BOOK OF ABSTRACTS

azti tecnalia

WELCOME TO THE
"WEFTA 2014 INTERNATIONAL MEETING: SEAFOOD SCIENCE FOR A CHANGING DEMAND"

We would like to warmly welcome you to the Basque Country, a land where seafood is very important for our economy. And this is not only due to the natural resources of the Basque coast, which are characterized by the abundance and quality of its species, but also to the marketing of its products on major markets across the world. It is undoubtedly a sector with great cultural, emotional and gastronomic roots in our country.

WEFTA is aimed to excellent research, and excellence in this area has to contribute to the development of products adapted to the changing demands of the market and its customers. This is the only option if the future is to be addressed with a guarantee of success; what is needed here is rapid adaptation by developing in accordance with the demands of the globalized market; this is a market characterized by more interconnected and more discerning customers and consumers, and by distances and time that are becoming increasingly shorter. Scientific and technological results need to generate social and economic impact by putting on the market competitive products and technologies capable of yielding profits and making our organizations sustainable.

We are committed to transfer to society the differentiated quality offered by our fish in terms of sustainability, traceability and food safety; we are also committed to reinforce the messages and arguments to encourage the consumption and marketing of our healthy seafood products.

WEFTA meetings like this one contribute towards setting up forums for debate in which the necessary exchange of experiences and knowledge among scientists and industry is conducted. It is where the latest advances in fish technology can be shared; a meeting to take an in-depth look at the health benefits and the guarantees of safety and quality of seafood products.

With the help of the Scientific and Organizing Committees, we have prepared a scientific and social program that we are sure will result in an excellent meeting. We wish you a very good and enjoyable WEFTA 2014.

Begoña Pérez Villarreal
Business Director. Food Research Division
AZTI-Tecnalia

SCIENTIFIC COMMITEE

Begoña Pérez Villarreal
Chair, AZTI

Ingrid Undeland
Chalmers University of Technology

Carmen Glez. Sotelo
CSIC-IIM

Erling Larsen
DTU-Technical University of Denmark

Mª Leonor Nunes
IPMA-Portuguese Institute of Sea and Atmosphere

Sigrún M. Halldórsdóttir
Matis-Icelandic Food and Biotech R&D

Jose Antonio Beltrán
Universidad de Zaragoza

ORGANIZING COMMITTEE

Begoña Pérez Villarreal
Chair

Meritxel González Intxausti
Secretariat manager

Begoña Alfaro

Carlos Bald

Kepa Escuredo

Irene Gartzia

Alberto González de Zárate

Idoia Olabarrieta

Miguel Ángel Pardo

ORAL COMMUNICATIONS. AGENDA

Monday, 9th June 2014

08:00 - 09:00	Registration
09:00 - 09:30	**Opening ceremony** *Leyre Bilbao .Director of technology and strategy. Basque Government*
09:30 - 10:00	**Key Note Lecture** "Health benefits and risks of seafood: simply fatty acids and mercury?" *Mª Leonor Nunes. IPMA-Portuguese Institute of Sea and Atmosphere*

SESSION 1: "SEAFOOD QUALITY REASSURANCE"

CHAIRPERSONS:
Mª Leonor Nunes, *IPMA- Portuguese Institute of Sea and Atmosphere*
Begoña Alfaro, *AZTI-Tecnalia*

10:00 - 10:15	"Quantification of fish partial volatile basic nitrogen by SPME-GC/MS". ***Alexandre DƐHAUT,*** *Frédéric KRZƐWINSKI, Assi N'GUƐSSAN, Ossarath KOL, Thierry GRARD, Anne BRISABOIS, Guillaume DUFLOS*
10:15 - 10:30	"Salt and water distribution in commercial Icelandic heavily salted Atlantic cod as affected by catching method, pre- and post-rigor processing, and pre-salting method: A 23Na and 1H multi-parametric MR analysis". ***María Gudjónsdóttir,*** *Amidou Traoré, Ásbjörn Jónsson, Magnea G. Karlsdóttir, Sigurjón Arason*
10:30 - 10:45	"Quality research on Norway lobster (Nephrops norvegicus)" ***Karen Bekaert,*** *Devriese Lisa, Deloof Daphné, Maes Sara, Johan Robbens*
10:45 - 11:00	"A novel non-destructive method for the determination of volatile amines from packaged fish". ***Lander Baliño-Zuazo,*** *Alejandro Barranco*
11:00 - 11:30	COFFEE-BREAK and POSTERS
11:30 - 11:45	"Effect of growth season, localisation, filleting and rigor-status on water holding capacity, dry matter and drip loss from farmed Atlantic salmon". ***Bjørn Tore Rotabakk,*** *Gaute Jørpeland, Jørgen Lerfall*
11:45 - 12:00	"Sensitive and advanced technique (NMR) as a tool for identification of quality changes in marine rest raw materials" ***Rasa Slizyte****, Elena Shumilina, Revilija Mozuraityte, Alexander Dikiy*
12:00 - 12:15	"Role of Fish Oils in Nutritional Quality: Study of lipid biactive oxygenated mediators" . ***Dasilva G.,*** *Pazos M., Méndez L., Gallardo J.M., Rodríguez I., Cela R., Medina*
12:15 - 12:30	"New tools for spoilage control in seafood products: bacteriophages". ***Igor Hernández,*** *Begoña Alfaro*
12:30 - 12:45	"Quality evaluation of iced sea bream (Sparus aurata) and desing of models for the freshness index". *Juan Calanche, S. Pedrós, V. Alonso and* ***Jose Antonio Beltrán***
12:45 - 13:00	"Quality of scallops - a cause of concern". ***Monika Manthey-Karl,*** *Ines Lehmann, Ute Ostermeyer, Ute Schröder*
13:00 - 13:15	"Detection of histamine in fish by Surface Enhanced Raman Spectroscopy using silver colloid SERS substrates". ***Tibor Janci,*** *Mile Ivanda, Lara Mikac, Tomislav Petrak, Nives Marušic, Helga Medic, Sanja Vidacek*
13:15 - 14:30	LUNCH

SESSION 2: "SAFETY EVALUATION AND EMERGING RISKS"

CHAIRPERSONS:
Karen Bekaert, *ILVO*
Kepa Escuredo, *AZTI-Tecnalia*

14:30 - 14:45	"Dioxins and anisakid species in cod liver from Greenland – consumer related aspects". ***Horst Karl****, Max Rubner*
14:45 - 15:00	"Effects of frozen storage on the allergenicity of surimi gels from hake infected with Anisakis simplex larvae". *Fabiola Olivares, Cristina de las Heras, Ana I. Rodríguez-Mahillo, Noelia Carballeda, Miguel González-Muñoz, Mª Teresa Solas, Alfonso Navas, Mercedes Careche,* ***Margarita Tejada***
15:00 - 15:15	"Factors affecting viability of Anisakis L3 larvae during the freezing process". *Isabel Sánchez-Alonso, Alfonso Navas, Susana C. Arcos, Miguel González Muñoz, Angel Mendizábal, Margarita Tejada,* ***Mercedes Careche***
15:15 - 16:00	COFFEE-BREAK and POSTERS
16:00 - 16:15	"A fast hotgun proteomics approach for the global characterization of fish-borne parasite proteins". *Mónica Carrera, Lorena Barros, Lucia Méndez, Santiago Pascual, Ángel F. González, José M. Gallardo,* ***Isabel Medina***
16:15 - 16:30	"Benefit and risk assessment of cooked farmed meagre (Argyrosomus regius)" . *Afonso C., Costa S., Cardoso C., Bandarra N.M., Batista I., Coelho I., Castanheiro I.; Pousão P.,* ***Nunes M.L.***

Tuesday, 10th June 2014

09:00 - 09:45	**Key Note Lecture** "The Power of Branding – Bringing New Consumers to Fish" *Charles Boardman, Business development Manager, Icelandic Seachill & The The Saucy Fish Co.* "KEY HOT Prepacked Fish Categories in the chilled and Frozen EU Retail Shelves" *Gonzalo Campos, Sealed Air's Fish Sector Marketing Manager Europe, Food Care Division*

SESSION 3: "ADVANCES IN SEAFOOD PROCESSING TECHNOLOGY AND SMART CONTROL"

CHAIRPERSONS:
Sigrún Mjöll Halldórsdóttir, *MATÍS*
Idoia Olabarrieta, *AZTI-Tecnalia*

09:45 - 10:00	"Comparing the effect of three antioxidants; Fucus vesiculosus extract, Rosemary extract and L-Ascorbic acid, during hydrolysis of Lumpfish head" ***Sigrún Mjöll Halldórsdóttir,*** *Dana Ran Jonsdottir, Hordur G. Kristinsson, Margret Geirsdottir, Eva Kuttner*
10:00 - 10:15	"The effect of bleeding on the quality and stability of cod (Gadus morhua) and saithe (Pollachius virens) products" ***Magnea G. Karlsdottir,*** *Sigurjon Arasona,b, Minh Van Nguyena, Hordur G. Kristinssona,c, Kolbrun Sveinsdottira, Arnljotur B. Bergssona*
10:15 - 10:30	"Highly elastic thermal gel production from squid mantle muscle by using Ohmic heating". ***Kunihiko Konno,*** *Yoshiko Konno*
10:30 - 10:45	"Protein thermal stability and water holding capacity of turbot (Scophthalmus maximus) and herring (Clupea harengus) during thermal treatment - Providing information for process optimization" . ***Izumi Sone,*** *Skipnes D., Rotabakk B.T.*
10:45 - 11:00	"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,*** *Kristine Kvangarsnes, Trygg Barnung, Turid Fylling*
11:00 - 11:30	COFFEE-BREAK and POSTERS

ORAL COMMUNICATIONS. AGENDA

Tuesday, 10th June 2014

11:30 - 11:45	"Opportunities for combining thermal processing with pressure treatment to reduce spore contamination in fish products". ***María Lavilla***, *Cristina Arroyo, Estibaliz Bilbao, Iñigo Martínez de Marañón*
11:45 - 12:00	"Elaboration of gels by using frozen pressurized Flying fish surimi". ***Helena Moreno,*** *Beatriz Herranz, Deysi Cando, Clara A. Tovar, Javier Borderias*
12:00 - 12:15	"Carob seed peel as natural antioxidant in chilled storage of mince horse mackerel (Trachurus trachurus)". ***Irene Albertos,*** *Lucía González Arnáiz , Isabel Jaime , Ana María Díez, Daniel Rico*
12:15 - 12:30	"Effect of electromagnetic field assisted freezing on yield, colour and textural properties of Albacore tuna". ***Eduardo Puértolas,*** *Idoia Olabarrieta, Iñigo Martínez de Marañón*
12:30 - 12:45	"A PAT approach for the discrimination between Fresh and Defrozen Hake". *Angela Blanco,* ***Raquel Rodríguez,*** *Iñigo Martínez de Marañón,* ***Ekaitz Martínez***
12:45 - 13:00	"Effect of active packaging and conventional modified atmosphere on the quality and shelf life extension of fish and shellfish". ***Amparo Goçalves,*** *Maria Leonor Nunes*
13:00 - 14:15	LUNCH

SESSION 4: "PRODUCT INNOVATION, CONSUMER ACCEPTANCE AND EXPECTATIONS"

CHAIRPERSONS:
José Antonio Beltrán, *University of Zaragoza*
Irene Gartzia, *AZTI-Tecnalia*

14:15 - 14:30	"European consumers' benefit - risk perception and the association with their consumption of seafood". ***Silke Jacobs,*** *Isabelle Sioen, Stefaan De Henauw, German Cano-Sancho, Maria Leonor Nunes, Gabriella Fait, Federico Cardona Pons, Wim Verbeke*
14:30 - 14:45	"Innovative use of natural extracts on the treatment of melanosis of three species of shrimp in the Mediterranean post capture". ***Alberio G.R.A.,*** *Todaro A., Muratore G.,Palmeri R., Bono G., Spagna, G.*
14:45 - 15:00	"Numerical gastronomy for optimising heat treatment of fish products". ***Dagbjørn Skipnes,*** *Izumi Sone*
15:00 - 15:15	"Fish quality and consumers; how do consumers' knowledge about and involvement in fish quality define factors that influence fish buying behaviour?" ***Themistoklis Altintzoglou,*** *Heide, M.*
15:15 - 15:30	"Shellfish refinement: are consumers able to distinguish between oysters fed with different algal diets?". ***Jasper van Houcke,*** *Markus Stieger, Jozef Linssen, Joop Luten*
15:30 - 15:45	BREAK
15:45- 16:00	"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 Manuel Gallardo, Josep Lluis Torres, Jara Pérez-Jiménez, María Rosa Nogués, Núria Taltavull, Isabel Medina*
16:00 - 16:15	"Postprandial lipid and insulin responses among healthy, overweight men to mixed meals served with baked herring, pickled herring of baked beef". ***Cecilia Svelander,*** *BG Gabrielsson, A Almgren, J Gottfries, J Olsson, I Undeland, A-S Sandberg*
16:15 - 16:30	"Reduction of salt in marinated herring (Clupea harengus L.) products". ***Revilija Mozuraityte,*** *Hanne Digre, Ida Aursand, Kirsti Greiff, Turid Rustad, Grethe Hyldig; Henrik Hauch Nielsen, Ingrid Undeland*
16:30 - 17:00	BREAK
17:00 - 18:00	INDUSTRY SESSION
	HIPERBARIC "Advances in commercial HPP Seafood applications". *Francisco Purroy. DVM* **HYGIENE SOLUTIONS. SEALED AIR FOOD CARE** "Safety and Hygiene, drivers of production maximisation and cost reduction" . *Fabrizio Tardioli, Sealed Air's Processed Food Sector Specialists Coordinator*
18:00 - 18:30	HAPPY HOUR
20:00	Social Dinner BOROA Restaurant (Amorebieta)

Wednesday, 11th June 2014

09:30 - 10:00	**Key Note Lecture** "Seafood innovation in Spain: a need, not an option" *Javier Arán, Isidro de la Cal. Operations Chief and R+D Manager*

SESSION 5: " INTEGRITY, AUTHENTICITY AND DIFFERENTIATION OF PRODUCTS"

CHAIRPERSONS:
Erling Larsen, *DTU AQUA*
Alberto González de Zárate, *AZTI-Tecnalia*

10:00 - 10:15	"Labelfish – towards a universal methodology to combat seafood fraud" ***Carmen G. Sotelo,*** *B. Boufana, D. Calvo, A. Griffiths, M. Jérôme, K. Kappel, J. Maguire, S. Mariani, R. Mendes, R. Pérez-Martín, U. Schröder, M. Shorten, H. Silva, C. Smith, A. Velasco, V. Verrez-Bagnis*
10:15 - 10:30	"On site and rapid tuna authentication system". ***Miguel Angel Pardo***
10:30 - 10:45	"Influence of size on texture properties of farmed meagre (Argyrosomus regius)". *Margarida Saavedraa, Teresa Gama Pereira, Ana Gradea, Pedro Pousão-Ferreira, Maria Leonor Nunesa,* ***Amparo Gonçalves***
10:45 - 11:15	COFFEE-BREAK and POSTERS

SESSION 6: " SUSTAINABLE USE OF CATCHES AND FARMING"

CHAIRPERSONS:
Erling Larsen, *DTU AQUA*
Alberto González de Zárate, *AZTI-Tecnalia*

11:15 - 11:30	"The EU Discard ban and the future handling and use of unavoidable unwanted catches". ***Erling P. Larsen,*** *Jørgen Dalskov*
11:30 - 11:45	"Demonstration Project to use and valorise discards of the Basque offshore fleet". ***Susana Etxebarria***
11:45 - 12:00	"LIFE iSEAS: Knowledge-Based Innovative Solutions to Enhance Adding-Value Mechanisms towards Healthy and Sustainable EU Fisheries". ***Ricardo I. Pérez-Martín,*** *Luis T. Antelo*
12:00 - 12:15	"An estimation of marine underutilized species and coproducts available in Portugal". ***Batista I.,*** *Vaz-Pires P, Coimbra R.*
12:15 - 12:30	"Seafood processing by-products as potential sources of inhibitors of proline-specific proteases". ***Oscar Martínez-Álvarez,*** *Pilar Montero, Carmen Gómez-Guillén*
12:30 - 13:00	CLOSING CEREMONY

SEAFOOD QUALITY REASSURANCE

"Optimization of the hydrolysis of horse mackerel using protease mixtures".
R. Perez-Galvez, *R. Morales-Medina, T. Tanimoto, Ɛ.M. Guadix, A. Guadix*

"Anticholesterolemic activity of protein hydrolysates from discarded species in alboran sea".
R. Perez-Galvez, *P.J. García-Moreno, R. Morales-Medina, A. Guadix, Ɛ.M. Guadix*

"An investigation on quality parameters of cultured seabass fillets fried in different oils".
Özge Poyraz, Can ALTINƐLATAMAN, Ufuk ÇƐLIK, ***Ɛvren Burcu SƐN YILMAZ****, Alper ƐRDƐM*

"Nutritional, Chemical, and Contaminants Characteristics Of Lipids Recovered With Isoelectric Solubilization/Precipitation From Different Parts Of Gilthead Sea Bream (Sparus aurata) ByProducts".
Nida Demirtas, *Sukran Cakli, Jacek Jaczynski*

"Handling and Quality of Sushi from Sushi Bars and Retailers in Izmir, Turkey".
Asli Cadun, E. Burcu Sen Yılmaz, Nida Demirtas

"Using VIS/NIR spectroscopy to estimate remaining shelf life of salmon fillets stored at different temperatures".
Martin H. Skjelvareid*, Karsten Heia, Svein Kristian Stormo*

"Recuperation of atlantic cod (gadus morhua) following exhaustive exercise in a swim tunnel – How can knowledge of swimming physiology improve flesh quality?"
Ragnhild A. Svalheim*, Anders Karlsson, Stein-Harris Olsen, Helge K. Johnsen, Øyvind Aas-Hansen*

"Assessment of biogenic amines changes of tilapia (Oreochromis niloticus) stored at 4°C and 30°C by a new HPTLC method".
Nadir Boudjlal DƐRGAL*, Marie-Louise SCIPPO, Guy DƐGAND, Sidi-Mohammed Ɛl-Amine ABI-AYAD*

"Influence of lipid oxidation and protein solubility on bioelectrical properties of fish during frozen storage".
Sanja Vidacek*, Emira Jakupovic, Tibor Janci, Ekatarina Drobat, Anja Rodin, Nives Marušic, Helga Medic, Tomislav Petrak, Igor Lackovic*

"Benefits and risks of chub mackerel (Scomber japonicus) after culinary treatment".
Rui Oliveira, Pablo Castaño, Maria Fernanda Martins, Narcisa Maria Bandarra, Maria Luísa Carvalho, ***Helena Maria Lourenço****, Maria Leonor Nunes*

"Estimation of lipid degradation of frozen saithe (Pollachius virens) and hoki (Macruronus novaezelandiae) muscles by colour analysis".
Magnea G. Karlsdottir*, Sigurjon Arason, Minh Van Nguyen, Hordur G. Kristinsson, Kolbrun Sveinsdottir*

"Innovative enzymatic methods for determining the freshness of the Mediterranean crustaceans".
Alberio G.R.A.*,Palmeri R.,Todaro A., Bono G., Spagna G.*

"Short time increased muscle temperature during primary processing of Atlantic salmon – Impacts on drip loss, rigor mortis and subsequent quality of cold-smoked fillets".
Jørgen Lerfall*, Bjørn Tore Rotabakk*

"How sample thickness affect spectroscopic analysis of fish samples".
Svein Kristian Stormoa, Torstein Skåra, Martin H. Skjelvareid, Karsten Heia.

