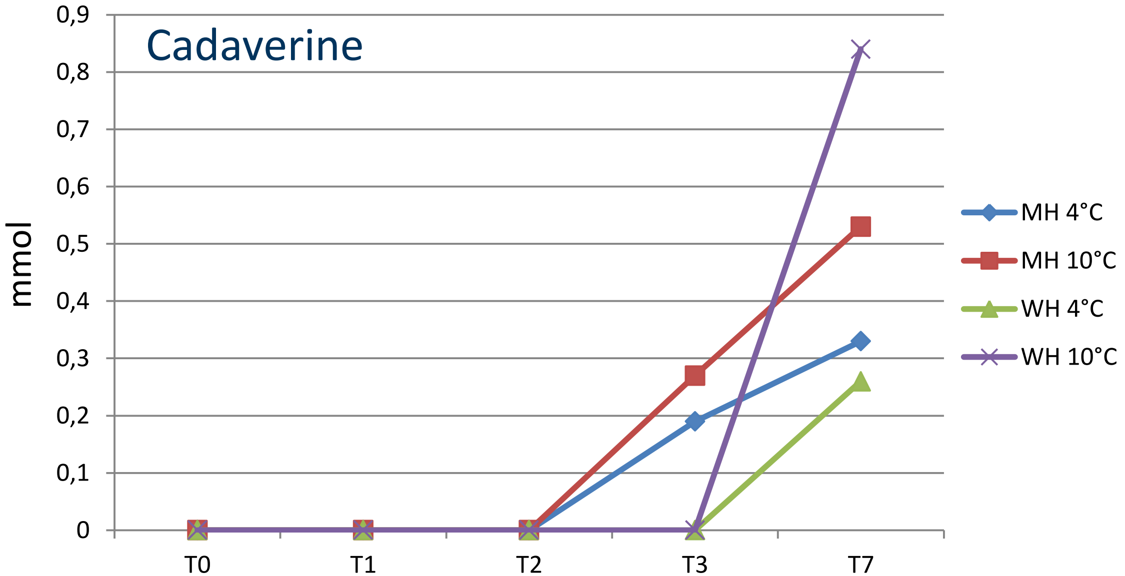
Temperature: do not influence
Time: do not influence
Mincing: more in minced



Temperature: do not influence
Time: increase
Mincing: more in minced



Biogenic amines

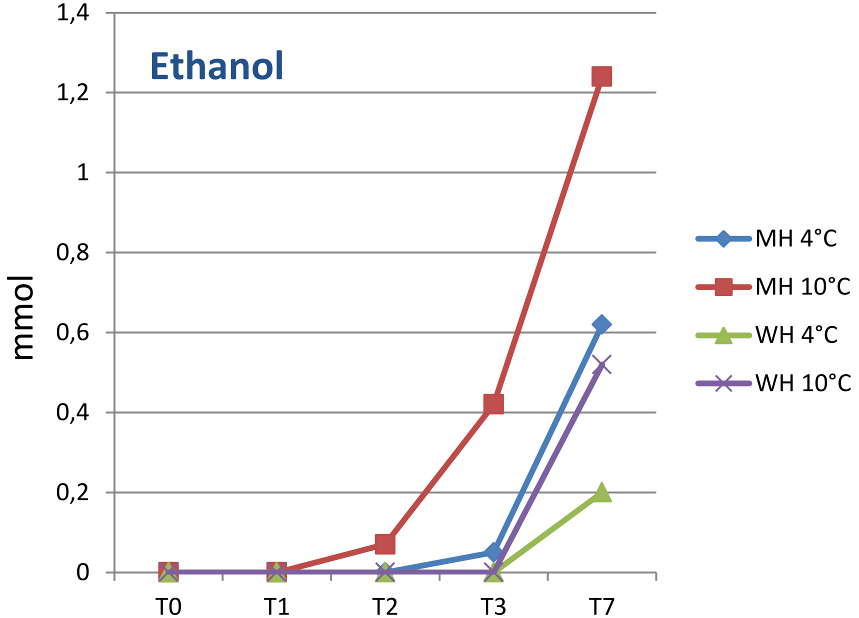


- Detected only Cadaverine and Tyramine
- Formation of tyramine only at 7th storage day

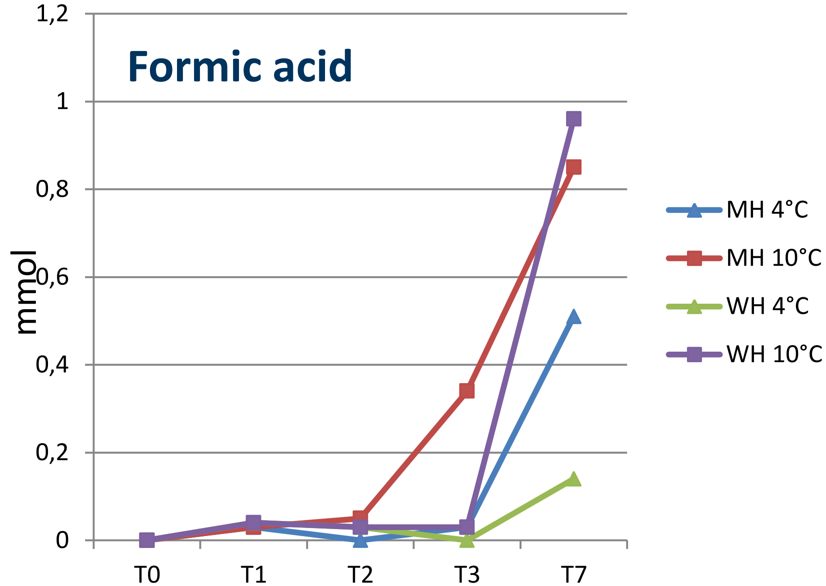
- ***Mincing:*** *Cadaverine forms faster in minced heads*
- ***Temperature:*** *lower temperature slows down formation of cadaverine*
- ***Time:*** amount of cadaverine increase with time

Conclusion: to prevent undesirable odor heads need to be kept whole and cold

Ethanolic fermentation and formation of acids



Temperature: faster at higher temperature
Time: increase
Mincing: faster in minced



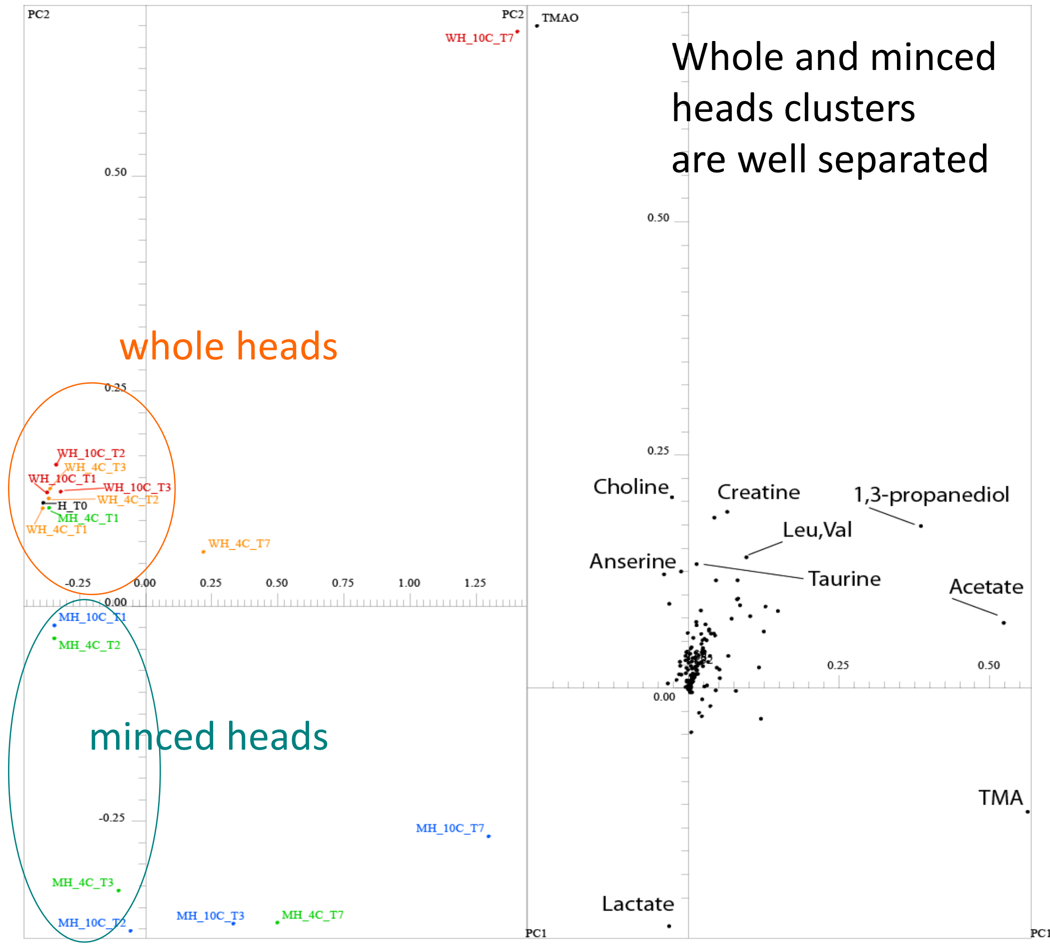
Temperature: faster at higher temperature
Time: increase
Mincing: do not influence

APROPOS

Multivatiate Data Analysis: PCA

- ***Mincing***
  - *increase: lactate; TMA;1,3-PrOH*
  - *decrease: choline; anserine; TMAO*
- ***Temperature:***
  - *direct: lactate; TMA*
  - *inverse: TMAO*
- ***Time:***
  - acetate; 1,3-PrOH; EtOH formation

<u>Conclusion:</u> to prevent undesirable odor heads need to be kept whole and cold



SEVENTH FRAMEWORK PROGRAMME

Conclusions

- NMR as a toll for analysis of quality changes in marine raw materials
  - Sensitive
  - Fast
  - Many compounds can be detected in one run
  - Small quality changes can be detected
- No significant quality changes during first 2 days of storage of both minced and whole salmon heads at 4°C
- Mincing of heads force formation of undesirable compounds

APROPOS

Thank you!!

SEVENTH FRAMEWORK PROGRAMME

University of Zaragoza
Faculty of Veterinary

Quality evaluation of ice stored sea bream (*Sparus aurata*) and design of predictive models for the freshness index.

J. Calanche, S. Pedrós, V. Alonso & J. A. Beltrán*

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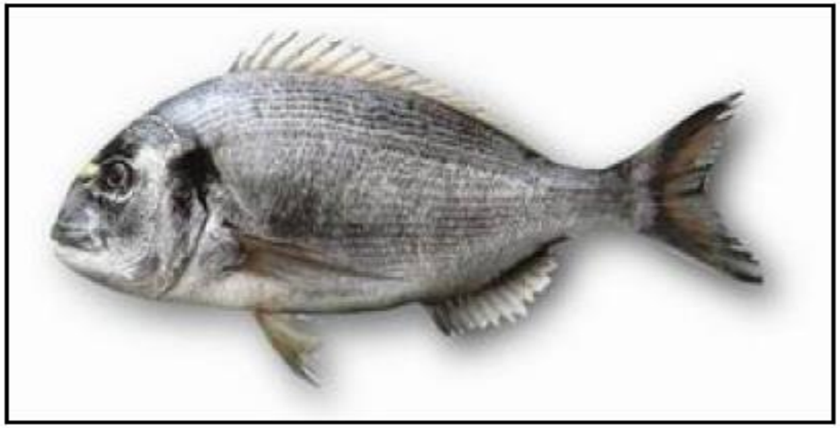
INTRODUCTION

Sparus aurata

Orden: Perciformes **Familia: Sparidae**



DORADA
DOURADA
ORADA
TXELBA URRABURUA
ORATA
GILTHEAD SEABREAM
DORADE ROYALE
DOURADA
GOLDBRASSEN

Yield	54%	Proteins	19.9 %	Lipids	3.2 %	Moisture	75%	Ration	100 Cal.

JACUMAR

In Europe, the consumption of fresh sea bream has increased signicantly over the past decade due to its desirable aroma and quality.

Gilthead sea bream

SOURCES

FISHING

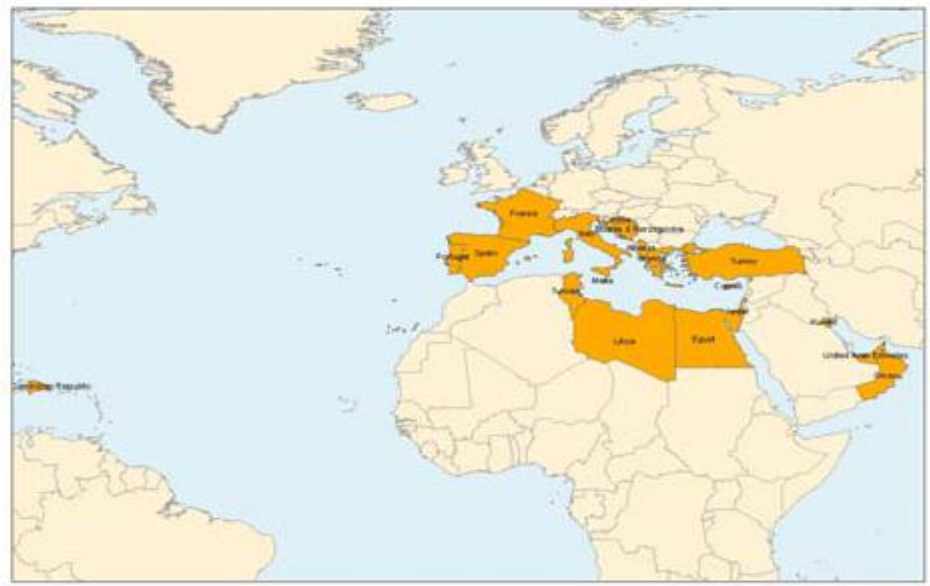
AQUACULTURE*

* The most important for the consumption

Aquaculture Sea bream

PRODUCTION ZONES

NATIONAL



INTERNATIONAL

Greece, Turkey and Spain covering 81.1% of the world production in 2010 (APROMAR, 2011).

OBJECTIVE

The objective was to develop predictive models based on quality parameters (physical, chemical, microbiological and sensory analysis) for estimation of the freshness index (%) and ice storage time (h) of sea bream.

Aquacultured Sea bream

Commercial size: 300–600 g

Source:

LES ALFACS, SL, San Carlos de la Rapita, Tarragona : 58 specimens (Design phase)

ACUIGROUP MAREMARE SL., Sagunto, Valencia:
36 specimens (Validation phase)

Fish stored in ice were analyzed:

0 (0-12h), 1 (24h), 2 (48h), 3 (72h), 5 (120h), 6 (144h), 7 (168h), 8 (192h), 10 (240h) & 13 (312h)

MATERIALS & METHODS

Physical and chemical parameters

Six fish were chosen randomly for each sampling

K_1 value (%) and Hx ratio (%)

PRECISE® K, NOVOCIB

TVBN (mg /100g)

C.R. 2074/2005

Torrymeter (TM)

Distell™ (STD. Scale)

pH (Puncture)

Crison, model PH25

Internal Temperature (TI)

Probe TESTO 926

Surface Temperature (TS)

Infrared sensor FR260M

Microbiological Counts and Sensory Analysis

Microbiological count

(PST) Total psychrotrophic viable count (log CFU/g) ISO 4833:2003

(MVC) Total mesophilic viable count (log CFU/g) ISO 4833:2003

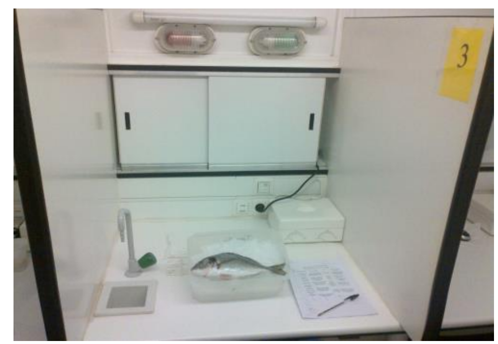
(ET) *Enterobacteriaceae* (log CFU/g) ISO 21528-2:2004

Listeria sp. (presence/absence) ISO 11290-2:1998 mod.

Sensory analysis (ISO 8586-2:2008)

Panel for models design: 8 selected assessors (UNIZAR)

Pane for validation: : 8 selected assessors (UPV)



Torry scale, Distell

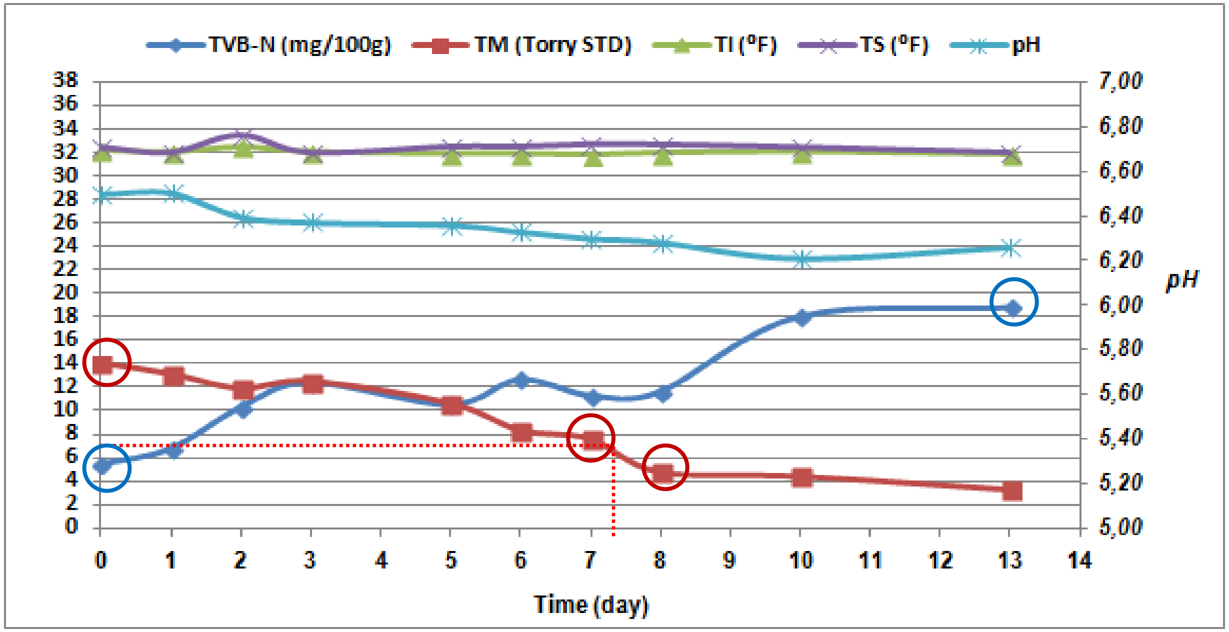
E.E.C's system (EU), Com. Reg. 2074/2005

Quality Index Method (QIM)

ATP-related compounds

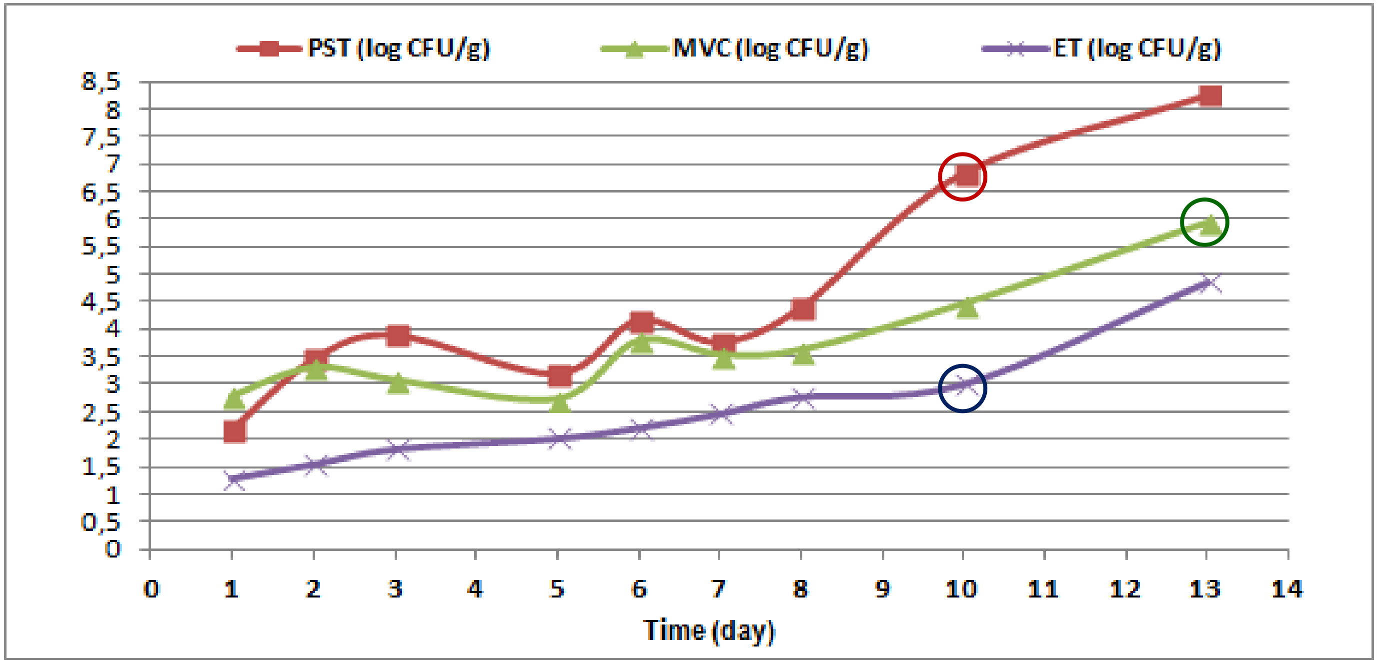
K_1 value (%) and *Hx ratio* for fish recently arrive were 13.60% and 0.024 μ mol.g^{-1} (<24h slaughter)

Physical and chemical parameters



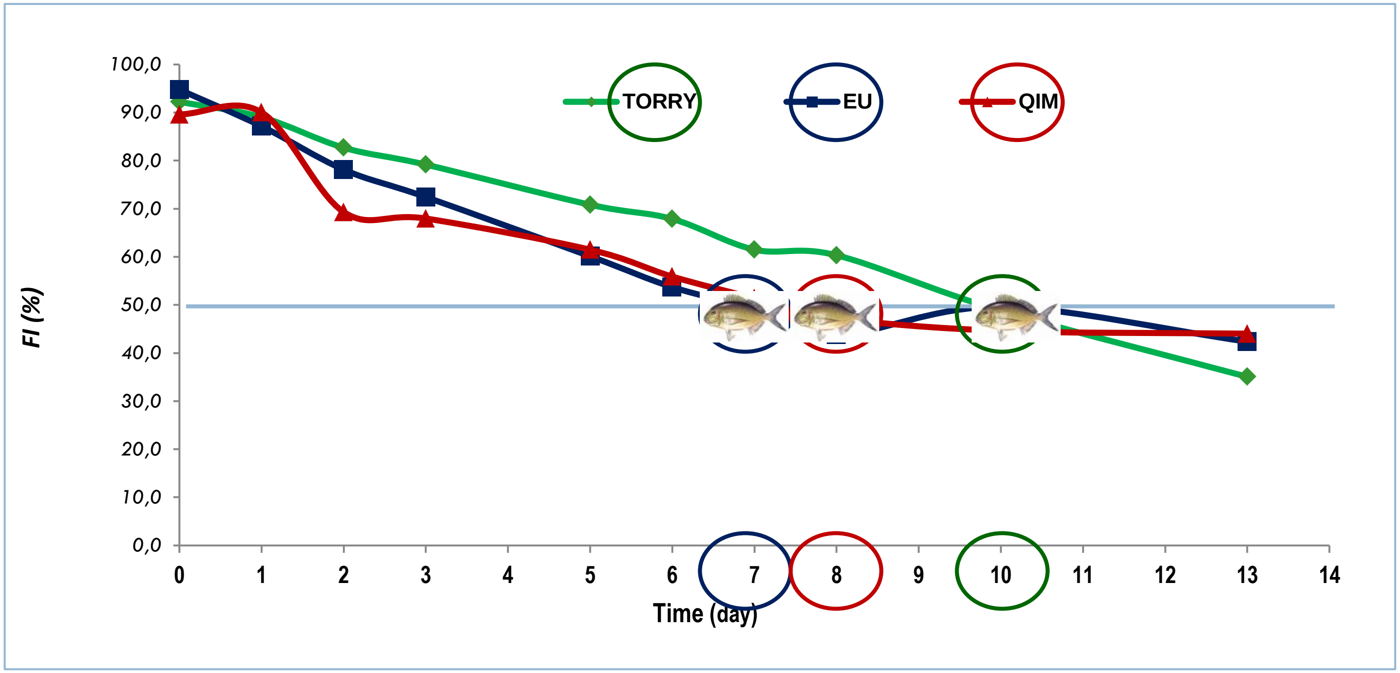
RESULTS

Microbiological Counts



RESULTS

Sensory Freshness Index (%)



Pearson's Correlation

TORRY-EU	0.904
EU-QIM	0.983
QIM-TORRY	0.924

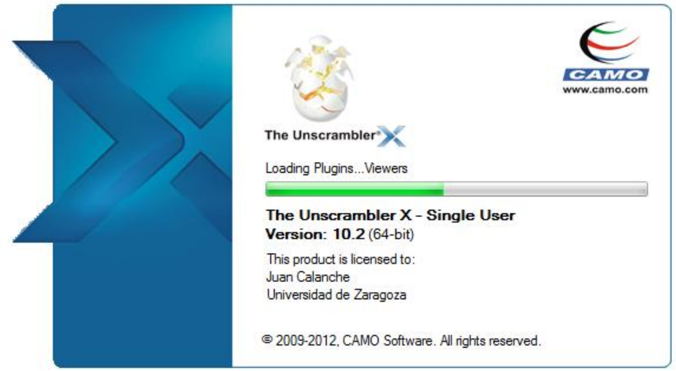
RESULTS

Predictive models

$$FI\ (\%)_{UE} = -1.91TVBN + 0.05\ pH + 1.85TM + 0.06TI + 0.01TS - 0.81PST - 0.44MVC - 0.48ET - 72.60$$

$$IST_{EU}\ (h) = -1.49FI_{EU} + 1.22TVBN + 0.08pH - 7.55TM - 4.08TI - 9.41TS - 6.43PST + 11.55MVC + 12.59ET + 613.70$$

Predictive models (Configuration)



Program: The Unscrambler X 10.2

The software was configuring as follows.

Analyze:	Partial Least Square Regression (PLSR)
Algorithm:	Non-linear Iterative Partial Least Square (NIPALS)
Warning limits:	Leverage limit 3.0
Mean center data:	Applied
Model validation:	Cross-Validation

RESULTS

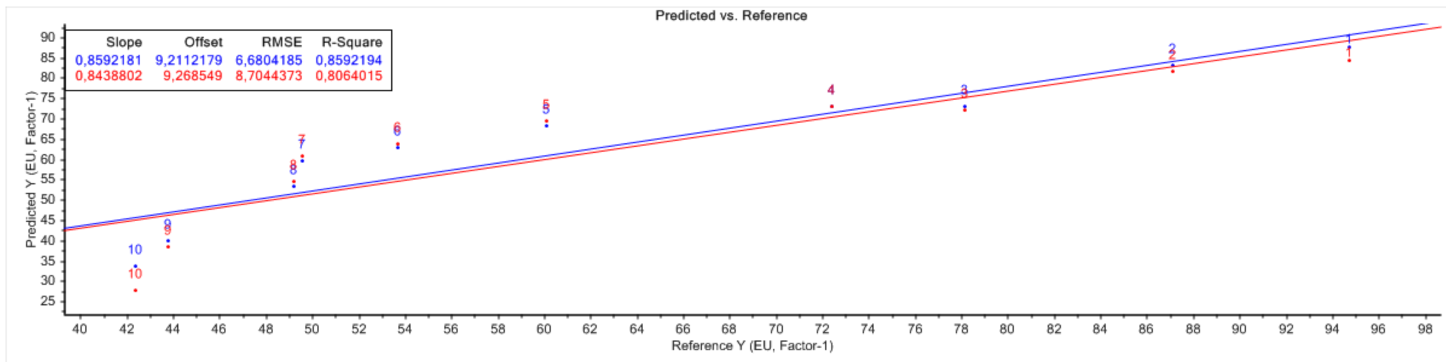
Predictive models

FRESHNESS INDEX (%)

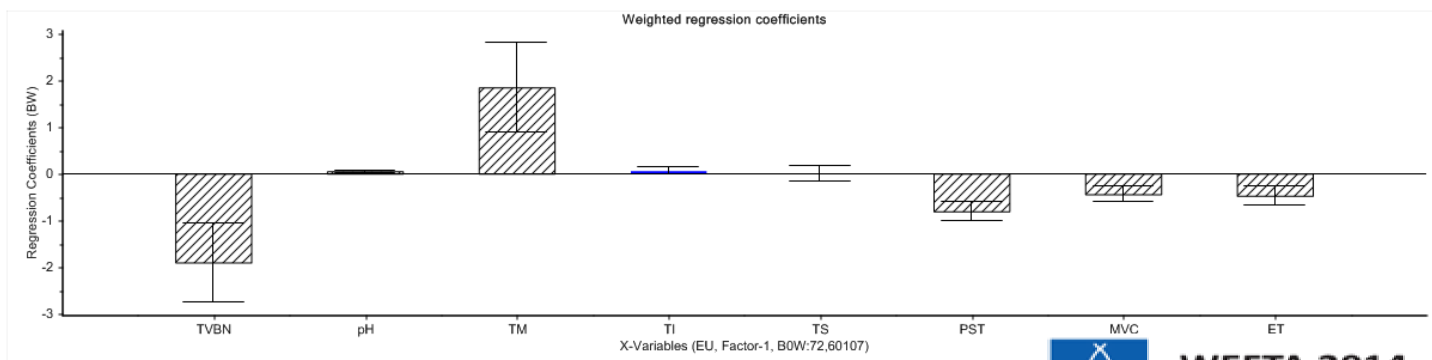
EU

$$FI\ (\%)_{UE} = -1.91TVBN + 0.05\ pH + 1.85TM + 0.06TI + 0.01TS - 0.81PST - 0.44MVC - 0.48ET - 72.60$$

Regression and prediction curve:



Weighted regression coefficients:



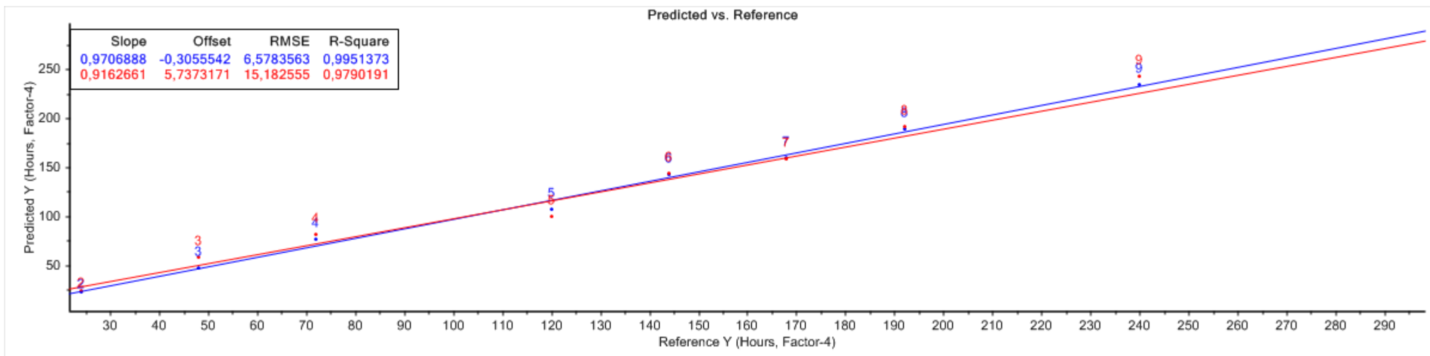
WEFTA 2014
SEAFOOD science for a changing demand

Predictive models

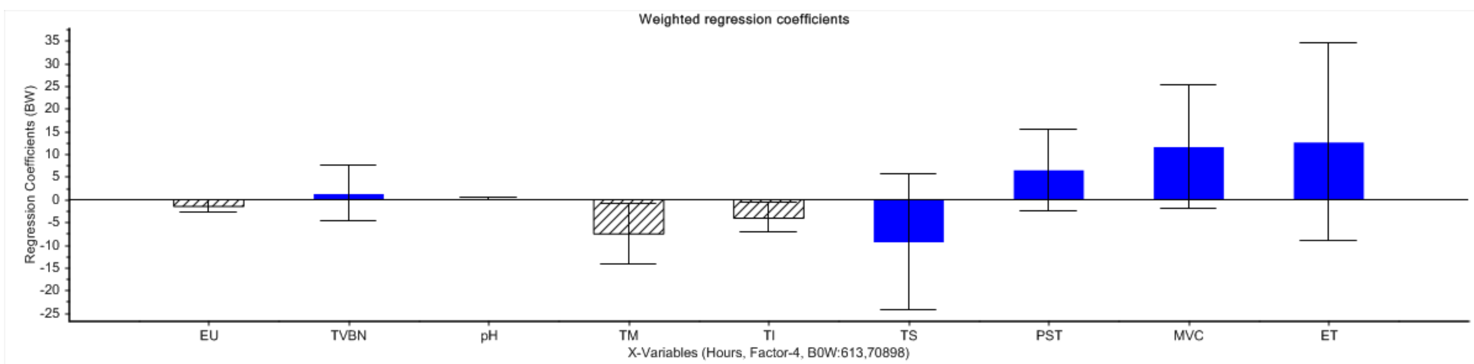
ICE STORAGE TIME (H)

EU ✓ $IST_{EU}\,(h) = -1.49FI_{EU} + 1.22TVBN + 0.08pH - 7.55TM - 4.08TI - 9.41TS - 6.43PST + 11.55MVC + 12.59ET + 613.70$

Regression and prediction curve:



Weighted regression coefficients:



RESULTS

Predictive models

$$FI\ (\%)_{UE} = -1.91TVBN + 0.05\ pH + 1.85TM + 0.06TI + 0.01TS - 0.81PST - 0.44MVC - 0.48ET - 72.60$$

$$IST_{EU}\ (h) = -1.49FI_{EU} + 1.22TVBN + 0.08pH - 7.55TM - 4.08TI - 9.41TS - 6.43PST + 11.55MVC + 12.59ET + 613.70$$

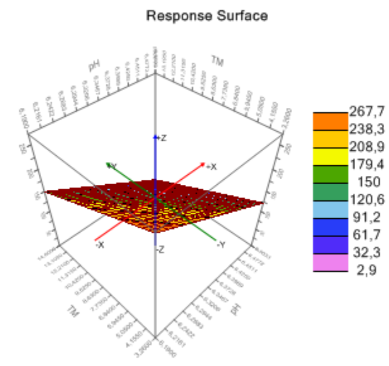
Predictive models

Applied models

Considering Torrymeter (TM):

$$IST\ (h) = -11.02TM - 467.46pH - 65.02TI + 5278.25$$

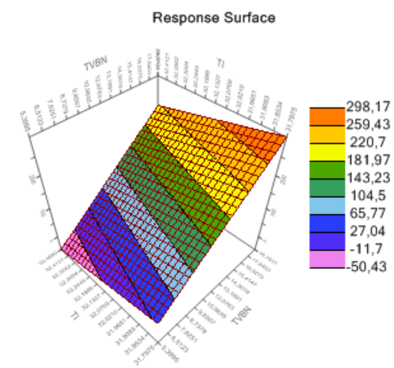
Slope = 0.97 r^2 =0.95



Considering Total volatile bases (TVBN):

$$IST\ (h) = 20.05TVBN - 11.64pH - 120.51TI + 3827.74$$

Slope = 0.96 r^2 =0.95



CONCLUSIONS

- We have developed **Predictive Models** for the freshness index (%) and the ice storage time (h) in aquacultured sea bream based on: physical (pH, Surface & Internal temperatures, Torrymeter measurements), chemical (TVB-N), microbiological (MVC, PVC and ETC) and sensory analysis (EU Sensory Scale)

- The short models based on TVB-N or Torrymeter measurements could be very useful for Fish Quality Control. The advantages are very clear: price and analysis speed combined with high accuracy.

Thank you very much for your attention

J. Calanche, S. Pedrós, V. Alonso & J. A. Beltrán*




Quality of scallops - a cause of concern ?

Monika Manthey-Karl, Ute Schröder

Max Rubner-Institut, Federal Research Institute of Nutrition and Food,
Institute of Safety and Quality of Milk and Fish Products,
Palmaille 9, 22767 Hamburg (Germany)   monika.manthey@mri.bund.de

A few years ago, in Germany the trade with scallops was clear and without problems.

Only one species was on the market:

the "great scallop" or "**king scallop**"

Picture: Monika Manthey

Picture: http://www.lachskontor.de/Kammmuscheln.htm

Recently the market share of frozen scallops (Pectinidae) has increased significantly.

The commercial designation „scallops“ represents a variety of species like:

King scallop (*Pecten maximus*)

Atlantic sea scallop *(Placopecten magellanicus)*

Japanese scallop *(Mizuhopecten yessoensis)*

Pictures: Monika Manthey

Why did we analyse scallops?

The group of quick frozen scallops often stands out for an incorrect labelling and excessively high water addition.

What did we analyse?

fresh and frozen scallops

composition – additives – species

What did we analyse ?

Moisture Protein Ash pH Lipids NaCl

Fatty acids P_2O_5 Di/Triphosphates Carbohydrates

Free amino acids Citric acid Arsenic

Calcium Sodium Zinc

Potassium Selenium Magnesium

Species TVB-N

Samples of *Pecten maximus*

Composition of fresh *Pecten maximus*

- hand-dived from Norway-
- landed in France, different areas

Composition of frozen muscle meat of *Pecten maximus*

- North Atlantic

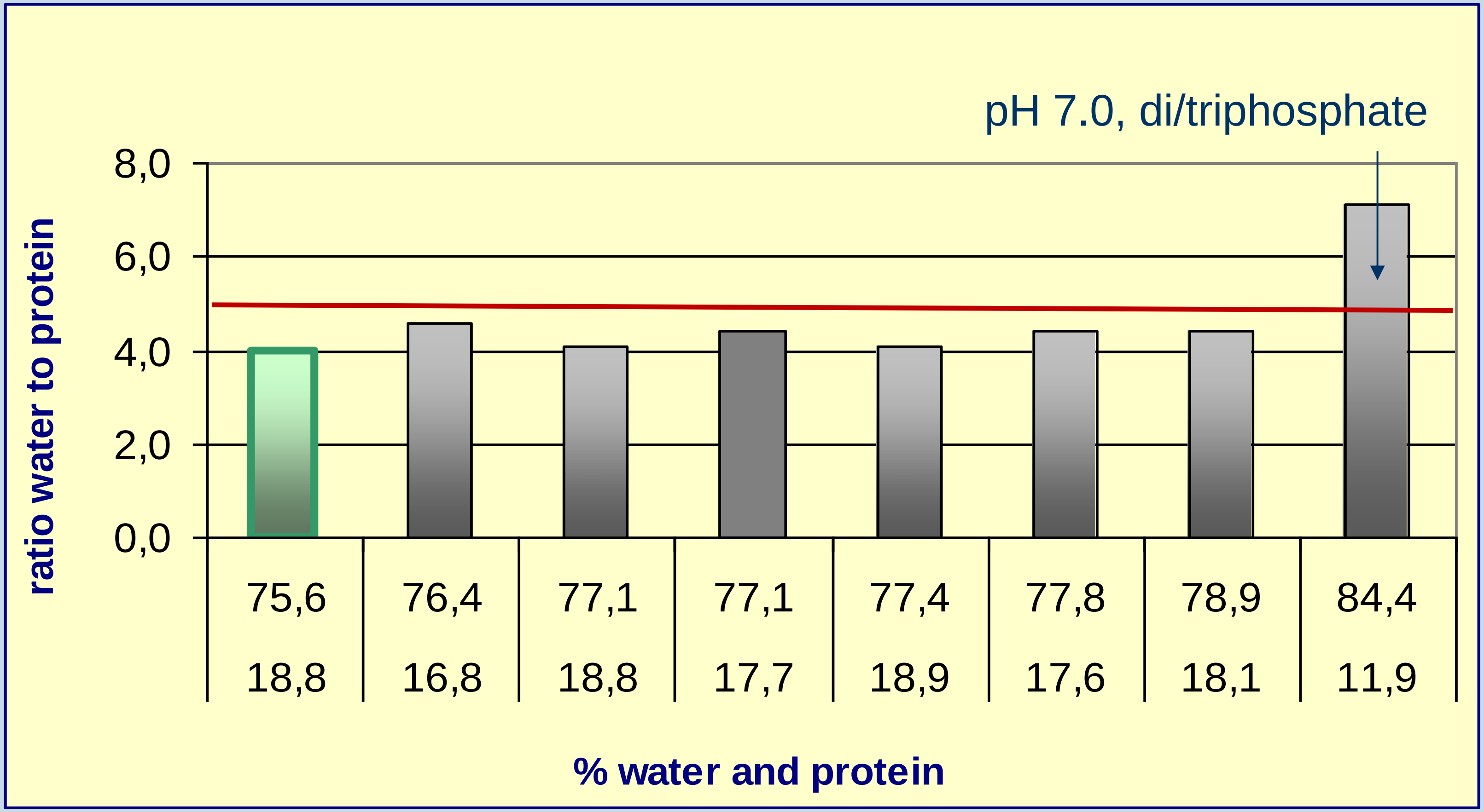
Comparison of fresh and frozen *Pecten maximus*

	fresh meat	frozen products
pH	6.0 - 6.1	6.4 (6.0 - 7.0)
Moisture (%)	74.9 - 78.2	80.7 (76.4 - 84.4)
Protein (%)	18.8 - 20.0	17.1 (11.8 - 18.9)
Moisture/ protein ratio	3.8 - 4.3	4.8 (4.1 - 7.5)

- untreated king scallops have a pH of approx. 6.0
- water content of max. 80%
- protein content min. 16 %
- water/ protein ratio < 5

Water/protein ratio as quality assessment

Fresh and frozen king scallops (*Pecten maximus*)



...had a good quality which is reflected by a low water to protein ratio < 5

Composition of Atlantic sea scallops

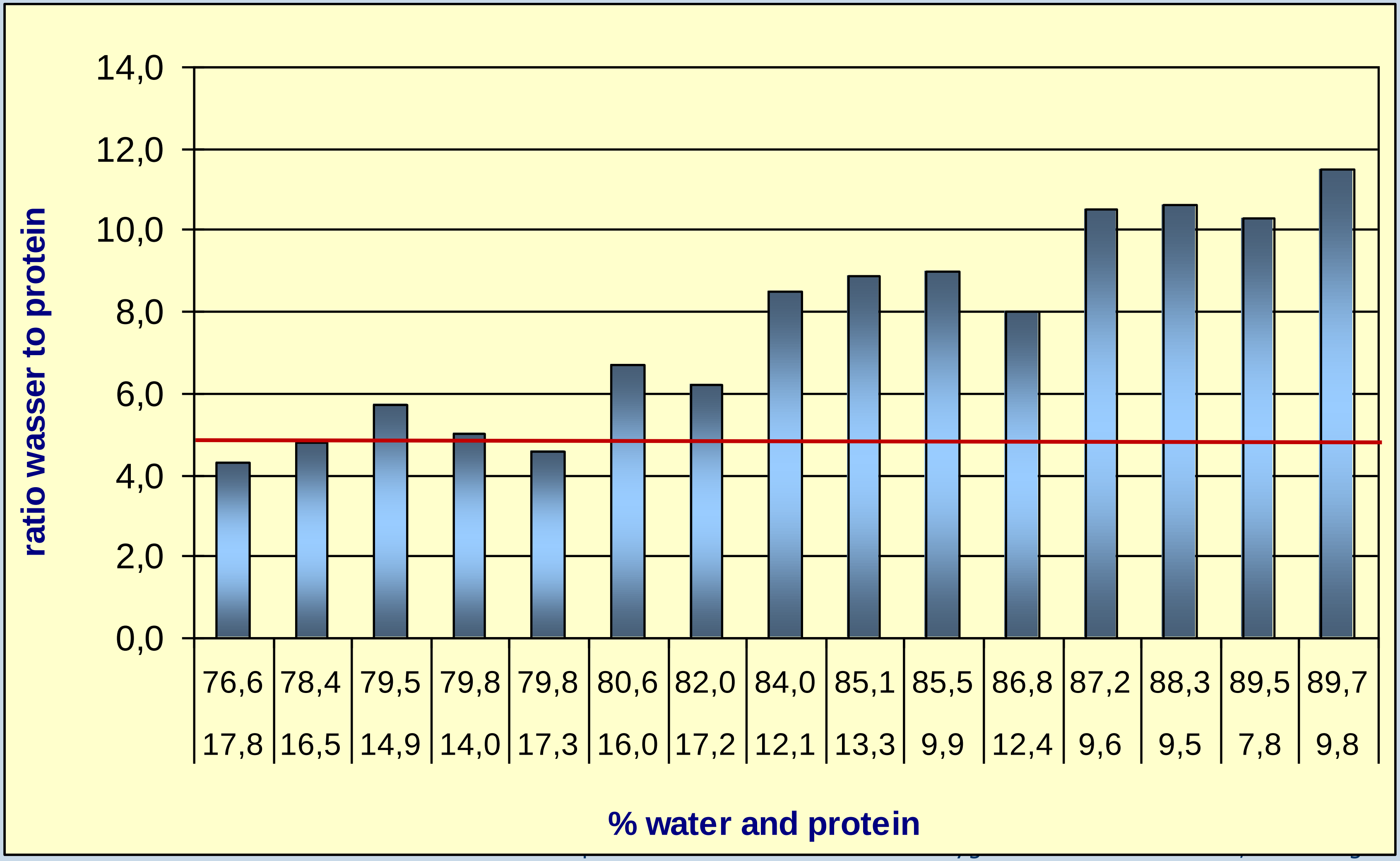
By far the largest market share in Germany has the Atlantic sea scallop (*Placopecten magellanicus)* harvested northeastern United States and eastern Canada.

- untreated fresh sea scallops have a pH of approx. 6.0,
- water content of max. 80%,
- protein content min. 16 %,
- water/ protein - ratio < 5.

In Germany Atlantic sea scallops are exclusively sold as frozen muscle meat.

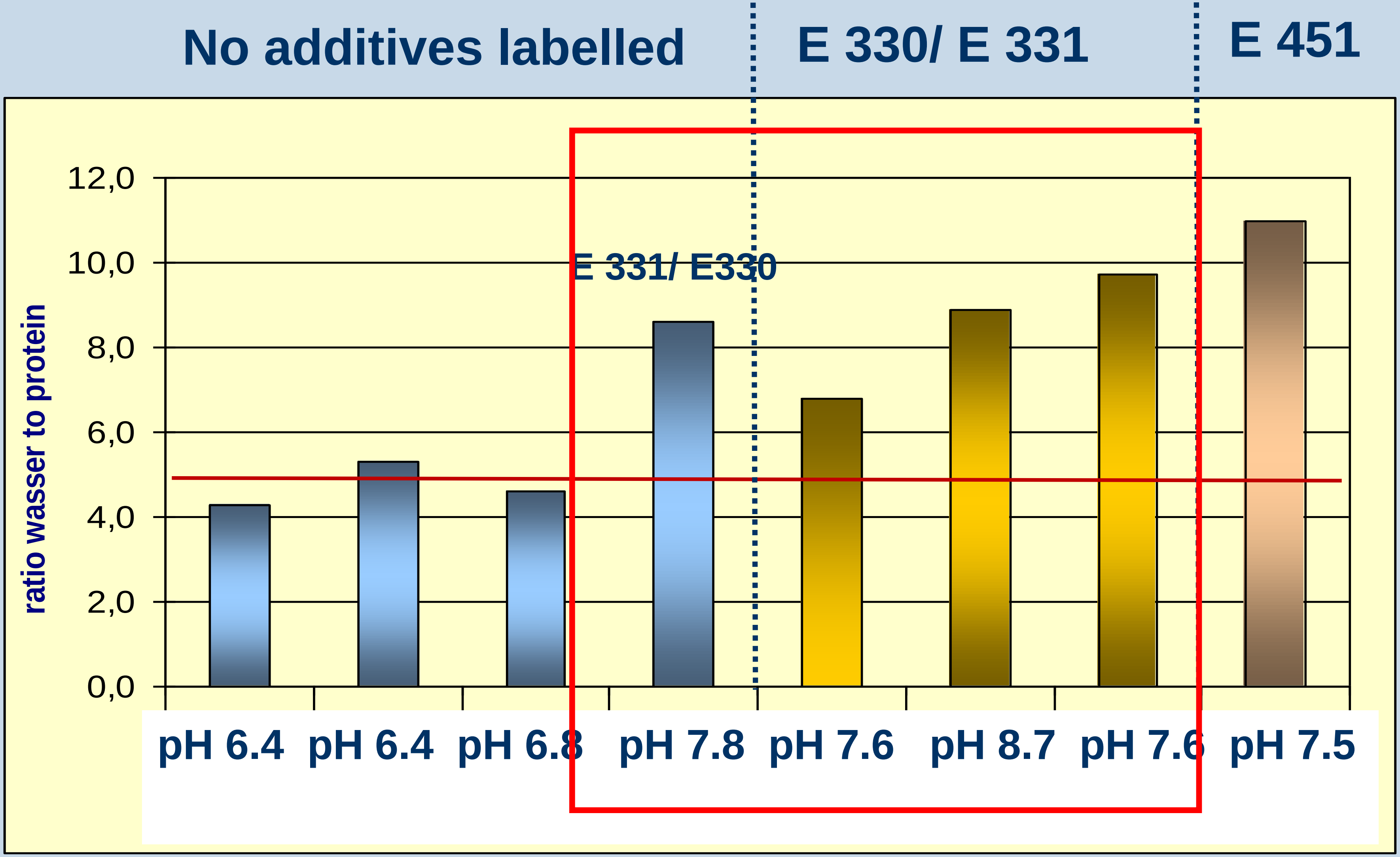
Water/protein ratio as quality assessment

Atlantic sea scallops (*Placopecten magellanicus)*

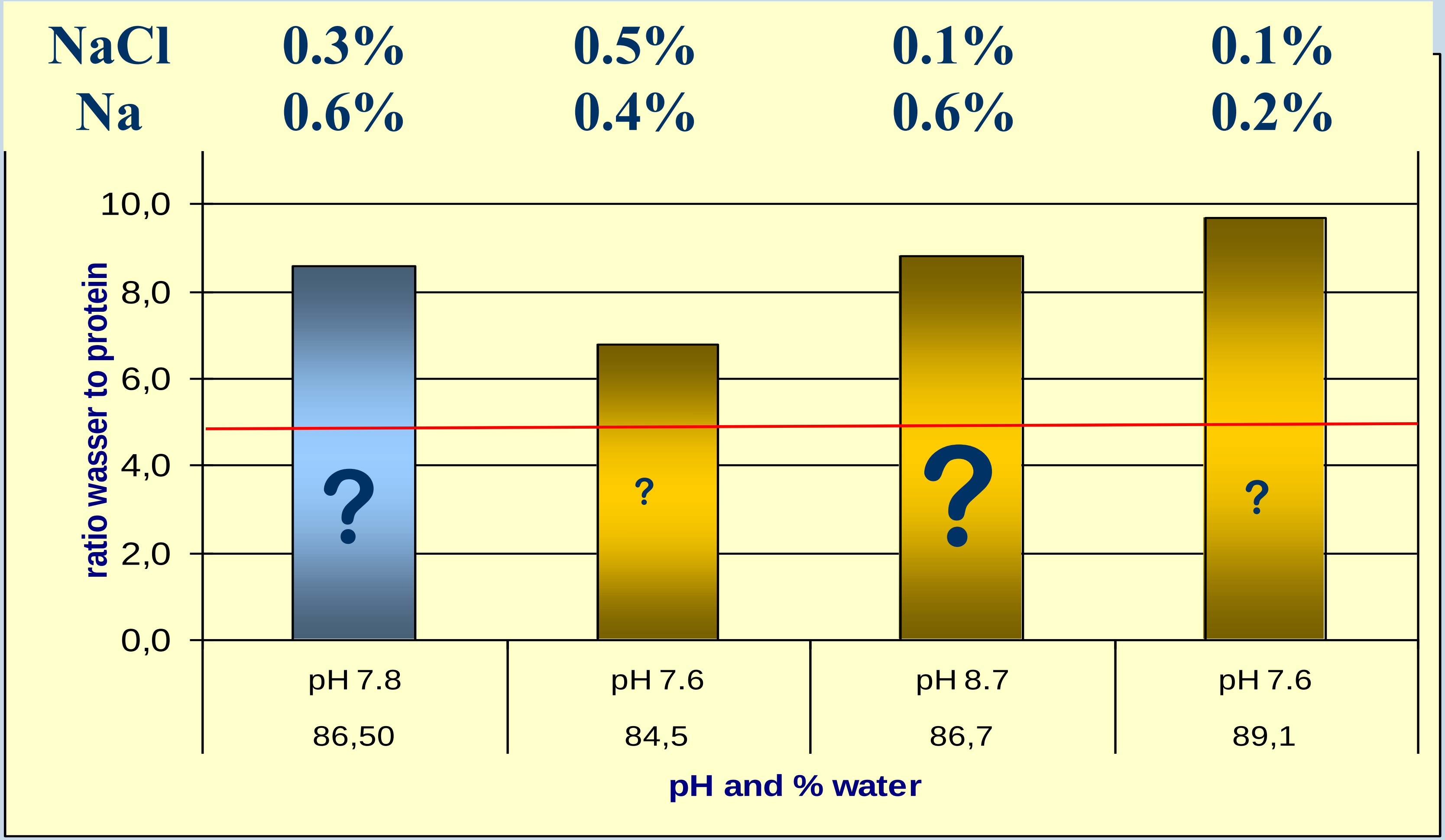


Water/protein ratio as quality assessment

in Atlantic sea scallops (*Placopecten magellanicus)*



Citric acid/sodium citrate (E 330/ E331)



Water addition is not only caused by citric acid or sodium citrate

Additives

Water addition is not only caused by citric acid or sodium citrate!

~~Polyphosphates~~

Citric acid/ Na-citrate + Na-carbonates

⇨ Up to now only an indirect proof
of an increased sodium content is possible

Conclusion

Many frozen scallop products differ considerably from their natural composition

The pH values of the processed scallops ranged from 6.0 to 8.7

Picture: Monika Manthey

pH values > 7.0 were always associated with added water and the presence of additives (phosphates/citric acid/citrate)

Conclusion

Labelling does not reliably reflect the composition.

Labelling of citric acid/ sodium citrate sounds good for the consumer, but is always associated with high water contents in the frozen products.

Data suggest that sodium(hydrogen)carbonate was added to increase the waterbinding ability in combination with citric acid/ sodium citrate.

A fast and accurate detection method for carbonates is needed.

Outlook

Water addition to seafood products is nothing new, but regains importance….

Picture: Christina jung

Picture: Horst Karl

Picture: Ute Schröder

Picture: Monika Manthey

A moisture content > 85% in scallops is the result of 30% water addition !

Modern technology should not be used to reduce the quality of seafood products.

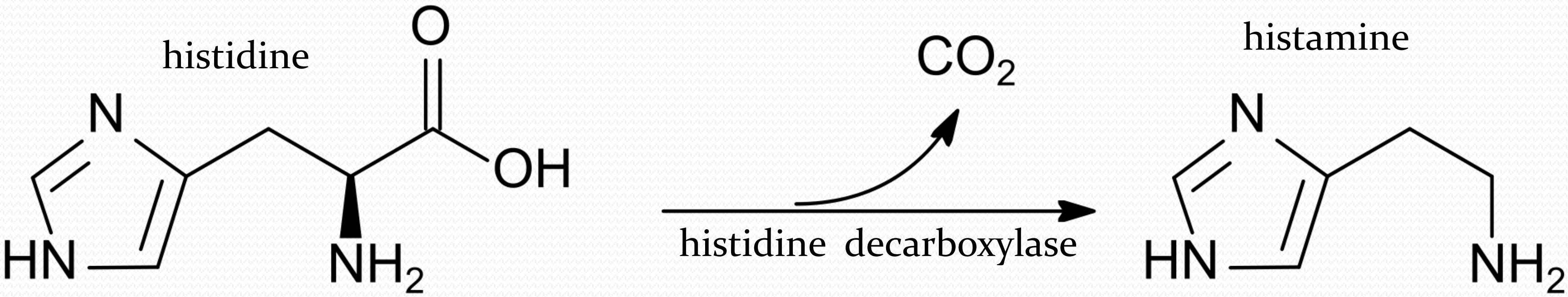
Thank you for your attention !

Detection of histamine in fish by Surface Enhanced Raman Spectroscopy using silver colloid SERS substrates

Tibor Janči[1], Mile Ivanda[2], Lara Mikac[2], Tomislav Petrak[1], Nives Marušić[1], Sanja Vidaček[1]

[1] Faculty of Food Technology and Biotechnology, University of Zagreb, Croatia
[2] Ruđer Bošković Institute, Zagreb, Croatia

Histamine



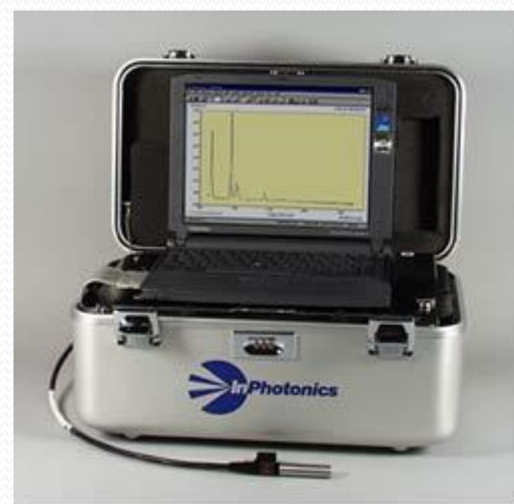
- Most frequent cause of health problems associated with seafood consumption
- Wide array of analytical methods – complex, expensive, long analysis time
- Need for simpler, faster methods adequate for „on field" analysis
- Legislative set limits:
  - 50 mg/kg of fish – USA
  - 100 mg/kg of fish - EU

Raman spectroscopy

- Vibrational spectroscopy method

- Advantages:
  - Specificity
  - Analysis of all tipes of samples (solid, liquid, gas, dissolved)
  - Minimal sample preparation
  - Short analysis time

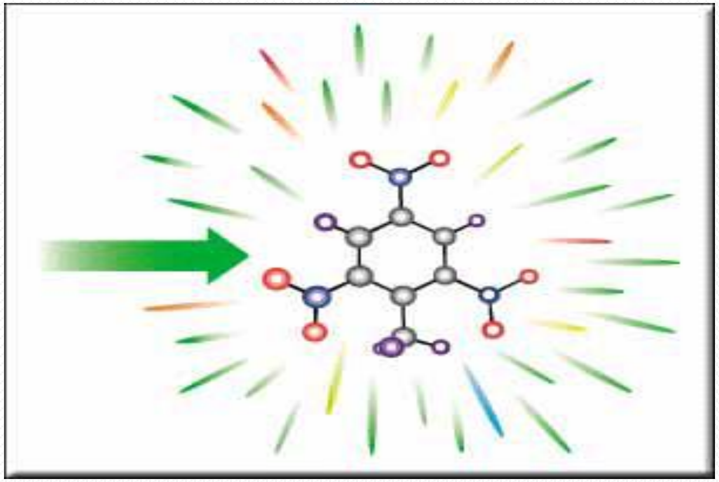
- Portable Raman spectrometers

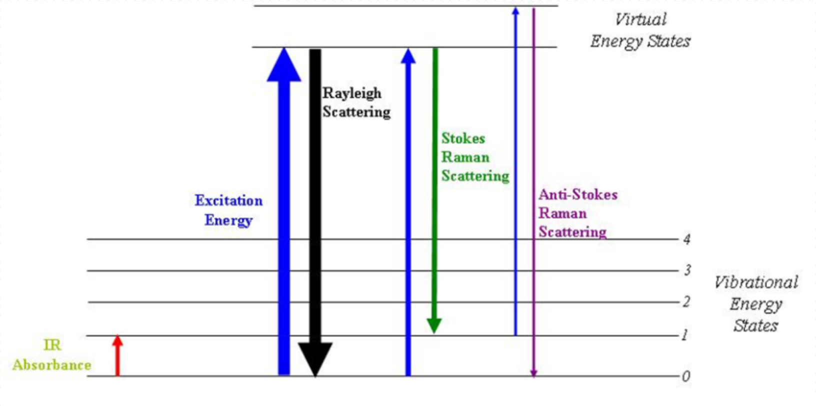


Raman spectroscopy

Raman effect

- Inelastic scattering of light
- Shift in wavelength of scattered light due to interactions between photons and molecules of analyte





- Wavelength shift corresponds to energy of molecular vibrations or/and rotations
- Raman spectrum – plot of intensity of scattered light as function of Raman shift

- Disadvantages:
  - Weak intensity - min. concentration of analite ~ 10^{-3} M
  - Fluorescence – obscuring of Raman signals
  - Analyte degradation

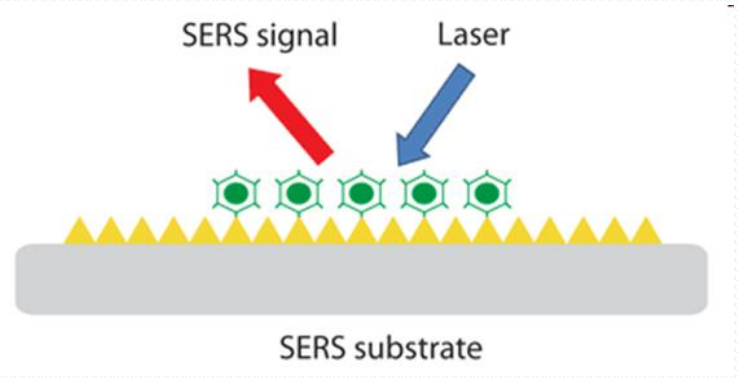
- Solution – **Surface Enhanced Raman Scattering (SERS)**

+
- Enhancement of Raman signals up to 10^{14} factor – high sensitivity
- Fluorescence elimination

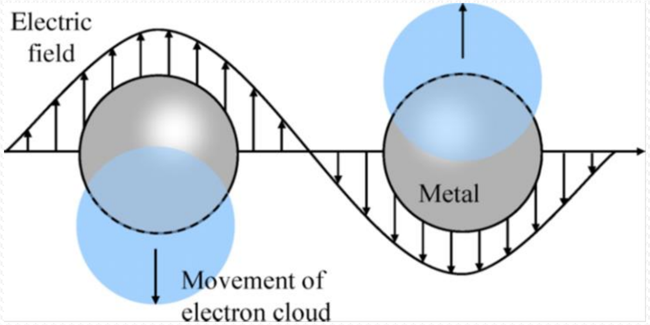
−
- Analyte degradation
- Contamination
- SERS substrate stability

Surface Enhanced Raman Scattering - SERS

- Enhanced Raman scattering on molecules adsorbed on rough metal surfaces or metal nanostructures – SERS substrates



- 2 proposed mechanisms:
  - Chemical enhancement – *„charge-transfer complexes"*, higher polarisability of molecule – enhancement factor ~10^2-10^4
  - Electromagnetic enhancement – excitation of localized surface plasmons - enhancement factor ~10^7-10^{11}



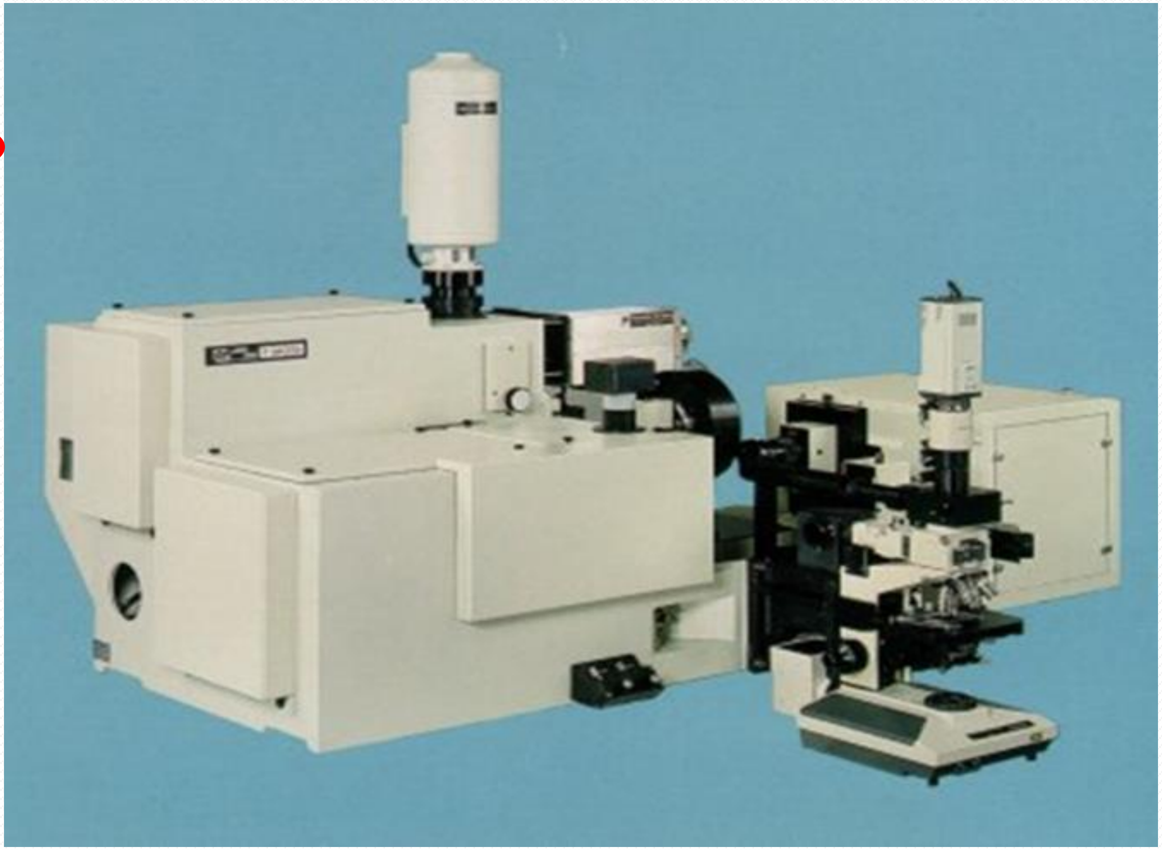
- Most frequently used SERS substrates – silver or gold:
  - Liquid – colloid solutions of metal nanoparticles
  - Sol – gel films
  - Solid – wide array of preparation techniques

- Total enhancement factor depends on:
  - Adsorption of analyte on SERS substrate
  - Surface characteristics - roughness
  - Size and shape of substrate particles

Experimental setup

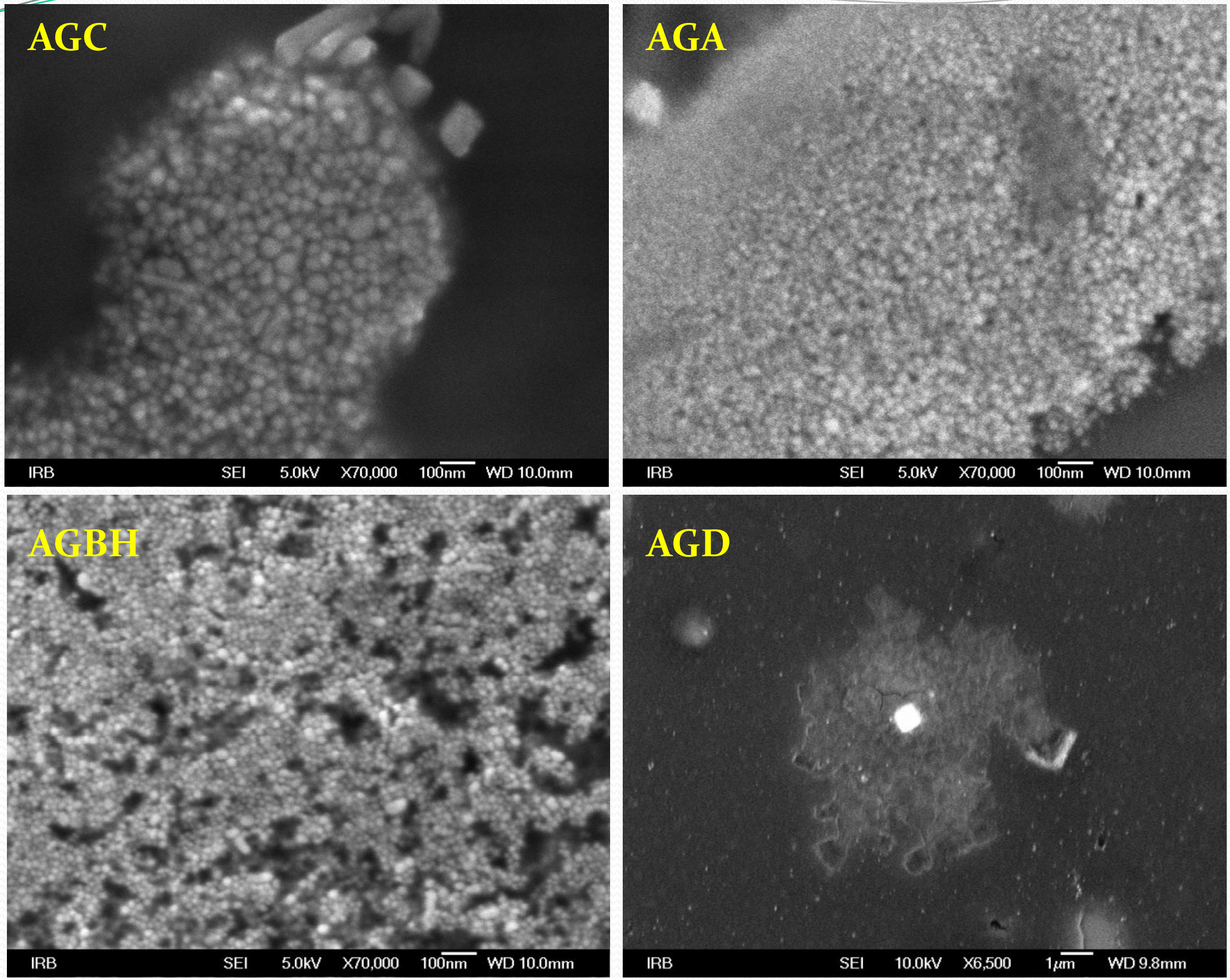
- Raman spectrometer Horiba Jobin Yvon T64000

- Diode laser – 532 nm
- Argon laser – 514.5 nm



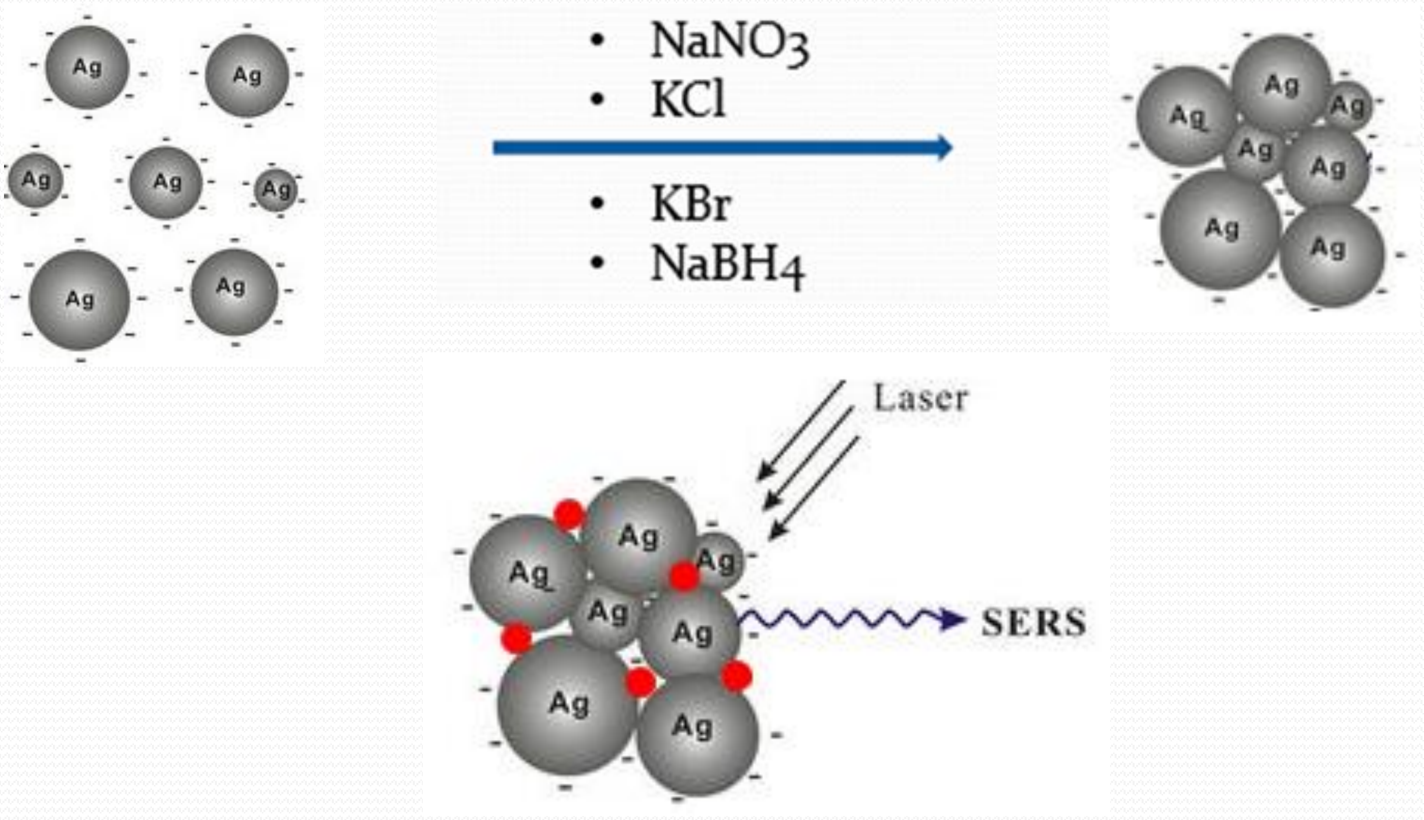
SERS substrates - silver nanoparticles preparation

Sample	Method	Reducing/ stabilizing agent	Diameter (nm) *SEM	Zeta (mV)	Total Ag concentration (mgL^{-1})	pH
AGC	*Lee and Meisel, 1982.*	citrate/citrate	35.8+/- 6.3	-33.4	104	7.7
AGA	*Qin et al., 2010.*	ascorbic acid /citrate	16.7 +/- 4.4	-46.8	107	7.9
AGBH	*Suh et al., 1983.*	$NaBH_4/BH^{4-}$	10.9 +/- 2.9	-10.1	27	7.5
AGD	*Yang et al., 2012.*	$NaBH_4$/DEAE-dextran	518 +/- 114	39.5	10^3	8.2


AGC
IRB SEI 5.0kV X70,000 100nm WD 10.0mm
AGA
IRB SEI 5.0kV X70,000 100nm WD 10.0mm
AGBH
IRB SEI 5.0kV X70,000 100nm WD 10.0mm
AGD
IRB SEI 10.0kV X6,500 1μm WD 9.8mm

SERS substrates – aggregation of silver nanoparticles

- Silver nanoparticles - smooth surface
- Aggregates – rough surface (nanoscale)

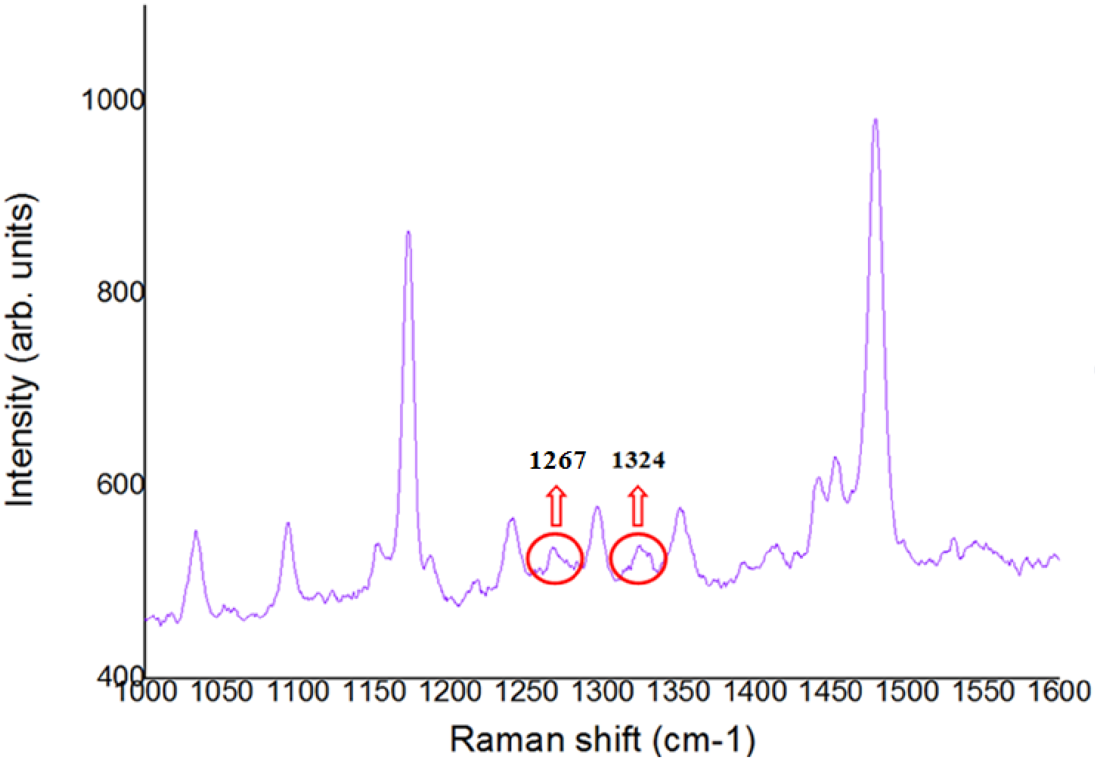


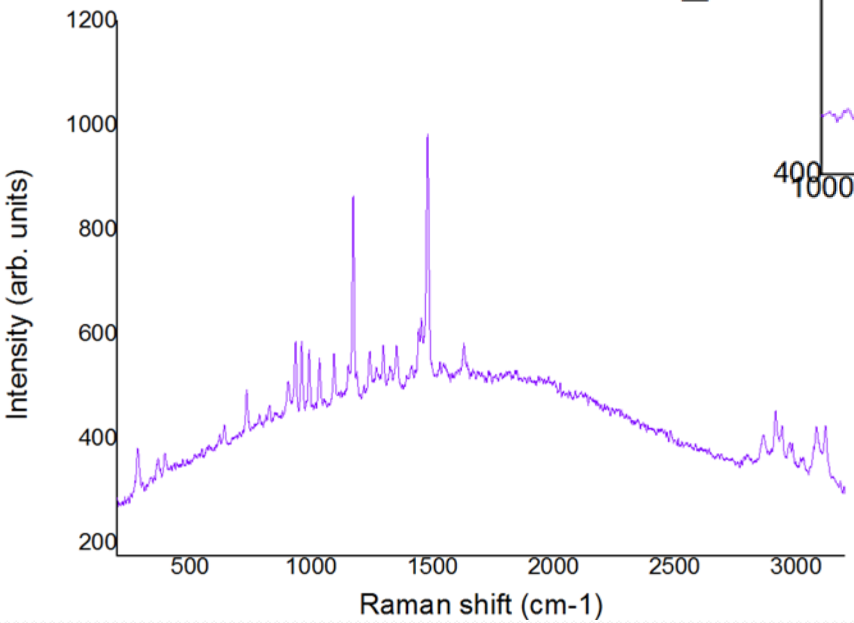
SERS measurements – sample preparation

- Silver colloid (80 µL) + aggregating agent (10 µL)
- Mixing (30 s)
- Standard solution (10 µL)
- Mixing (30 s)
- SERS measurement

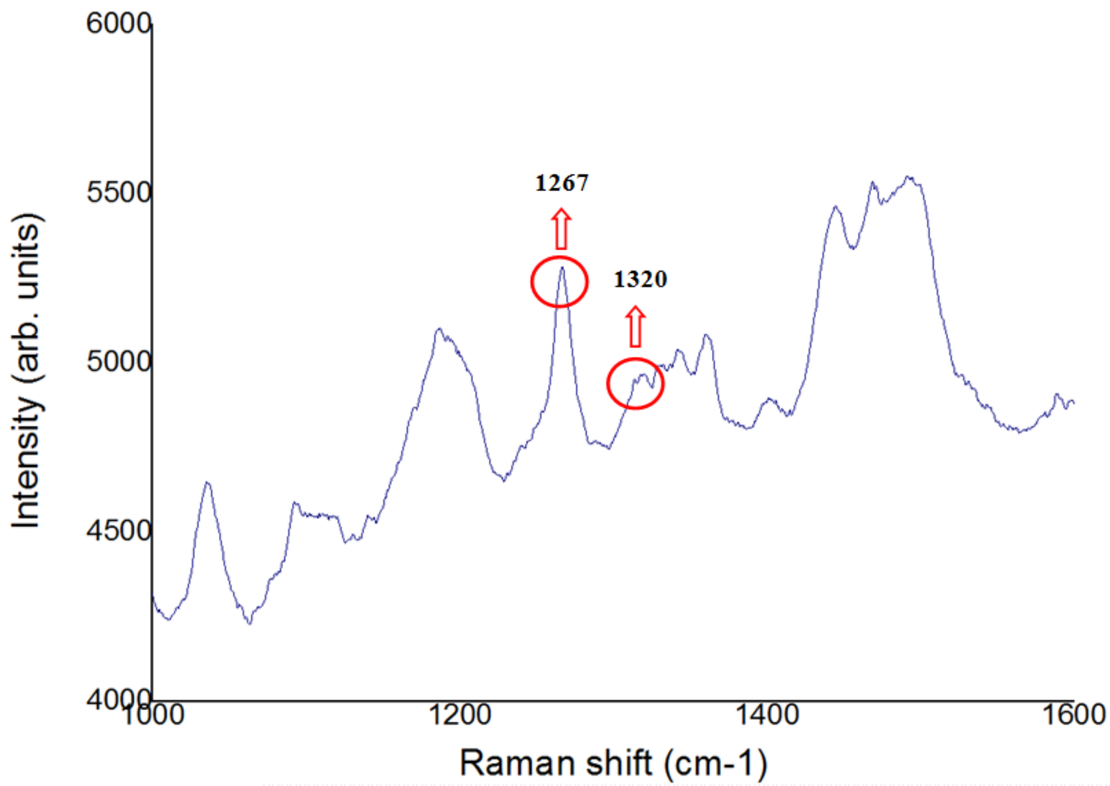
Raman measurements

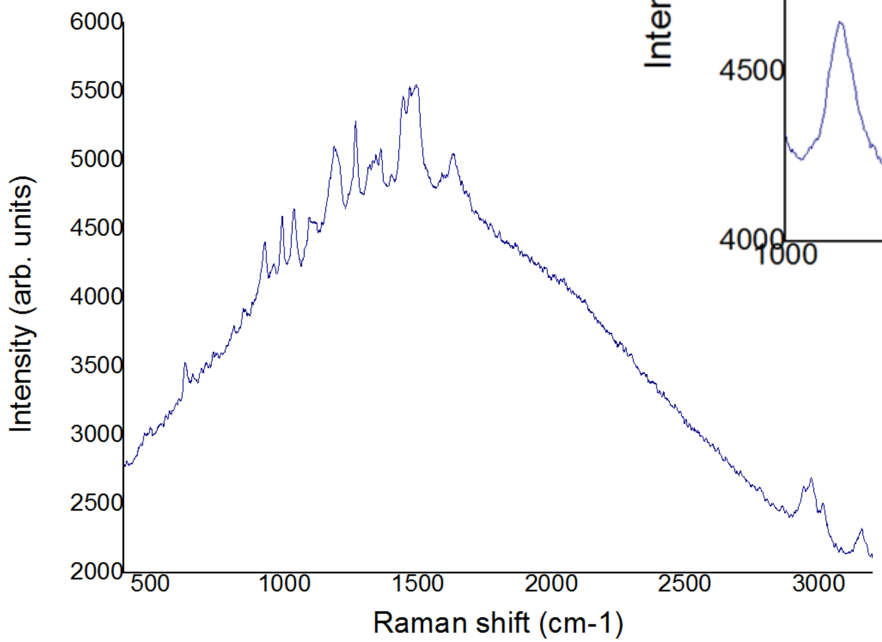
- Raman spectrum of solid histamine dihydrochloride