"Automatic process control – Validation of heat treatment by interactance imaging spectroscopy".
Karsten Heia*, Martin H. Skjelvareid, Svein Kristian Stormo*

"Active films from cooked shrimp enriched with polylysine-coated liposomes containing bioactive hydrolysate".
Ailén Alemán Pérez, *Ireta Mastrogiacomo, Begoña Ferrari Fernández, M. Ɛlvira López Caballero, M. Carmen Gómez Guillén , M. Pilar Montero García*

"Comparative study of spoilage in different hake species and design of models for estimating the freshness index".
J. Calanche*, S. Pedrós, V. Alonso, J. Beltrán*

ADVANCES IN SEAFOOD PROCESSING TECHNOLOGY AND SMART CONTROL

"Quality enhancement of chilled sardine (Sardina pilchardus) by employment of quinoa (Chenopodium quinoa Willd.) extract".
Liliana Zura, Marcos Trigo, Montserrat López, Roberto Iglesias, José M. Gallardo, Antonio Vega-Gálvez, ***Santiago P. Aubourg***

"Obtaining bioactive components of Hass avocado pear (Persea americana Mill) by CO2-supercritic extraction: Effect n Atlantic salmon (Salmo salar) quality during refrigerated storage".
Jaime Ortiz, Juan Pablo Vivanco, Camila Mella, Donaji Velázquez, ***Santiago P. Aubourg***

"Application of fermentation techniques for fish processing".
Fang Yang*, Turid Rustad, Wenshui Xia*

"Changes of Energy- and Taste-Related Compounds of Bivalves Preserved in Anaerobic Environments".
Takeya Yoshioka*, Tomoko Nishimura, Kunihiko Konno*

"Minimal processing of cod results in a prolonged shelf life than unprocessed and less quality change than pasteurized".
Lene Kramer*, Dagbjørn Skipnes, Izumi Sone, Svein Kristian Stormo, Aase Vorre Skuland*

"Brining of cooked ready to eat shrimp (Pandalus borealis) with carbonated brine".
Bjørn Tore Rotabakk,Trond Løvdal

"Addition of Bifurcata bifurcata and Fucus spiralis extracts to refrigerated fatty fish: Effect on quality changes".
Santiago P. Aubourg*, Marcos Trigo, Montserrat López, Roberto Iglesias, J. Marina Ezquerra-Brauer, José M. Gallardo*

"A novel process for obtaining a smoked cod product".
Arantxa Rizo, ***Ana Fuentes****, Isabel Fernández-Segovia, José M. Barat*

"High pressure effect over the gelation ability of low-quality surimi to elaborate low and high sodium content gels"
Deysi Cando*, Helena M. Moreno, Javier Borderias*

"Effect of oil and salt addition after pasteurization and chilled storage on restructured fish muscle products based on glucomannan gelation"
Beatriz Solo-de-Zaldívar, Beatriz Herranz, ***Javier Borderias****, Clara A. Tovar*

"Application of High Hydrostatic Pressure (HPP) as a tool to extended shelf-life of hake fillets".
María Lavilla*, Austin Lowder, Idoia Olabarrieta, Iñigo Martínez de Marañón*

INTEGRITY, AUTHENTICITY AND DIFFERENTIATION OF PRODUCTS

"Characterization of process induced changes in matjes herring, using 2D gel electrophoresis".
Torstein Skåra*, Flemming Jessen, Henrik Hauch Nielsen,Bjørn Tore Rotabakk*

"Identification of Ling (Molva molva) in Commercial Products Using Real-Time PCR".
Ledicia Taboada, Ana Sánchez, ***Ricardo I. Pérez-Martín****, Carmen G. Sotelo*

"A genetic traceability tool for the Atlantic mackerel (Scomber scombrus, L.) through NGS transcriptome-derived SNP discovery".
Iratxe Montes, Urtzi Laconcha, ***Jorge Langa****, Mikel Iriondo, Carmen Manzano, Darrell Conklin, María Santos, Haritz Arrizabalaga, Xabier Irigoien, Andone Ɛstonba*

"A genetic tool for traceability of European anchovy (Engraulis encrasicolus, L.) and albacore (Thunnus alalunga, Bonn.) fisheries derived food products".
Iratxe Montes, Urtzi Laconcha, ***Jorge Langa****, Mikel Iriondo, Carmen Manzano, Darrell Conklin, María Santos, Haritz Arrizabalaga, Xabier Irigoien, Andone Ɛstonba*

"Product information at your fingertips".
Jónas R. Viðarsson, Valur N. Gunnlaugsson, Ólavur Gregersen, Durita R. Djurhuus,Petter Olsen

PRODUCT INNOVATION, CONSUMER ACCEPTANCE AND EXPECTATIONS

"Evaluation of the properties of blue whiting mince during frozen storage".
Katie Healy

"Post-catch survival amongst brown shrimp (Crangon crangon L.) in the Flemish shrimp fishery".
Vermeersch Xavier, *Vlaemynck Geertrui*

"Changes during production of hot smoked carp (Cyprinus carpio) and rainbow trout (Oncorhynchus mykiss): fresh vs frozen raw material".
Revilija Mozuraityte, *Ana Pesic, Rada Brdar, Ulf Erikson, Ekrem Misimi, Danilo Mrdak*

"Does information affect consumer liking for farmed and wild fish?"
Anna Claret, Luis Guerrero, ***Irene Gartzia***, *Maruxa Garcia-Quiroga, Rafael Ginés*

SAFETY EVALUATION AND EMERGING RISKS

"Use of Growth Inhibitors for Controlling Some Specific Bacterial Pathogens in the Seafood Industry".
E. Burcu Sen Yılmaz, *Kitiya Vongkamjan, Sükran Çaklı*

"Live bivalve molluscs produced and marketed in Portugal: main microbiological hazards".
Sónia Pedro, *Helena Silva, Maria Leonor Nunes*

"Effect of cryoprotectants and frozen storage on Anisakis allergens in surimi processing".
Fabiola Olivares, Cristina de las Heras, Ana I. Rodríguez-Mahillo, Noelia Carballeda, Miguel González-Muñoz, Alfonso Navas, ***Mercedes Careche***, *Margarita Tejada*

"Chemical contaminants associated to the consumption of bivalve molluscs produced in Portugal".
Helena Maria Lourenço, *Maria Fernanda Martins, Susana Gonçalves, Maria Leonor Nunes*

"Microplastics in the food chain? Occurrence of microplastics in brown shrimp (Crangon crangon) and blue mussel (Mytilus edulis)"
Bekaert Karen, *Devriese Lisa, Griet Vandermeersch, Johan Robbens*

SUSTAINABLE USE OF CATCHES AND FARMING

"MARMED Project: Development of innovating biomedical products from marine resources valorisation"
Ricardo I. Pérez-Martin, *Patricia Ramos Ariza, Maria Blanco, Jose A. Vazquez, Fco. Javier Fraguas, Marta Pérez Testa, Carla Lopes, Carmen G. Sotelo*

"Influence of feed composition on the shelf-life of gilthead sea bream"
Irene Díaz-Pasquín, ***Ana Fuentes***, *Silvia Martínez-Llorens, Ana Tomás-Vidal, Isabel Fernández-Segovia, José M. Barat*

"Valorisation of shrimp cephalotorax waste by obtaining and encapsulating a lipid extract rich in astaxanthin: broadening its utilization as a food ingredient"
J. Gómez-Estaca, *P. Montero, M.M. Calvo, M.C. Gómez-Guillén*

"Recovery of Marine Proteins and Lipids from Herring (Clupea harengus) Processing Water Using Flotation with Microbubbles, Electroflocculation and Ultrafiltration"
Seyed Vali Hosseini, *Ali Osman, Nina Gringer, Tore Svendsen, Caroline P. Baron, Ingrid Undeland*

"Stabiliy Of Fish Protein Hydrolysate From Heads of Gilthead Sea Bream (Sparus aurata), European Sea Bass (Dicentrarchus labrax) and Rainbow Trout (Oncorhynchus Mykiss Walbaum, 1792) During Storage"
Omer Alper Erdem, Nida Demirtas, ***Sukran Cakli***

"Comparision Of Different Production Methods Of Fish Protein Hydrolysates And Effects On Functional and Antioxidative Properties and Storage Stability"
Sukran Cakli, *Nida Demirtas, Omer Alper Erdem*

"Differential scanning calorimetry analysis of structured acyglycerols obtained from caprylic acid and omega-3 concentrates of rainbow trout (Oncorhynchus mykiss) belly oil"
Rivera M., Berríos M., Pando Mª E., Galleguillos M., Cedano J.M., Contreras E., Hernández C., Rodríguez A., ***Aubourg S.P.***

"Bioactive peptides from Boarfish: Protein extraction and generation of health beneficial peptide hydrolysates using established techniques"
Maria Hayes, ***John Fagan***

"Fuel usage and sustainability impact calculation – case studies from the Norwegian fisheries"
Kathryn AM Donnelly

"Valorization of shrimp (Litopenaeus vannameis) farm byproducts for the production of chitin and chitosan"
J. Pinedo, *A. M. Larrán, A.B. Martín-Diana, M.A. Sanz Calvo*

"Valorisation of brines from marinating herring industry and their potential to be used as a source of natural antioxidant in fish mince"
Irene Albertos, *Nina Gringer, Daniel Rico, Caroline P. Baron*

"Edible films enriched with active peptides from crustacean waste encapsulated in nanoliposomes"
Mosquera M., Martínez-Alvarez M., Giménez B., Montero P., Gómez-Guillén, C.

"Chemical characterization of brown crab (Cancer pagurus) shells from Scotland and France"
Batista I., *Louro M., Mendes R., Carvalho M.L., Louro M.L., Marques A., Pires, C.*

WEFTA 2014

SEAFOOD Science for a changing demand

ABSTRACTS
ORAL
PRESENTATIONS

SEAFOOD QUALITY REASSURANCE

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

Quantification of fish partial volatile basic nitrogen by SPME-GC/MS

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Abstract

Freshness is a key parameter in the evaluation of the fish quality. As this matrix is highly perishable, objective tools for the freshness estimation are required. By the past, numerous methods including sensorial, chemical, microbiological and physical analysis were developed to follow evolution of odour, sight or texture throughout the spoiling process.

Spoiling of fish is a complex process combining autolysis and exogenous degradations. One of the most famous examples is the degradation of trimethylamine-N-oxide (TMAO) in Gadidae by both TMAO reductases of specific spoiling organisms and TMAO demethylase, an endogenic enzyme. These reactions lead respectively to the production of trimethylamine (TMA) and dimethylamine (DMA). To date, TMA and DMA are routinely non-specifically measured among other volatile amines thanks to total volatile basic nitrogen (TVB-N) analysis; TMA can be nonetheless measured more specifically by TVB-N when formaldehyde is added. The concept of partial volatile base nitrogen (PVB-N) was implemented using SPME-GC/MS to quantify both TMA and DMA. Further, this technique allows specifically detecting and measuring TMA and DMA.

Extraction (temperature, time, sample preparation) and separation (temperature, column phase, split type) parameters were optimized to obtain best chromatographic profiles. Both fresh and spoiled fish were analyzed by TVB-N and PVB-N techniques. First results show consistent conclusions. Moreover, comparison of TVB-N and PVB-N leads to the conclusion that the current TMA measurement, with addition of formaldehyde, is overestimating TMA content in the flesh of fish.

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Salt and water distribution in commercial Icelandic heavily salted Atlantic cod as affected by catching method, pre- and post-rigor processing, and pre-salting method: A ^{23}Na and ^{1}H multi-parametric MR analysis

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The salt and water distribution of various commercially available Icelandic heavily salted Atlantic cod (*Gadus morhua*) products were analysed with proton and sodium NMR and MRI methods. The products varied in choice of catching method (long line, trawler or net), in pre- or post-rigor processing, flattening or filleting cut, and pre-salting technique (brine injection with salt with/without polyphosphates, brining and pickling) and choice of brine injection instruments.

Proton T_2 relaxation time distribution maps indicated that fish from all products contained spots with unsaturated brine, increasing the risk of microbial denaturation of the fillets during storage. The analysis also showed that double brine injection and brine injection into pre-rigor muscle lead to needle traces in the muscle, even after kench salting and storage. Comparison of sodium images to the proton images indicated that higher sodium signals were generally observed where the proton signal also was high, indicating that most of the salt, seen in the images, was dissolved in the muscle water. Apparent Diffusion Coefficient (ADC) maps showed a higher ADC in the brine injected fillets compared to the pickled fillets, in agreement with the higher water content and higher water mobility in the injected fillets. Low field NMR T_2 analysis indicated that pickle salting lead to the highest degree of protein denaturation in the muscle of all the pre-salting methods. Brine injection during pre-salting generally lead to salt-induced swelling, which effect remained after the kench salting step, except in the fish caught by net and processed post rigor. Sodium T_2 relaxation time analysis lead to shorter sodium relaxation times in the pickle salted fillets, probably related to the low water content and high muscle denaturation observed in this product.

The multi-parametric analysis performed in this study indicated how powerful the NMR methods are for process and product characterisation and optimization.

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Title

Quality research on Norway lobster (Nephrops norvegicus)

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Abstract

Norway lobster (Nephrops norvegicus) as many other seafood products, is a very perishable food item. They are landed in Belgian harbors as whole products or as Norway lobster tails. Research on the quality of Norway lobster was performed in order to optimize handling conditions.

The aim of the first part of the study was to investigate the microbial quality of whole Norway lobster and Norway lobster tails by Total Viable Count (TVC) and by characterizing dominant microbiota on both products. The cultivable microorganisms were quantified on Plate Count Agar (PCA) and Marine Agar (MA). Molecular techniques (PCR-DGGE) and sequencing were performed to characterize the bacterial species present. The microbiota of Nephrops norvegicus were dominated by Gram-negative genera such as Psychrobacter spp., Pseudoalteromonas spp., Pseudomonas spp., Luteimonas spp., Aliivibrio spp. At the end of the storage period, mainly Psychrobacter spp. and Pseudomonas spp. were observed on whole Norway lobster and tails.

In the second part of the study two different storage methods for Norway lobster were evaluated. The Irish on board storage method uses a bag with fine meshes between the Norway lobster and the ice, whereas the traditional icing method in Belgium makes use of direct contact between seafood and ice. The difference between the two storage methods was assessed by using microbiological (TVC on MA and Iron agar, H_2S-producing bacteria, Pseudomonas spp.), sensory (Quality Index Method) and chemical parameters (Total Volatile Basic Nitrogen TVB-N) during a 14-day storage experiment. From day 6 of storage, a significant higher amount of bacteria was observed on the Norway lobster stored in the Irish way for TVC on MA and H_2S-producing spoilage bacteria. The amount of TVB-N started to increase from day 7 of storage. Therefore, for short fishing trips, the use of the meshed bag cannot be considered as disadvantageous. However, this storage method is not applicable to the Belgian situation due to longer sea trips.

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

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Volatile amines coming from the metabolism of fish microflora and/or the activity of some enzymes during post mortem storage are commonly used as fish quality indicators. This work is aimed at the determination of these amines in a single short-time liquid chromatographic analysis improving the main features of existing methodologies.

A novel HPLC-MS-ESI method for the simultaneous analysis of trimethylamine (TMA), dimethylamine (DMA) and methylamine (MA) in the headspace gas from a fish packaged in heat-sealed trays has been optimized and validated in two fish species (hake and atlantic horse mackerel) stored at chilling or freezing temperatures.

A derivatising process with tert-butyl bromoacaetate was included to improve the sensitivity. The influence of the pH, incubation temperature, and reaction time were optimized to obtain the maximum yield of the reaction. After derivatization, separation was conducted on an HILIC column with a gradient elution using tetraethyl ammonium chloride as internal standard. Chromatographic and mass detector conditions were optimized with the objective of developing a screening method to detect all amines reacting with the derivatising agent. Adequate sample treatments were optimized for both muscle (destructive method) and gas phase (non destructive method). Good correlations were observed between both type of matrices (muscle and gas).

This methodology was sensible enough to detect these compounds even in good quality fish. In the case of fish muscle extracts the limits of detection were below 0.5 mg-N/kg. When headspace was analyzed, this new methodology was able to measure 10 ng of TMA from the surrounding atmosphere of fish.

This novel multianalyte method provides a rapid and simultaneous determination of some volatile amines at very low concentrations and, as a result, relevant information about the spoilage level of fish along its storage can be extracted

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

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Post mortem weight loss is of particular interest for the aquaculture and fishery industry as it represents an economical loss. The percentage of weight loss varies from species to species, but for Atlantic salmon (*Salmo* salar) up to 3.5 is reported as normal. Salmon muscle can contain up to 80 % water and fat. During storage, the fillet will lose weight and is referred to as drip loss. Several factors can affect the fish muscle content and drip loss, while pre- or post-rigor processing and storage conditions are known factors that can affect weight loss.

A full factorial design with the factors “localization”: north or south of Norway; ”season”: November or June; and “rigor status”: pre- or post-rigor filleting was set up to follow the drip loss and the composition of the drip loss during 14 days of storage. In addition, the factor “fillet status”: whole fish or fillet was included when studying water holding capacity (WHC) and water content of the flesh at the day of processing.
WHC was quantified by centrifuging for 15 min at 4 °C at 530 g and expressed as % retained water in the fillet. Dry matter was quantified by drying at 105 °C for 16 to 24 hours and expressed as % water of the fillet. Drip loss was quantified as weight change between day 0 and day X and expressed as % weight change from day 0. In addition, water, fat, protein and astaxanthin content (%) of the drip loss were quantified during storage.

The trials end in May 2014, and results will be presented at the conference.

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

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Abstract
Quality changes of marine products can be detected by sensory evaluation and determining chemical changes by using classical standard analysis methods. However, sensory methods are subjective, time and human source demanding, while many traditional chemical methods are not sensitive enough. Therefore, more advance and sensitive methods for quality evaluation are needed. In this work analysis of changes during storage of salmon co-streams indicated that microbiological quality and enzymatic degradation (amount of free fatty acids) were easier to determine. However other chemical changes measured by degree of hydrolysis, peroxide value (PV) and anisidin value (AV) were negligible. Due to this it was difficult to follow quality and chemical changes of material during storage and describe their dependency of various parameters. Therefore more sensitive and advance technique (NMR) was used to indicate quality changes during storage as well as release of bioactive components which is important factor for processing. Generally, NMR is a powerful tool for food quality evaluation. It is a non-targeted approach that allows simultaneous characterization of wide number of fish metabolites determining fish quality on a molecular level. This makes NMR spectroscopy a valid and in many aspects unique tool to characterize fish and fish co-streams quality. This study discuss the influence of different factors like various salmon co-streams, storage temperature and time, homogenisation before storage on the changes of quality parameters followed by NMR. Salmon fillet sample was included into test as a reference/control sample. For changes analysis the followed NMR experiment set have been performed: 1D 1H; 2D TOCSY; 2D 13C HSQC.

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Role of Fish Oils in Nutritional Quality: Study of lipid biactive oxygenated mediators

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Consumption of fish and fish oils has been recently suggested to contribute in the prevention of metabolic disseases such as dyslipidaemia, hyperglycaemia, hypertension or insulin resistance. A novel approach to understand the role of marine ω-3 PUFAs, EPA and DHA, on metabolic health is presented. Eicosanoids and other lipid mediators derived from EPA and DHA, have been pointed like one of the most efficient mechanisms to stop inflammation and oxidative stress in a highly coordinated, active process. The amount of EPA and DHA in fish muscle and fish oils is crucial in the production of these local mediators. However, the simultaneous determination of these fatty acids and their lipid mediators is a challenge due to their instability, low physiological levels and the difficulty of identifying the large number of compounds and isomers formed in vivo with very similar physicochemical properties.

The aim of this research was to develop a robust and sensitive targeted analysis platform based on Solid-phase Extraction and LC-ESI-IT-MS/MS for the simultaneous quantification in blood plasma of a large number of eicosanoids/docosanoids and their PUFA precursors. The method here developed overcame issues associated to the thermal stability, the wide range of polarity and physiological concentration of targeted compounds. Moreover, the proposed MS/MS detection mode allowed the discrimination between coeluting isomers minimizing false positive identifications.

This lipidomic platform was applied to the production of PUFA metabolites in a metabolic study aimed to test the nutritional effect of different fish oils. Different metabolic effects associated to dispidilemia, oxidative stress and inflammation could be correlated with the different production of lipid mediatorsassociated to each fish oil. Results were stressed in terms of recomendations of the optimised amounts of DHA and EPA in the fish oils.

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New tools for spoilage control in seafood products: bacteriophages

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Abstract

In the recent years, interest in the use of bacteriophages has increased as viable alternative to chemical antimicrobials against food pathogens and as food preservers.
The objective of this study was the isolation, selection and characterization of bacteriophages against Serratia species and the evaluation of their use as biological control of fish spoilage. In a previous work, we described Serratia, Shewanella and Yersinia as dominant bacteria genus (over 57.2% of the total) in the late spoilage stages of Atlantic horse mackerel (Trachurus trachurus) fillets stored in modified atmosphere (MAP). Isolates of Serratia were obtained from fish samples and employed as hosts for phage isolation. Eleven bacteriophages were isolated from food material and tested for bactericidal activity against two spoilage bacteria (S. proteomaculans and S. fonticola) and one opportunistic pathogen (S. marcensens). Phages were active against, at least, 8 Serratia strains from a collection of 12 and were able to form plaques at 6ºC. Titers of isolated phages ranged from 6.9 Log PFU/ml to 9.3 Log PFU/ml after a single round of 24 h incubation with the host bacteria.
Bacteriophage AZT6 was selected because showed the broadest host range against Serratia. Results demonstrated that treatment with high phage concentration of AZT6 (MOI 1000:1) significantly reduce the Serratia population in a fish extract (99.9% reduction) after 5 days at 6ºC and in fish fillets (90.0 % reduction) after 6 days at 6ºC. However, phage effect was dependent on fish sample, what reflects that phage effect on wild bacteria population was variable.
Hereby described strategy allows an effective attenuation of Serratia growth during fish spoilage. AZT6 fulfill the conditions for a good candidate for food applications in order to reduce the Serratia population in fresh fish. In summary, the findings in this work demonstrate the potential use of phage as food spoilage control.

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Title

Quality evaluation of iced sea bream (*Sparus aurata*) and desing of models for the freshness index.

Presenting author, co-authors, affiliations, E-mail for the presenting author

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Abstract

The present research studied sea bream (*Sparus aurata*) freshness evolution during storage in ice by analyzing different quality parameters and developed sensory spoilage profiles and predictive models for freshness index and storage time in ice. A design phase was carried out using a selected assessor panel in sensory analysis; an assay of fish stored in ice was made and models were developed. Then other phase was conducted with fish directly provided by another location supplier and using another sensory panel in order to validate the proposed models. Initial freshness showed a K_{value} of 13.60% and Hx_{ratio} = 0.024 µmol/g. Physico-chemical and microbiological parameters evidentiated good relationship between them. After 10 days *enterobacteriaceae* and psicrotrophics counts were very close to the maximum level for acceptability for marine fish. Sensory methods allowed to establish a shelf-life of 8 days in average, corresponding a freshness index of ≤ 50%. Sensory profiles showed that gills and peritoneum were the most vulnerable aspects. Finally, predictive models were established for the freshness index (%) and the ice storage time (h) using three different sensory methods: Torry, European official method (UE) and Quality Index method (QIM) that exhibited more than 95% accuracy during validation.

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Title

Quality of scallops - a cause of concern

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Abstract

The market share of marine bivalve mollusks of the family Pectinidae, commonly known as scallops, has increased significantly in recent years and has been extended besides the king scallop (*Pecten maximus*) to a variety of other species, mainly the sea scallop (*Placopecten magellanicus*).

Consumer´s growing interest in compositional aspects and the reservation against ingredients on chemical basis like phosphate containing moisture retention agents lead to an increasing demand for "chem-free" clean labels. In response, additives like citric acid and its salts were introduced, sometimes in combination with bicarbonate salts which are difficult to proof. Currently, especially scallops are related to mislabeling and excessive moisture contents.

The new EU Food Information Regulation 1169/2011 provides a more transparent labeling and improved consumer protection against hidden water. As prerequisite manufacturers and inspection authorities need to know the natural composition of the scallops muscle.

As untreated raw material live king scallops of various origins were analysed for the most important quality parameters including proximate composition, minerals, free amino and fatty acids. Results were compared with frozen products of *Pecten maximus* and *Placopecten magellanicus* from retail. Fresh king scallops had moisture and protein values between 74.9 und 78.2 % and 18.0 and 20.0%, respectively. In frozen products these parameters varied much more, mainly towards more water and less protein.

The water to protein ratio (W/P) in fresh king scallops was between 3.0 and 4.2, whereas the majority of frozen products, mainly *Placopecten magellanicus,* had as consequence of high moisture contents W/P ratios > 5.

Citric acid and di and triphosphate were analyzed by HPLC. Amounts up to 212 mg citric acid /100 g muscle flesh were found in frozen products which were always combined with a W/P ratio > 6.8.

The sodium content in fresh scallop meat was between 82.5 und 116.7 mg/100 g, in frozen products between 82.2 and 681.5 mg Na /100 g were found.

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

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In recent years, there has been increasing interest in the use of spectroscopic methods such as Raman spectroscopy for fast and non-invasive evaluation of food safety and quality. Histamine poisoning occurs throughout the world and is probably the most frequent form of intoxication caused by consumption of fish. Therefore, the potential of Surface Enhanced Raman Spectroscopy (SERS) to detect histamine in water solution and fish muscle extract was investigated in this study. Normal Raman spectra of histamine in solid state and SERS spectra of histamine in solutions were collected using 2 different lasers with excitation wavelengths of 532 and 514,5 nm. Four different silver colloids were used as SERS substrates. Colloids were prepared by chemical reduction of silver nitrate using trisodium citrate, dextran, sodium borohydride and ascorbic acid as reducing agents. Combination of each of these colloids with different aggregating agents (KNO_3, KBr, KCl and $NaBH_4$) added in different concentrations has been investigated in order to obtain maximum SERS signal of histamine. Best results were obtained using citrate reduced silver colloid with addition of 0,23 M $NaBH_4$ enabling detection of histamine in water solution at concentration of $5*10^{-5}$ M. Fish muscle extracts were prepared by homogenization of fish muscle in 0,4 M perchloric acid and spiked with different concentrations of histamine in order to record histamine spectra. Direct spectra acquisition from extract was not possible probably due to impact of perchloric acid on silver colloid and high background noise generated by other extracted components of fish muscle. After purification with anion exchange resin histamine has been detected in fish muscle extract at concentration $1*10^{-4}$ M. Although further improvements are needed to achieve detection of histamine at legislative set limits this preliminary results show a potential for development of new histamine detection method in fish and fish products.

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SAFETY EVALUATION AND EMERGING RISKS

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Title *Dioxins and anisakid species in cod liver from Greenland – consumer related aspects*

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Abstract

Canned cod liver (Foie de Bacalao) is a product of regional interest in various countries. It is very rich in vitamin A and D and a good source for w-3 polyunsaturated fatty acids. But cod livers can be heavily contaminated with dioxins and dl-PCB[1)]. Liver from the North- and Baltic Sea are not suitable for consumption, but new data confirmed that cod liver from Greenland is only low contaminated.
Cod livers are also frequently infected with anisakid species and information on nematode infection parameters are as well essential to use livers from Greenland as raw material for canned products. Heavily infected products can cause aesthetical and allergenic problems. Data will be given on actual contamination levels with dioxins and dl-PCB as well as on the prevalence, infection intensity and abundance of anisakid larvae in cod livers from Greenland.
Samples were taken in autumn 2010 and 2013 during several cruises of the FRV W. Herwig III from cod caught in fishing areas east of Greenland.
With 5 ng WHO-TEQ$_{(2005)}$/kg ww. the sum of dioxins and dl-PCB kept well below the EU limit of 20 ng/kg ww.. Quantitative determination of the parasite load showed that cod liver from Greenland waters were heavily infected with Anisakis simplex and partly also with Pseudoterranova decipiens.
Virtually all 100 cod livers were infected with anisakid nematodes, the prevalence was 99 %.
Investigations of commercial available canned liver products from Icelandic waters confirmed high infection levels.

1) *Karl, H., Lahrssen-Wiederholt, M. (2009). Dioxin and dioxin-like PCB levels in cod liver and – muscle from different fishing grounds of the North- and Baltic Sea and the North Atlantic. J. Consumer Protection and Food Safety 4: 247-255.*

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Effects of frozen storage on the allergenicity of surimi gels from hake infected with Anisakis simplex larvae

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Surimi, a myofibrillar protein concentrate from fish muscle, is an intermediate foodstuff used as a basic ingredient in the manufacture of many seafood products. To obtain the final gels the surimi is ground with salt and the viscous sol formed turns to an elastic gel upon heating, producing changes in the structure of myofibrillar proteins which may entrap or react with remaining muscle proteins. Studies on sterilization of canned fish have shown that the detection of allergenic proteins, including those with high thermal resistance, decreases after heat treatment. Thus, during gel forming, the allergenicity of these proteins could be potentially affected. In order to continue in the designing of strategies to reduce the allergenic capacity of seafood products, we investigated the effect of solubilization in salt and heat treatment used on the gel forming process on the allergen concentration from heavily infected fish. The recognition of Anisakis allergens during long term frozen storage of surimi gels was also evaluated.

Hake muscle infected under controlled conditions (50 L3 larvae/100 g mince) was washed [3 cycles, muscle:washing solution, 1:4 (w:v)] with water, sodium phosphate buffer, sodium bicarbonate, or sodium hypochlorite. Two cryoprotectant blends were added to each of these four raw surimis: 4% sucrose+4% sorbitol and 4% sucrose+4% sorbitol+0.2% sodium pyrophosphate, thus making a total of 8 combinations. Each combination was ground with 2.5% of NaCl (3 min, 5°C), stuffed into stainless steel cylinders (30x30 mm), heated (90°C, 30 min), cooled in iced water and kept at room temperature (24-25°C) before measurement. Gels were made from frozen surimi (-20°C) after 90 or 180 days. Also, gels from chilled surimi were frozen stored for 90 and 180 days. Ani s 4 and A. simplex antigens were quantified by immunodetection (Dot blot) and immunohistochemistry.

The heat treatment decreased the detection of Ani s 4. This decrease was higher with surimi gels made from frozen surimi than with gels made from chilled surimi and frozen stored under the same conditions of time and temperature.

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Factors affecting viability of *Anisakis* L3 during the freezing process

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Anisakis L3 have been shown to be moderately freezing tolerant. The EU and US regulations on thermal treatments given to fishery products differ in terms of time and temperature conditions and no information is available on factors that may affect the viability of larvae, such as the effects of other technological parameters (i.e freezing rates) or intrinsic factors (i.e. species of Anisakis, ageing, metabolic rate).

The aim was to analyze the viability of Anisakis during the freezing process in both isolated larvae and in experimentally infected minced fish. Live L3 Anisakis (5 larvae/10 mL water) samples were placed in quadruplicate in plastic containers in a conventional freezer and taken out at different intervals to monitor the freezing process until temperature reached -30 ºC. Also, minced fish infected with Anisakis (10 larvae/75g fish) was analyzed at a fixed freezing rate and varying final temperatures (-10, -15, - 20, and -30 ºC) at 0, 12, and 24 hours after freezing. The temperature profiles were mapped in the freezer per each sample location, and viability of larvae was monitored against these temperature values. Viability of larvae was measured, taxonomic identification was performed for all the batches and differences in metabolic rate and antigenicity were also analyzed.

Isolated larvae displayed a decrease in viability from the ice nucleation period down to -20 ºC but it was only when the temperature reached – 30 ºC that all larvae were found non viable. In minced fish larvae may resist freezing at all four analyzed temperatures. The results are discussed in the light of the critical time to convert liquid water in ice, local temperatures in the freezer, antigenicity, and metabolic rate.

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A FAST *SHOTGUN* PROTEOMICS APPROACH FOR THE GLOBAL CHARACTERIZATION OF FISH-BORNE PARASITE PROTEINS

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*Fish and seafood are one of the most frequent causes of food allergy. Additionally to fish intrinsic allergens, there has been a marked increase over the last ten years in the reported prevalence of allergic reactions to fish-borne parasites, mainly to **Anisakis simplex**. Twelve **Anisakis**-derived allergens have been recognized and their complete or partial protein sequences have been submitted to the universal UniProtKB database (Ani s1-s12). The scientific opinion of the EFSA (European Food Safety Authority), recognized the current high risk throughout the world and identified the necessity of developing new methods to detect, monitor and control these seafood-borne parasites.*

*We present a fast **shotgun** proteomics approach for the identification and characterization of proteins from fish parasites belonging to **Anisakidae.** This high-speed methodology is based on:*

a) *Purification of thermostable proteins of the extract by heat treatment followed by centrifugation*
b) *Accelerated cleavage by means of in-solution trypsin digestions under an ultrasonic field provided by a high-intensity focused ultrasound (HIFU).*
c) *LC-ESI-IT-MS/MS analysis of the resulting peptides by using a LTQ-Velos Pro Mass Spectrometer (Thermo Fisher, San José, CA).*

MS/MS spectra were searched using bioinformatics tools: Proteome Discoverer, Sequest HT (Thermo Fisher, San José, CA) against Nematoda UniProt database, which also included their decoy sequences. Results were subjected to statistical analysis with the Peptide Prophet algorithm.