- Raman spectrum of histamine dihydrochloride dissolved in water





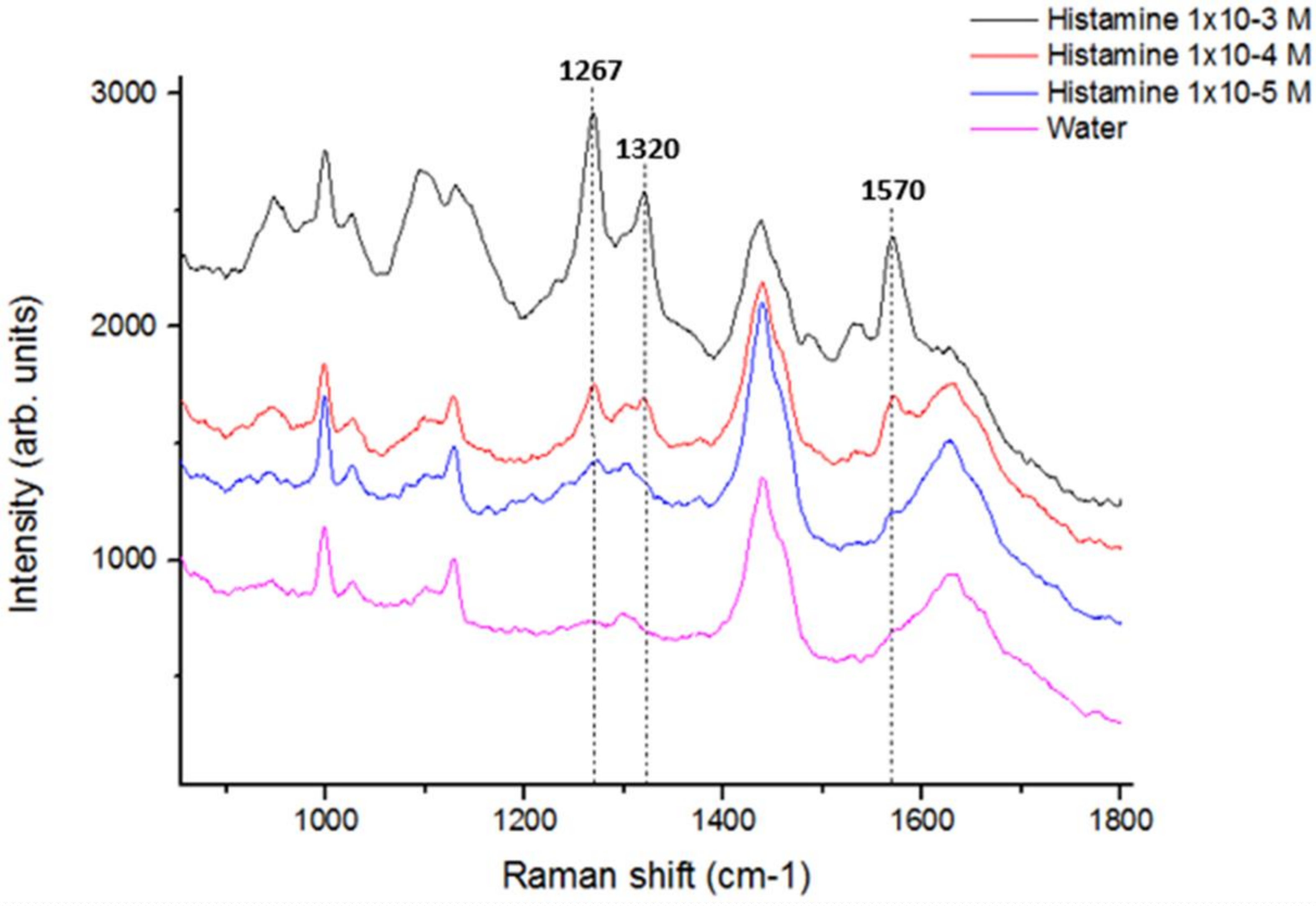
SERS measurements

- Combination of different silver colloids and 3 concentrations (0.1, 0.5, 1 M) of different aggregating agents

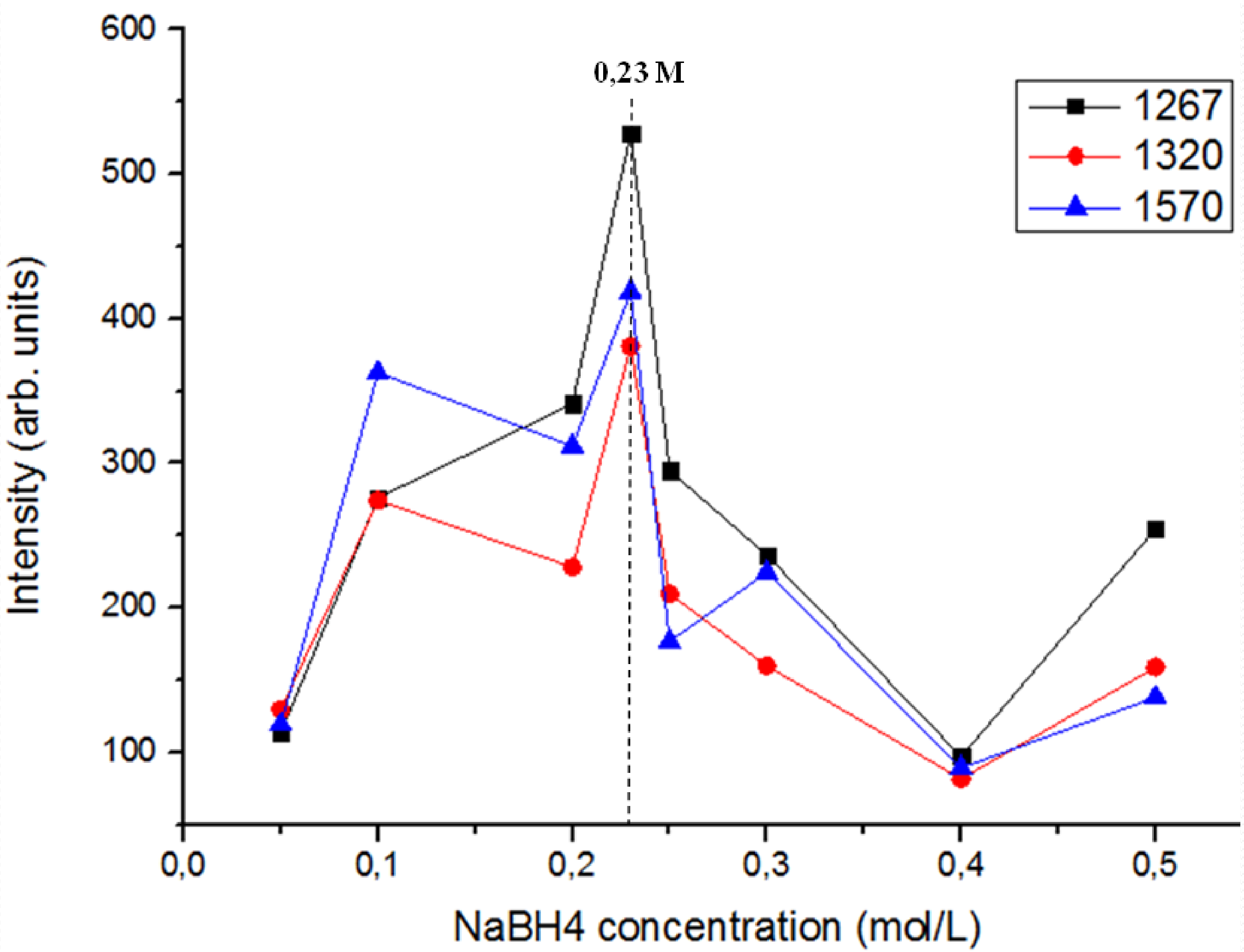
	KCl	KBr	$NaNO_3$	$NaBH_4$
AGC				
AGA				
AGBH				
AGD				

- Optimization of aggregating agent concentration for best colloid / agregating agent combination

SERS measurements – AGC + $NaBH_4$ combination



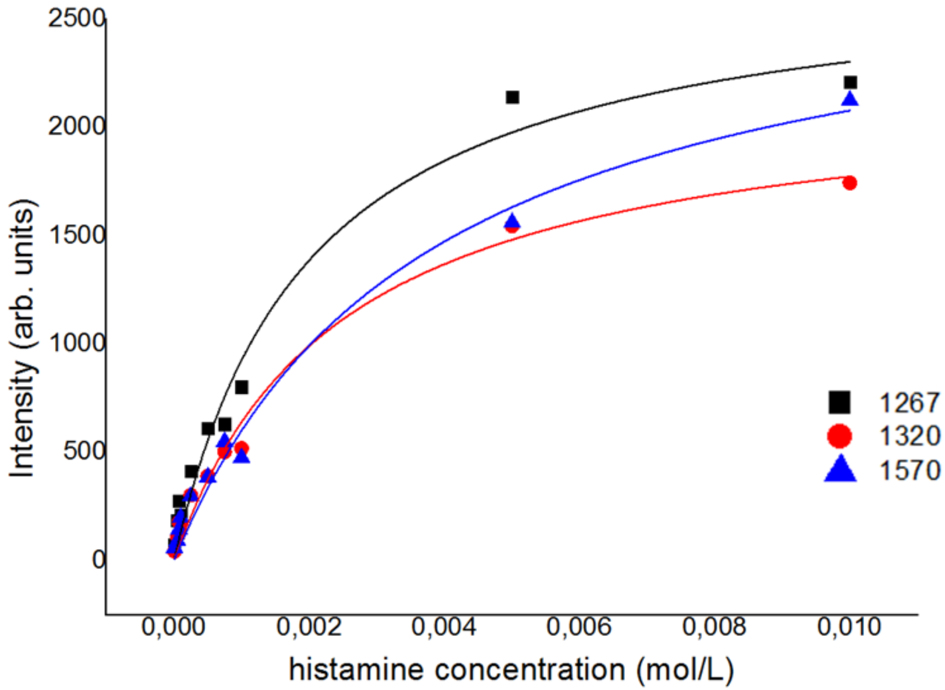
SERS measurements - optimization of NaBH4 concentration



Calibration curve

- Langmuir adsorption isotherm

$$I = \frac{I_{max} K c}{1 + K c}$$



v (cm^{-1})	R^2	I_{max}	K
1267	0,9722	2759,4 ± 195,3	504,6 ± 99,3
1320	0,9811	2208,2 ± 144,7	407,4 ± 71,6
1570	0,9810	2859,7 ± 252,0	265,5 ± 56,7

SERS measurements in fish extracts

- Sample – mackerel (*Scomber scombrus*)
- Extraction solvent – perchloric acid 0.4 mol/L
- Perchloric acid – negative impact on silver colloid
- Neutralisation and/or removal of perchloric ions:
    - NaOH
    - KOH
    - Anion exchange resin

SERS measurement – fish extract preparation

Fish sample (5 g) + perchloric acid (50 ml) + histamine dihydrochloride (standard)

↓

Homogenisation

↓

Centrifugation

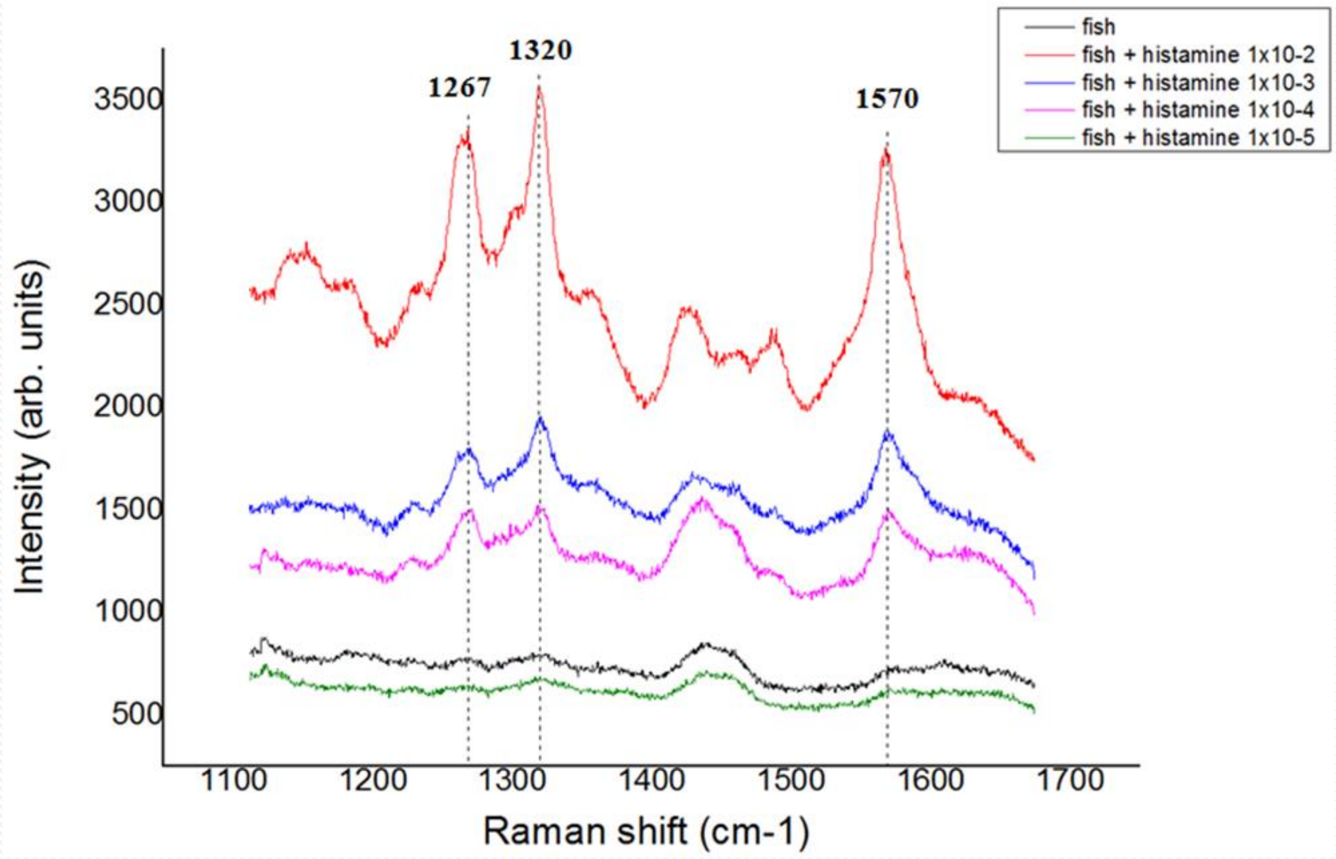
↓

Supernatant + anion exchange resin

↓

Sample preparation for SERS measurement

SERS measurements – fish extracts



- Limit of detection: 1 x 10^{-4} mol/L ≈ 115 mg/kg of fish

Summary

- Preliminary results:
  - Best results obtained with AGC colloid and 0,23 M $NaBH_4$
  - Detection of histamine in water solution at concentration 1×10^{-5} mol/L
  - Extraction with 0,4 M perchloric acid and removal of perchloric ions with anion exchange resin
  - Detection of histamine in fish muscle extract at concentration 1×10^{-4} mol/L

- Problems:
  - Limit of detection higher than legislative set limits
  - Fluctuation of results :
    - Analyte degradation
    - SERS substrate stability

Future focus

- Improvement of extraction methods
- Analyte degradation – measurement parameters (acquisition time, laser power)
- SERS substrate stability – solid SERS substrates

Thank you!

WEFTA 2014

SEAFOOD Science for a changing demand

PRESENTATIONS

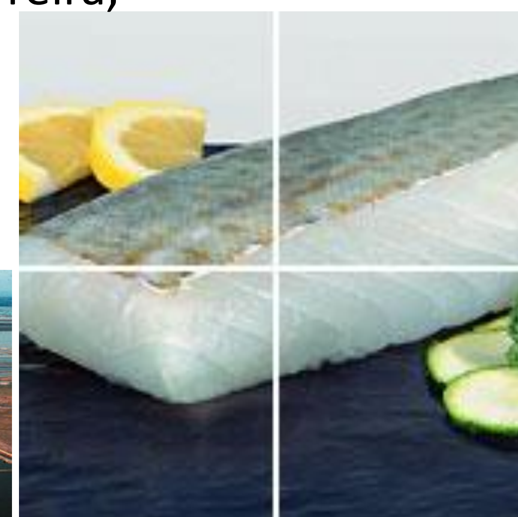
SAFETY EVALUATION AND EMERGING RISKS

instituto português do mar e da atmosfera
NATIONAL INSTITUTE FOR THE SEA AND ATMOSPHERE

BENEFIT AND RISK ASSESSMENT OF COOKED FARMED MEAGRE (*Argyrosomus regius*)

Cláudia Afonso, Sara Costa, Carlos Cardoso, Narcisa Bandarra, Irineu Batista, Inês Coelho, Isabel Castanheiro, Pedro Pousão-Ferreira, **Maria Leonor Nunes**

Division of Aquaculture and Seafood Upgrading/IPMA, I.P.; Lisbon-Portugal
cafonso@ipma.pt



SUMMARY

OVERVIEW

OBJECTIVES

METHODS

RESULTS

CONCLUSIONS

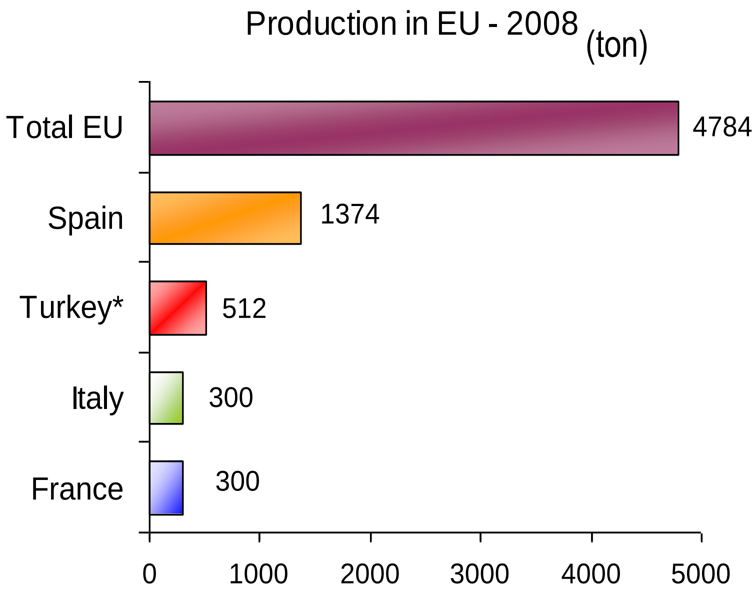
Work developed under the frame of AQUACOR (Ref. PROMAR 31-03-05FEP-003) and GOODFISH (Ref. PTDC/SAU-ESA/103825/2008) Projects

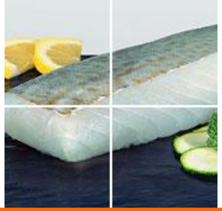
OVERVIEW

- Meagre (*Argyrosomus regius*) is a fast growing species and exhibits good food conversion rates. It is a well species known by consumers.

- Based on these attributes meagre is considered one of the best potential candidates for large scale farming, in particular for Mediterranean aquaculture.

- Portugal consumers have one the highest *per capita* consumption in the world (60 kg) and imports covers almost two thirds.





OBJECTIVES

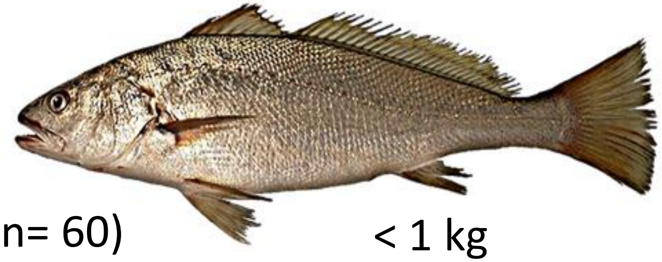
Thus, the aim of this work is to present some of the main achievements acquired for (…):

- **EPA, DHA, Se, Hg, and MeHg levels;**
- **Effect of different culinary treatments;**
- **Bioaccessibility of EPA, DHA, Se, Hg, and MeHg**
- **Health benefits and risks associated with the consumption of this species.**

EXPERIMENTAL DESIGN

IPMA facilities in Olhão (Portugal):
Earthen ponds, semi-intensive production

Final fish density:
1.1 kg/m^3



(n= 60) < 1 kg

Raw and Cooked (household culinary cooking)

METHODS

EPA+DHA Fatty acids

Fatty acid methyl esters (FAME's) of non-polar and polar lipids (Bandarra et al., 1997).

Mineral elements and contaminants

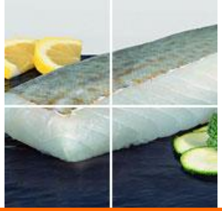
Selenium (Se) (CEN, 2009). Total mercury (Hg) (EPA, 1998), MeHg (Afonso et al., 2013).

Bioaccessibility (quantity of a nutrient/contaminant solubilised during the digestive process).
In vitro digestion method (Versantvoort et al., 2005).

Risk/Benefit assessment

software @ RISKR® —advanced risk analysis for spreadsheets, version 4.5, 2005 (Cardoso et al., 2010).

Se-HBV - Selenium health benefit value (Ralston and Raymond, 2014).



METHODS

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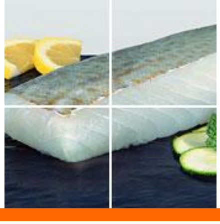
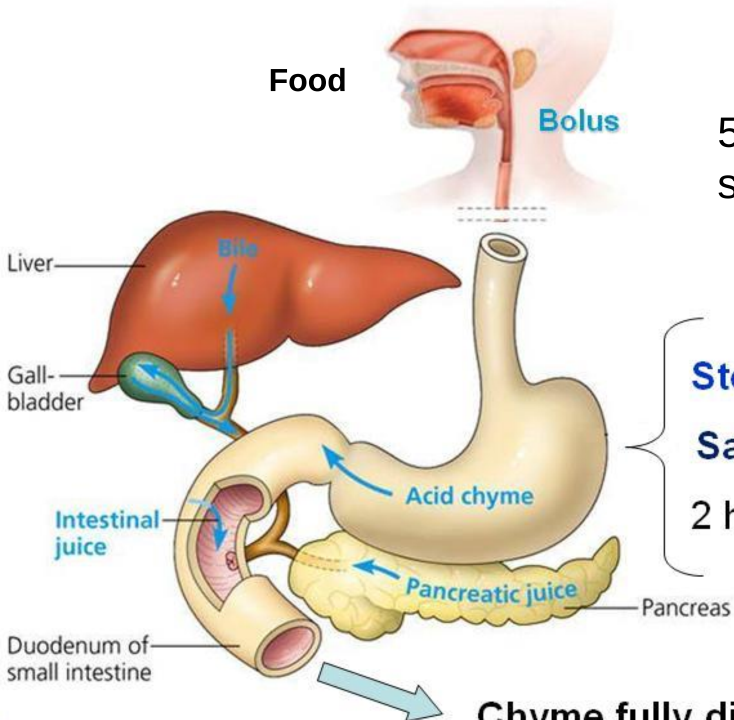


METHODS

	(a) Carbohydrate digestion	(b) Protein digestion	(c) Nucleic acid digestion	(d) Fat digestion
Oral cavity, pharynx, esophagus	Polysaccharides (starch, glycogen) ↓ **Salivary amylase** Smaller polysaccharides, maltose			
Stomach		Proteins ↓ **Pepsin** Small polypeptides		
Lumen of small intestine	Polysaccharides ↓ **Pancreatic amylases** Maltose and other disaccharides	Polypeptides ↓ **Trypsin, Chymotrypsin** Smaller polypeptides ↓ **Aminopeptidase, Carboxypeptidase** Amino acids	DNA, RNA ↓ **Nucleases** Nucleotides	Fat globules ↓ **Bile salts** Fat droplets (emulsified) ↓ **Lipase** Glycerol, fatty acids, glycerides
Epithelium of small intestine (brush border)	↓ **Disaccharidases** Monosaccharides	Small peptides ↓ **Dipeptidases** Amino acids	↓ **Nucleotidases** Nucleosides ↓ **Nucleosidases** Nitrogenous bases, sugars, phosphates	

Source:http://teacher.cgs.k12.va.us/bwebster/Biology/Chapter%20PowerPoints/Chap41AnimNutr.pdf

METHODS



Mouth

Saliva (α-amilase)

5 minutes; pH >6.5 (Saliva solution 6.8±0.2); 37±2 ºC

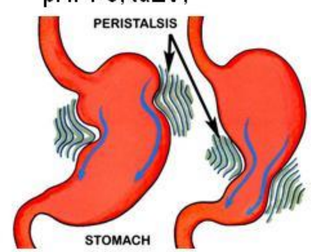
No changes

Stomach

Saliva + Gastric juice (Pepsin)

2 hours; pH≈2 (HCl); 37±2 ºC

pH: 1-3; tαEV;

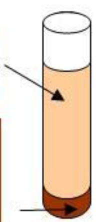


tαEV; pH>5.5; Lipase+Pancreatina+Bile salts

Chyme fully digested

Bioaccessible

Not Bioaccessible



Small intestine

Saliva + Gastric juice +Duodenal juice (Trypsin, Chymotrypsin, "Pancreatin" and Lipase) + Bile salts

2 hours; 6.0<pH<7.0 ($NaHCO_3$); 37±2 ºC

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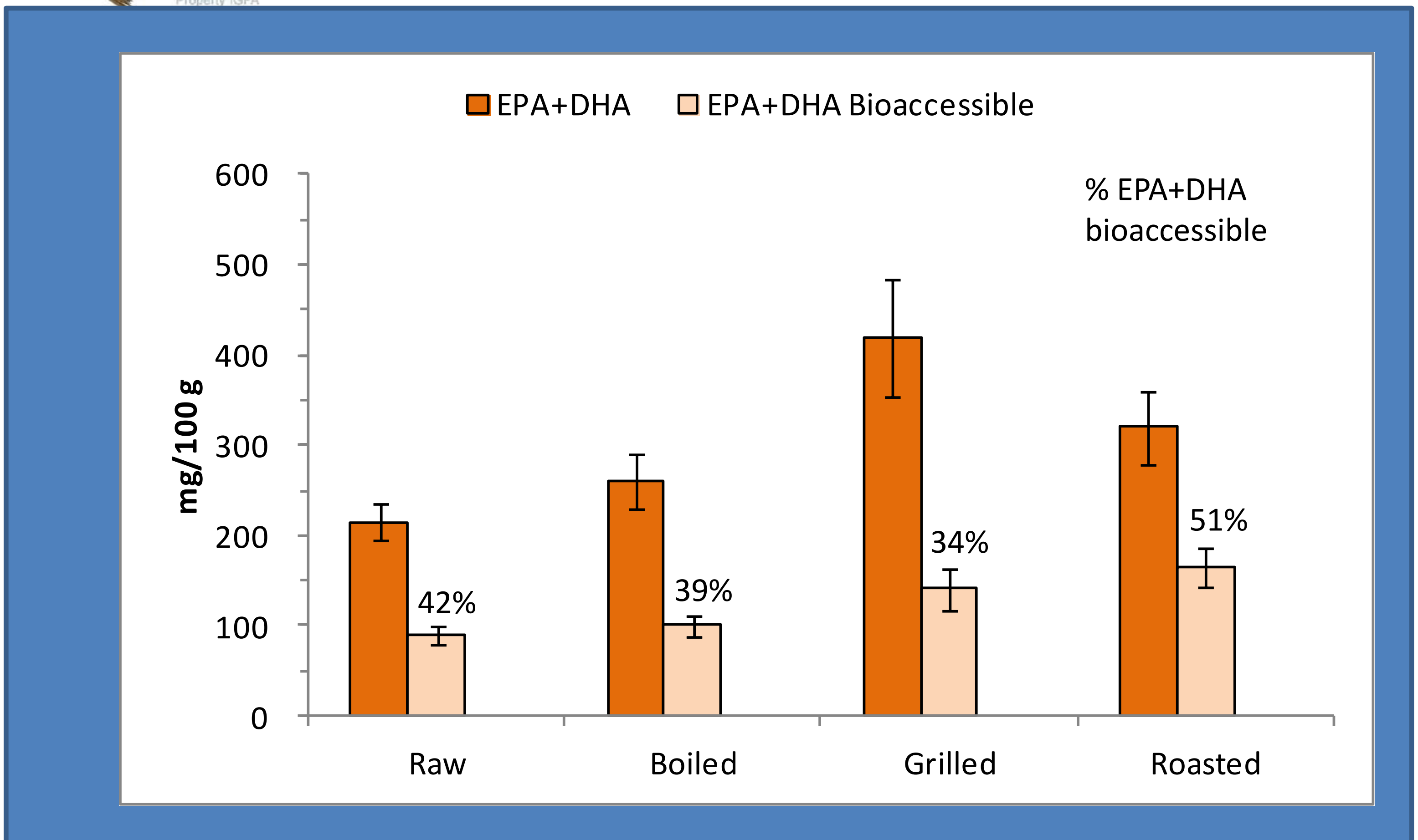
RESULTS

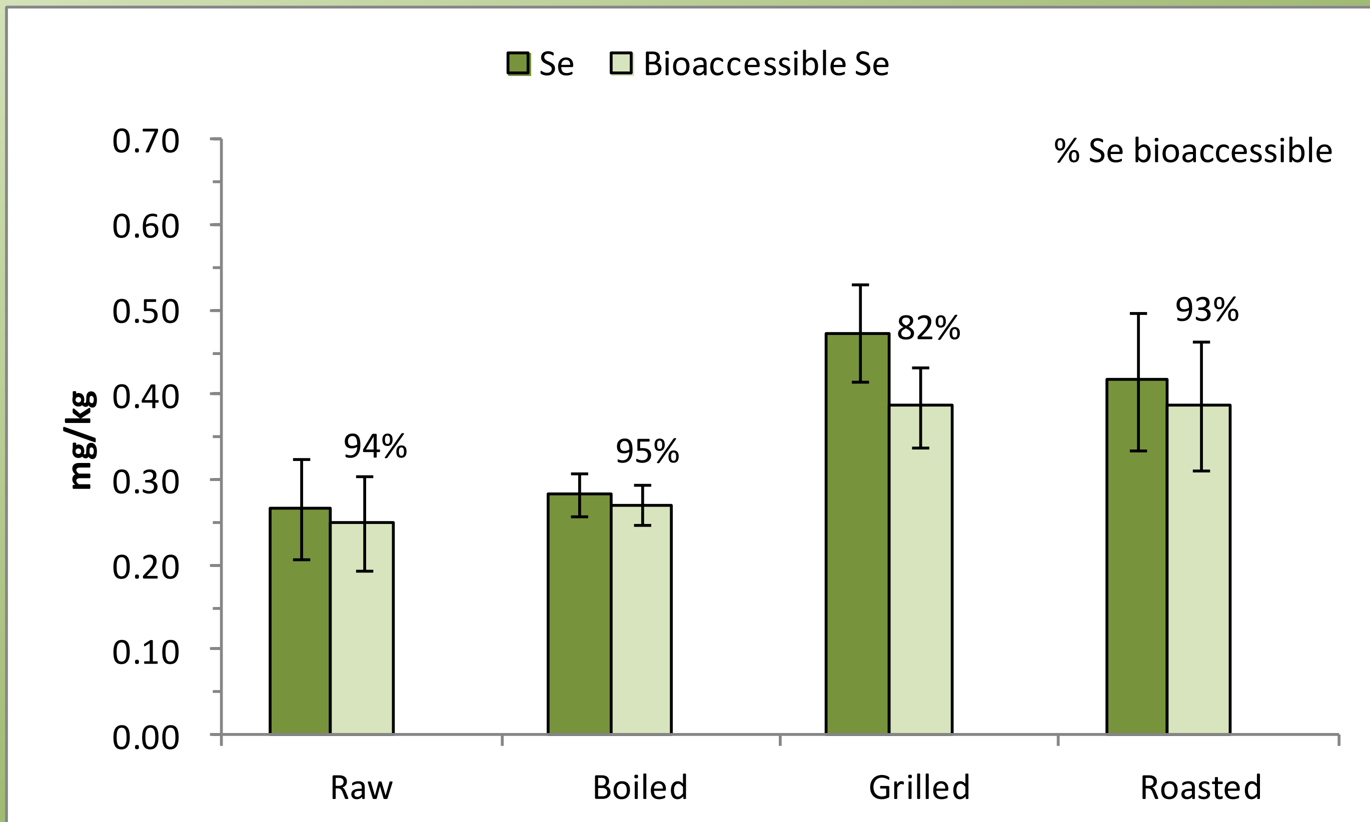
EPA + DHA



RESULTS

Se

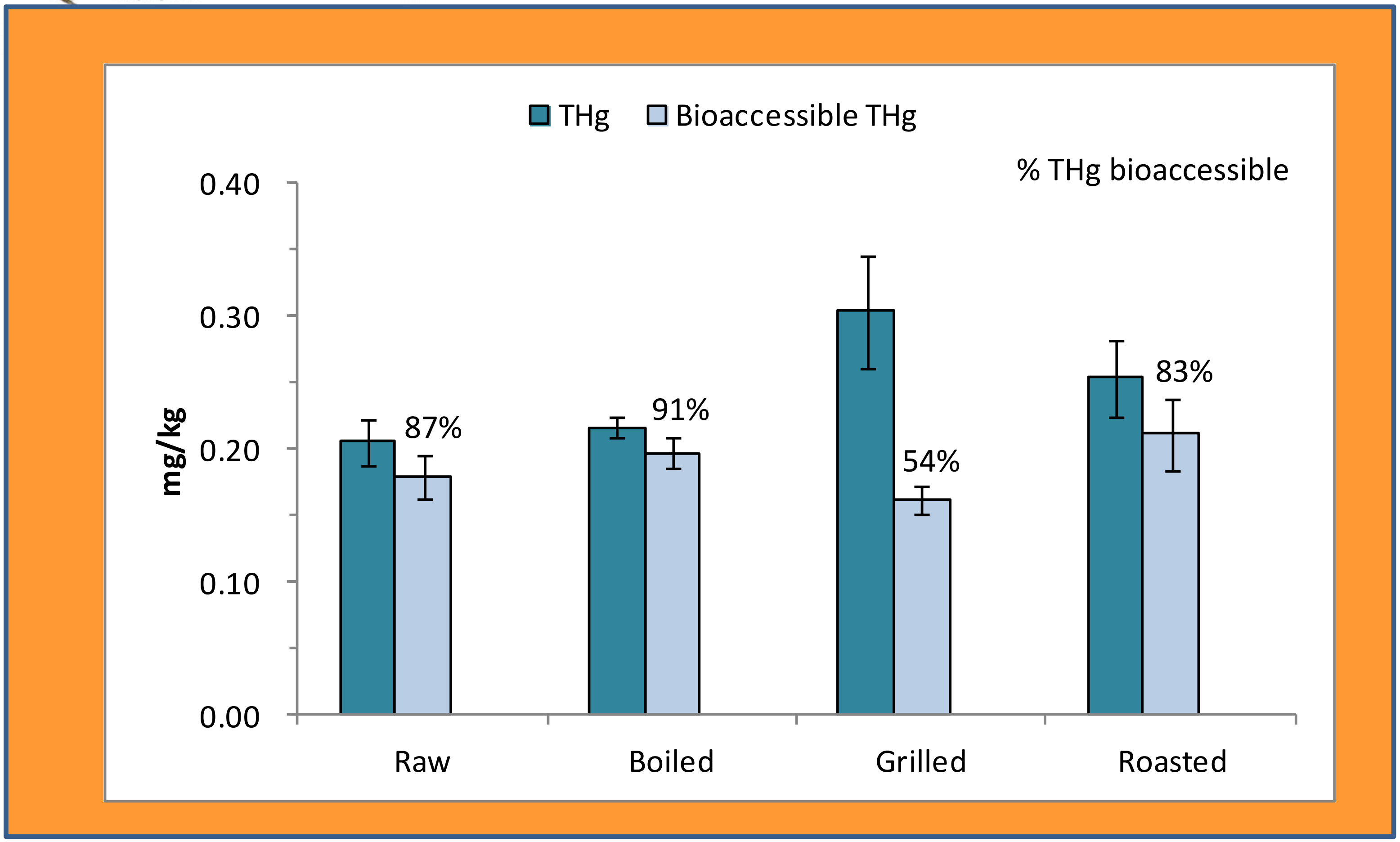
Property IGFA



Se
Bioaccessible Se
% Se bioaccessible
mg/kg
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
94%
95%
82%
93%
Raw
Boiled
Grilled
Roasted

RESULTS

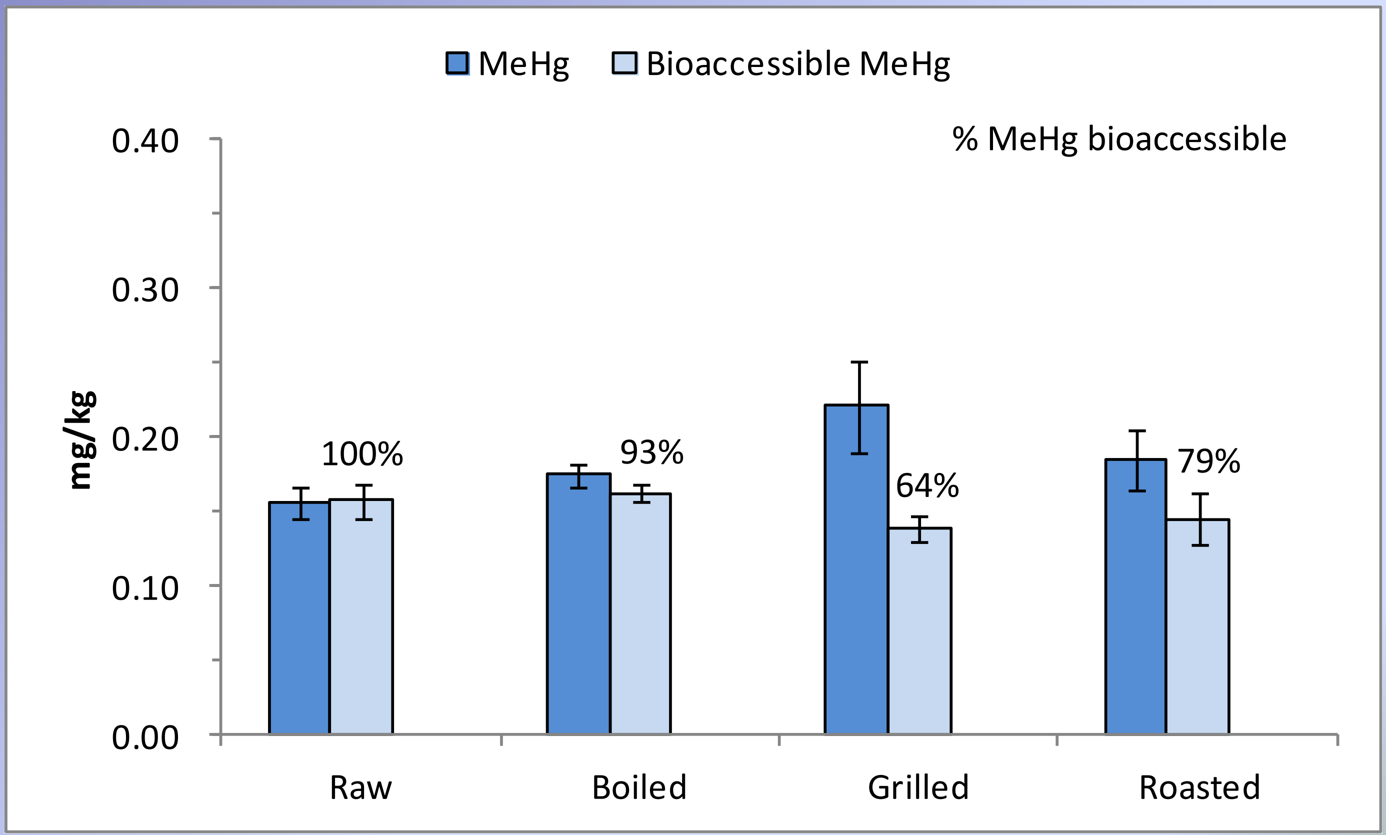
THg

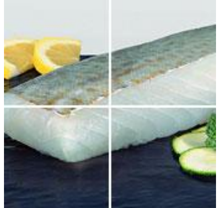


THg
Bioaccessible THg
% THg bioaccessible
mg/kg
0.40
0.30
0.20
0.10
0.00
87%
91%
54%
83%
Raw
Boiled
Grilled
Roasted

RESULTS

MeHg



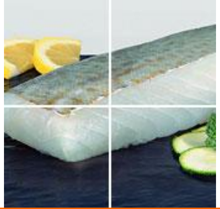


RESULTS

Probability of Exceeding the MeHg PTWI and EPA+DHA and Se DRI, P(Xi > PTWI or DRI) (%), as a result of raw and cooked meagre consumption.

		P(X_i > PTWI or DRI) (%)		
		1 Meal/ Week	2 Meals/ Week	3 Meals/ Week
Raw	MeHg (PTWI)	$<1.0x10^{-8}$	$1.8x10^{-5}$	0.34
	Se	$2.6x10^{-2}$	0.12	0.84
	EPA+DHA	$<1.0x10^{-8}$	$<1.0x10^{-8}$	$<1.0x10^{-8}$
Boiled	MeHg (PTWI)	$<1.0x10^{-8}$	$9.2x10^{-7}$	1.10
	Se	$2.3x10^{-8}$	$1.5x10^{-4}$	$1.9x10^{-3}$
	EPA+DHA	$<1.0x10^{-8}$	$9.8x10-^{4}$	0.36
Grilled	MeHg (PTWI)	$<1.0x10^{-8}$	$2.9x10^{-3}$	**86.98**
	Se	$<1.0x10^{-8}$	$4.1x10^{-5}$	$2.9x10^{-3}$
	EPA+DHA	$1.9x10^{-7}$	0.11	**100.00**
Roasted	MeHg (PTWI)	$3.0x10^{-5}$	0.17	**29.32**
	Se	$4.6x10^{-6}$	$7.5x10^{-4}$	$6.0x10^{-3}$
	EPA+DHA	$1.2x10^{-4}$	0.10	**10.15**

Consumptions up to two meals of 160 g a week are recommended (PTWI).



RESULTS

Probability of Exceeding the Me-Hg PTWI and EPA+DHA and Se DRI, P(Xi > PTWI/TWI or DRI) (%), as a result of raw and cooked meagre consumption - bioaccessible fraction.

		P(X_i > PTWI/TWI or DRI) (%)		
		1 Meal/ Week	2 Meals/ Week	3 Meals/ Week
Raw	MeHg (PTWI)	$<1.0\times10^{-8}$	1.5×10^{-6}	0.10
	MeHg (TWI)	$<1.0\times10^{-8}$	5.1×10^{-4}	**57**
	Se	0.01	0.10	0.54
	EPA+DHA	$<1.0\times10^{-8}$	$<1.0\times10^{-8}$	3.1×10^{-7}
Boiled	MeHg (PTWI)	$<1.0\times10^{-8}$	4.1×10^{-7}	0.13
	MeHg (TWI)	$<1.0\times10^{-8}$	2.6×10^{-4}	**85**
	Se	$<1.0\times10^{-8}$	$<1.0\times10^{-8}$	5.0×10^{-4}
	EPA+DHA	$<1.0\times10^{-8}$	$<1.0\times10^{-8}$	$<1.0\times10^{-8}$
Grilled	MeHg (PTWI)	$<1.0\times10^{-8}$	$<1.0\times10^{-8}$	0.002
	MeHg (TWI)	$<1.0\times10^{-8}$	3.1×10^{-6}	0.89
	Se	1.9×10^{-8}	7.2×10^{-5}	1.1×10^{-2}
	EPA+DHA	$<1.0\times10^{-8}$	$<1.0\times10^{-8}$	2.7×10^{-7}
Roasted	MeHg (PTWI)	$<1.0\times10^{-8}$	0.01	1.35
	MeHg (TWI)	$<1.0\times10^{-8}$	0.09	**24**
	Se	1.7×10^{-7}	1.1×10^{-3}	3.5×10^{-2}
	EPA+DHA	4.8×10^{-6}	6.6×10^{-4}	3.9×10^{-2}

No consumption restriction is recommended (PTWI).

Two weekly meals of 160 g for boiled/roasted and three for grilled (TWI).

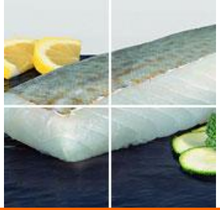
RESULTS

The Se-HBV values were >0, indicating a protection against mercury toxicity.
However, the practical implications of the modification of mercury toxicity by selenium are still unclear. So,

The consumption of this species involves a low health risk

Se-HBV = ([Se]–[Hg or MeHg])/ [Se] x ([Se]+[Hg or MeHg])

(calculated in molar concentrations)



CONCLUSIONS

- The bioaccessibility of EPA + DHA was lower than 50 % in raw, boiled, and grilled meagre and barely topping this level for roasted products;

- The bioaccessibility of Se was higher than 80 %;

- The bioaccessibility of THg and MeHg was higher in raw, boiled and roasted and lower in grilled meagre.

CONCLUSIONS

- No consumption restriction is foreseen, attending to the PTWI ;

- Consumptions up to 2 meals a week for boiled and roasted and 3 meals for grilled are recommended, attending to TWI;

- Se-HBV obtained for raw, boiled, grilled and roasted meagre was positive, meaning that the consumption of this species involves a low health risk.

Thank you!

MEAGRE …is FOOD for the FUTURE!

WEFTA 2014

SEAFOOD Science for a changing demand

PRESENTATIONS

ADVANCES IN SEAFOOD PROCESSING TECHNOLOGY AND SMART CONTROL

Comparing the effect of three antioxidants during enzymatic hydrolysis of Lumpfish head

Sigrún Mjöll Halldórsdóttir, Ph.D.

44th WEFTA meeting, 9-11th June 2014, Bilbao, Spain

Fish protein hydrolysates (FPH)

- Bioactive properties
- Functional food and nutraceutical market

- **Why have FPH not successfully entered the market?**

Fish protein hydrolysates (FPH)

Lipid oxidation

- Bad taste and smell
- Decreased bioactivity
- Decreased nutritional value

- **Is there a solution?**

Fish protein hydrolysates (FPH)

- Antioxidants
- Protect the fish protein
- Different antioxidative mechanism
- Natural vs synthetic

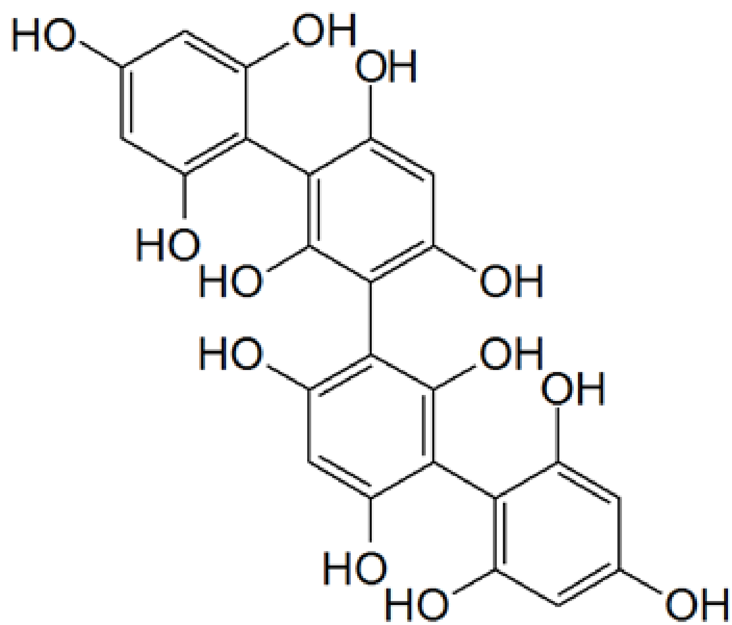
Objectives

Lumpfish (*Cyclopterus lumpus*)

Objectives

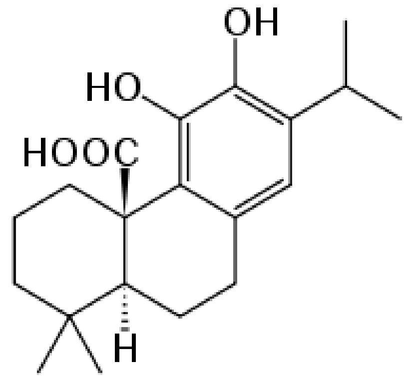
Objectives

Seaweed *(Fucus vesiculosus)* extract

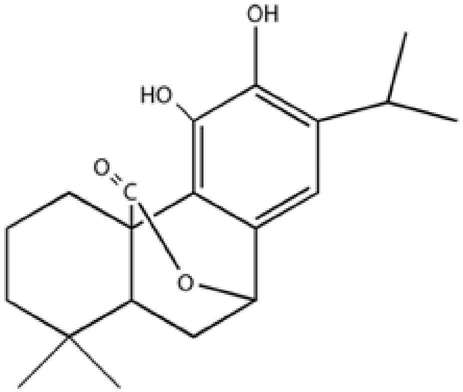


Phlorotannin

Objectives

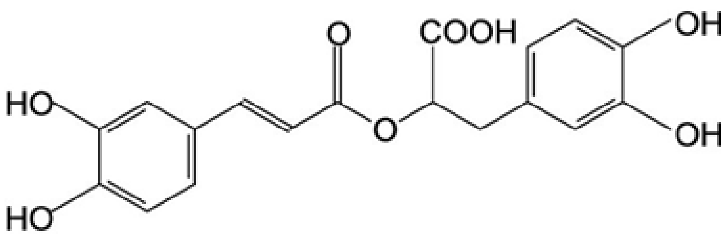


Carnosic acid



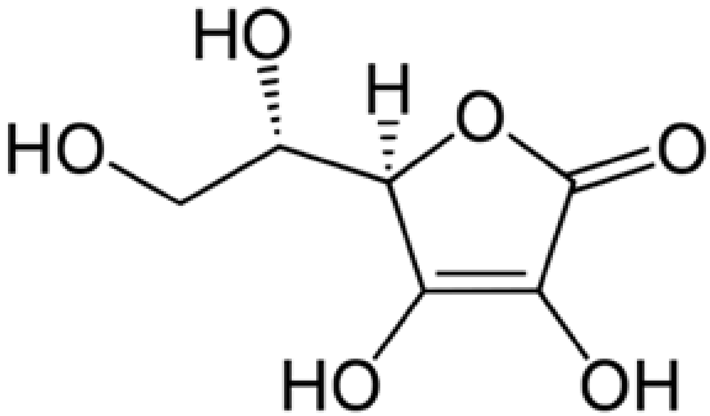
Carnosol

Rosemary *(Rosmarinus officinalis)* extract



Rosemarinic acid

Objectives



L-Ascorbic acid

L-Ascorbic acid

Methods

Enzymatic hydrolysis

- Protease M Amano (40°C for 2 hours)
- OPA

Rancidity measurements

- Peroxide value
- TBARS (Thiobarbituric reactive substances)

Sensory analysis

- Generic descriptative analysis

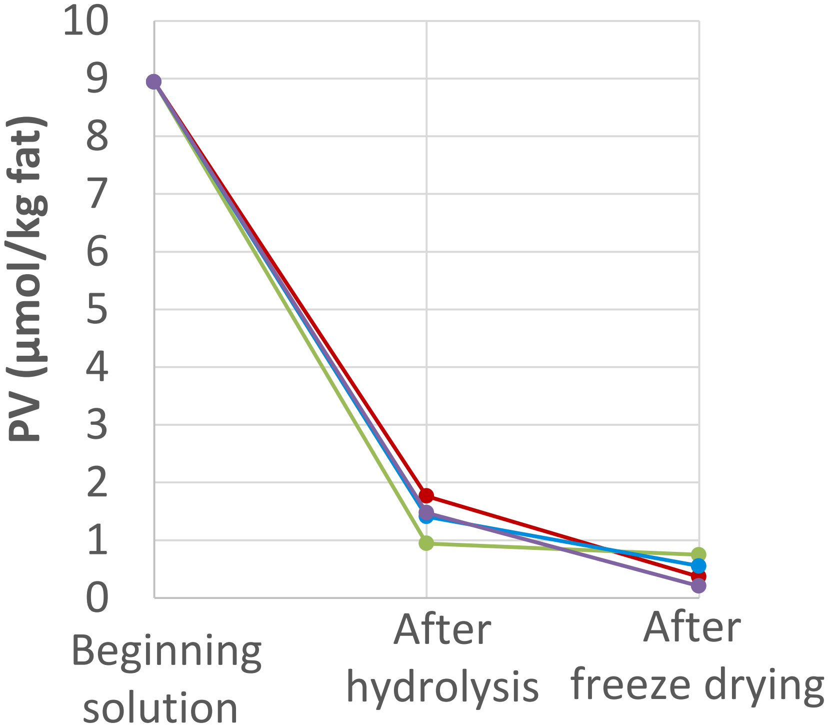
Bioactivity analysis

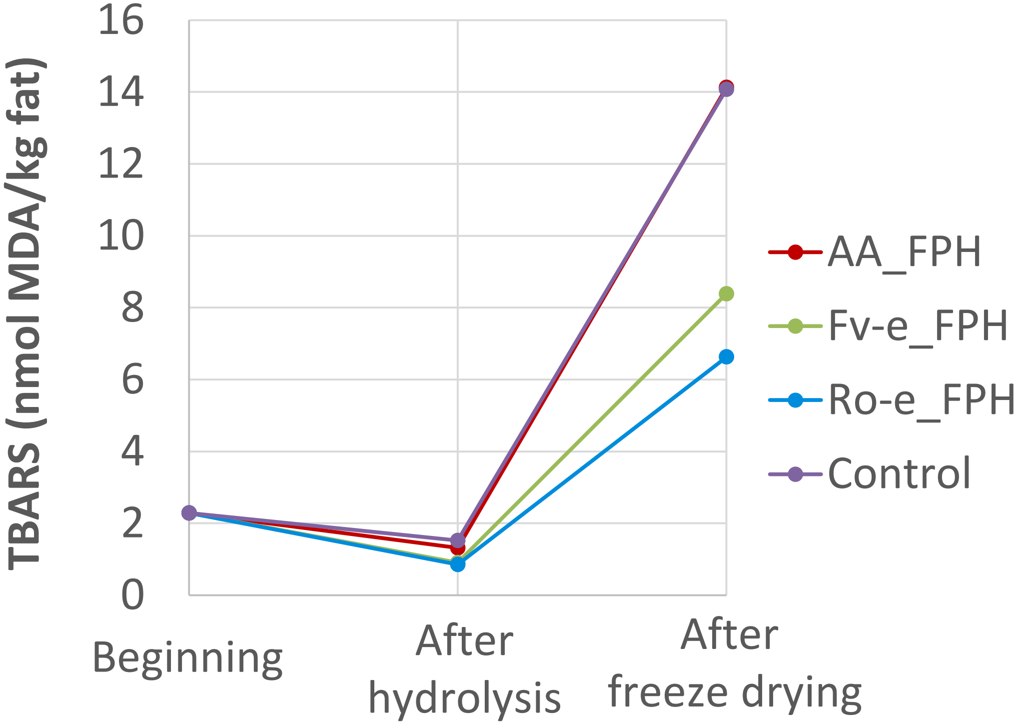
- Antioxidant activity
- Blood pressure lowering (ACE inhibition)

Results – OPA

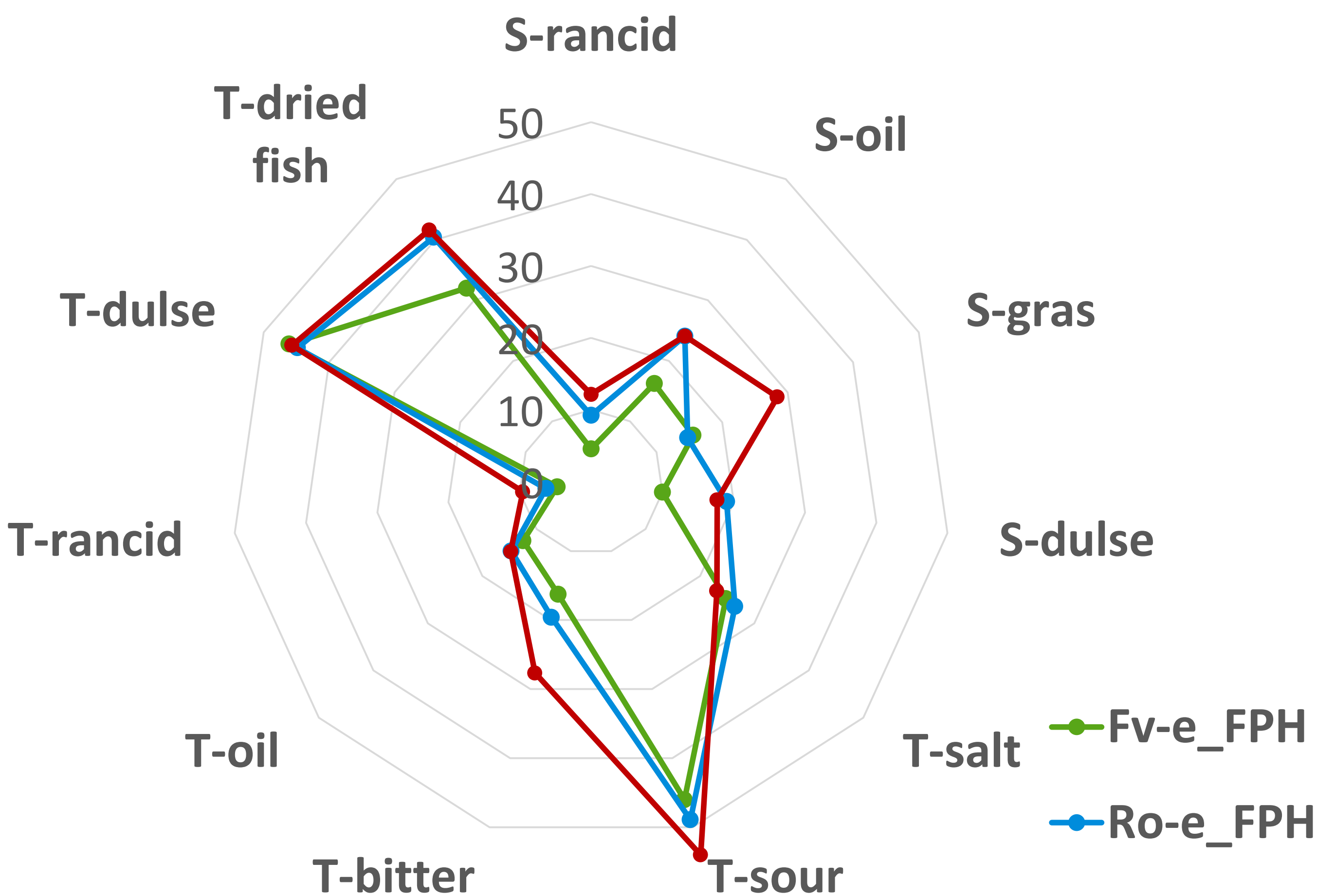
Sample	Name	Degree of hydrolysis (%)
FPH with Ascorbic acid	AA_FPH	18.4
FPH with Seaweed extract	Fv-e_FPH	16.0
FPH with Rosemary extract	Ro-e_FPH	18.4
FPH without antioxidants	Control	18.1

Results – Lipid oxidation

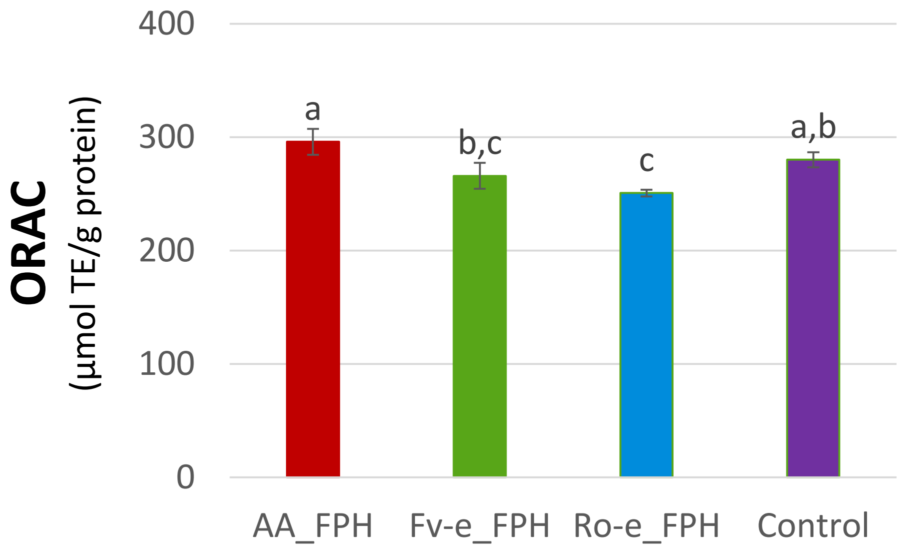


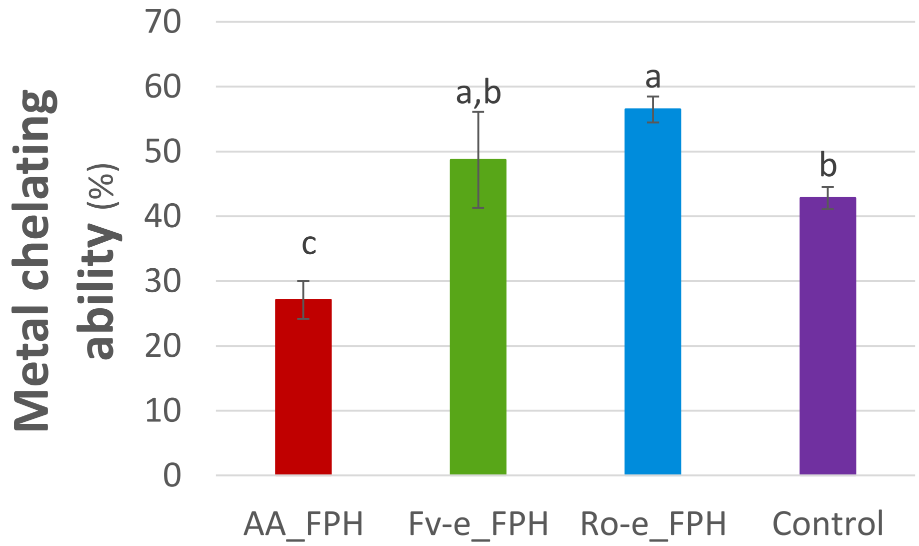


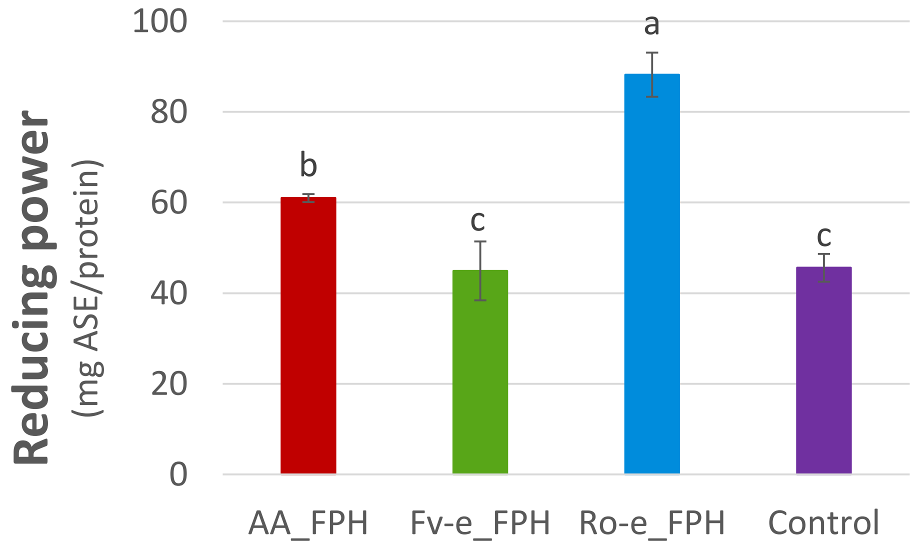
Results – Sensory analysis



Results – Antioxidant activity

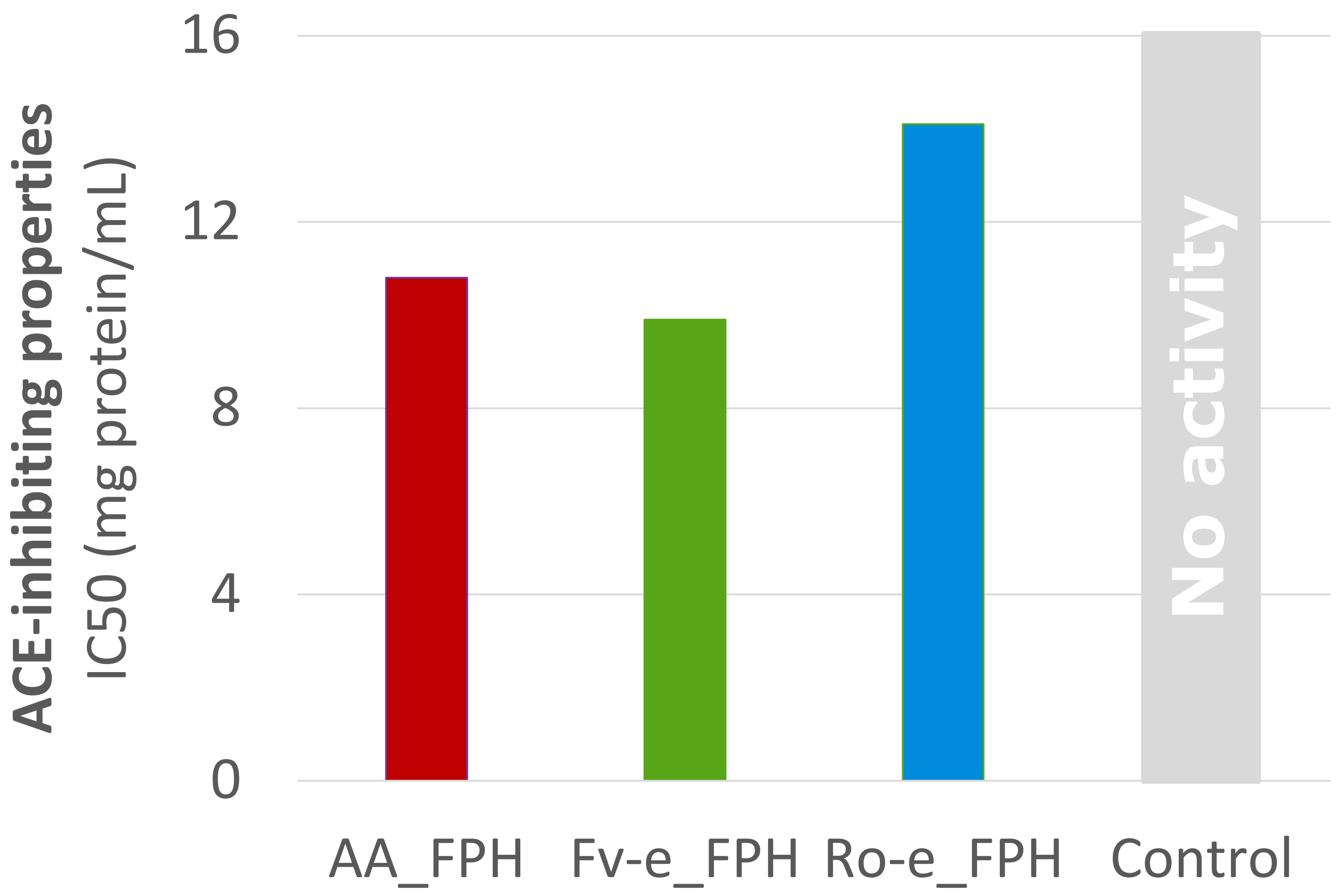






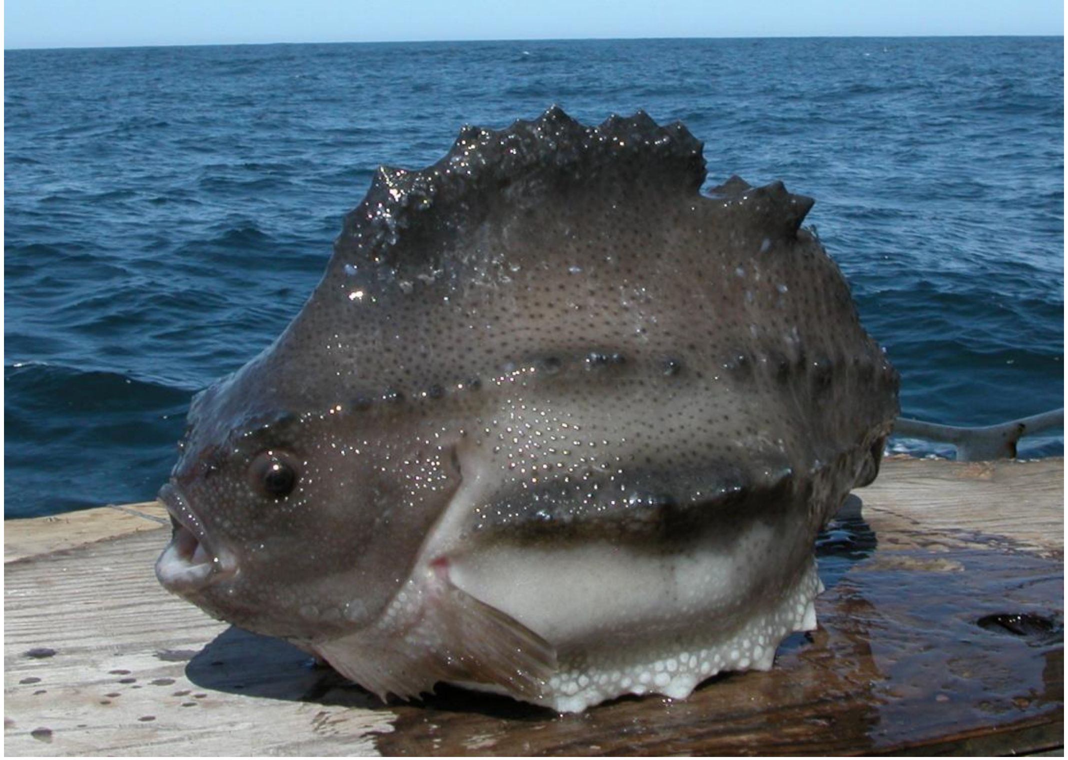
AA_FPH
Fv-e_FPH
Ro-e_FPH
Control

Results – ACE-inhibiting properties



Conclusion

- Seaweed extract and Rosmary extract inhibited oxidation during hydrolysis
- Seaweed extract → best tasting FPH
- Rosemary extract → FPH with strongest antioxidant capacity
- All antioxidants contributed to ACE-inhibiting properties of FPH



References

Frankel, E.N. (2007). *Antioxidants in food and biology: facts and fiction*. Bridgewater: The oily press.

Halldórsdóttir S.M. (2013). *New and improved strategies for producing bioactive fish protein hydrolysates: Oxidative processes and the use of natural antioxidants during enzymatic hydrolysis.* Doctoral thesis. Reykjavík: University of Iceland.

Schwarz, K. (2002). *Phenolic diterpenes from rosemary and sage. In: Functional Foods – Biochemical and Processing Aspects* (edited by J. Shi, G. Mazza & M. le Maguer). New York: CRC Press.

Wang, T., Jónsdóttir, R., Liu, H., Gu, L., Kristinsson, H.G., Raghavan, S. and Ólafsdóttir, G. (2012). Antioxidant capacities of phlorotannins extracted from the brown algae *Fucus vesiculosus. Journal of agricultural and food chemistry, 60,* 5874-5883.

Protein thermal stability and water holding capacity of turbot and herring muscle during thermal treatment

- Providing information for species specific optimization

Izumi Sone, Dagbjørn Skipnes and Bjørn Tore Rotabakk
Nofima, AS

WEFTA 2014
SEAFOOD science for a changing demand
44th WEFTA meeting · 9-11 June 2014 · Bilbao (Spain)

The background of the study

Thermal treatment

EdelPix.com © PerEide

The background of the study

Thermal treatment

Microbial safety

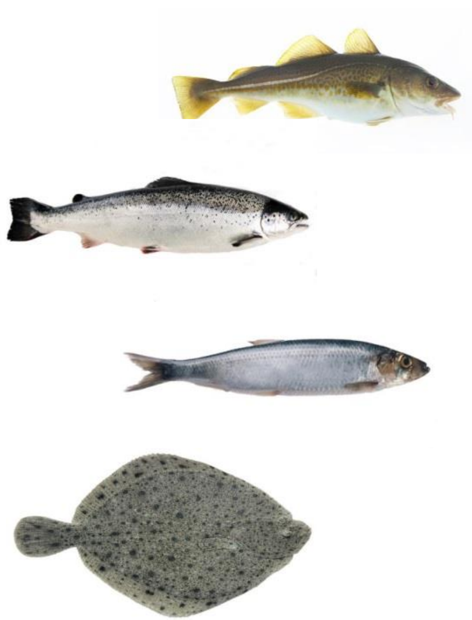
Increased shelf life

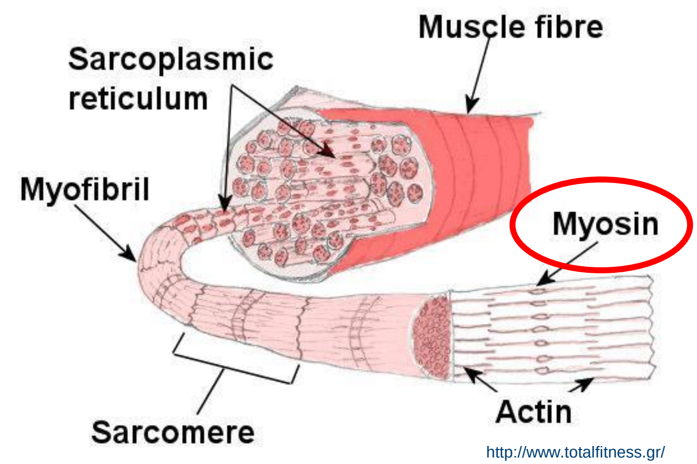
Protein denaturation

Influence water holding capacity (WHC)

- Product quality
- Product weight

The background of the study





http://www.totalfitness.gr/

Thermal treatment

Protein denaturation

Influence water holding capacity (WHC)

- Product quality
- Product weight

The background of the study

- Thermal stability of fish myosin is species dependent.

- The temperature at which the lowest WHC occured was 5 ºC lower for cod than for salmon, corresponding with myosin denaturation (Ofstad *et al*, 1993).

- Pelagic and flat fish?

Foto: © Frank Gregersen / Nofima

Nofima

The objective of the study

- To investigate the effect of thermal treatment on protein denaturation and WHC in turbot and herring muscle.

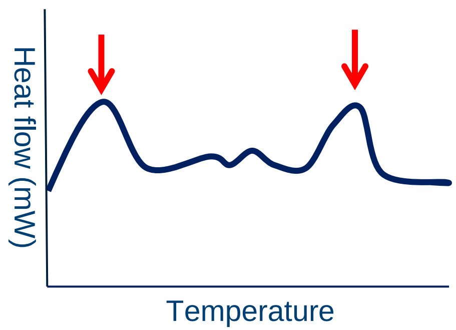
Materials and methods

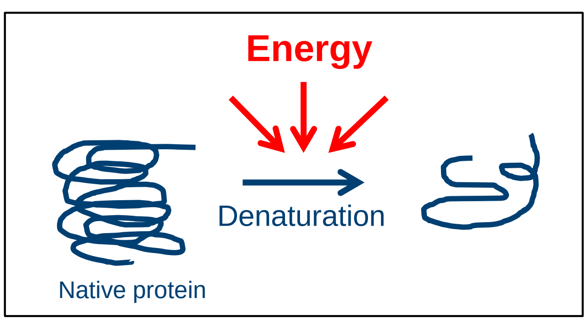
Turbot

Herring

↓

Thermal treatment in water bath
30, 40, 50, 60, 70 and 80 ºC for 10 min.