*The method here proposed provides a useful and fast tool for the direct analysis of complex mixtures of peptides and allows the identification of related fish parasites of **Anisakidae** in less than 2 h. The method was validated in terms of resolution, sensitivity and reproducibility.*

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Benefit and risk assessment of cooked farmed meagre (*Argyrosomus regius*)

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Abstract

Farmed meagre (*Argyrosomus regius*) has been considered one of the most promising fish species for Mediterranean aquaculture diversification. Thus, the primary purpose of this study was to collect information supporting the evaluation of benefits and risks associated to its consumption. The fish used was reared in earthen ponds (semi-intensive system) at IPMA Aquaculture Research Station. Therefore, the *in vitro* bioaccessibility of EPA, DHA, Se, Hg, and methylmercury (MeHg) in raw and cooked samples was studied and a balanced risk-benefit assessment based on the bioaccessibility data was carried out. The bioaccessibility of EPA and 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 %. Likewise, for Hg and MeHg, high levels of bioaccessibility were determined with the exception of grilled meagre, displaying the lowest values (54 and 64 %, respectively). For the evaluation of risk-benefit associated to the consumption of this species a meal of 160 g of fish, an average human body weight of 60 kg and the bioaccessibility EPA, DHA, Se and MeHg were considered. The risk-benefit probabilistic assessment was done on the basis of the MeHg TWI and EPA, DHA and Se DRIs.

Based on this probabilistic assessment it was brought about a recommendation of a maximum consumption of two weekly meals for boiled or roasted meagre and three weekly meals for grilled meagre. However, all Se health beneficial values obtained for raw, boiled, grilled and roasted meagre were positive, which means that the consumption of this species involves a low health risk.

This research was funded by the projects "GOODFISH" (Ref. PTDC/SAU-ESA/103825/2008) and AQUACOR (Ref. PROMAR 31-03-05FEP-003). The author C. Afonso acknowledge the individual FCT Post Doctoral Grant Ref. SFRH /BPD/64951/2009.

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Comparing the effect of three antioxidants; *Fucus vesiculosus* extract, Rosemary extract and L-Ascorbic acid, during hydrolysis of Lumpfish head

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Abstract

Value added products such as fish protein hydrolysates (FPH) can be produced from by-products such as Lumpfish (*Cyclopterus lumpus*) heads which are currently unutilized material. Lipid oxidation, bad taste and smell are major challenges in the commercialization of bioactive FPH. Studies indicate that antioxidant strategies can enhance the quality of FPH. Natural antioxidants are preferred over synthetic due to consumer attitude and health aspects. There is a variety of natural antioxidants available, each with its unique activity dependent on the system and conditions they are subjected to.
The aim of this research was to compare the effect of three different natural antioxidant; seaweed (*Fucus vesiculosus*) extract, rosemary (*Rosmarinus officinalis*) extract and L-ascorbic acid, during enzymatic hydrolysis of Lumpfish heads in terms of oxidation, sensory and bioactive attributes.
Oxidation during the FPH production was evaluated (lipid hydroperoxides and thiobarbituric acid reactive substances). The FPH were sensory analyzed (generic descriptive analysis). Antioxidant activities (oxygen radical absorbance capacity (ORAC), reducing power and metal chelating activity) and blood pressure lowering effect (angiotensin converting enzyme (ACE)-inhibiting properties) of the FPH were evaluated. Results indicated that oxidation developed during the process and a protecting effect with regard to oxidation was observed from the seaweed and rosemary extracts, but not the ascorbic acid. Results show that the seaweed extract generally contributed to better tasting and smelling FPH with regard to bitter taste, rancidity taste, dried fish taste, rancidity smell, fish oil smell and dulse smell, as compared to the other antioxidants. In general the antioxidants contributed to enhanced bioactivity. FPH with rosemary extract and seaweed extract had the strongest antioxidant capacity and ACE-inhibiting properties, respectively. This study contains valuable insights for fish manufacturers and producers of functional food and nutraceaticals that want to produce high quality bioactive FPH from by-product material such as Lumpfish head.

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The effect of bleeding on the quality and stability of cod (*Gadus morhua*) and saithe (*Pollachius virens*) products

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Abstract

Bleeding of fish is performed to eliminate most of the blood from the muscles. In the whitefish industry, bleeding is considered the most important steps in the processing line and has big influence on overall quality and commercial value of final products. If fish is not bled properly, quality deterioration occur faster since residual blood in the fish muscle is one of the main factors responsible for inducing development of undesirable flavor and promoting lipid oxidation. The rupture of fine blood vessels in the fish results also in bruises on the surface of fillets and is considered a major quality defect. Hence, choosing the most suitable bleeding method is important for assuring good quality of fish products and promoting economic gain.
The main objective of the project was to explore the effects of different bleeding methods on quality and storage life of frozen and salted cod and saithe products. Fishes were bled and gutted by hand or by machine. Moreover, the effects of waiting time before bleeding, as well as procedure of bleeding (bleeding and gutting in one procedure vs. gutting after blood draining) were investigated.
Lipid degradation and physical properties (water holding capacity, drip and color) were analyzed.
Importance of the different parameters investigated varied with regard to fish species and final products. Comparison of parallel treatments of cod and saithe demonstrated that optimum bleeding procedures are different for each species. Waiting time and procedure during bleeding had great impact on the storage life. Shorter storage life was generally observed when fish was bled and gutted in one step compared to gutting after bleeding. Less efficiency blood draining was also observed when fish was bled manually. Lipid oxidation was generally more progressive in manual bled fillets while machine bled fillets were more prone towards formation of FFAs. The accumulation of FFAs affected physical properties of the fillets, leading to lower water holding capacity and higher drip loss.

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Title

Highly elastic thermal gel production from squid mantle muscle by using Ohmic heating

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Abstract

Squid mantle muscle does not form elastic thermal gel. It is generally believed that myosin degradation during the heating process is the reason for it. The proteinase responsible for it is Astacin-like metalloproteinase that cleaves myosin molecule selectively into two parts of heavy meromyosin- and light meromyosin-like fragments. Moreover, NaCl addition to dissolve myosin accelerates the degradation by the enzyme. The activity is easily inhibited by adding chelating reagent in vitro such as EDTA. However, edible chelating reagent is difficult to find.

In this study, the problem was overcome by rapid heating on Ohmic heating apparatus. Very quick and homogeneous heating of squid meat inactivated the enzyme before degradation of myosin.

Firstly, the heating rate to obtain no myosin degradation was determined by using squid meat homogenate. The homogenate was heated from 0 to 60C linearly at various heating rates. Heating rate of 1 degree/min was quick enough to obtain the sample with no myosin degradation. It was also found that proteinase lost the activity above 50C.

Skinned squid mantle muscle itself was the material for the gel production so as to keep tasty compounds. Chopped squid meat was further ground with 2.5 % NaCl to prepare salted meat paste. The paste was stuffed into plastic tube (ϕ 30 mm x 25 mm height), and the tube were sandwiched with titanium electrodes of the apparatus for applying the current.

The time needed to heat the paste from 0 to 90C was shorter than I min. The heating rate was sufficiently greater than the required rate. The gel produced by the method was highly elastic. It gave 650 g of breaking force and 12 mm of deformation when measured with ϕ 3 mm plunger. The gel was equivalent to elastic gel from Alaska pollock Surimi. High elasticity of the gel was confirmed by showing no crack by folding twice examined with sliced gel. There was no myosin degradation for the gel.

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Title
Protein thermal stability and water holding capacity of turbot (Scophthalmus maximus) and herring (Clupea harengus) during thermal treatment - Providing information for process optimization.

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Abstract
Characterization of protein thermal stability is important to both understanding the mechanisms behind heat induced quality changes and optimizing thermal processing of fish products. Turbot (Scophthalmus maximus) and Atlantic summer herring (Clupea harengus) are highly esteemed food fish in Europe with great economical and nutritional significance. Yet, few reports are available to describe the protein denaturation in muscle during thermal treatment and to provide information necessary for process optimization of these valued species.

To investigate an optimal temperature for thermal treatment, the thermographs of turbot and herring whole muscle were obtained using differential scanning calorimetry (DSC). The peak maximum temperature and residual denaturation enthalpy of the proteins were recorded. In addition, water holding capacity (WHC) of untreated and heat treated fish muscle was determined.

The results revealed that thermal treatment at temperatures below 60 °C could be beneficial for herring with respect to juiciness, while a processing temperature in the range 60 °C to 70 °C may minimize a major loss of WHC in turbot muscle. The greater thermostability of turbot myosin was demonstrated in comparison with herring myosin, yet herring muscle showed greater WHC during thermal treatment up to 60 °C. This indicated that other intrinsic factors contributed to the WHC of herring muscle. A further study including transmission electron microscopy is suggested to investigate the mechanism behind the species differences and contribute to species specific understanding of thermal processing effects on the fish proteins.

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Title

Opportunities for combining thermal processing with pressure treatment to reduce spore contamination in fish products.

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Abstract
Abstract should be no more than 300 words and should contain brief background information, key methods and major findings

The seafood industry is seeking new alternatives to produce safe, healthy and stable food products. One way to meet this aim is by exposing food up to 600 MPa high pressure, which is referred to as "cold pasteurization". High pressure can also be applied in combination with high temperatures (90-121 °C) to inactivate spores. As a result of this, the so-called High Pressure Thermal Sterilization (HPTS) is a promising technology that arises as an alternative to the conventional thermal sterilization, to produce shelf-stable low acid food.

In this work, the impact of different process parameters on the viability of spores of three spore-forming species (two strains of *Bacillus subtilis*, *B. cereus* and *Clostridium sporogenes*) has been evaluated. The most resistant strains to heat and HPTS treatments at 90 and 100 °C were firstly identified when treated in buffer and fish soup. Then, the impact of both technologies on the survival of the selected resistant spores was tested in mince fish meat and fish filets which were previously inoculated with a known quantity of spores (10^6 CFU/g).

In all fish products tested, for the same final temperature and treatment time, the effectiveness of HPTS was higher than that of the conventional heat treatments. For instance, a short HPHS treatment (100 °C; 6000 bar; 2 min) led to a reduction of 4.0-4.7 and 2.0-2.8 $\log_{10}$ cycles of *B. subtilis* and *C. sporogenes*, respectively, depending on the product, while the corresponding heat treatment only reduced the population of both species by 1.0 $\log_{10}$ cycle. In this sense, to obtain the same level of microbial inactivation, HPTS may help to reduce the treatment time and temperature, and consequently to diminish the heat damage in food. Since this trend concerned all tested fish products, the HPTS technology has a strong potential for the development of safe fishery products.

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

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To achieve good quality, proper processing is important both on board vessels and in the industry on land. The sooner in the process quality is ensured, the better. Quality is highly dependent on temperature through the production chain. Because seawater is used in production on board vessels temperature varies with seasons and therefore a method of keeping temperature low through all seasons are important.

The aim of this study was to compare quality of fish bleed out with different methods and temperatures. Use of ice slurry and higher water flow in bleeding tanks and ice slurry in bulk tanks were tested onboard a long liner. A small trial with slow hauling speed on the long line was also conducted. Between 5 and 6 tons of cod for each treatment was frozen for further production on land. On land the fish was produced to salt cured and dried cod before graded and stored. Shelf-life was tested on rehydrated salted and dried cod. Different methods for quality were conducted on thawed, salt cured and dried and stored fish. Such as sensory ratings, temperature and yield were registered and instrumental measurements of color and texture were conducted.

Earlier studies have shown that use of ice slurry in bleeding tanks and bulk tanks have had positive effect on quality when seawater temperatures have been as high as 14-15 °C. In this study the seawater temperature was measured to 4-6 °C and still there were quality differences when using ice slurry. The results in this study showed that fish bled at higher water flow and when using ice slurry to keep a low temperature gives 2-5 % higher share of superior (highest quality) of salt cured and dried cod. There were not observed any difference in shelf-life between the different treatments of the fish.

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Elaboration of gels by using frozen pressurized Flying fish surimi.

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The application of high hydrostatic pressure (HHP) treatment to low functionality surimi, when it is in frozen state, in order to improve gelation, has been studied. Gels were analyzed by Fourier transform infrared spectroscopy (FTIR), Puncture test and Dynamic mechanical thermal analysis (DMTA). Water binding capacity as well as the color were also determined. For this study HHP treatment (0, 40, 80, 125 and 200MPa) during 10 min at -15ºC has been applied to low quality frozen flying fish surimi in order to induce changes in protein structure and subsequently improve gelation (Suwari gels: 5ºC/24h -S- and Definitive gels: 40ºC/30min + 90ºC/30min -D-).

After applying HHP to frozen surimi it was observed an increase in luminosity (L*) at 200MPa due to protein aggregation. The effect over color on suwari and definite gels was only observed as consequence of heating on definitive gels. The application of HHP to frozen surimi resulted into an increment in the presence of α-helix and a reduction in β- and random structures in suwari gels as compared with the raw material, what indicates a benefit from the protein structure point of view. The decrease in α-helix together with an increase in β- and random structures in D samples is due to the heating treatment. Regarding the mechanical properties, breaking force and deformation increased in both kinds of gels, as consequence of HHP. The thermal profile of suwari gels showed that 200 MPa reduced the T_{max} at which the bond strength was the greatest. At T>70°C for any pressure (except 80MPa), both viscoelastic moduli (G' y G'') augmented, showing the thermo-induced rigidity due to the formation of higher number of bonds with lower elastic character in the pressurized samples.

As conclusion it can be stated that HHP can be applied on low quality surimi in order to improve physicochemical properties of the suwari gels. No advantages were observed in definitive gels in which the formation of covalent bonds by heating overlapped the HHP effect.

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To be sent to meritxel.gonzalez@azti.es before April 1st 2014

Title Carob seed peel as natural antioxidant in chilled storage of mince horse mackerel (*Trachurus trachurus*)

Presenting author, co-authors, affiliations, E-mail for the presenting author
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Abstract
Abstract should be no more than 300 words and should contain brief background information, key methods and major findings
Carob seeds are industrially applied for carob bean gum extraction (E-410). Novel process of carob seeds has allowed to obtain the peel as by-product, as it was lost up until recently during the traditional processing. Therefore, it has not been previosly characterised or studied for food applications. The aims of the present study were: A) Characterisation of carob seed peel B) Evaluation of the effectiveness of carob seed peel in retarding oxidation of refrigerated horse mackerel mince.
Nutritional parameters, total phenolic content, phenolic profile and antioxidant capacity *in vitro* of carob seed peel were determined. Mackerel mince formulated with three different carob seed peel concentrations (1%, 2% and 3% w/w) and 0% control were prepared. The samples were stored at 4ºC and the sampling was done at 0, 1, 2 and 3 storage days.
Carob seed peel, which contains high amounts of phenolics compounds, was very effective in retarding lipid and protein oxidation. Mince fish mixed with carob seed peel presented lower levels of peroxide value, hydroperoxides (dienes and trienes), TBARS, protein carbonyls and loss of α-tocopherol than the control. The addition of carob seed peel also improved physicochemical parametes (pH, a_w, NVBN) over storage. Sensory data were also consistent with a reduction of oxidation in samples with carob seed peel. The higher the concentration of carob seed peel, the larger the antioxidant effect observed.
In conclusion, carob seed peel could be used as natural antioxidant additive as a result of its antioxidant properties observed *in vitro* and in fish minced assays.

Session to be presented in? 5. Advances in seafood processing technology and smart control

*Oral presentation or poster?*Oral presentantion

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Title

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

Presenting author, co-authors, affiliations, E-mail for the presenting author
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Abstract
Abstract should be no more than 300 words and should contain brief background information, key methods and major findings

Freezing is a common practise used to preserve quality and extend the shelf-life of fishery products even though several negative sensory changes occur throughout freezing, storage and thawing. Furthermore, after thawing important drip losses are usually detected, affecting not only the quality but also the process yield and economic return. Electromagnetic field assisted freezing (EMF freezing) has been proposed to mitigate these negative effects. Although EMF freezing is used for more than 10 years, mainly in Japan, published works about the effects of the technology on different food matrix are scarce.

In present work, the impact of EMF freezing and frozen storage time (up to 3 months) on Albacore tuna (*Thunnus alalunga*) steaks was studied. Two different freezing trials were conducted: Control (-50ºC; 1 m/s; without electromagnetic energy) and EMF (-50ºC; 1 m/s; maximum electromagnetic energy). After storage at -20ºC for different times (0, 1.5 and 3 months), samples were defrosted at 4ºC (24h). Colour characteristics (CIELAB), textural properties (TPA; texture profile analysis) and yield (drip loss) were then evaluated.

EMF freezing significantly decreased the drip loss regardless of storage time (up to a 22.2%). Concerning CIELAB and TPA, improvements were detected in redness (a*), hardness and chewiness along the frozen storage time. Based on these results, the profitability of EMF freezing of Albacore steaks would mainly arise from the decrease on drip loss after thawing and the consequent better product yield. Electromagnetic field assisted freezing could be therefore an interesting technology for frozen fish processing industry. In any case, more studies are needed to understand its mechanism of action and assess yield improvements in other seafood products.

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Title

A PAT approach for the discrimination between Fresh and Defrozen Hake

Presenting author, co-authors, affiliations, E-mail for the presenting author
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Abstract

Hake is a fish highly appreciated by consumers and it is sold fresh and defrozen. However, the replacement of fresh fish with frozen-thawed fish is a fraud that can confuse customers (eg. consumers, retailers, food industry, …) when buying fishery products . Approaches based on PAT (Process Analytical Technology) analyzers are required as the classification ability is strongly influenced by fish species and quality. NIR spectroscopy was selected as an analyzer to develop a classification method attending to its state (fresh or defrozen) due to its potential to be adapted to an online process. Multivariate data analysis techniques have been proposed to deal with the classification of this fish species. We have considered Linear Discriminant Analysis and k Nearest Neighbor.

All hake samples were analysed with the NIR spectrometer before freezing and after thawing. Comparative between the data collected from the fresh and defrozen state of each individual sample were assessed. Five biclass problems were considered in this study: fresh vs defrozen hake after a frozen storage for 9 days, 3 months, 6 months, 9 months and 12 months

The results pointed out the potential to differentiate between fresh and defrozen hake using NIR and a multivariate data algorithm such as k-Nearest Neighbor with an accuracy greater than 91%. The accuracy of the model improved with the frozen storage time, tending to 100% over the 9 months of freezing. The algorithm kNN enhanced the generalisation ability obtained by LDA for all the five problems considered.

The novelty of this approach lies in the detection of fraud which could be implemented in an online classification process.

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

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The need to preserve seafood, maintaining their sensory and nutritional properties has led to the development of innovative technologies in food industry. Thus, different technologies, capable of inactivating spoilage microorganisms, maintain product quality and to extend the shelf life have been a major research subject over last decades. The application of most of the innovative technologies allows having convenient food products, which satisfy the requests of today's consumer in relation to fresh, safety and healthy food. These technologies include the use of packaging, since it is a crucial element in the preservation and marketing of food products, avoiding contamination along the value chain and economic losses.

The application of active packaging, conventional modified atmosphere packaging (including enriched oxygen atmosphere) on different fresh fish and shellfish products (ready to cook fish, fish fillets/stakes, fresh shrimp and live clams) will be of special focus in this work. The effectiveness of each technology on the quality preservation and shelf life extension of those products will be discussed

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Title

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

Presenting author, co-authors, affiliations, E-mail for the presenting author

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Abstract

A nutritional-toxicological conflict exists regarding the consumption of seafood. Therefore, it is of great interest to reveal different seafood consumer groups based on their benefit-risk perception and their differences in seafood consumption pattern.

For this purpose, a web based survey was performed in 2013 in five European countries, namely Belgium, Ireland, Italy, Spain, and Portugal (n=2917; age 18 to 75 years; 1451 women and 1466 men). Risk and benefit perception statements were scored on a 7-point Likert scale ranging from totally disagree to totally agree, forming a construct of seven and three items, respectively. Cluster analysis was performed based on these two constructs.

A six-group solution emerged as the optimal solution. The cluster characterized by a low perceived risk and a high perceived benefit forms the largest group, namely 30.5%. The next smallest group (8.5% of the sample) is described by a high risk perception and a neutral benefit perception. In addition, 91.5% of the respondents belong to a cluster with a mean risk-construct-score below the neutral point. Hence, the perceived health benefits outweigh the perceived risks for most of the respondents.

Notable is the significant difference between the clusters regarding seafood consumption frequency, ranging from 1.67 (± 1.80) to 2.56 (± 1.60) times per week. The gradient in benefit perception seems more important than the gradient in risk perception regarding these significant differences. Subsequently, a significant association has to be underlined between the clusters and the countries (χ^2, $p<0.001$, Cramer's $V=0.147$). Within the cluster with high risk perception, a higher amount of Irish, Italian and Belgian respondents are observed. Furthermore, within the cluster characterized with a high benefit perception and low risk perception, a higher amount of the respondents are from Portugal and Spain.

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Innovative use of natural extracts on the treatment of melanosis of three species of shrimp in the Mediterranean post capture

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Abstract

The melanosis represents one of the major commercial issues that affect the acceptability of the fish product by the consumer. This alteration is catalyzed by the oxidative enzyme polyphenol oxidase determining, in the post-mortem of the crustacean, the hydroxylation of tyrosine to DOPA and the subsequent oxidation of DOPA in dopaquinone. 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.In particular it was observed that the extract of ginkgo biloba has significantly reduced the enzymatic activity of the PPO at the level of the cephalothorax in all species analysed. Treatment with lutein has reduced the activity of polyphenol oxidase only in pink and red shrimp. Unlike treatment with green tea extracts has been ineffective in all species analysed. These data were correlated to the evaluation of the QI and the consistency of which have confirmed the efficacy of treatment in vivo with extracts of ginkgo biloba and lutein. 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. Moreover these extracts determine a value added to the crustacean thanks to their healthy properties

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Title

Numerical gastronomy for optimising heat treatment of fish products

Presenting author, co-authors, affiliations, E-mail for the presenting author

Dagbjørn Skipnes and Izumi Sone, Nofima, dagbjorn.skipnes@nofima.no

Abstract

Most tasks in food technology involve multiphysics, e.g. transient heating of food involve both heat and mass transfer combined with mechanical forces (contraction of muscle due to protein denaturation). While it is common to relate observations of physical changes to biochemical processes by regression models there is a lack of models built on the fundamentals of physics for predicting food quality. The methodology of how to build a numerical thermodynamic model for creating a culinary sensation will be demonstrated, starting with fundamental heat conduction as governed by

$$\rho C_P \frac{\partial T}{\partial t} - \nabla \cdot (K \nabla T) = Q$$

,where T is temperature (°C) in the fish, c_p is the specific heat capacity as determined by DSC, ρ is density as determined gravimetrically, K is heat conductivity as measured by a linear heat source pulse method and t is time (s). This basic equation can easily be combined with models of heat load dependent quality changes.

How this leads to gastronomy will be illustrated with two case studies: the preparation of a halibut meal by Norwegian master chef Gunnar Hvarnes, who recently won the silver medal at the "culinary olympiads", the Bocuse d'Or in 2011. One of the major findings was the temperature distribution as shown for the cross section of the halibut in the figure. Built on the same methodology, but extended to prediction of water loss, microbial inactivation and quality changes, a recent model of minimal processing versus pasteurisation has been built for a mild thermal process. The construction and validation of this model demonstrates how numerical gastronomy leads to new and innovative products.

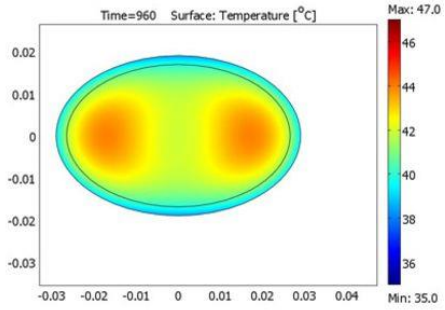

Figure: Cross section showing the hot spot resulting from frying and subsequent air cooling of halibut.

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Fish quality and consumers; how do consumers' knowledge about and involvement in fish quality define factors that influence fish buying behaviour?

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Despite recommendations, seafood consumption is low in several countries. One of the many relevant factors that influence seafood consumption is the quality of fish products. However, consumers differ in involvement in and knowledge about fish quality.

The aim of this study was to reveal differences in involvement in and knowledge about fish quality among consumers. We aimed to explain these differences based on factors that influence fish consumption, social and demographic characteristics and measure the effect involvement in and knowledge about fish quality may have on factors that influence the choice of fresh fish fillets.

This study was based on data collected from 738 Norwegian consumers who responded to a questionnaire. The survey included items regarding knowledge and involvement in fish quality, objective and subjective knowledge measures, factors important when buying fish and finally sociodemographic characteristics.

This paper describes how perceived quality is the most important factor that influences buying behaviour when it comes to fish fillet products in Norway. Consumers can have a high or low involvement with and knowledge about fish quality. However, when confronted with the decision of what fish product they buy, all groups reported using fish quality as a main driver.

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

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Land-based shellfish refinement opens up opportunities for product differentiation. By feeding shellfish different algae diets it has been shown that aroma and taste assessed by trained panelists can be effected. The aim of this study was to evaluate whether naïve consumers could distinguish between Pacific cupped oysters fed with different algae.

Pacific cupped oysters were fed either *Skeletonema costatum* or *Rhodomonas baltica* for a period of 7 weeks within the period November-December 2013. Fresh oysters were evaluated after 4 and 7 weeks of feeding. Naïve consumers were asked to point out the divergent oyster using 3-Alternative Forced Choice tests (3-AFC). Oysters fed with both diets were compared with each other as well as with Pacific cupped oysters from Lake Grevelingen as reference oysters.

Results show that consumers are not able to distinguish oysters fed with *Skeletonema costatum* and reference oysters ($p=0.58$, $n=40$ and $p=0.42$, $n=38$ after 4 and 7 weeks of feeding respectively). However the consumers are able to positively discriminate between oysters fed with *Rhodomonas baltica* and the reference oysters on both sampling times ($p=0.01$, $n=40$ and $p=0.03$, $n=40$ respectively). In the 3-AFC composed with oysters fed with the different algae diets no significant distinction was shown ($p=0.37$, $n=40$ and $p=0.57$, $n=38$ after 4 and 7 weeks of feeding respectively).

It seems that naïve consumers are able to distinguish between oyster fed with different algal diets. However not in all cases. Oysters fed with *Rhodomonas baltica* lead to a different product, as perceived by naïve consumers.

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

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EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid) play a critical role in prevention and palliation of disorders diet-induced such as type 2 diabetes and cardiovascular diseases. This fact has promoted the development of food products and supplements rich in marine oils that can provide health benefits to consumers. However, the ω-3 PUFA amount added to these foodstuffs is highly variable and not specifically declared. To the date, in many studies the origin of the ω-3 acids is not distinguished and functional foods commercialized often contain mostly ALA (alpha-linolenic acid) and minor amounts of DHA and EPA. ALA and marine acids have distinct physiological effects and cannot replace each other. In turn, EPA and DHA exert selective and independent influence on health. In order to enhance the formulation of fish oil enriched foods, we investigated the amounts of EPA and DHA able to prompt positive effects on health. For this purpose, animal models fed fish oils having different amounts of DHA and EPA were tested against animals fed soybean oil and ALA rich-oil. Metabolic disturbances were studied in terms of obesity, hyperglycaemia, dyslipidemia and inflammation. Since oxidative stress is an initial key factor underlying several alterations diet-induced, a novel proteomic approach based on fluorescent labelling and MS/MS identification was used for understanding the impact of fish oils on in-vivo protein oxidation.
Results showed that different ω-3 PUFA amounts exert unequal efficiency reducing metabolic disturbances. EPA and DHA resulted in higher healthy effects than ALA and soybean oils. Moreover, several proteins (one in plasma and seven in liver) were revealed as the main targets of EPA and DHA beneficial action. These results demonstrate the role of the right proportions of EPA and DHA on health promotion and can help to optimize the design of new functional foods based on ω-3 marine oils.

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Postprandial lipid and insulin responses among healthy, overweight men to mixed meals served with baked herring, pickled herring of baked beef

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Purpose The aim was to compare postprandial lipid and insulin responses after consumption of herring prepared by two different methods, baking or pickling, served with otherwise identical meals, as well as to compare the postprandial responses to the baked herring meal with a baked beef meal.

Methods Seventeen healthy, overweight, men (mean age 58 years, BMI 26.4-29.5 kg/m^2) consumed standardized lunches together with baked herring, pickled herring or baked minced beef on three occasions in a cross-over design. Blood samples were taken just before and up to 7 hours after the meal. The postprandial lipid response was measured as serum concentrations of triglycerides (TG), total cholesterol and lipoproteins (LDL, HDL and VLDL), along with serum insulin, 25-OH Vitamin D_3 and plasma fatty acid composition.

Results There was no difference in postprandial lipid responses between the two herring meals, whereas the baked minced beef meal caused a higher postprandial TG response. The 150 g servings of baked and pickled herring provided 3.3 and 2.8 g of LC n-3 PUFA respectively, which was reflected in a substantial postprandial increase in plasma LC n-3 PUFA levels. The pickled herring contained 22 % sugar, and consequently gave a higher postprandial insulin response.

Conclusions The results showed that pickled herring could be a convenient source of LC n-3 PUFAs in the diet. The lower postprandial TG response to the herring meals compared with the beef supports previous studies on the beneficial effect of herring on cardiovascular health.

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Title Reduction of salt in marinated herring (Clupea harengus L.) products

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Marinated herring is a healthy and popular dish in Scandinavia. Consumption of fatty fish, such as herring, provides numerous important nutrients, such as lipids (rich in LC omega-3 polyunsaturated fatty acids), proteins and water soluble compounds. However, the healthy marinated herring also contains about 6-8% salt (NaCl) depending on the recipe. This work studies the possibilities to reduce sodium (Na+) content in marinated herring products to further increase the healthiness.

Traditional marinated herring is usually processed in three steps: pre-salting, pre-marinating and final marinating. In the final marinating, spices, vegetables etc. are used, in addition to the salt and acid. In this study five marinades with different NaCl content were used for pre-marinating of herring, in which the Na+ content was reduced by up to 25%. In two of the marinades the amount of Na+ was replaced by potassium (K+) salt. The total pre-marinating time was from 30 days to 10 months. The effect of pre-marinating temperature (0°C and -4°C) on the chemical composition, lipid oxidation development, salt content, weight changes, colour, and texture of the marinated herring will be presented. After the pre-marinating step the final marinating was performed. Sensory analysis of the final marinated herring by a trained sensory panel was performed and the results will also be presented.

The financial support of The Research Council of Norway (NFR project No. 222476/E40) and The Norwegian Seafood Research Fund (FHF project No 900860) is gratefully acknowledged.

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INTEGRITY, AUTHENTICITY AND DIFFERENTIATION OF PRODUCTS

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Title

Labelfish – towards a universal methodology to combat seafood fraud

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Abstract

Fraud refers to deliberate actions intended for the misleading of consumers in different ways. In the case of seafood, most of the time the term fraud involves the substitution of valuable species by others of lower price, therefore meaning an economic loss for consumers, but also mislabelling can hide other malpractices such as illegal capture procedures.

Traceability of fish and seafood is mandatory since 2005 within the EU. Full implementation requires an adequate management of information and also the availability of techniques, which allow the verification of the information transmitted. These are essential tools to combat food fraud, however recent cases have shown that although legislation and techniques are available there are still some crisis related with food fraud which merit a deep evaluation and analysis of the problem .

LABELFISH is a project funded by the Atlantic Area Programme and includes participants of six countries in Europe, mainly from the Atlantic area, which are characterized by an intense economic and social relationship with marine resources. One of the main aims of LABELFISH is the establishment of a network of laboratories and national control bodies with experience and interest in seafood labelling and traceability. The objectives include the level of implementation of traceability schemes in most important European seafood value chains, the analysis and detection of possible examples of seafood fraud across Europe, the consumers perception about seafood labelling, the current methodologies used for controlling the veracity of seafood labels, and how to propose harmonized methodologies for the adequate control of seafood labelling in the European Union. This talk will focus on the Labelfish aspects related with the harmonization of fish species identification methodologies in the context of LABELFISH.

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Title ***On site*** **and rapid tuna authentication system**

Presenting author, co-authors, affiliations, E-mail for the presenting author
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Abstract
Abstract should be no more than 300 words and should contain brief background information, key methods and major findings

Tuna is one of the most important commercial fish and according to the International Seafood Sustainability Foundation (ISSF); yellowfin (*Thunnus albacares*), bigeye (*T. obesus*), bluefin (*T. thynnus*, *T. orientalis*, and *T. macoyii*), albacore (*T. alalunga*), and skipjack (*Katsuwonus pelamis*) are the most consumed tuna species, generally canning. During last years, canning industry has led to a processing revolution, since canned products are produced, in many cases, using imported frozen tuna fillets or loins. These skinned fillets offer tremendous advantages in terms of productivity and yield of the processes, yet on occasions, in view of the difficulty in distinguishing between species visually, errors may occur in the labelling of canned products. For example, real difficulties in identifying juvenile yellowfin and bigeye do exist because, unfortunately, these two species look very similar in their juvenile's stages and they are captured together from the same fishing area. Therefore, the development of rapid and *on site* authentication tools would allow the enforcement of labelling regulation, benefit the canning industry and finally the confidence of the final consumer. Authentication methodologies for canned products are generally based on DNA fragment detection. These methods, known as genetic methods, are always very reliable but the downside is that it takes several days to obtain a conclusive result and it must be carried out by high qualified personal in control laboratories. These limitations have been overcome thanks to the innovative portable PCR system, based on fluorescent battery of probes, enables the identification of the most important commercial tuna species with accuracy and within 3-4 hours including DNA isolation.

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INFLUENCE OF SIZE ON TEXTURE PROPERTIES OF FARMED MEAGRE (*Argyrosomus regius*)

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Market studies indicate that the suitable marketable size for farmed meagre (Argyrosomus regius) is over 1 kg and undoubtedly above this weight have a very attractive aspect, silvery skin and muscle covering the body. Thus, the differentiation between smaller fish (< 1 kg) and larger fish (3–5 kg) in terms of flesh quality is still important. In particular, a better understanding of the factors that are the major contributors for the texture properties is essential, since texture can strongly affect the sensory acceptance of farmed fish by consumers. Thus, the purpose of the present work was to discriminate the texture properties of meagre having three commercial sizes: 800 g, 1.5 and 2.5 kg. The fish was reared in earthen ponds (semi-intensive system) at IPMA Aquaculture Research Station. Morphometrics characteristics (condition factor, percentage dressing, fillet yield), instrumental texture analysis, histological analysis and sensory assessment were carried out .