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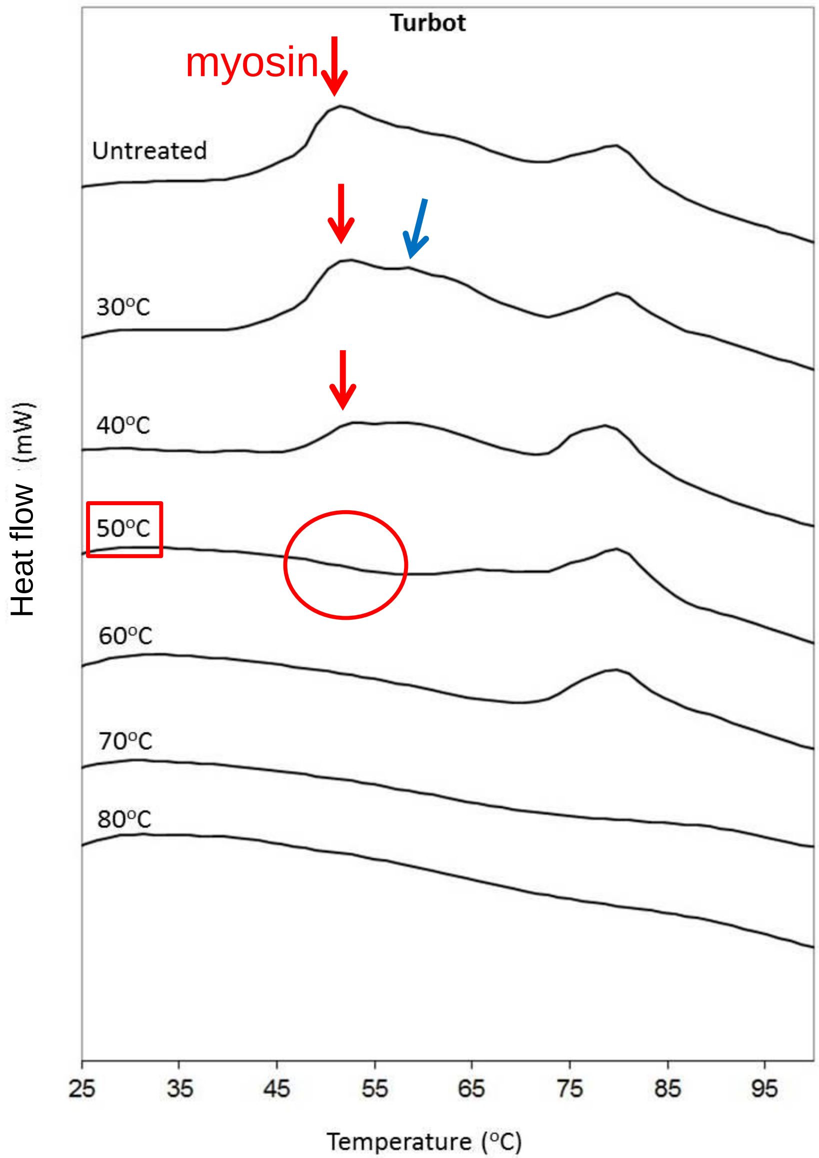
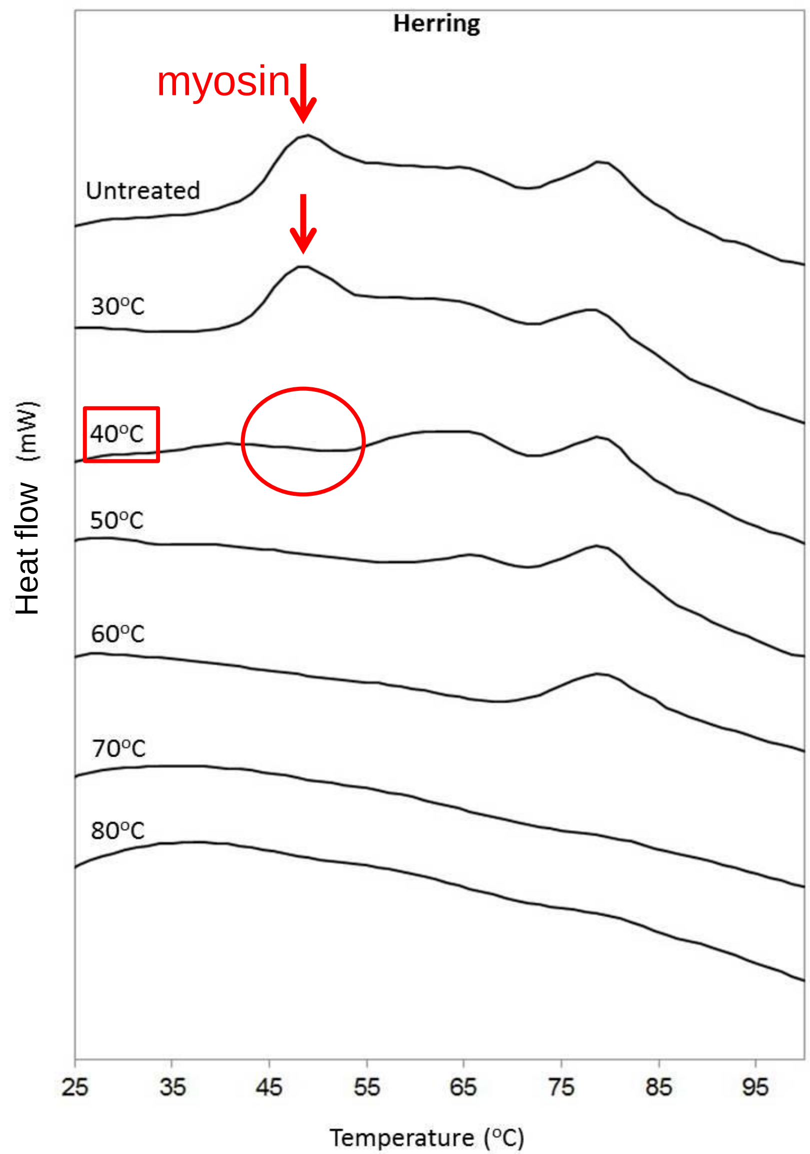
DSC
Thermograms

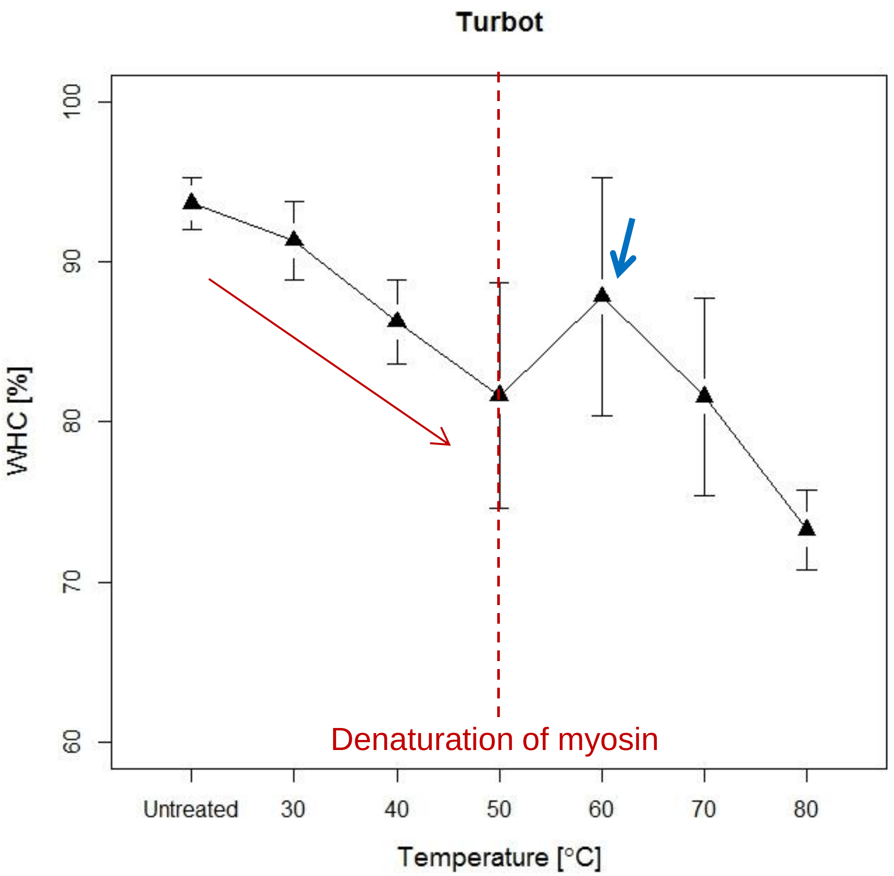
Water holding capacity (WHC)

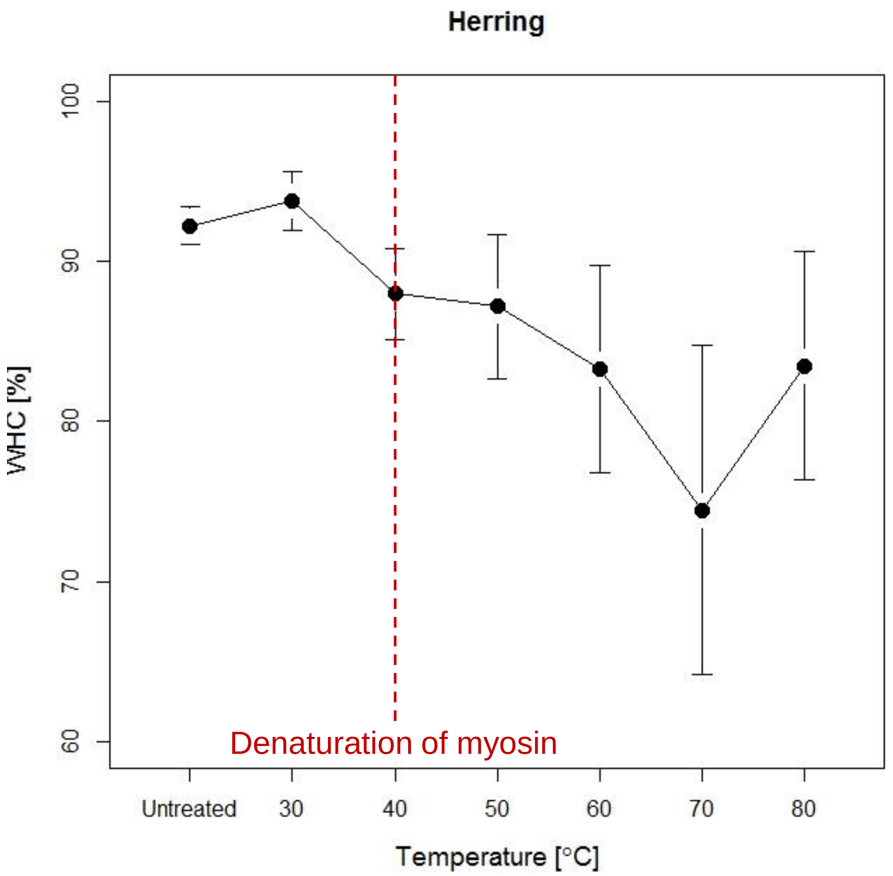
Results – DSC thermograms





Results – Water holding capacity (WHC)





Nofima

Conclusions

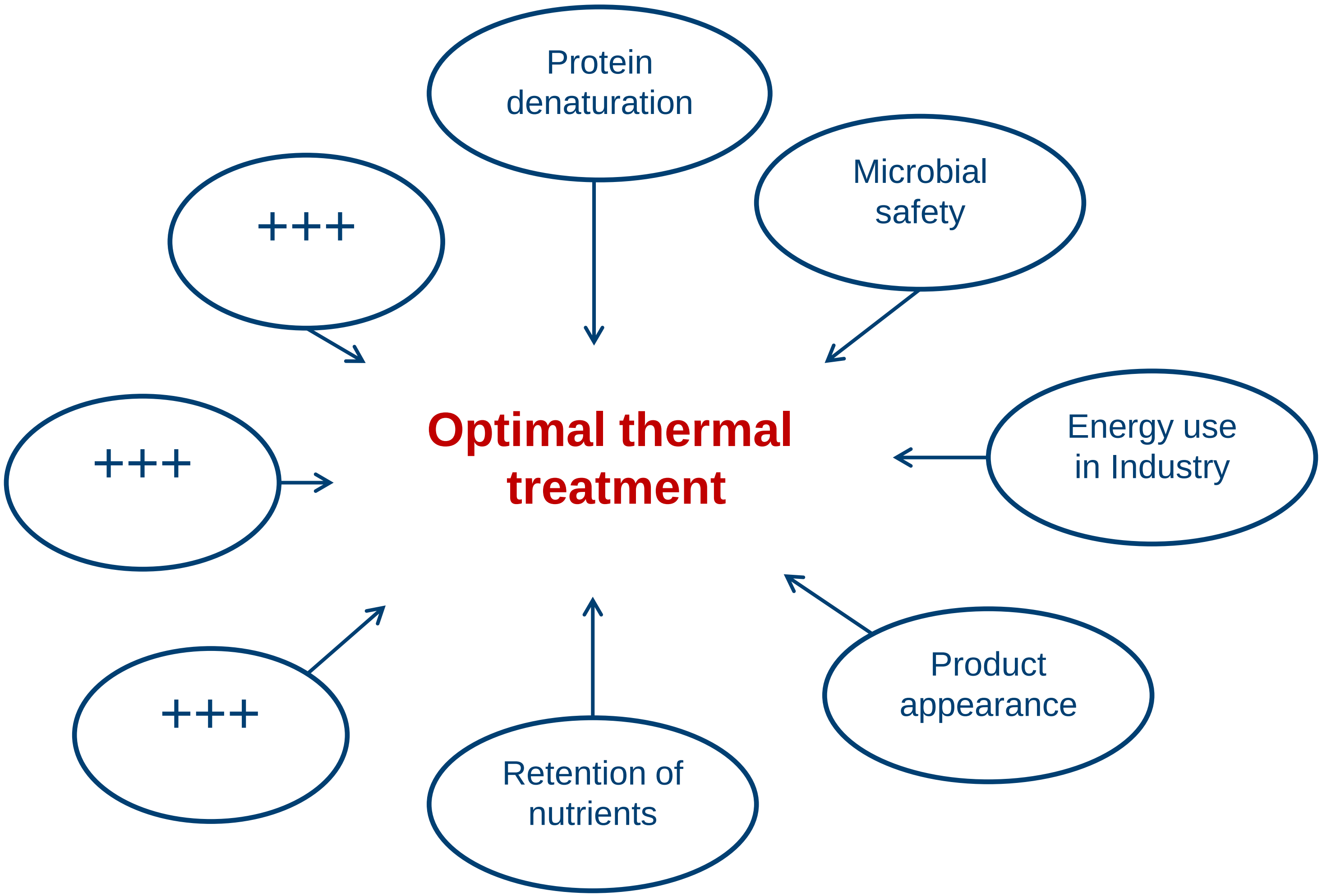
- Complexity and species variations in the effects of thermal treatment on fish proteins and WHC of heat treated turbot and herring.

- Optimal thermal temperature with respect to protein denaturation and WHC:

  Herring below 60 ºC

  Turbot between 60 and 70 ºC

- Providing information for species specific optimization



Thank you for your attention!

MØREFORSKING

Higher share of superior quality salt cured and dried cod (*Gadus Morhua*), when using ice slurry during processing on board long liners.

Ann Helen Hellevik, Trygg Barnung, Kristine Kvangarsnes, Ingebrigt Bjørkevoll og Turid Fylling

WEFTA Bilbao 2014

MØREFORSKING

Content:

- Short about the project

- Results production onboard long liner and further production of salt cured and dried cod

- Summary

MØREFORSKING

Short presentation of the project:

- A cooperate project between industry and fleet
- Financed by
  - Innovation Norway,
  - The Norwegian Seafood Research Fund - FHF
  - Møre and Romsdal County

The overall objective:

- develop methods for bleeding that ensures good quality of cod for use in salt cured and dried cod industry

  - operating systems for the long line
  - temperature regimes in production on board
  - how this affect the quality of manufactured salt cured and dried cod

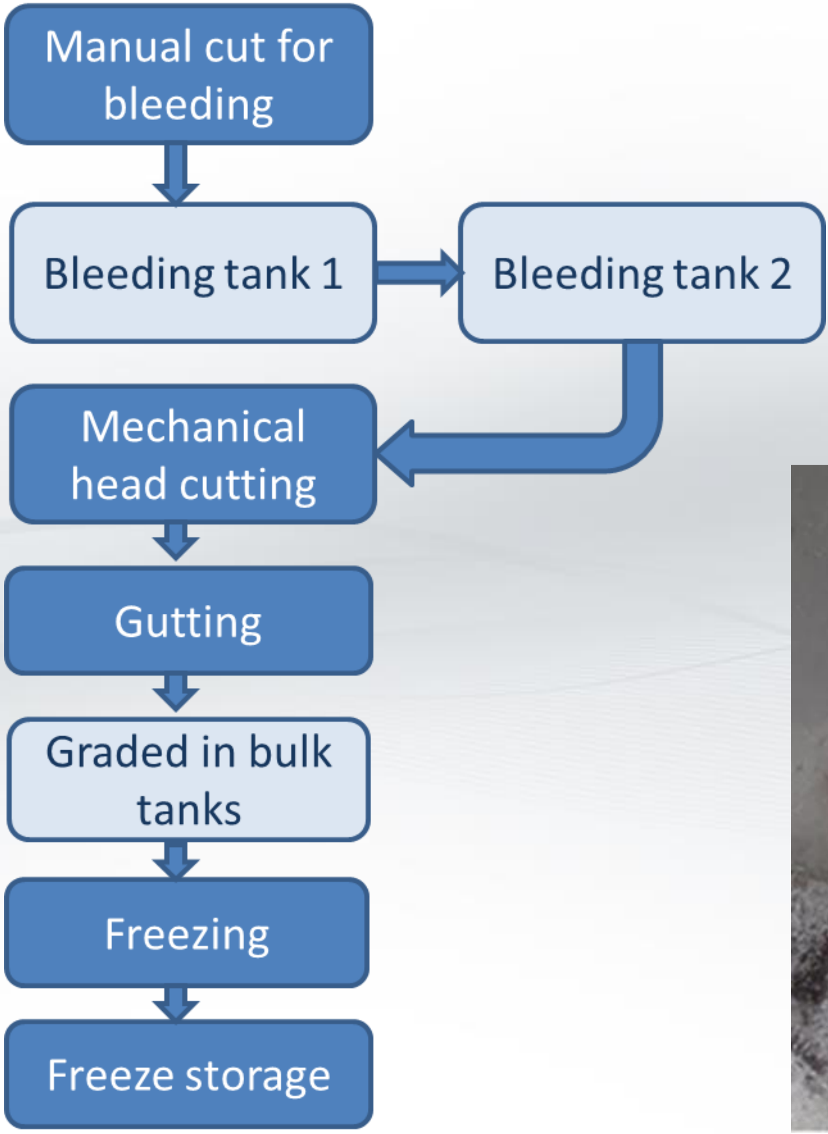


Figure 1: Ice slurry in the production line on board the long liner

Processing onboard

- Raw material: cod 2,5 – 5 kg
- Bleeding time: 30 min
- Measuring temperature in fish and tanks during production
- Series produced:

Series	Type	Description
1	Control	Seawater in bleeding and bulk tanks (normal operation of the long line)
2	Increased water flow	Increased seawater flow in bleeding tanks (otherwise treated as control)
3	Seawater and ice slurry	Seawater in bleeding tank and ice slurry in bulk tank (normal operation of the long line)
4	Ice slurry and ice slurry	Ice slurry in bleeding- and bulk tanks (normal operation of the long line)
5	Change in hauling speed	From 55 hooks/min to 40 hooks/min. Seawater in bleeding and bulk tanks

MØREFORSKING

Overview of temperature conditions

Series	Temp. bleeding tank 1 (°C)	Temp. bleeding tank 2 (°C)	Temp. bulk tank (°C)	Temp. fish going in to bleeding tank (°C)	Temp. fish going in to bulk tank (°C)	Temp. fish before freezing (° C)
Control	5,2	5,2	5,4	2,8	4,3	5,1
Increased water flow	5,6	5,5	5,8	2,0	4,6	5,3
Seawater and ice slurry	5,4	5,4	-0,6	3,7	5,1	1,5
Ice slurry and ice slurry	2,5		-0,7	3,3	3,1	0,3
Change in hauling speed	6,1	6,2	6,4	2,4		6,5

Quantity of fish produced in each series

Series	Survey 1 kg	Survey 2 kg	Total kg
Control	1824	3120	4944
Increased water flow		5520	5520
Seawater and ice slurry	1872	3456	5328
Ice slurry and ice slurry	2496	3360	5856
Change in hauling speed		1032	1032

Production of salt cured and dried cod

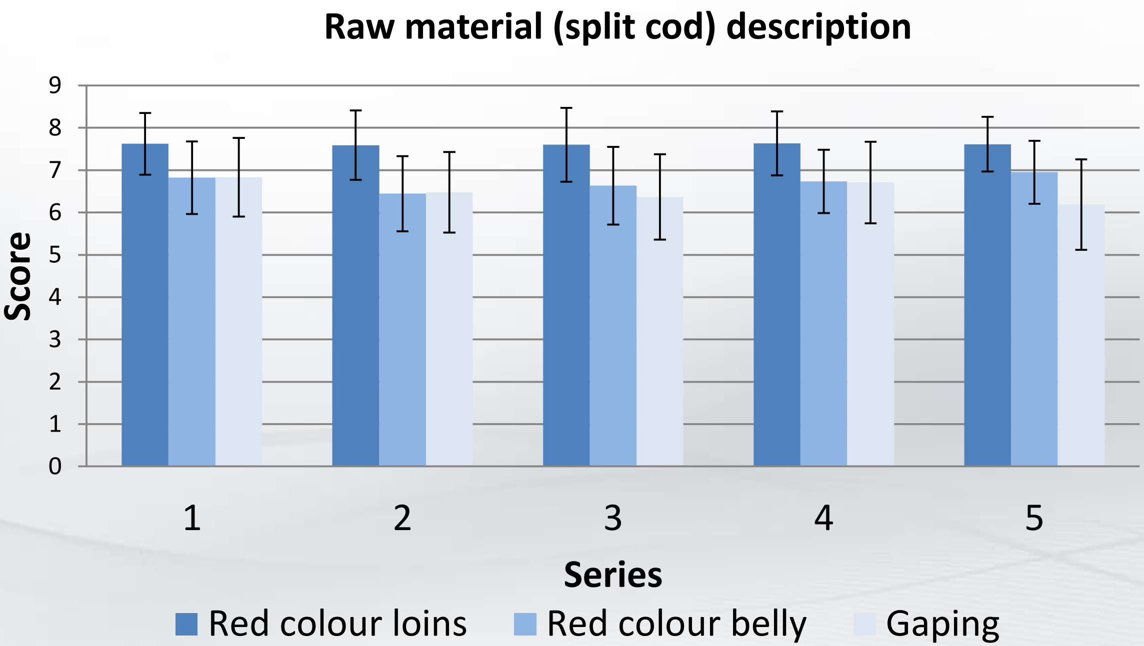
- Cod cold stored for 3 months
- Thawed approx. 18 hours at approx. 0 – 0,5 °C
- Pickle salted 14 days at 7,9 – 9,7 °C
- Matured for 14 days at 1,2 – 2,2 °C
- Dried for 3 days at 22 °C
- Stored at approx. 2 °C for 3 months

MØREFORSKING

Several measures were done:

- Instrumental texture measurement
- Procedure for sensory evaluation
- Instrumental colour measurement
- Yield
- pH
- Temperature
- Sorted in superior and universal groups by qualified workers
- A smaller rehydration and shelf-life study was conducted
- Water and salt content in loin.

MØREFORSKING



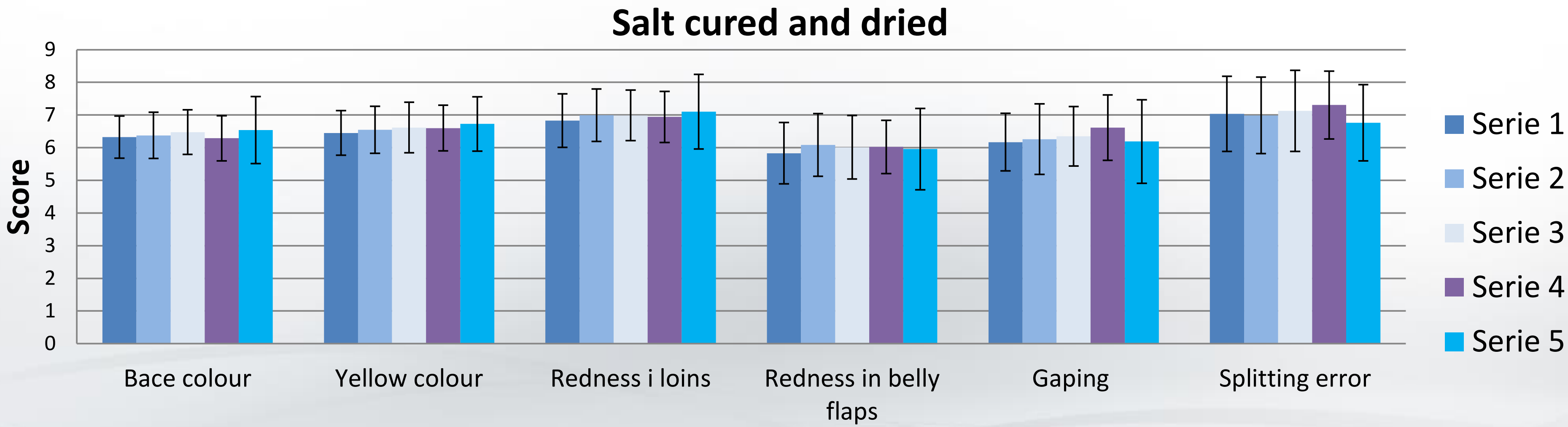
SPSS: one-way anova

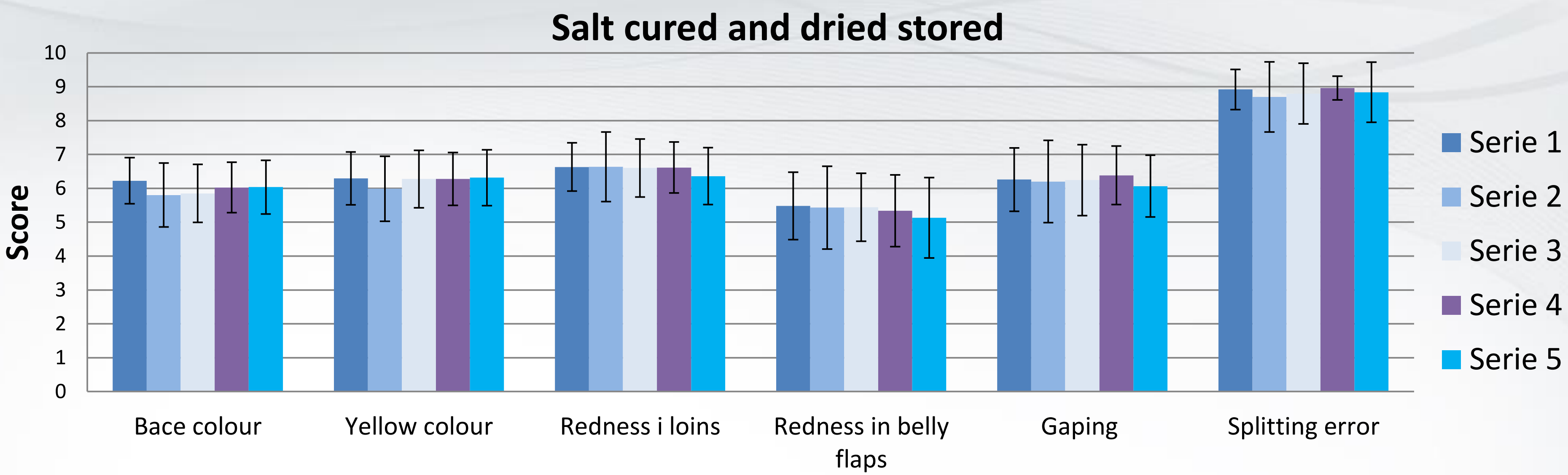
Series	pH	Temperature (°C)	Weight (gram)
1 (n=45)	6,86	0,2	3076
2 (n=45)	6,74	1,4	3142
3 (n=45)	6,98	0,5	3044
4 (n=45)	7,02	1,6	2908
5 (n=40)	6,88	7,5	3187

Series 1: Control. Series 2: Increased water flow. Series 3: Seawater and ice slurry. Series 4: Ice slurry and ice slurry. Series 5: Change in hauling speed

MØREFORSKING

Sensory assessments

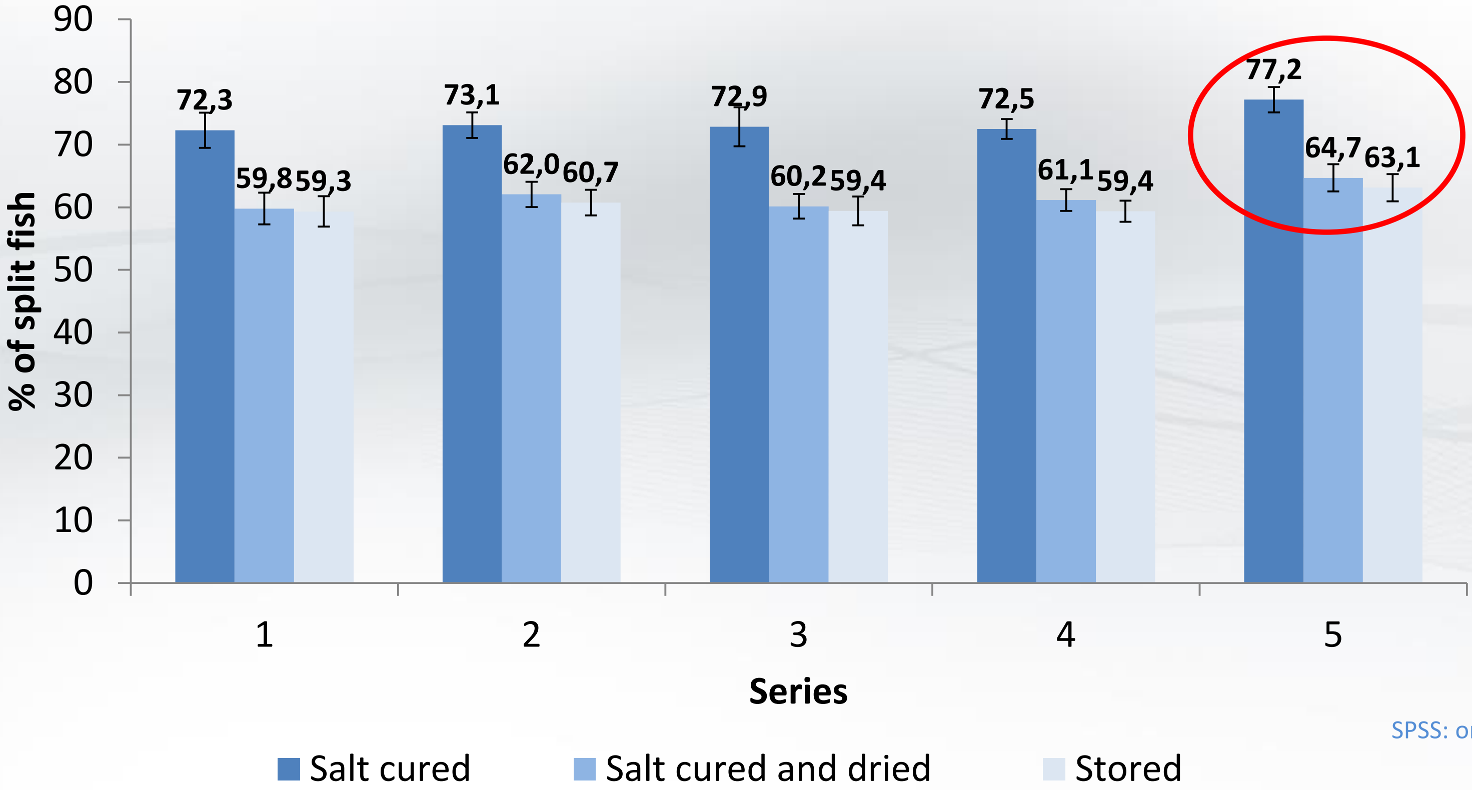




Series 1: Control. Series 2: Increased water flow. Series 3: Seawater and ice slurry. Series 4: Ice slurry and ice slurry. Series 5: Change in hauling speed

MØREFORSKING

Yield



SPSS: one-way anova

Series 1: Control. Series 2: Increased water flow. Series 3: Seawater and ice slurry. Series 4: Ice slurry and ice slurry. Series 5: Change in hauling speed

MØREFORSKING

Commercial sorting

	Salt cured and dried cod				
	Control	Increased water flow	Seawater and ice slurry	Ice slurry and ice slurry	Change in hauling speed
Share of Superior (%)	91	93	88	93	88
Share of Universal (%)	9	7	12	7	12
Blood errors (%)	75	66	76	78	74
Gaping/tearing (%)	25	34	24	22	26

Summary

- Greater share of superior quality using ice slurry in bleeding and bulk tanks
- Lower share of blood error using higher water flow in bleeding tank

- Positive effects from lowering temperatures
- Higher yield when thawing fish in higher seawater temperature?


Thank you for listening
annhelen@mfaa.no

WEFTA 2014

SEAFOOD science for a changing demand

44th WEFTA meeting · 9-11 June 2014 · Bilbao (Spain)

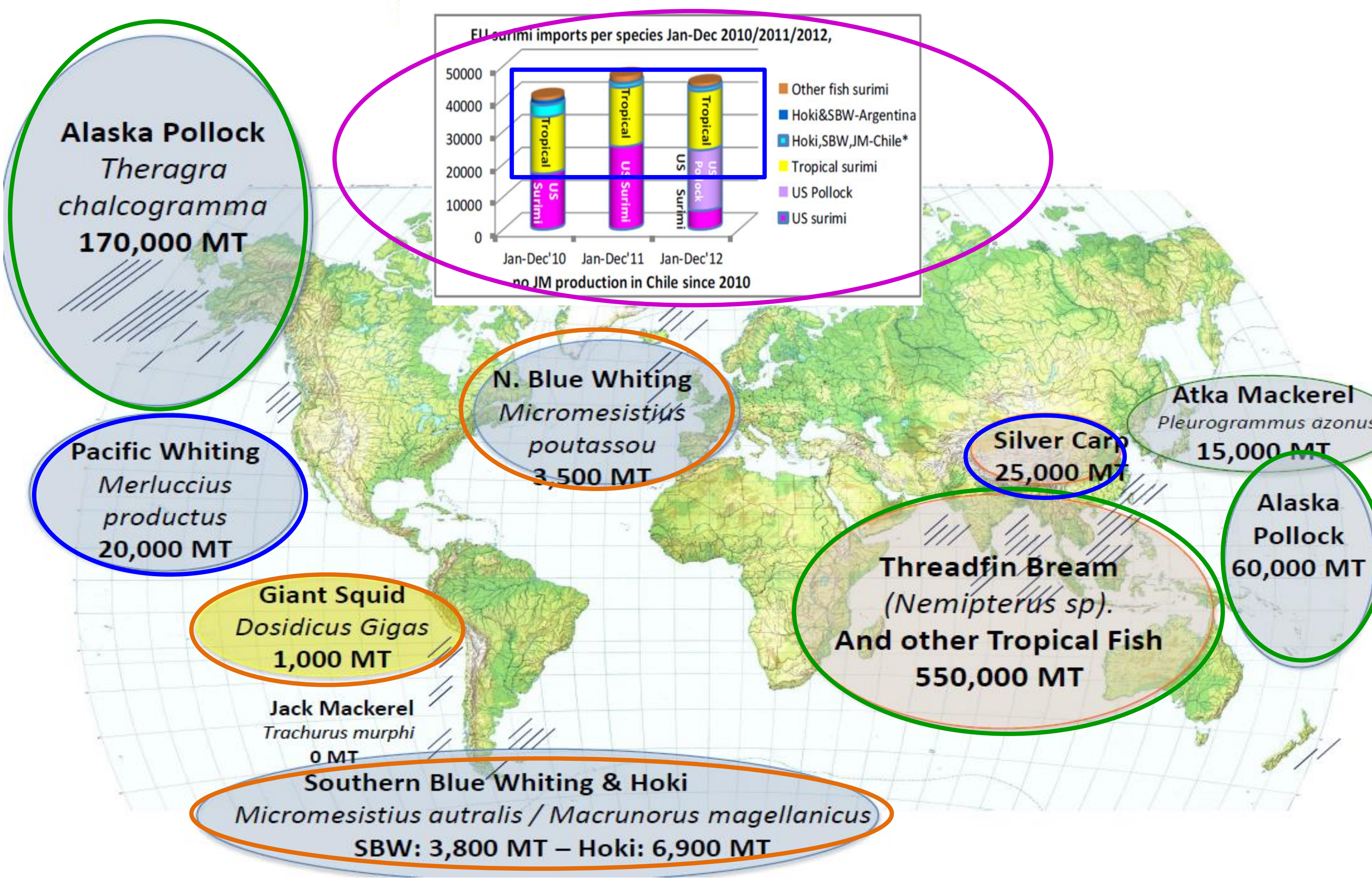
Elaboration of gels by using frozen pressurized Flying fish surimi.

Helena M. Moreno[1], Beatriz Herranz[1], Deysi Cando[1], Clara A. Tovar[2] and Javier Borderias[1].

[1]Department of Products, Institute of Food Science, Technology and Nutrition (CSIC), Madrid, Spain.
&
[2]Department of Applied Physics, Faculty of Science, University of Vigo, Ourense, Spain.

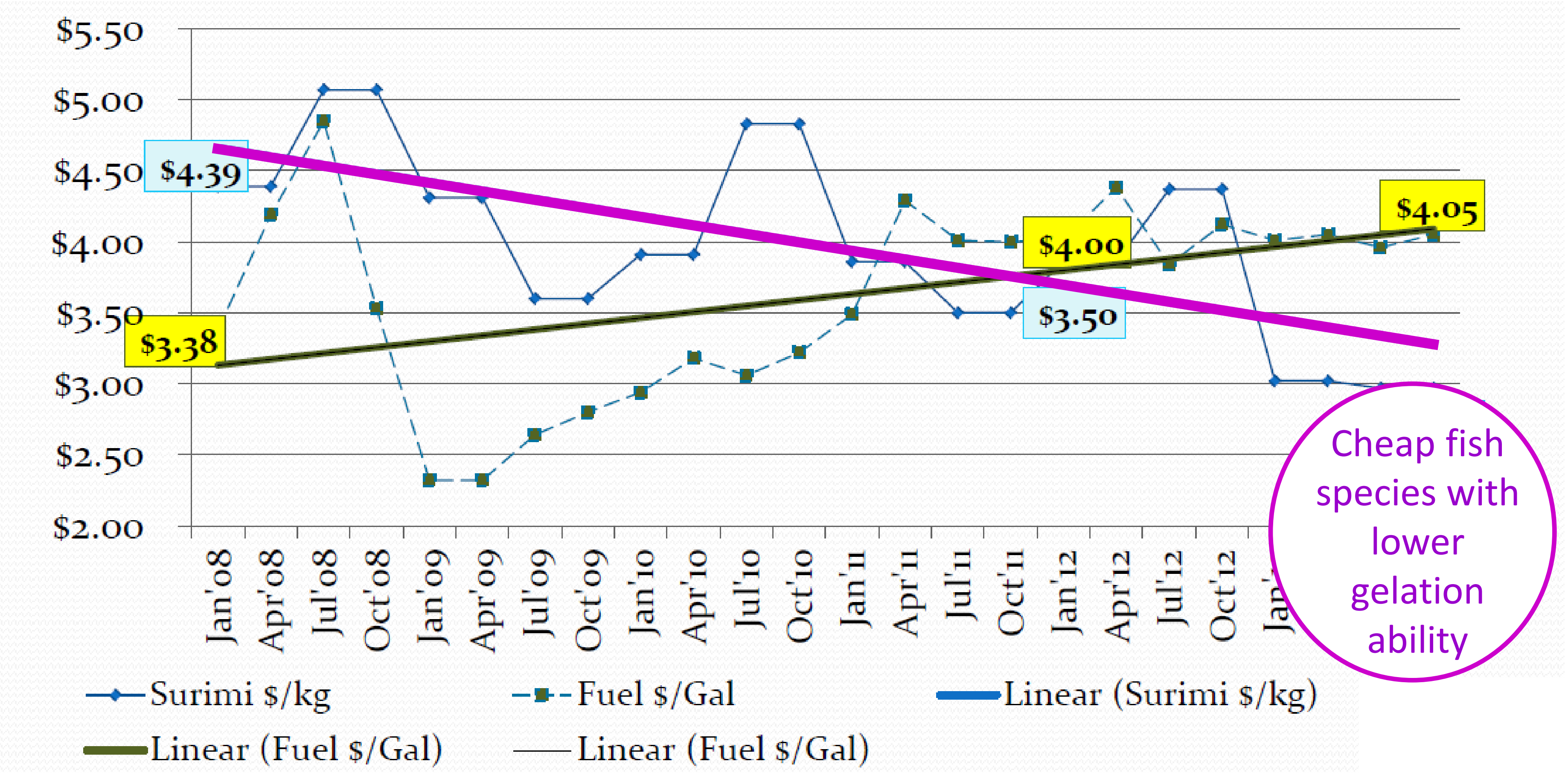
Introduction

✓ Surimi industry: species, quality



Introduction

✓ Surimi industry: price (Evolution 2008-2013)



Introduction

✓ **Improvement of low quality surimi gelation ability**

- Setting process: Calcium salts

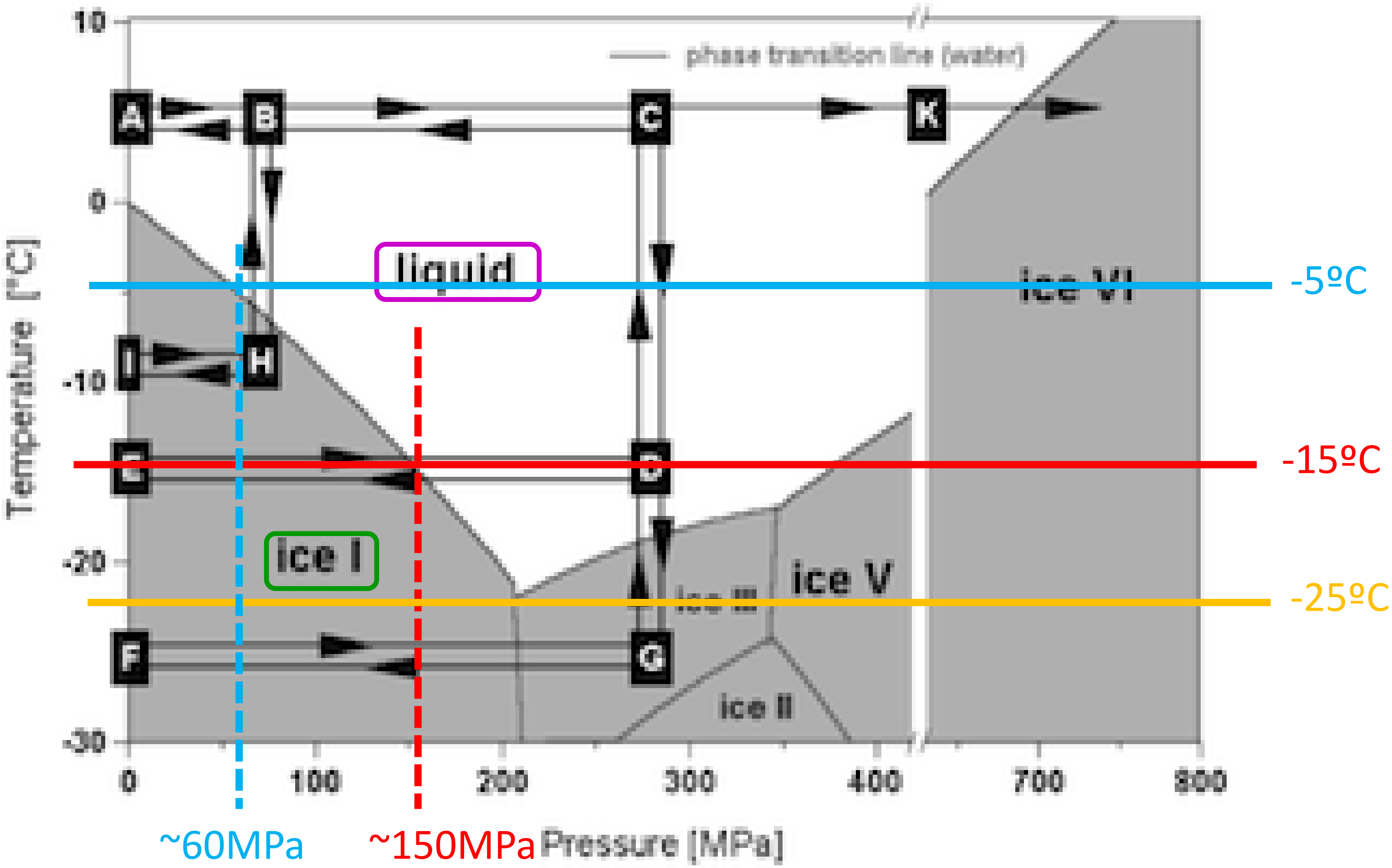
- Addition of different ingredients: Chemicals and enzimes

- Application of Hydrostatic high pressure (HHP)
  - During gels surimi processing
  - To frozen surimi →

To be sold as presurized surimi raw material

Introduction

✓ Pressurization at -15ºC



✓ Improvement of low quality surimi gelation ability??

Objective

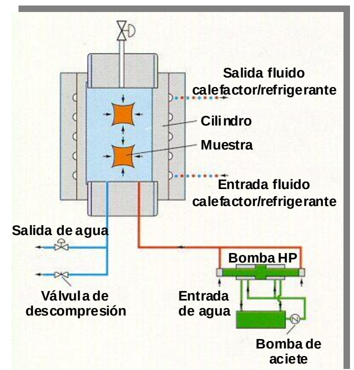
✓ The aim of this study was to determine whether the HHP treatment (0, 80 and 200MPa) applied to frozen flying fish surimi improves subsequent protein gelation on both suwari (5ºC/24h) and definitive gels (40ºC/30min + 90ºC/30min) .

Materials & Methods

I.- INITIAL FROZEN SURIMI TREATMENTS

Flying fish surimi FFS (-15ºC)

1.-High pressure treatments (HHP)



- 0MPa /10min /-15ºC
- 80MPa /10min /-15ºC
- 200MPa /10min /-15ºC

2.- Treated raw material to elaborate the surimi gels

- 0 FFS
- 80 FFS
- 200 FFS

Frozen Storage (-15ºC/1mes)

Three different raw materials

II.- SURIMI GELS

HHP treated surimi
+
2% NaCl
+
Moisture adjustment 80%

Setting at 5ºC/24 hours

Setting 40ºC/30min + Heating 90ºC/30 min

Suwari gels (S)

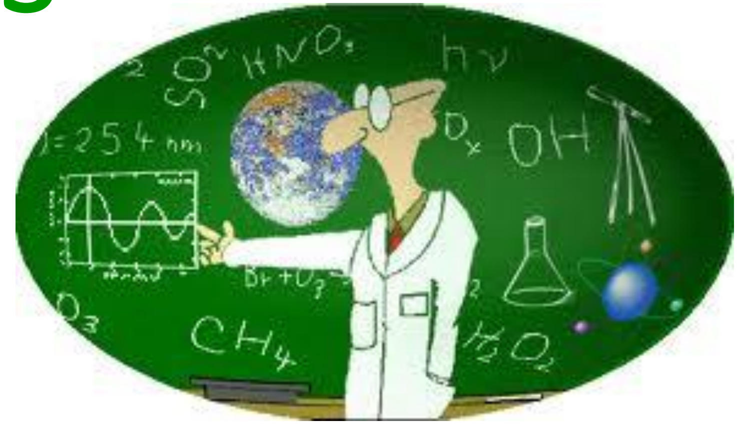
Definitive Gels (G)

Samples*	Frozen FFS Pressure treatments (MPa)	Gels treatment (°C)
0S 0G	0	5°C/24hours 40°C/30min+90°C/30min
80S 80G	80	5°C/24hours 40°C/30min+90°C/30min
200S 200G	200	5°C/24hours 40°C/30min+90°C/30min

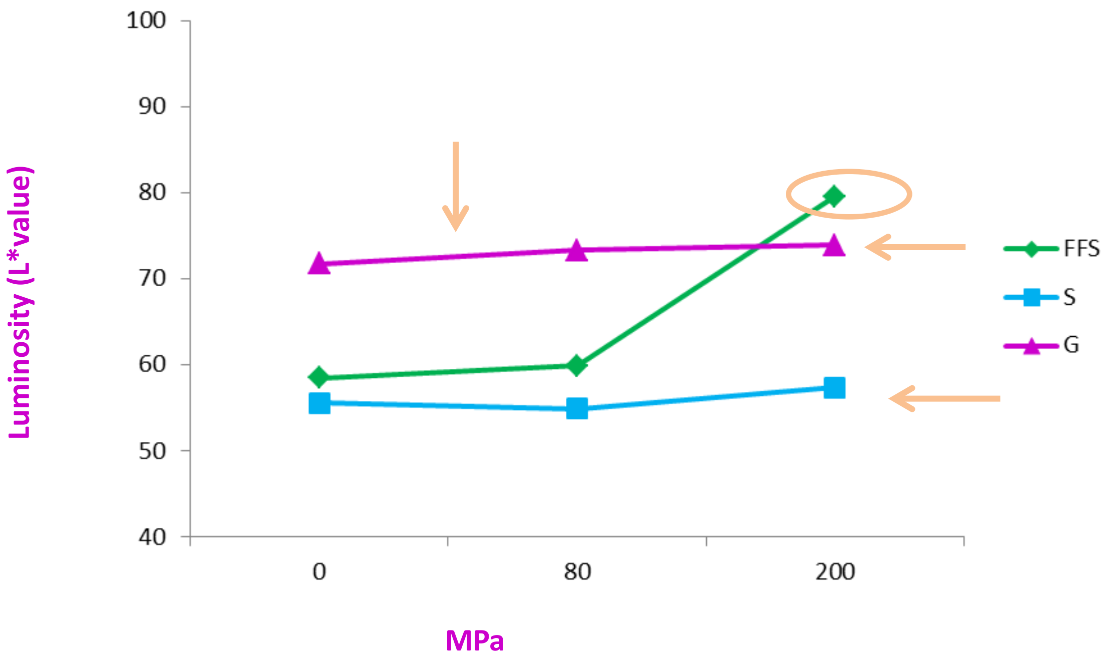
III.- M&M: Samples determinations

Samples		
HP treated raw material	0 FFS 80 FFS 200 FFS	Luminosity (L* value) Fourier transform infrared spectroscopy (FTIR)
Surimi gels	0S 0G 80S 80G 200S 200G	Luminosity (L* value) Pucture test: Breaking force and breaking deformation Fourier transform infrared spectroscopy (FTIR) Dynamic mechanical thermal analysis (DMTA): Changes of storage modulus (G') with increasing temperature (from 15 to 85°C) in suwari gels.

Results



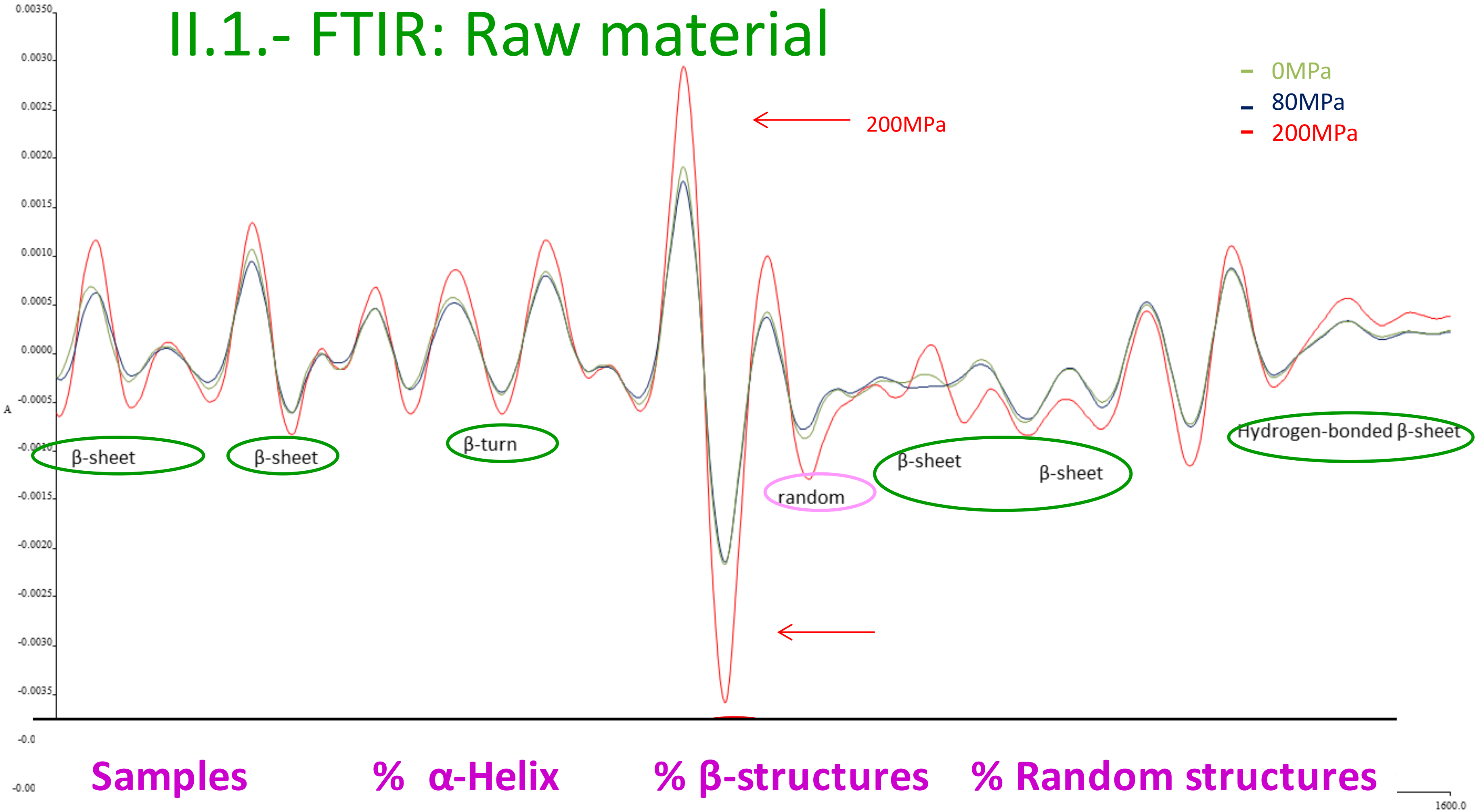
I.- Effect of over color



- Luminosity of surimi only increased at 200 MPa.
- The effect of pressure processing is not observed in the surimi gels.
- G gels exhibited higher luminosity.

II.- Effect over protein structure

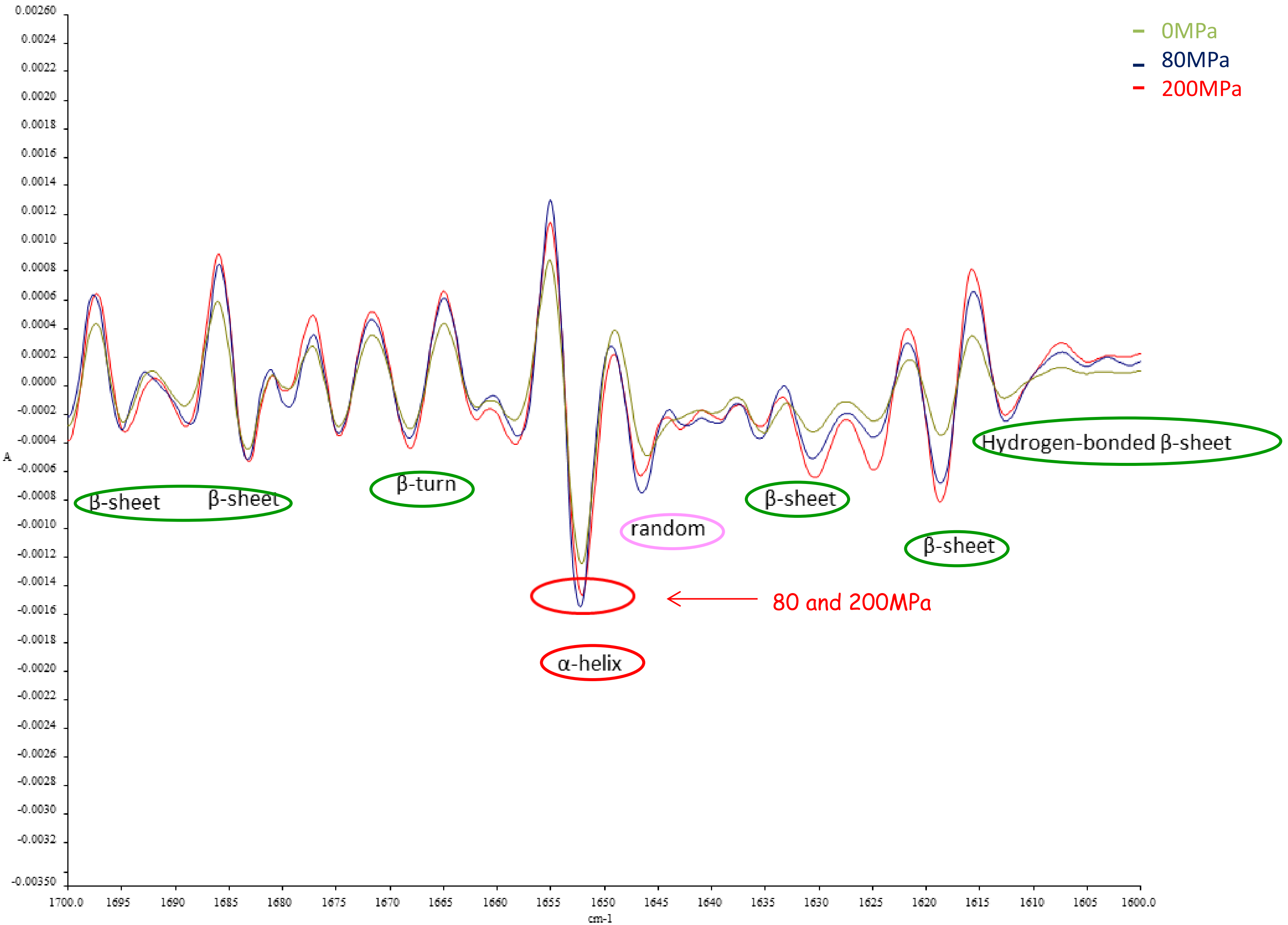
II.1.- FTIR: Raw material



Samples	% α-Helix	% β-structures	% Random structures
0 FFS	21.93±0.22	66.01±0.71	12.07±0.11
80 FFS	28.78±0.28	57.68±0.58	13.53±0.12
200 FFS	25.88±0.26	64.61±0.34	9.71±0.08

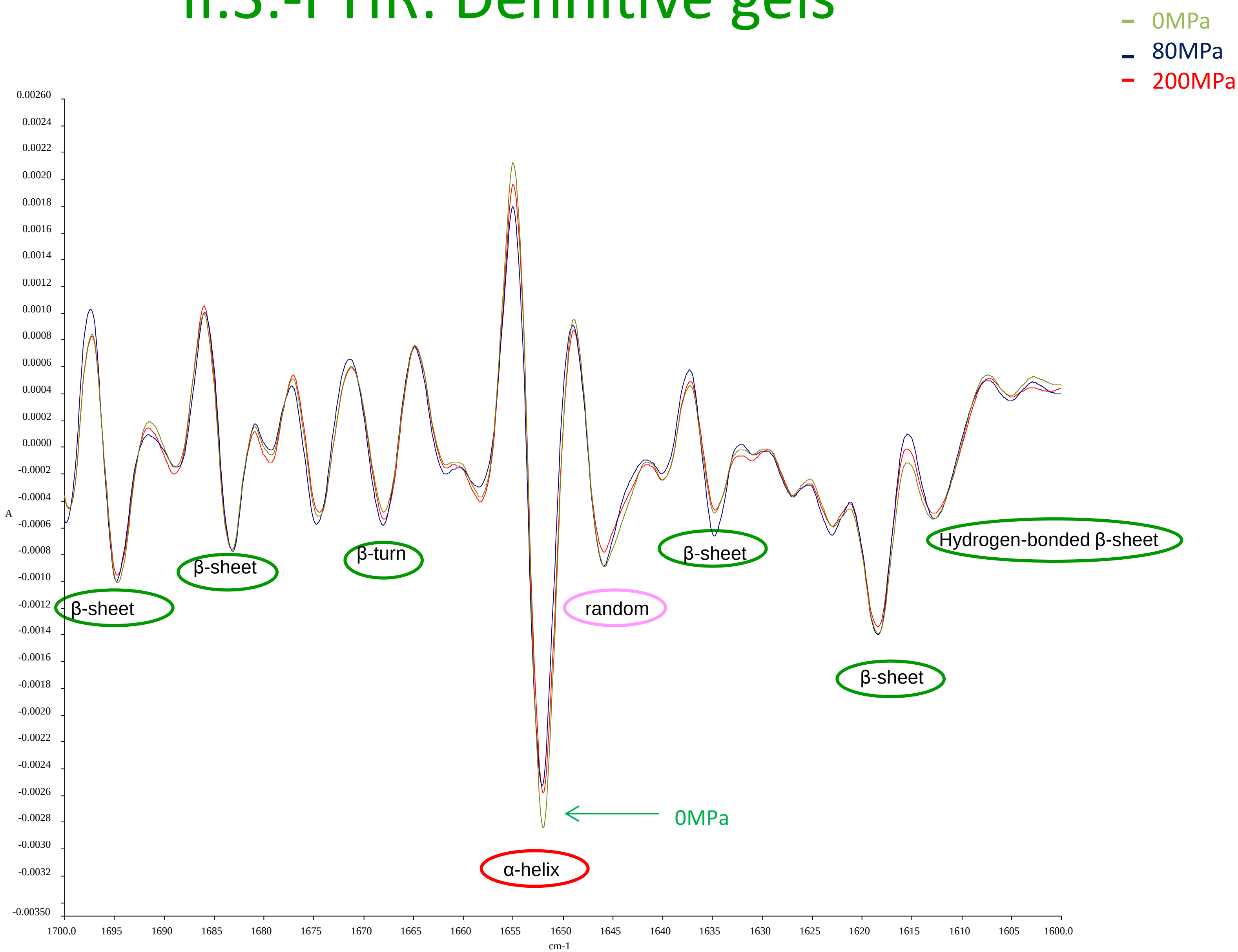
II.- Effect over protein structure

II.2.-FTIR: Suwari gels



II.- Effect over protein structure

II.3.-FTIR: Definitive gels



II.- Effect over protein structure

II.4.- Cuantification of secondary structures

Samples	% α-Helix	% β-structures	% Random structures
0 FFS	21.93±0.22a	66.01±0.71a	12.07±0.11a
80 FFS	28.78±0.28b	57.68±0.58b	13.53±0.12b
200 FFS	25.88±0.26c	64.61±0.34c	9.71±0.08c
0S	34.73±0.35a1	53.22±0.59a1	12.04±0.11a1
80S	37.13±0.37b1	49.98±0.50b1	12.88±0.02a1
200S	47.99±0.48c1	43.14±0.43c1	8.86±0.01b1
0G	18.85±0.19a2	71.31±0.72a2	9.19±0.01a2
80G	36.78±0.37b1	43.07±0.43b2	19.78±0.03b2
200G	19.61±0.21a2	62.38±0.62c2	18.01±0.05b2

- ✓ In raw material (FFS) HP processing increased α-helix.
- ✓ At 200MPa the presence of random structres is reduced.
- ✓ In suwari samples there was an increased proportion in α-helix and a decrease in β-sheets as compared to FFS.
- ✓ In Definitive gels there was a decreasement in α-helix and an increasemenet in β-sheets and random structures as compre to suwari samples.

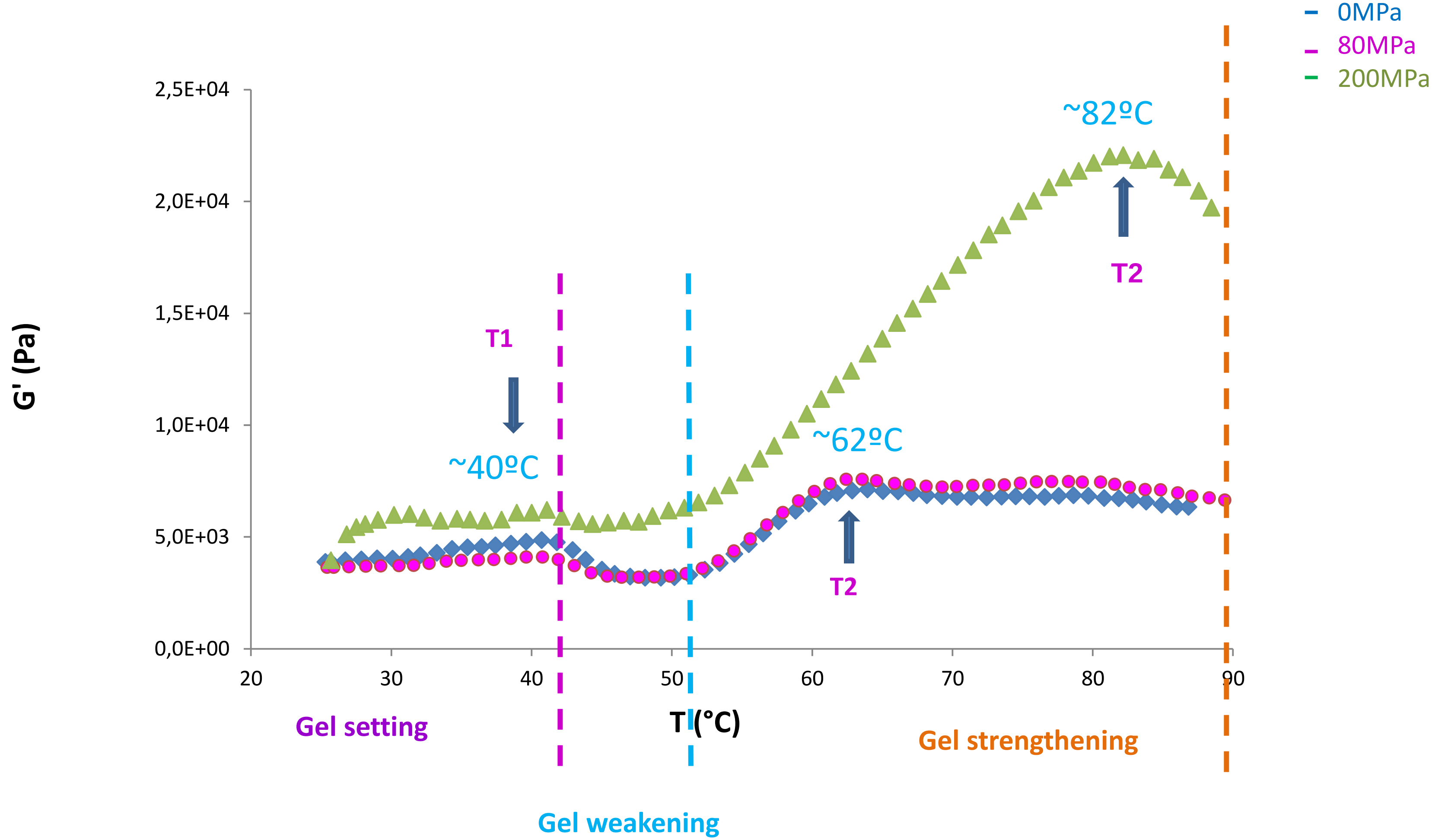
III.- Effect over Mechanical properties

Samples	Breaking Force (N)	Breaking Deformation (mm)
	Suwari gels (S)	
0S	0.170±0.007a1	7.79±0.64a1
80S	0.295±0.030bc1	7.71±0.58a1
200S	0.313±0.052bc1	9.6±1.2b1
	Definitive gels (G)	
0G	2.21±0.30a2	10.7±1.1a2
80G	4.36±0.35b2	14.34±0.78b2
200G	3.59±0.77b2	12.7±1.8ab2

- ✓ In Suwari and Definitive gels the previous treatment of the surimi raw material increased breaking force.
- ✓ In both groups of samples, S and D, breaking deformation increased or keep even due to a better conformational flexibility.

IV.- HHP effect over Reological properties (DMTA)

Heat-induced gelation profiles of suwari gels



✓ 200FFS gave as result a gel with a stronger and more stable protein network than 0FFS and 80FFS.

Conclusions

- ✓ Conformational changes in proteins induced by high pressure processing on frozen FFS (80 and 200MPa), resulted into protein structural benefit improving the structural, mechanical and rheological properties of suwari gels (S) especially at 200MPa.

- ✓ 200MPa was the most appropriate pressure to be applied on frozen FFS because it forms stronger and more stable gels.

THANKS!!

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Effect of electromagnetic field assisted freezing on yield, colour and textural properties of Albacore tuna

Eduardo Puértolas, Ph.D.

azti tecnalia
Transforming science into business

Unión Europea
Fondo Europeo de Pesca (FEP)
Invertimos en la pesca sostenible

EUSKO JAURLARITZA
GOBIERNO VASCO
EKONOMIAREN GARAPEN ETA LEHIAKORTASUN SAILA
DEPARTAMENTO DE DESARROLLO ECONÓMICO Y COMPETITIVIDAD

Work financed by EU and Basque Government (European Fisheries Fund)

INTRODUCTION

Conventional freezing

Decrease of temperature

Decrease of water activity (a_w)

Slow down chemical, enzymatic and microbial reactions

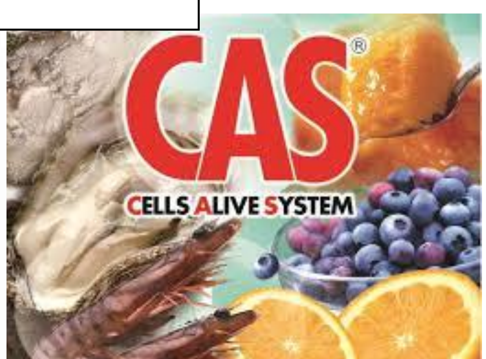
Preserve fish

Increase shelf life (frozen storage)

INTRODUCTION

Magnetic field assisted freezing (CAS: Cell Alive System)

ABI Co.,Ltd.



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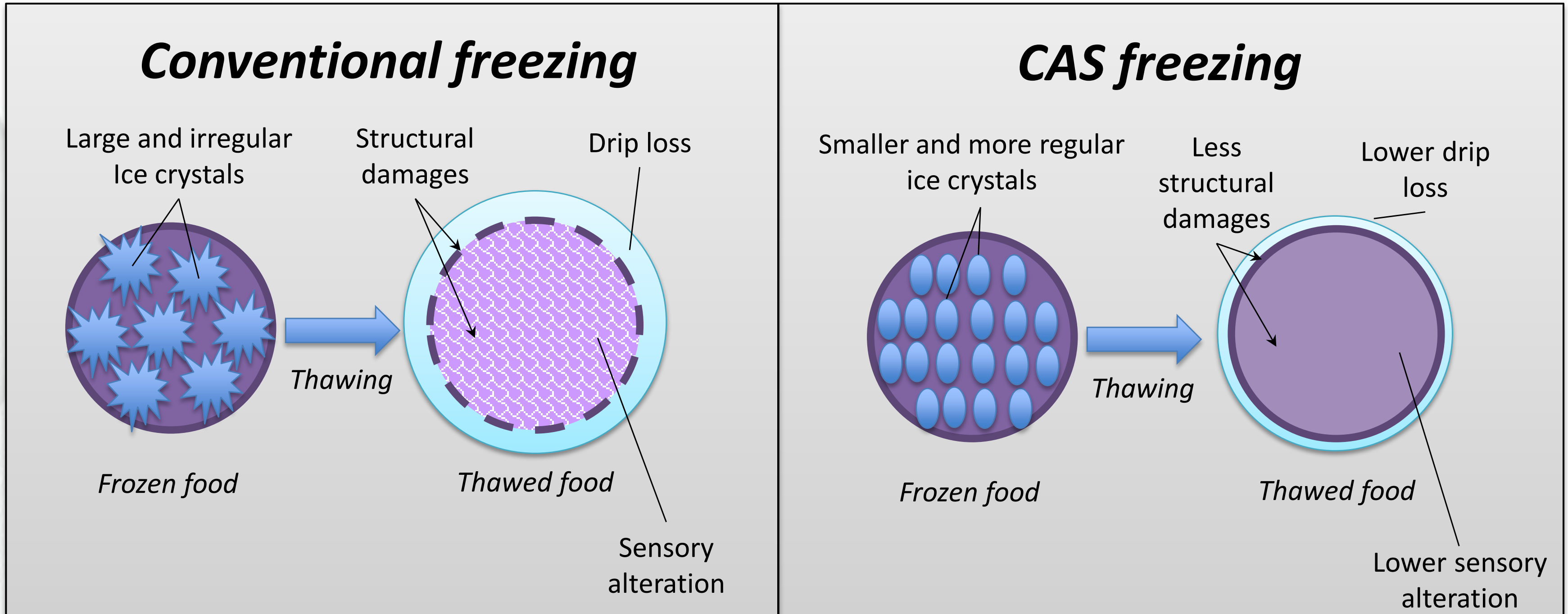
(54) **METHOD AND APPARATUS FOR QUICK FREEZING**

Patented process (Owada & Kurita, 2001)

INTRODUCTION



Conventional freezing	CAS freezing
Sensory properties alteration	**Lower sensory alteration**
Drip losses	**Lower drip losses**
Low economic return	**Higher economic return**

Owada & Kurita, 2001

OBJECTIVE

To study the impact of magnetic field assisted freezing (CAS technology) on yield, colour and textural properties of Albacore tuna

MATERIAL & METHODS

Bermeo fishing harbour
Albacore tuna (4-5kg)

AZTI-Tecnalia pilot plant
Steaks (180-190 g)

CAS pilot unit

CAS *Freezing conditions* **Magnetic field: 0.55 mT** -50ºC; 1m/s
Control *Freezing conditions* -50ºC; 1m/s

Packaging
Vacuum (100 mbar)

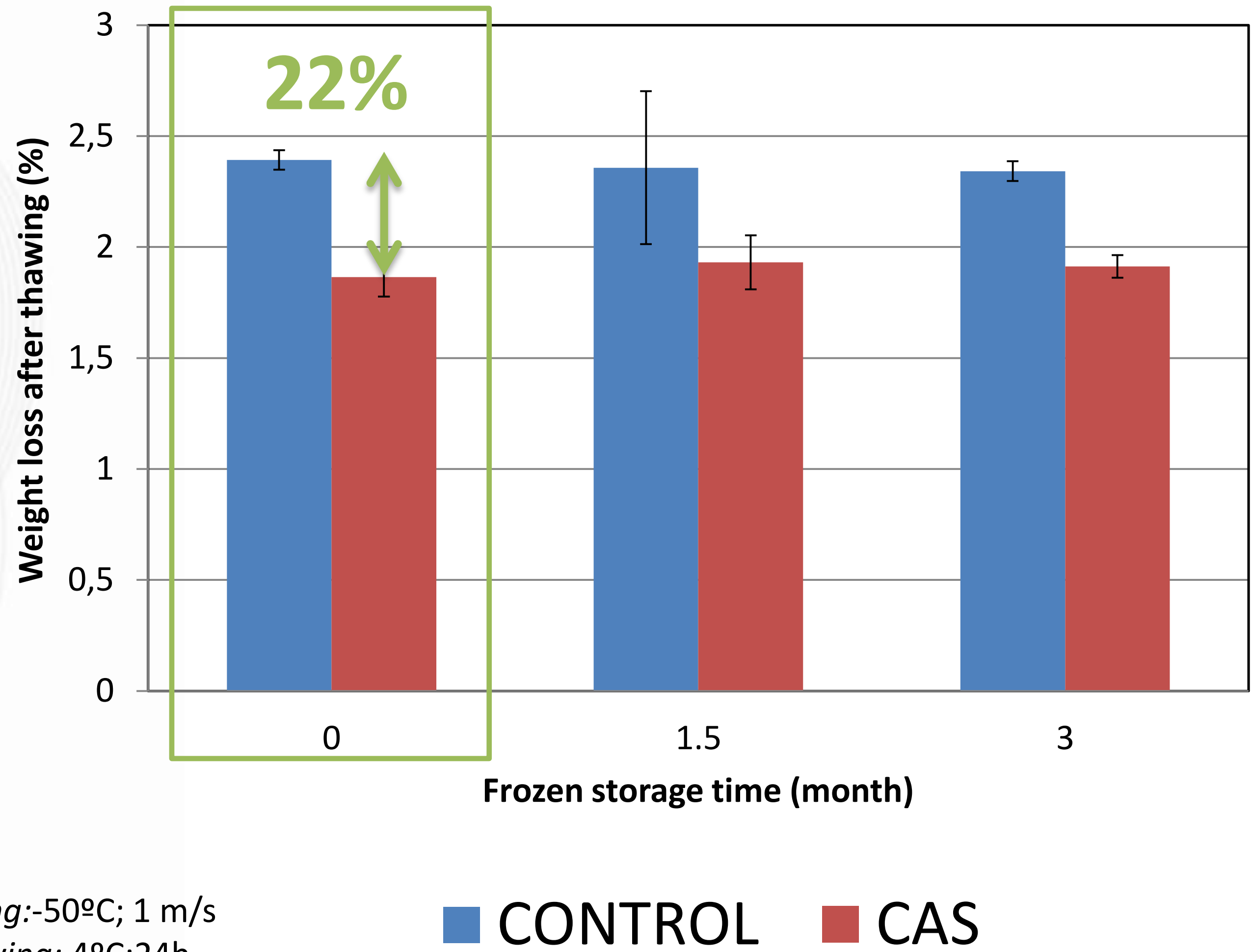
Frozen storage
Temperature: -20ºC
0,1.5 and 3 months

Thawing
4ºC; 24h

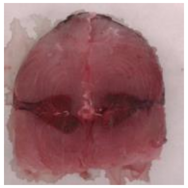
Analysys
Yield (weight loss) ; Colour (CIELab); Texture (TPA)

RESULTS

Freezing Yield (weight/drip loss)



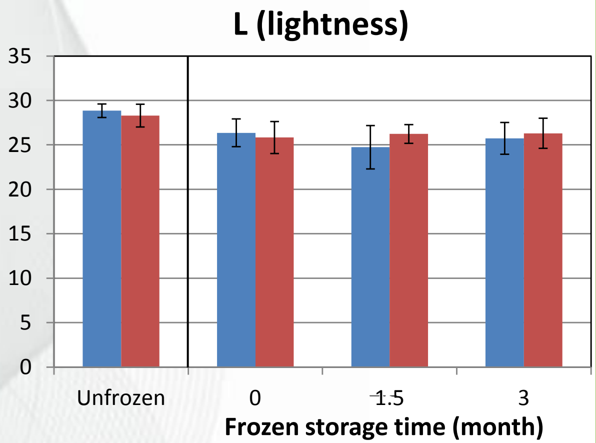
Freezing:-50ºC; 1 m/s
Thawing: 4ºC;24h
Frozen storage: -20ºC

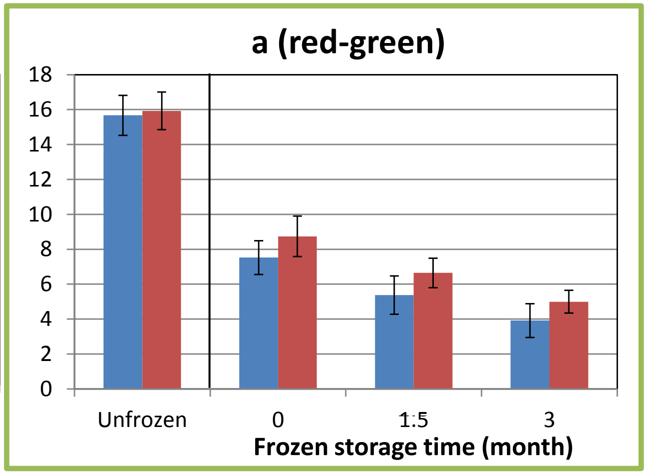


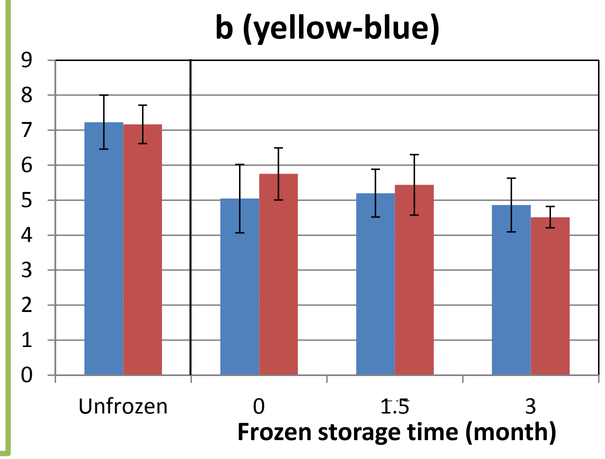
Albacore tuna steak

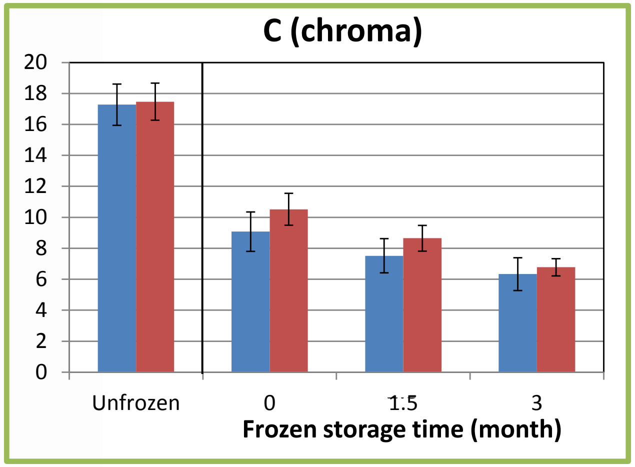
RESULTS

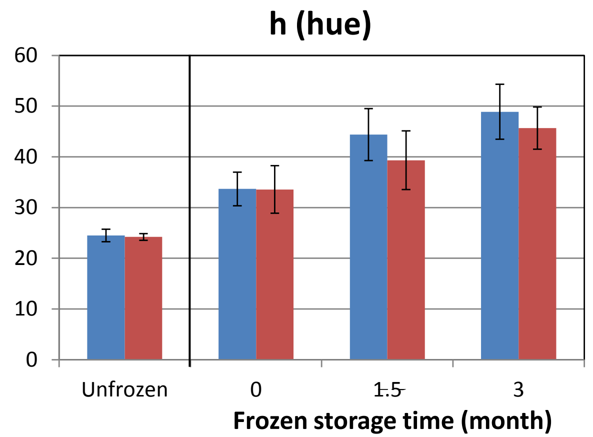
Colour (CIELab)





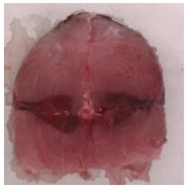






Freezing:-50ºC; 1 m/s
Thawing: 4ºC;24h
Frozen storage: -20ºC

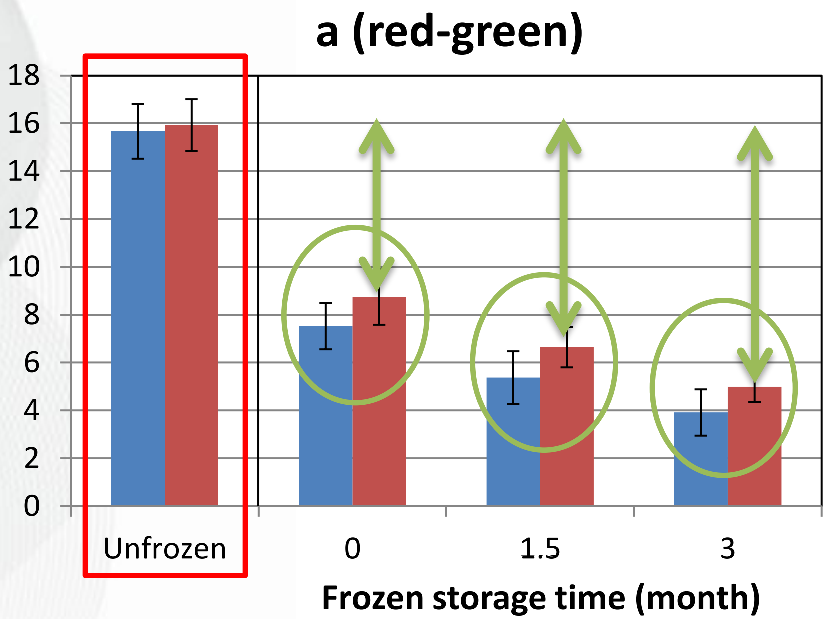
CONTROL CAS

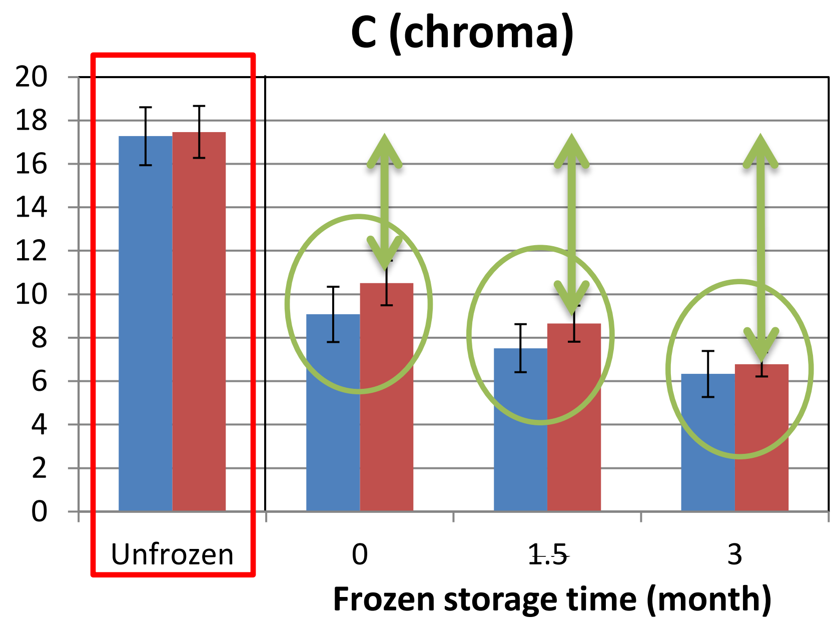


Albacore tuna steak

RESULTS

Colour (CIELab)

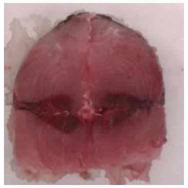




Increase of red component

CONTROL CAS

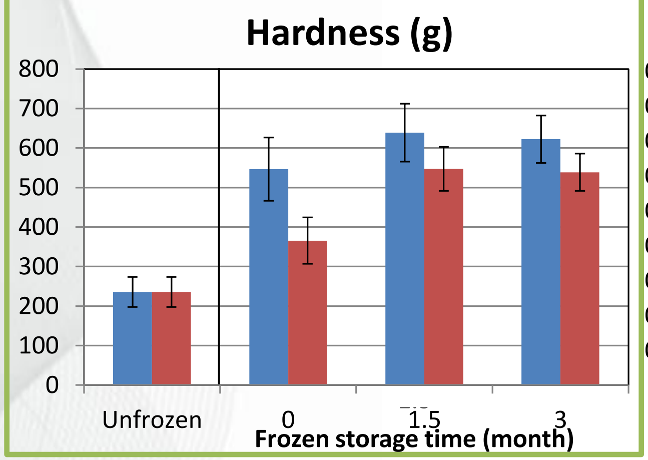
Freezing:-50ºC; 1 m/s
Thawing: 4ºC;24h
Frozen storage: -20ºC

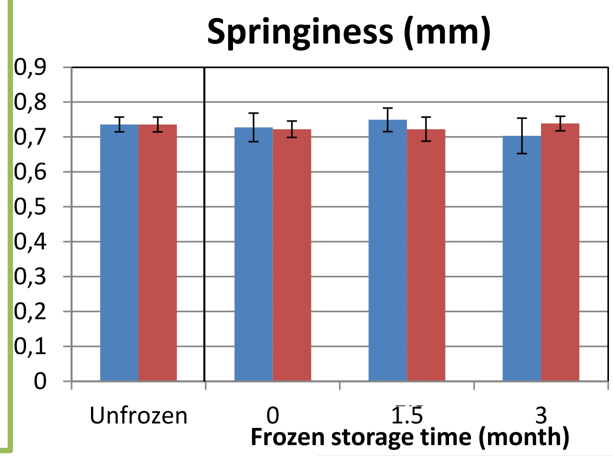


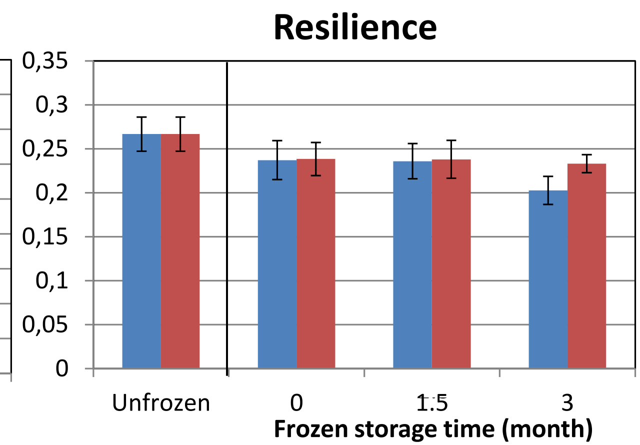
Albacore tuna steak

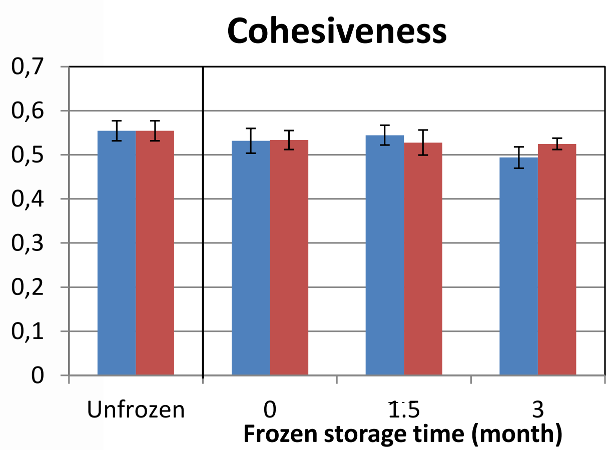
RESULTS

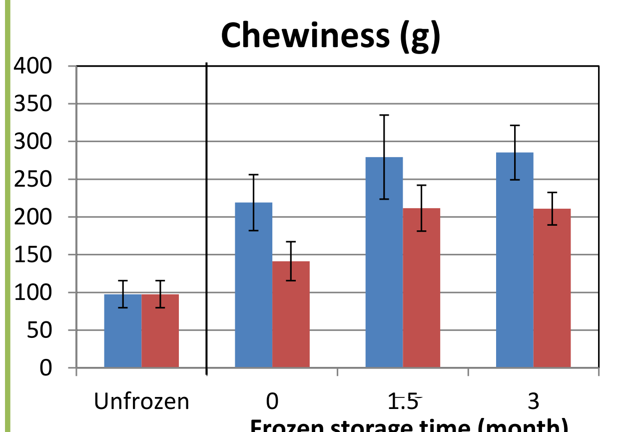
Texture Profile Analysis (TPA)





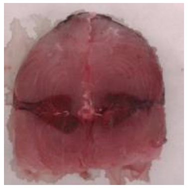






Freezing:-50ºC; 1 m/s
Thawing: 4ºC;24h
Frozen storage: -20ºC

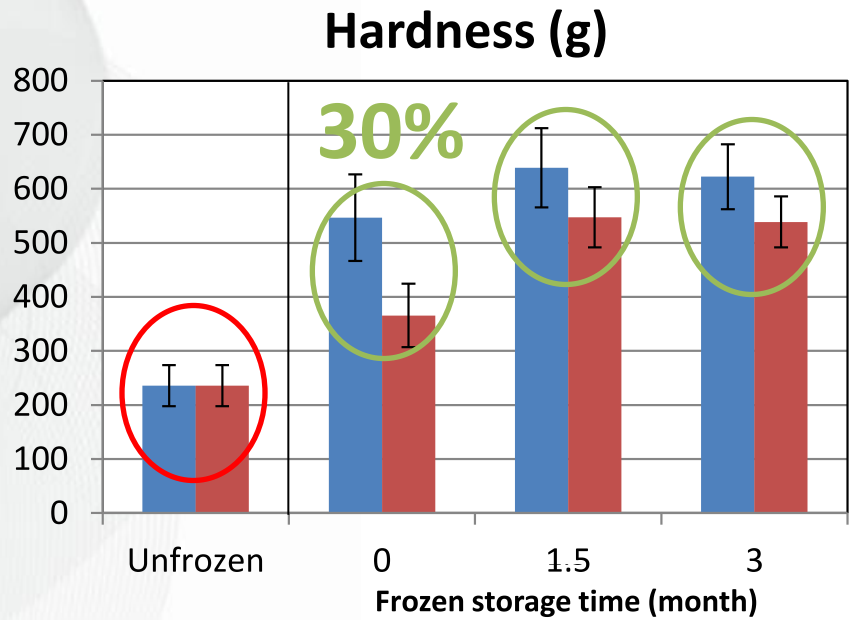
CONTROL CAS

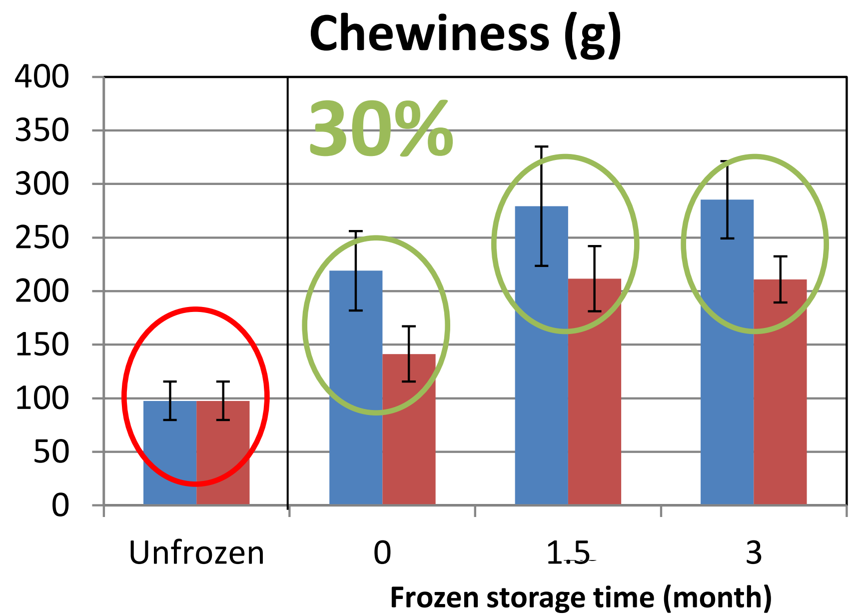


Albacore tuna steak

RESULTS

Texture Profile Analysis (TPA)





Freezing:-50ºC; 1 m/s
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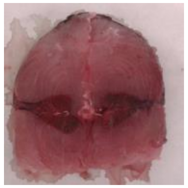
CONTROL CAS



Albacore tuna steak

CONCLUSIONS

- Magnetic field assisted freezing (Cell Alive System) could be a useful technology for albacore steak freezing, **decreasing drip losses after thawing in up to 22%, reducing hardness and chewiness in up to 30%** and producing a **more fresh-like texture** than conventional freezing

- The **impact of CAS freezing on colour was slight** and without sensory implications

- Further studies are needed to understand and determine:
  - ✓The particular mechanism of action of CAS
  - ✓The impact on other food properties
  - ✓The influence of process parameters
  - ✓The effect of CAS on other seafood products

THANK YOU FOR YOUR ATTENTION

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Unión Europea

Fondo Europeo de Pesca (FEP)

Invertimos en la pesca sostenible

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DEPARTAMENTO DE DESARROLLO
ECONÓMICO Y COMPETITIVIDAD

Work financed by EU and Basque Government (European Fisheries Fund)

A PAT approach for the discrimination between Fresh and Defrozen Hake

E. Martínez, A. Blanco, R. Rodríguez, I. Martínez-Marañón

ablanco@azti.es, 667.174.322

INDEX

Introduction

Aim

Material and Methods

- Data acquisition
- Classification models

Results and Discussion

Conclusions

Future work

INTRODUCTION

- Hake is highly appreciated by the Spanish consumer: reasonable price and high nutritional value
- Represents 14% of total fish consumption.

Consumers demand products:

- Tailored to their needs
- Healthy, safe and high organoleptic quality
- Prefer fresh fish to defrozen

Features associated with fresh produce

Hake is sold both at refrigerated and frozen state

Chilled fish products come from thawed ones

They are not always properly labeled

Consumer confusion

INTRODUCTION

Determining the quality of the fish is a challenge in all stages of the value chain product from fish processing to the supermarket.

In the literature one can find authors who have evaluated different methods and sensors for the objective determination of fish quality :

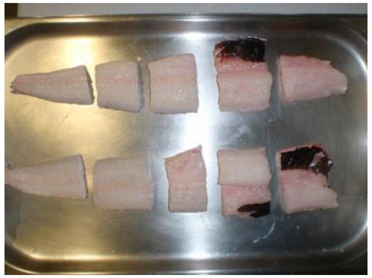
- Methods of sensory evaluation: Quality Index Method (QIM).
- Biosensors, chemical sensors and micro-and nano-technologies for the evaluation of freshness as they can be implemented in low-cost devices, durable and portable.
- Slow, destructive methods → cannot be applied to a processing line.

AIM

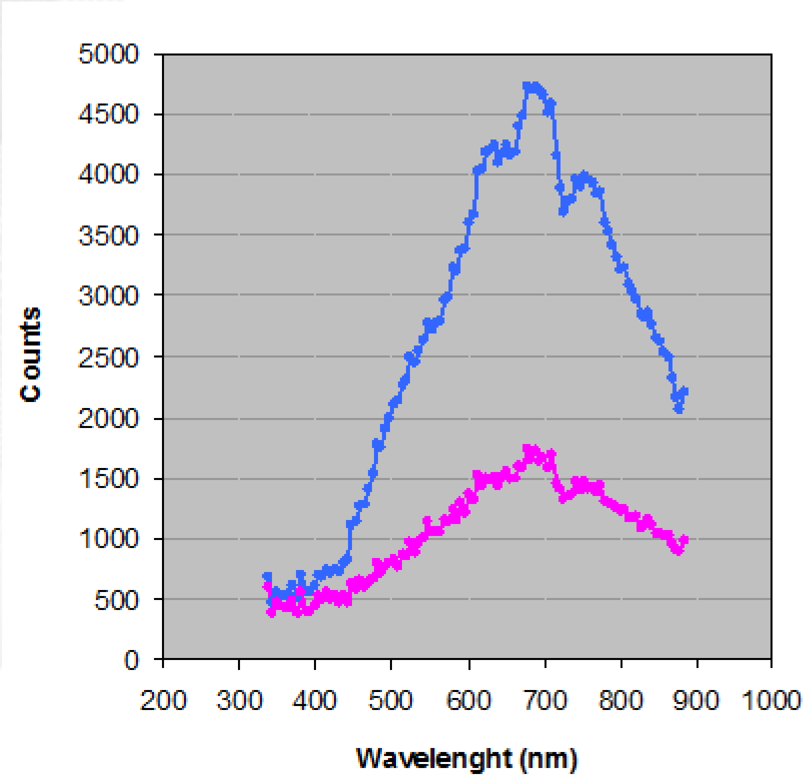
DEVELOPMENT OF AN OBJECTIVE METHOD FOR ON-LINE CLASSIFICATION OF HAKE ON THE BASIS OF FRESHNESS

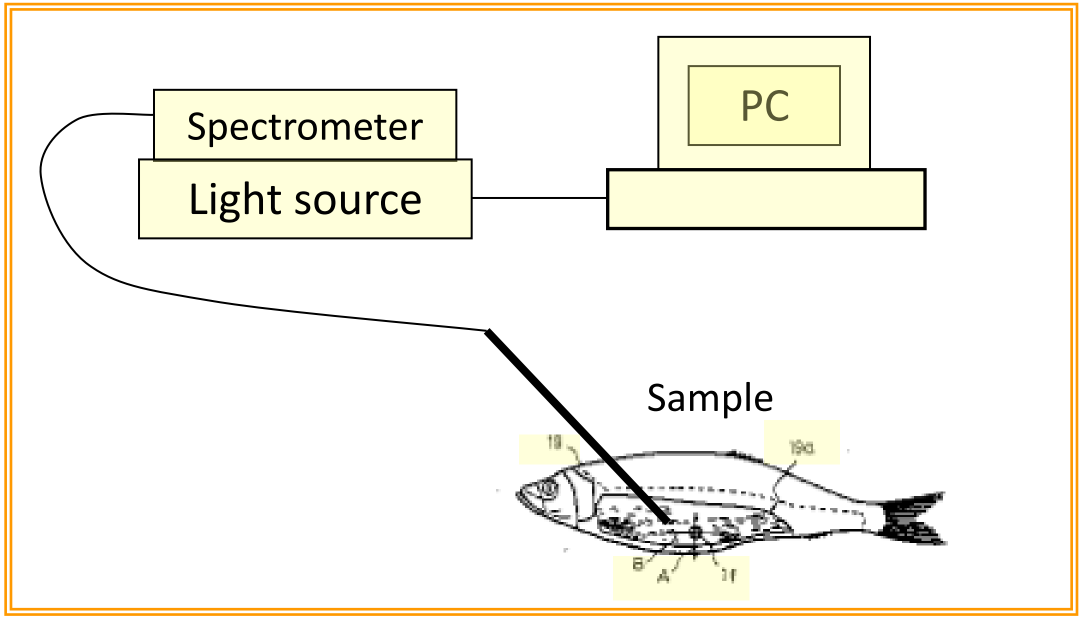
PAT analyzer: Near Infrared Spectroscopy (NIR)
+
Chemometrics: data mining

MATERIAL AND METHODS



- Portions 35-40grams
- 30 hakes * 6
- Dataset: fresh, 9 days, 3-6-9-12 months





MATERIAL AND METHODS

DATA ACQUISITION

↓

CALIBRATION METHODS

- The variables were not standardised in order to increase the diversity among them
- No need to pre-process the data: spectra was not noisy

MATERIAL AND METHODS

DATA ACQUISITION

CALIBRATION METHODS

MODEL SELECTION

2. Choose the proper classifier *:*
   - Linear Discriminant Analysis (LDA).
   - K-Nearest Neighbours (k-NN).

MATERIAL AND METHODS

DATA ACQUISITION

↓

CALIBRATION METHODS

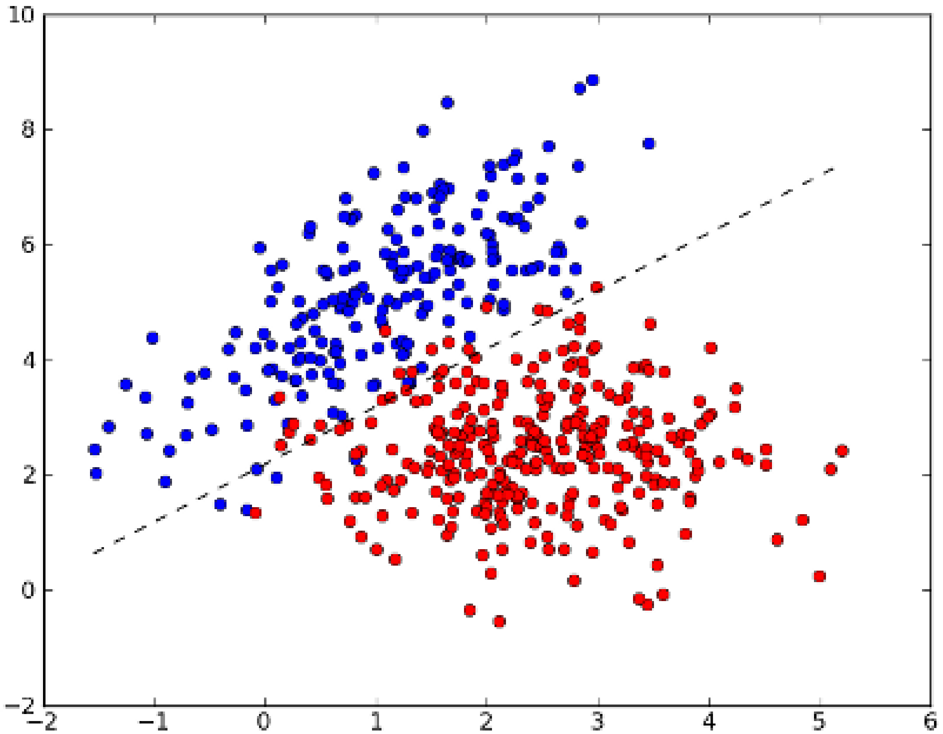
↓

MODEL SELECTION

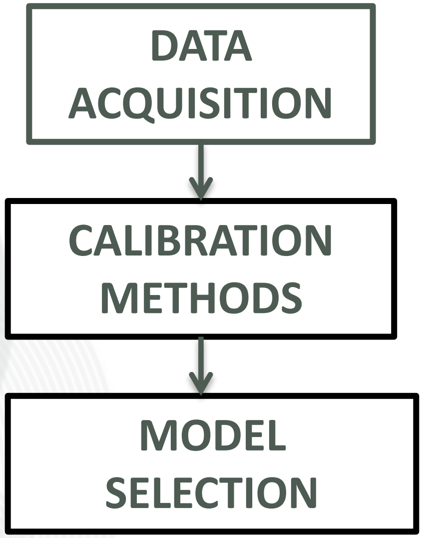
1. Election of the classification model:

Linear Discriminant Analysis(LDA):

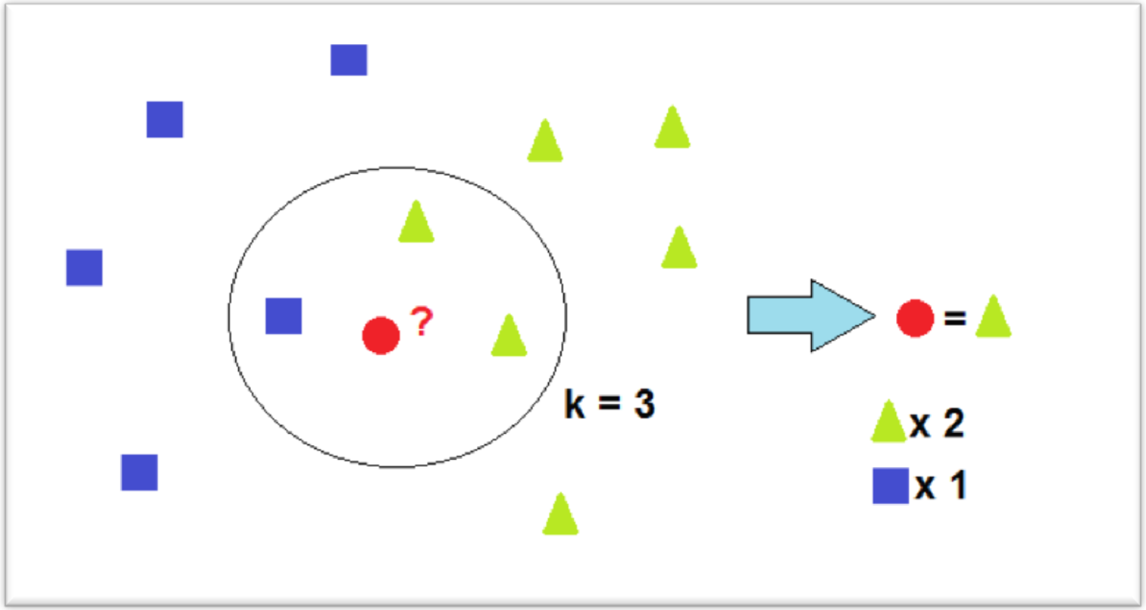
Used to find a linear combination of features which separates two or more classes of objects or events



MATERIAL AND METHODS



K-Nearest Neighbours classifier (k-NN): classifies the object by majority vote of its K closest neighbours



There are 3 key elements in this approach :

1. Set of labeled objects
2. Distance or similarity measure to calculate the distances between objects
3. K-value, number of neighbours

MATERIAL Y MÉTODOS

DATA ACQUISITION

CALIBRATION METHODS

MODEL SELECTION

TRAINING

- Select the **relevant features** using a wrapper method using Random Forest classifier based
- Dataset:70% training + 30% validation
- **k-NN:** Find the optimal value of the neighbours (k)

MATERIAL Y METODOS

DATA ACQUISITION

↓

CALIBRATION METHODS

↓

MODEL SELECTION

↓

TRAINING

↓

TEST

- Train the model with the training set
- Validate with the independent test set
- Compute the error

RESULTS AND DISCUSSION

Dataset	Classifier	min acc (%)	media acc (%)	max acc (%)
F vs D9 days	KNN	91,56	93,27	95,18
	LDA	81,90	85,67	88,23
F vs D3 months	KNN	93,37	95,48	98,19
	LDA	85,06	88,08	90,04
F vs D6 months	KNN	94,27	95,48	96,68
	LDA	88,28	90,26	92,30
F vs D9 months	KNN	99,69	99,90	100
	LDA	91,85	92,15	92,30
F vs D12 months	KNN	96,68	98,29	99,69
	LDA	89,14	92,31	94,57

- It is possible to differentiate between fresh and thawed hake for all problems using near infrared spectroscopy and multivariate techniques such as the k nearest neighbors.
- K-NN >> LDA
- The generalization ability of the classifiers increases with time freezing of hake.
- The predictive power of the KNN classifier tends to almost 100% success in classification from the ninth month.

CONCLUSIONS

The NIR technology and multivariate data analysis are efficient non-invasive techniques for differentiation between fresh hake and thawed after different periods of frozen storage

NIR spectroscopy technology in combination with multivariate data analysis is presented as a promising non-invasive technology for use and application in a process line in order to control the quality of fish

FUTURE WORK

Work with non-euclidean dissimilarities in the k-NN algorithm to study the impact of dissimilarities in the performance of the classifier.

In addition, we will work on developing multiclass classification algorithms capable of differentiating fresh hake and thawed at different periods of freezing.

Thanks for your attention!!!

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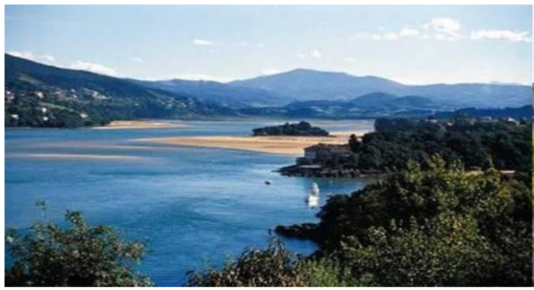

WEFTA 2014
SEAFOOD science for a changing demand
44th WEFTA meeting · 9-11 June 2014 · Bilbao (Spain)

ADVANCES IN SEAFOOD PROCESSING TECHNOLOGY AND SMART CONTROL

Effect of active packaging and conventional modified atmosphere on the quality and shelf life extension of fish and shellfish

Quality

Innovation

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Safety

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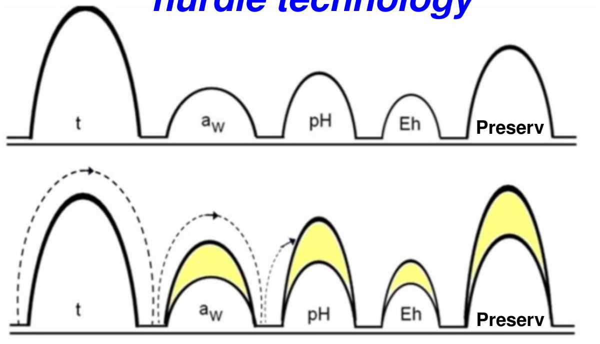
instituto português do mar e da atmosfera
Portuguese Institute for the Sea and Atmosphere, Lisbon, Portugal

"hurdle technology"



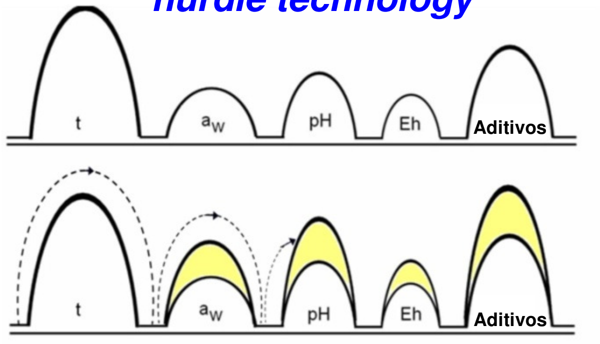
Adaptad from Leistner and Gorris (1995)

+ Packaging
- Conventional
  - Air
  - MAP
- Active

- Preserve quality (freshness, nutritional value)
- Safety assurance
- Extend the shelf life
- Minimize economic losses
- Innovate and upgrading products (diversification)

Leistner, L.; Gorris, L.G.M., 1995. Trends in Food Science and Technology, 6: 41-46

"hurdle technology"



+ ❑ Packaging

- ❑ Conventional
  - ❖ Air
  - ❖ MAP
- ❑ Active

Fresh/convenient products

✓ Ready to cook

✓ Ready to eat

Shelf life extension: 3 – 10 days

Aim of this presentation

Evaluation of shelf life extension in ready to cook products (comparing with packaging in air), based mainly on sensory criterion:

- ✓ Scaled/gutted seabream
  - ❑ Active packaging (O_2 absorbers)
  - ❑ MAP
- ✓ Salmon steaks – MAP
- ✓ Whole shrimp – MAP

Whole shrimp – MAP

Black spot (melanosis) in fresh shrimp stored at 2 °C

Air

Shelf life = 5 days

($33\%CO_2/31\%\ O_2/36\%N_2$)

Shelf life = 7 days

($37\%CO_2/6\%\ O_2/57\%N_2$)

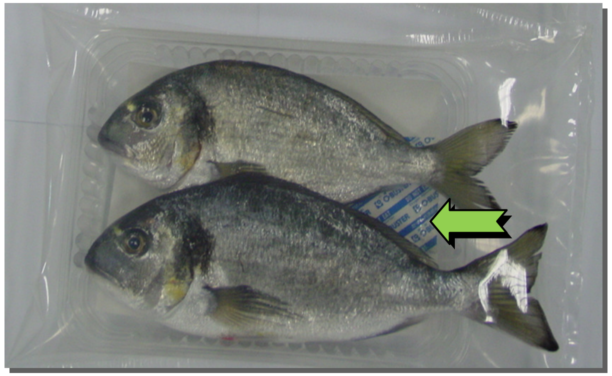
Shelf life = 9 days

Gonçalves et al. (2003): Journal of Food Science, 68: 2586-2590
López-Caballero et al. (2002): European Food Research and Technology, 214: 192-197

Scaled and gutted seabream - Active packaging : Oxygen absorbers (O_2 A)

Air

O_2 A



Chilled

storage at 5 ºC

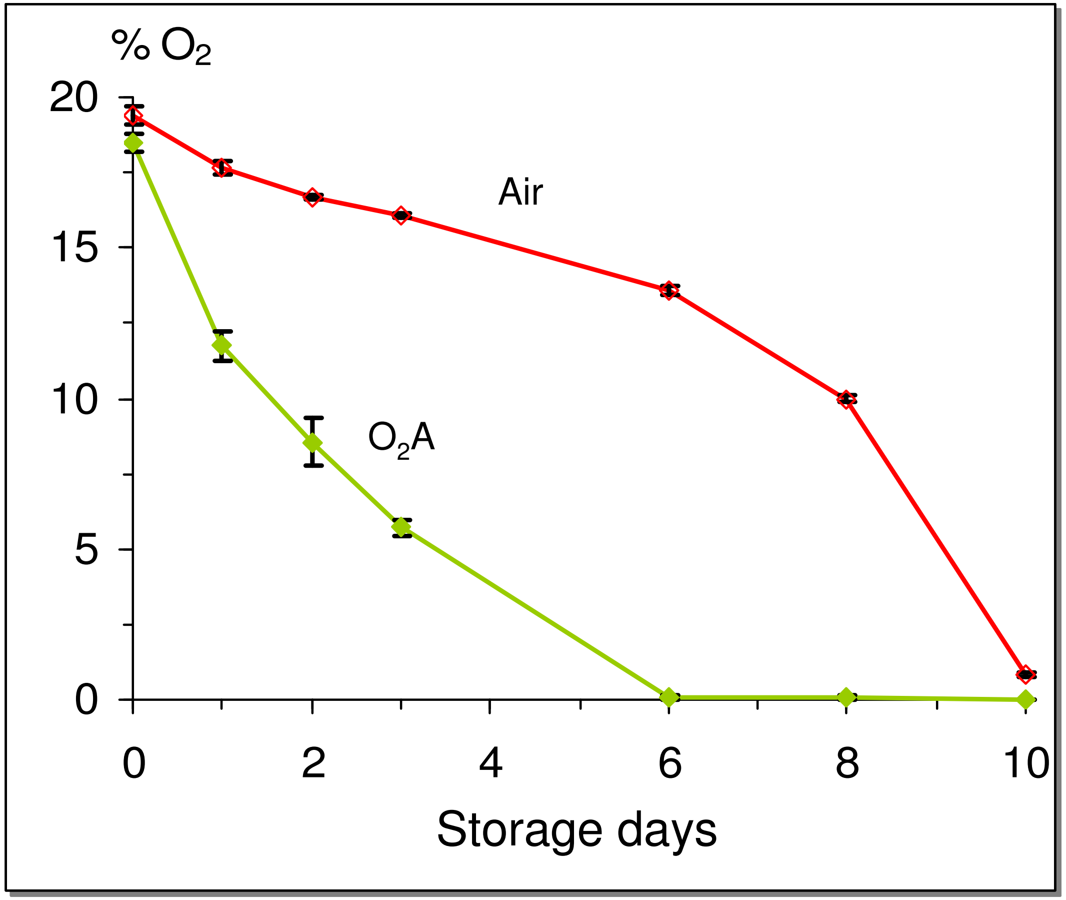
1 ºC

Gonçalves et al. (2004), *Journal of Aquatic Food Product and Technology,* 13 (3): 49-59

Scaled and gutted seabream - Active packaging : Oxygen absorbers (O_2 A)

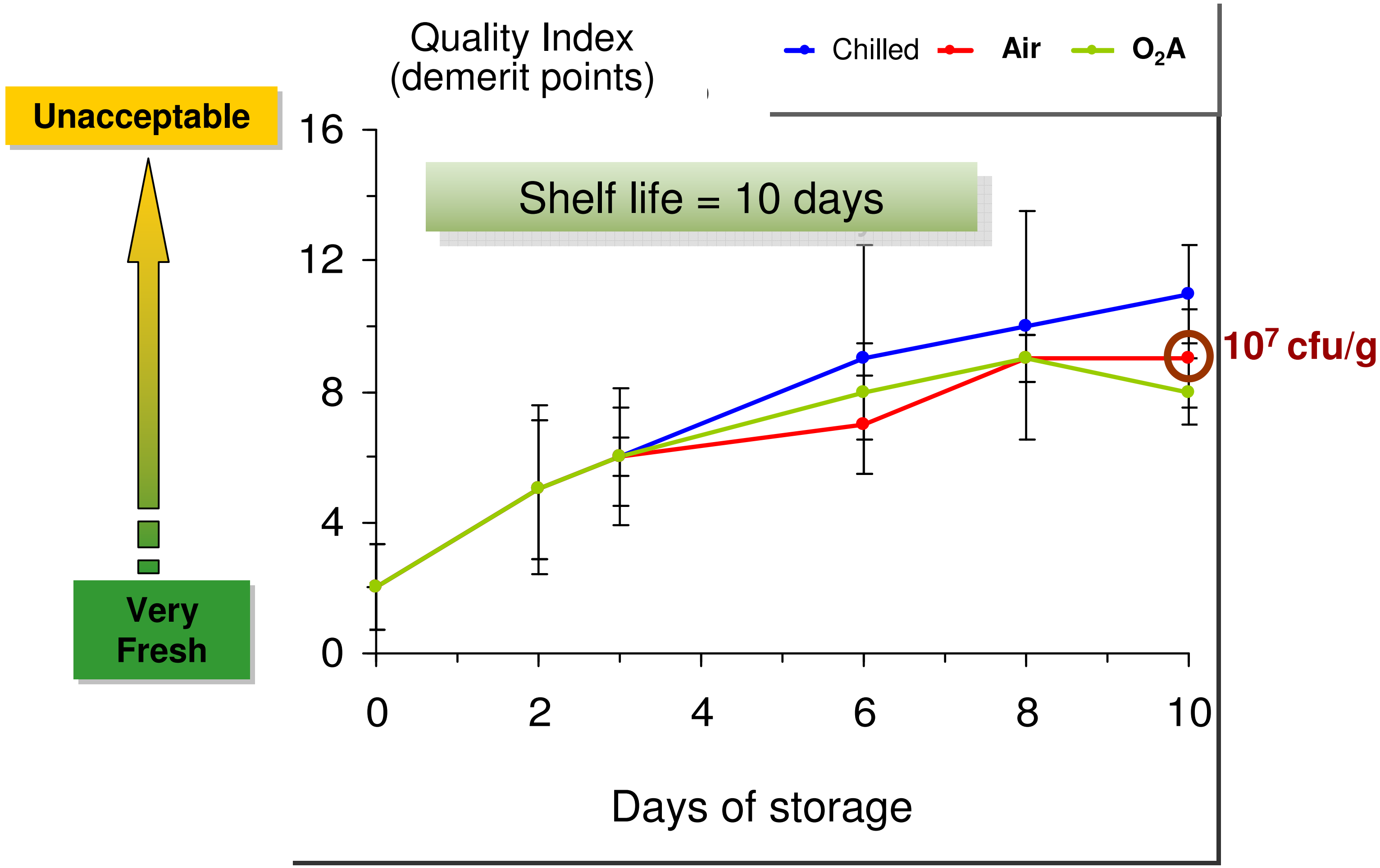
O_2 A

Air



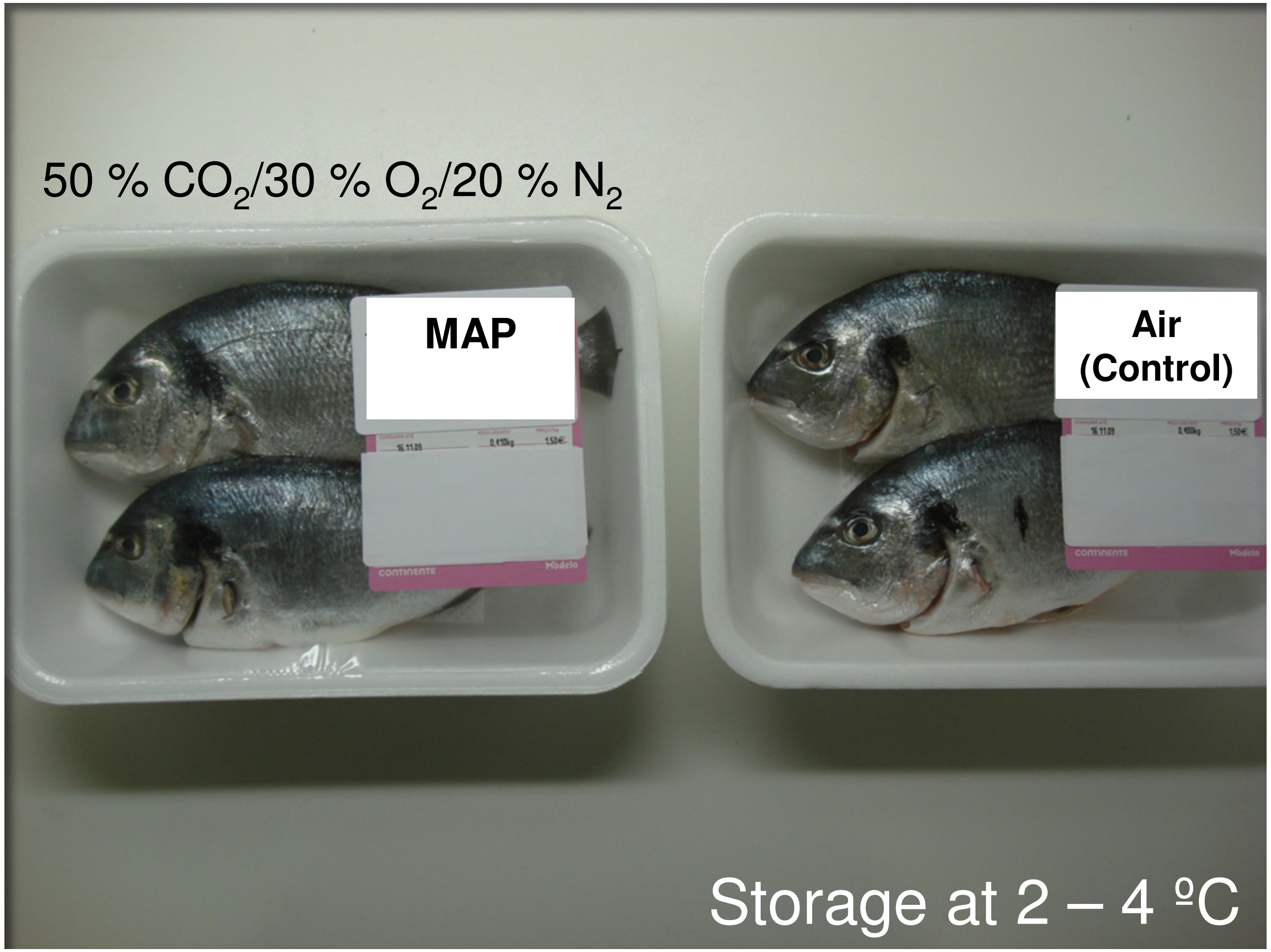
Gonçalves et al. (2004), *Journal of Aquatic Food Product and Technology*, 13 (3): 49-59

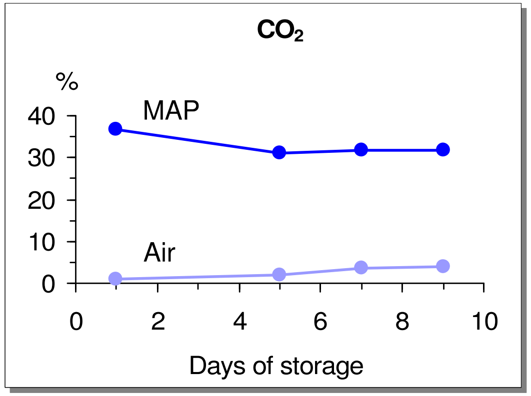
Scaled and gutted seabream - Active packaging : Oxygen absorbers

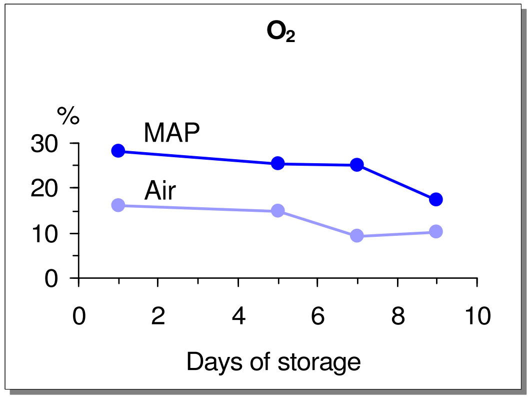


Gonçalves et al. (2004), *Journal of Aquatic Food Product and Technology,* 13 (3): 49-59

Scaled and gutted sebream – MAP



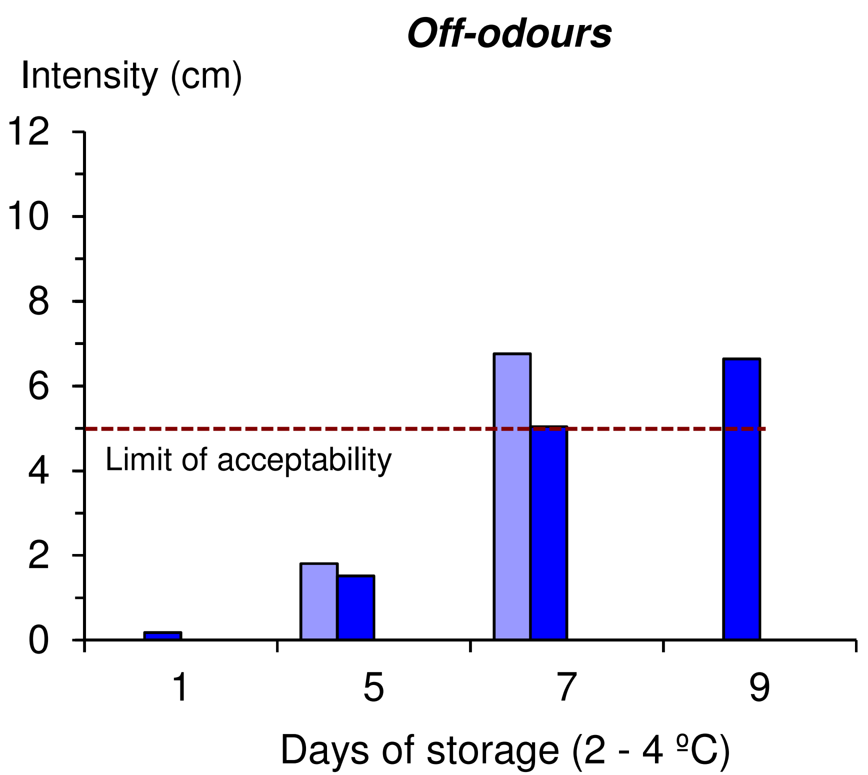


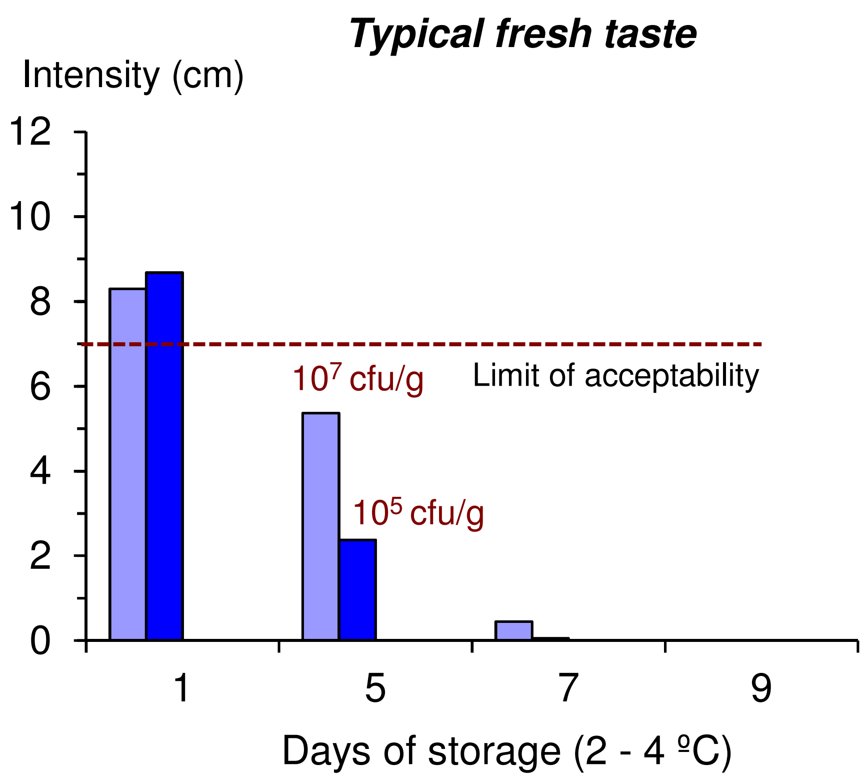


This work was conducted in collaboration with SONAE, Portugal

Scaled and gutted sebream – MAP

Shelf life = 5 days





Air MAP (50 % CO_2/30 % O_2/20 % N_2)

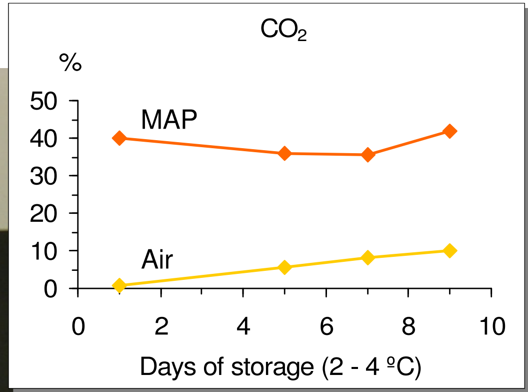
This work was conducted in collaboration with SONAE, Portugal

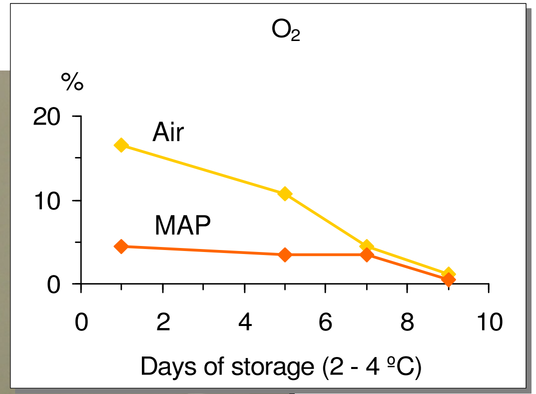
instituto port

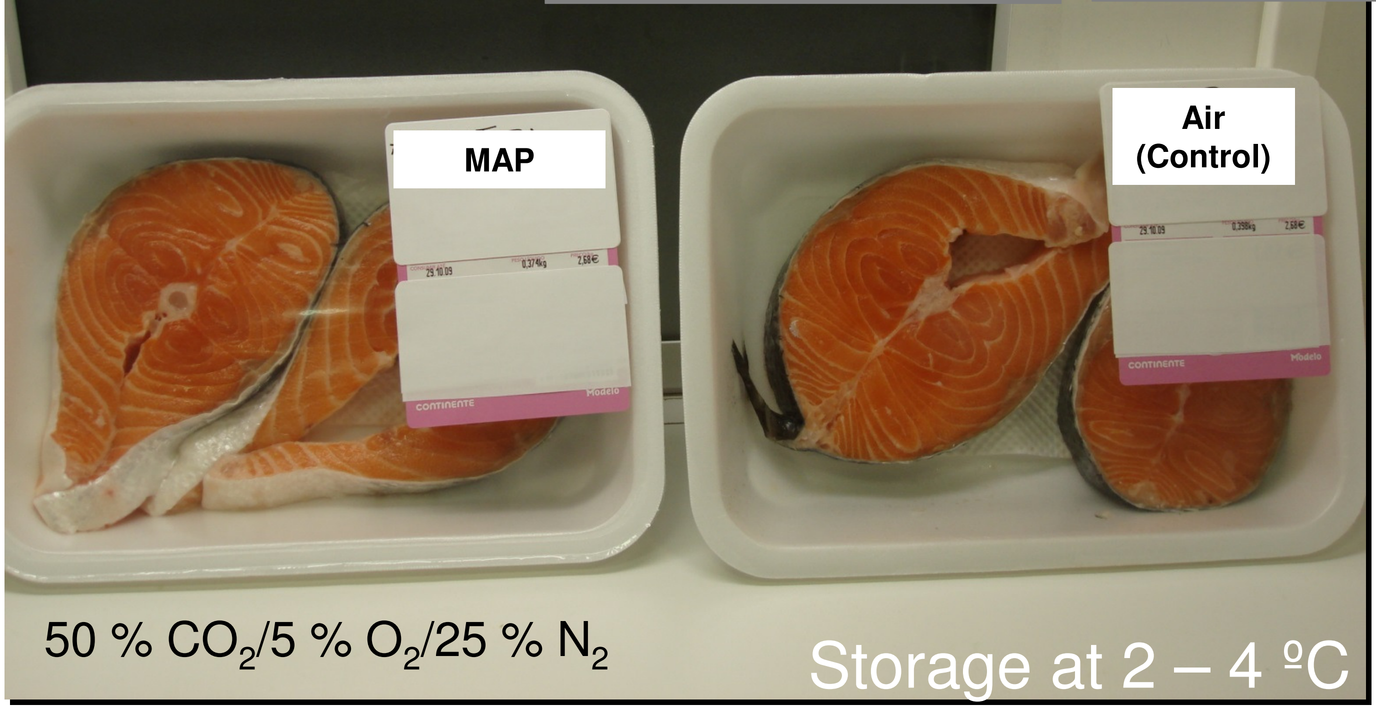
nd shelf life of fish/shellfish

This work was conducted in collaboration with SONAE, Portugal

Salmon steaks – MAP



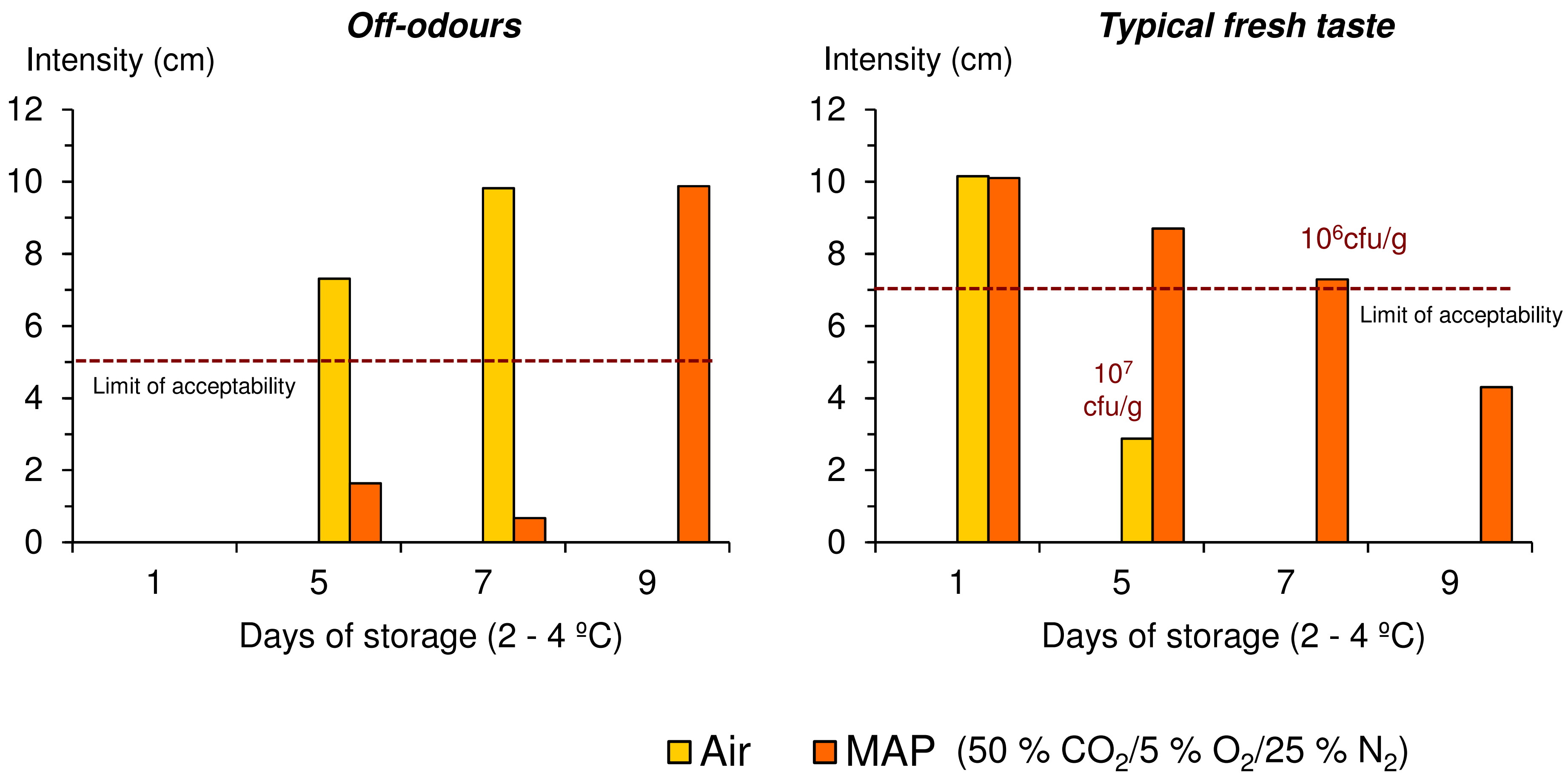




This work was conducted in collaboration with SONAE, Portugal

Salmon steaks – MAP

Shelf life: Air = 5 days
MAP = 7 days



This work was conducted in collaboration with SONAE, Portugal

Conclusion

- **Shelf life extension** in ready to cook products:
  - ✓ Whole shrimp – MAP: **2 – 4 days**
  - ✓ Scaled/gutted seabream
    - ❑ Active packaging - O_2 absorbers: **no extension**
    - ❑ MAP: **no extension**
  - ✓ Salmon steaks – MAP: **2 days**
- Higher efectiveness for fish portions

Thank you for your attention!

Quality

Innovation

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Maria Leonor Nunes

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Safety

WEFTA 2014

SEAFOOD Science for a changing demand

PRESENTATIONS

PRODUCT INNOVATION, CONSUMER ACCEPTANCE AND EXPECTATIONS

European consumers' benefit-risk perception and the association with their consumption of seafood

44th WEFTA meeting, SEAFOOD science for a changing demand, 9-11 June 2014, Bilbao (Spain). Product innovation, consumer acceptance and expectations.

<u>*Silke Jacobs*</u>[1]

Isabelle Sioen[2], Stefaan De Henauw[2], German Cano-Sancho[3], Maria Leonor Nunes[4], Gabriella Fait[5], Federico Cardona Pons[6], Wim Verbeke[1]

[1] Department of Agricultural Economics, Ghent University; [2] Department of Public health, Ghent University; [3] Laboratory of Toxicology and Environmental Health – Tecnatox, Universitat Rovira i Virgili (URV); [4] Division of Aquaculture and Upgrading (DivAV), Portuguese Institute for the Sea and Atmosphere (IPMA); [5] Aeiforia Srl; [6] AquaTT

The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement no 311820.

Overview

- Introduction
  - Nutritional-toxicological conflict
  - Framework
  - Research question
- Methods
  - Data collection
  - Questionnaire
- Results
  - Sample
  - Consumption frequency
  - Risk and benefit statements
  - Cluster analysis and the association with consumption frequency
- Conclusion
- Further research

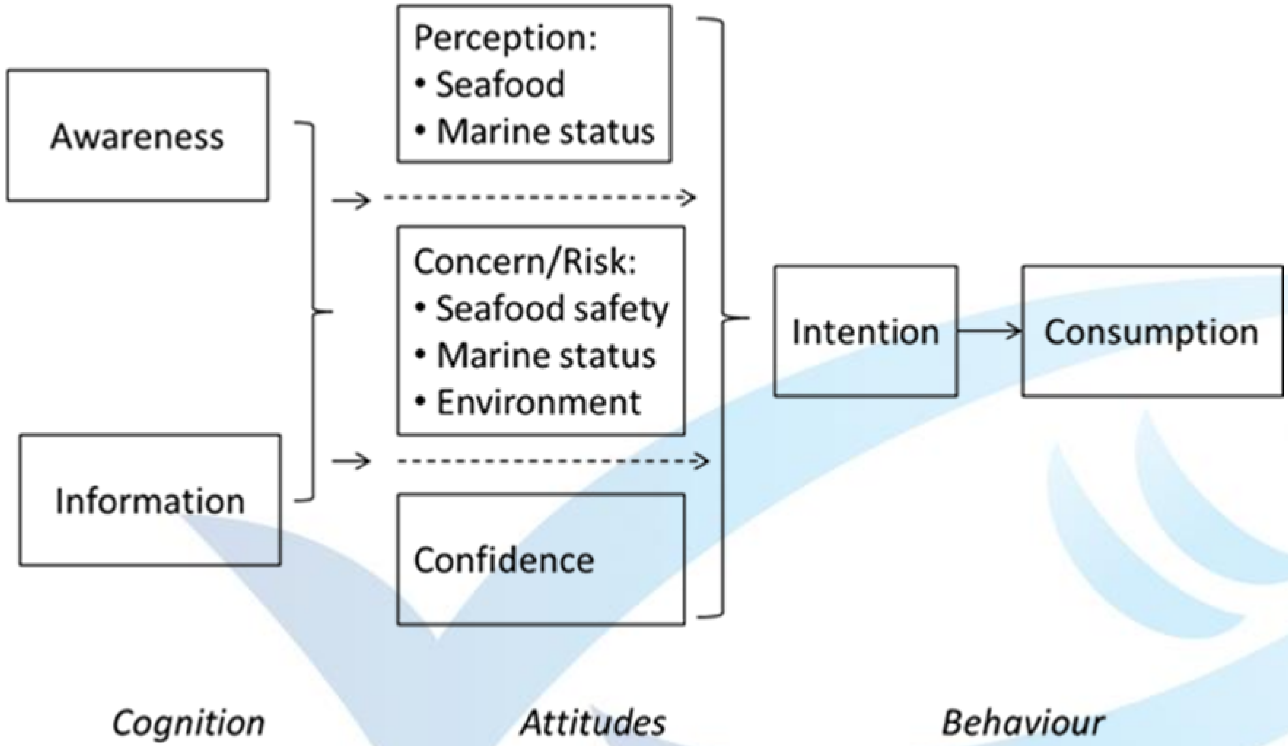
The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement no 311820.

Introduction: nutritional-toxicological conflict

- Source of proteins, unsaturated fatty acids, vitamins and minerals
- Potential source of environmental contaminants, such as PCBs and mercury
- Fish has in general a positive image among consumers (Pieniak et al., 2008)
- In general, consumers are unaware of environmental problems and health problems (Hall and Amberg, 2013)

The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement no 311820.

Introduction: framework



The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement no 311820.

Introduction: Research question

Market segmentation regarding benefit-risk perception?

↓

Differences in seafood consumption pattern?

The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement no 311820.

Methods: Data collection

- Web based survey, 2013
- Five European countries
  - Belgium, Ireland, Italy, Spain and Portugal
- N = 2917, age 18-75 years, 1451 women and 1466 men
- National representative sample (age and gender)

The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement no 311820.

Methods: Questionnaire

- Risk and benefit perception statements

  Scored on a 7-point Likert scale (Pieniak et. al, 2008)

- Cluster analysis

Constructs and items	Factor loadings	
Seafood risk perception		(0.957)
I do not want to eat seafood too often because I am afraid of food poisoning from micro-organisms (bacteria and viruses)	0.940	
I do not want to eat seafood too often because I am afraid of food poisoning from parasites	0.928	
I do not want to eat seafood too often because I am afraid of food poisoning from algae (bio)toxins	0.913	
I do not want to eat seafood too often because I am afraid of food poisoning from chemicals (heavy metals. dioxins. residues. micro-plastics)	0.892	
I am very concerned about getting ill from eating seafood	0.883	
I do not want to eat seafood too often because I am afraid of seafood spoilage	0.863	
Seafood is more risky to eat with respect to food poisoning from chemicals than meat	0.825	
Seafood benefit perception		(0.941)
Eating seafood allows me to live healthily	0.957	
Eating seafood is good for my health	0.944	
Eating seafood helps to grow up healthy	0.936	

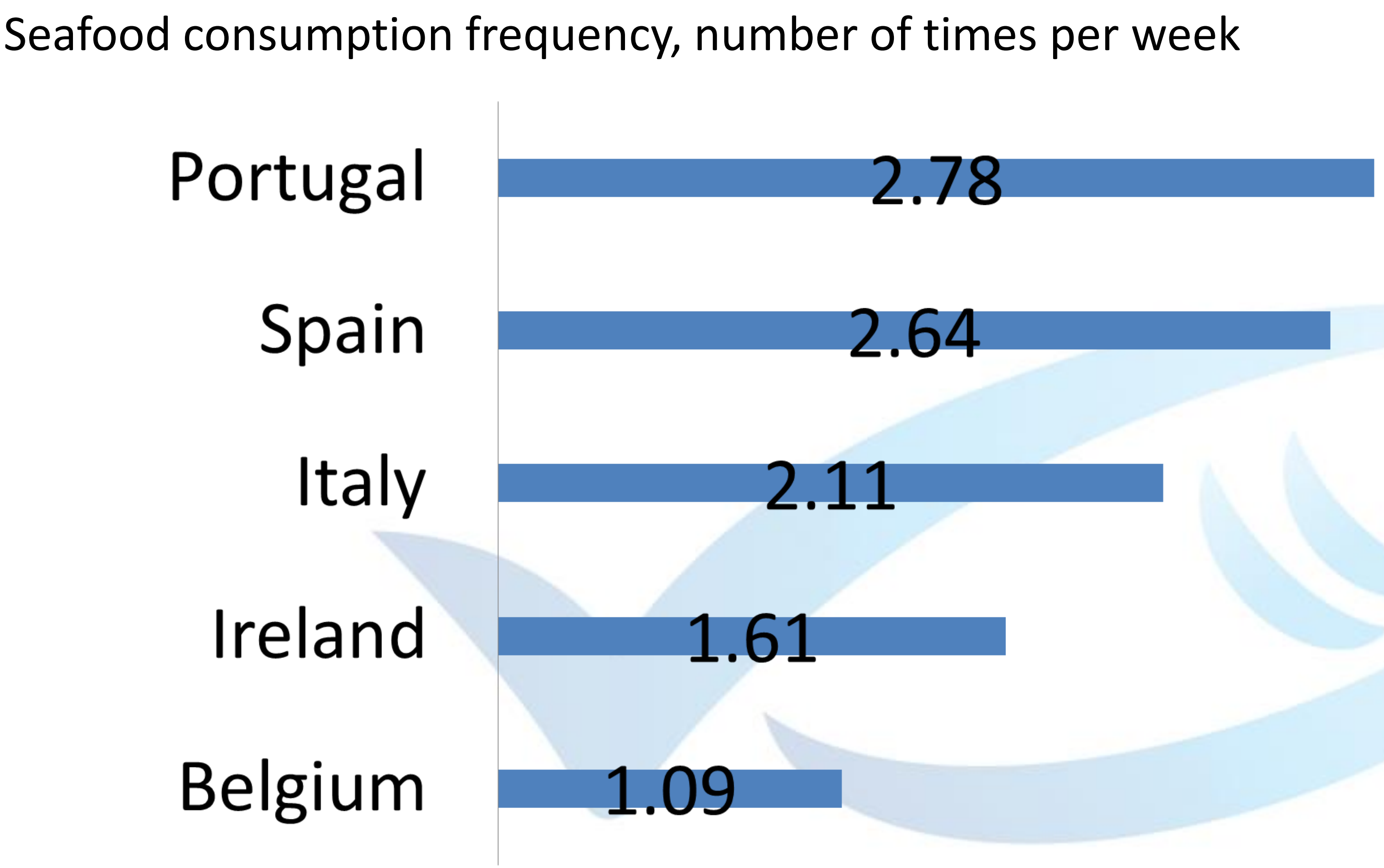
The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement no 311820.

Results: sample

Gender	Ireland	Belgium	Italy	Portugal		Spain		Total
				non Madeira	*Madeira*	*non Canary*	*Canary Islands*	
Female	290	269	286	284	26	263	33	1451
Male	285	271	274	291	38	273	34	1466
Total	575	540	560	575	64	536	67	**2917**

The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement no 311820.

Results: consumption frequency



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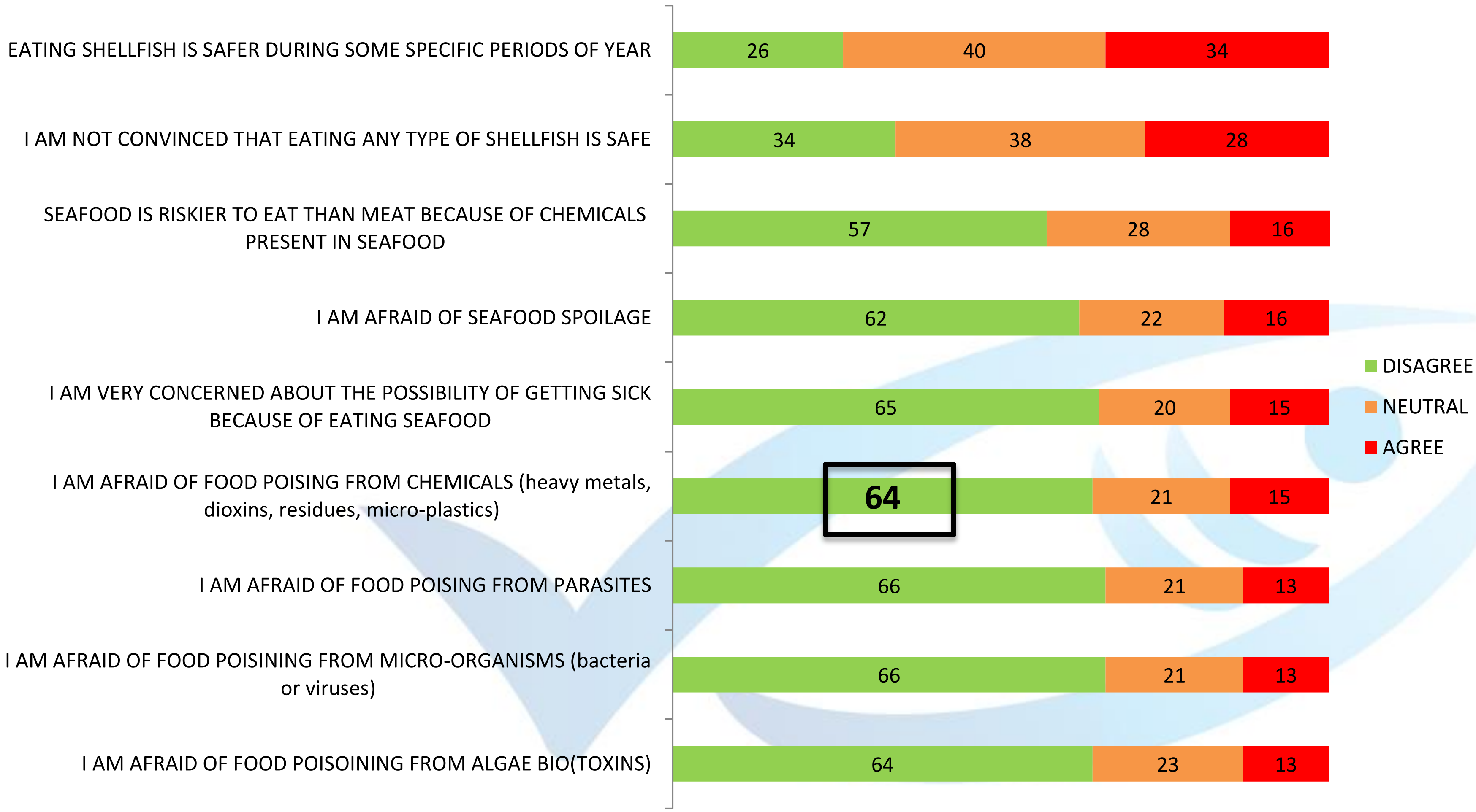
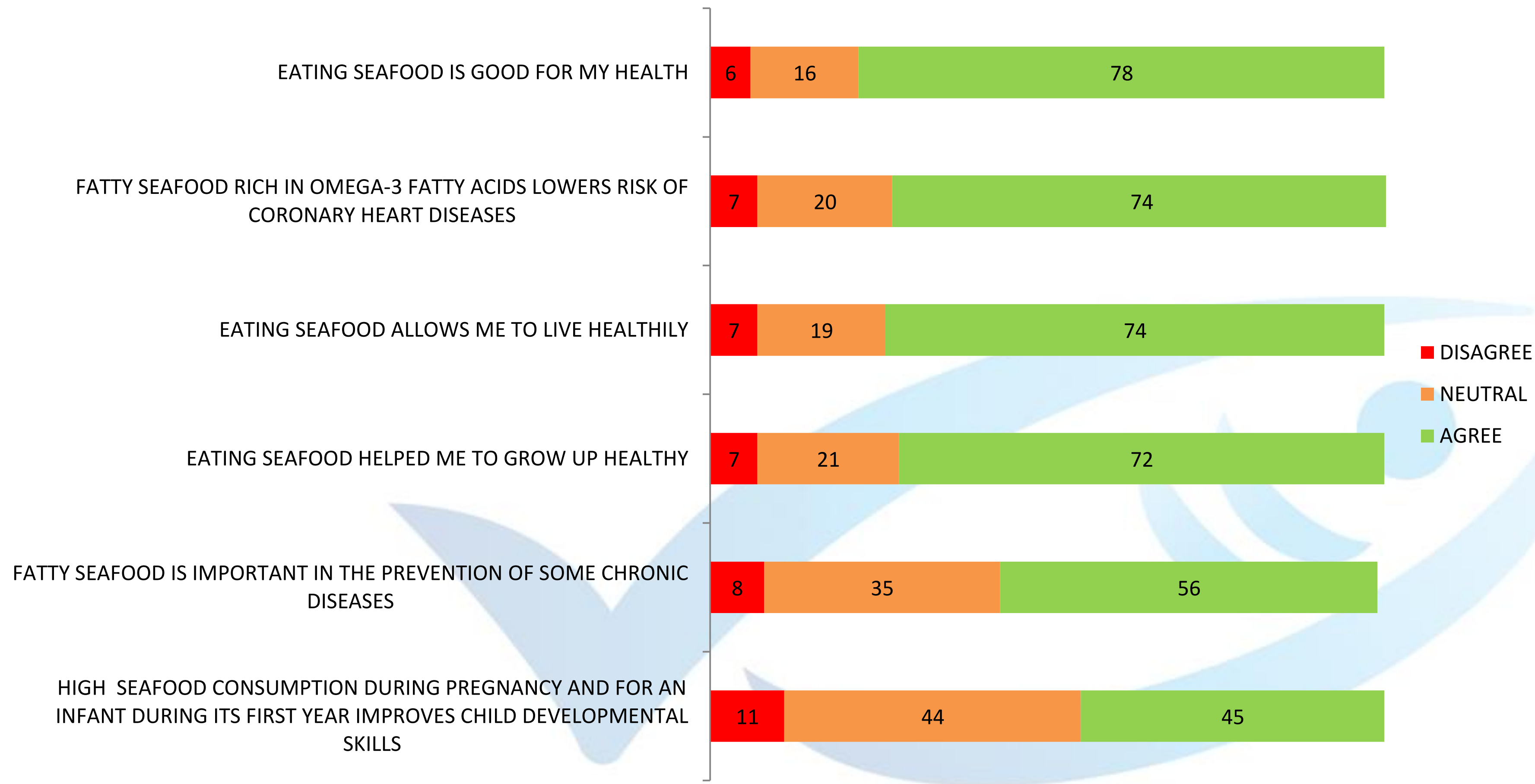
Results: risk statements



The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement no 311820.

Results: benefit statements



The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement no 311820.

www.ecsafeseafood.eu

Results: cluster analysis

Consumer segments	high risk & neutral benefit perception	neutral risk & neutral benefit perception	low risk & neutral benefit perception	low risk & low benefit perception	neutral risk & high benefit perception	low risk & high benefit perception	F-value	Eta-squared	p-value
Size (% of sample)	8.5%	22.1%	16.9%	3.6%	18.4%	30.5%			
Risk-construct: mean (SD)	5.70 (0.76)	3.85 (0.48)	1.64 (0.56)	2.26 (1.10)	3.48 (0.67)	1.35 (0.44)	3161.14	0.850	<0.001
Benefit-construct: mean (SD)	4.88 (1.39)	4.36 (0.60)	4.83 (0.58)	1.88 (0.83)	6.24 (0.53)	6.63 (0.46)	1717.28	0.755	<0.001

The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement no 311820.

Results: clusters and consumption

Significant difference in seafood consumption frequency

Consumer segments	high risk & neutral benefit perception	neutral risk & neutral benefit perception	low risk & neutral benefit perception	low risk & low benefit perception	neutral risk & high benefit perception	low risk & high benefit perception	F-value	Eta-squared	p-value
Size (% of sample)	8.5%	22.1%	16.9%	3.6%	18.4%	30.5%			
Consumption frequency (number of times per week)	1.67[a](1.80)	1.68[a](1.55)	1.73[a](1.41)	2.02[a,b,c](2.11)	2.16[b](1.50)	2.56[c](1.60)	31.32	0.053	<0.001

The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement no 311820.

Results: clusters and consumption

- Gradient in benefit perception seems more important than the gradient in risk perception

↓

- Weak negative association between risk perception and consumption ($r=\mathbf{-0.145}$, $p<0.001$)
- Weak positive association between benefit perception and consumption ($r=\mathbf{0.214}$, $p<0.001$)

The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement no 311820.

Results: clusters and countries

Significant association between the clusters and the countries

- Chi-squared test, $p<0.001$, Cramer's V = 0.147

Higher risk perception

↕

Irish, Italian and Belgian respondents

Higher benefit perception

↕

Portuguese and Spanish respondents

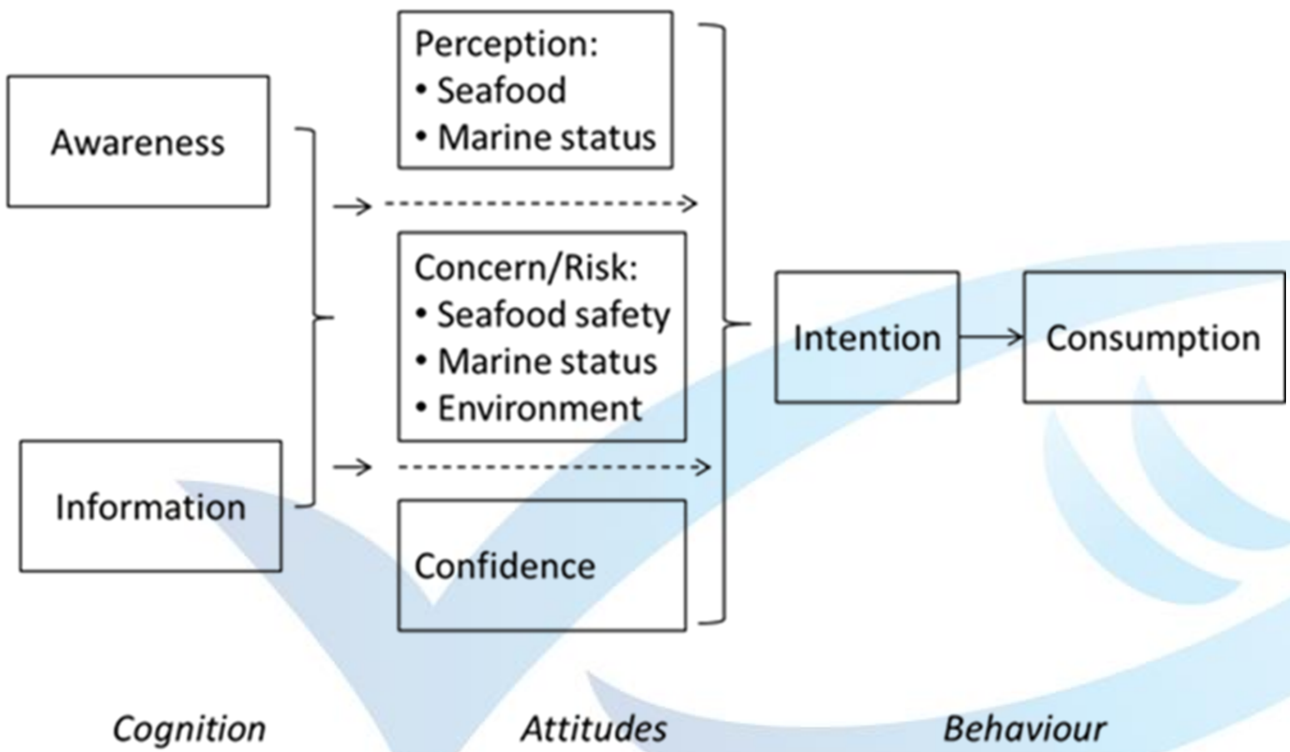
The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement no 311820.

Conclusion

- Highest seafood consumption frequency in Portugal, lowest seafood consumption frequency in Belgium
- Higher agreement with benefit statements
- The **perceived health benefits outweigh** the perceived risks
- Significant **association** between the clusters (**risk-benefit perception**) and **seafood consumption frequency**
- **Portugal** and **Spain** have a **higher benefit** perception and a lower risk perception
- **Italy**, **Ireland** and **Belgium** have a **higher risk** perception and a lower benefit perception

The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement no 311820.

Further research



The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement no 311820.

The research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under the ECsafeSEAFOOD project (grant agreement n° 311820).

ECsafeSEAFOOD

Priority environmental contaminants in seafood: safety assessment, impact and public perception

WEFTA 2014

SEAFOOD SCIENCE FOR A CHANGING DEMAND

June 2014. 44th WEFTA meeting

INNOVATIVE USE OF NATURAL EXTRACTS ON THE TREATMENT OF MELANOSIS OF THREE SPECIES OF SHRIMP IN THE MEDITERRANEAN POST CAPTURE

Dott.ssa Giuseppina R. A. Alberio [1]

(1) Dip. DiSPA - Universita' di Catania (Italy)

SESSION "PRODUCT INNOVATION, CONSUMER ACCEPTANCE AND EXPECTATIONS"

Melanosis

The "*melanosis or black spot*" represents one of the major commercial problems that affect the acceptability of the shrimp product by the consumer.

Melanosis Shrimp

General characteristics

✓The most important problem occurring in shrimp(fresh, cooked, shelled and packaged product) during post-mortem storage, is the oxidation because of ‘tyrosinase’, producing pigments responsible for its undesirable dark colour.

✓Browning intensity is regulated by the quantity of active forms of the enzyme and tyrosine content present in the shrimp tissue.

✓Polyphenol oxidase (PPO, EC 1.14.18.1) is primary enzyme which causes enzymatic browning in shrimps.

Principal products subject to enzymatic browning

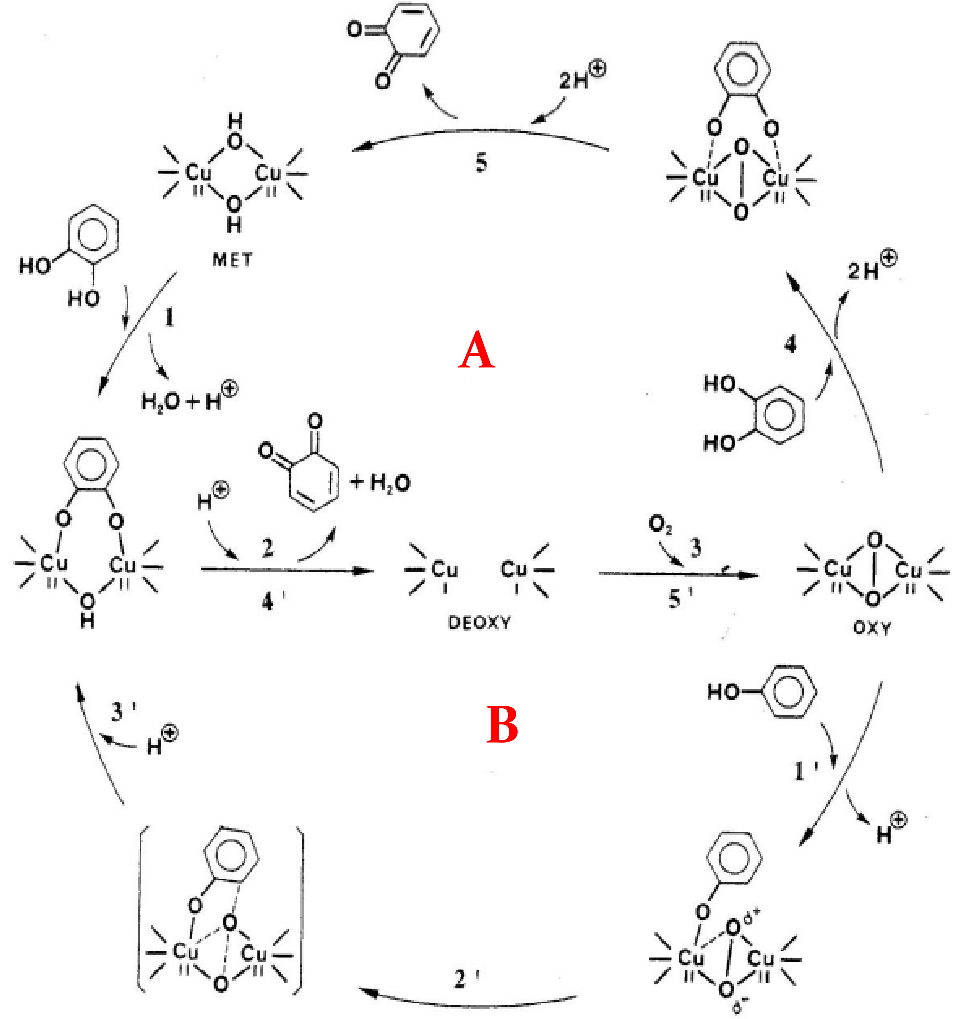
(fresh, cooked, shelled and packaged product…)

Biochemical mechanism of Polyphenol Oxidase

✓In ditail,the two copper atoms within the active site of tyrosinase enzyme interact with dioxygen to form a highly reactive chemical intermediate that then oxidizes the substrate .

✓The activity of tyrosinase is related to catechol oxidase, a class of copper oxidase.

✓Tyrosinase and cathecol oxidase are collectively termed polyphenol oxidase, therefore it would be more properly use this nomenclature (PPO, EC 1.14.18.1).



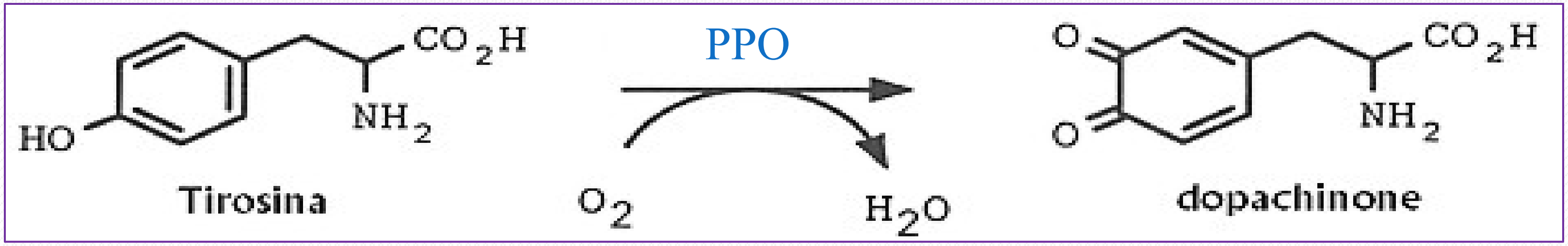
(Yoruk & Marshall, 2003)

PPO

Catalyzes two different reactions in the post mortem of the crusteans

Activity cresolasica
The hydroxylation of TYROSINE to DOPA

Activity catecolasica
the subsequent oxidation of DOPA in DOPAQUINONE



O2 used as a co-substrate

The oxidation due to “tyrosinase” produces pigments responsible for its undesirable dark colour (black spot or melanosis).

TREATMENT OF MELANOSIS

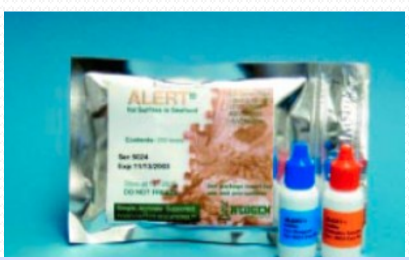
Ascorbic Acid

✓Sulphites and resorcinol derivatives (e.g. 4-hexylresorcinol) are the most common and effective additives used to prevent melanosis in crustaceans (Montero et al., 2006).

Metabisulphite

Sulphite

Author	inhibitor traditional	Seafood
	Agente riducente	
Otwell e Marshall (1986)	Ascorbic Acid	Shrimp
Chinivasagam et al. (1998)	sulphite compounds	Crustaceans
Mendes R., 2002	metabisulphite	Crustacesns
	Chelating	
Applewhite et al., (1990)	Acid kojico	Parapenaeus Longirostris
Lopez-Caballero et al., (2005)	4-Esilresorcinolo	Shrimp



4-Esilresorcinolo

PROBLEM TREATMENT OF MELANOSIS

- It is necessary to properly inform the consumer, explaining the need to use certain substances (such as additives natural) during industrial processes, making him also informed on legislative protection that is recognized to him. (Reg. 1196/11).
- In fact, after having discovered that these antioxidants were related to allergic reactions (bronchial asthma, nausea, abdominal pain, blue lips, nails and skin) in some consumers, several researches were carried out with alternative compounds.