Texture measurements were done on raw and cooked blocks of fillets using a texture analyser TA.XTPlus equipped with a load cell of 30 kg by a double compression test (Texture Profile Analysis). Compression (40 % of the fillet thickness) was applied using a flat ended metal probe (75 mm diameter) at a constant speed of 2 mm/s. For histological analysis, samples (0.5 mm x 1 cm) were fixed in 10% buffered formalin, dehydrated in alcohol followed by immersion in xylol and embedded in paraffin. Two serial sections (8-10 µm) were stained in haematoxylin and eosin. Muscle cellularity was determined using an Image Analysis System, connected to video camera and a light microscope. Regarding sensory assessment, the firmness, succulence and fat perception were evaluated on cooked fillets using a 12 cm unstructured line intensity scale, in which 0 corresponds to the absence of attribute and 12 cm to the highest intensity.

The final treatment of the results are still in progress.

This research was funded by the National Project AQUACOR (PROMAR 31-03-05FEP-003)

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SUSTAINABLE USE OF CATCHES AND FARMING

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Title: The EU Discard ban and the future handling and use of unavoidable unwanted catches.

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The Landing Obligation of the new EU Common fisheries Policy (CFP) aims to gradually eliminate discard in the EU fisheries. The overall political goal is to reduce waste and increase the net value of the fisheries for the society. The Landing Obligation does not cover all fishery activities, but only a subset of the stocks. As a consequence many species will still be discarded. This new policy will start to be implemented from the 1st January 2016 and then the rest of the stocks will follow in the years to come. There is a major challenge in handle this amount of fish onboard in an optimal way and not least to find an optimal use in the market.

The unavoidable unwanted fish (UUF) make up a fraction of raw material that have to be handled in a suitable manner. It has been decided, that it shall not be possible to use undersized quota regulated fish for human consumption – to avoid creating new markets for this fraction of fish. In 2012-2014 DTU Aqua has conducted a feasibility study on how many quantities there would be of UUF from specific fisheries where Danish fishermen participated. Different methods for handling and processing onboard the vessels have been evaluated. Calculations of cost/benefit have been done of the different fractions of the UUF's. The amount of UUF from different fisheries has been evaluated and the use for either human consumption or reduction to feed purposes will be discussed.

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Title

Demonstration Project for use and valorise discards coming from the Basque offshore fleet

Presenting author, co-authors, affiliations, E-mail for the presenting author

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Abstract

Despites increasing research on technical development of fishing gear, catching accessory species is still unavoidable. These by-catches, when returned to the sea, are named as discards. Discards, dead or alive, can be caused by either lack of commercial value, lack of fishing quotas, or by certain harvest control rules which limit the amount of certain species from being landed. Basque offshore fleets are concerned about this loss of protein and they have been intensively working with AZTI in searching for solutions in finding integral solution to valorize discards, as in some fisheries, are still inevitable.

In VALORPESC study, feasible technical and economical solutions are developed to use and valorize possible discards (other than those under minimum conservation size) coming from 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.

Two feasible valorization alternatives for unwanted catches are shown; the first one relates to the availability of raw material to produce high quality fish meal and the second one relays on the possibility of high value products for human consumption. To test the viability of these alternatives along the complete valorization chain, two pilot trials have been carried out, one in relation to species caught during 24 hours fishing trip in the southern part of the Bay of Biscay, and a second one, an experiment with species caught along the French Coast during a one week fishing trip.

Results proved that it is technically and economically feasible to maintain and store fish, coming from the Basque offshore fleet, on suitable conditions on board, giving them a posterior use and revalorization. A detailed protocol for this process has been developed. This project has been funded by the European Fisheries Fund.

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

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Abstract
Fishery Discards are one of the most important topics in fisheries management. Nowadays, there is a social agreement that perceives discards as very negative and that solutions have to be implemented in order to avoid the purposeless waste of these valuable biomass. It is a fact that any fishing operation has an unavoidable percentage of discards, from long-liners (2-10%) to trawlers (up to 90%). Sustainability is therefore a basic premise for the economic and social future of European fisheries and the key objective of the reform of the Common Fisheries Policy. With the entry into force of the new measures of the CFP, and in the case of successfully implementation of LIFE iSEAS, it is foreseeable that the quantity of biomass previously referred as discards available in land will be lower. Therefore, a balance/complement of this raw material supplied to developed in-land facilities with other products available in-land would be required.
In this framework, the main objective of LIFE iSEAS is to demonstrate that a sustainable scenario (in terms of biological and socioeconomic indicators) of the European 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.
According to this objective, the aims of this project are:
1. To test the implementation and performance of the *iObserver* on board oceanographic vessels.
2. To optimize the fishing activity through the definition of a reliable tool based on mathematical models that analyze the spatio-temporal conditions of considered fishing areas. This tool will help:
   2a) to take real time decisions over fishing activity, defining more appropriate areas/periods/species in terms of lower discard levels, and to develop effective short-time policies over marine resources/fishing areas that guarantee the stocks populations while maximizing the yield of the fishing activity.
   2b) to perform more selective fishing, saving fuel and on-board caught processing times.

3. To define a real fully operative in-land demonstration facility for discards valorization processes and trade named *iDPV* (Integral Discards Processing and Valorization Point).
4. To demonstrate the environmental and socio-economic impacts/benefits that the implementation of proposed innovative solutions and the new management model will have in the fishing sector.

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Title

An estimation of marine underutilized species and coproducts available in Portugal

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Abstract

MARMED (Development of innovating biomedical products from marine resources valorization) is an INTERREG project envisaging the valorization of marine residues and coproducts and the estimation of the added-value and high potential applicability of these materials in biomedical applications in close industrial collaboration. In the frame of this project the amount of underutilized marine species and coproducts from fish processing industries in Portugal was analyzed and estimated. A descriptive survey utilizing a multimethod approach was used in order to evaluate the "quantity of marine by-products produced/available in Portugal" and the "quality (type) of marine by-products produced/available in Portugal". The following data collection instruments were used: (i) questionnaires sent out by email or fax, (ii) standardized interviews, and (iii) documental analysis.

The estimated amount of discards from the demersal and crustacean fleets was 3084.6 t in 2011. The discarded species included Atlantic chub mackerel, blue whiting, boarfish, hake, sardine and sharks.

At the fish auctions the total rejections were around 507 t/year and the withdrawals were about 530 t/year and they included anchovy, horse mackerel, chub and Atlantic mackerel, European conger, pout, hake, rays, and sardine.

Estimations of the major figures were drawn from the ≈ 16.9% of the companies that answered to the questionnaire and from documental analysis.

In mainland Portugal the total amount of coproducts reached 4176.1 t/year where 43.42% come from the fish canning industry, 31.9% from the cod drying and salting industry and 24.67% from the fresh and frozen fish products industry. In the Azores islands the fish canning industry produces 2943 t/year and in Madeira Island, the fresh and frozen fish industry produces 175 t/year.

Some coproducts produced in Spain are valorized in Portugal and vice/versa.

This work was developed in the frame of the Project MARMED (2011-1/164) funded from ERDF through Atlantic Area Transnational Cooperation Programme.

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Title: Seafood processing by-products as potential sources of inhibitors of proline-specific proteases.

Oscar Martínez-Álvarez, Pilar Montero and Carmen Gómez-Guillén

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Abstract
Abstract should be no more than 300 words and should contain brief background information, key methods and major findings

Seafood processing by-products generated from industry represent about 70% of seafood landings. Although this waste is generally discarded, it could be subjected to protein hydrolysis to obtain bioactive molecules with promising applications in functional foods. In this work, different by-products derived from the industrial processing of seafood were used as raw material to obtain, by using different commercial enzymes, interesting inhibitors of two proline-specific proteases: Prolyl-oligopeptidase (PO) and Dipeptidyl-Peptidase IV (DPP-IV). PO and DPP-IV cleave bioactive peptides after proline residues, and are therapeutic targets for several diseases. A significant increase in the serum PO activity has been associated with autism and various psychological diseases, as depression or schizophrenia, while DPP-IV is a key target in the treatment of type 2 diabetes mellitus because it inactivates glucagon-like peptide-1.
Squid (*Illex argentinus*) and shrimp (*L. vannamei and P. notialis*) protein hydrolysates showed ability to inhibit PO in vitro, with IC50 values ranging from 0.15 to 5.99 mg/ml. Moreover, these protein hydrolysates showed different ability to inhibit DPP-IV, with IC50 values ranging from 0.46 to 0.80 mg/ml. The obtained results suggested that trypsin-like enzymes are of interest to obtain PO- and DPP-IV inhibiting hydrolysates. As well, the obtained results suggested the importance of both the raw material and the hydrolysis degree in PO- and DPP-IV-inhibiting activities. Some of these protein hydrolysates were characterised and the most interesting PO- and DPP-IV inhibiting molecules were partially isolated by chromatography. Moreover, the effect on in vitro digestion on PO- and DPP-IV inhibiting activities was evaluated. The seafood by-products used in this work could be a potential source of promising nutraceuticals with ability to alleviate symptoms of depression or to exert an important hypoglycaemic effect in humans.

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Title

OPTIMIZATION OF THE HYDROLYSIS OF HORSE MACKEREL USING PROTEASE MIXTURES

Presenting author, co-authors, affiliations, E-mail for the presenting author
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Abstract
Abstract should be no more than 300 words and should contain brief background information, key methods and major findings

Extractive fishing generates an important amount of discards, which comprise small-size individuals and non-targeted species with low commercial value. EU Fisheries regulations intend to eliminate the usual practice of returning such discards to the sea and, therefore, promote their valorization. In this context, the processing of the protein fraction present in the discarded fish arises as a promising alternative. Effectively, it has been demonstrated that the hydrolysis of fish protein releases peptides with both functional and biological activity.

In this work, horse mackerel (*Trachurus mediterraneus*) was selected as representative discarded species from the Alboran Sea. Samples of horse mackerel presented an average protein content of 17% and were hydrolysed in batch mode by employing mixtures of two proteases (subtilisin and trypsin). A factorial experimental design was executed varying the relative percentage of the enzymes (5 levels), the protein concentration (2 levels) and the temperature (4 levels), while the degree of hydrolysis was monitored for 4 h of operation according to the pH-stat method.

As output variable, the degree of hydrolysis was fitted to an empirical model including both mixture and process input variables. At fixed values of reaction time and substrate concentration, the model allowed the maximization of the degree of hydrolysis at optimal temperatures and compositions of the enzyme mixture. A high degree of hydrolysis is desirable since the presence of small peptides has a positive impact on some functional (e.g. solubility, emulsification capacity) and biological activities (e.g. antihypertensive).

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Title

ANTICHOLESTEROLEMIC ACTIVITY OF PROTEIN HYDROLYSATES FROM DISCARDED SPECIES IN ALBORAN SEA

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Abstract
Abstract should be no more than 300 words and should contain brief background information, key methods and major findings

Alboran Sea is the portion of Mediterranea Sea lying between Morocco and the southern coast from Spain. Spanish fisheries in this area present an average discard rate (i.e. ratio of discarded fish to fish retained for sale) between 10 – 23%. This represents an underutilization of fish resources, especially in a fishing area which has reduced fish captures in a half during the past decade. The zero-discards policy of the European Union will avoid progressively discards in EU fisheries. This prohibition must be accompanied of technical solutions to process fish discards into products of improved added value. In this sense, fish discards are raw materials of low cost suitable for obtaining fish protein hydrolysates (FPH) exhibiting bioactive properties such as antihypertensive, antioxidant, antimicrobial or anticholesterolemic.

In this work, six protein hydrolysates from the main discarded species from the Alboran Sea (sardine, horse mackerel, axillary seabream, bogue, small-spotted catshark and blue whiting) were tested for their bile acid binding capacity, which is directly linked to their ability to lower cholesterol levels in bloodstream. FPH were obtained by three enzymatic treatments: hydrolysis with subtilisin (2 h) followed by trypsin (2 h), trypsin (2h) and then subtilisin (2h) and the hydrolysis with a mixture of both enzymes for 4 h. Freeze-dried samples from each hydrolysate were mixed with a solution of artificial bile and then subjected to simulated gastrointestinal digestion. The amount of bile acids retained by each digested hydrolysate was then determined spectrophotometrically.

The results show that both the fish species and the enzymatic treatment influenced the bile acid binding capacity of the FPH, which ranged from 17% (small-spotted catshark hydrolysed with a mixture of subtilisin and trypsin) to 31% (horse mackerel hydrolysed with trypsin and then subtilisin).

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An investigation on quality parameters of cultured seabass fillets fried in different oils

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In this study, some quality parameters of cultured seabass fillets which fried in different vegetable oils (sunflower, corn, hazelnut) and stored at refrigerator were investigated. All fillet samples were pan-fried at 190°C for 1 min each surface by using 100 ml of oil and packaged with plastic boxes to store at +4°C. Determination of quality parameters was performed by carrying out total protein, moisture, ash, total fat, total volatile basic nitrogen (TVB-N), thiobarbituric acid (TBA), total aerobic bacterial count (TAMB), psychrotrophic bacteria count, vitamin E (as α-tocopherol), selenium, fatty acids, color and texture profile in 3 analysing period of 8 days.

Results showed that all samples were in consumable limits for TVB-N and TBA analysis. Samples fried in corn and sunflower oil were exceed the limits for TAMB and PBC on day 8. Most increased vitamin E amount was detected in sample fried in sunflower oil as 331,3mg/kg which was 169.8 mg/kg in raw material. Selenium amount was rised up to 1.09mg/kg in samples fried in corn and hazelnut oil that 0.388mg/kg in raw. In comparison of total unsaturated fatty acid changes, the only significant diffrence among all, was determined in oil of sample fried in corn oil on day 8 as 60.85g/100g which is detected as 73.19g/100g in raw material oil. The highest EPA (Eicosapentaenoic acid) and DHA (Docosahexaenoic acid) content were detected in oil of sample fried in sun flower oil on day 4 as 3.07 and 5.08g/100g. Moreover, color, texture and sensorial analysis were presented.

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Nutritional, Chemical, and Contaminants Characteristics Of Lipids Recovered With Isoelectric Solubilization/Precipitation From Different Parts Of Gilthead Sea Bream (Sparus aurata) ByProducts

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Abstract

Fish lipids contain important nutrients , the polyunsaturated fatty acids (omega-3 and 6 fatty acids) that are essential for human nutrition. EPA and DHA are especially important fatty acids for human health. Several reseachers have reported that omega-3 fatty acids protect against cardiovascular disease, cancer and also promote immune system and cognitive functions. Fish lipids can be recovered with different methods. Although isoelectric solubilization/ precipitation (ISP) is a method for recovering protein, lipids are also recovered. However, the ISP-recovered lipids are mostly underutilized. But, they can have a potential as the other lipids recovered with different methods. Also, fish filleting by-products (head, frames, viscera etc.) which also are underutilized can be raw materials for the ISP lipid recovery. Therefore, determination of nutritional composition and environmental contaminants of the ISP-recovered lipids is critical.

The objective of the present study was to determine moisture, fat content, chemical quality (peroxide value, acid value, saponification number), fatty acid composition, and environmental contaminant (polychlorinated biphenyls (PCBs) and heavy metals (cadmium, arsenic, mercury, lead)) in the ISP-recovered lipids from different parts of gilthead sea bream by-products. For this purpose, head, frames, and mixture of all by-products were separetely collected and lipids were recovered by ISP. Then, the analyses were performed in triplicate and data were evaulated with one-way ANOVA and multiple comparision test.

Key words: Isoelectric solubilization/ precipitation, lipids, gilthead sea bream.

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Handling and Quality of Sushi from Sushi Bars and Retailers in İzmir, Turkey

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Abstract

Sushi consist of cold cooked rice acidified with vinegar and topped with raw or cooked fish or formed into a roll with fish, egg or vegetables and wrapped in seaweed. Sushi is regarded as a potentially hazardous food because of involving perishable ingredients such as rice and raw fish. In Turkey sushi is becoming popular; there is very limited information about the quality of sushi products sold in Turkey. As a matter of fact, sushi samples collected randomly from sushi bars and retailers in İzmir were analyzed for chemical, microbiological and physical quality. Raw samples of tuna and salmon were examined for the presence of histamine. To assess the microbiological quality, total viable count, Bacillus cereus, Clostridium botulinum, Escherichia coli, Vibrio spp. were determined. Furthermore, colour measurements were done to differentiate the samples from different retailers.

Key words: Sushi, handling, chemical, physical and microbiological quality

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Title: Using VIS/NIR spectroscopy to estimate remaining shelf life of salmon fillets stored at different temperatures

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Abstract
Previous studies have shown that VIS/NIR spectroscopy can be used to estimate the remaining shelf life of seafood products such as cod and salmon. Such measurements are enabled by the change in optical properties of the fish muscle during storage, mainly due to oxidation of heme proteins. The remaining shelf life is often estimated from the number of storage days on ice. However, if the product is stored at a higher temperature, e.g. at 4°C in a refrigerator, the rate of spoilage is much higher.

The purpose of this study was to make a model for estimation of remaining shelf life of fish with an unknown temperature history. Salmon fillets were stored at 0°C, 4°C and 7°C, and measurements were performed using an imaging spectrograph with a spectral range of 410-990 nm, operated in interactance mode. The effective number of storage days on ice were calculated based on storage time and temperature, and were used as a response variable to train a PLS model for the spectroscopic data.