NEWS RESEARCH AND AIMS

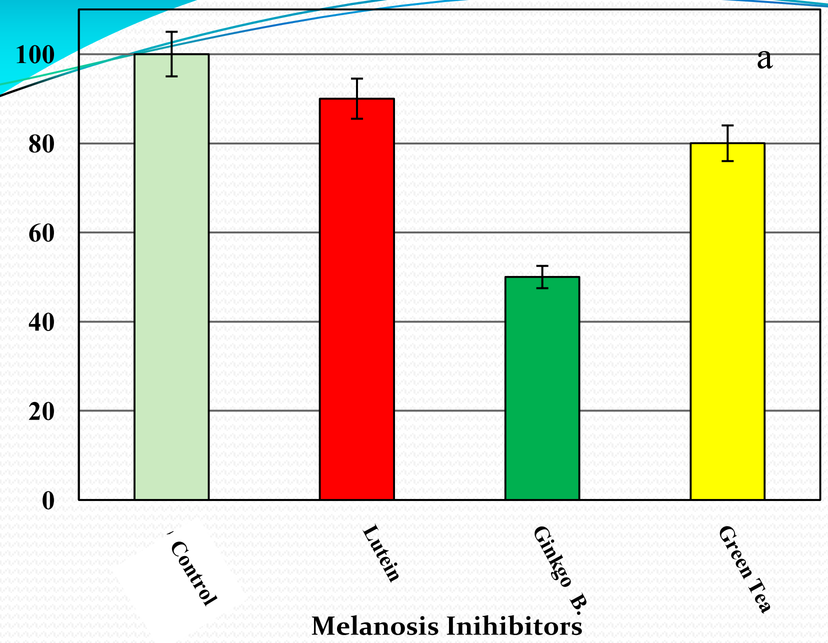
- ✓ This work evaluates the effectiveness of natural extracts (ginkgo biloba, green tea, lutein) on the process of melanosis of three species: pink shrimp (Parapeneus Longirostris), purple shrimp (Aristeus Antennus) and red shrimp (Aristaeomorpha foliacea) in Mediterranean Sea treated in post capture.

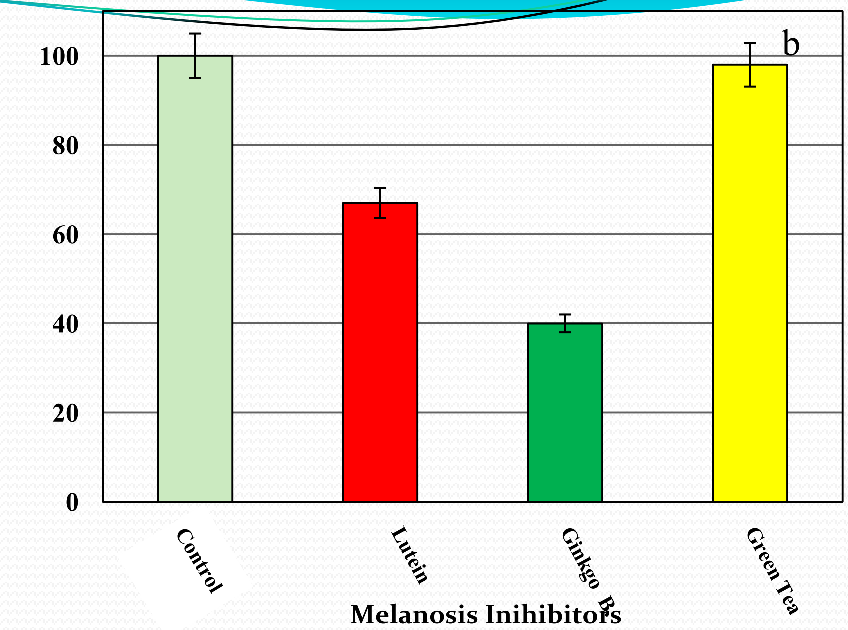
- ✓ The shrimp (pink shrimp, "Parapeneus longirostris", red shrimp "Aristaeomorpha foliace", purple shrimp (Aristeus Antennus) were purchased from Port of Catania (Sicily, Italy).
- ✓ The crustaceans were kept in ice with a shrimp/ice ratio of 1:2 (w/w) and transported to the DISPA laboratory within 1.5 h. Upon arrival, shrimp were washed in cold tap water, air-dried to remove the water in excess present in surface, peeled of cephalothoraxes.
- ✓ The peeled shrimp were homogenized with an Ultraturrax T25 (Janke & Kunkel, Germany) for 5 min in an iced bath, minimizing light and oxygen exposition by wrapping the samples with aluminum foil.

METHODS

- ✓ The PPO determination was carried out according to the method by Espín (1996)
- ✓ The enzyme extraction and the spectrotophometric assay were carried out according to the method of Zamorano et al. (2009) with some modifications.
- ✓ The potential melanosis inhibitors (ginkgo biloba , green tea , lutein) at same concentrations (1%) were individually mixed with crude PPO extract to obtain the final concentrations of 0.5% (w/v).
- ✓ Sensory analysis was conducted by a panel of 10 trained assessors, according to the Quality Index method.

ENZYME ACTIVITY





✓In particular it was observed that the extract of ginkgo biloba has significantly reduced the enzymatic activity of the PPO in all species analysed (in vitro).

✓Treatment with lutein has reduced the activity of polyphenol oxidase only in pink and red shrimps.

✓Unlike treatment with green tea extracts has been ineffective in all species analysed (Fig.1-2-3).

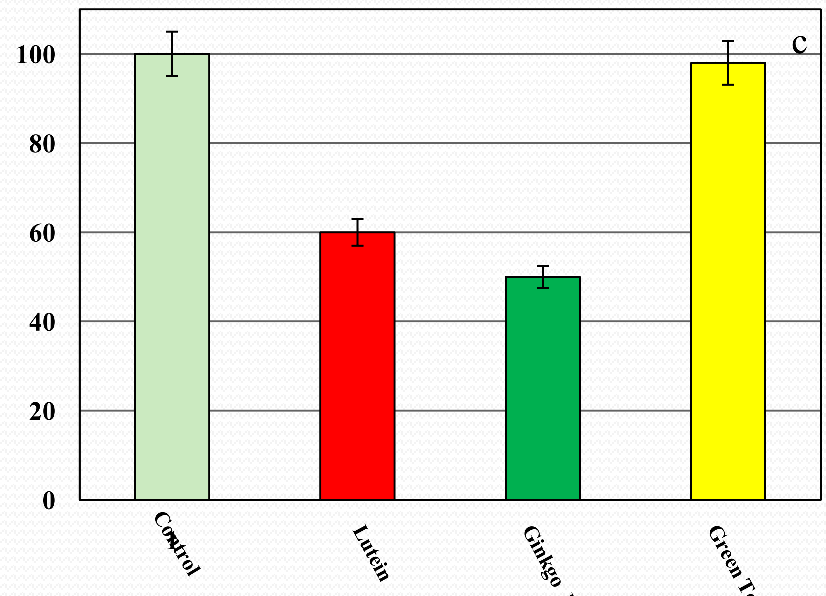


Fig. 1-2-3 Effect of anti-brawing treatments on the inihibition of PPO enzyme from pink shirmp (a), red shrimp(b), purple shrimp (c). Bars represent the standard deviation from triplicate determinations. .

ENZYME ACTIVITY

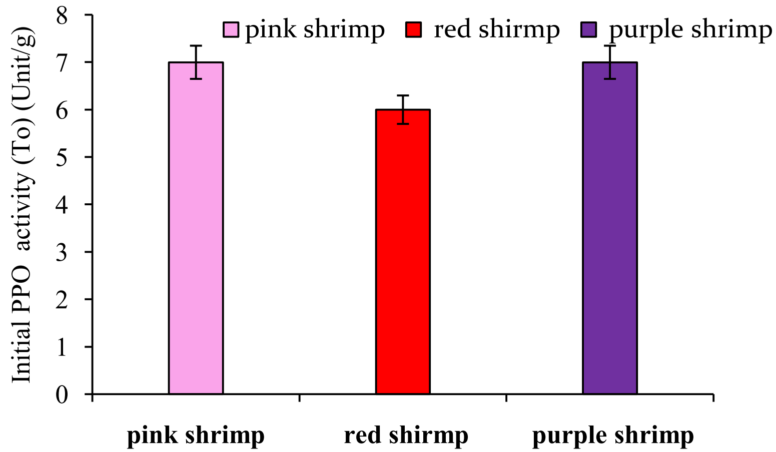


Fig. 4. Initial PPO activities in pink shrimp, red shrimp, purple shrimp.

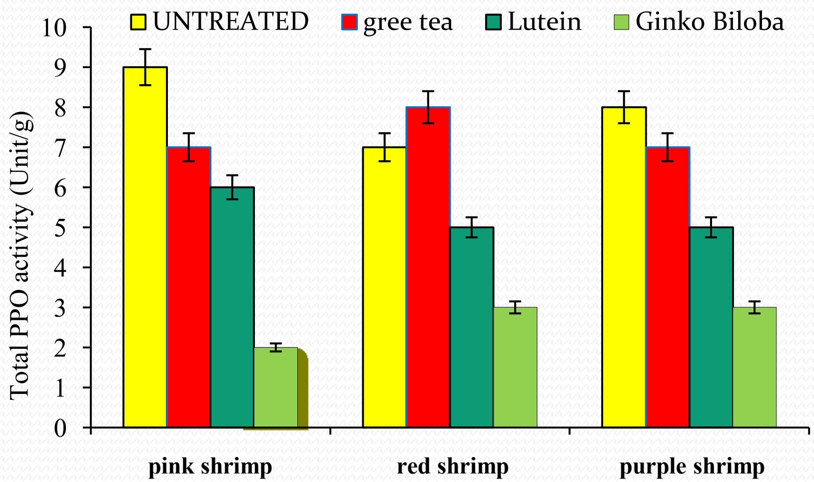


Fig. 5 PPO total activities during storage for pink shrimp, red shrimp, purple shrimp. The symbols show the different treatments in vivo. Bars represent the standard deviation from triplicate determinations. .

✓The enzymatic activities (PPO) of shrimps (Pink Shirimp, Red Shrimp, Purple Shrimp) have been characterized in the fresh product (Fig. 4). The three shrimps analyzed showed initial values of PPO activity comparable, with slightly higher values activity for the shrimps pink and purple

✓The Fig. 2 respectively showed the total enzymatic activity (PPO) in response to different conditions such as dipping in green tea, lutein and gingko biloba for the packaging of minimally processed shirmps.

✓The extract of ginkgo biloba has significantly reduced the enzymatic activity of the PPO at the level of the cephalothorax in all species analysed (Fig.4-5) .

✓Unlike treatment with green tea extracts has been ineffective in all species analysed.

VISUAL ASSESSMENT

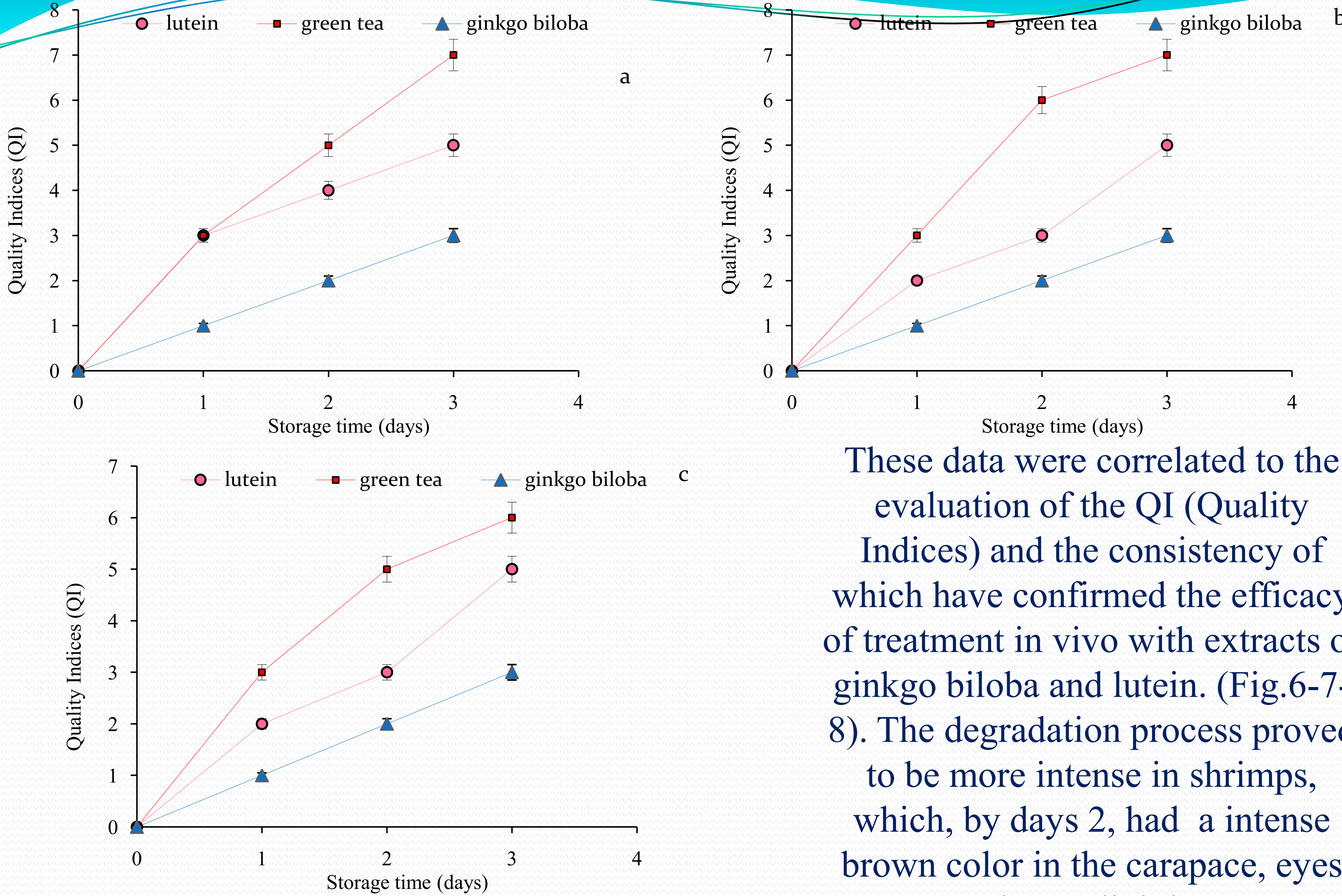


Fig. 6-7-8. Sensory assessment of shrimp (a:pink, b:red, c:purple) during 3 days of storage. Each point represents the mean of 5 independent determinations.

These data were correlated to the evaluation of the QI (Quality Indices) and the consistency of which have confirmed the efficacy of treatment in vivo with extracts of ginkgo biloba and lutein. (Fig.6-7-8). The degradation process proved to be more intense in shrimps, which, by days 2, had a intense brown color in the carapace, eyes glossy slightly.

Conclusions

✓ The addition of these natural extracts can be considered a viable alternative to the treatment of crustaceans in alternative to chemical treatments, such as sulphites present today in commerce.

✓The extract of ginkgo biloba and lutein has significantly reduced the enzymatic activity of the PPO in vivo and vitro.

✓ Moreover these extracts determine a value added to the crustacean thanks to their healthy properties.

✓In general the tests on shrimp minimally processed showed obtaining a shelf-life of 3 days as they did not affect the health component of the product.

✓Future objectives may be to assess the effect of natural extracts on shrimp immediately after capture in the boat.

Thanks for the attention

Fish quality and consumers

Knowledge about fish quality,
Involvement in fish quality and
factors that influence **fish buying behaviour**?

Themis Altintzoglou & Morten Heide
Consumer and Marketing Research, Division of Fisheries, Industry and Market

Typical structure

- Background
- Aim
- Method
- Results
- Conclusion

Background

Fish consumption

- Health benefits
  – More than risks
- Recommended
  – 2 per week
- Low in several countries
  – Especially youth
- Many factors influence consumption
  – Price, quality, convenience, value for money, health, origin, sustainability, household situation, age, education ...

Background

Fish quality

- Sensory characteristics
  - Perceived (in shop?)
  - Experience learning
- Consumers differ
  - Involvement in
    - Fish
    - Aquaculture
  - Knowledge about
    - Fish
    - Aquaculture
  - **Fish Quality?**

Aim

to reveal differences in

- **involvement** in
  fish quality
- **knowledge** about
  fish quality

to measure how they influence

- **factors** that influence
  fish buying behaviour

Methods

738 Norwegian consumers completed a **questionnaire**:

- **Knowledge** about fish quality
- **Involvement** in fish quality
- **Objective** knowledge (fish)
- **Subjective** knowledge (fish)
- **Factors** important when **buying fish**
- **Sociodemographic** characteristics

Results

~43y.o.

~52% females

> couples +/- children

~1/3 1-2 children

~1/3 secondary/BSc/MSc

> office, skill, trade or service employment

~balance between incomes:

- from <300 000nok to >800 000 (100 000 steps)

Representative population of urban and rural Norway

Results

Involvement with fish quality:

- Single parents, singles, couples no children
- Pension, self-employed

- Living with parents, couples +children; ++children
- Students and office

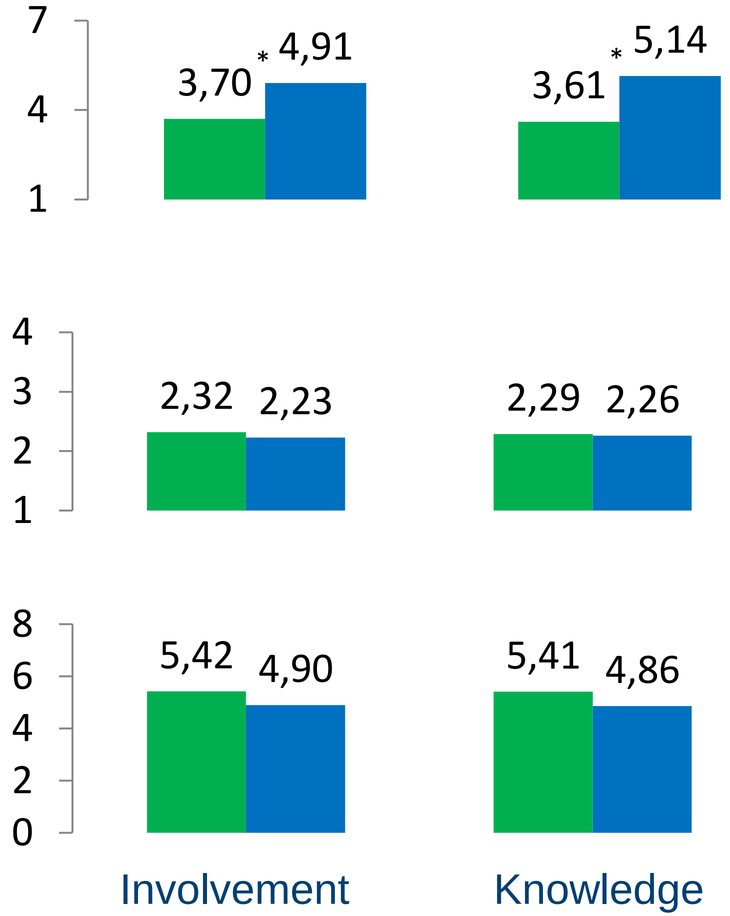
Knowledge about fish quality

- Couples no children
- Pension, self-employed

- Living with parents, single parents, couples +children

Results

- Significant differences between **low** and **high** groups in **subjective knowledge**
- Almost equal **objective knowledge** between **low** and **high** groups
- **Fish consumption** per month not significantly different between **low** and **high** groups



Results

Importance of factors that influence fish buying behaviour

Conclusions

Consumers

- high or low involvement with and knowledge about fish quality

What drives fish buying

- all groups reported using fish quality as a main driver

"Ensure and Communicate quality!!"

Thank you for listening…

…and success with retaining the best fish quality
for the consumers

Shellfish refinement: are consumers able to distinguish between oysters fed with different algal diets?

Jasper van Houcke, Markus Stieger, Jozef Linssen and Joop Luten.

WAGENINGEN UNIVERSITY
WAGENINGEN UR

WEFTA 2014
SEAFOOD science for a changing demand
WEFTA
44th WEFTA meeting · 9-11 June 2014 · Bilbao (Spain)

Introduction: Shellfish refinement

- Common practice in France for oysters
- Shellfish kept in land-based pond systems
- Goals: shellfish refinement (affinage)
    - Increase condition index (shellfish tissue ratio)
    - Influence aroma and taste of shellfish

Example: Marennes-Oleron (Fr)

Refinement ponds

Marennes-Oleron

Oysters in the ponds

Final product

The Fine de Claire Verte

Added value

Schaal- en schelpdieren

Creuses Gillardeau, nr 3

- Gesloten
- Open

Heerlijke oesters van het wereldberoemde oesterhuis Gillardeau! Ze slagen erin om 365 dagen per jaar topoesters te leveren. De Gillardeau's hebben een volle romige smaak, zowel zoet als zoutig.

Per 6 stuks

Aantal: 1 **€ 13,75**

Creuses Zeeuws

- Gesloten
- Open

Deze middelgrote creuse van eigen bodem heeft een romige, minder zilte, delicate en fijne smaak.

Per 6 stuks

Aantal: 1 **€ 7,50**

Aim of study

- The aim of this study was to evaluate whether naïve consumers could distinguish between Pacific cupped oysters fed with different algae.
- Or in other words: does oyster refinement lead to noticeable differences (in sensorial aspects) for consumers.

Methods: Experimental set-up

- Pacific cupped oysters (80-120 g) were fed:
    - *Skeletonema costatum* or
    - *Rhodomonas baltica*
- Feeding rate 30 mg dry weight algae day^{-1} $oyster^{-1}$
- Reared in saline groundwater (30g l^{-1})
- Evaluation after 4 and 7 weeks

Methods: Algae diets

- Different fatty acid profiles (Renaud et al. 1999).

	Rhodomonas	Skeletonema
12:0	-	-
14:0	6.4	16.4
16:0	13.7	15.3
18:0	2.5	1.3
Σ SFA	22.6	33
14:1	0.4	0.4
16:1n-7	3.5	26
18:1n-9	2.4	1.7
18:1n-7	4.7	1.4
Σ MUFA	11	29.4
16:2n-6	-	-
16:2n-7	-	2.6
16:3n-3	-	-
16:3n-4	-	10
16:4n-1	-	1.5
16:4n-3	-	-
18:2n-6	1.9	1.2
18:3n-6	1.8	0.5
18:3n-3	**25.2**	**1**
18:4n-3	22.6	1.8
18:5n-3	-	-
20:4n-6	-	1.4
20:5n-3	**8.7**	**13**
22:6n-3	**4.6**	**1.8**
ΣPUFA	65.8	34.8

Methods: Algae cultivation

- *Skeletonema costatum*
    - Outdoor raceway systems
    - Simplified Walne medium
- *Rhodomonas baltica*
    - Indoor SEACAPS systems
    - Simplified Walne medium

Methods: Biochemical composition

- Lipids
- Protein
- Carbohydrates
- Glycogen
- Fatty acid profiles

Methods: Sensory evaluation

- 3-Alternative Forced Choice tests
- Reference oysters from Lake Grevelingen

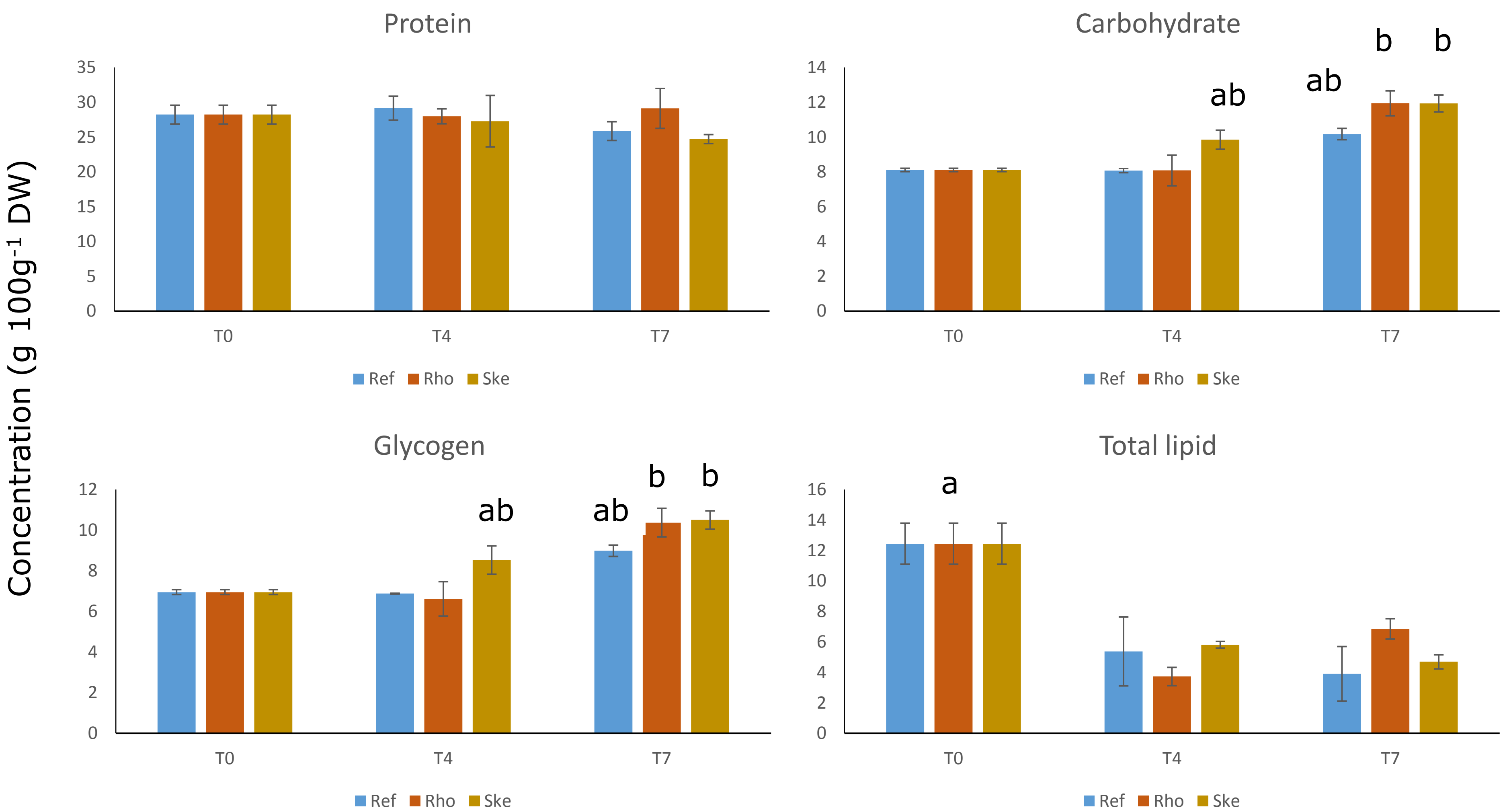
3-AFC	Test groups
a	*Skeletonema* fed oyster vs. reference oysters
b	*Rhodomonas* fed oyster vs. reference oysters
c	*Rhodomonas* fed oyster vs. *Skeletonema* fed oysters

Methods: Consumer panel

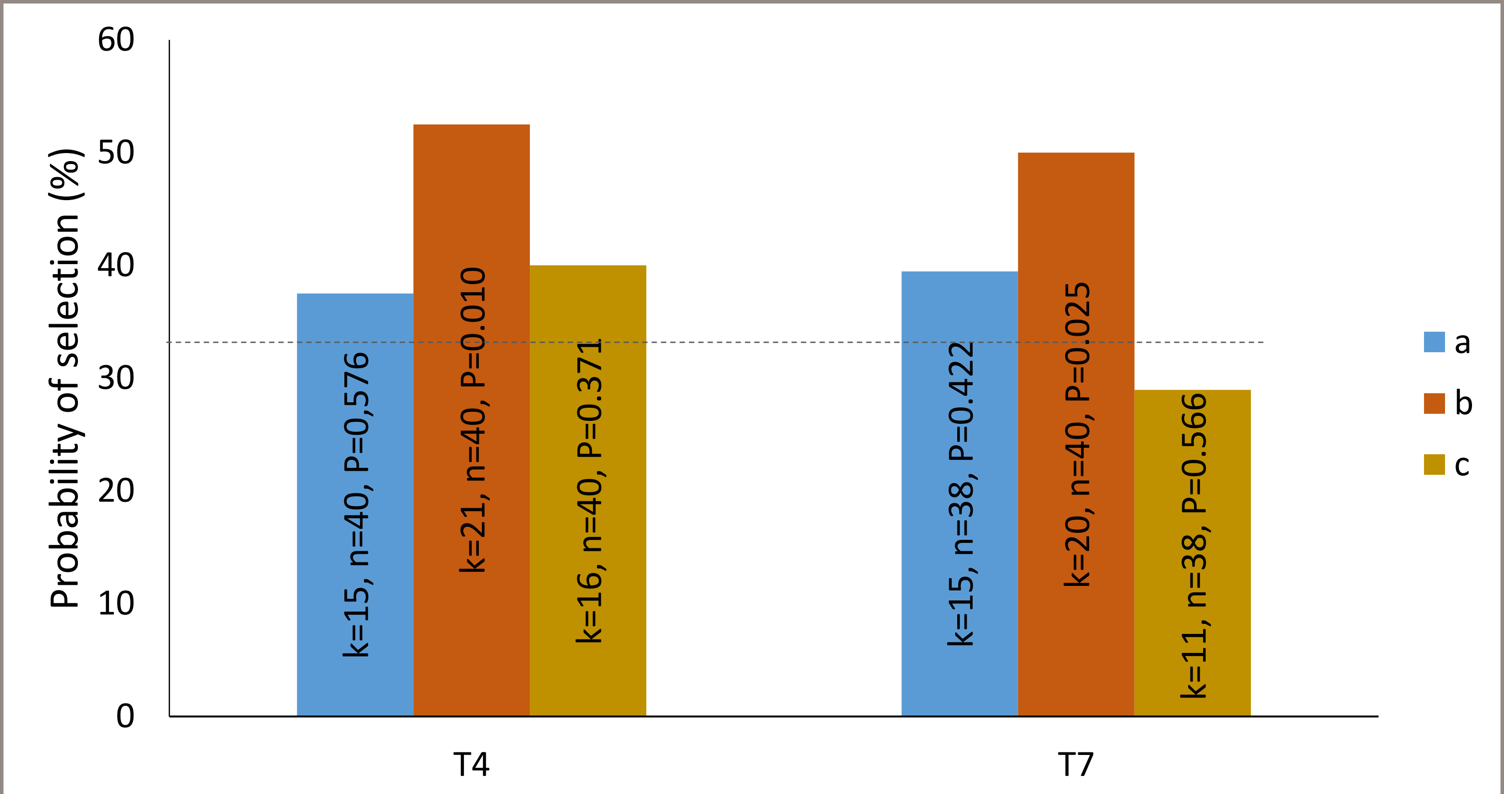
- Untrained consumers recruited from panel in previous studies.
- Consumers participated in 2 out of 3 (a, b & c) AFC tests
- Randomized design

Gender (%)	
Female	26
Male	74
Age (years) (%)	
≤ 25	8
26 - 35	9
36 - 45	7
46 -55	21
> 55	54
Frequency oyster consumption (%)	
Once a year	6
2- 3 times a year	34
4 – 10 times a year	38
> 10 times a year	22

Results: Biochemical composition



Results: Sensory evaluation (3-AFC tests)



a *Skeletonema* fed oyster vs. reference oysters

b *Rhodomonas* fed oyster vs. reference oysters

c *Rhodomonas* fed oyster vs. *Skeletonema* fed oysters

Discussion

- Biochemical composition of oysters comparable with values found in literature.
- Increase of carbohydrates (glycogen) normal effect in refinement of oysters.
- High initial lipid levels could be related to long 'summer period'.
- Refinement effects highest with a water temperature of 14 °C.
- Fatty acid profile of oysters not yet available.

Conclusions

- Naïve consumers are able to distinguish between oyster fed with different algal diets.
- Oysters fed with *Rhodomonas baltica* lead to a different product, as perceived by naïve consumers.

Acknowledgments

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IIM
Instituto de Investigaciones Marinas de Vigo

Correct design of Omega 3 enriched functional food: optimized amounts of DHA and EPA for improving metabolic health

Lucía Méndez*, Manuel Pazos, Eduardo García-Egido, Gabriel Dasilva, José M Gallardo, Josep L Torres, Jara Pérez-Jiménez, M Rosa Nogués, Núria Taltavull and Isabel Medina

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WEFTA 2014
SEAFOOD science for a changing demand
44th WEFTA meeting · 9-11 June 2014 · Bilbao (Spain)

Background

Bioactive effect of Marine ω-3 EPA and DHA

Metabolic diseases diet-induced :

Cardiovascular diseases

Type-2 diabetes

Functional foods enriched in

ω-3 fatty acids

PROBLEMS:

Origin no distinguished

ALA and Marine oils

EPA and DHA induce different health properties

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Objetives

Formulation of fish oil enriched foods: OPTIMIZATION FOR HEALTH BENEFITS

Optimal ratio EPA and DHA → ↑ **Health effects**

Effect of fish oil on OXIDATIVE STATUS, key factor underlying disorders diet-induced

↓

Protein carbonylation

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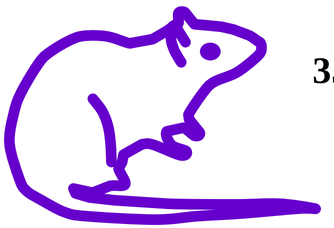
Experimental design



35 ♀ WISTAR RATS
(n=7)

EPA:DHA

EPA	DHA	1:1
EPA	DHA	2:1
EPA	DHA	1:2

LINSEED	ω-3 ALA
SOY	ω-6 LA

13 WEEKS

WEEKLY ORAL DOSE

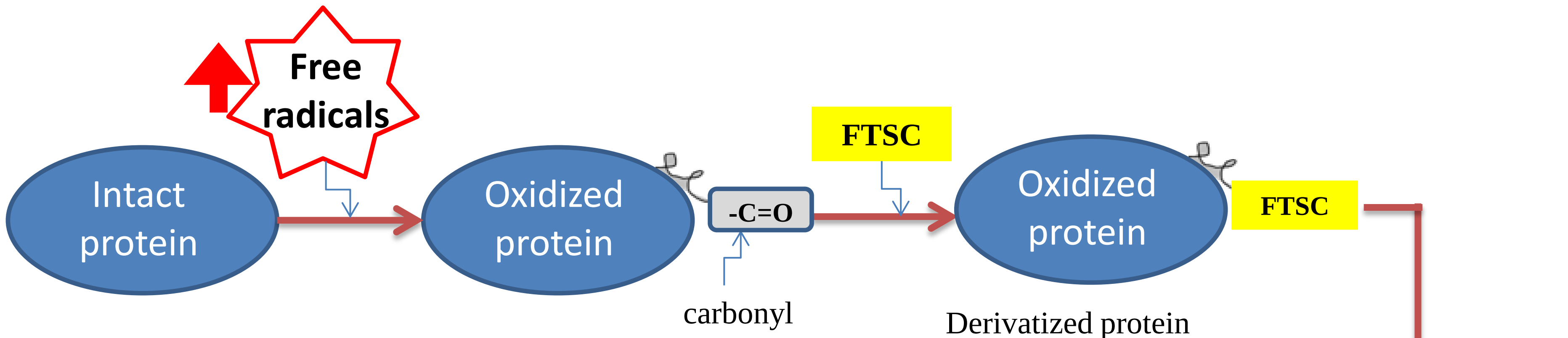
OXIDATIVE STATUS

Protein Carbonylation

Antioxidant Activities and Oxidative Stress Biomarkers

Lucía Méndez; luciamendez@iim.csic.es

Proteomics for studying of protein carbonylation

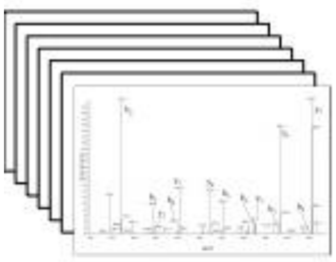


1-D/2-D Electrophoresis gels

UV Transilluminator

Image analysis

Protein identification by LC-ESI-IT-MS/MS



PLASMA 

LIVER 

SKELETAL MUSCLE 

KIDNEY 

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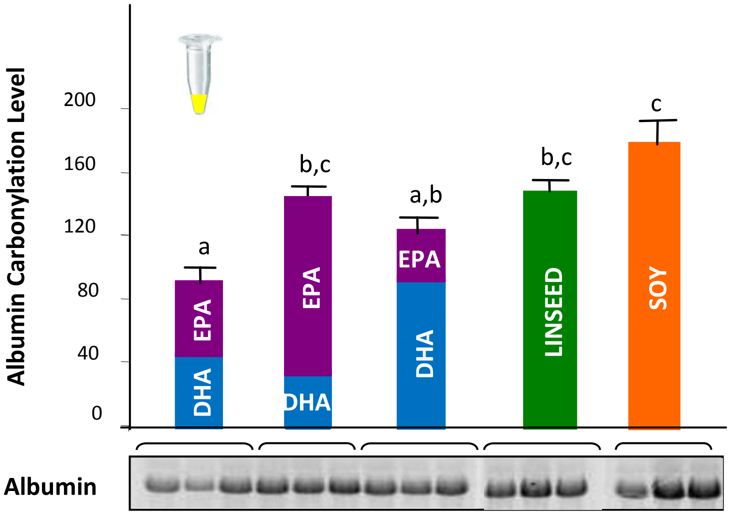
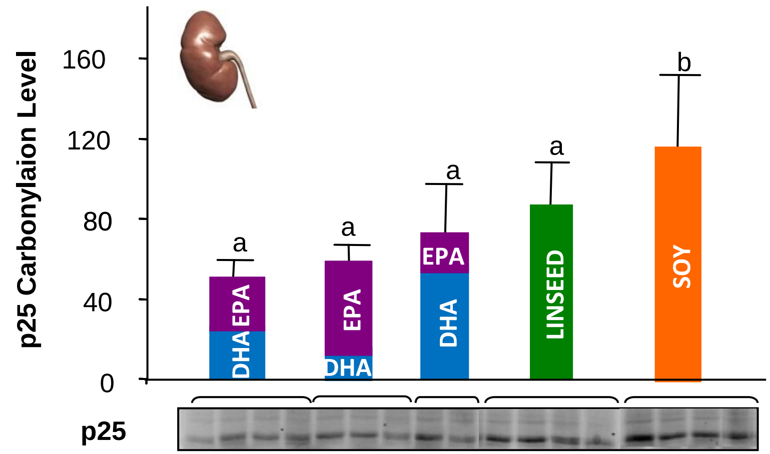
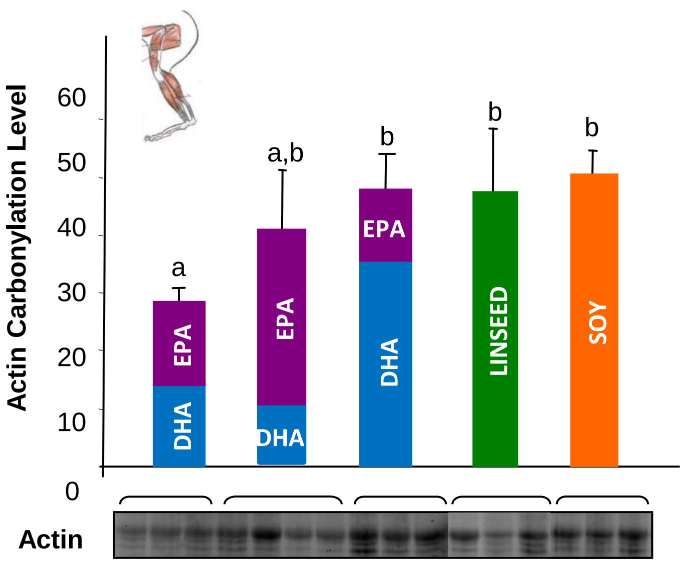
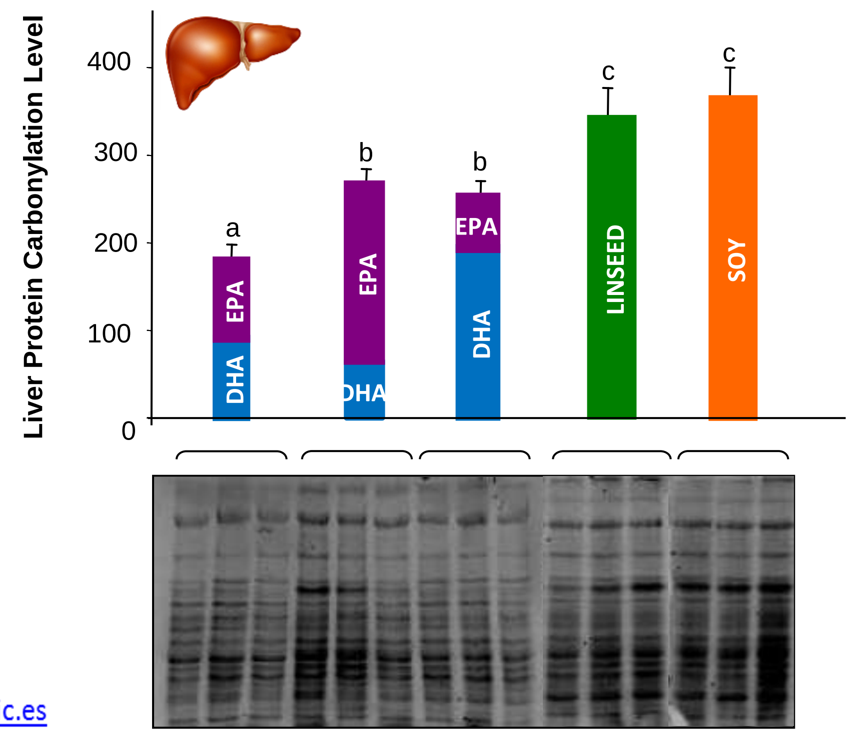
Effect on diet on Protein carbonylation









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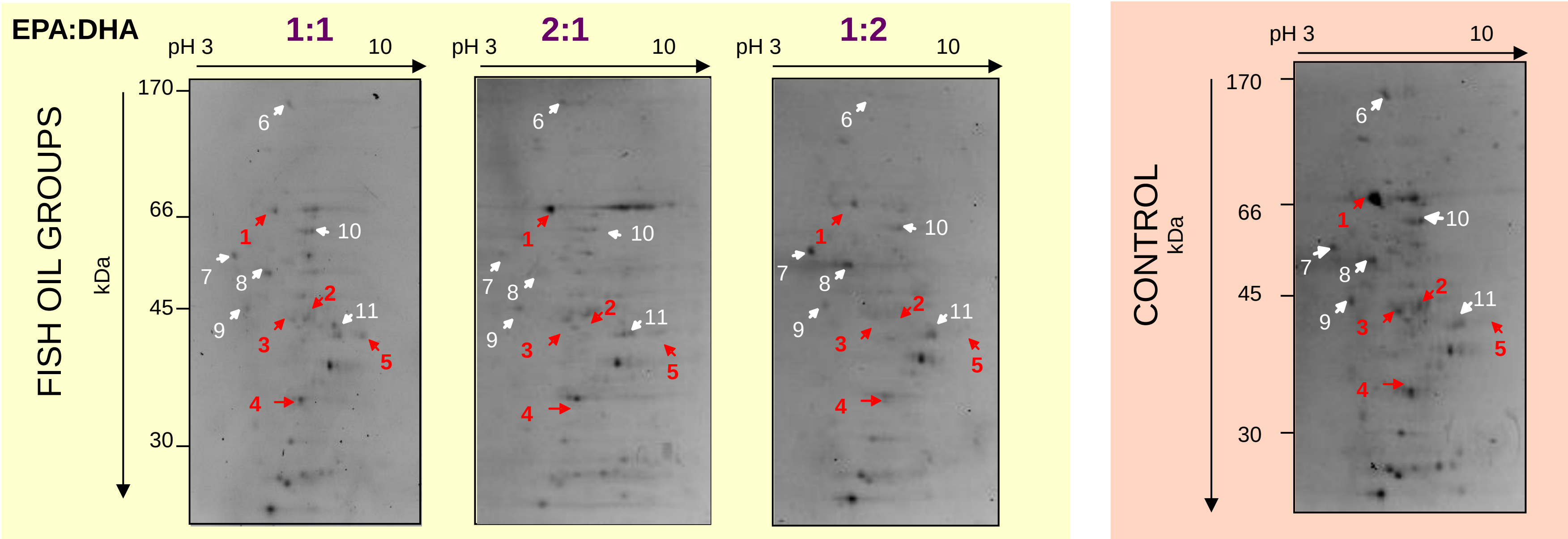
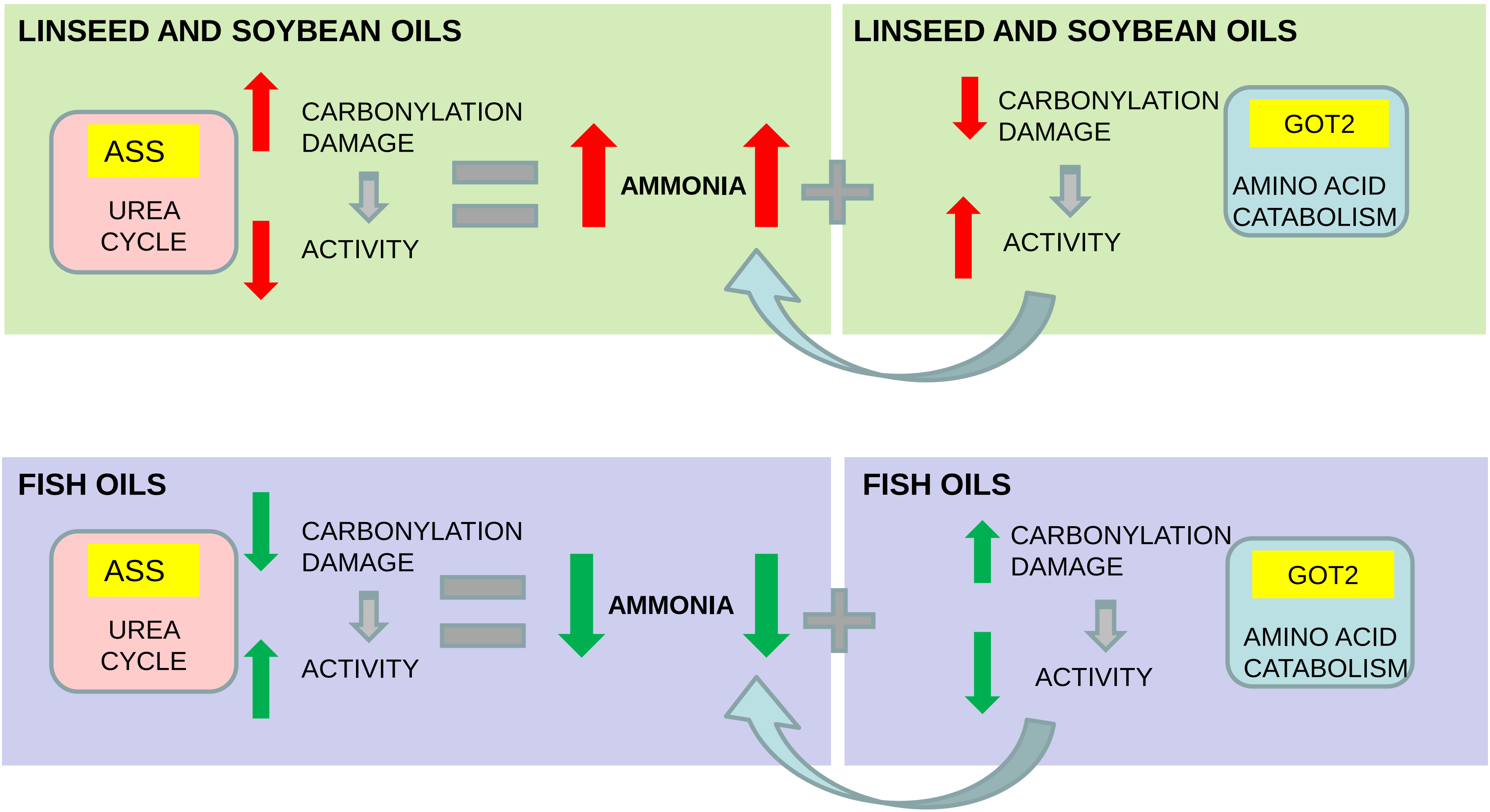
LIVER

Effect of diet on Protein carbonylation



Spot Nº	Gene name	Identification	Carbonylation level Fish oil Vs. Control
1	Alb	Serum albumin	⬇
2	Ass1	Argininosuccinate synthetase	⬇
3	Hpd	4-hydroxyphenylpyruvic acid dioxigenase	⬇
	Upb1	β-Ureidopropionase	
	Acadl	Long-chain acyl-CoA dehydrogenase, mitochondrial precursor	
4	Akr1c9	3-alpha-hydroxysteroid dehydrogenase	⬇
5	Got2	Aspartate aminotransferase, mitochondrial	⬆
6	Cps1	Carbamoyl-phosphate synthase [ammonia], mitochondrial	=
7	P4hb	Protein disulfide-isomerase	=
8	Aldh2	Aldehyde dehydrogenase, mitochondrial	=
9	Actb	Actin, cytoplasmic 1	=
10	Cat	Catalase	=
11	Adh1	Alcohol dehydrogenase 1	=

Effect of diet on Protein carbonylation



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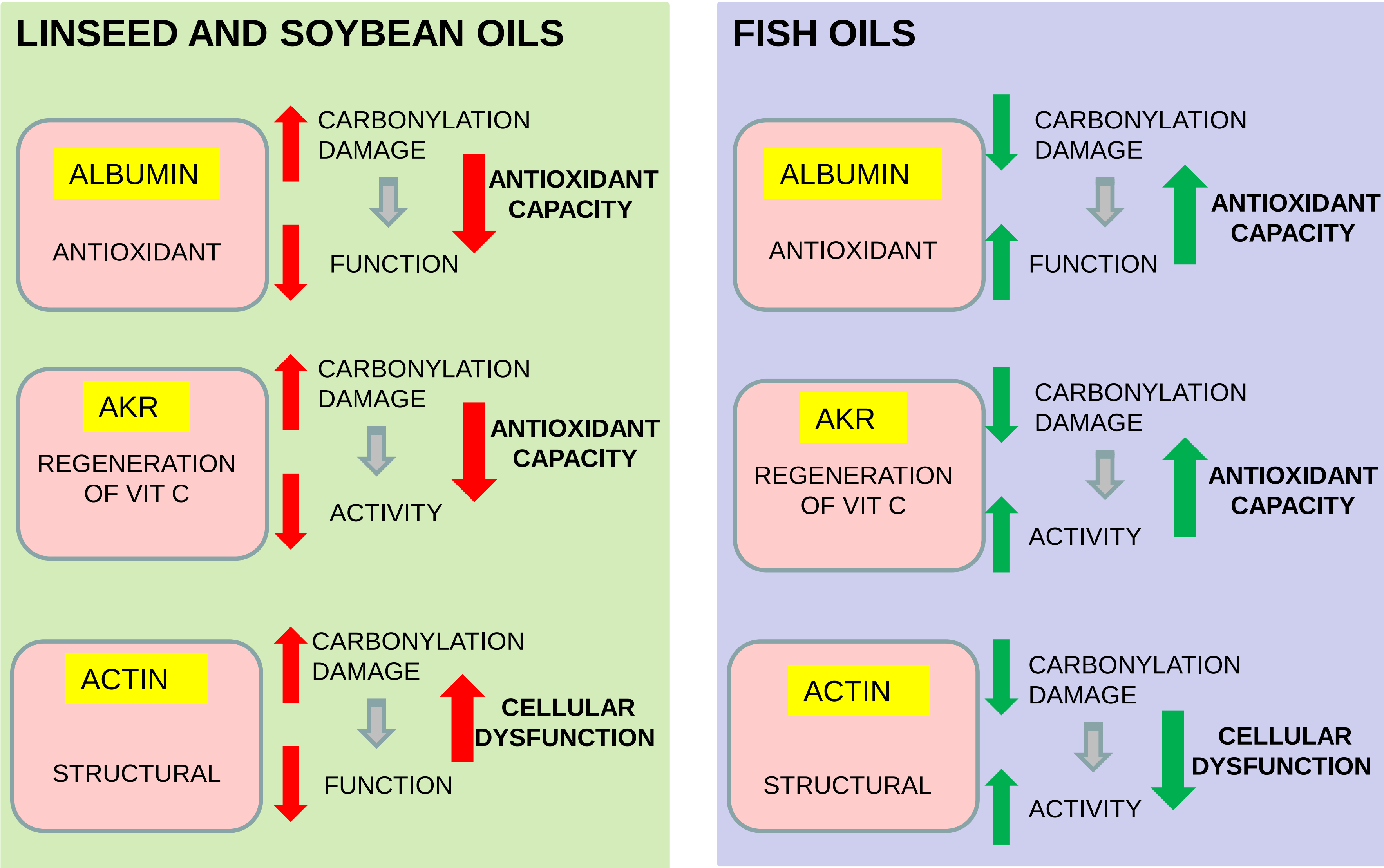
Effect of diet on Protein carbonylation



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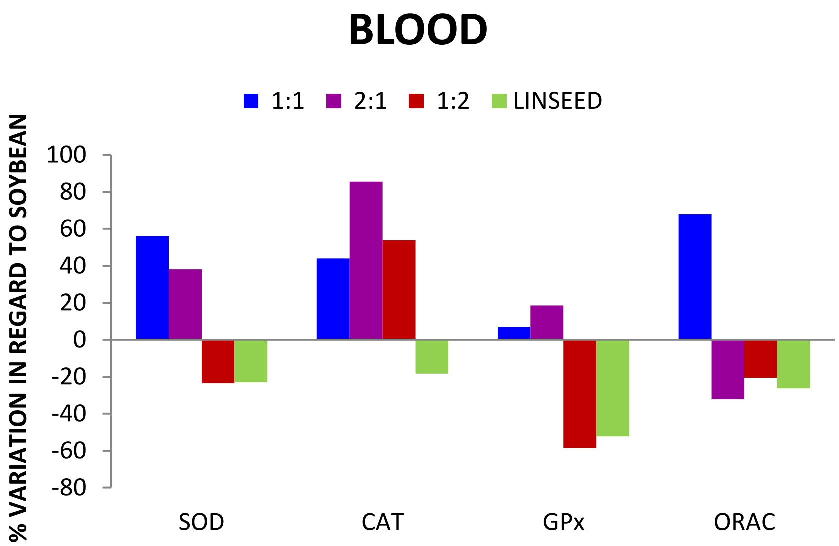
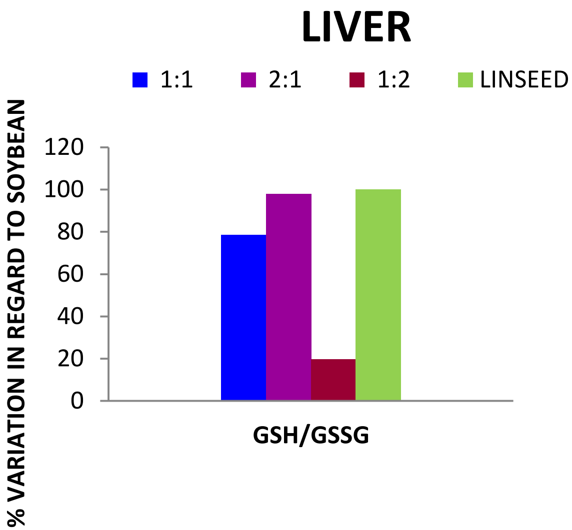
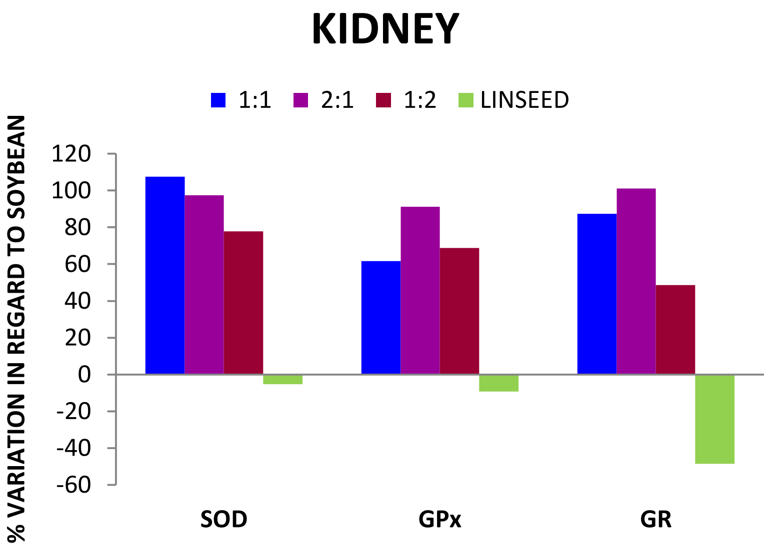
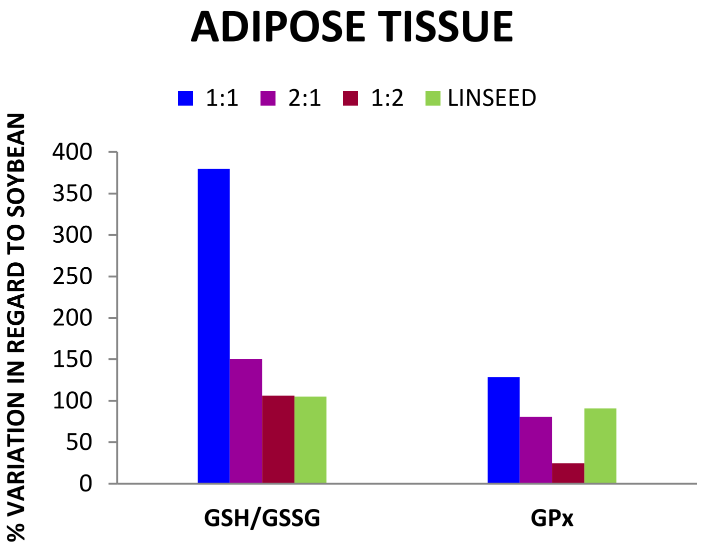
Results: Antioxidant activities and Oxidative Stress biomarkers









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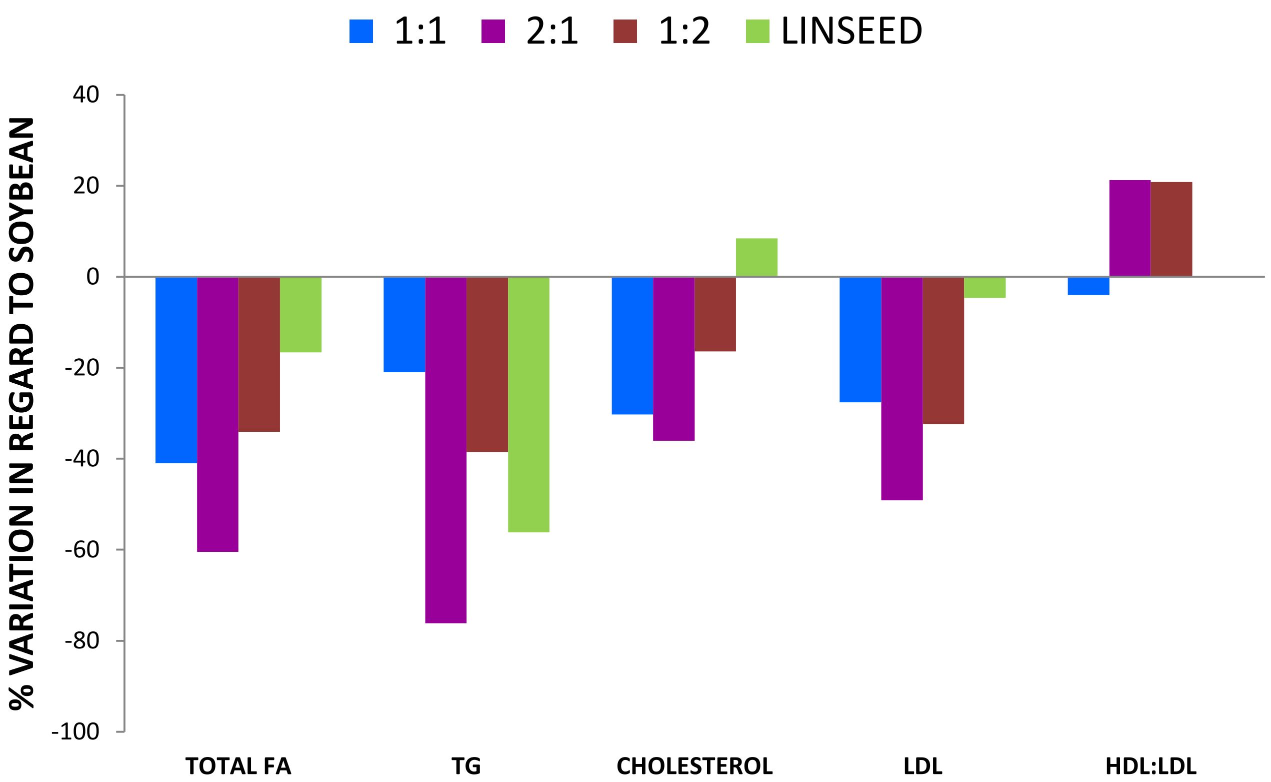
Results: Plasma lipid profiles



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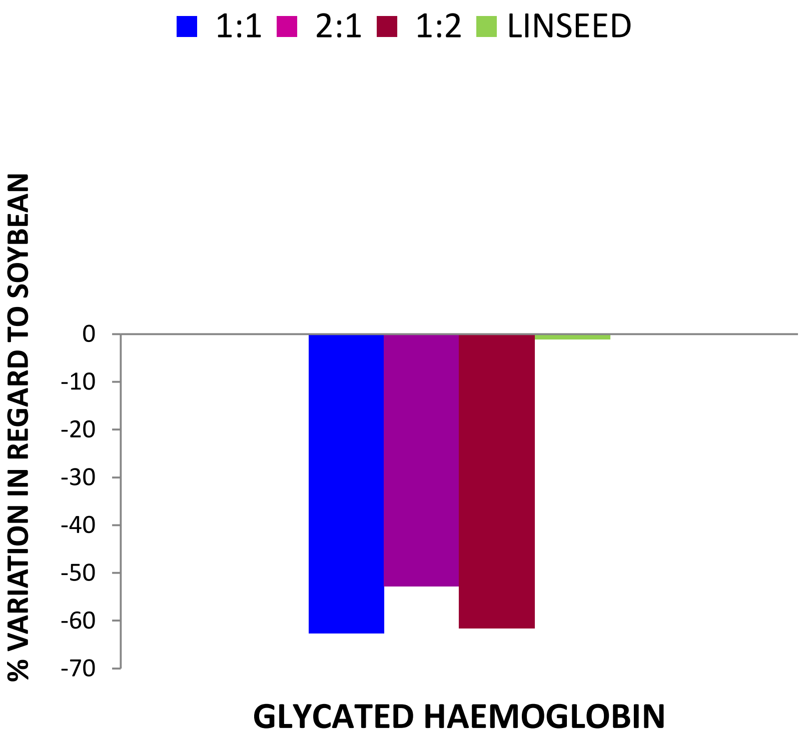
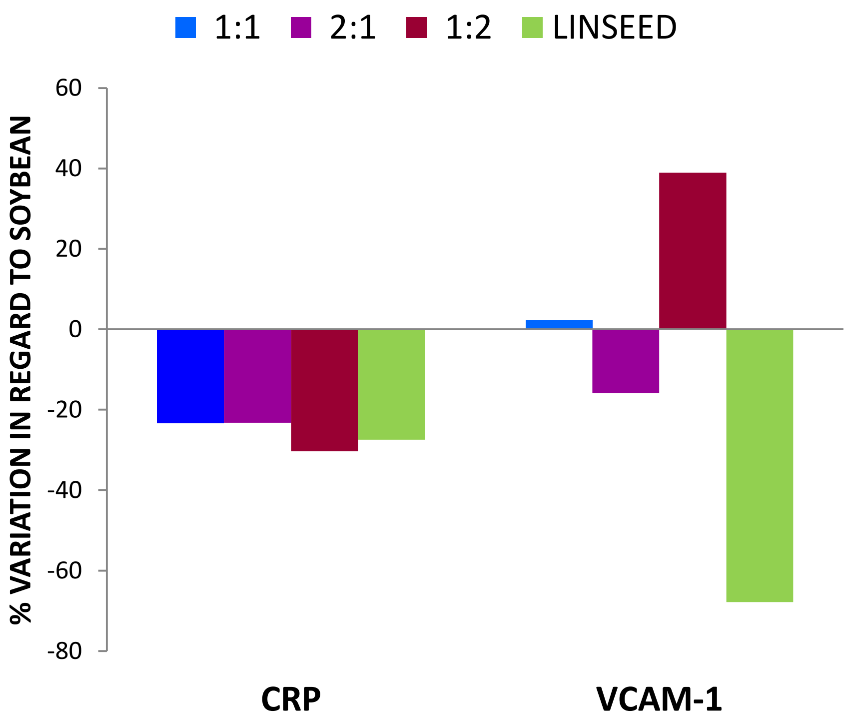
Results: Insulin Resistance and CVD risk biomarkers





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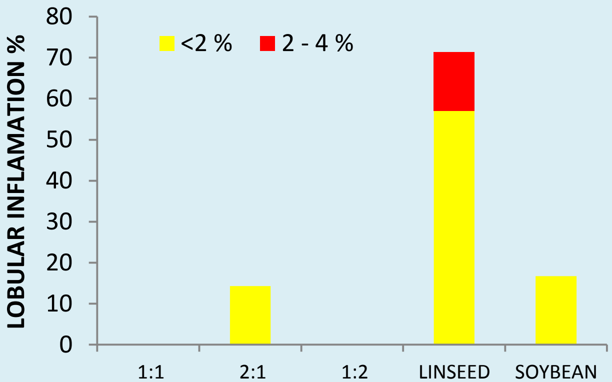
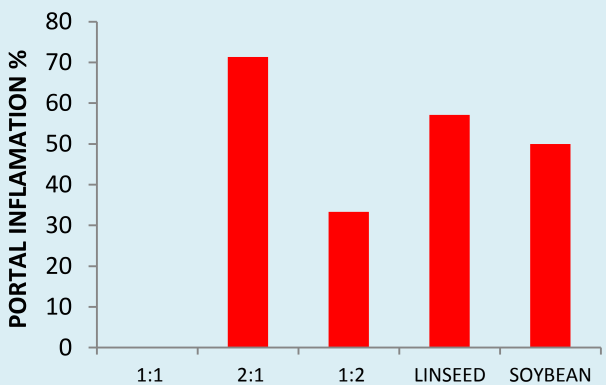
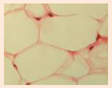
Results: Tissue histological evaluation

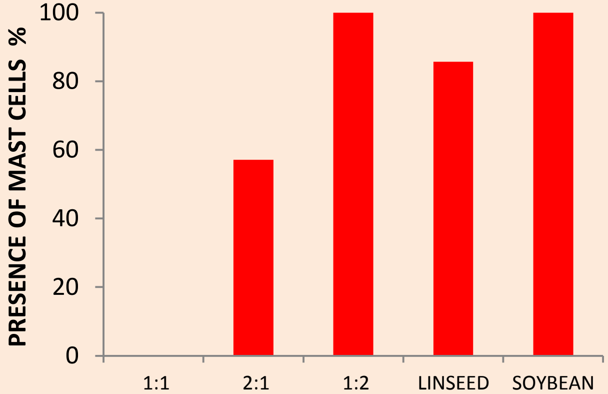
LIVER

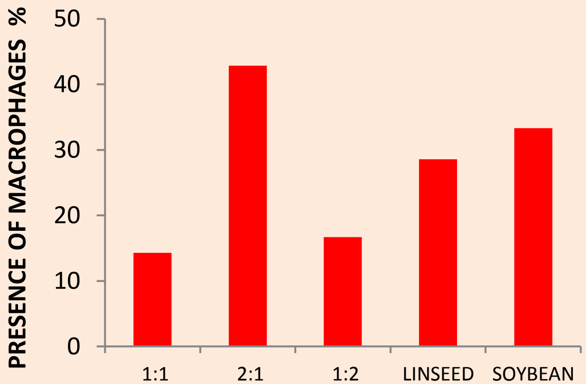






ADIPOSE TISSUE





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Summary

		EPA:DHA 1:1	EPA:DHA 2:1	EPA:DHA 1:2	LINSEED
BLOOD	Albumin carbonylation				
	SOD				
	CAT				
	GPx				
	ORAC				
	LDL-ox				
	Total FA				
	TG				
	Cholesterol				
	HbA1c				
	VCAM-1				
LIVER	Protein carbonylation				
	GSH/GSSG				
	Lobullar inflamation				
	Portal infamation				
ADIPOSE TISSUE	GSH/GSSG				
	GPx				
	Presence of mast cell				
	Presence of macrophagues				
KIDNEY	SOD				
	GPx				
	GR				

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Conclusions

Fish oils display more health benefits than linseed diet

EPA:DHA 1:1 ratio is the best fish oil proportion to improve most of the parameters analyzed

EPA:DHA 1:1 ratio specially reduces protein damage and improves general oxidative status

Fish oils and specially EPA:DHA 1:1 ratio seem to influence specific molecular pathways (urea cycle, cellular dysfunction and redox homeostasis) that could explain some of their health effects

EPA:DHA 2:1 ratio improves plasma lipid profiles

Functional foods with higher EPA amounts (1:1 and 2:1 ratios) have more success in improving health markers

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THANK YOU VERY MUCH FOR YOUR ATTENTION!

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WEFTA 2014

SEAFOOD Science for a changing demand

PRESENTATIONS

INDUSTRY SESSION

Hiperbaric
HIGH PRESSURE PROCESSING

WEFTA 2014, Bilbao

Francisco Purroy

Technical Sales Manager – Projects Europe&Asia-Pacific

Hiperbaric.com

Hiperbaric

Hiperbaric (formerly NC Hyperbaric) designs, manufactures and markets industrial High Pressure Processing (HPP) equipments for food processing since 1999

Market leader with 132 HPP industrial machines installed in 26 countries and more than 80 companies for meat, vegetable, fruits, dairy, seafood, toll processing…

¿Who we are?

Hiperbaric factory in Burgos, Spain

Hiperbaric USA, our subsidiary in Miami, USA

Hiperbaric Range

The current largest offering of industrial HPP equipment, from 250Kg/h up to more than 3,000Kg/h for the new Hiperbaric 525

HIPERBARIC | 55

The Hiperbaric 55 is ideal equipment for small/medium production, product development and market tests. For instance: SME's with relatively low production environments, food companies servicing "niche" markets, seasonal production, or installed in a R&D centre willing to not only investigate High Pressure Processing, but to provide real food concepts to the market and test them before upscaling.

Its robust and compact design, with one integrated single intensifier, makes it easy and quick to install in almost any facility. It is a perfect fit for the first steps into High Pressure Processing.

Equipment	Throughput (Kg/h)	Vessel Volume (liters)	Vessel Diameter (mm)	Footprint (sqm)
Hiperbaric 55	255 (562)	55 (14.5)	200 (7.9")	22 (237)

HIPERBARIC | 120

The Hiperbaric 120 is designed to service medium sized industries in need of consistent production while minimizing the initial investment. Together with the Hiperbaric 135, it is part of our range of equipment solutions for food industries with average to high production.

Hiperbaric 120 brings a highly innovative concept to High Pressure Processing. It is the first HPP equipment in the world with two integrated, but independent, high pressure intensifiers; it has no external modules, thus minimizing space requirements and facilitating hygiene of the area.

This piece of equipment was developed by integrating the most reliable components with the most advanced designs, to provide highly productive and profitable High Pressure Processing.

Equipment	Throughput (Kg/h)	Vessel Volume (liters)	Vessel Diameter (mm)	Footprint (sqm)
Hiperbaric 120	525 (1157)	120 (31.7)	200 (7.9")	37 (3989)

HIPERBARIC | 135

Hiperbaric 135 is targeted for medium-high food production environments. Its 135 litre capacity vesse together with its bigger diameter, 300 mm, provide an improved filling ratio and allows the processing of large products (whole hams, large formats etc.), enables it to achieve throughputs of more than 500 Kg/h.

Its horizontal design and a contained footprint make it very easy to install, operate in an ergonomic way, and perform maintenance. The standard configuration includes two high pressure intensifiers which can work separately for optimized reliability and uptime, an exclusive characteristic of the Hiperbaric High Pressure Processing range.

A pioneer middle sized industrial equipment, it has been installed in 4 continents (America, Europe, Asia and Oceania) and in such a variety of sectors such as: meat, fruit and vegetable, juices, seafood and dairy. Many technological centers, international reference in new and innovative food products development, have this equipment as one of its main R&D tool.

Equipment	Throughput (Kg/h)	Vessel Volume (liters)	Vessel Diameter (mm)	Footprint (sqm)
Hiperbaric 135	650 (1500)	135 (36.7)	300 (11.8")	39 (420)

HIPERBARIC | 300

Since its conception back in 2002, Hiperbaric 300 very rapidly became the benchmark in big Hiperbaric units. Developed from the start as a game changer in the High Pressure Processing world, it has surpassed expectations. Its optimized vessel volume (300 l.) and diameter (300 mm) along with outstanding cycle times, make it the classic high production equipment; the target for any food industry with demanding throughput requirements.

Constant improvement of Hiperbaric 300 by our Engineering Department has made it become the fastest industrial HPP equipment in the world, in its 6 high pressure intensifier version, and provided it with maximum reliability.

Equipment	Throughput (Kg/h)	Vessel Volume (liters)	Vessel Diameter (mm)	Footprint (sqm)
Hiperbaric 300	1300 (2874)	300 (79.3)	300 (11.8")	61 (657)

HIPERBARIC | 420

The Hiperbaric 420 is the best-selling HPP equipment in the market. Its productivity and profitability have been far ahead of any other equipment in the world and it represents an important improvement in efficiency and economy for food industries.

Hiperbaric 420 includes all the new features and developments in components and material design that our engineers from the R+D Department achieved, making it the most reliable and highly productive from a new generation of industrial high pressure processing equipment. Its 420 litre capacity and 380 mm diameter vessel together with its 8 high pressure intensifiers, allow this equipment to process more than 2 Tonnes per hour.

The Hiperbaric 420 was awarded the IFT Innovation Award (Institute of Food Technologist) in 2008.

Equipment	Throughput (Kg/h)	Vessel Volume (liters)	Vessel Diameter (mm)	Footprint (sqm)
Hiperbaric 420	2200 (4800)	420 (111)	380 (15")	56 (601)

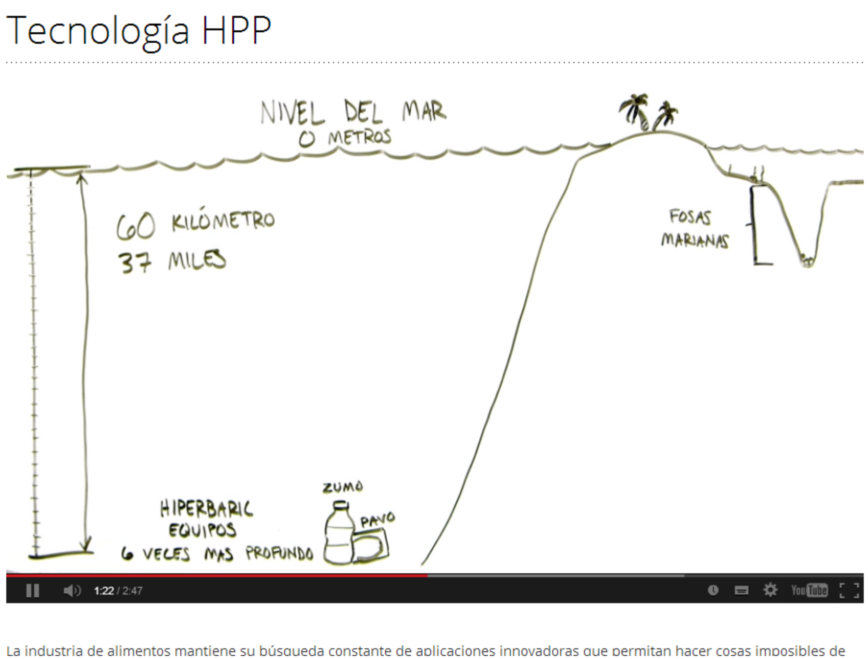
HIPERBARIC | 525

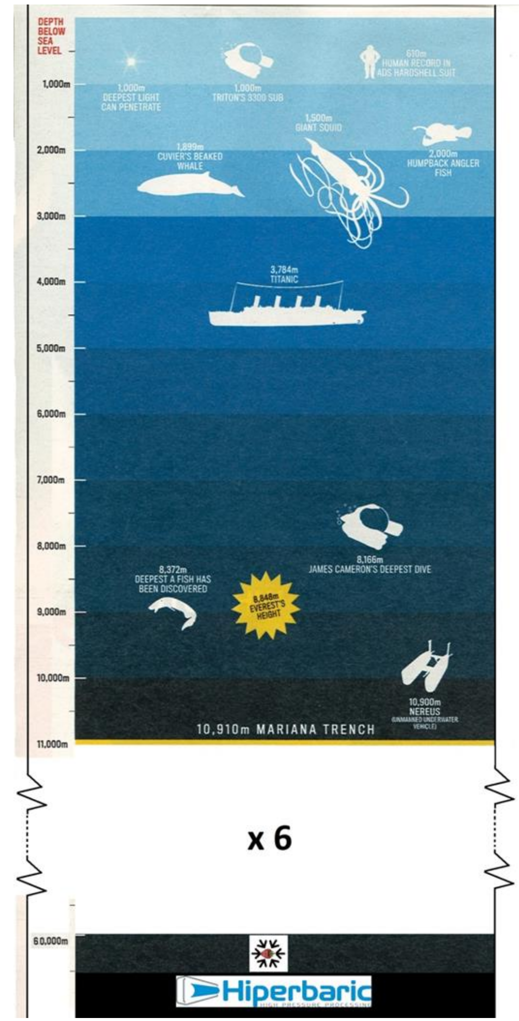
Our latest addition, following the demands of those customers with the largest production environments. The biggest, and most productive, HPP system in the world.

With a 525 litre capacity and large 380 mm diameter, it shows throughputs of over 3,000 Kg of product per hour. It's capacity is unmatched and the resulting costs per Kg of product being processed, are the cheapest ever possible.

Equipment	Throughput (Kg/h)	Vessel Volume (liters)	Vessel Diameter (mm)	Footprint (sqm)
Hiperbaric 525	3000 (6000)	525 (14.5)	380 (15")	61 (657)

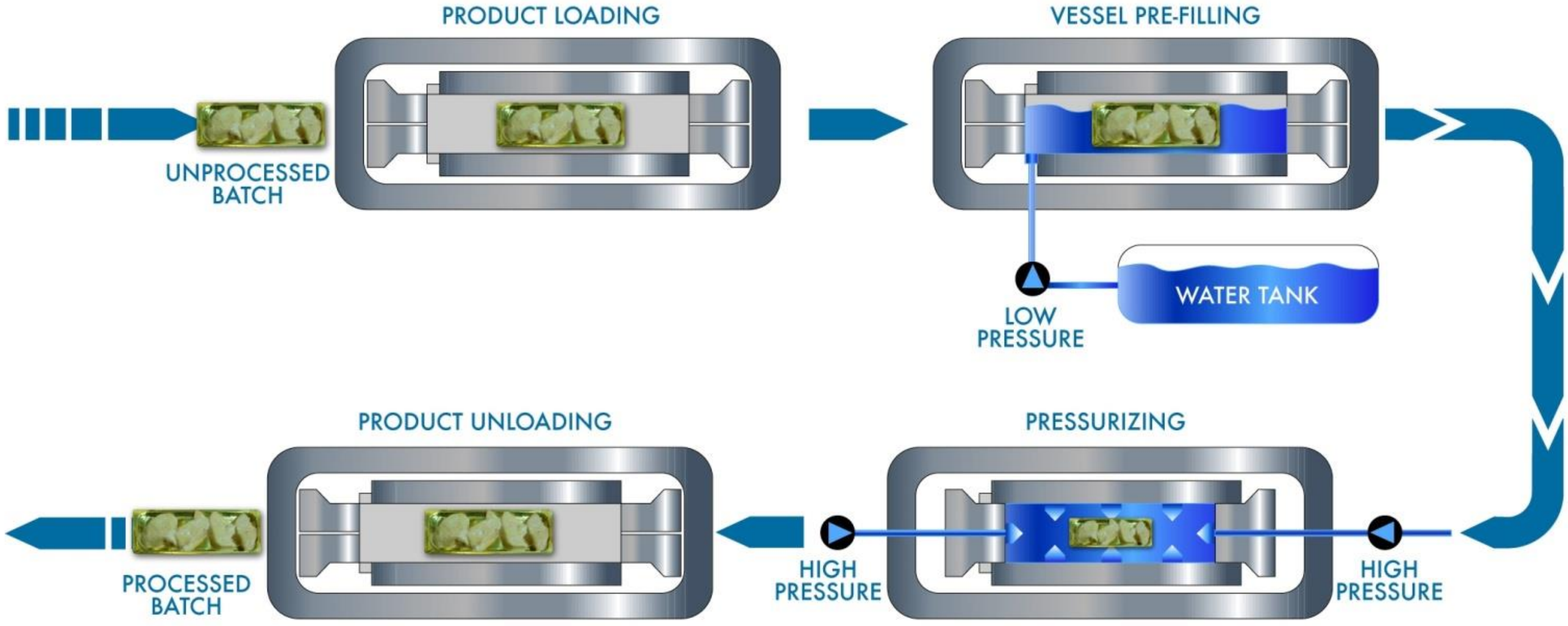
What is HPP, how does it work?