For validation, the model was applied to measurements of fish with the same total number of storage days, but with parts of the storage time at different temperature (0°C or 4°C). This influenced the remaining shelf life and hence the calculated storage days on ice. So far, our results indicate that the effective number of storage days on ice can be accurately predicted among different storage regimes, making it possible to measure and subsequently predict the remaining shelf life.

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To be sent to meritxel.gonzalez@azti.es before April 1st 2014

Title

RECUPERATION OF ATLANTIC COD (*GADUS MORHUA*) FOLLOWING EXHAUSTIVE EXERCISE IN A SWIM TUNNEL – HOW CAN KNOWLEDGE OF SWIMMING PHYSIOLOGY IMPROVE FLESH QUALITY?

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Abstract

In order to achieve a good fish product, it is important to have the best possible raw materials. The quality of fish harvested from the sea can be influenced by a number of factors, such as seasonal variations in feeding, temperature and spawning. The quality of the raw material is also strongly dependent on how the fish is handled during capture. During trawling operations, fish are exposed to a number of stressors, such as swimming to exhaustion, crowding in the cod end, severe barotrauma, and lack of controlled killing and bleeding, which may reduce the final quality of the flesh. However, by keeping the fish alive and allowing it to recuperate before being slaughtered, it may be possible to obtain high quality flesh from fish caught by trawl. The aim of this study was to investigate the effect of recovery, following exhaustive swimming, on the physiology and flesh quality in Atlantic cod. A total of 95 cod (64 ± 6cm) were swum to exhaustion in a large swim tunnel (80 cm diameter, 1400 L fish chamber), followed by recuperation for 0, 2, 4, 6 or 10 hours, before being euthanized. Residual blood in fillets and development of *rigor mortis* were selected as quality parameters. Fish killed immediately after swimming entered *rigor mortis* significantly faster than those that were allowed to recuperate. There were also higher levels of blood lactate and lower levels of blood glucose in this group, compared to the other groups. Residual blood in the muscles increased during the first 4 hours of recuperation and then declined during the next 6 hours. We conclude that swimming to exhaustion reduces flesh quality, but the negative effects can be prevented by allowing the fish to recuperate after capture.

Presented in session 2 or 5

Oral presentation or poster

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Assessment of biogenic amines changes of tilapia *(Oreochromis niloticus)* stored at 4°C and 30°C by a new HPTLC method.

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A simple and rapid HPTLC method was developed for the assessment of six biogenic amines from tilapia (*Oreochromis niloticus*) conserved at +4°C and 30°C, corresponding to usual fish selling conditions in Algeria. The performance parameters of the method were evaluated according to the recommendation of the Commission decision EC/2002/657. Correlation coefficients of linear regressions were higher than 0.98 for all amines. Detection limits were 5 $\mu g.g^{-1}$ for all biogenic amines and the accuracy was higher than 84 %. The relative standard deviation of repeatability was between 1.8 to 6.8 % and it was between 1.2 to 13.4 % for reproducibility in the concentration range from 50 to 200 $\mu g.g^{-1}$. The new method was used for a simple screening by comparing the intensity of the revealed spots from the analyzed samples with the intensity of the reference's spot (100 $\mu g.g^{-1}$ which is the regular limit of histamine in Europe). The method was also used for quantification using a TLC scanner controlled by Win CATS software from CAMAG instrument. We found a good correlation between the screening results and the confirmation ones. Concentrations of spermine and spermidine are rather important (> 55 $\mu g.g^{-1}$) and relatively stable along the shelf life of both storage modes (refrigerated and ambient). At 30°C, kinetics of tyramine seems to be inversely proportional to the other amines (putrescine, cadaverine and histamine). Tyramine appears during the first hours of conservation then disappears after 18 hours. Contrary to histamine (concentration < 35 $\mu g.g^{-1}$), putrescine and cadaverine concentrations exceed the threshold of 100 $\mu g.g^{-1}$ and can be a useful index of fish quality at ambient temperature. At refrigerated storage (4°C), only spermine, spermidine and tyramine are detectable along the shelf life. This work contributes in studies of freshwater fish quality.

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Influence of lipid oxidation and protein solubility on bioelectrical properties of fish during frozen storage

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Abstract

In our earlier studies, the potential of the bioelectrical measurements for differentiation the frozen fish fillets with low lipid content was evaluated. The results showed that the frozen fillets with low lipid content may be differentiated by bioelectrical measurements and that these measurements possibly reflect changes on proteins during frozen storage. Unlike the frozen fish with low lipid content where shelf life is primarily limited by the loss of protein functionality, the shelf life of fish with higher lipid content is most often limited by the oxidation of fatty acids. The occurrence of lipid oxidation in frozen fish may lead to the changes in flavor, appearance and also, protein functionality.
With the aim of assessing the relationship between changes on proteins and lipids with bioelectrical measurements of frozen fish with higher lipid content, frozen Atlantic chub mackerels with lipid content between 7 and 10%, were purchased from a retailer and examined after 1, 2, 3 and 5 months of storage.
The HP 4294A Precise LCR meter was used to measure impedance magnitude (|Z|) and phase (φ) at 200 frequencies from 100 Hz to 100 MHz. The protein solubility, fatty acid content and the oxidation products of fatty acids were also determined.
Impedance measurements (phase) showed the best results for detecting the differences among the fillets at frequencies between 10 and 30 MHz. The correlation between phase and protein solubility was moderate. Protein solubility was strongly negatively correlated with lipid content and with some products of fatty acids oxidation (octanal and heptanal), which confirmed the interaction between lipid oxidation and changes in proteins. Overall, the results indicated that lipid oxidation resulted in loss of protein solubility but the correlation between protein solubility and impedance measurements is not as strong as when measured on the fish with lower fat content.

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Benefits and risks of chub mackerel (Scomber japonicus) after culinary treatment

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Abstract
Pelagic fish are an important group of seafood, owing to their nutricional benefits. Among this group, chub mackerel (*Scomber japonicus)*, is not yet widely consumed, but can be a good alternative from the economic point of view since it is an abundant resource in Iberian Atlantic waters. In this context, the proximate composition, fatty acid profile, some essential (K, Na, Cl, S, Mg, Ca, Zn, Cu, Fe, Mn and Se) and toxic elements (total As and Hg, Cd and Pb) were determined in the edible part before and after culinary treatment(boiling), in order to evaluated the benefits and risks associated to the consumption of this species.
Proximate composition was determined according to AOAC methods and fatty acid by gas chromatography (GC). Mineral content was performed by atomic absortion spectrophotometry (AAS) and energy dispersive X-Ray flurescence (EDFRX).
The results showed that this species has high protein and fat contents. Polyunsaturated fatty acid is one of the dominant group and about 87% of them belonged to the n-3 family. After the culinary treatment, there was a substantial increase in all classes of fatty acids. Attending to the recommended daily intakes (DRIs), this fish species can be considered a good source of potassium and zinc. The other minerals can give a relevant contribution to the DRIs in an equilibrated diet.
Levels of non-essential elements for chub mackerel in particular, cadmium, lead and mercury, were always below the limits set by the European Union, even after culinary treatment. Taking into account these results found for toxic elements in the edible part, serving portions of 160 g and the recommended PTWI or PTMI proposed by JECFA (FAO/WHO), consumptions of chub mackerel do not pose a hazard to human diet.

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Estimation of lipid degradation of frozen saithe (*Pollachius virens*) and hoki (*Macruronus novaezelandiae*) muscles by colour analysis

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Abstract

Color and general appearance is an important quality attribute of white fish products which highly affects consumer´s acceptance since consumers mostly associate color with freshness, better flavor and high product quality. Color changes that occur during storage can be used as an indicator of quality deterioration. Moreover, color measurements can be fast, non-invasive and require little or no sample preparation.

In the present study, evaluation of color changes as an indirect tool to follow lipid deterioration of lean fish muscle during frozen storage was studied. The specific objectives of this project were to establish the quantitative relationship between color attributes (*L**, *a** and *b**) with lipid oxidation and hydrolytic degradation occurring in saithe and hoki muscles during frozen storage. Furthermore, the aim was to study the use of color measurements to estimate rancid flavor and frozen storage flavor, which significantly affects the quality of fish products during prolonged frozen storage.

Based on principal component analysis and correlation analysis of the color measurements, partial-least-squares regression models were developed to quantify peroxide value (PV), thiobarbituric acid reactive substances (TBARS), fluorescent compounds (OFR), free fatty acids (FFA), phospholipids (PL) and rancid and frozen storage flavor. The regression models differed considerably between the two species. Good regression models were developed to estimate PV, TBARS and PL content in saithe muscles, while development of similar models for hoki was not successful. Moreover, the results indicated that color measurements can be used to estimate rancid and frozen storage flavor, which highly affects quality and acceptance of frozen fish. Traditional chemical and sensory methods to follow quality degradation are generally costly and time-consuming. It is therefore of great importance for the seafood industry to have a rapid and simply method to follow these factors.

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Innovative enzymatic methods for determining the freshness of the Mediterranean crustaceans

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Abstract

Nowadays it is a common commercial fraud substitution of fresh crustaceans with frozen ones and selling them with the label of "fresh crustacean." This represents a danger to the health of the consumer, in fact, the freshness of crustaceans is one of the most important characteristics for food security. Among the innovative methods for assessing the freshness of the seafood we have the lysosomal enzyme test (a-glucosidase (AG), b-galactosidase (B-GAL)). The process of freezing /thawing causes tissue damage within the crustaceans that determines the breakage of lysosomes, vesicles filled with lytic enzymes that act on different organic substances causing the degradation. This work evaluates the effectiveness of the lysosomal enzymatic methods for assessing the freshness of two species of shellfish in the Mediterranean, in particular, pink shrimp (Parapeneus longirostris) and red shrimp (Aristaeomorpha foliacea) measured for a retention period of 21 days. It was observed a significant increase in the B-GAL ($p \leq 0.05$) in both species with a high rise already after only one day of storage. The activity of the AG has increased significantly in the red shrimp. During the whole period of preservation it was observed a significant increase ($p \leq 0.05$) of all the lysosomal enzymes in both species. These data were correlated with visual parameters such as the assessment of Quality Index (QI) and index of rigor mortis. The values of QI have confirmed the changes observed in the lysosomal enzymes subsequent to the process of freezing and thawing. Finally, the use of such enzymatic tests can be useful as a predictive marker for limiting commercial fraud in these species of crustacean.

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Title: Short time increased muscle temperature during primary processing of Atlantic salmon – Impacts on drip loss, rigor mortis and subsequent quality of cold-smoked fillets

Presenting author, co-authors, affiliations, E-mail for the presenting author
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Abstract
Todays practice with live-chilling or chilling during exsanguination secure cold fish during primary processing of Atlantic salmon. However, the industry is curiously about effects of short time increased muscle temperature during slaughtering and the subsequent effects on drip loss and flesh quality of raw and smoked fillets.

In this study Atlantic salmon (n=63) were sampled pre mortem at the pre-slaughtering netpen and instantly killed by a blow to the head. All fish (5.65±0.95Kg, Kf: 1.23±0.08, pH: 7.29±0.11, muscle temperature: 6.68±0.19) where thereafter exsanguinated by gill cutting and temperated in ice slurry/fresh water (0, 8 and 16 °C, respectively). Muscle temperature was followed during exsanguination and at temperature equilibrium the salmon were gutted and machine filleted. Before icing, pH, temperature and fillet weight were measured of the right fillets which were thereafter used to measure weight changes during a period of 14 days ice storage.
Left fillets (n=21) were used to follow rigor mortis during ice storage over a period of 144h. Rigor mortis were followed by measuring the length between 6 needles (3 in the dorsal- and 3 in the belly muscle, respectively). At day 6, left fillets used for rigor measurements were dry salted (22h, 4°C, dried (3h, 22°C, high airflow) and thereafter cold-smoked (3h, 22°C). During processing and 4 weeks refrigerated storage weight changes, pH and colorimetric properties were followed. Moreover, textural properties, WHC and salt content were measured at the end of the storage period.
The results did not show a definite connection between increased muscle temperature and drip loss from fillets during 14 days ice storage. However, a definite effect on initial muscle pH and the onset and strength of rigor mortis were observed. Moreover, strong correlations were observed between muscle pH, muscle temperature, rigor contractions and colorimetric properties of cold-smoked fillets.

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How sample thickness affect spectroscopic analysis of fish samples

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It has been shown that quality monitoring can be done through spectroscopic measurements of food products. Most other methods used today are labour-intensive and can be highly sensitive to water associated with the sample. In previous studies we have showed that non-invasive spectroscopic analysis in the visible (VIS) range avoids the dominating effect of water absorption that is typically seen in the near infrared region (NIR). This has been shown for surimi, which has been used as a model fish product in colloid state, as well as intact white fish fillets.

The aim of this study was to document how sample thickness influneces the signal in a standard benchtop spectrometer. The purpose of a diffuse reflectance spectroscopic setup is mainly to analyze the surface of the sample. However, if some of the incident light leaves the sample (travels through it) because the sample is too thin, this portion of light will not be able to reflect back to the detector and hence cause a loss of intensity. This can greatly affect samples where absolute signal intensity is of interest.

Our results show that thickness greatly influences the visible and lower range of the NIR spectrum for surimi samples. This effect is smaller above 1200 nm due to the increasing absorption of water in the higher NIR range. Nevertheless, for analyses where signal intesnsity is a vital attribute it is important to use samples with adequate thickness to minimize this effect

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Title: Automatic process control – Validation of heat treatment by interactance imaging spectroscopy

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Abstract
A production procedure involving surface sterilization by fast heat treatment just after filleting has been tested. The purpose with the treatment is to reduce the effect of product contamination that occurs during filleting and thereby increase the product shelf life. For this approach to be applicable three criteria has to be fulfilled; 1) shelf life has to be increased, 2) the product sensory properties has to be preserved, and 3) the heat treatment has be validated on-line during production.

The purpose of this study was to develop an instrumental technique to measure the thermal load on a vacuum packed cod product. The vacuum packed cod products were put into water baths with different temperatures, and for different time periods. The purpose was to treat only the outer 1-4 mm of the product with a sufficient thermal load to reduce the surface bacteria count. After heat treatment the products were put directly into ice water to cool down before going into storage.

The vacuum packed cod products were measured spectroscopic both before and after the heat treatment. The measurements were carried out using a hyperspectral imaging system, with a spectral range from 410-990 nm, operated in interactance mode. Using interactance mode ensures that the light travels some distance inside the product before being measured. Two different mathematical models were developed based on the spectroscopy readings; 1) estimation of treatment time with known water temperature and 2) estimation of water temperature when the treatment time is known. Preprocessing spectra by using the 1st derivative yielded the most accurate models.

The results show that spectroscopic measurements can be used to predict both water temperature and treatment time for fish products with light thermal load.

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Title: Active films from cooked shrimp enriched with polylysine-coated liposomes containing bioactive hydrolysate.

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Abstract

The need for new antimicrobial packaging remains as an important requirement because of the food spoilage. Nowadays, the incorporation of antimicrobial and antioxidant agents into edible films represents one of the major food advances. According to environmental issues, it is increasingly desirable that food packaging being biodegradable. The objective of this investigation was to recovery protein from cooked shrimp, for the development of antimicrobial and active films, by the addition of a hydrolysate encapsulated into liposomes covered by polylysine.

The bioactive hydrolysate was obtained from shrimp cooked using Alcalase. The hydrolysate showed antihypertensive capacity determined by ACE inhibition, and antioxidant activity evaluated by reducing power and ABTS radical scavenging capacity. The bioactive hydrolysate was encapsulated into nanoliposomes prepared from phosphatidylcholine. The liposomes suspension was characterised in terms of average size, polydispersity index, encapsulation efficiency and zeta potential. The liposomes negatively charged were coated by polylysine positively charged, which showed a strong antimicrobial activity evaluated by the disk diffusion method in agar plates.

The hydrolysate-liposome-polylysine complex was incorporated into edible films prepared from cooked shrimp. The resulting film, with similar physical and mechanical properties than the control film, showed a potent antimicrobial activity against different microbial strains, including both Gram-positive and Gram-negative organisms. These results suggest that films from cooked shrimp, enriched with polylysine-coated liposomes containing bioactive hydrolysate, could be used for the development of active food packaging material.

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Title

Comparative study of spoilage in different hake species and design of models for estimating the freshness index.

Presenting author, co-authors, affiliations, E-mail for the presenting author

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Abstract

The purpose of this study was to characterize and compare the shelf life of Spanish Hake (*Merluccius merluccius*) and Cape Hake (*Merluccius capensis*) stored in ice. The final objective was to develop predictive models for freshness index and storage time in ice based on quality parameters evaluated. It was carried out in two phases: analysis of fish stored in ice was made and models were developed; the second phase was conducted in order to validate the proposed models. Initial freshness showed a K_{value} of 43,26 and 48,64 % (48-96 h post capture) in Spanish and Cape hakes respectively. Physical, chemical, microbiological and sensory parameters showed good relationship between them in both species. Torrymeter measurements and TVB-N standing out and were high correlated ($p<0.000$) with psychrotrophic flora, Spoilage Specific Organisms (SSO) and all sensory methods. These last allowed establishing a shelf-life of 11 to 12 days, corresponding to an index of freshness ≤ 50%. Sensory profiles showed that "gills" and "eyes" were the most vulnerable aspects in Spanish hake while "eyes" and "texture" were in Cape hake. Demonstrated that spoiled in both hakes was different. Predictive models based on the most important parameters (sensory analysis, SSO, TVBN, torrymeter and temperature) were established for the freshness index (%) and the ice storage time (h) that exhibited during validation more than 98 and 95 % accuracy respectively.