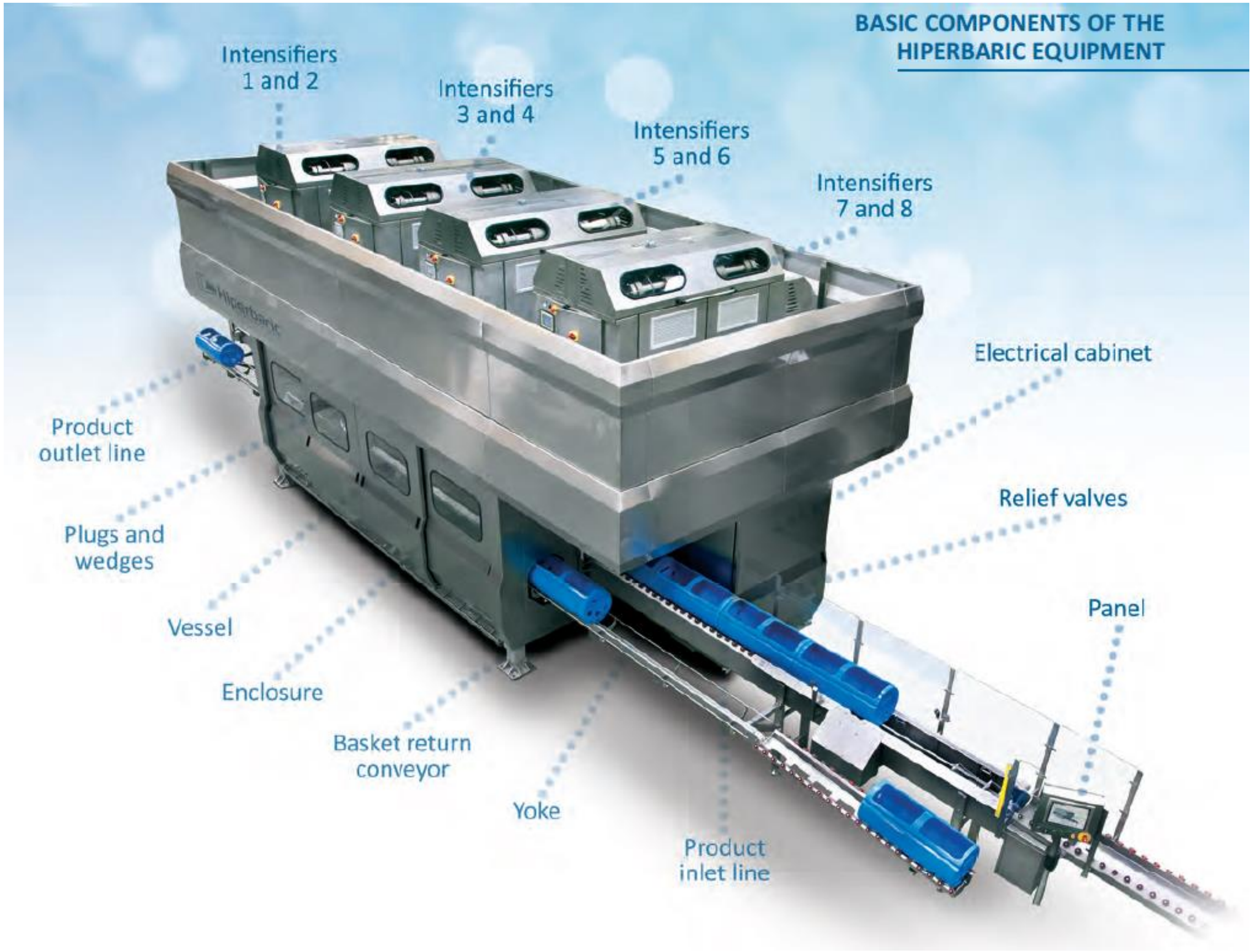


PRESSURE	HEAT
Instantaneous transmission	Slow transmission
No gradients	Temperature gradients
Identical in every point	Not uniform

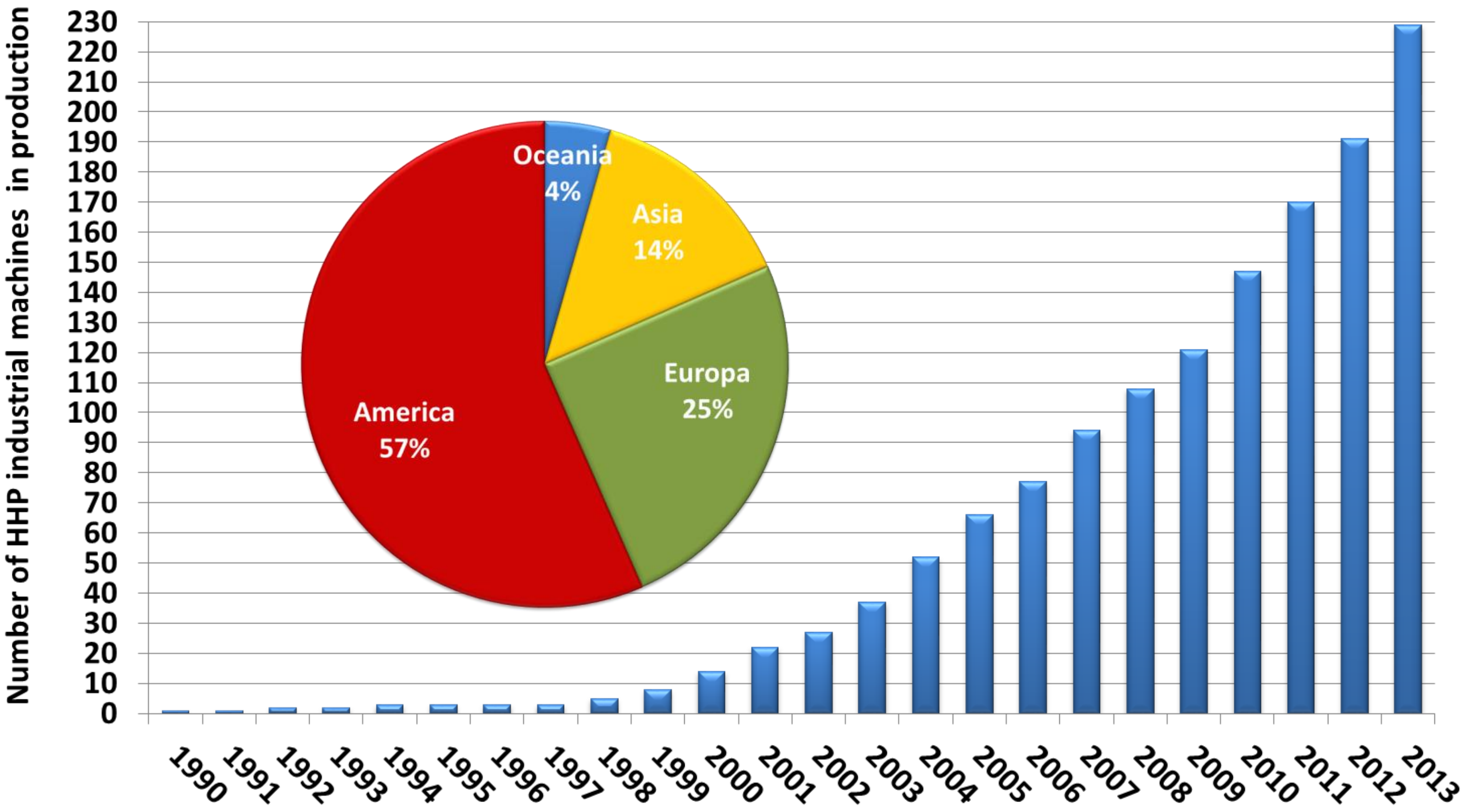
How does an industrial HPP equipment work?



Main components of HPP equipment



Evolution of number of HPP machines



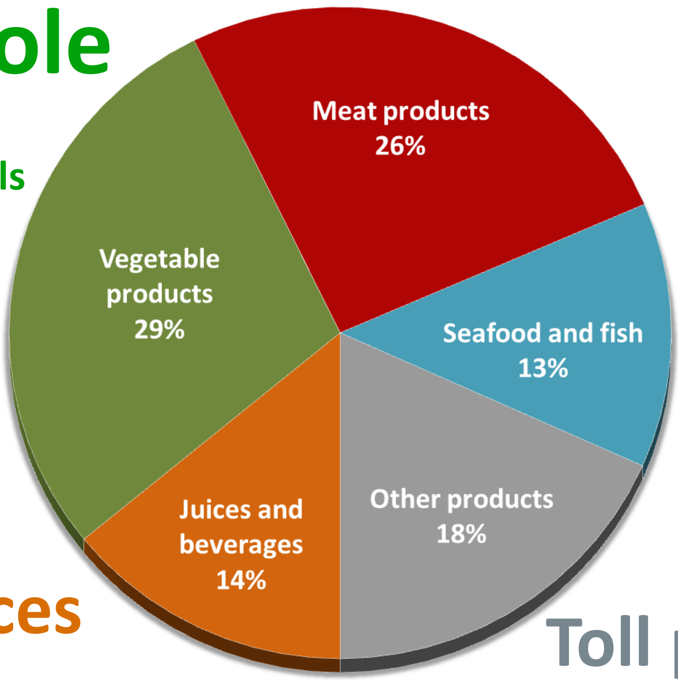
Total number of HPP production machines, end of 2013 : 229

(Not counting 15 machines already dismantled – all of them installed before 2003)

Industrial HPP machines share by food sector (2013)

Pathogen-free sliced cooked meats
Preservative-free deli meats
Listeria-free dry-cured products
Raw beef products
Preservative-free sausages

Guacamole
Wet salads
RTE vegetable meals



Oyster shucking
Lobster meat extraction
Clams & mussels shucking
RTE seafood meals

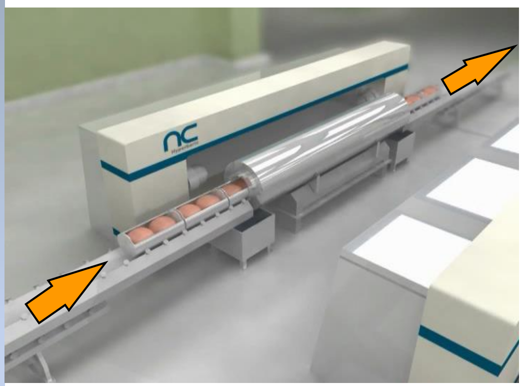
Fruit juices
Smoothies
Vegetable juices

Toll processing
Cheese products

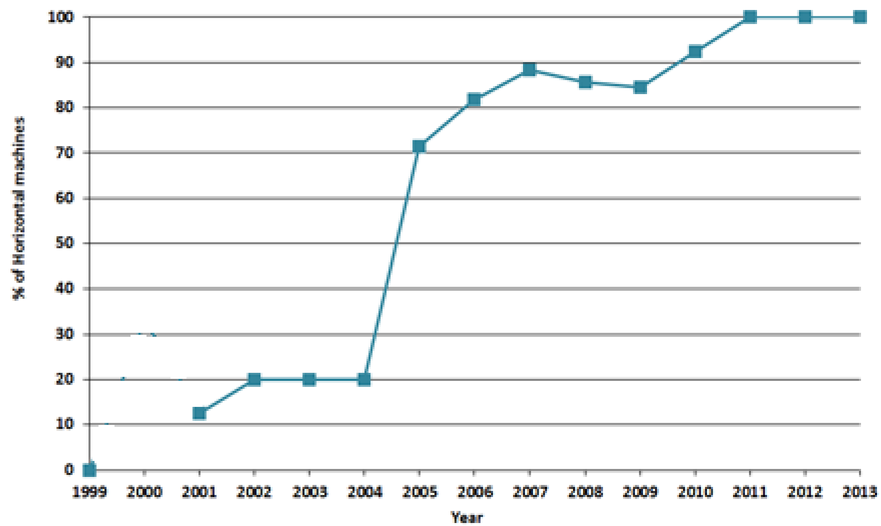
Global HPP food production in 2012 : 350,000,000+ Kg / 770,000,000+ lbs

Horizontal design

Improves product traceability

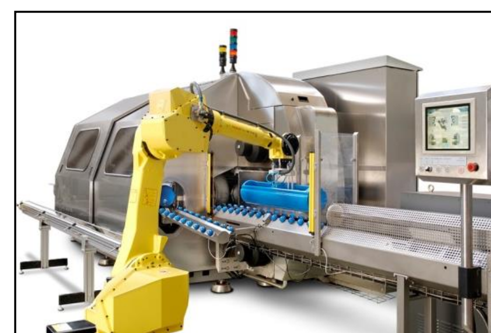


Evolution of % HPP horizontal equipment



Easier to install

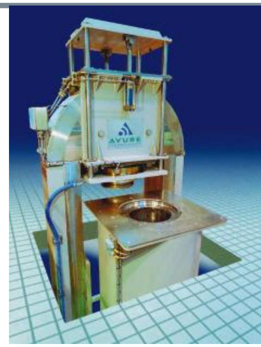
Facilitates loading , unloading, automation…



Hiperbaric
HIGH PRESSURE PROCESSING

EVOLUTION: SIZE, VOLUME

2001



215 l

300 l

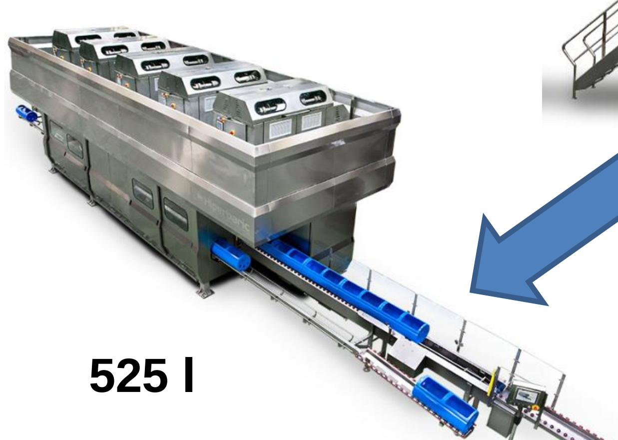
2004

350 l

2008

420 l

2010



2013

525 l

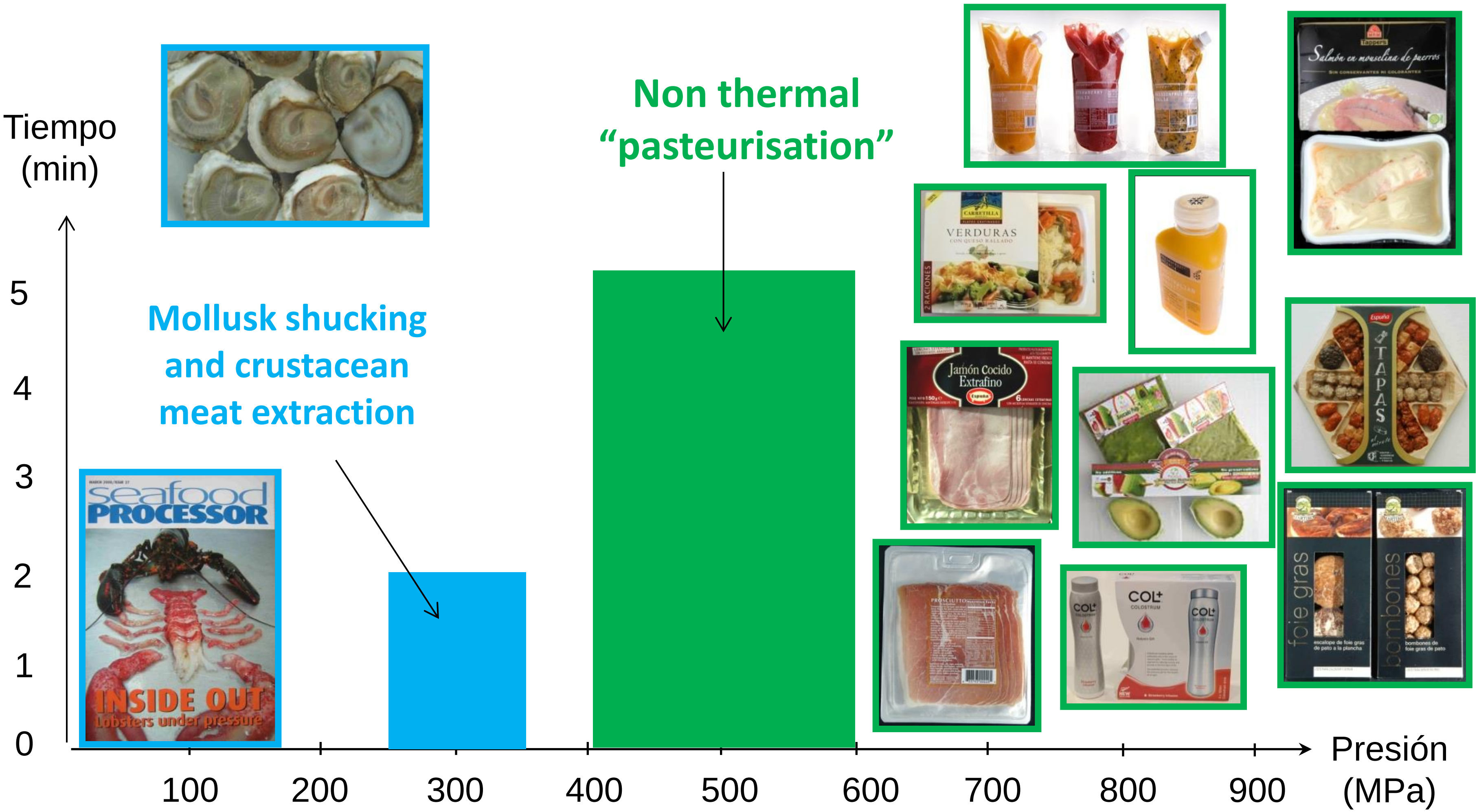
EVOLUTION: SPEED

CYCLE	Units	Hiperbaric 300, 2004	Hiperbaric 300, 2007	300, 2010	Hiperbaric 300, 2013	420, 2010	Hiperbaric 420, 2013
Vessel filling ratio		**0,5**	**0,5**	**0,5**	**0,5**	**0,6**	**0,6**
Machine time *	min	3,4	2,9	1,45	1,33	2,05	1,72
Pressure come up time	min	6,5	5,3	3,1	2,79	2,35	1,95
Holding time	**min**	**2**	**2**	**2**	**2**	**2**	**2**
Total cycle duration	min	11,9	**10,2**	6,55	6,12	6,4	5,67

Hourly production	**Kg**	**769**	**882**	**1374**	**1471**	**2363**	**2667**
Hourly production	**pounds**	**1696**	**1945**	**3030**	**3243**	**5209**	**5880**
Daily production	tons	12,3	**14,1**	22,0	23,5	37,8	42,7
Yearly production	tons	3692	**4235**	6595	7059	11340	12800

COST PER LITRE OR KG	0,120	**0,103**	0,081	0,078	0,061	0,057

Two major uses of HPP technology

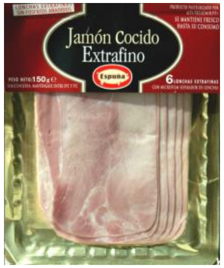


Hiperbaric
HIGH PRESSURE PROCESSING

Commercial HPP Products

Meat products

- Pathogen destruction and brand protection
- Shelf life extension
- Products with less or no artificial preservatives, less salt etc



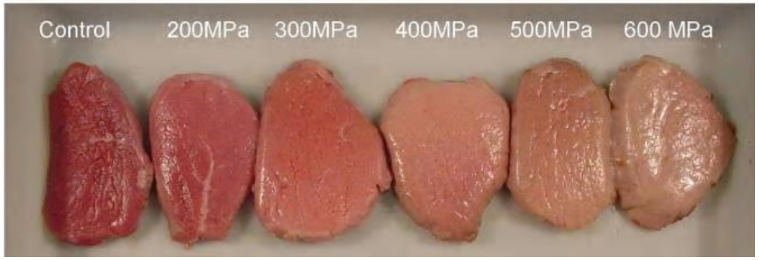
Country	Year	Products
Spain	1998	Sliced cooked ham and "tapas"
USA	2001	Sliced cooked products and proscuitto ham
USA	2001	Poultry products
USA	2002	Pre-cooked chicken and beef strips
Spain	2002	Sliced cooked meats products, Serrano cured ham
Italy	2003	Proscuitto ham, salami & pancetta
Germany	2004	Cured and smoked sliced and diced ham
Japan	2004	Nitrites-free bacon, sausages and sliced meat
USA	2005	Ready-to-eat meat based products
Spain	2005	Cured meat products & Serrano ham
Canada	2006	Cured & cooked meat products
USA	2006	Whole roasted chicken
USA	2006	Sliced cooked turkey and chicken
Canada	2006	Ready-to-eat meat meals
USA	2007	Chicken sausages
USA	2008	Cooked pork & beef sliced products
USA	2008	Pet food
Canada	2008	Sausages and bacon
Canada	2009	German style cooked meat products
USA	2009	Sliced RTE meats
Canada	2010	Proscuitto ham and cured meats
Australia	2010	Sliced and diced preservative free poultry products
Switzerland	2011	Cooked pork sliced products and sausages
USA	2011	Proscuitto ham and cured meats
USA	2011	RTE sliced meats
Rumania	2011	RTE pork products
Spain	2011	Serrano ham and cured meats

Effects of HPP on raw, fresh protein

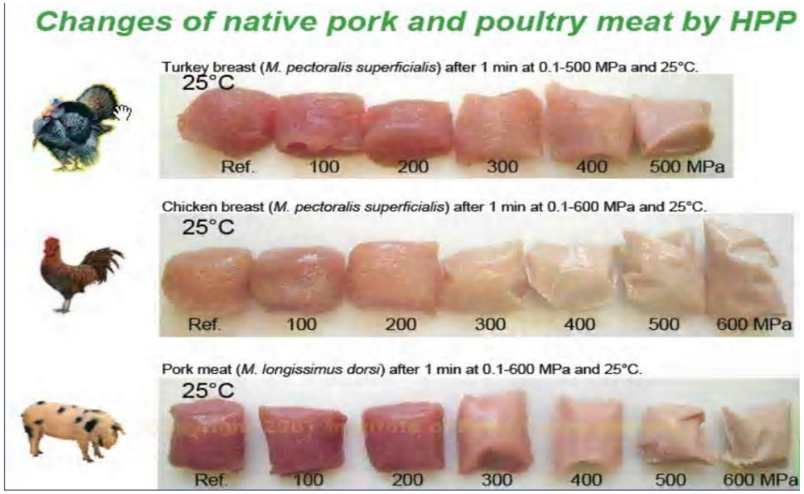
Color and texture of raw protein: beef, pork, poultry, fish is modified at P> 200 or 300 MPa due to denaturation of protein and modification of polysaccharides

❖ **Beef samples opened 30 min after HP treatment (5 min)**

Fresh ➔



Modification of beef color with increasing pressure (Serra, 2008)



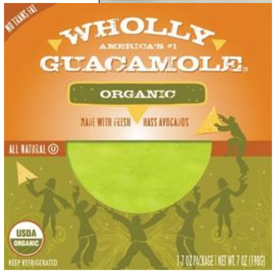
Color of turkey, chicken, pork meat (Heinz, 2007)

But no modification takes place on further processed protein –cooked, cured, etc!

Commercial Products

Vegetable Products

- Cold "pasteurisation" and shelf life extension
- Color, flavour and nutrient retention.
- Inactivation of PPO in avocado.
- Rice starch modifications.



Country	Year	Products
Japan	1990	Fruit jams and fruit and vegetable sauces
Japan	1994	Pre-cooked & hypoallergenic rice
USA	1997	Avocado products : guacamole, sauces
Italy	2001	Fruit jams
USA	2002	Avocado products
Mexico	2003	Avocado products
Mexico	2003	Avocado products
Mexico	2003	Avocado products
Canada	2003	Apple products : jam and sauce
USA	2004	Tofu
Spain	2005	RTE vegetable meals
USA	2006	Tomato sauces
Australia	2008	Fruit pures & coulis
Mexico	2008	Avocado products
Peru	2008	Avocado products
Chile	2008	Avocado products
USA	2009	Wet salads and soups
Peru	2010	Avocado products
N. Zeland	2010	Avocado products
China	2010	Fruit jams
Mexico	2010	Avocado products
Spain	2011	Avocado products

Commercial HPP products

Juices & smoothies

- Shelf life extension
- Retention of flavor and nutrients
- Pathogen destruction

Country	Year	Product
France	1994	Citrus juices
Portugal	2001	Apple & citrus blended apple juice
Italy	2001	Fruit and vegetable juices
Czech Republic	2004	Broccoli & apple, beetroot, carrot juices
USA	2007	Juices and superfood smoothies
Spain	2007	Smoothies & juices
Australia	2008	Smoothies & juices
Northern Ireland	2008	Wheatgrass & broccoli sprout juices
The Netherlands	2009	Smoothies & Juices
USA	2010	Citrus juices
Mexico	2010	Agave juices
Korea	2010	Juices and smoothies
Italia	2010	Smoothies
UK	2011	Apple juices
USA	2011	Coconut water
USA	2011	Super fruit and vegetable juices
Korea	2011	Citrus juices

Commercial HPP products

RTE Seafood

- Cold “pasteurisation” and shelf life extension
- Reduction of cooking process
- Reduction of additives and acidity of seafood salads
- Sandwich fillings without additives…

Our Equipment in production

MRM (Spain)

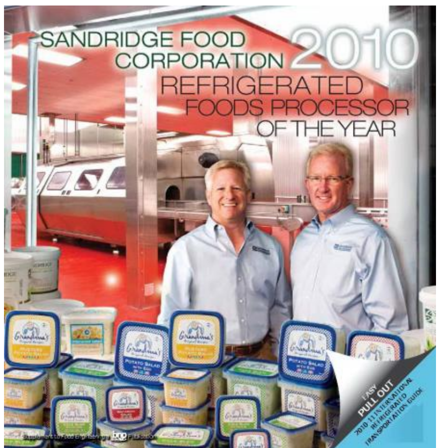
Hiperbaric 55 – All Natural RTE meals

Hiperbaric
HIGH PRESSURE PROCESSING

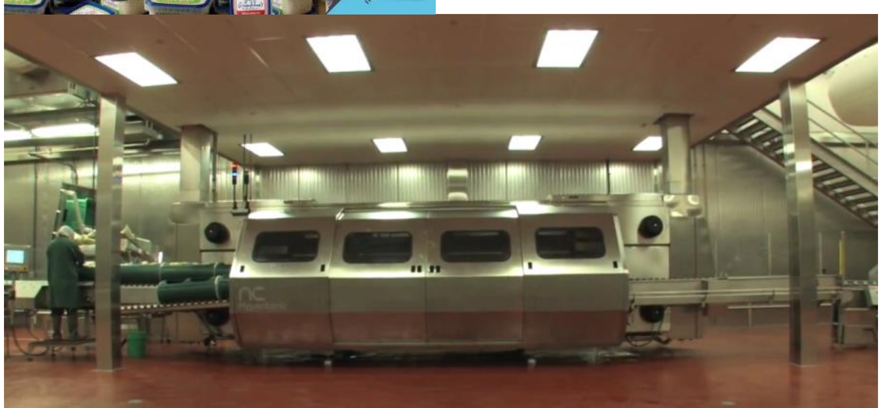
Our equipment in production

Sandridge (USA)

Two Hiperbaric 420 for wet salads, soups, chowders



CELEBRATING 50 YEARS
1960 2010
SANDRIDGE Food Corporation



New Premium Seafood Salads and Dips Available

Sandridge launches Pacific Coast Cuisine, delivering seven new seafood items.

MEDINA, Ohio (Oct. 4, 2011) – Sandridge Food Corporation introduces seven new premium seafood salads and dips in its latest product line—Pacific Coast Cuisine. The flavor-packed salads are made with smoked salmon, tender shrimp and premium surimi crab and are

available in the following flavors: Coastal Seafood Salad, Crab and Dill Salad, Shrimp and Crab Salad, Crab Slaw, Cajun Crab Dip, Honey Smoked Salmon Dip, and Low Country Crab Dip. The Sandridge Culinary Team developed these new Pacific Coast Cuisine Premium Seafood Salads and Dips with the consumer in mind. The recipes are made with recognized and trusted ingredients and are small-batch mixed—a philosophy that has built Sandridge's reputation, and the finished product and ingredient statements reflect this.

Additionally, Pacific Coast Cuisine premium seafood salads and dips are designed to have seafood listed as the first ingredient on the back-of-package ingredient statement—an important detail when marketing premium seafood salads and dips.

http://www.youtube.com/watch?v=BBnNxJ2DV2o

Our equipment in production

Shelf-life increase

Pathogen-free

Rodilla (Spain)

Hiperbaric 135 for sandwich fillings

(tuna, surimi, smoked salmon)

MITI (France)

Shrimp and mussels

Fresh fish: future application

Sea bream in skin pack – 600 Mpa – 4 min

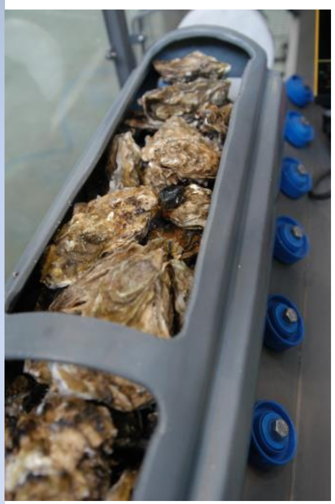
Microorganisms (cfu/g)	C	HPP	C	HPP	C	HPP	HPP	HPP
Days of storage at 4ºC	0	0	5	8	12	15	25	35
Mesophillic	6.10^3	21	2.10^5	99	4.10^8	48	48	5.10^7
Psycrophillic	230	<3	2.10^5	<3	9.10^7	<3	<3	3.10^7
Enterobacteria	570	<3	6.10^4	<3	4.10^7	<3	<3	<3
Clostridium sulfito-reductor	<3	<3	<3	<3	<3	<3	<3	<3
Listeria monocytogenes	P	A	P	A	P	A	A	A

LEGEND: C : control, HPP : High Pressure Processed, P : Presence, A : Absence

Commercial HPP applications

Opening/shucking of bivalve mollusks

Pressure denatures the aductor muscle



- Opening at cold temperature
- Hand labor savings
- Yield improvement
- Inactivation of virus and bacteria (Vibrio)
- Oysters, mussels, cockles, clams…

Manual shucking in raw

HPP Shucking

Our equipment in production

Future Cuisine-Export LTD (New Zealand)

Hiperbaric 55 for greenshell mussels

Mussels ready to HPP

4 minutes

HPP MUSSELS, shucked. Unloading stage

Tip onto shaking table

Shaking and meat-shell separation

Our equipment in production

Mitsunori (Japan)

Hiperbaric 55 for clams, lobster, whelk

http://www.youtube.com/watch?v=OYSbc1_l7tM

HPP commercial products

Crustacan meat extraction

Crustacean flesh is compressible, but the shell is not!

- Easy meat extraction
- "Raw" quality and flavor profile of meat retained
- Yield improvement around 20%
- Lobster, Homard, king crabs…

Our equipment in production

Ocean Choice (Canada)

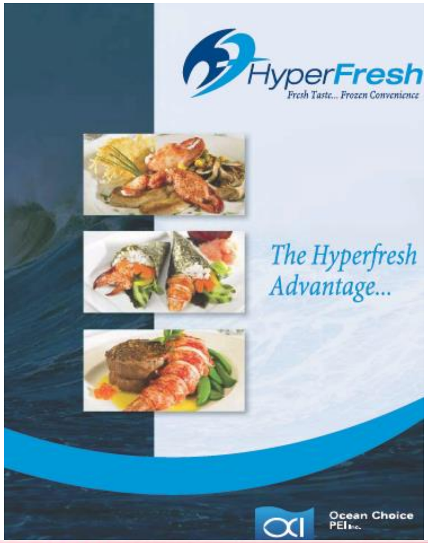
Hiperbaric 300 for American lobster meat extraction

Ocean Choice International Inc.

Ocean Choice (Canada)

HYPERFRESH CULINARY ADVANTAGES

- **ENHANCED SAFETY** – The HyperFresh processing system dramatically reduces food safety risks by destroying virtually all bacteria during the high pressure processing.
- **ENHANCED QUALITY** – HyperFresh technology ensures a higher level of tenderness while retaining sweet flavor and snappy texture.
- **CREATIVITY** – Less handling and preparation time means more time for menu creativity and presentation.
- **DINING EXPERIENCE** – Whole me
and claws results in a more impressive
meat extraction from the whole boiled l
more pleasurable dining experience for



HYPERFRESH COST ADVANTAGES

- **PRICING** – Cost certainty means stable menu pricing and cost forecasting.
- **YIELD** – 100% meat yield! The HyperFresh process ensures that virtually 100% of the meat can be easily extracted from the shell.
- **DISTRIBUTION** – Seamless! HyperFresh provides fresh live quality and is distributed through traditional broadline frozen distribution systems reducing regional price variances and higher freight costs.
- **LABOR** – Easy meat extraction! Because the HyperFresh pressure process separates the meat from within the shell there is minimal preparation time and handling.
- **HOLD TANKS** – HyperFresh technology delivers fresh live quality without the need for lobster tank investment – eliminating costly tank maintenance and improving inventory yield.
- **SHELF-LIFE** – HyperFresh Lobsters and Lobster Meat are cold-pasteurized and vacuum packed prior to freezing. This improves shelf life after thawing.

Our equipment in production

Cinq Degrés Ouest (France)

Hiperbaric 55 for lobster, clam, oyster

Hautes pressions

Cinq Degrés Ouest en action

En mai dernier, nous vous annoncions la création d'une unité de traitement hautes pressions destinée à décortiquer les homards et les crustacés. Voici en images, la solution développée par la jeune société Cinq Degrés Ouest.

C'est à Riec, au bord de la rivière du Belon, dans une partie des bâtiments des Huîtres Cadoret, que la jeune société Cinq Degrés Ouest réalise une première en France : le traitement par hautes pressions des homards et coquillages.

Dans le local, des ogives sortent d'une enceinte, elles contiennent des « bleus », des homards bretons. Ils viennent d'être traités par hautes pressions. Ils sont aussitôt déchargés sur des tables ou les opératrices coupent les élastiques des pinces, les pinces et sortent la chair de la carapace, aussi facilement qu'un esquimau de son étui ! Les corps sont déposés sur le tapis d'un tunnel de surgélation Cryoline de Linde. A la sortie, ils sont conditionnés sous-vide un par un. Il aura fallu moins d'une demi-heure pour décortiquer et emballer les queues de homards.

Hautes pressions, haute qualité

Ainsi, depuis quelques mois, Cinq Degrés Ouest crée de la valeur ajoutée grâce à son cycle de traitement hautes pressions breveté et à la cryogénie. L'association de technologies permet de restituer dans l'assiette les qualités organoleptiques des homards, à l'identique d'un produit sorti du vivier.

LA PAROLE À Alexis Taugé, gérant de la société

« Nous travaillons, pour les restaurateurs, du homard de pêche reconnaissable aux antennes longues, à la carapace dure et bien remplie. »

Les queues de homards, traitées ce matin-là, ont été expédiées vers la cuisine d'un grand restaurant parisien. *« Les chefs ont été saisis par la qualité. Le produit reste dans son jus tout au long du traitement, il conserve le goût et la texture du frais »*, souligne Alexis Taugé, créateur de Cinq Degrés Ouest. Ce qui ne surprend pas puisque dans les procédés hautes pressions, c'est l'eau qui est le vecteur de la pression. Et dans cette application, c'est de l'eau de mer qui est utilisée. Pour le moment, seuls les coques et les homards sont traités ainsi.

Actuellement, les Canadiens sont les principaux fournisseurs du marché français (30 à 35 tonnes) mais Alexis Taugé espère prendre 15 % de parts de marché. Et déjà, il envisage d'autres types de produits. Un projet Valorial, avec le fabricant de plats cuisinés Guyader vient de commencer avec des applications pour les produits traiteurs. Une ouverture vers d'autres marchés.

ISABELLE DULAU

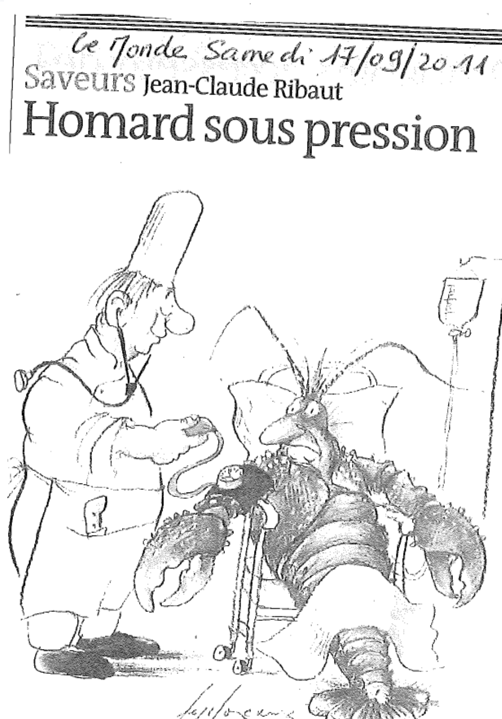
La cellule hautes pressions NC Hyperbaric, 55 l, installée dans l'atelier de Cinq Degré Ouest chez l'ostréiculteur Cadoret.

❶ Après traitement hautes pressions, le homard se décortique facilement sans perte de matière.

❷ Les queues tout juste décortiquées sont disposées sur un film plastique qui va les convoyer à l'intérieur du tunnel de surgélation Linde.

❸ Après cryogénie, les queues sont mises en poche avant d'être conditionnées sous-vide.

84 | PROCESS • Septembre 2011 – N° 1284



Shucks Maine Lobster (USA)

SHUCKS
MAINE LOBSTER

CERTIFIED SUSTAINABLE SEAFOOD MSC www.msc.org

WILD CAUGHT SUSTAINABLE - INNOVATIVE

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Raw In The Shell

HPP'd Tails in Shell

Split Maine Lobster

Whole Frozen Lobster

Raw Shucked Maine Lobster

'Naked' Maine Lobster

Raw Claw/Knuckle meat

Raw shucked tails meat

Animal welfare

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Portland Press Herald

WEDNESDAY, MAY 28, 2014

46° Rain
RealFeel® 37°
High: 53° | Low: 40°
High Tide: 11:47AM
Low Tide: 5:40PM

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September 17, 2013

PETA says Maine lobster processor has cruel 'kill' method

But it's unclear whether the practice is outside the industry's norms, and unproven that crustaceans feel pain.

By Eric Russell erussell@pressherald.com
Staff Writer

A controversial animals-rights group is targeting a Maine lobster processor for what it considers inhumane slaughtering methods, although it's unclear whether the methods are outside the industry's standards.

People for the Ethical Treatment of Animals plans to release video footage Tuesday that it says was taken in a processing plant in Maine, the state that's synonymous with lobster.

This photo taken from a video shot by PETA shows a worker holding a lobster after its shell was removed while it was still alive. click image to enlarge

Courtesy PETA

Select images available for purchase in the Maine Today Photo Store

The organization, which has conducted and publicized hidden-camera investigations into factory farming of chickens and dairy cows, among other animals, called the methods shown in the video cruel. It said it plans to file a complaint with local authorities Tuesday alleging that the lobster processing plant violates Maine's animal cruelty statute.

However, there are no state or federal laws that govern how a lobster should be killed during processing, and it has not been established whether crustaceans feel pain.

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Hiperbaric HIGH PRESSURE PROCESSING

THE BEHAVIOR OF CRUSTACEANS DURING HIGH PRESSURE PROCESSING

ABSTRACT

High Pressure Processing (HPP) is a non-thermal food processing technology that allows for food products with a longer shelf-life and safer, while preserving nutrients and their fresh taste and appearance. Industrial applications use high pressure to extract meat from crabs and lobsters.

Several studies have shown crustaceans have the capacity to suffer and to experience pain. European Food Safety Authority (EFSA) classified decapods in Category 1 status, animal who are able to experience pain and distress after concluding that largest of the decapods have a pain system.

Pressure induces different physiologic responses in crustaceans (low metabolic rate, reduced activity), depending the species and pressure level. Exposure above 7,348 psi (50.6 MPa) is lethal in many marine animals. At cellular (neuronal) level high pressure induces several changes, reducing influx of Ca^{2+}, inhibiting neurotransmitter release, which affects presynaptic response. These changes are related to high pressure does affect N-type Ca^{2+} channels, key mediators of nociceptive signaling. Nociceptive (high intensity stimuli) mechanism is associated to pain experience. It is possible to suggest that HPP would not induce pain in crustaceans, since the inhibition of these channels induced by pressure would lead to an analgesic response.

Although there is no direct evidence of welfare of crustacean processed by HPP, available scientific literature suggests that meat extraction by HPP does not lead to suffering during processing.

Document redacted by Diego Wilches, PhD. Applications and Process Development
Document verified by Carole Tonello, PhD. Applications and Process Development Manager
Hiperbaric

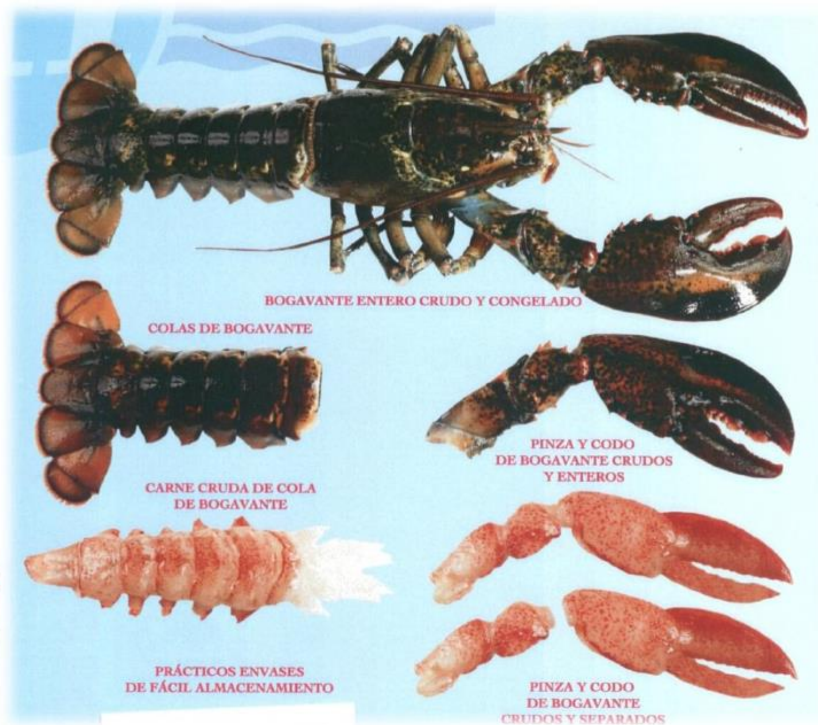
CONCLUSIONS

Although there is no direct evidence of welfare of crustacean processed by HPP, available scientific literature suggests that meat extraction by HPP does not lead to suffering during processing. The process is conducted at room or chilled temperature and high pressure induces, in few seconds, changes in neurological processes at cellular and physiological level which inhibit pain and distress of animals.

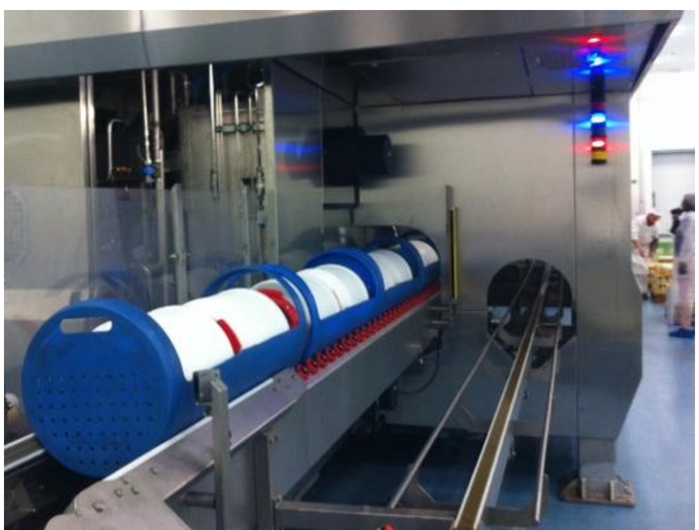
Maresmar (Spain)

maresmar

Maresmar presenta en Conxemar el **bogavante Hyperfresh**. Es **"la combinación perfecta entre negocio y placer"** ya que su presentación permite ahorrar tiempo de elaboración, de preparación y espacio de conservación y **"sabe y resulta exactamente como el bogavante fresco vivo"**.



¡La carne es compresible pero la cáscara no!



Schmidt Seafood (The Netherlands)

PASCALISATION

schmidt SEAFOOD ROTTERDAM THE NETHERLANDS

OYSTER AND LOBSTER REINVENTED

A cutting-edge approved preservation process known as pascalisation makes it possible to enhance food safety by means of preservation using water pressure. It allows food to be kept longer and also has certain other advantages for chefs and consumers: oysters will open without having to use a knife, and lobster will loosen from the shell so that more lobster meat can be used and be processed raw as well.

Michelin two-star chef Moshik Roth has been studying the phenomenon of pascalisation for a number of years and conducted a series of tests in collaboration with food design company Top BV and production company Chez Pascal BV in Wageningen, The Netherlands, in order to achieve the very best results. New opportunities are presenting themselves!

Reactions from chefs of top restaurants are full of enthusiasm:
... a fuller and more refined texture ... new possibilities for preparation ... cooking at low temperatures ... oysters can now also be grilled... the juices are fully drawn into the meat ... it gives lobster a deeper colour ... tastier ... it's now easier to process it raw ...

THE ONLY FISH FRESHER THAN OURS IS STILL SWIMMING.

pascalisatie

WHAT IS PASCALISATION?

Pascalisation is a new preservation method in the Netherlands. Food is naturally subject to decay, but can be kept longer by using preservation methods such as pasteurisation (heating briefly), sterilisation (prolonged heating) or adding preservatives. The disadvantages of these ways of preservation may be a loss of nutritional value, vitamins and taste.

With pascalisation, packaged foods such as meat, fish, fruit and vegetables are

Our equipment on site

Canadian Centre for Fisheries Innovation (Canada)

Minister Dalley with Robert Verge, managing director, Canadian Centre for Fisheries Innovation during a tour of the centre's High Pressure Processing unit.
http://www.mi.mun.ca/news/title,9905,en.php

AZTI-Tecnalia (Bilbao)

La cocina de lo imposible en Madrid fusión

Una feria gastronómica en Madrid nos trae sabores con imaginación, limones con sabor a manzana, platos que cambian de color o lo último para combinar los sabores de un plato y a la vez percibir los olores que nos inspiran.

Me gusta 74 Twittear 1 g+1 0 Compartir 0 Comentarios

En febrero 2011 en esta revista, Azti-Tecnalia mostró su procesador de altas presiones de 55 litros, Hiperbaric, y sus buenos resultados. Aquí ampliamos el tema, y nos apartamos totalmente del tratamiento térmico, que Azti-Tecnalia llaman 'Esterilización térmica asistida por presión'.

Fig.2. Procesador de 55 litros de AZTI-Tecnalia.

Tratamiento de altas presiones para el desarrollo de nuevos productos

La alternativa al tratamiento de pasteurización por calor con mejores propiedades sensoriales

HPP TOLL PROCESSING AND COPACKING

25 tolling companies, 4 technology centers, 30+ machines in total

- USA: Millard Refrigeration, Ameriqual, APC, Safepac, Quantum, GL Foods, Universal Cold Storage, Eddy Packing, HPPFS, Fresh Bev
- Canada: Natur+l XTD, CDBQ
- Taiwan: Kee Fresh
- Benelux: Pascal Processing
- England: Deli 24
- Italy: SterilParma, Hybartec, Parco ASDI
- Spain: APA Processing, MRM, Rodilla, CENTA-IRTA, ITACyL

Hiperbaric technology around the world

Thanking all of our customers around the globe

You are welcome!

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Food Safety and Hygiene, drivers of production maximisation and cost reduction

Fabrizio Tardioli – Sector Specialist Coordinator Europe
Hygiene Solutions Food Care

WEFTA 2014 SEAFOOD SCIENCE FOR A CHANGING DEMAND, Bilbao 10th June 2014

Sealed Air
Re-imagine™

WHO WE ARE

Sealed Air creates a world that works better by re-imagining the industries we serve. By uniting ingenious ideas and diverse expertise, we discover new possibilities and create new approaches that enhance business and the world we live in. Where we thrive is transforming sustainable, end-to-end solutions into business-changing results.

How We Deliver Value

Sealed Air Re-imagine™

Food Care

2013 Sales: $3.8B

55% of 2013
Adj. EBITDA, excl SARs

- Packaging/Hygiene Solutions
- Engineering Plant Designs
- Full Range of Equipment/Systems
- Effective resource management, including water and energy

Diversey Care

2013 Sales: $2.2B

21% of 2013
Adj. EBITDA, excl SARs

- Building & Kitchen Care Services
- Infection Prevention
- Fabric Care
- Consulting Services & Consumer Brands

Product Care

2013 Sales: $1.6B

24% of 2013
Adj. EBITDA

- Engineered Solutions & Packaging Systems
- Packaging Design & Testing
- Lean Six Sigma Expertise
- Service & Support

WE DELIVER

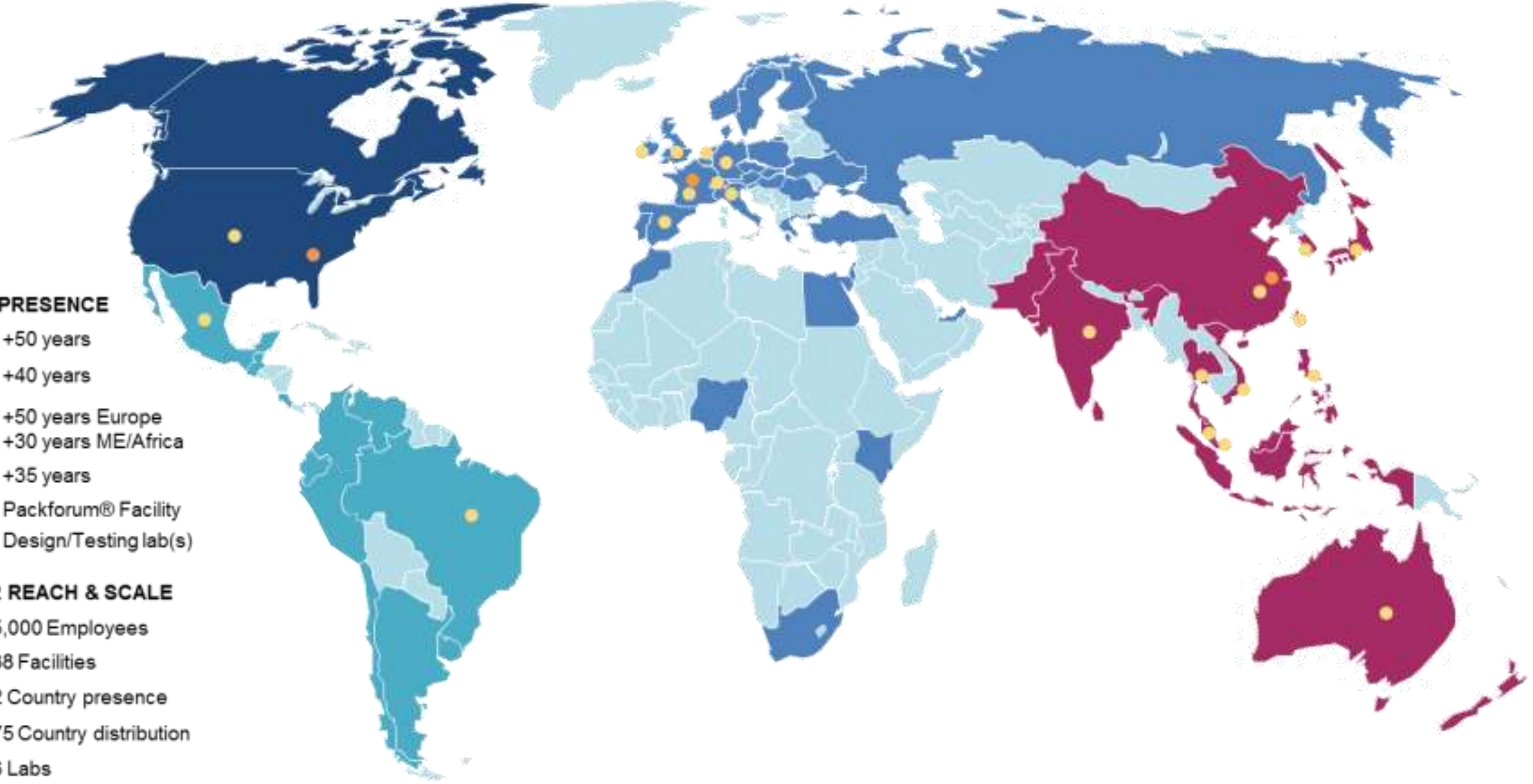
SUSTAINABILITY

INNOVATION

PARTNERSHIP

SHARED VALUE

A Global Network Backed by Local Expertise



OUR REACH & SCALE

- 25,000 Employees
- 138 Facilities
- 62 Country presence
- 175 Country distribution
- 56 Labs

Who We Serve

Food Care

TOP 20 CUSTOMERS ACCOUNT FOR APPROX. 25% OF SALES

Diversey Care

TOP 20 CUSTOMERS ACCOUNT FOR NEARLY 20% OF SALES; DISTRIBUTION ACCOUNTS FOR APPROX. 35% OF SALES

Product Care

DISTRIBUTION ACCOUNTS FOR APPROX. 65% OF SALES

Source: Sealed Air Estimates

Food Care Purpose

We help sustain healthy communities by ensuring the safety and quality of what people eat and drink by creating sustainable innovative solutions.

We deliver **measureable business results** to our partners by focusing on 4 value drivers for **purposeful innovation** so that together we can share in the value created:

FOOD SAFETY

OPERATIONAL EFFICIENCY

SHELF LIFE EXTENSION

BRAND BUILDING

Sealed Air
Food Care

Food Safety and Hygiene, drivers of production maximisation and cost reduction

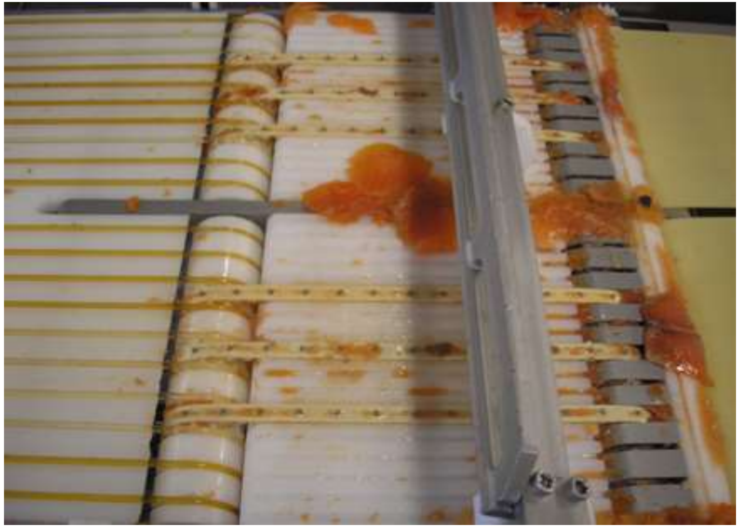
Fabrizio Tardioli – Sector Specialist Coordinator Europe
Hygiene Solutions Food Care

WEFTA 2014 SEAFOOD SCIENCE FOR A CHANGING DEMAND, Bilbao 10th June 2014

What is Hygiene?

Hygiene comes from the Greek ὑγιεινή (τέχνη) - hugieinē technē, meaning «art of health».

In ancient Greek religion, Hygeia (Ὑγίεια) was the personification of health



Food Safety risks in the Fish Industry

Sealed Air
Food Care

Food Born Illness	Food Poisoning	*Pathogenic* bact.: **Salmonella / Staphyl. Aureus / Clostridium Perfr. / Clostridium Botul. / Bacillus cereus**
		Non-Bacterial: Chemicals / Metals / Virus / **Mycotoxins (mould) /** Fish and Plants
	Food Born Disease	*Pathogenic* bact. : **Listeria / E. Coli /Campylobacter Ent. / Bacillary Dysentery / Typhoid**
		Viruses: Hepatitis A
Food Spoilage	**Chemical**	Fat rancidity / Enzyme activity
	Micro-organisms:	***Spoilage* / Bacteria /Moulds & Yeast**
	Physical:	Freezer burn / Insect infestation
Injury		
Allergens		

Hygiene? Cleaning?

Hygiene and effective cleaning are prerequisites required to be able to produce safe food.

Hygiene may not be a pleasant task though… Most of the time it is carried out at night and deals with heavy soils, wet environment and intense labor.

Hygiene? Cleaning?

Hygiene shall not be considered as *«something that happens between two production shifts»*…

…but as something that needs do be done correctly and effectively in order to be able to carry out production shifts and produce **safe food**.

Hygiene? Cleaning?

Hygiene is not only «cleaning» and cleaning chemicals, it is a far more complex matter that involves:

Personal Hygiene and Personnel behaviour;

Training

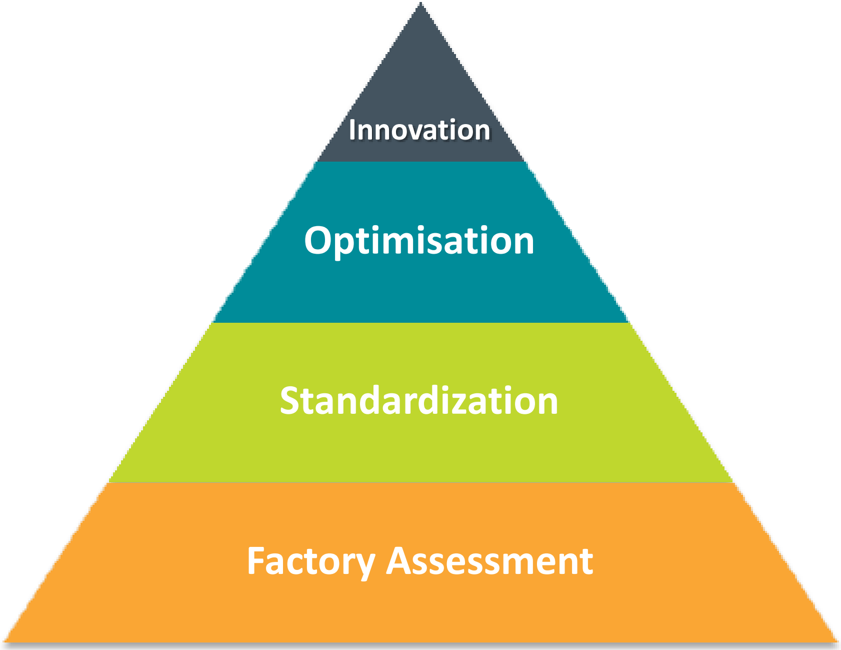
Use of resources like water, energy, labour; in other words… **sustainability**

Hygiene impacts massively on very sensitive topics like…

- **Shelf life** of your products
- **Brand protection**, one of your main assets to be protected

The Hygiene Solutions Approach

Sealed Air
Re-imagine



The Hygiene Solutions Approach

Total Factory Cost

CLEANING FOOTPRINT

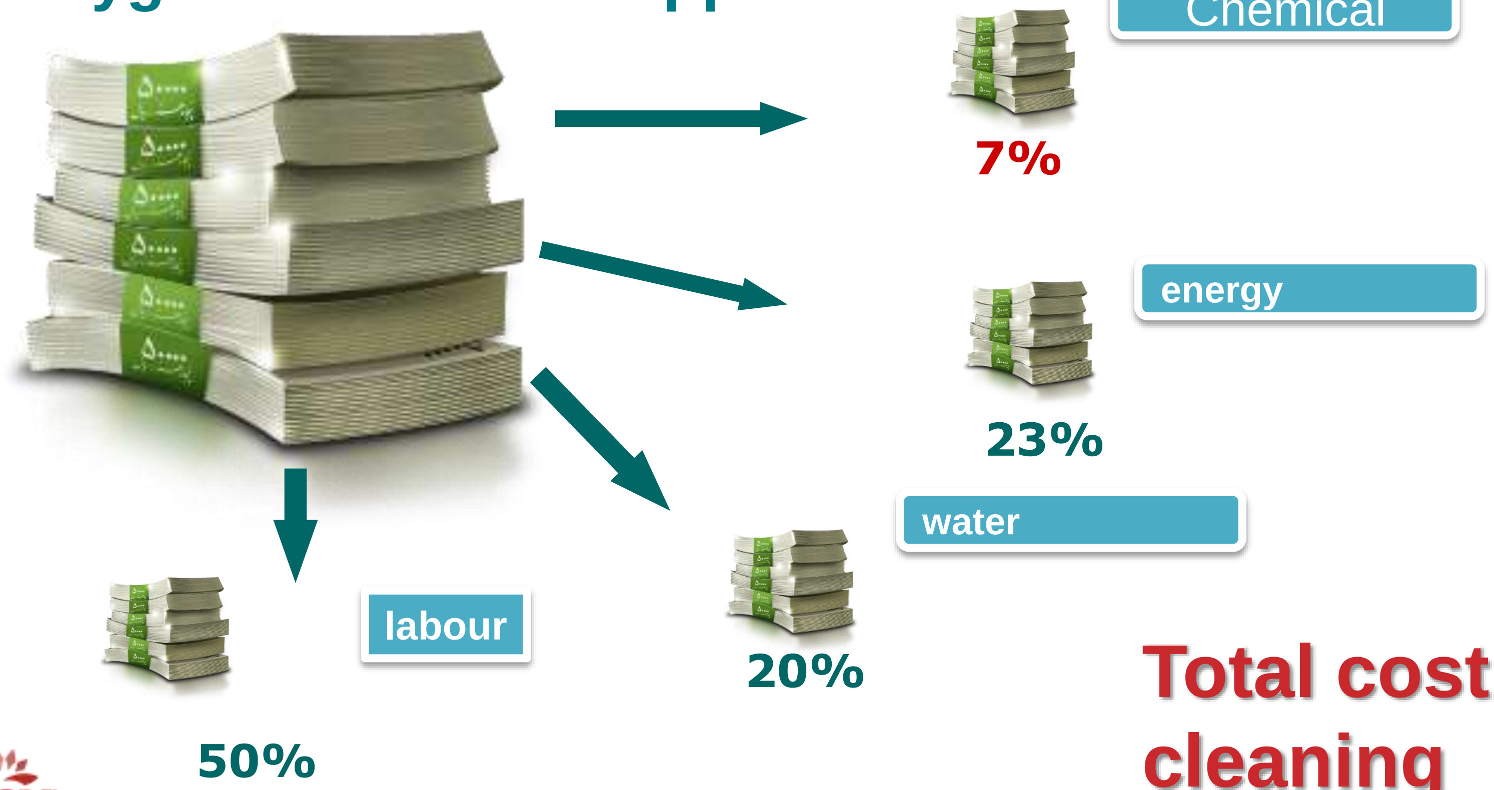
Total Cost of Cleaning

Food Safety

COMMON ASSESSMENT PLATFORM AND TRACKING OF VALUE

PROGRAMS TO DELIVER LONG TERM PROJECTS AND VALUE TO CUSTOMERS

The Hygiene Solutions Approach



Total cost of cleaning

The Hygiene Solutions Approach

FOOD SAFETY

Cleaning & Sanitation
Chemical Cost

0,08%

OPERATIONAL EFFICIENCY

Sustainability

Cleaning & Sanitation
Total Cost (water, energy, labour, chem)

1%

FOOD SAFETY PHASE

OPERATIONAL EFFICIENCY PHASE

Step 1

Assessment of current situation

- Assessement of current situation
- Sanitation effectivity
- GMP
- Benchmark
- Standard solutions

Step 2

Implementation of Diversey™ Programs

- Implementation of Diversey solutions in C&S and personal hygiene
- SOP & Master Cleaning program
- Training
- Engineering

Step 3

Optimization of C&S procedures

Step4

Water management program

On going process to improve food hygiene and reduce micro risks

- Operational efficiency
- Optimisation of cost of cleaning
- Water/ energy reduction

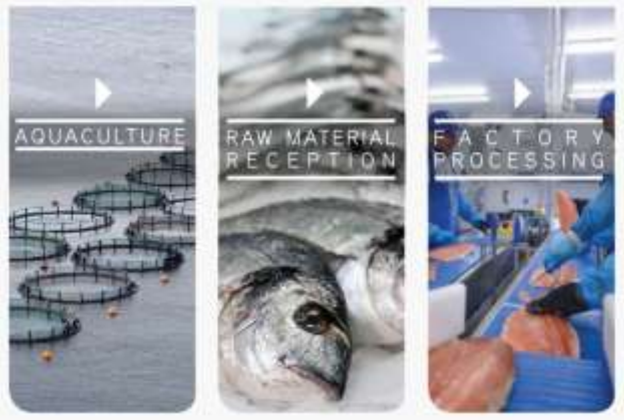
- Total water assessement
- Identifying water consumption reduction

KPI based change mangamentem process

How can we create value for you?

Sealed Air Food Care

Total Solutions for fish and aquaculture



- **Diversey® Open Plant Cleaning Solutions**

Chemical and Equipment range, EnduroPower™, Conveyor Cleaning Program, Mid Shift Cleaning Program, UV Disinfection, Fogging, Hand Hygiene, Building Care range.

- **Diversey® Cleaning in Place Solutions**

CIP Chemical and Equipment Installations, Optimisation, Project Management

- **Diversey® DiverContact™**

Direct food contact antimicrobial treatments

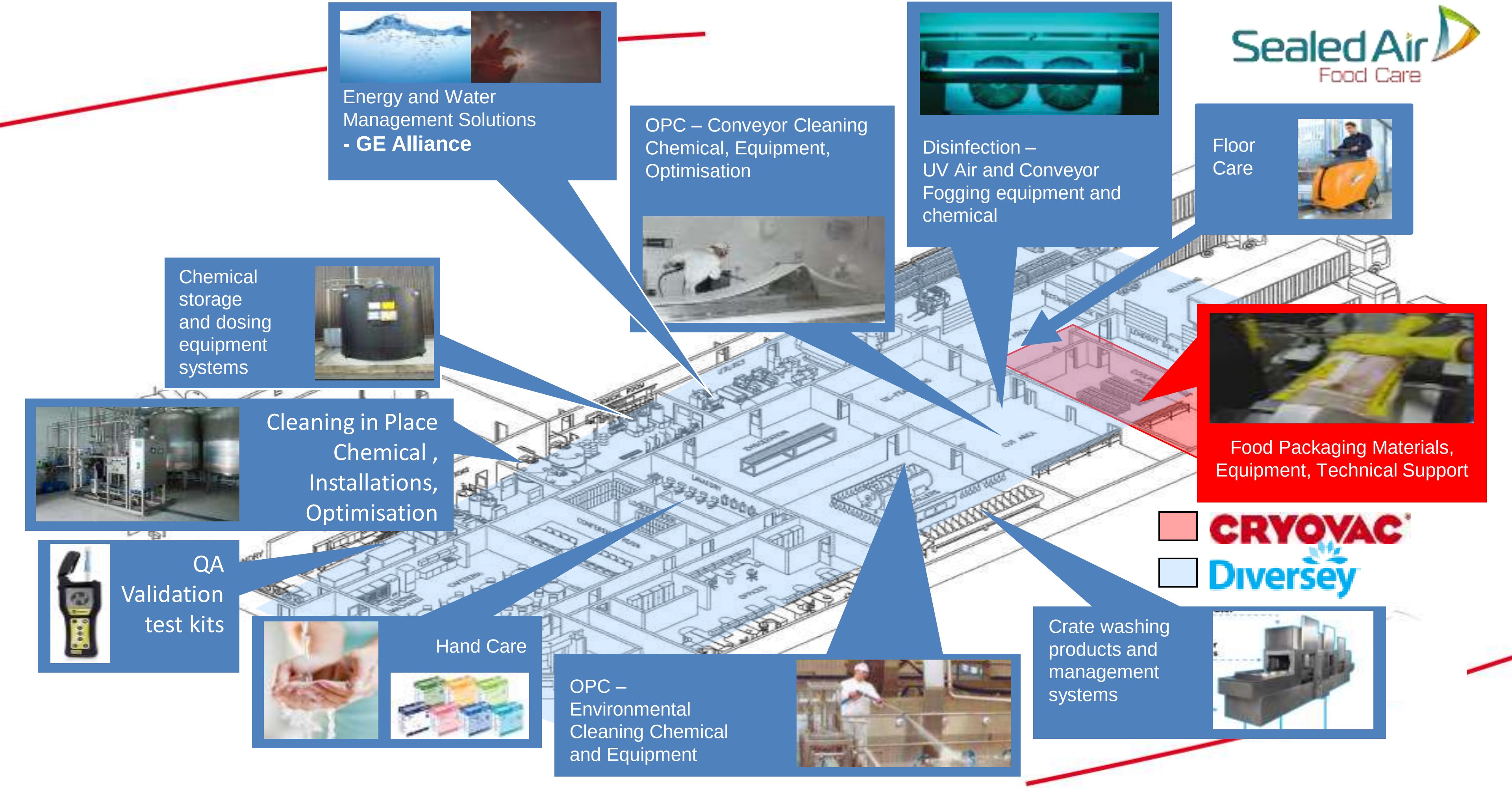
- **Diversey® Process Improvements**

SecureCheck™, SecureCard, iCMS, Listeria Management, ATP monitoring, Training

- **Diversey® Sustainable Solutions**

AquaCheck™, EnergyCheck™, GE Alliance

Cryovac® Packaging Solutions


Sealed Air
Food Care
Energy and Water Management Solutions
- GE Alliance
OPC – Conveyor Cleaning Chemical, Equipment, Optimisation
Disinfection – UV Air and Conveyor Fogging equipment and chemical
Floor Care
Chemical storage and dosing equipment systems
Cleaning in Place Chemical , Installations, Optimisation
Food Packaging Materials, Equipment, Technical Support
CRYOVAC
Diversey
QA Validation test kits
Hand Care
OPC – Environmental Cleaning Chemical and Equipment
Crate washing products and management systems

SecureCheck™ assessment

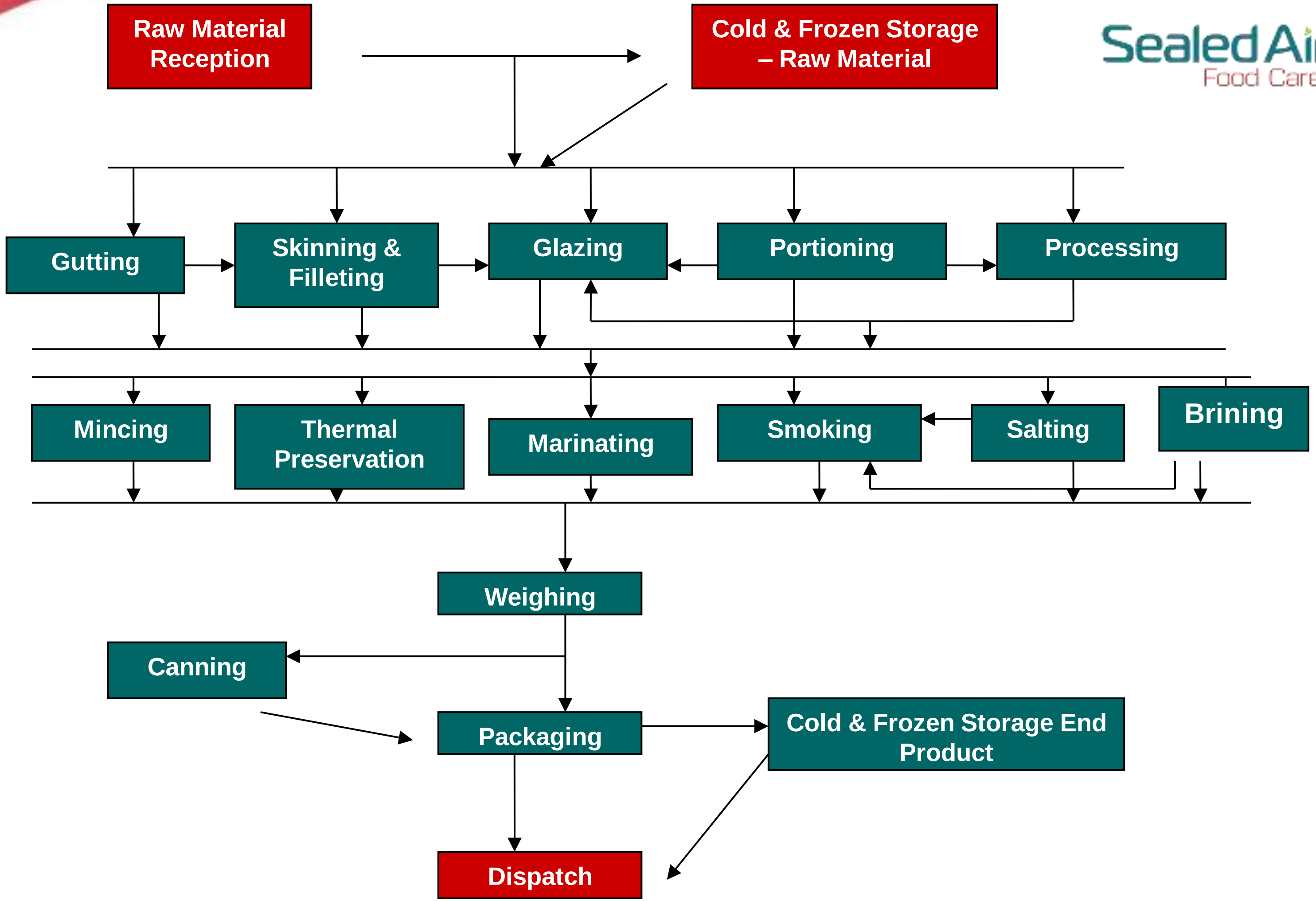
by qualified and certified specialists
Time: ca. 8-24 hours

the module-like questionnaire follows the steps of the food processing

only those processing areas which are available at the individual custome
checked

General questions on
Customer specific data
Cleaning & disinfection
Microbiological checks
Equipment

Specific sub-sector questions
Risks
Cleaning & Disinfection
Personal hygiene
GMP
Food safety



Raw Material Reception
Cold & Frozen Storage – Raw Material
Gutting
Skinning & Filleting
Glazing
Portioning
Processing
Mincing
Thermal Preservation
Marinating
Smoking
Salting
Brining
Weighing
Canning
Packaging
Cold & Frozen Storage End Product
Dispatch

SecureCheck™ ratio

Question → Answer: YES

Possible risk → Answer: NO

↓

Potential risk might not be under control

↓

Pathogene	Food spoilage
Psychrotrophe	Yeast & moulds

↓

- C&S
- GMP
- Personal hygiene
- Documentation

SecureCheck^{TM} Solutions package

1. Report
Short analysis

2. Report
Overall analysis and recommendation

Sealed Air
Food Care

Customer Name	
Customer Address	
Contact Person	
Assessment Date	22 Jun 2010

SecureCheck Program

This report describes and summarises the analysis of your production facility with regard to potential food safety risks. The assessment is carried out in all production areas of your facility by means of a questionnaire. This report shows the preliminary outcome based on the questionnaire data gathered. The questionnaire data will be further processed in a dedicated website and a fully detailed report will be processed within 2 weeks. This fully detailed report will be presented by our representative. This preliminary report details the outcome of the questionnaire based on a colour coding system related to risk.

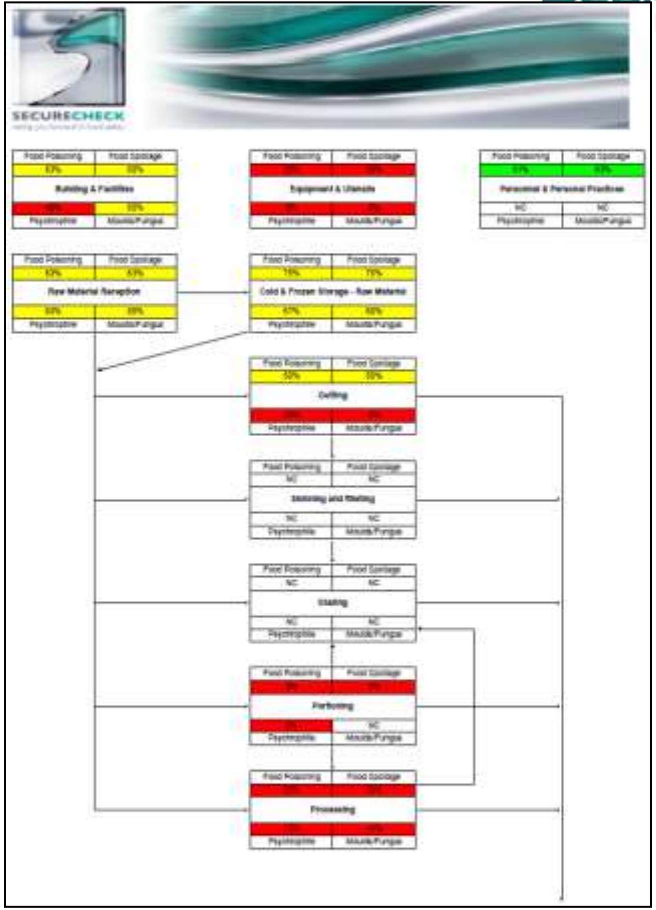
- Red
- Yellow
- Green
- Low Risk

		Industry Average
Your Result	58%	71%

Bug Groups	Your Result	Industry Average
Food Poisoning	60%	72%
Food Spoilage	61%	72%
Psychrophile	[illegible]	68%
Moulds/Fungus	[illegible]	68%

Benchmarking

The results of the assessment are stored in a web based database which will make it possible to benchmark your results against our industry average. The data is treated confidentially and is not accessible by others.



Diversey

Specific "pathogen combat" programs

- Listeria management program
- Control of Salmonella

No "Silver Bullets"!

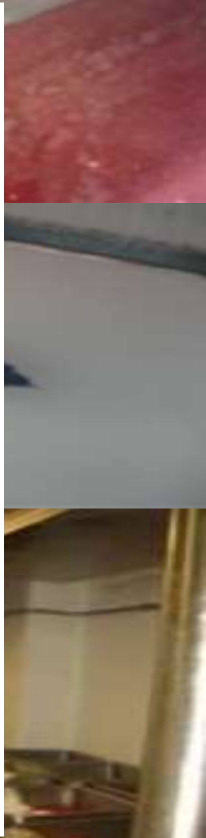
Sealed Air Food Care

Diversey

FOOD SAFETY

Expertise, experience, know how and a professional approach are needed to effectively achieve results

Ehm, yes…also some chemicals will be required…



Implementing Effective Food Safety Training

Our team of experts can provide an array of professional or tailor-made training programs to ensure the right transfer of knowledge which will drive behavioral change and the effectiveness of your food safety program.

FOOD SAFETY

Chemical product Solution example: Enduro Power Foam Range - Reduced Cleaning Cost

Traditional Chlorinated Foam

Enduro Chlor

FOOD SAFETY

OPERATIONAL EFFICIENCY

Chemical product Solution example:
Enduro Power Foam Range - Reduced Cleaning Cost

Sealed Air
Food Care

Enhanced cling

Ease of Rinse

Reduced Chemical Usage

Resource Savings

More sustainable solution

REAL WORLD EXAMPLE - **Fish processing site (Spain)**

The site processes salmon and cod. Trials were carried at pre-cutting area before moving the fillets into the smoke chambers.

The Result:

- Current concentration of chlorinated alkaline product **reduced to 2% from 4% with Enduro Plus**
- **Total cost reduction of 22%,** considering labour, product and water costs.

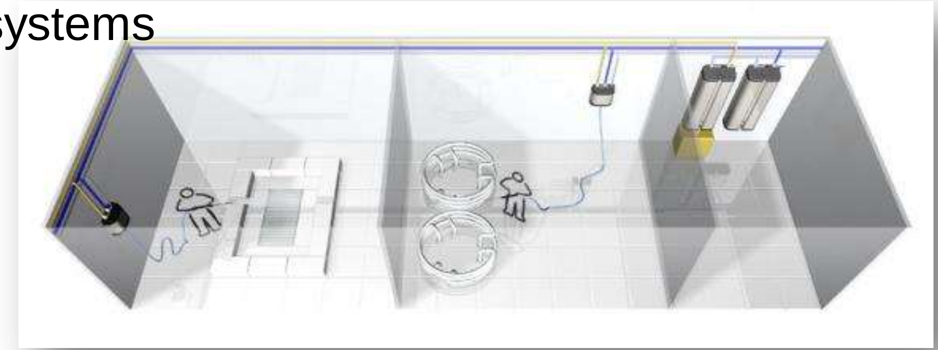
Diversey

FOOD SAFETY

OPERATIONAL EFFICIENCY

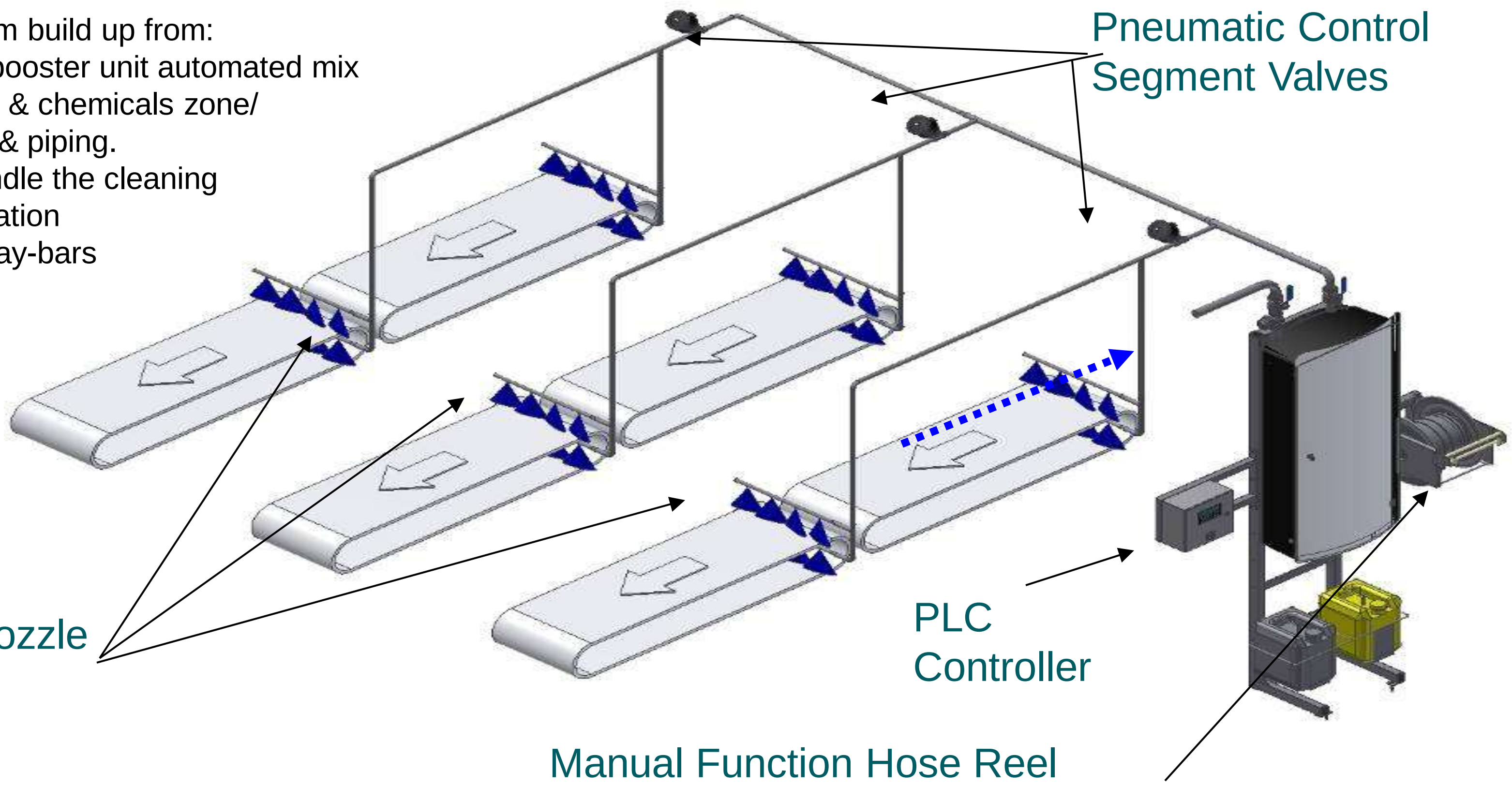
Engineering solutions for sustainable processing

- Open plant cleaning systems for aquaculture, fishing boats, processing areas
- Crate washing dosing and monitoring
- UV-C systems for water, belts and environment
- Fryer boil out
- Freezing tunnels
- Automatic Conveyor belt washing systems
- Fogging installations
- Hygienic entrances



Automatic belt cleaning

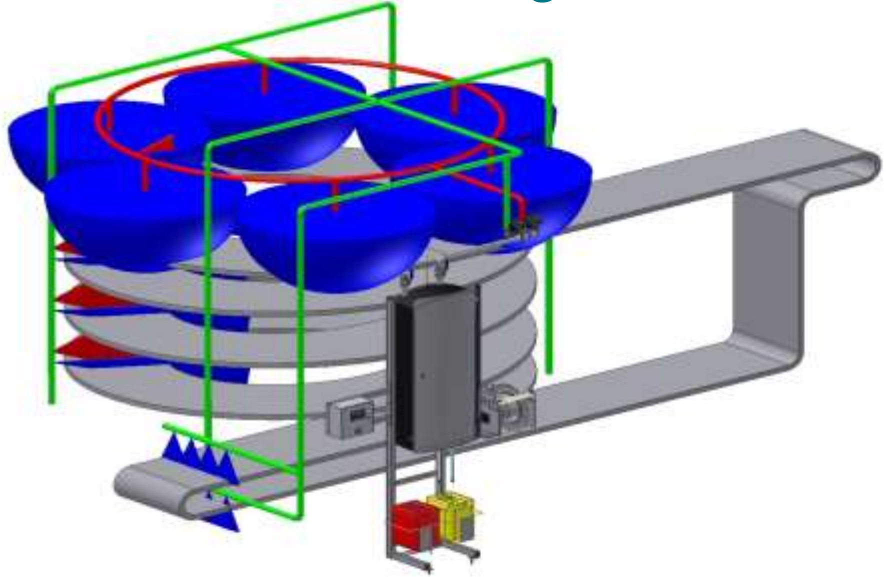
Automatic system build up from:
water pressure booster unit automated mix unit to mix water & chemicals zone/ segment valves & piping.
Controller to handle the cleaning programs application
components spray-bars & nozzles

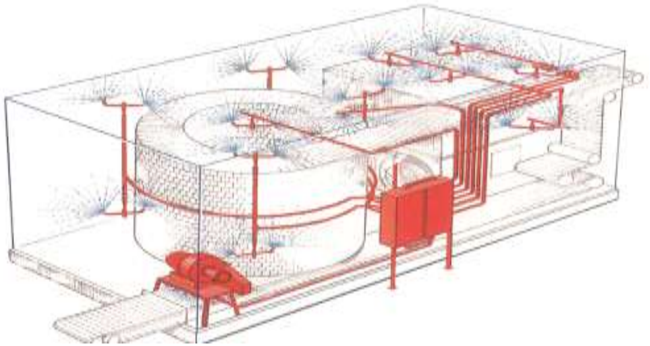



101:35:10

Sealed Air Food Care

Integrated Hygiene Solutions for Fish Processing:
Spiral Freezer Cleaning





FOOD SAFETY

OPERATIONAL EFFICIENCY

Diversey

Automated Cleaning

Advantages of Automation/Semi-automation

01 — **Operators Safety**

02 — **Savings**
- Time → regained production?
- Water/Energy
- Labour

03 — Control of Cleaning parameters to get ***Repetitive results***

FOOD SAFETY

OPERATIONAL EFFICIENCY

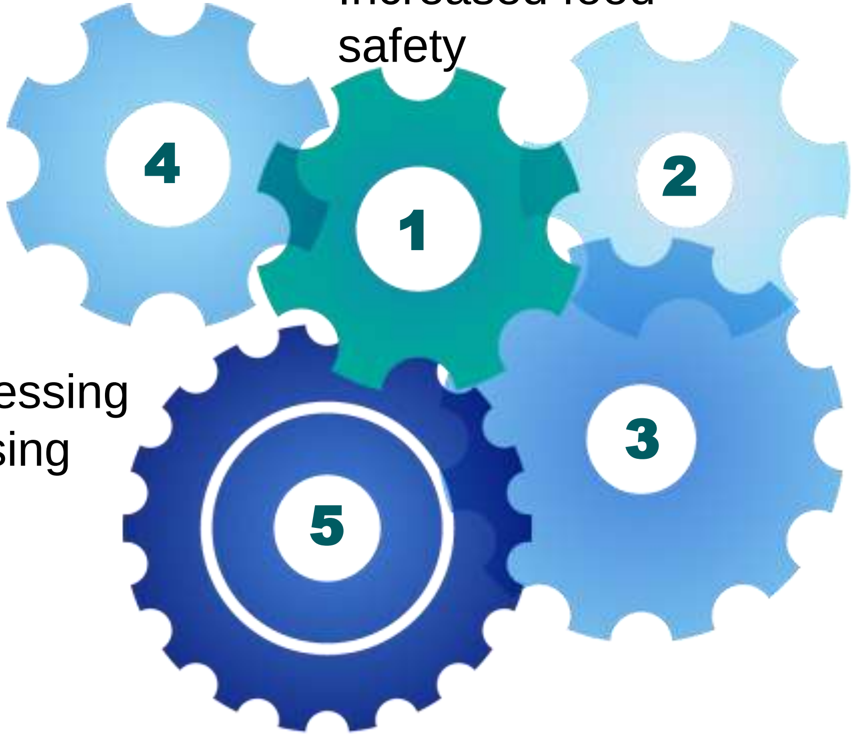
Sealed Air
Food Care

Process Improvements

Increased food safety

Chemical Control and Dosing

Simplification of Cleaning and Disinfection Processes



Maximising processing capacity, minimising downtime

Process Automation and Optimisation

Diversey

Questions?

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Hygiene Solutions
Food Care

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WEFTA 2014

SEAFOOD Science for a changing demand

PRESENTATIONS

INTEGRITY, AUTHENTICITY AND DIFFERENTIATION OF PRODUCTS

WEFTA 2014
SEAFOOD science for a changing demand
44th WEFTA meeting · 9-11 June 2014 · Bilbao (Spain)

INTEGRITY, AUTHENTICITY AND DIFFERENTIATION OF PRODUCTS

Influence of size on texture properties of farmed meagre (Argyrosomus regius)

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Research funded by AQUACOR Project
(PROMAR 31-03-05FEP-003)

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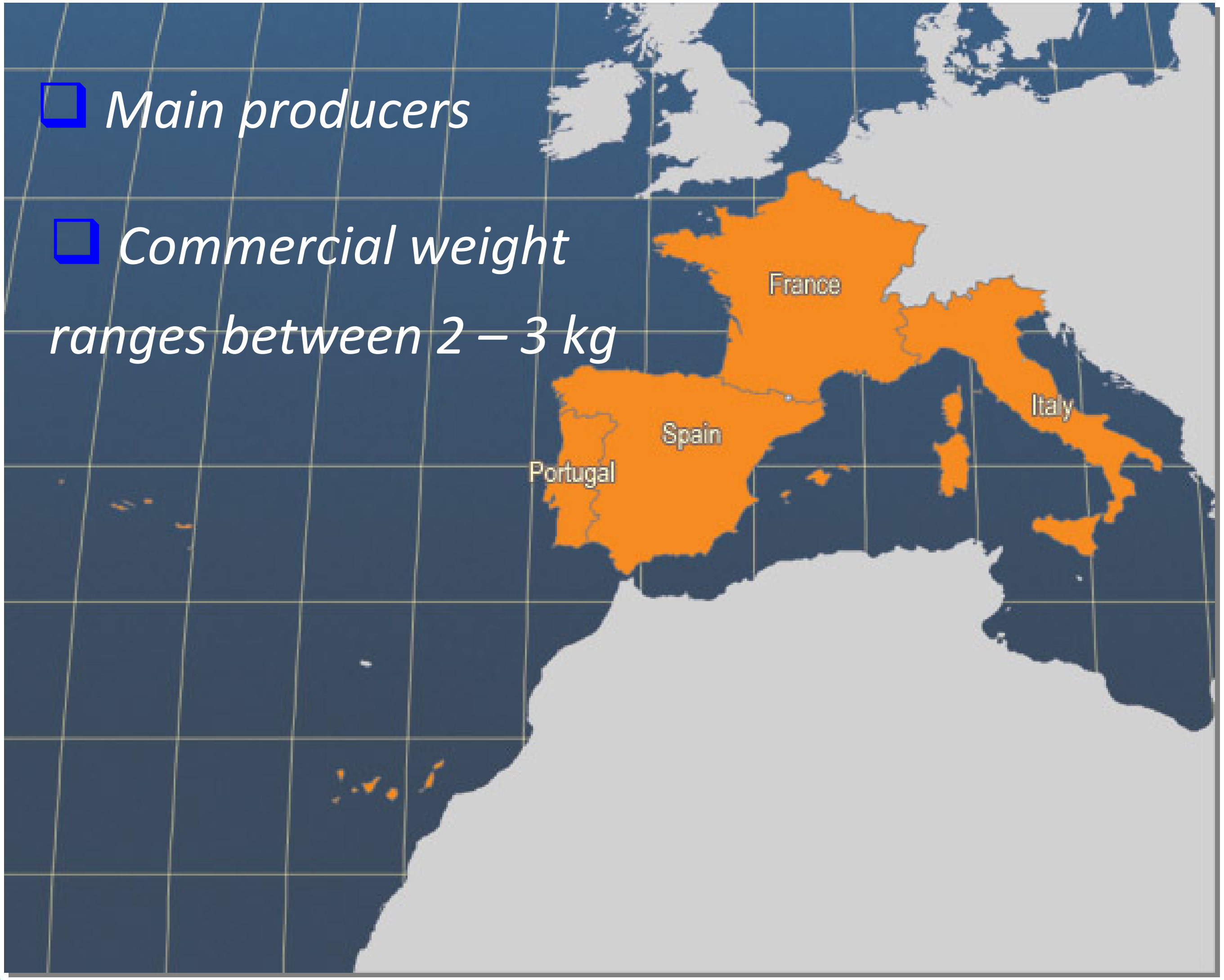
Portuguese Institute for the Sea and Atmosphere, Lisbon, Portugal

Divison Aquaculture and Upgrading

Department of Sea and Marine Resources

Background


Main producers
Commercial weight
ranges between 2 – 3 kg
France
Spain
Portugal
Italy

Influence of size on texture properties of farmed meagre

Previous works: portion-size (800 g) and 1.5 kg

- ... **Texture was the most critical quality attribute**

- Low fat content
- Balanced fatty acids (w3/w6 ratio)
- Good sensory acceptance

Which is the best size of meagre?

Influence of size on texture properties of farmed meagre

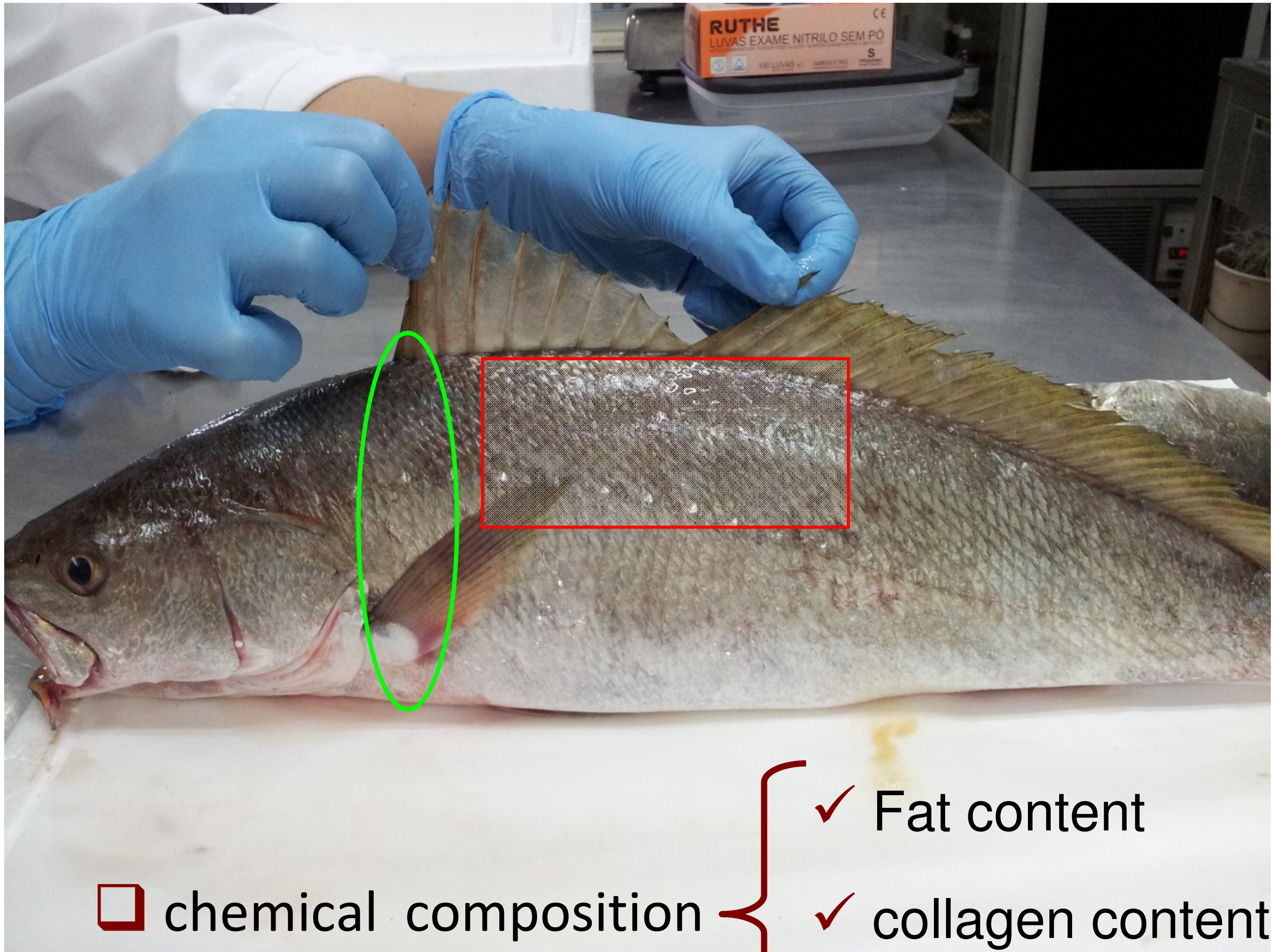
FISH

- 800 g
- 1.5 kg
- 2.5 kg

Fish Rearing

Influence of size on texture properties of farmed meagre

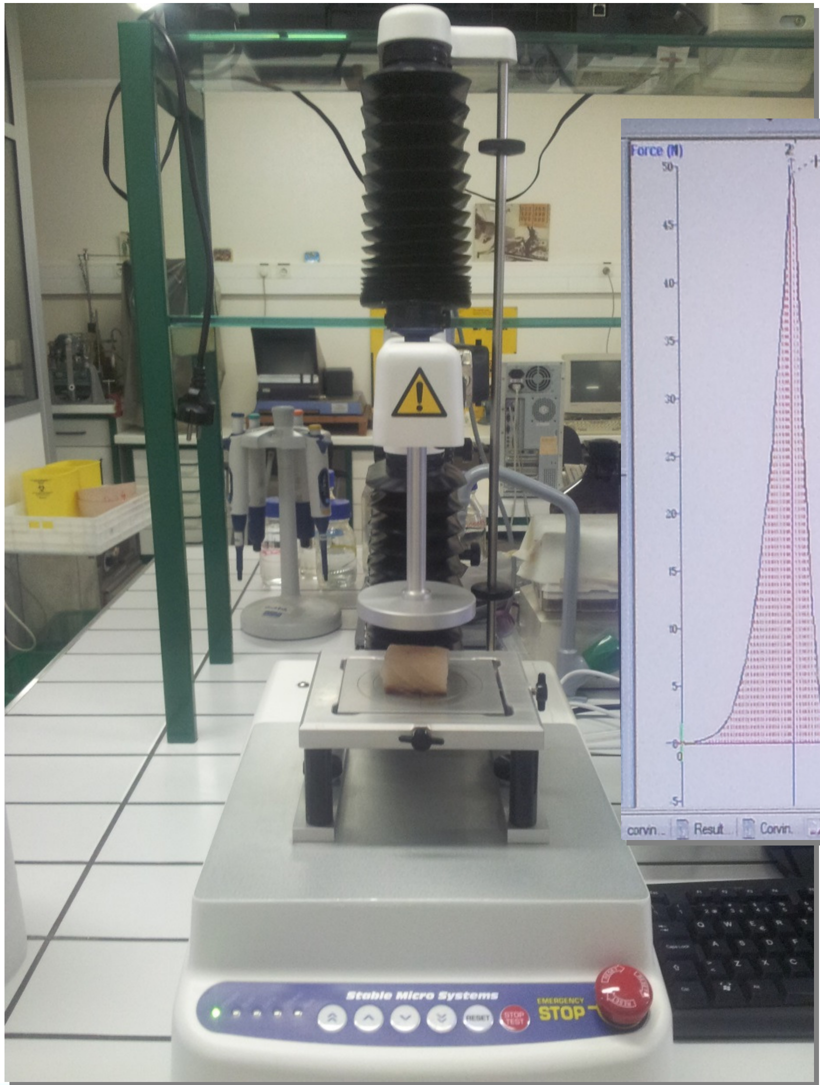
Fish Sampling (N=8) and Analysis



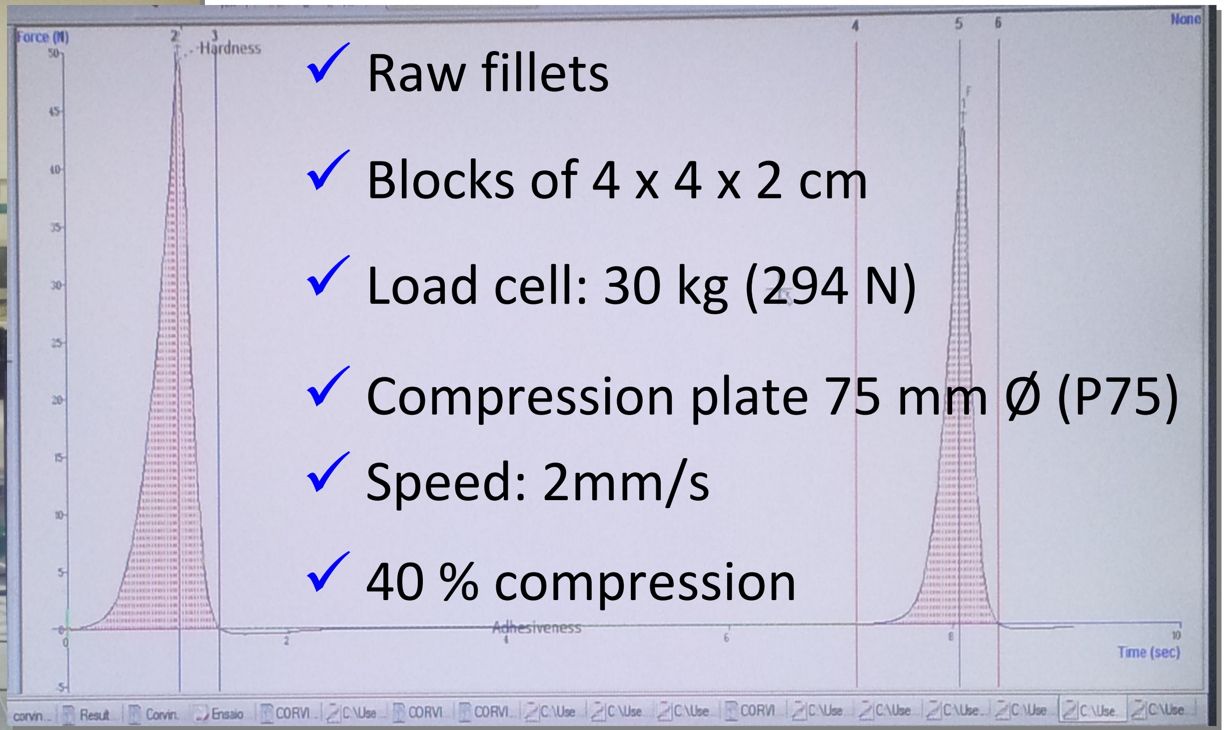
- ❑ Morphometrics
- ❑ Histology

- ❑ Texture measurements
- ❑ Sensory assessment
- ❑ chemical composition
  - ✓ Fat content
  - ✓ collagen content
  - ✓ Fatty acids profile

Texture Measureaments – TA.XTPlus



- Texture Profile Analysis (TPA)



- ✓ Raw fillets
- ✓ Blocks of 4 x 4 x 2 cm
- ✓ Load cell: 30 kg (294 N)
- ✓ Compression plate 75 mm Ø (P75)
- ✓ Speed: 2mm/s
- ✓ 40 % compression

Influence of size on texture properties of farmed meagre

Histological Analysis

- Fish Steak at 1st ray of dorsal fin

✓ 2 Samples 0.5 cm thickness

✓ Fixed 10 % buffered formalin

✓ Dehydrated in alcohol; Immersion in xylol

✓ Included in paraffin

✓ 2 serial sections of 7 µm were stained in haematoxylin and eosin

✓ Muscle cellularity was determined using an Image Analysis System, Image J

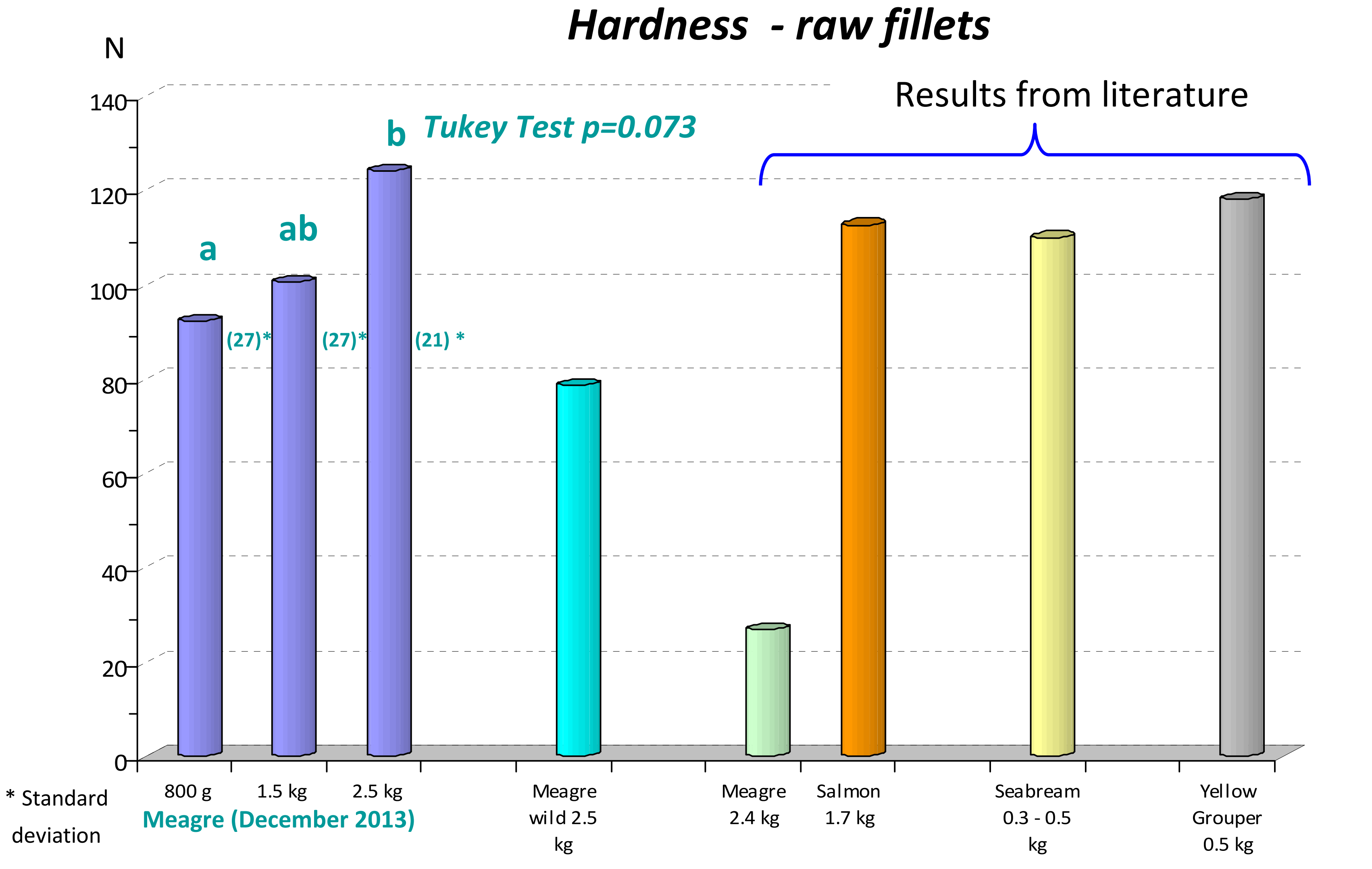
Sensory Evaluation

- ✓ Steamed cooked fillets
- ✓ 8 Panellists
  - ❖ 30 – 60 years old
  - ❖ 60 % women
- ✓ Line scale 12 cm

Attribute Intensity

Absent — Very Intense

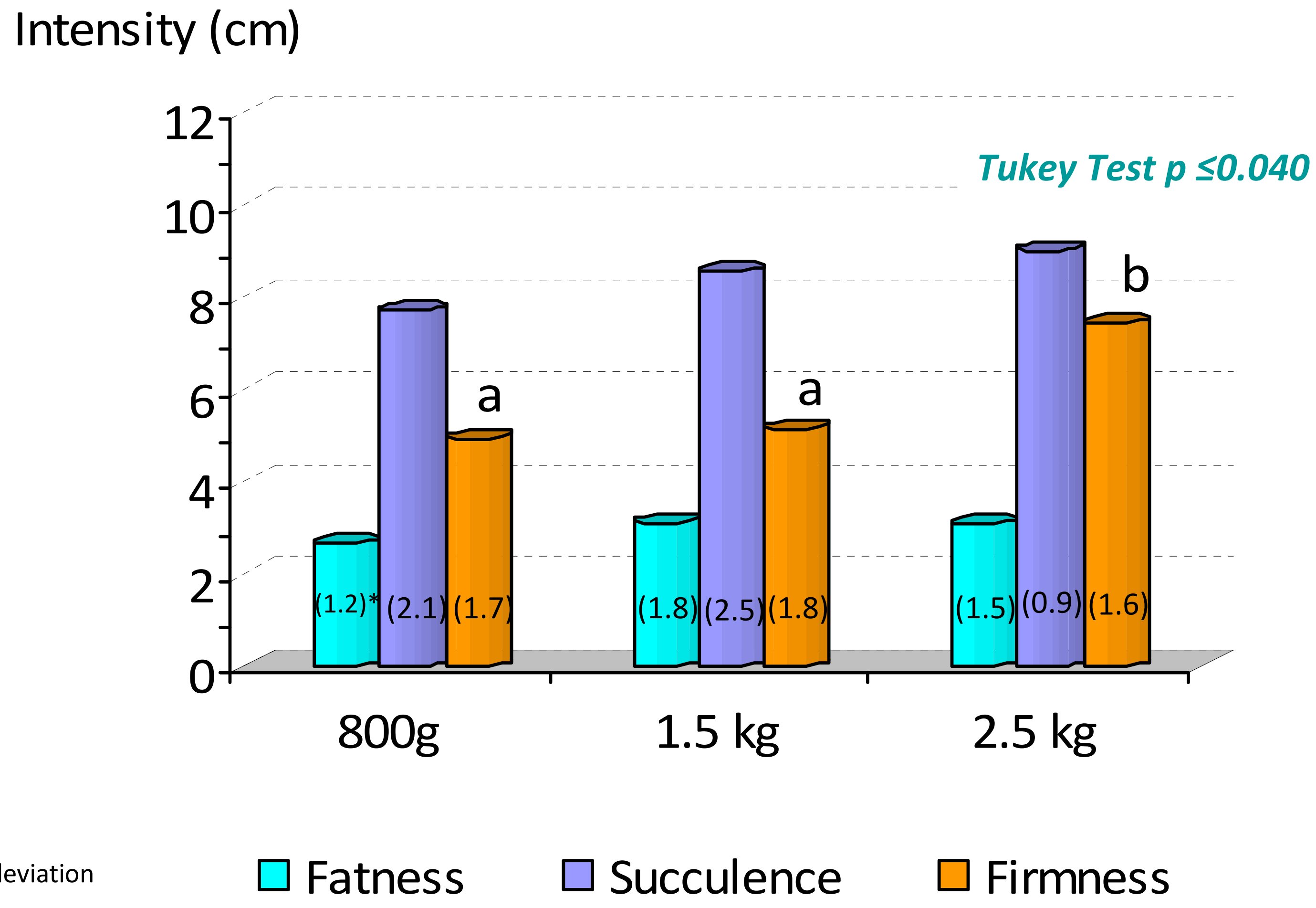
Results – Texture properties



Influence of size on texture properties of farmed meagre

Results

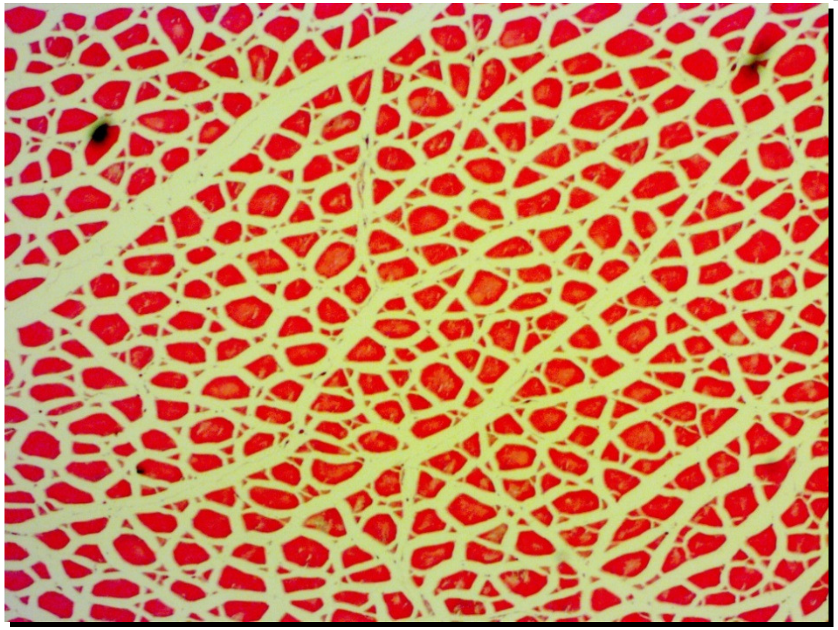
Sensory properties

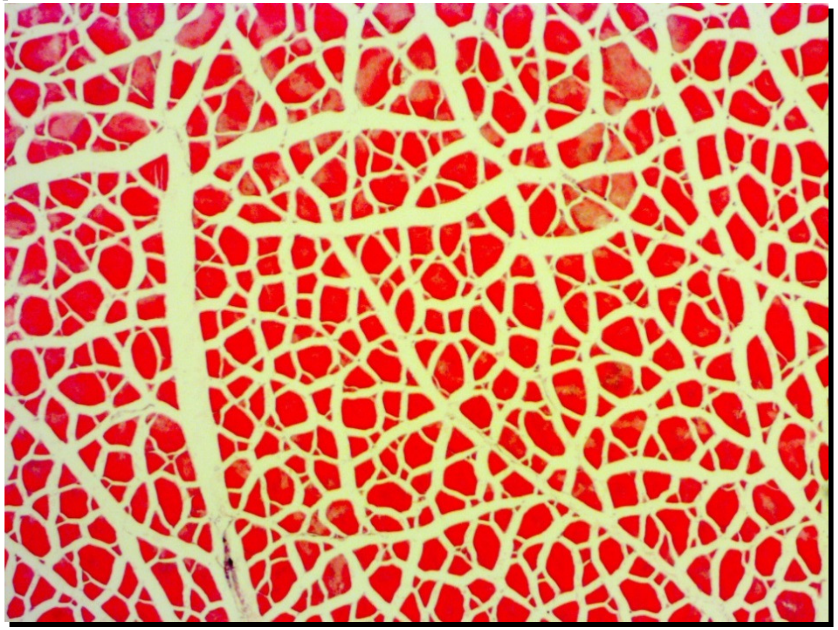


* Standard deviation

Results – Muscle cellularity

40 x

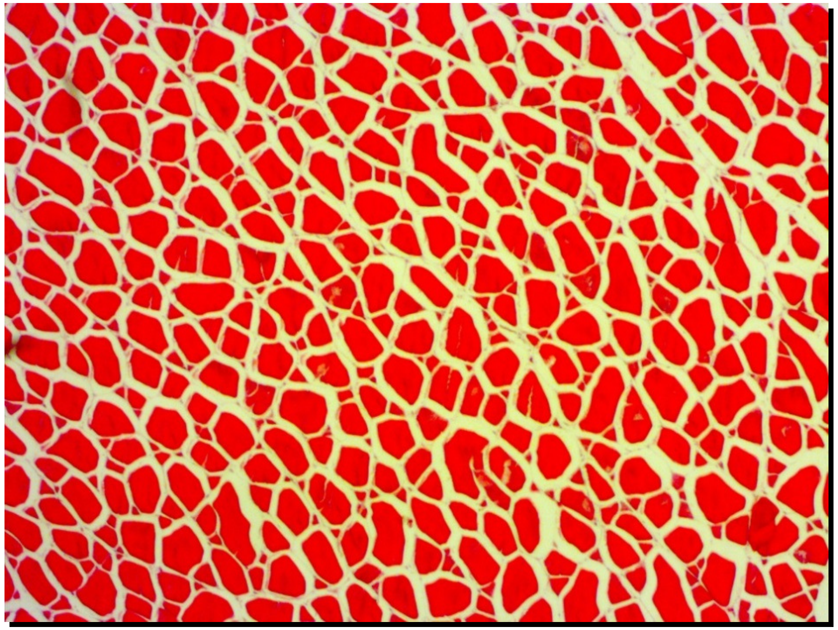




800 g

< 3×10^{-4} mm²

[1 – 3 [$\times10^{-3}$ mm²



1.5 kg

< 3×10^{-4} mm²

[1 – 3 [$\times10^{-3}$ mm²

2.5 kg

[1 – 3 [$\times10^{-3}$ mm²

≥ 3×10^{-3} mm²

Future work

- 800 g
- 1.5 kg
- 2.5 kg

Summer

- wild meagre 2.5 kg

- Analysis
  - ✓ Muscle cellularity
  - ✓ Texture

instituto português do mar e da atmosfera
Portuguese Institute for the Sea and Atmosphere, IPMA IP - Lisbon, Portugal

Influence of size on texture properties of farmed meagre (Argyrosomus regius)

THANK YOU FOR YOUR ATTENTION!

amparo@ipma.pt

Divison Aquaculture and Upgrading

Department of Sea and Marine Resources

WEFTA 2014
SEAFOOD science for a changing demand
WEFTA
44th WEFTA meeting · 9-11 June 2014 · Bilbao (Spain)

On site and rapid tuna authentication system

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WEFTA

WEFTA 2014
SEAFOOD science for a changing demand
44th WEFTA meeting · 9-11 June 2014 · Bilbao (Spain)

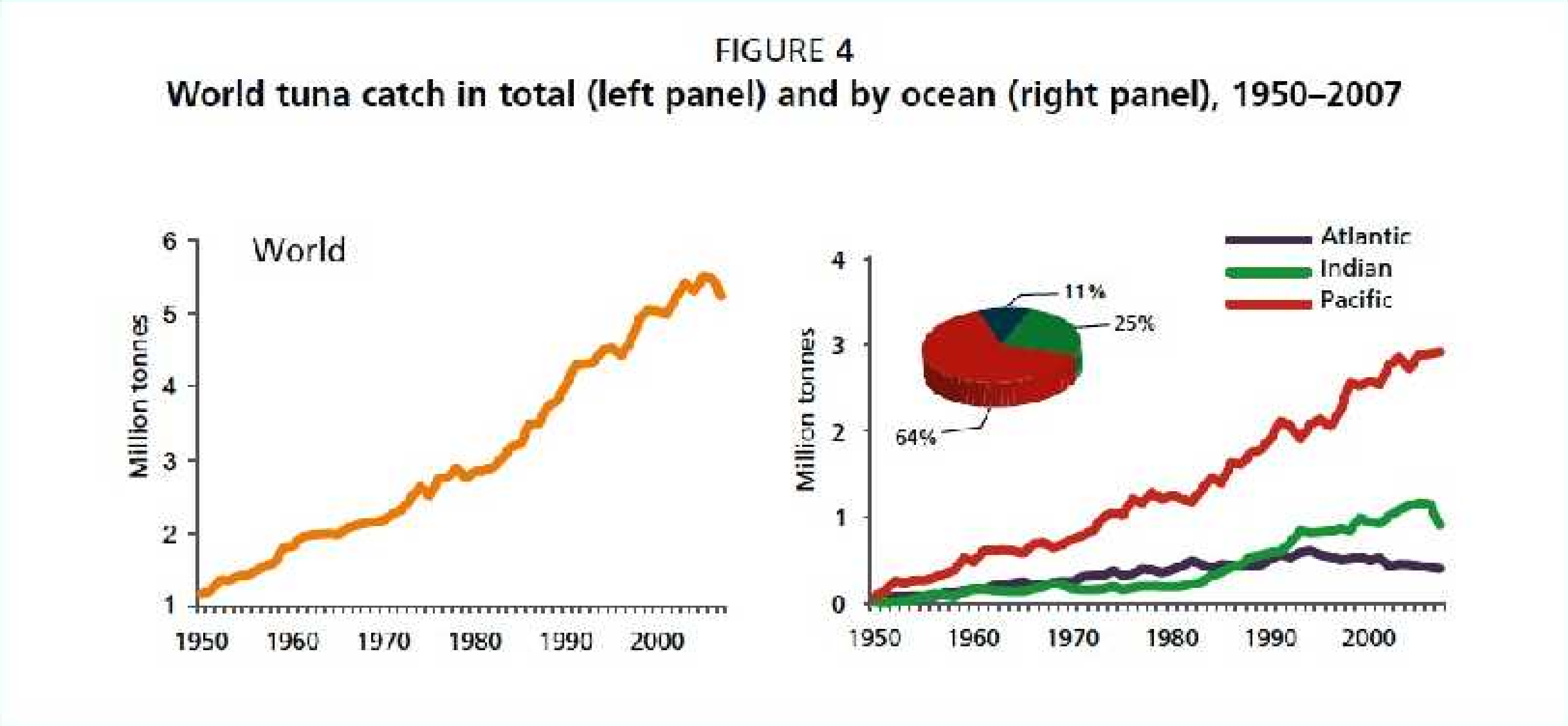
SUMMARY

Importance of commercial tuna species

Canning industry

On site and rapid authentication system

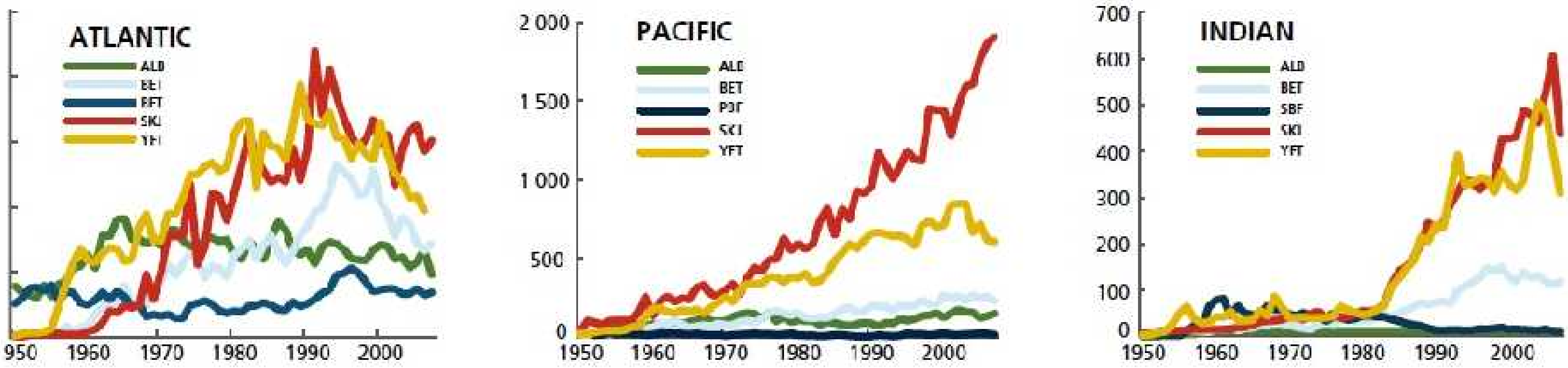
Importance of commercial tuna species



Note: The pie chart in the right panel represents the average share by ocean for the period 2001-2005.
Source: FAO and RFMO databases.

Importance of commercial tuna species

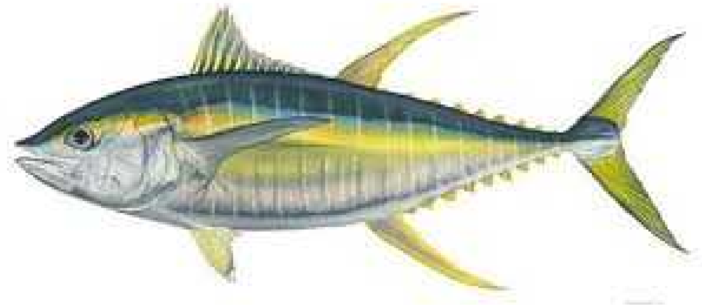
FIGURE 6
Catch (in thousand tonnes) of major tuna species by ocean, 1950–2007



Source: FAO and RFMO databases.

Importance of commercial tuna species

Skipjack



Yellowfin

Bigeye

Albacore

Importance of commercial tuna species

Canning industry

On site and rapid authentication system

Canning industry

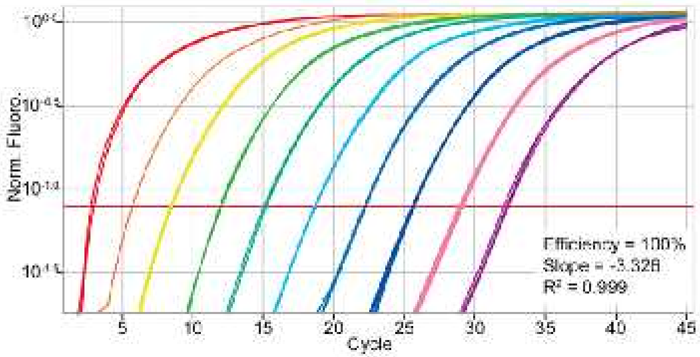
Two ways of receiving tuna suppliers:

Canning industry

HOW CAN INDUSTRY IDENTIFY THE LOINS TO KEEP TRACEABILITY?

HOW CAN INDUSTRY IDENTIFY THE LOINS TO KEEP TRACEABILITY?

HOW CAN INDUSTRY IDENTIFY THE LOINS TO KEEP TRACEABILITY?



HOW CAN INDUSTRY IDENTIFY THE LOINS TO KEEP TRACEABILITY?

On site and rapid tuna authentication system

On site

rapid

On site and rapid tuna authentication system

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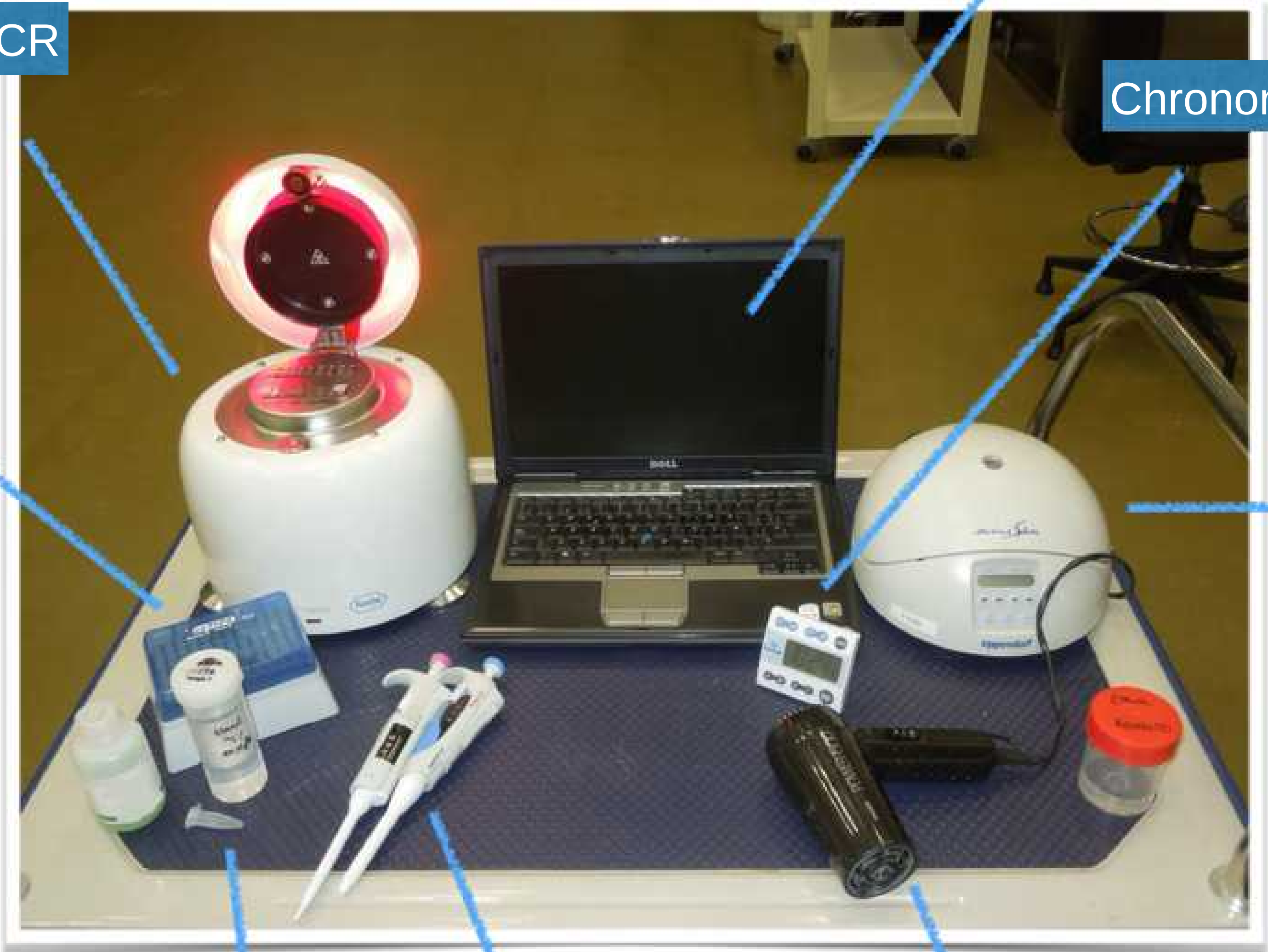
On site and rapid tuna authentication system



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Sampling

DNA Isolation

Analysis by qPCR

Sampling

5'

25-50 mg

DNA Isolation

Lysis

Centrifugation I

EtOH Precipitation

Centrifugation II

EtOH Washing

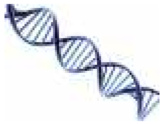
Drying

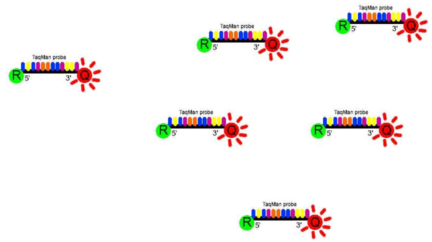
Rehydrating

20'

0,1-0,2 mg DNA

Analysis by qPCR

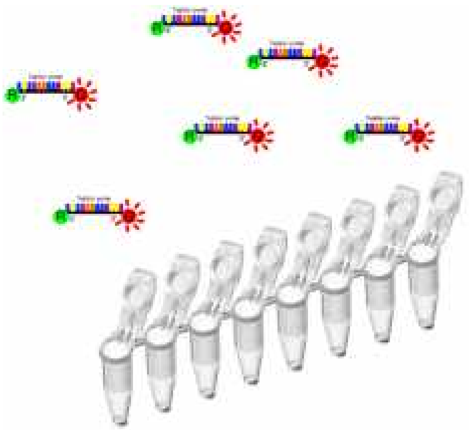




120'

Analysis by qPCR

120'



On site and rapid tuna authentication system

Analysis by qPCR

120'

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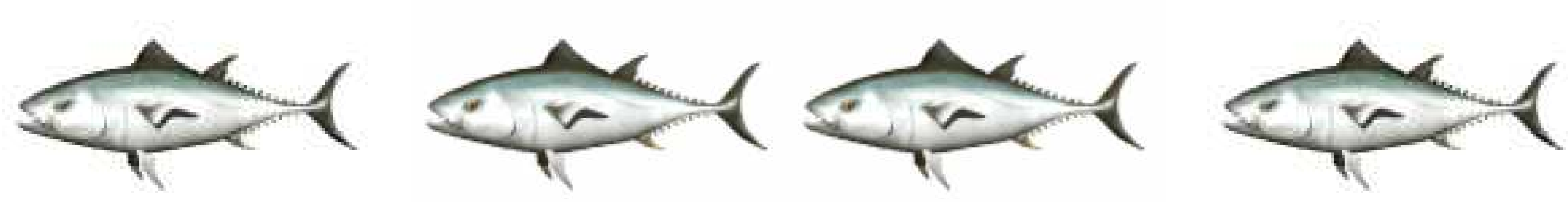
THANK YOU
GRACIAS
ESKERRIK ASKO



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SEAFOOD Science for a changing demand

PRESENTATIONS

SUSTAINABLE USE OF CATCHES AND FARMING

Demonstration Project for use and valorise discards of the Basque offshore fleet

June 11th 2014, Bilbao

Susana Etxebarria
setxebarria@azti.es

VALORPESC PROJECT: INDEX

- Context
- Objective
- Results:
  - Diagnosis
  - Study of Valorisation alternatives
  - Pilot trials:
    - Fish meal for animal feed
    - Fish pulps for human consumption
- Conclusions
- Next challenges

VALORPESC PROJECT: CONTEXT

Funded by the Basque Government and European fisheries fund (EFF)

Start

Finish

[cfp-**reform**watch.eu/](cfp-reformwatch.eu/)

2008 → 2012

(Meanwhile there has been a Common Fisheries Policy reform)

The new CFP **does away with the wasteful practice of discarding** through the introduction of a **landing obligation**. To allow fishermen to adapt to the change, the landing obligation will be introduced gradually, between 2015 and 2019 for all commercial fisheries (species under TACs, or under minimum sizes) in European waters.

Approved December 2013

VALORPESC PROJECT: OBJECTIVE

In VALORPESC study, feasible technical and economical solutions have been developed to use and valorize possible discards (other than those under minimum conservation size) of the Basque offshore fleet. The final objective has been to contribute to the sustainability of the fleet making a better use of the possible high amount of proteins to be discharged

VALORPESC PROJECT: RESULTS

1 Diagnosis and detailed inventory of discards of the Basque offshore fleet with discharged port in Ondarroa

2 Study of valorisation alternatives from economic, technical and market point of view

Discarded species	% annual average*	Use outlined
Total amount of discards	100	Fish-meal and fish oil
Species with high interest (Atlantic horse mackerel, Atlantic mackerel, Blue whiting)	64	Fish pulp and surimi Pet-food (no muscular fraction)
Minority species	29	Fish-meal and fish oil Biogas Pet-food
Invertebrate	7	Calcium carbonate Chitosan

Table 1. Availability of discards as raw material for different uses

*Based in 52 weeks/year (average made with confidential data provided by UIM AZTI from 2004 to 2007)

VALORPESC PROJECT: RESULTS

Potential use	Yield rate (%)	Potential value (euro/kg)	Final value (Euro)
SURIMI	16	2	1.644.480
FISH-MEAL	22	0,6	1.052.832
FISH OIL	5,5	0,8	350.944
BIOGAS	325 kwh/Tn	0,042	
COMPOST*	50	0,025	28.525
CHITOSAN	4,8	800	21.292.800

Table 2. Potential product sourcing and final value to be obtained

Taking into account:

- *Availability of discards as raw material for the different uses*
- *Quality and composition of discards in relation to their uses*
- *Potential product sourcing and their obtaining value*

Two feasible valorisation alternatives for unwanted catches were studied:

HIGH QUALITY FISH MEAL (animal feed)
FISH PULPS-SURIMI (human consumption)

VALORPESC PROJECT: RESULTS

Two pilot trials to test the viability of the alternative HIGH QUALITY FISH MEAL:

PILOT TRIAL 1: Species caught during 24 hours fishing trip in the southern part of the Bay of Biscay (Bottom pair trawl)

Exhaustive analysis of the infrastructures and human resources needed for storage and classification of discards on board

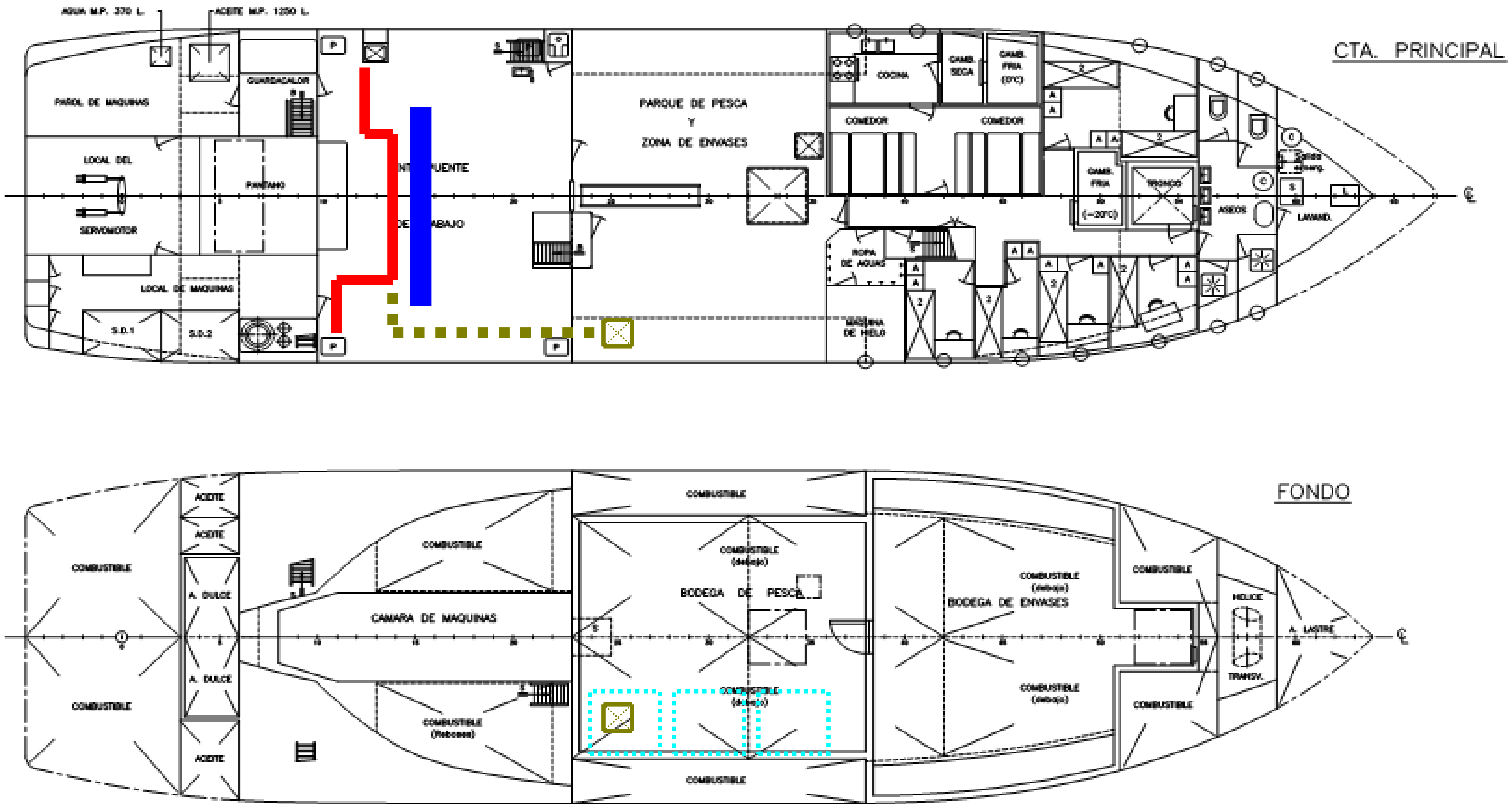
Viability of the alternative that fulfilled these characteristics:

- ✓Minor modifications on board
- ✓No extra work for crew
- ✓Simple but profitable use

Picking up unwanted species in insulated bins of 0.6 m3 (500 kilogram of fish ±) located in the cold room

VALORPESC PROJECT: RESULTS

HIGH QUALITY FISH MEALS (Provisional layout)



Conveyor belt for fish downloading to the sea

Classification desk

On side sloped conveyor belt to the cold room

Bins of 0,6 m3

VALORPESC PROJECT: RESULTS

Bins filled in the cold room

Data-loggers to measure Tª of the fish along the value chain

<u>PILOT TRIAL 1</u>

Objective fish spices: Blue whiting/Hake

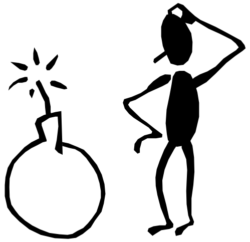
Discards picked up: Smashed Blue whiting

- **Technical and organizational aspects**
  (Valorising company/OPPAO)
  - Cold storage of the fish
  - Logistics to pick up the fish at port and sent it to valorise
- **Legal aspects**
  - Classification of species (Atlantic horse mackerel)
  - Quotas
- **Economics** (Valorising company/OPPAO)
  - Cold storage costs
  - Logistics costs
  - Price of the fish

VALORPESC PROJECT: RESULTS

IMPORTANT!

All landings species **must be quantified** in the logbook (REGULATION (EC) No. 2847/93) and **deducted from the quota** (REGULATION (EU) No 57/2011



Discards must be **counted and classified** in someway & **deducted** from the corresponding quota

ATLANTIC HORSE MACKEREL

26%

Available quota

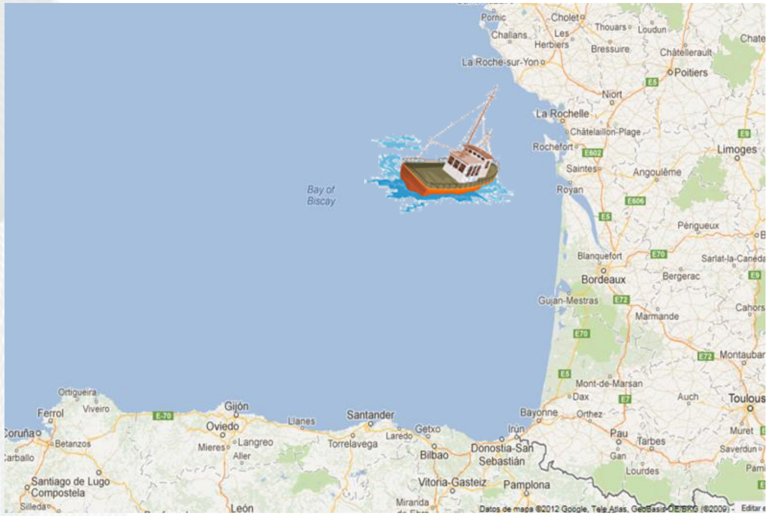
Enough volume of discards for a profitable valorisation ([illegible]2% of the total discards of the offshore fleets)

Simple classification of species

PILOT TRIAL 2: Experiment with species caught along the French coast during one week fishing trip (Bottom otter trawls, demersal species fishery)

Objective species: Hake

Discards picked up: Common dragonet *Callionymus lyra* (no quota species)



OBJECTIVE: To carry out and adjust a protocol to valorise discard of a single fish species

Protocol to valorise discards as high quality fish meals for animal feeding

VALORPESC PROJECT: RESULTS

Protocol to valorise discards as high quality fish meals for animal feeding

At port (**loading isolated bins**)

On board

Classification
Weigning
Addition of ice
Cold storage

At port (**downloading discards to be valorised**)

Cold storage at port until valorising company pick them up

Reception of raw material for production of high quality fish meal

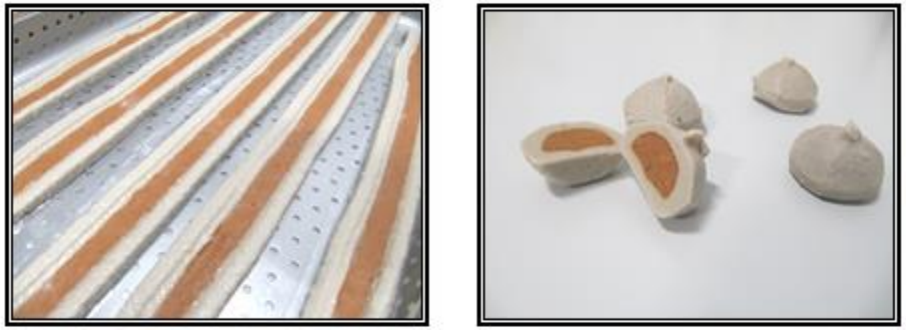
VALORPESC PROJECT: RESULTS

FISH PULPS FOR HUMAN CONSUMPTION

MAIN OBJECTIVE: Study the technological feasibility to develop high value products from Atlantic horse mackerel pulps

Two product lines with different shapes and sizes have been carried out:

- Fish product stuffed with marinara sauce into pellets of fish
- Fish product bilayer laminated with marinara sauce



Picture 1. Fish product bilayer laminated and fish product in pellets

Fish products in pellet form have a 76% by weight in fish mass (external layer) and a 24% in marinara sauce

VALORPESC PROJECT: CONCLUSIONS

Profitability: Both manufacturing fish pulp and high quality fishmeal are viable for use and valorisation of unwanted catches. The support of the company that manufacture the fishmeal makes profitable this activity.

Capacity for the use of unwanted catches: For the full valorisation of discards is necessary to adapt properly the offshore fleet.
The model used to exploit and valorise discards is unique and individual to each fleet.

Fish classification: Manual classification is effective for one spices, blue whiting and common dragonet in this case. For mixed species, these must be counted and classified, so we propose more advanced systems to classify them, such as artificial vision.

Legal aspects: Proposal of Dual controlled quota (2012). There is a quota for each discard spices with potential to be used. Thus we avoid return to the sea unwanted catches that will hardly survive once on board. Requirement: this secondary activity does not become core business!

NEXT CHALLENGE

The landing obligation will be introduced gradually, between 1st January 2015 and 2019 for all commercial fisheries (species under TACs, or under minimum sizes) in European waters.

It will be **a great challenge** for fishermen to compliance with **Article 15. Landing obligation** of the Common Fisheries Policy reform (Regulation EU Nº 1380/2013 of the European Parliament and the Council of 11 December 2013).

Landing Obligation encourages improving selectivity, fleet behavioral changes and developing new marine products.

Real and feasible solutions are needed by fleets to get adapted **on time** to this new regulation.

The approach to discard reduction and valorization should be taken including all variables affecting the fishing activity from extraction to the port.

Work team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LIFE iSEAS: Knowledge-Based Innovative Solutions to Enhance Adding-Value Mechanisms towards Healthy and Sustainable EU Fisheries

Ricardo I. Pérez Martín and Luis T. Antelo

Marine Research Institute (IIM-CSIC)

Vigo - Spain

IIM Instituto de Investigaciones Marinas de Vigo

CSIC Consejo Superior de Investigaciones Científicas

WEFTA

WEFTA 2014

SEAFOOD science for a changing demand

44th WEFTA meeting · 9-11 June 2014 · Bilbao (Spain)

The LIFE iSEAS Project

Knowledge-Based Innovative Solutions to Enhance Adding-Value Mechanisms towards Healthy and Sustainable EU Fisheries

- **BUDGET** → Total: 3,866,342 €; % EU Co-financing: 1,919,325 € (49,79%)
- **DURATION** → Begins: 01/07/2014 Ends: 30/06/2018 (*48 Months*)
- **BENEFICIARIES:**
  - Coordinating Beneficiary:

AGENCIA ESTATAL CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS (CSIC) – *INSTITUTO DE INVESTIGACIONES MARINAS*

  - Associated Beneficiaries:

Centro Tecnológico del Mar – Fundación CETMAR	Centro de Supercomputación de Galicia - CESGA	Universidad de Santiago de Compostela	Instituto Español de Oceanografía - IEO	Organización de Productores de Pesca Fresca del Puerto y Ría de Marín	Talleres Josmar, S.L.

Why LIFE iSEAS

* **Discards** are one of the most important issues in fisheries, both from an socio-ecocomic and environmental point of view.

> *"**Discards or discarded catch** is that portion of the total organic material of animal origin in the catch, which is thrown away or dumped at sea for whatever reason. It does not include plant materials and post-harvest waste such as offal"*
>
> *Food and Agriculture Organization of the UN*

* It is a fact that any fishing operation has an unavoidable percentage of discards, from **long-liners** (2-10%) to **trawlers** (up to 90%), for a total of up to **7 millions of tons/year** of discards.

Why LIFE iSEAS

REASONS FOR DISCARDING

Economic

- *Existence of little or no market for some species and/or sizes*
- *The need to maximise the quantity of other marketable and more valuable species*
- *The preference for larger specimen of the same species (high-grading)*

Regulatory

- Exceeding quotas for a particular species in mixed fisheries
- Existing Minmum Landing Sizes (MLS).
  Captured undersized specimens are unmarketable and, therefore, they must be discarded
- Existence of protected and, therefore, unmarketable species

Technical

- Poor selectivity characteristics of the fishing gear deployed.
- The multi-species nature of some fisheries

Why LIFE iSEAS

* **Discards** constitute a purposeless waste of valuable marine resources which plays an important role in the depletion of marine populations.

  * ***Ecological adverse impacts:***
    a) Changes in the ecosystem and in the overall structure of trophic webs take place.
    b) Discarding of juveniles of target species results in a future reduction of spawning biomass.
    c) Discarding of mature specimen of target species inmediatelly reduces the spawning biomass of the stock.

  * ***Socio-economic adverse impacts:***
    a) Fish which is killed without contributing to the income to the sector will not contribute to the income in the future either (*non-discarded fish will be a resource in the future*).
    b) Fishing industry is affected in the longer term since it is dependent on a healthy marine ecosystem.

Why LIFE iSEAS

* **Discards** are considered as an unacceptable waste of resources and a New Common Fisheries Policy has been set up by the European Commission to mitigate and prohibite them.

Final compromise draft Regulation of the European Parliament and of the Council on the Common Fisheries Policy (14.06.2013)

Article 15

Obligation to land all catches

*"All catches subject to catch limits, **and in the Mediterranean also catches subject to minimum landing sizes as defined in the Annex to Regulation (EC) No. 1967/2006**, caught during fishing activities in Union waters or by Union fishing vessels outside Union waters **in waters not subject to third countries' sovereignty or jurisdiction, in the fisheries and geographical areas listed below** shall be brought and retained on board the fishing vessels, recorded, landed, **and counted against the quotas where applicable**, except when used as live bait."*

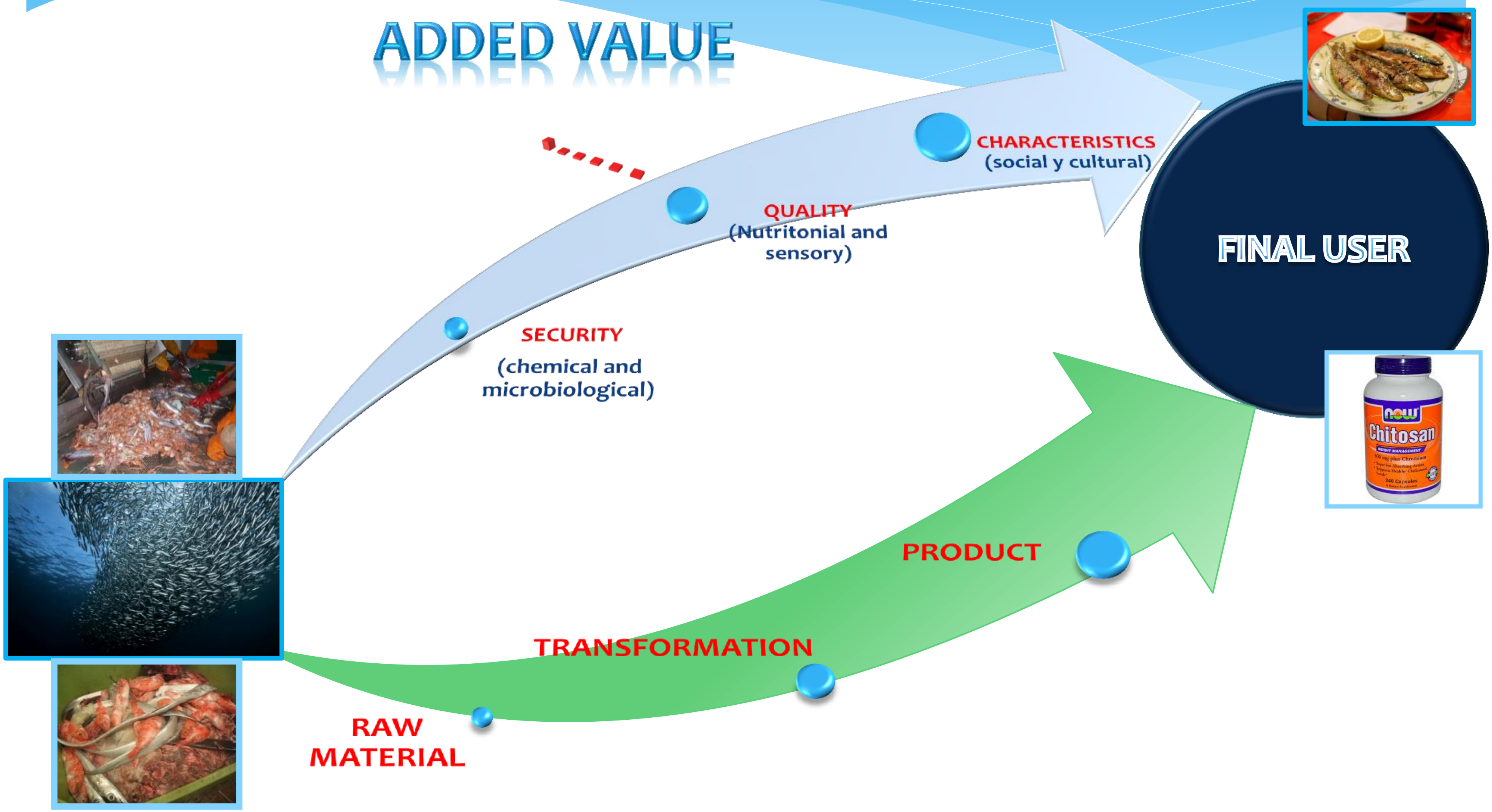
Species	Date
(a) Small pelagic fisheries; i.e. fisheries for mackerel, herring, horse mackerel, blue whiting, boarfish, anchovy, argentine, sardine, sprat; Large pelagic fisheries; i.e. fisheries for bluefin tuna, swordfish, albacore tuna, bigeye tuna, blue and white marlin; fisheries for industrial purposes; i.e. fisheries for capelin, sandeel and Norway pout; salmon in the Baltic Sea.	At the latest by 01/01/2015
For *species defining the fisheries* in fisheries in Union waters of the Baltic Sea for species subject to catch limits other than those covered by (a) above.	At the latest by 01/01/2015
for all other species in fisheries in Union waters of the Baltic Sea - those species subject to catch limits other than those covered by point (a).	Not later than 01/01/2017
(i) The North Sea fisheries for cod, haddock, whiting, saithe[3]; Norway lobster; common sole and plaice; hake; Northern prawn; (ii) North Western waters fisheries for cod, haddock, whiting, saithe; Norway lobster; common sole and plaice; fisheries for hake; (iii) South Western waters fisheries for Norway lobster; common sole and plaice; hake; (iv) Other fisheries for species subject to catch limits.	At the latest from 1 January 2016 for *species defining the fisheries* and not later than 1 January 2019 for all other species

Why LIFE iSEAS

Why LIFE iSEAS

* In this new legal framework defined by the new CFP, the pursued objectives are:
    * Reduce/Eliminate discards (by improving fishing gears selectivity, avoiding non-targeted species zones or seasons).
    * **Make the best possible use of discarded biomass in a sustainable manner and avoid its waste**, also reducing the costs derived from shortage the storage capacity in the vessel.

Why LIFE iSEAS



Previous work to LIFE iSEAS

BE-FAIR

FAROS

BIOTECMAR

BE-FAIR	FAROS	BIOTECMAR
LIFE Programme - EU (2005-2008)	LIFE Programme - EU (2008-2012)	INTERREG IVB (Atlantic Area Programme) – EU (2009-2012)
IIM-CSIC, CETMAR, IFREMER, IPIMAR, Autoridad Portuaria de Vigo, Espaderos del Atlántico, HRG, S.L.	IIM-CSIC, CETMAR, IEO, IPIMAR, CESGA, Autoridad Portuaria de Vigo	UEB-UBO, CSIC, MNHN, IPIMAR, Technopole-Quimper, Université de La Rochelle, Irish Seaweed Centre, Université de Nantes, IFREMER, Indigo Rock, CETMAR, NET, S.A.

IBEROMARE

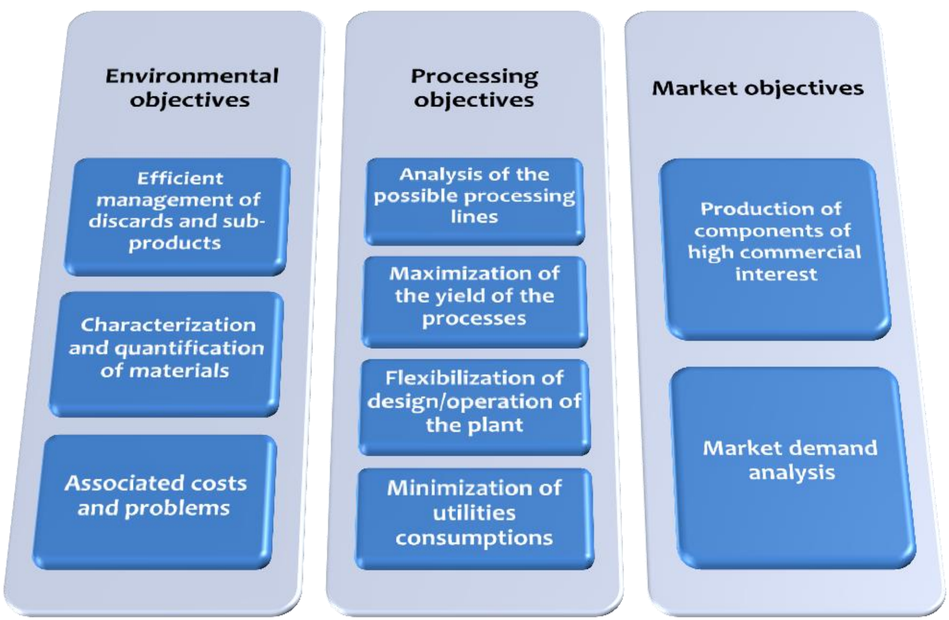
MARMED

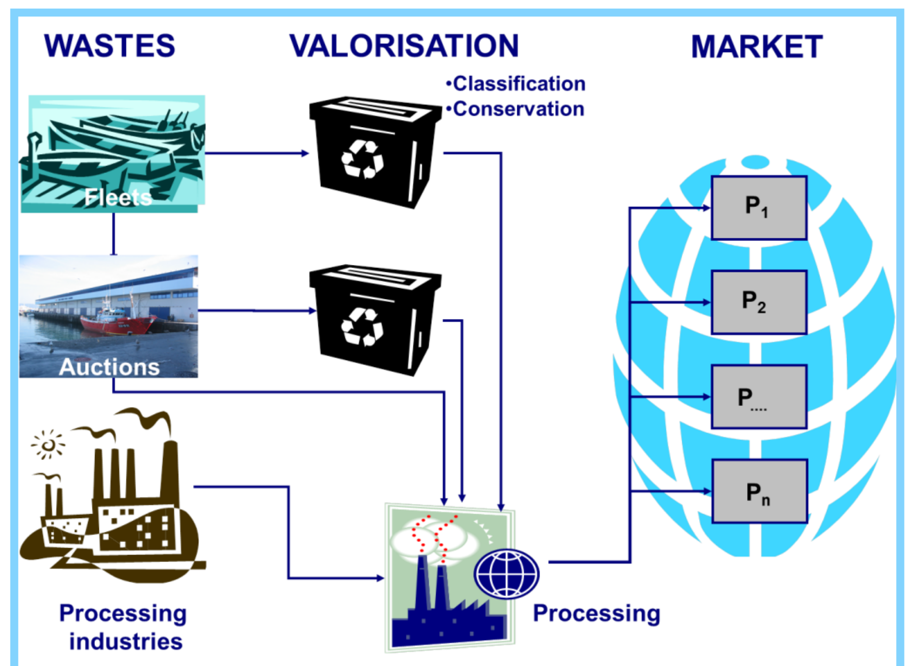
FROM

The BE-FAIR Project

Benign and **E**nvironmental **F**riendly Fish Processing Practices to Provide **A**dded Value ar
Innovative Solutions for a **R**esponsible and Sustainable Management of Fisheries

* **MAIN OBJECTIVE:** Development and implementation of an **effective and integrated management system both on board and on land in order to recycle and reuse the waste produced by the fishing industry**, including discards and by-catch.





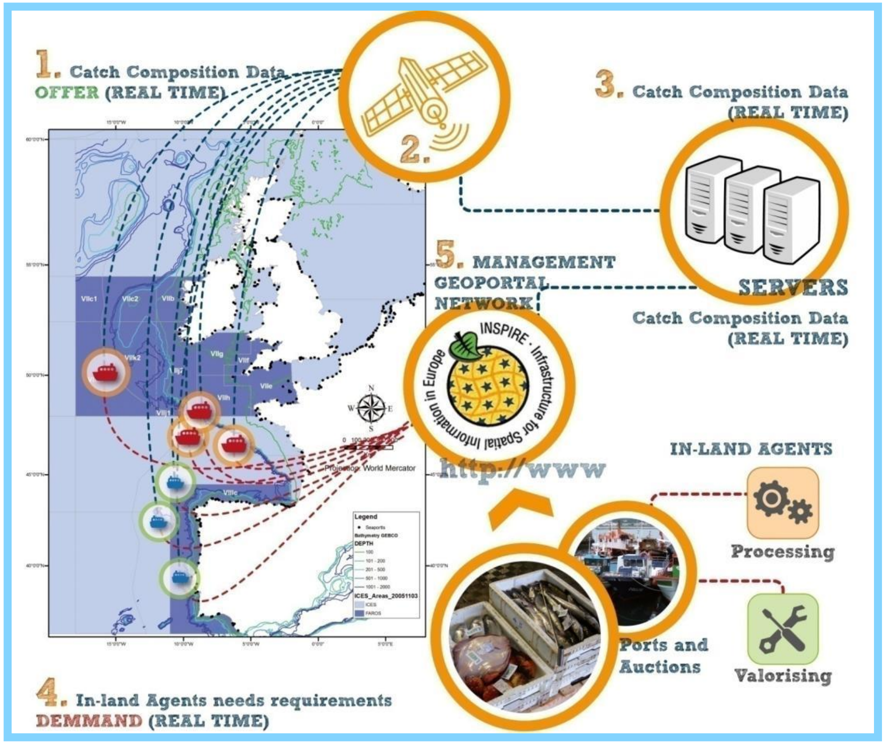
The BE-FAIR Project

The BE-FAIR Project

The FAROS Project

Integral Networking of Fishing Sector Actors to Organize a Responsible, Optimal and Sustainable Exploitation of Marine Resources

- **MAIN OBJECTIVE:** To define an efficient and **optimal discards management network** of actors involved in the fishing activity by exploiting the existing synergies between them.



The On-Board FAROS Technologies

To on-line identify volume and types/fractions of species with higher levels of discards

BIOMASS ESTIMATOR OPTICAL SYSTEM (BEOS)

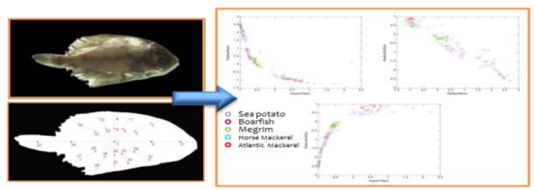
To transmit this well-structured data to land for the considered fleets

RED BOX SYSTEM

- **The BEOS system integrates machine vision technologies, optical information processing and feature extraction by means of nonlinear modeling based on artificial neural networks. The steps in the characterization methodology are: 1) Image capturing → 2) Pre-processing → 3) Body shape information extraction → 4) Color modeling → 5) Species classification and Biomass estimator.**

BEOS ON BOARD

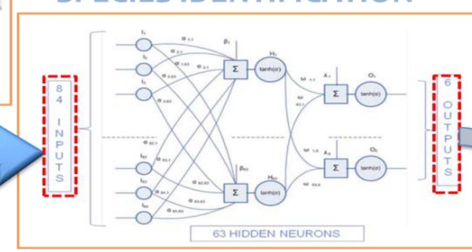
IMAGE FROM BEOS



MORPHOMETRIC ALGORITHMS

COLORIMETRIC ALGORITHMS

NEURAL NETWORK FOR SPECIES IDENTIFICATION

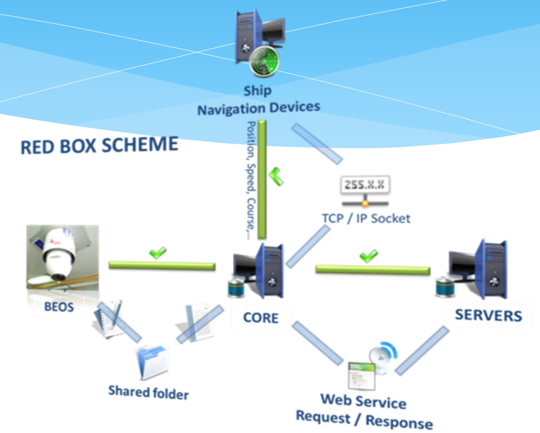


SPECIES	CORRECT IDENTIFICATION
Megrim	87%
Atlantic Horse Mackerel	88%
Boarfish	92%
Atlantic Mackerel	79%
Sea Potato	95%
Largehead Hairtail	93%
Other species (no target)	83%

- **The percentage of correct discarded species identification and mass estimation is up to a 90% and 98%, respectively.**

The FAROS MGN Environment

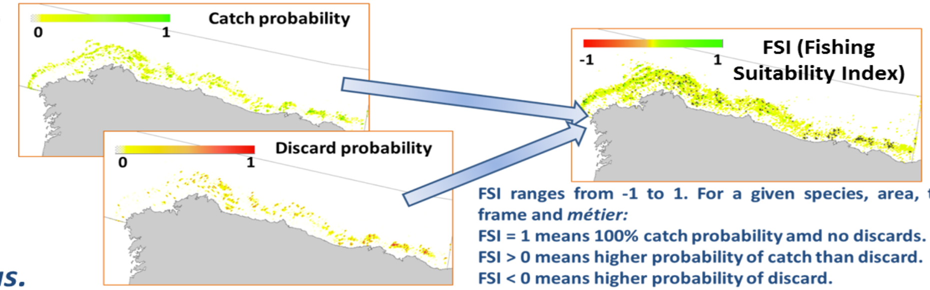
- **Once the data (species and estimated biomass) is acquired by BEOS, information is pre-processed and sent to land (to the data management servers) by making use of the RED BOX system.**



- **Based on this data, a *fully-operative global operation network* aiming an efficient management of discards has been developed. This is the so called FAROS Management Geoportal Network (MGN). It is a real-time web environment based on information flows exchanged between fleets (generated by BEOS and RED BOX) and in land agents.**

The idea is that the fishing fleets, acting as OFFER, will know the DEMAND (from processing/valorizing industries) for all the biomass captured during a campaign, generating a market exit to discards.

- **Finally, the data obtained on-board is the base of developed *predictive models of fishing areas for characterization/estimation of discarded volumes*.**



FSI ranges from -1 to 1. For a given species, area, time frame and *métier*:
FSI = 1 means 100% catch probability amd no discards.
FSI > 0 means higher probability of catch than discard.
FSI < 0 means higher probability of discard.

Such real-time models aim:
a) To know the health of the marine resources.
b) To perform a spatial rating of the fishing areas.
c) To plan in advance (in port) fleet's future activity, minimizing discard levels, fishing pressure, other negative environmental impacts (like fuel consumption) or legal restrictions over stocks while maximizing their profit.

The LIFE iSEAS Paradigm

Fishing patterns

If the areas with higher discards levels (no commercial, no quota, no size) are precisely known in real time, other vessels, working in the area, would surely try to avoid these specific zones, so reducing the total catch of discards

Efficient Valorisation

Nowadays, a quite large amount of fishing organic matter is going to produce fish meal/oil, generating products of low-medium value.

If the discards can be kept on board and landed, we think that is an opportunity to use that biomass in a more optimal/efficient way, increasing the socio-economic benefits.

Demonstration Character

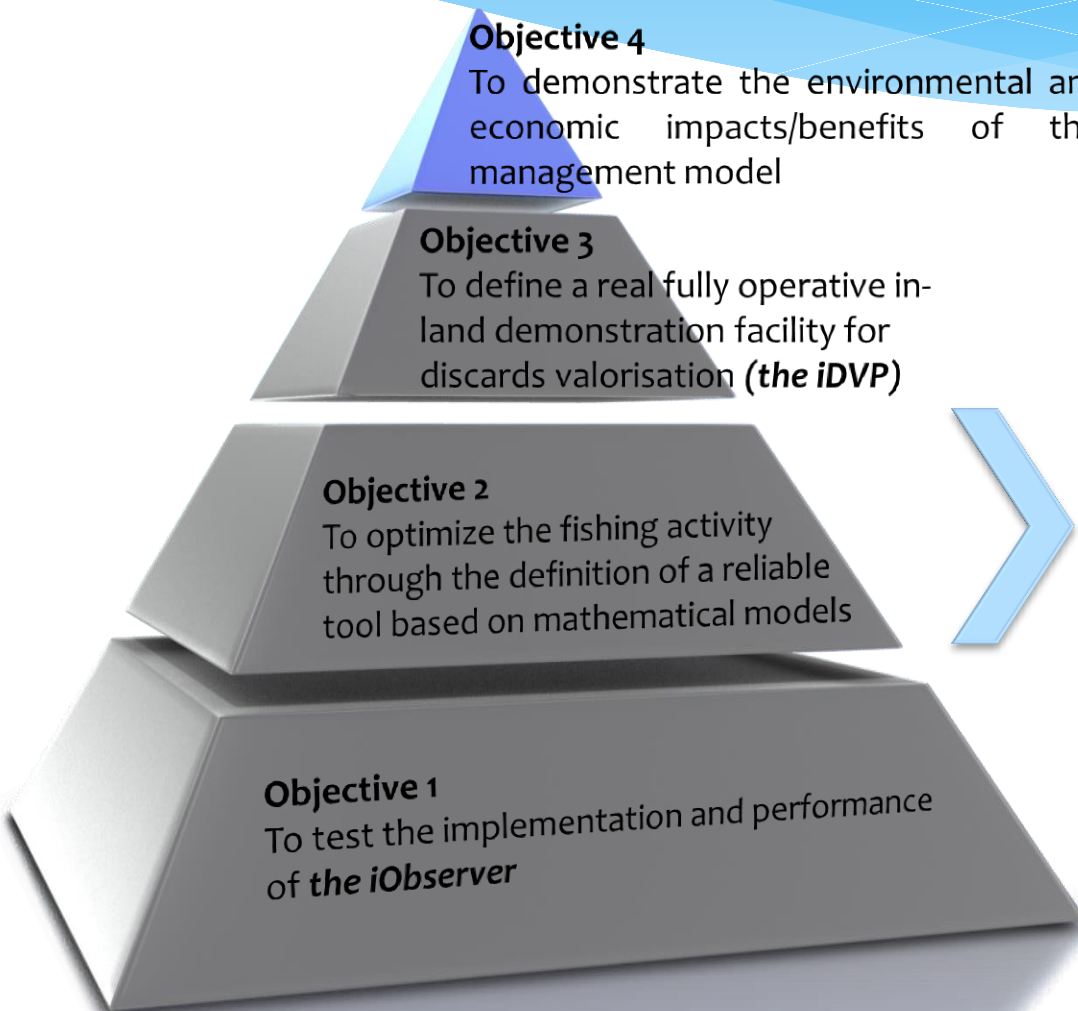
It is possible to demonstrate the validity of the proposed approach to guarantee the sustainability of fisheries only by including on it:

1. Accurate data of discards types, volumes and fishing zones.
2. Problems related to management of discards.
3. Technical procedures to obtain more specific products.
4. Socio-economic aspects related to the different steps in the value chain.

LIFE iSEAS

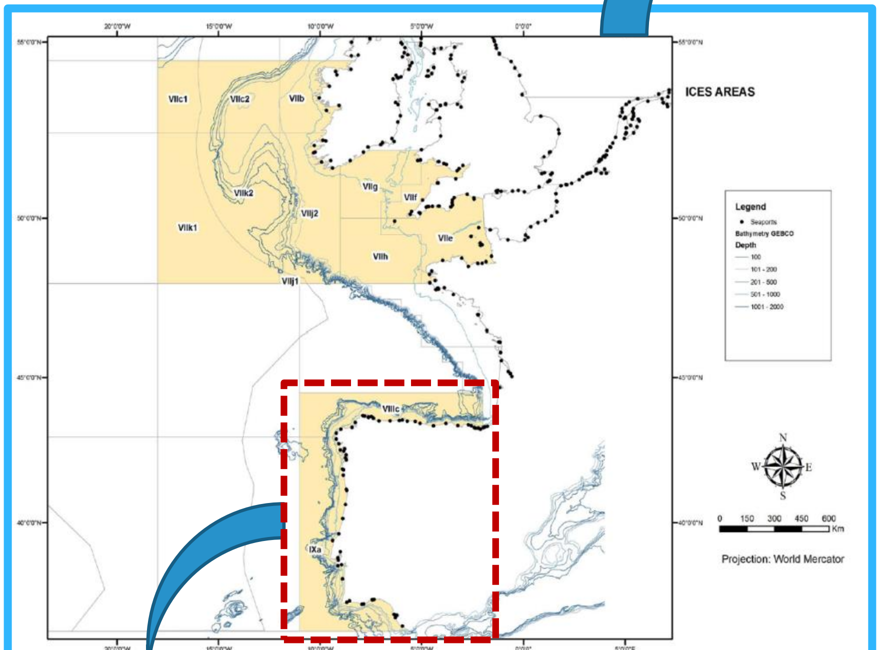
The LIFE iSEAS Objectives

The main objective is to demonstrate that a sustainable scenario (in terms of biological and socio-economic indicators) of the EU fisheries is possible through the enhancement of the real application on the fishing sector of existent knowledge and innovative solutions on discards reduction and management



- **To take real time decissions over fishing activity**
- **To perform more selective fishing**

The LIFE iSEAS Objectives



The LIFE iSEAS Expected Results

- A complete assessment of the actual situation of discards issues on selected fisheries, focusing on the socio-economic implications/impacts that the new CFP will have on the fishing sector.
- A system able to perform the work of a human observer (identifying class/quantity of discarded/target catch) on-board but without interfering the normal activity of fishermen: the iObserver.
- A data and metadata model and a complete range of OGC services (Open Geospatial Cosortium) for acquired discards information integrable on a fish discards SDI, satisfying INSPIRE Directive.
- A powerfull modelling tool to analyze the spatio-temporal conditions of considered fishing areas in terms of discards/stock status.
- A real pilot service located on the Port of Marín facilities (Galicia, NW Spain) to valorise, manage and trade discards landed: the iDVP.
- An exhaustive analysis of the environmental and socio-economic impacts of proposed solutions over all fishing sector agents as well as over the whole region (Galicia), paying special attention on capacity building for better management/reduction of discards.

LIFE iSEAS Actions

PREPARATORY

- A1. Drivers and incentives for discarding: socio-economic implications and quantification of discards in target fisheries.

TECHNICAL

- B1. Definition and testing of an iObserver.
- B2. Development of a fish discards SDI.
- B3. Optimization of the fishing activity monitoring towards the sustainability of resources.
- B4. Definition of a real fully operative on-board and in-land pilot facility for discards valorization and management.

- C1. Monitoring of impacts of the project
- C2. Environmental and socio-economic impact assessment of proposed solutions
- D1. Diffusion, demonstration and dissemination
- D2. After-LIFE+ Communication Plan
- E1. Management, coordination and information to the EC
- E2. Networking with other similar LIFE+ Projects
- E3. External audit

THANK YOU FOR YOUR ATTENTION

WEFTA

WEFTA 2014

SEAFOOD science for a changing demand

44th WEFTA meeting · 9-11 June 2014 · Bilbao (Spain)

LIFE iSEAS: Knowledge-Based Innovative Solutions to Enhance Adding-Value Mechanisms towards Healthy and Sustainable EU Fisheries

Ricardo I. Pérez Martín and Luis T. Antelo

Marine Research Institute (IIM-CSIC)

Vigo - Spain

IIM Instituto de Investigaciones Marinas de Vigo

CSIC Consejo Superior de Investigaciones Científicas

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SEAFOOD science for a changing demand

44th WEFTA meeting · 9-11 June 2014 · Bilbao (Spain)

An estimation of marine underutilized species and coproducts available in Portugal

Irineu Batista (IPMA), Paulo Vaz-Pires (ICBAS), Raquel Coimbra (ICBAS)

Work developed in the project:
“Development of innovating biomedical products from marine resources valorisation” – MARMED

2007-2013 Atlantic Area Programme
Promote transnational entrepreneurial and innovation networks

44th WEFTA Meeting, 9-11th June 2014, Bilbao, Spain

OBJECTIVES

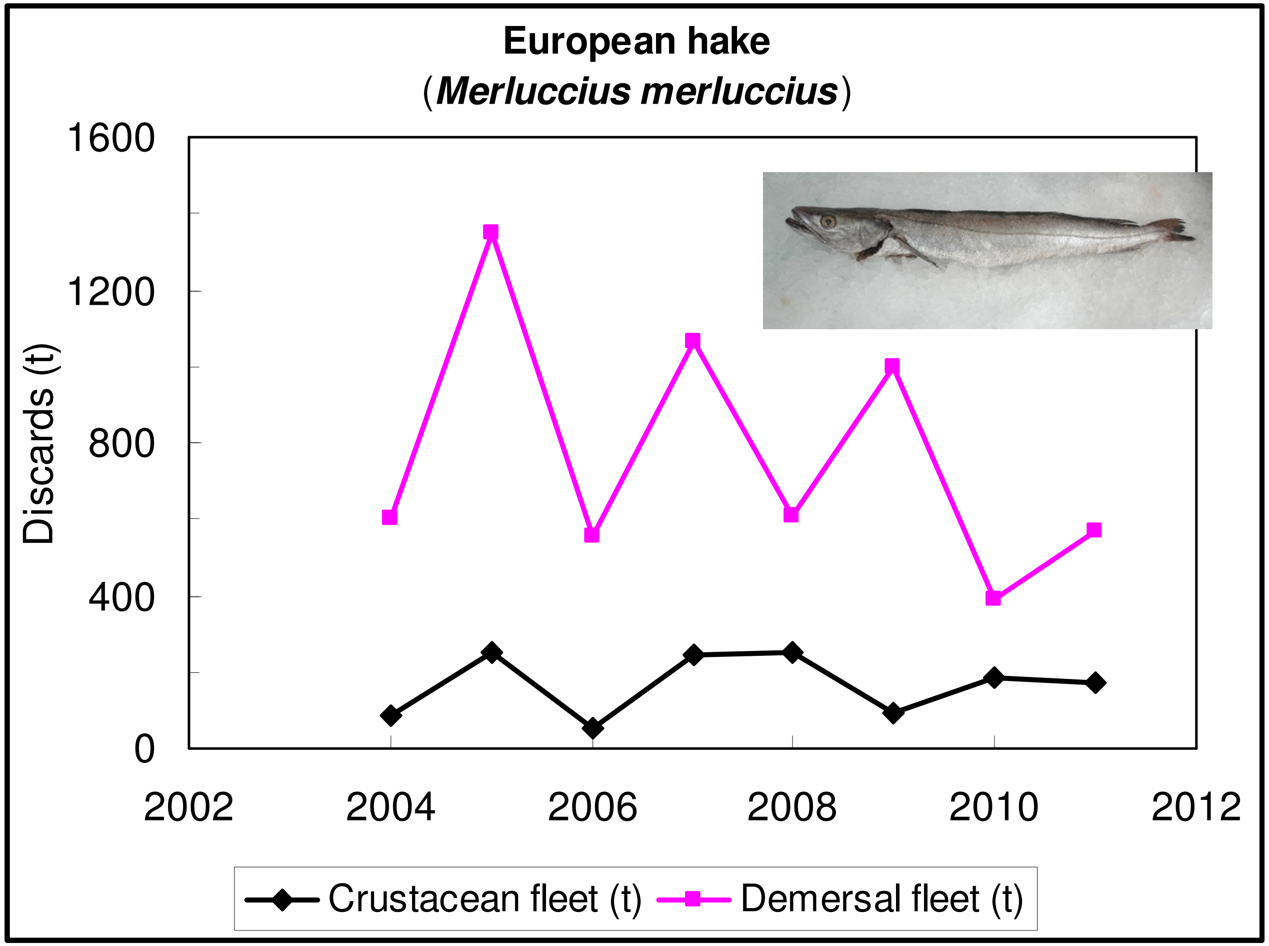
- Compilation of published data on fish discards in fishing boats and withdrawals and rejections in fish auctions.
- Evaluation of the available coproducts from fish processing industry.

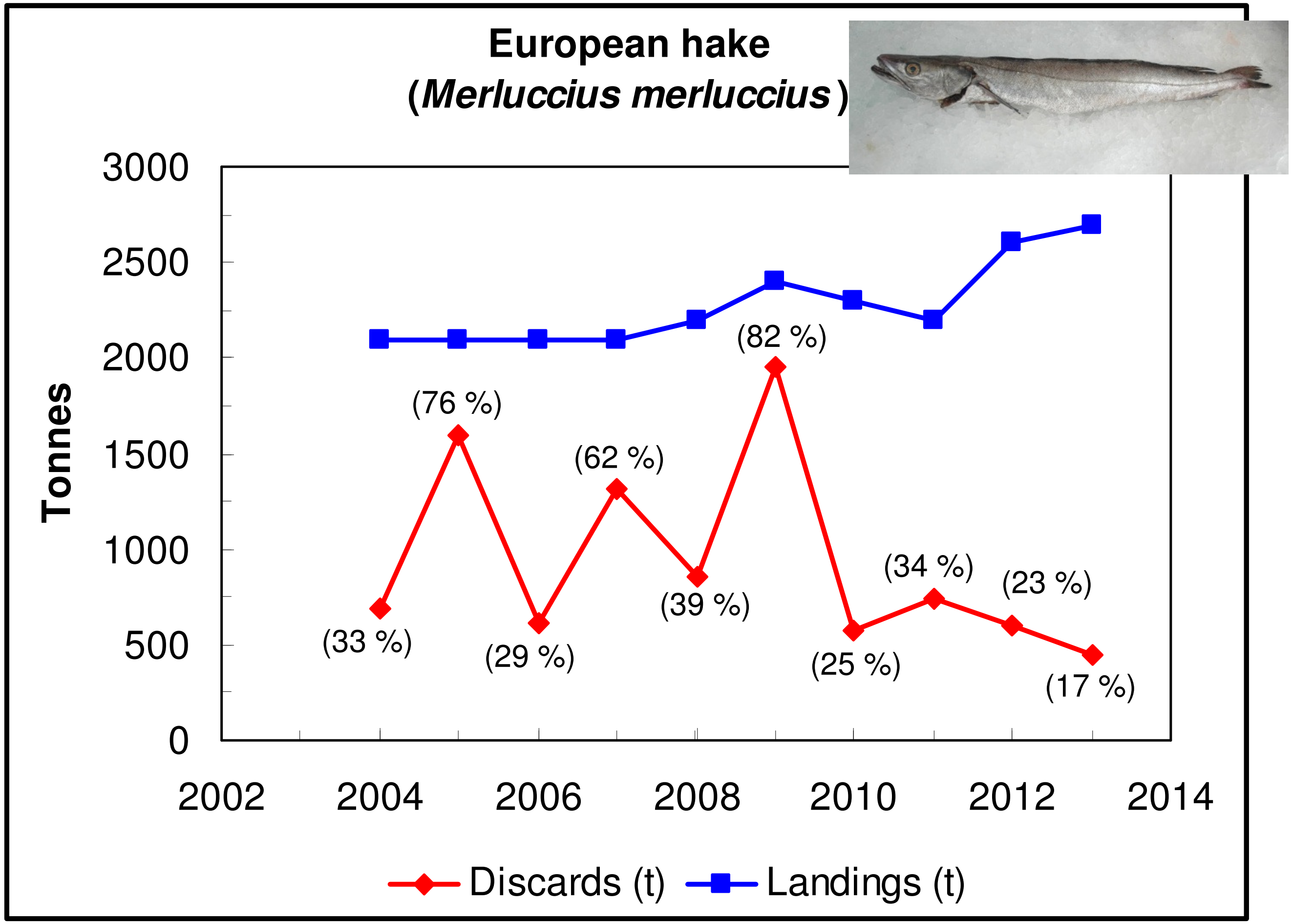
EVALUATION OF THE AMOUNT, DISTRIBUTION AND QUALITY OF AVAILABLE COPRODUCTS

The following data collection instruments were used:

- Questionnaires sent out by email or fax
- Standardized interviews
- Document analysis (scientific papers, reports, etc.)

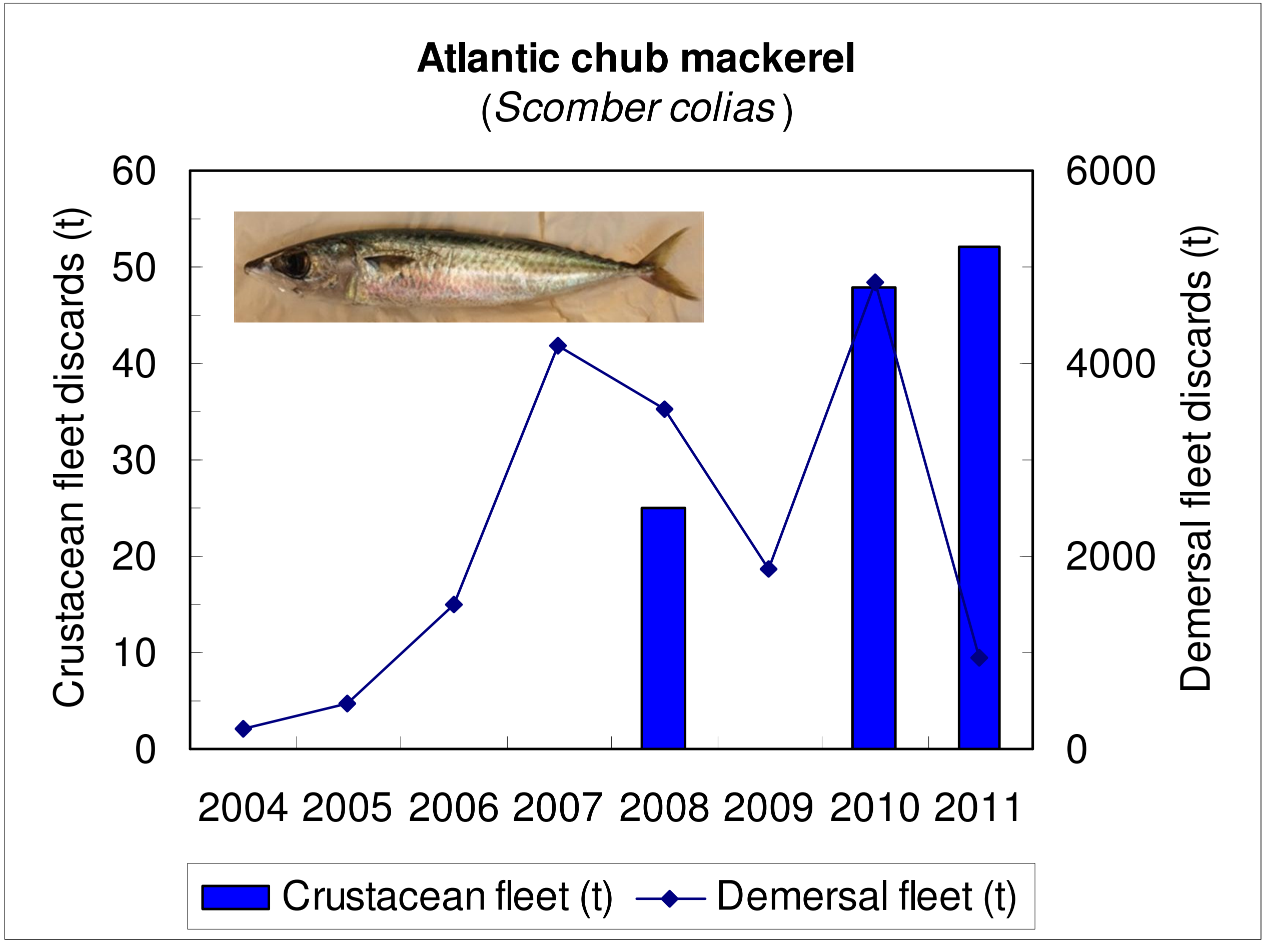
Discards of European hake



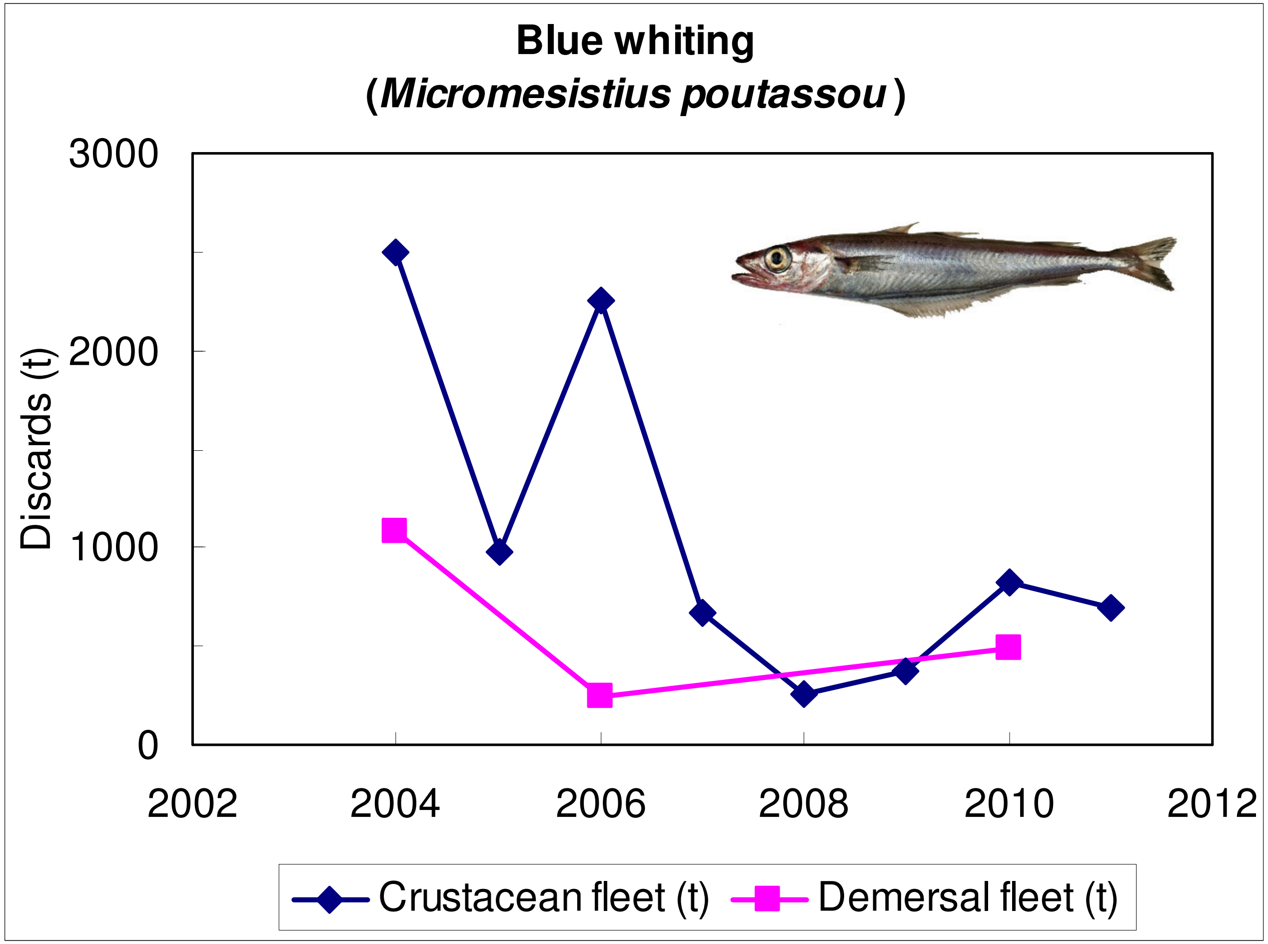


In brackets: Discards*100/Landings

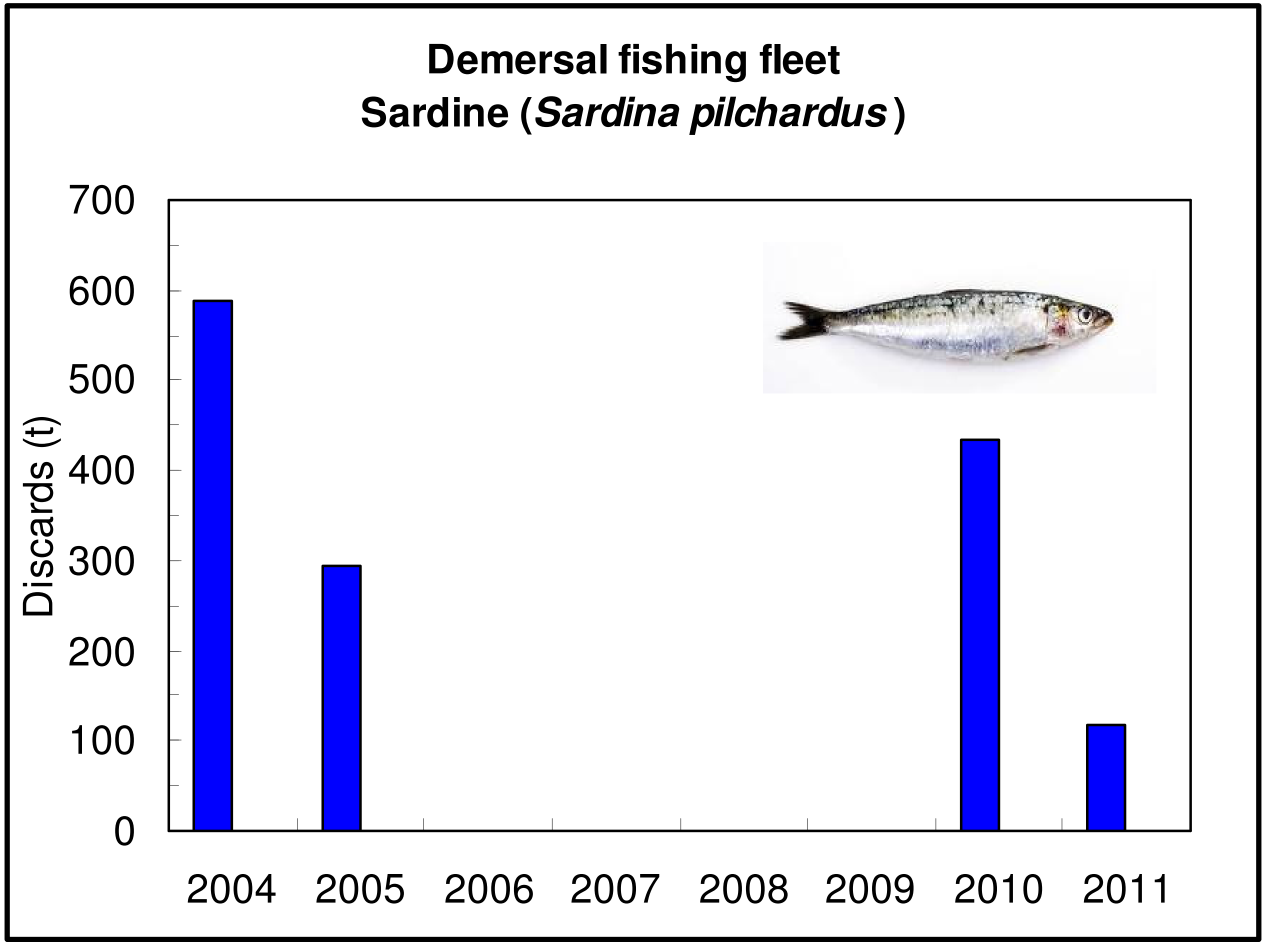
Discards of chub mackerel



Discards of blue whiting



Discards of sardine



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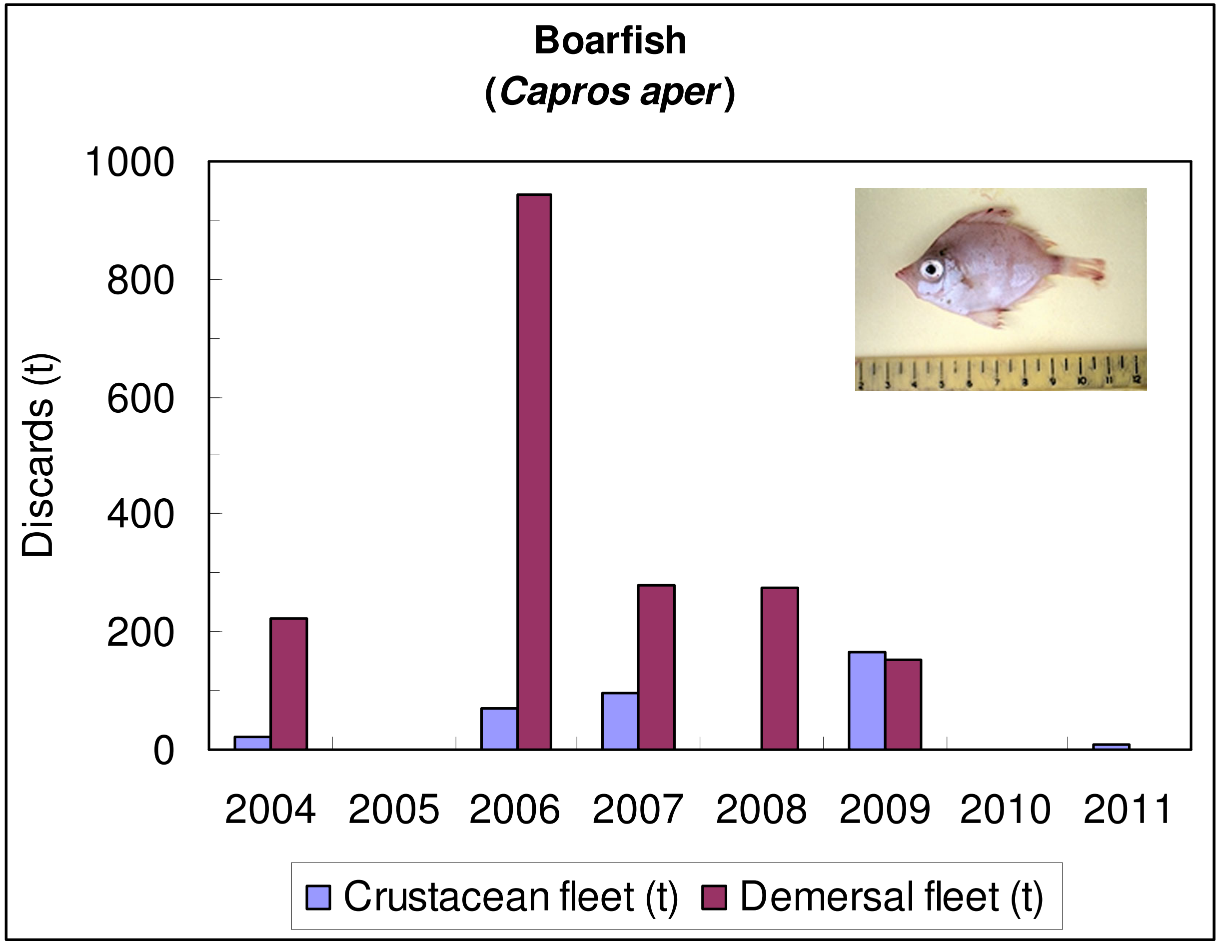
Discards of boarfish

(A typical underutilized species)



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Discards of elasmobranch species

Crustacean fleet

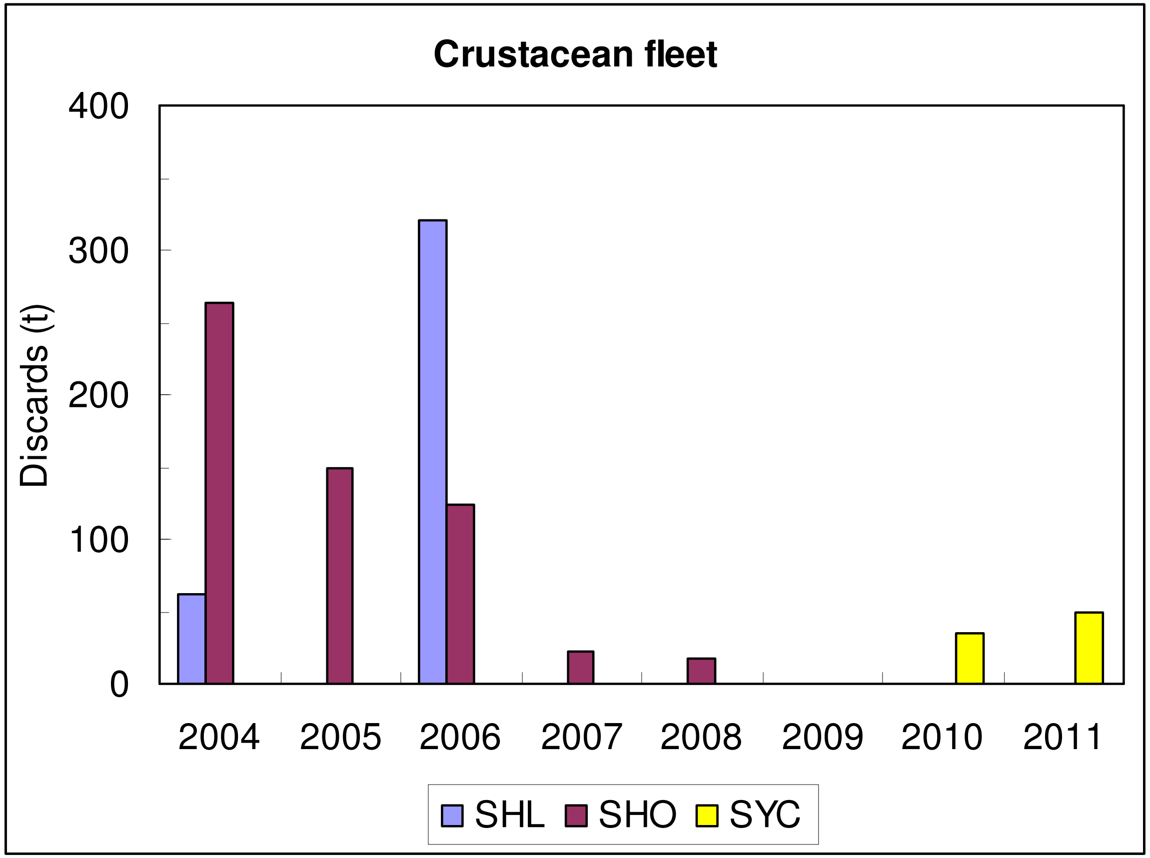
Other frequent elasmobranch species discarded:

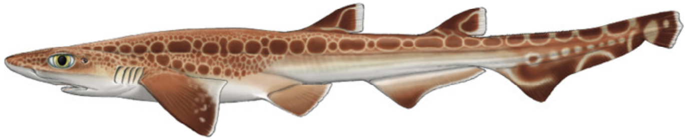
- Rabbit fish - *Chimera monstrosa*
- Brown ray – *Raja miraletus*
- Thornback ray – *Raja clavata*
- Blonde ray – *Raja brachyura*
- Spotted ray – *Raja montagui*
- Cuckoo ray - *Leucoraja naevus*

Demersal fishing fleet

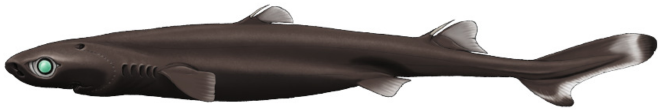
Discards of smallspotted catshark in 2011 – **111, 3 t**

Discards of elasmobranch species





SHO - Blackmouth cat shark
Galeus melastomus



SHL - Smooth lanternshark
Etmopterus pusillus

SYC - Smallspotted catshark
Scyliorhinus canicula

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Discards in the trawling fleet (2009)

Species	Demersal fish fleet (t/year)	Crustaceans fleet (t/year)	Total discards (t/year)
Blue jack mackerel (*Trachurus picturatus*)	2024 (30.5 %)	167 (6.7 %)	2191
Horse mackerel (*Trachurus trachurus*)	4 (0.06 %)	775 (15.2 %)	779
Bogue (*Boops boops*)	342 (5.1 %)	-	342
Atlantic mackerel (*Scomber scombrus*)	264 (4.0 %)	-	264
Triglidae	145 (2.2 %)	-	145
Henslow's swimming-crab (*Polybius henslowi*)	120 (1.8 %)	11 (0.4 %)	131

In brackets is the percentage of discards from each trawling fishing fleet

Other species discarded: Pout (*Trisopterus luscus*), trumpet fish (*Macrorhamphosus scolopax*), *Octopidae*, silver scabbardfish (*Lepidopus caudatus*)

Withdrawals and rejections in the fish auctions

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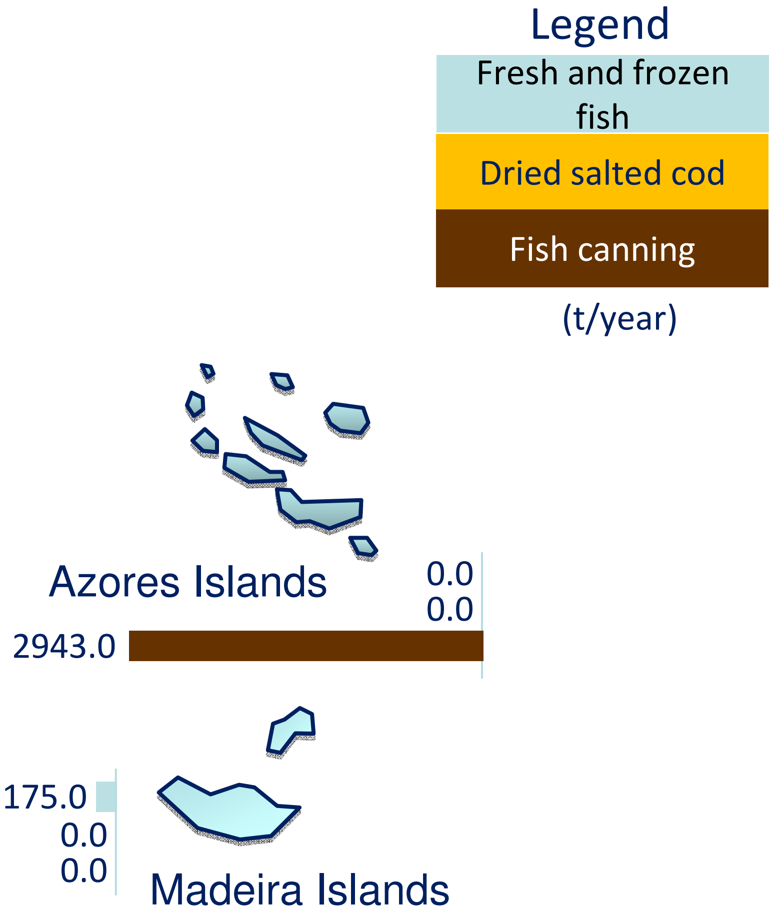
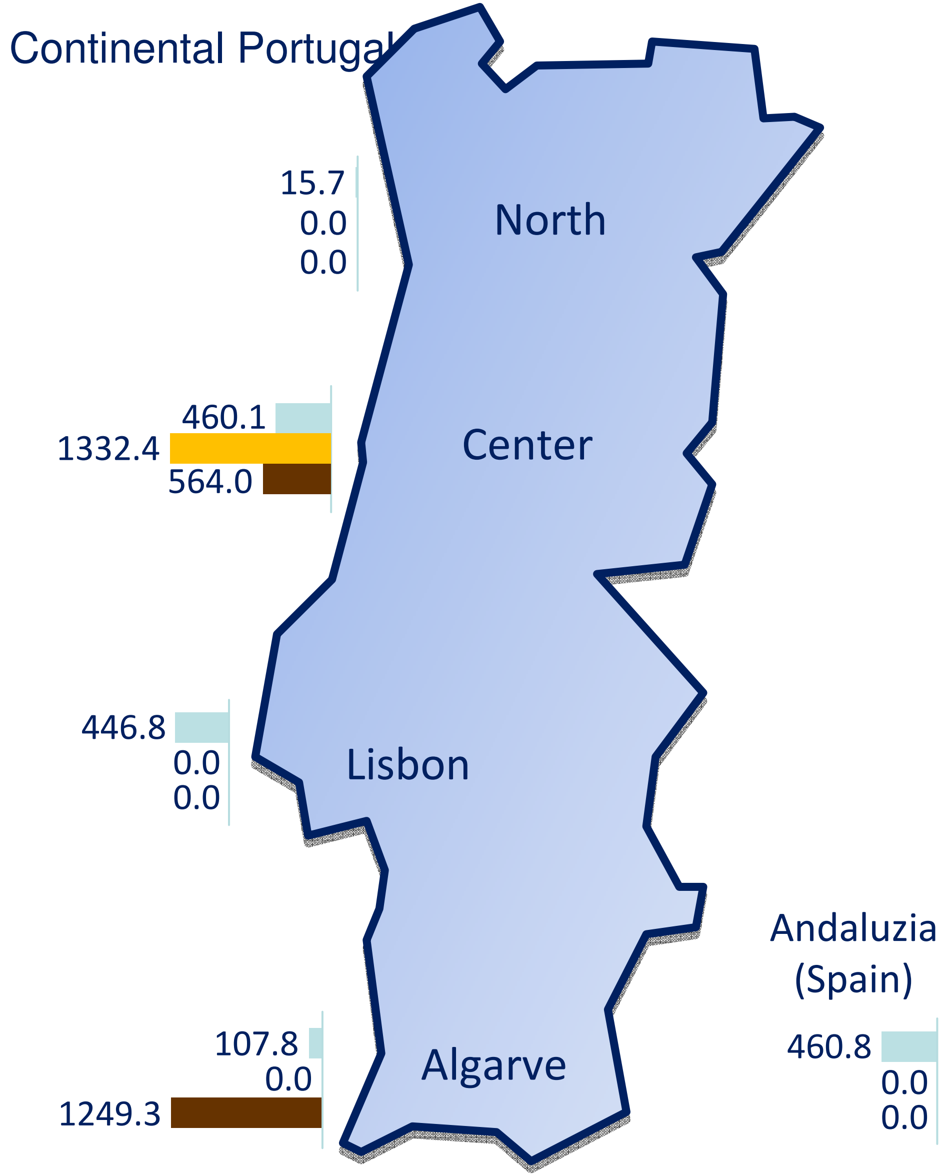
Marine co-products





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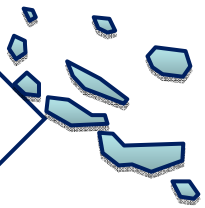
Main destination of coproducts:

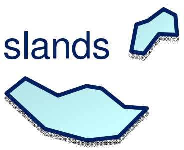
Azores Islands



Cofaco
S. Miguel, Pico

(landfill; at S. Miguel, partially to biogas)

Madeira Islands



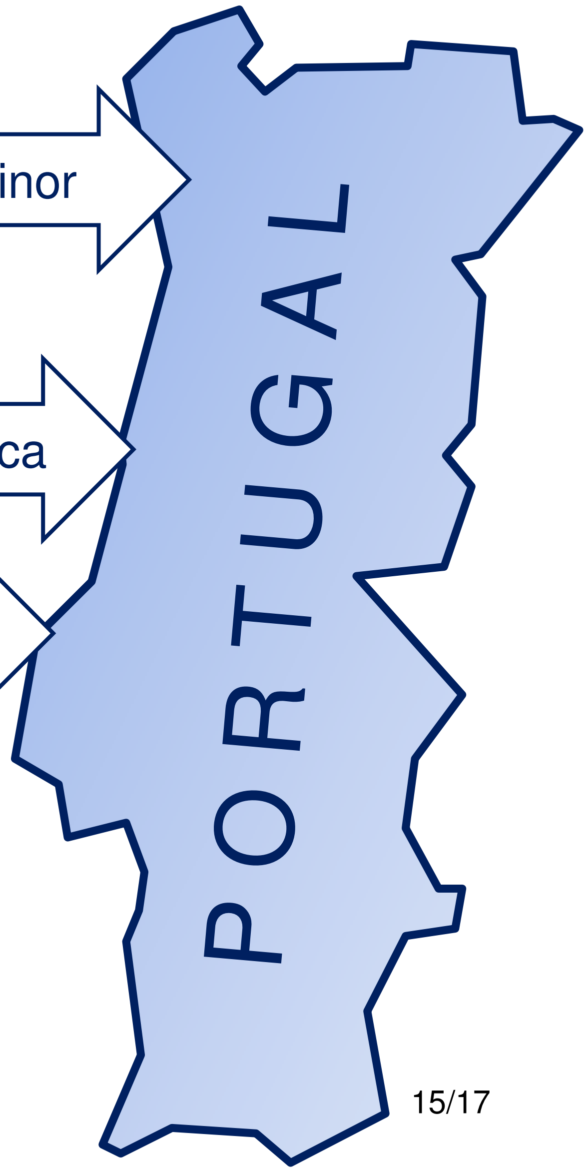
(All to landfill)

Fishmeal plants

Savinor

E.F. Pesca

Narciso e F^os^



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CONCLUSIONS

- Data available on discards on board fishing vessels is limited and the estimates should be improved;
- Data on coproducts from the processing industries are underestimated;
- A better estimation of the available coproducts could be achieved by multiplying these values by a factor between 2 and 3;
- The estimation of discards on board and coproducts is an endless job (variability of co products available, unavailable official data on fish co products, high number of small enterprises).

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Thanks for your attention

ATLANTIC AREA
Transnational Programme
INVESTING IN OUR COMMON FUTURE

Seafood processing by-products as potential sources of inhibitors of Proline-specific proteases

Oscar Martínez Álvarez, Pilar Montero, Carmen Gómez-Guillén

Institute of Food Science, Technology and Nutrition (ICTAN, CSIC). C/ José Antonio Novais, 10, 28040, Madrid, Spain

6.4 million tonnes

Crustaceans in the market (2012)

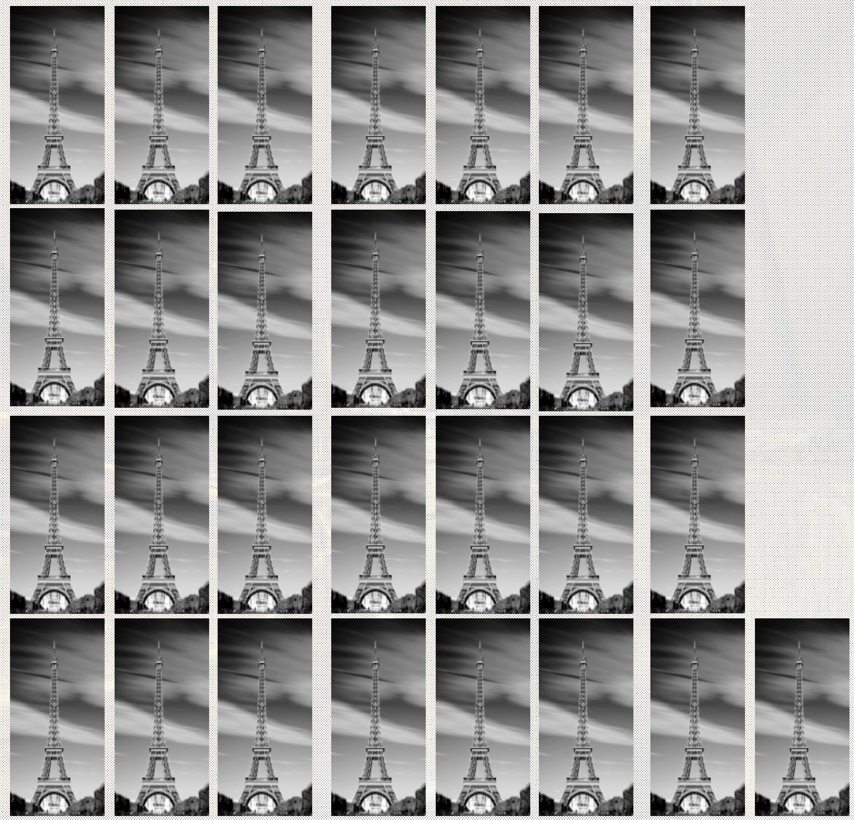

> 2.4 million tonnes
Squids captured in 2012

40-60 %

Squid waste

Total **weight** of **wastes** from **squid** and **shrimp processing** → Similar to the weight of more than…

500 Eiffel towers!!!!



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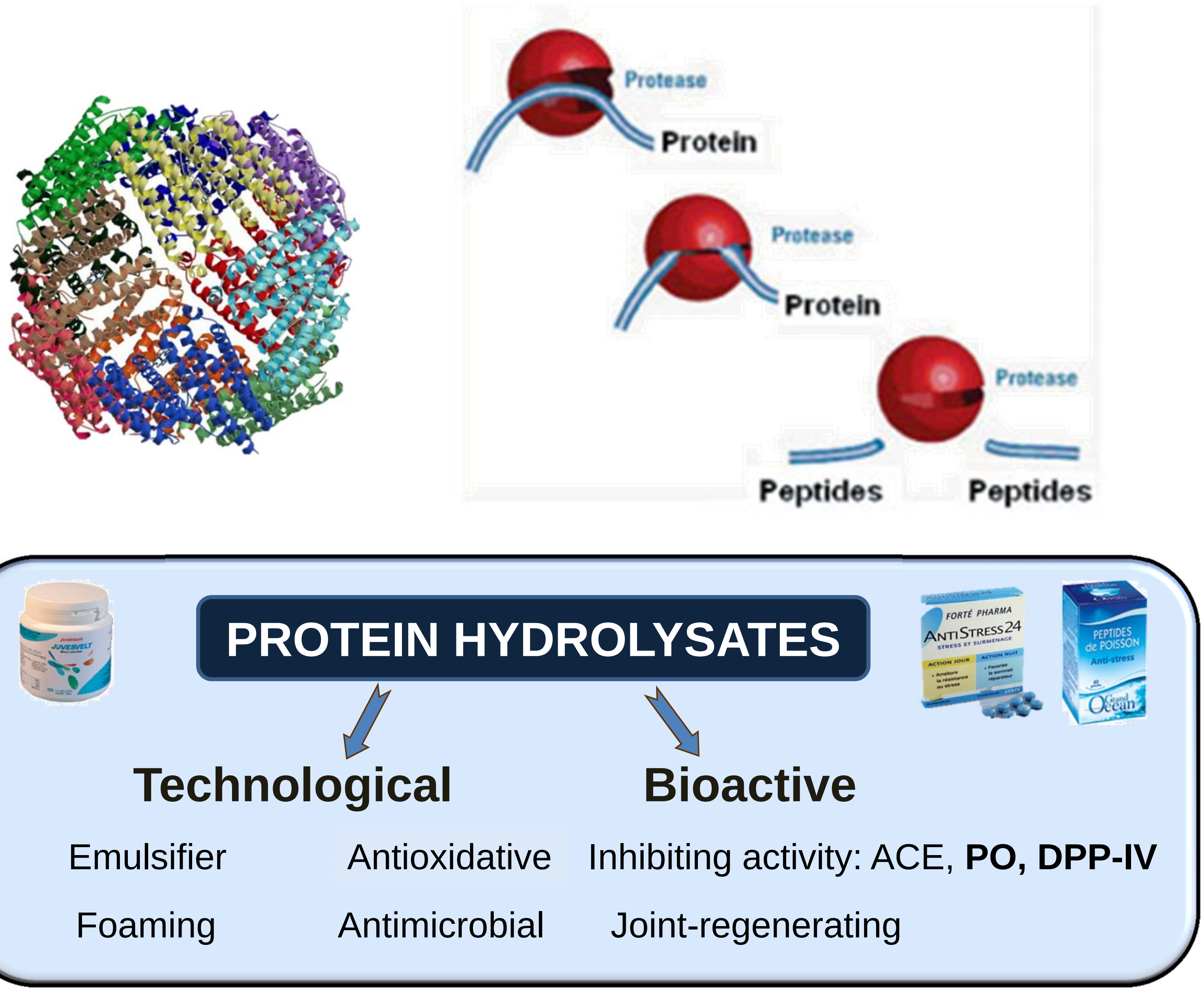
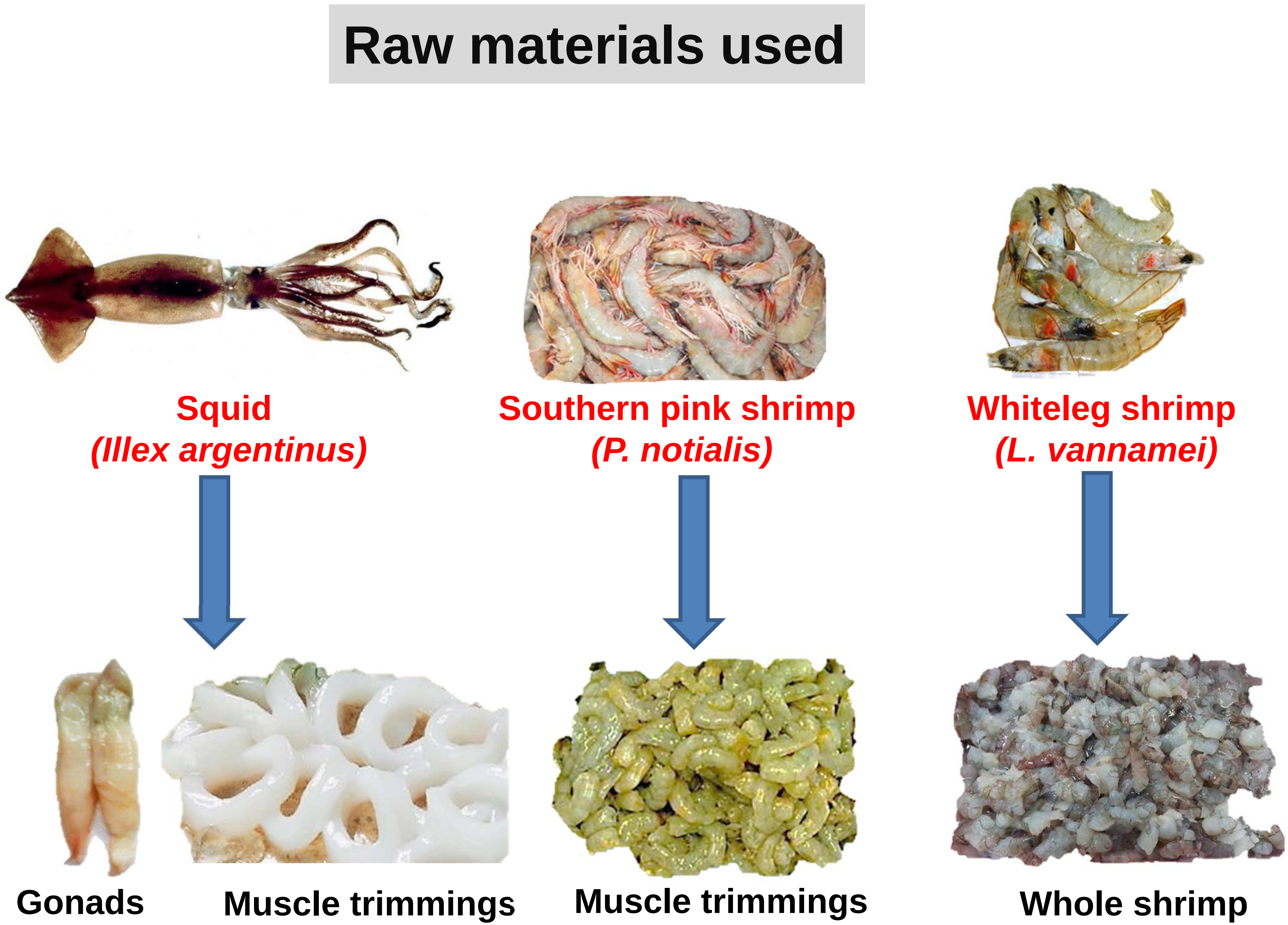

Protease
Protein
Protease
Protein
Protease
Peptides
Peptides
PROTEIN HYDROLYSATES
JUVESVELT
FORTÉ PHARMA
ANTISTRESS24
PEPTIDES de POISSON
Anti-stress
Technological
Bioactive
Emulsifier
Antioxidative
Inhibiting activity: ACE, **PO, DPP-IV**
Foaming
Antimicrobial
Joint-regenerating

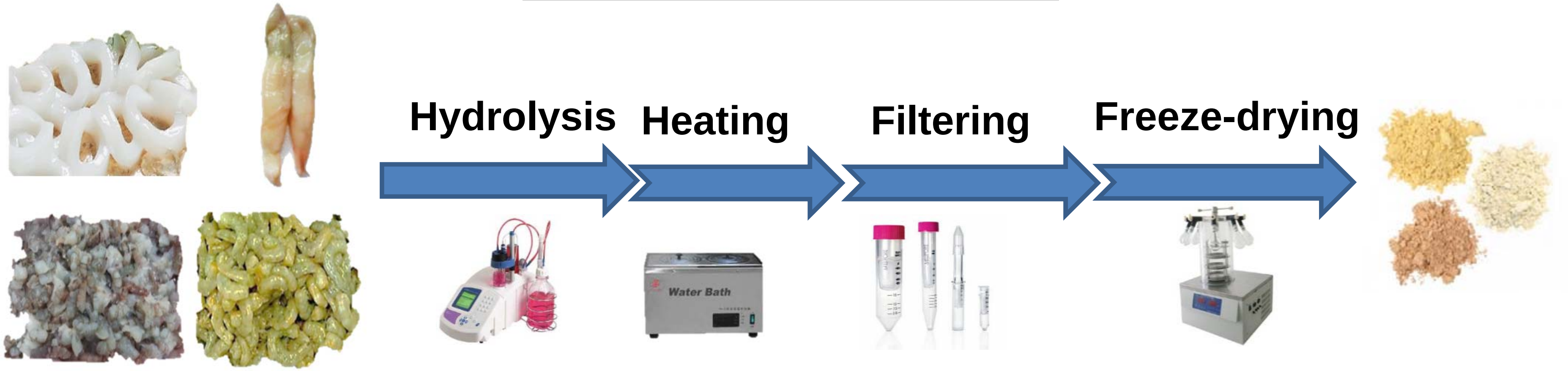
Prolyl oligopeptidase (Post-Proline cleaving enzyme, PO)	Dipeptidyl peptidase-4 (DPP-IV)
Involved in neurological disorders	Involved in type-2 diabetes
Involved in blood pressure control	

Could protein hydrolysates from shrimp or squid wastes inhibit PO and/or DPP-IV activity?

Polgár, L. (2002). *Cellular and Molecular Life Sciences, 59*(2), 349-362.


Raw materials used
Squid
(Illex argentinus)
Southern pink shrimp
(P. notialis)
Whiteleg shrimp
(L. vannamei)
Gonads
Muscle trimmings
Muscle trimmings
Whole shrimp

What was done?

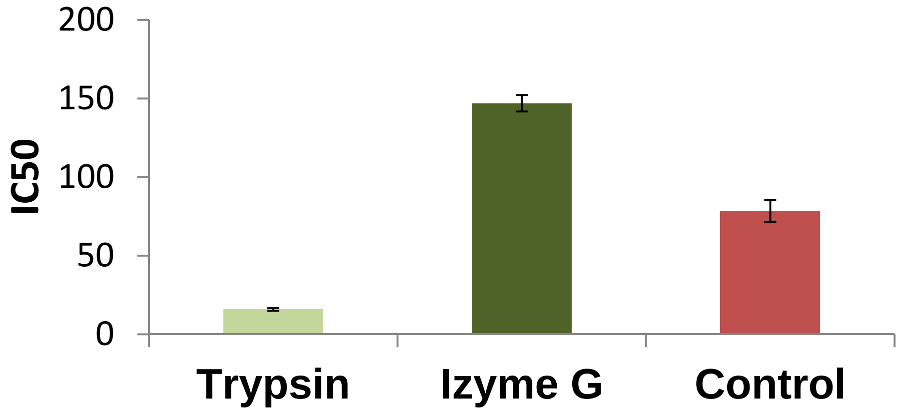


Analyses
- Hydrolysis Degree (DH, %)
- DPP-IV inhibiting activity (IC50, µg N/ml)
- PO-inhibiting activity (IC50, µg N/ml)
- Molecular Weight profile (Da)

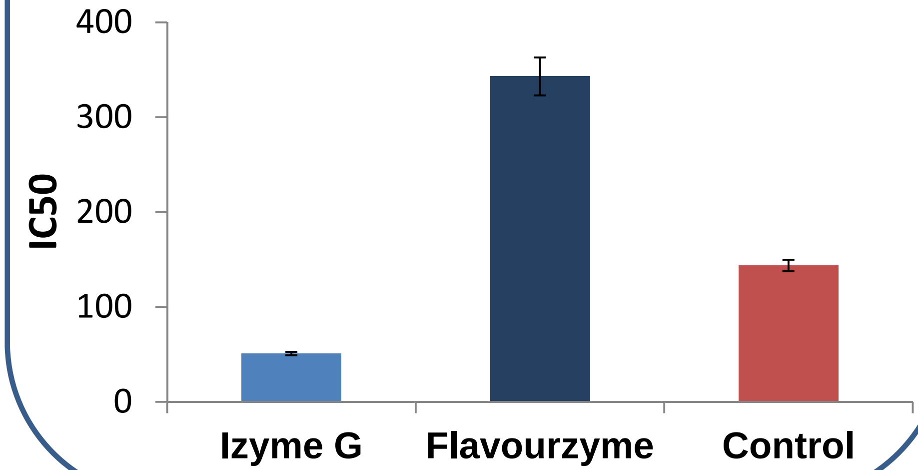
The best and worst DPP-IV/PO-Inhibiting hydrolysates

Squid gonads

DPP-IV-Inhibiting activity

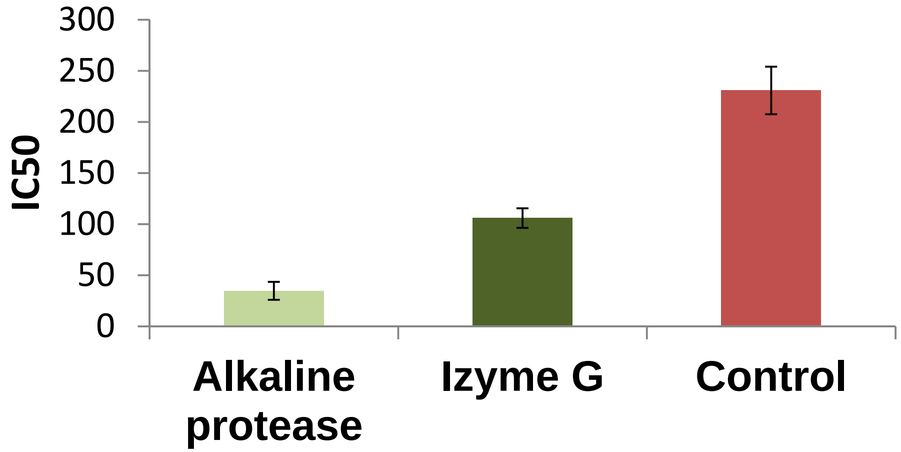


PO-Inhibiting activity

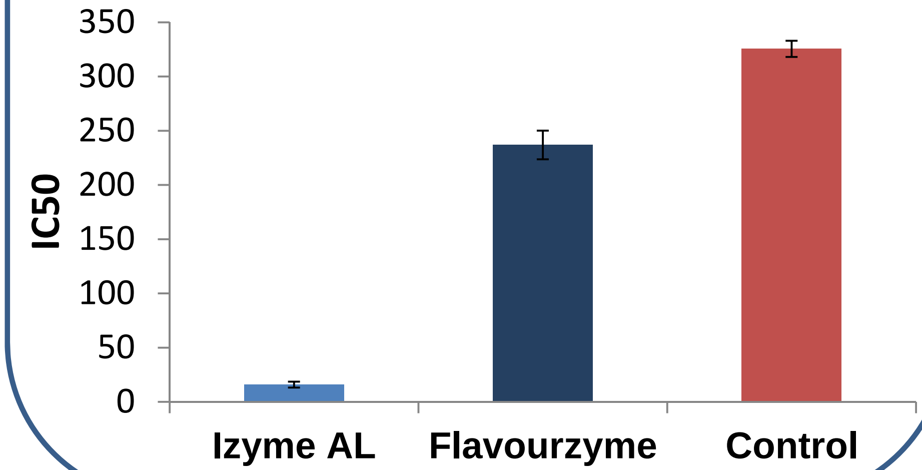


Squid muscle

DPP-IV-Inhibiting activity



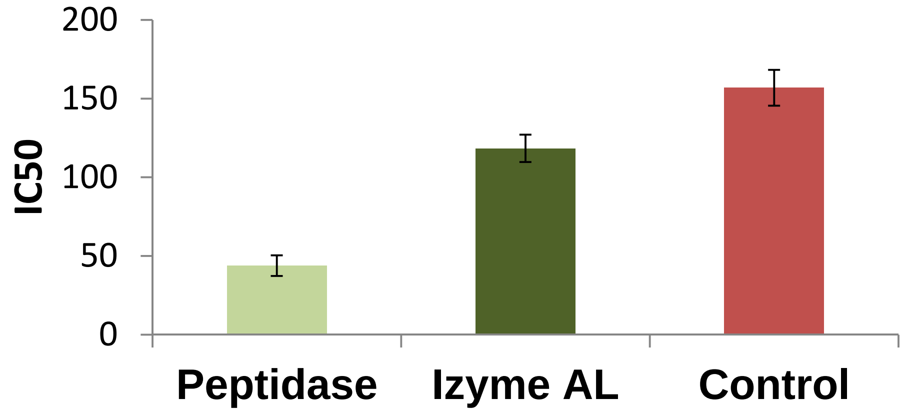
PO-Inhibiting activity



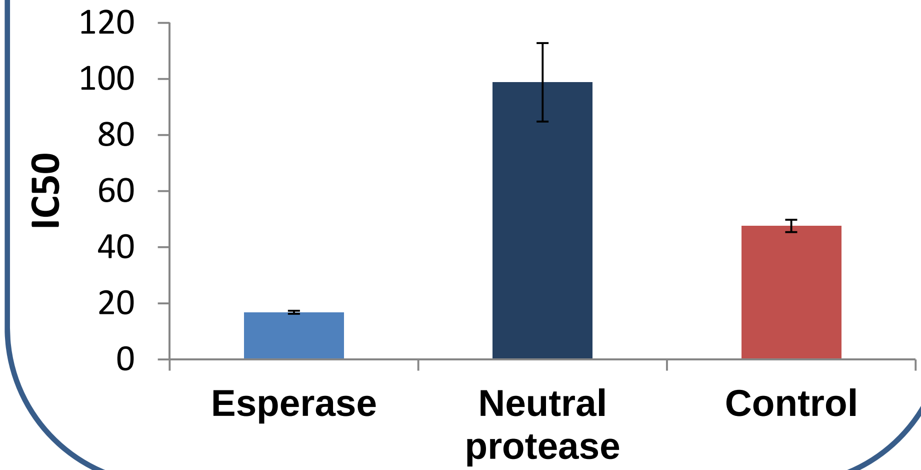
The best and worst DPP-IV/PO-Inhibiting hydrolysates

Whiteleg shrimp

DPP-IV Inhibiting activity

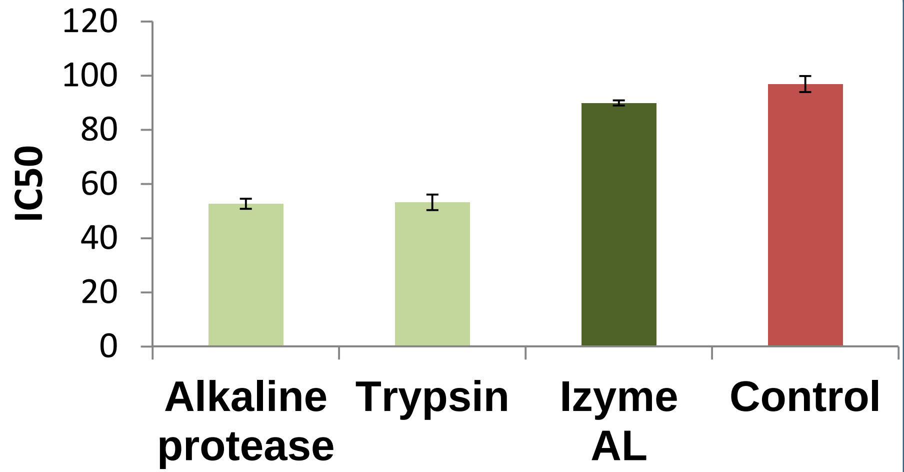


PO-Inhibiting activity

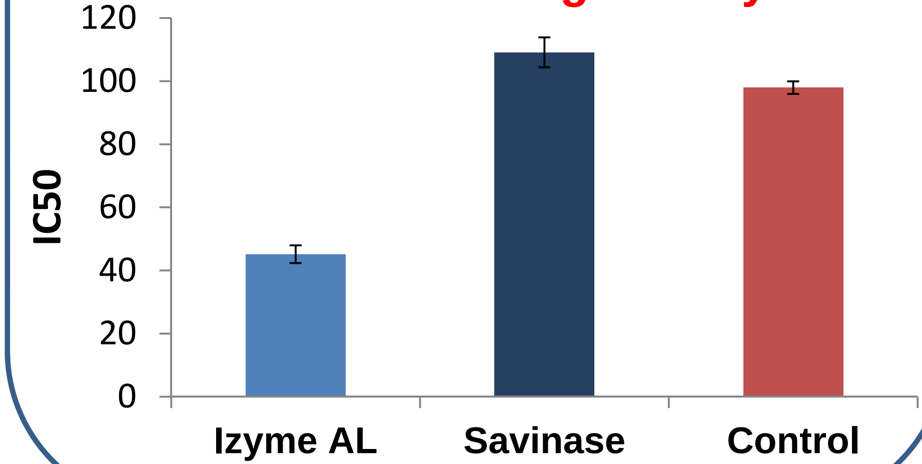


Southern Pink shrimp

DPP-IV Inhibiting activity



PO-Inhibiting activity



Relationship among variables (PC Analysis)

	RAW MATERIAL			
	Squid gonads	Squid muscle	S. P. shrimp	W. shrimp
IC50 (DPP-IV) and DH	-	-	-	-
IC50 (PO) and DH	-	-	+	+
IC50 (DPP-IV) and IC50 (PO)	-	-	-	-
DH and MW	-	-	-	-

* **DH:** Hydrolysis Degree and **MW:** Molecular Weight

Best hydrolysates?

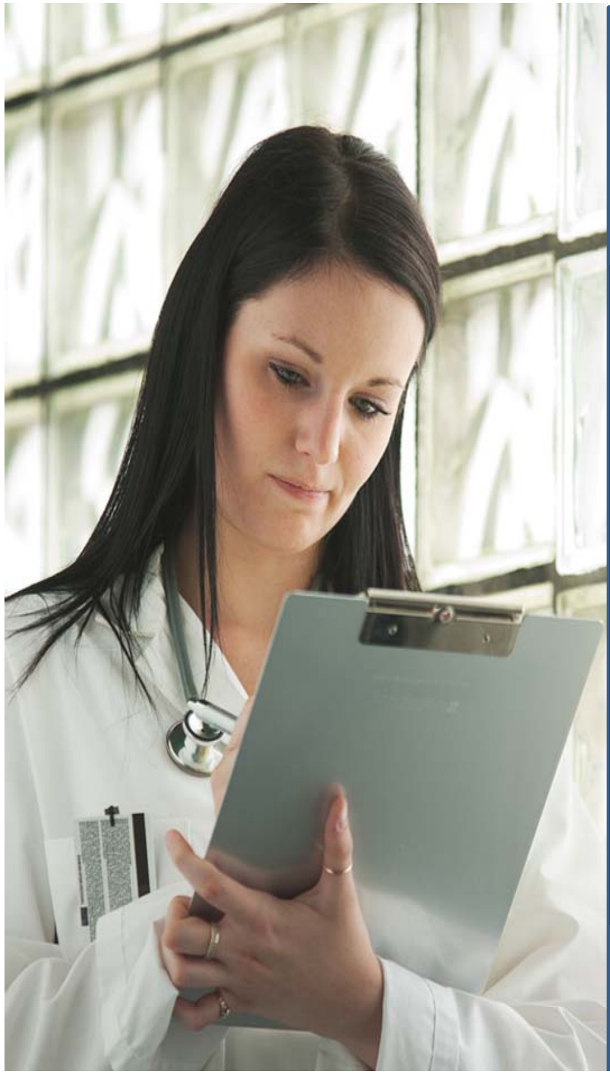
Raw material	DPP-IV-inh. activity	PO-inh. activity
Squid gonads	Trypsin	Izyme G
Squid muscle	Alkaline protease	Izyme AL
S. P. Shrimp muscle	Alkaline protease Trypsin	Izyme AL
Whiteleg shrimp	Peptidase	Esperase

Trypsin and Izyme AL

Different effect on DPP-IV- and PO-activity

Importance of Hydrolysis Degree

Main conclusions



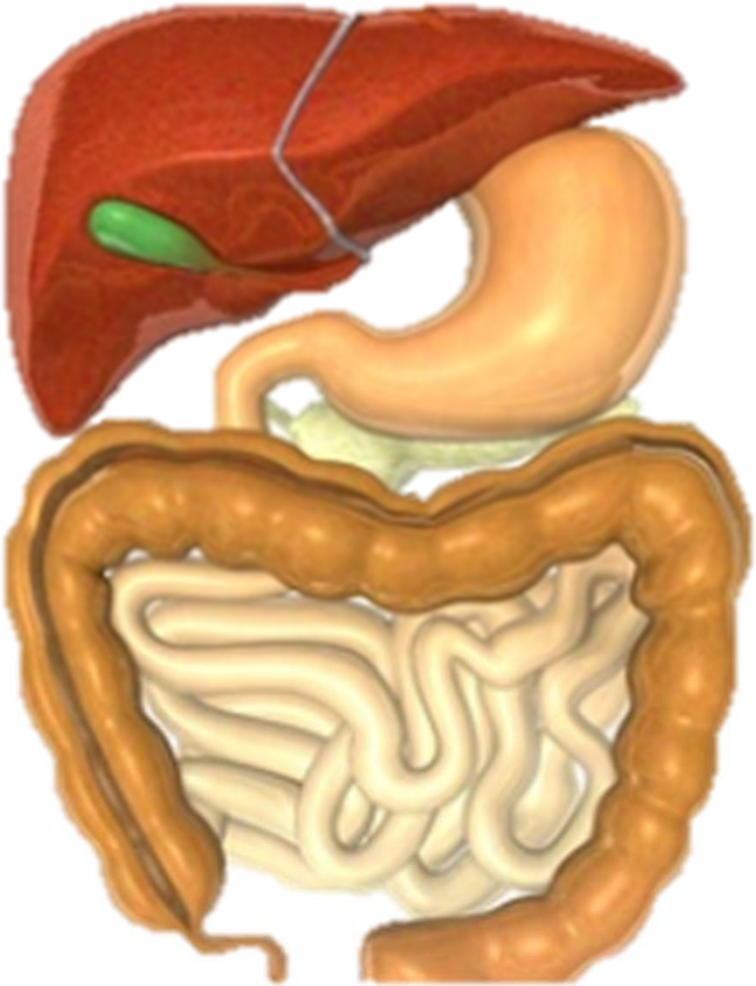
Main conclusions

The enzyme used is very important to achieve good results

Good PO-inhibitors → Bad DPP-IV inhibitors
Mainly those obtained with Izyme AL

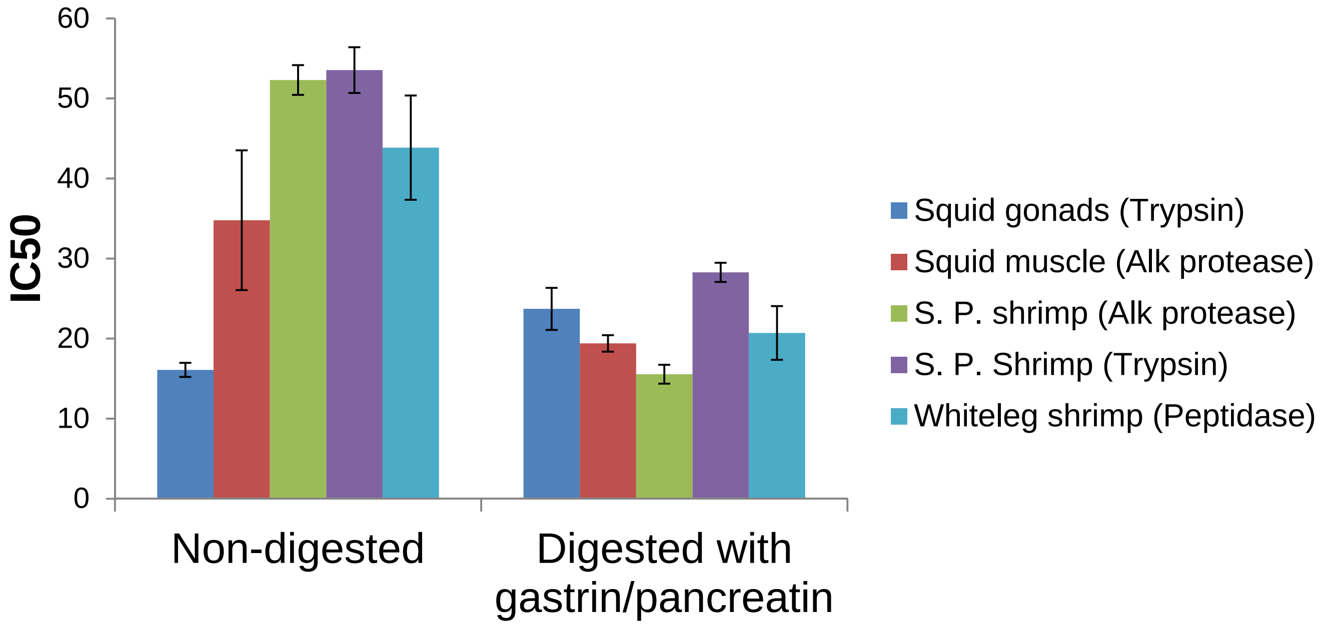
Higher DH → better DPP-IV inhibiting ability
REGARDLESS OF THE RAW MATERIAL USED

The best hydrolysates:



In vitro
gastrin-pancreatin Gastro-Intestinal Digestion (GID)

DPP-IV-inhibiting activity of the digested hydrolysates

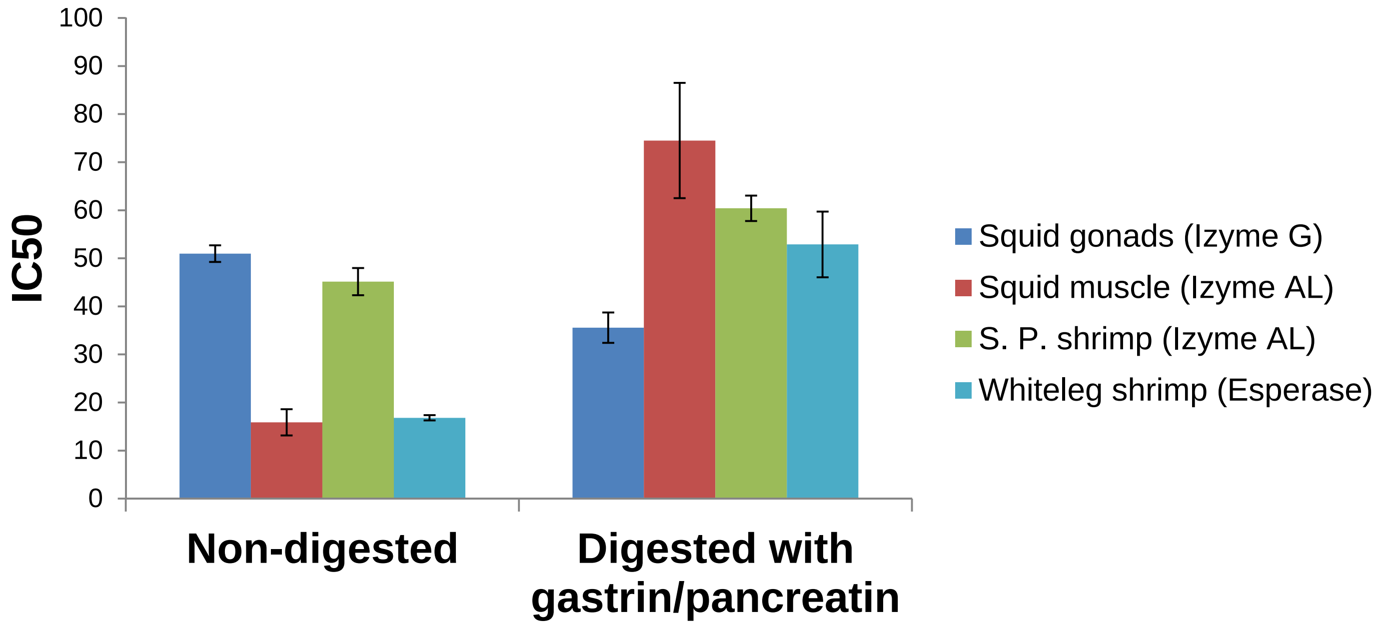


Main conclusions

Gastrointestinal digestion may increase DPP-IV-inhibiting potency

DPP-IV inhibiting molecules (digested samples) → 2-4 residues?

PO-inhibiting activity of the digested hydrolysates



Main conclusions

Gastrointestinal digestion may negatively affect PO-inhibiting activity

PO-inhibiting molecules (digested squid gonads hydrolysate) → 3-4 residues?

Main conclusions

- Enzyme used → Important to achieve good results
- Good PO-inhibitors → Bad DPP-IV inhibitors Mainly with Izyme AL
- Higher DH → better DPP-IV inhibiting ability
- Gastrointestinal digestion increases DPP-IV-inhibiting potency
- DPP-IV inhibiting molecules in digested hydrolysates→ 2-4 residues?
- Gastrointestinal digestion may negatively affect PO-inhibiting activity
- PO-inhibiting molecules in digested squid gonads hydrolysate → 3-4 residues?

Thank you for your attention

oscar.martinez@ictan.csic.es

Institute of Food Science, Technology and Nutrition (ICTAN, CSIC). C/ José Antonio Novais, 10, 28040, Madrid, Spain

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