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ABSTRACTS
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Quality enhancement of chilled sardine (Sardina pilchardus) by employment of quinoa (Chenopodium quinoa Willd.) extract

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Abstract

To extend the shelf life time during storage of fatty fish species, the employment of natural antioxidants represent a relevant choice. Recent efforts have focused on the positive role of antioxidant molecules present in different kinds of plant extracts. Quinoa (Chenopodium quinoa Willd.) is a native plant of the Andean region and has aroused great technological and commercial interest for both human and animal feeding because of the presence of high-protein content and a balanced amino acid presence. In the latest few years, this plant has attracted a great attention because of its antioxidant activity, playing an important role as functional and nutraceutical food. The present research was focussed on the quality loss of sardine (Sardina pilchardus) during its chill storage. Its basic objective was to investigate the effect of including an aqueous-ethanol extract of quinoa in the icing medium employed. For it, aqueous solutions of varying concentrations of quinoa extracts were individually tested as icing medium, being quality changes monitored for a 12-day chill storage of fish. A sensory quality enhancement was evident in sardine as a result of including increasing quinoa extract contents in the icing medium. Marked performances were obtained in sensory descriptors such as external odour and raw- and cooked-muscle odours; on the contrary, descriptors such as skin, consistency and muscle taste were hardly affected by the presence of plant extracts. Quinoa-treated fish were still acceptable at day 12, while control fish was found rejectable at this time. Concerning chemical assessments, an inhibitory effect of quinoa extracts on lipid damage development (free fatty acid and fluorescent compound assessments) and microbial activity (trimethylamine formation) was observed. However, the determination of peroxide value, thiobarbituric acid index, and total volatile base-nitrogen content did not imply a significant effect for the quinoa extract presence in the icing medium.

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Obtaining bioactive components of Hass avocado pear (Persea americana Mill) by CO_2-supercritic extraction: Effect n Atlantic salmon (Salmo salar) quality during refrigerated storage

Jaime Ortiz[1], Juan Pablo Vivanco[1], Camila Mella[1], Donaji Velázquez[1] and Santiago P. Aubourg[2]

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Abstract

Hass avocado pear (Persea americana Mill) is a high-nutritional value fruit, having a great content on bioactive polyphenolic compounds in seeds and skin that may be employed for their antimicrobial and antioxidant properties in the marine food preservation. The present work addresses the lipid oxidation and microbial activity development in refrigerated Atlantic salmon (Salmo salar). In it, the effect of the addition of different kinds of polyphenolic extracts obtained from mature Hass avocado pear seeds by traditional extraction (water-ethanol) and by a CO_2-supercrític-ethanol mixture extraction was investigated. Lipid oxidation development was measured by means of the peroxide and anisidine values. Fatty acid composition was analysed by GLC, tocopherols content by HPLC-Fluorescence and astaxanthine level by HPLC-DOD. Meantime, microbial development was measured by total mesophile and coliphorme counts as well as by total volatile base (TVB) formation. Results showed a partial damage inhibition of refrigerated salmon, according to the peroxide, total mesophile and TVB values reached. Present results prove the suitability of employing bioactive components obtained from Hass avocado in order to enhance the quality of refrigerated marine species.

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Application of fermentation techniques for fish processing

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Abstract
Fish has an important place in human diet because it is a good source of high-quality protein and lipids in addition to many vitamins and minerals. In general, fish has little cholesterol and more unsaturated fat than meat. Therefore, fish consumption is increasing leading to an increased demand. However fish is highly perishable and there is a need to develop new as well as improve existing processing and preservation methods. The use of lactic acid fermentation to both preserve the fish and modify their sensory and functional properties is receiving considerable attention. Fermentation of fish has been shown to be a good method for four reasons: 1. The rapid decline of pH during fermentation and the low pH of product inhibit the growth of most hazardous food microorganisms thus leading to a long shelf-life. 2. The nutritional value of the fish measured as amino acid retention, is retained. In addition, the lactobacillus has beneficial effects on gastrointestinal health. 3. Lipolysis and protein hydrolysis by endogenous and microbial enzymes lead to formation of a unique flavor during fermentation. This unique flavor could mask the musty odor and taste of some fish. 4. Fermentation also leads to good textural properties, giving elastic and firm fish products. The promotion of application of fermentation techniques for fish processing will provide a new method for fish industry.

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Title Changes of Energy- and Taste-Related Compounds of Bivalves Preserved in Anaerobic Environments.

Presenting author, co-authors, affiliations, E-mail for the presenting author
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Abstract

Oxygen is an essential element for almost all creatures to produce energy for life. Some marine mollusks have unique systems to survive under hypoxia environments. Arginine phosphate (ArP) functions as an energy supplier under the conditions for mollusks especially shellfish. Bivalves are usually kept in sea water tanks equipped with poor aeration systems or in dry boxes after the harvest and are delivered to factories or consumers under anaerobic environment.

We proposed that ArP is an excellent index to evaluate their quality in WEFTA 2013. In this presentation, we studied the change in the energy- and taste-related compounds in two species of bivalves when stored under anaerobic environments.

Live Ezo giant scallop *Patinopecten yessoensis* and hen-clam *Spisula sachalinensis* were stored either in a hypoxic seawater tank at 15°C or in a dry box at 0°C. When stored in hypoxic tanks, ArP in scallop adductor muscle disappeared within 48 hours. Octopine, lactic acid, and succinic acid contents increased. In contrast, ArP decrease in hem-clam foot muscle was very slow with no increase of octopine and lactic acid, while succinic acid increased higher than in scallop. Under the conditions, ATP contents for both muscles were kept high. Similar profiles of these compounds were obtained when stored in dry boxes but the changes were a little slower.

In both species, storage increased succinic acid, which gives characteristic taste to shellfish meat. Storage of shellfish under hypoxic conditions may enhance the taste but oppositely it shortens shelf life after the harvest because of decrease in ArP. Octopine is known to be an end compound of the metabolism in the muscle of mollusks under anaerobic conditions. The accumulation of octopine and consumption of ArP in scallop muscle suggested that scallop is less tolerant to hypoxia than hen-clam.

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Minimal processing of cod results in a prolonged shelf life than unprocessed and less quality change than pasteurized.

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Abstract
Chilled ready-meals of limited shelf life including cod are typically preserved by full industrial pasteurization (with a heat load equivalent to 90 °C for 10 min at the core). For fish muscle such an extensive heat regime can lead to excessive cook loss, a dry mouth feel and unpleasant texture. The aim of this study was to investigate the following a) does minimally heat processed cod have longer shelf-life than unprocessed cod with respect to microbial breakdown and b) does minimally heat processed cod have better sensory characteristics than industrial pasteurized fish?

Vacuum-packed loin filets of farmed Atlantic cod (*Gadus morhua*) were used as raw material. Minimally heat processed samples of temperature load at 67 °C in 249.5 s and for 87 °C in 31.5 s were compared to industrial pasteurized and unprocessed samples. These temperatures were selected based on heat transfer modelling (COMSOL Multiphysics ®) that simulated temperature development in the filet during heat treatment. A series of analysis were performed in order to evaluate the quality of the processed filets. Sensory analysis and pH measurement showed a difference between industrial pasteurization treatment and all other treatments. Microbiological analysis and drip loss measurements both indicated correlation between temperature treatment and observed CFU and cook loss, respectively. Also, a longer heat treatment at low temperature seems to have greater impact than a short heat treatment for both these parameters.

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Brining of cooked ready to eat shrimp (Pandalus borealis) with carbonated brine

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Abstract

Deep-water shrimp (*Pandalus borealis*) is a popular product in Europa, and exist in a various range of products including cooked, peeled and packaged in modified atmosphere (MA). Soluble gas stabilization (SGS) is a novel way to increase the microbiological quality of the product. In addition, the technique counteracts packaging collapse and enables smaller packages. Combination of traditional SGS and MA packaging has shown promising results (Sivertsvik and Birkeland, 2006), but traditional SGS is time consuming. A novel way to include SGS on MA packaged shrimp is to include CO_2 in the brining step (liquid-SGS), by using carbonated brine.

In this study, two groups were used; Standard (s) that was brined traditionally and Carbonated (C) that were brined with carbonated brine. The brining step for both groups was performed using 6.6 % NaCl brine with the ratio of 1:1 with brine and cooked and peeled shrimp in 72 hours at 1.0 °C in sealed pouches. The C-brine was carbonated using a SodaStream. After bringing, the shrimp was drained and packaged with 60 % CO_2 and 40 % N_2. Head space gas composition, sensory properties (QIM), microbiological quality and color was measured during storage for 87 days at 4.4 ± 0.5 °C.

Pretreatment with carbonated brine significantly ($P<0.05$) increased the head space CO_2 amount with 14 % and counteracted deflation of the top web. The increased amount of CO_2 significantly ($P<0.05$) reduced the growth of microorganisms giving a product with increased shelf life. Sensory analysis revealed no significant differences in the overall sensory score, but carbonated brine gave increased taste score. No effect was detected on color.

Based on this trial, carbonated brine gave increased quality. However, the brining step must be optimized.

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Addition of Bifurcata bifurcata and Fucus spiralis extracts to refrigerated fatty fish: Effect on quality changes

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Abstract

Fatty fish is attracting considerable attention because of the positive role of marine lipids in human nutrition and health. To extend the shelf life time during storage of such species, a great attention is being given to natural antioxidant employment. For centuries, edible marine algae have represented an important component in human diet in many Far East countries. Marine algae contain a wide range of constituents with important health benefits and preserving characteristics, and can provide a profitable tool for the enhancement of food quality. The present research was focussed on the quality loss of sardine (Sardina pilchardus) during its chilled storage. Its basic objective was to investigate the effect of including algae (Bifurcaria bifurcata; Fucus spiralis) extracts in the icing medium employed; such algae species were chosen because of their abundance in the Galician coast (NW Spain) and their great content on polyphenol compounds (40.8±8.3 and 53.3±5.0 mg gallic acid/g seaweed). For this reason, aqueous solutions of varying concentrations of both algae were individually tested as icing medium, being quality changes monitored for a 13-day chill storage. A sensory quality enhancement was evident in sardine as a result of including the extracts of both seaweeds in the icing medium; this effect was found higher by increasing the extract concentration. Marked performances were obtained in sensory descriptors such as external odour and raw- and cooked-muscle odour. On the contrary, descriptors such as skin and consistency were hardly affected by the presence of algae extracts. Concerning chemical assessments, an inhibitory effect of Bifurcaria bifurcata extracts on lipid damage development was implied according to the determination of thiobarbituric acid index, fluorescent compound formation and free fatty acid content; additionally, the presence in the icing medium of Fucus spiralis extracts led to an inhibition of microbial activity development (decrease of trimethylamine content).

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Title

A novel process for obtaining a smoked cod product

Presenting author, co-authors, affiliations, E-mail for the presenting author

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Abstract

Fish processing industry seeks new methods to reduce processing times, minimise waste, reduce overall weight loss and/or improve the hygienic quality of the final product. Recently, materials with high water vapour transmission rates have been investigated. The use of highly water vapour-permeable bags (WP) in fish processing could be interesting since these new materials facilitate the control of product dehydration and at the same time, minimise the risk of microbial contamination. The aim of this work was to optimise a new salt-smoking method using WP bags to obtain smoked cod. This involved a one-step salting-smoking process using WP bags with three levels of salt dosage (2, 3 and 4 g salt/100 g fresh cod), two relative humidity conditions (60 and 70% RH) and three processing times (48, 72 and 96 h). After processing, samples were analysed in order to determine moisture, sodium chloride content, water activity (aw) and pH. WP bags allow for complete evaporation of water released by fish muscle during processing, in all the conditions tested. Moisture and aw of the smoked product were affected by HR employed during processing. As expected, the longer processing time, the lower moisture and aw were found in the final product. Among all the conditions studied, only those samples processed during 96 h reached values of moisture, salt content and aw similar to the commercial smoked cod. The use of WP bags with a salt dosage of 2%, 60% HR and 96 h of processing time were the conditions that allowed obtaining a smoked cod product with the closest physico-chemical characteristics to the commercial ones. According to these results, this method could substitute traditional procedures for cold smoking since enables to reduce brine wastes, processing time and handling along the chain production without affecting physico-chemical characteristics of the product.

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High pressure effect over the gelation ability of low-quality surimi to elaborate low and high sodium content gels.

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In case of low grade surimi, it should be convenient to use complementary processing in order to improve its gelation. High hydrostatic pressure (HHP) processing is able to modify the protein structure in order to change its functionality to get better gelation avoiding the use of non-healthy ingredients such as higher salt proportion or starches.
The main purpose of this work was to study the effect of high pressure (300 MPa) on surimi gelation at two NaCl concentrations 0.3% (Lot A) and 3% (Lot B), on suwari (Lot S: 5ºC/24h) and definitive gels (Lot SQ: 5ºC/24h + 90ºC/30min).
Gels were analysed by FTIR, DSC and Scanning Electron Microscopy (SEM). It was also determined the content of sulphydryl groups, mechanical and color properties.
FTIR results showed that in Lot A, when pressure is applied, that β-sheet structure increases. However, in Lot B β-sheet percentage is not statistically different at any pressure, because protein has been previously solubilized by higher proportions of salt, thus HHP effect is not evident. These results are consistent with DSC data that indicated a higher protein denaturation in Lot B than in Lot A, regardless effect of pressure. Related to gel strength, at low salt concentration (Lot A), it increased under HHP processing in both batches, in suwari (Lot S) as well as in definitive gels (Lot SQ); contrary, HHP processing in Lot B only improve gel strength in suwari (Lot S). Furthermore, sulphydryl group content decrease in gels with high content of NaCl and when HHP is applied, indicating disulphide bond formation in Lot A which is also consistent with the L*value due to the higher formation of covalent bonds. In addition, these results are supported with SEM images which showed a more ordered and homogenous structure in samples processed with HHP.

In conclusion, the effect of HHP processing is more evident in low salt gels which open the possibility to elaborate low salt content gels with adequate properties.

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Effect of oil and salt addition after pasteurization and chilled storage on restructured fish muscle products based on glucomannan gelation.

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The effect of the addition of oil and salt as ingredients in the composition of three fish restructured prototypes, analog to fish muscle, made with non-functional fish muscle ("sawdust") and glucomannan, was studied after pasteurization and 1 - 21 days of chilled storage.

Three restructured fish prototypes, were made at a ratio of 25:75 (5% aqueous glucomannan solution : sawdust) at 1.25% final glucomannan concentration (lot C), plus a 5% of fish oil (lot O) or plus 0.8% of salt (lot S). Oil and salt percentages are based in previous studies. The three lots were pasteurized (80ºC 20 min) and analyzed their physicochemical (WBC, cooking loss and L*), mechanical (puncture) and viscoelastic sensorial properties at 1 - 21 days of chilled storage. The mechanical and sensorial results showed that the prototype with 5% oil was the most suitable of a fat fish muscle.

Pasteurization produced a significant decrease in water binding capacity and cooking loss in the three fish prototypes. It was less notable in lots O and S, during all the storage period, due to their particular structural organization. Lightness (L*) did hardly change by pasteurization and posterior chilled storage, showing lot O the highest values because of its more heterogeneous network. Viscoelastic parameters showed that pasteurization and chilled storage reduced the network flexibility in all lots. In lot S, an increase of the network strength was observed, conversely in lot O, as was reflected in the lowest breaking force. Therefore, salt improved the connectivity of the gel network of glucomannan and mince producing firmer and more homogeneous networks. All these results agreed with the sensorial analysis, scoring lot S the best for texture and taste attributes.

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Title

Application of High Hydrostatic Pressure (HPP) as a tool to extended shelf-life of hake fillets.

Presenting author, co-authors, affiliations, E-mail for the presenting author.
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Abstract
Abstract should be no more than 300 words and should contain brief background information, key methods and major findings

European Hake (*Merluccius merluccius*) is an economically important commodity in Spain. However, like most fish, it has a limited shelf life due to several factors. One potential process to preserve freshness is the application of hydrostatic pressure, typically at levels ranging from 100 – 600 MPa. However, in muscle based foods like fish, pressure above 400 MPa tends to negatively affect quality parameters such as texture, color and oxidation potential. The aim of this work was to determine the effects of moderate high hydrostatic pressure (<300 MPa) on chemical, textural and microbiological characteristics of filleted European Hake.

After pressure treatment (0.1, 100, 200 or 300 MPa) for 5 min at 6 °C, the following parameters were studied throughout 10 days cold storage (4 °C): muscle protein solubility, dimethylamine (DMA) and trimethylamine (TMA) formation, color, purge loss and cook yield, texture and microbial (psychrotrophic) counts. To assess the protein modification polyacrylamide gel electrophoresis (PAGE) was also carried out.

The application of 200 or 300 MPa of pressure markedly reduced hake protein solubility. Treatments at 200 MPa and over lead to a change in the electrophoretic profile, showing a loss of the higher molecular mass protein bands. These pressure treatments (200-300MPa) also significantly reduced the formation of TMA and microbial counts through the 10 day study without increasing fluid losses. In fact, we found unexpected lower purge loss values at 300 MPa than 0.1 or 100 MPa on the 10th day of storage. The changes to raw muscle texture were more evident at 300 MPa than 200 MPa by instrumental methods. However, these promising results for HPP fish treatment should be further explored by sensory methods to determine if these textural changes are detectable by consumers in cooked fillets.

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INTEGRITY, AUTHENTICITY AND DIFFERENTIATION OF PRODUCTS

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Title

Characterization of process induced changes in matjes herring, using 2D gel electrophoresis

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Abstract
Traditional matjes herring is a popular product, particularly in the Netherlands. It is produced from fatty North Sea herring (Clupea harengus) which should contain calanus in its intestinal tract in order to achieve the proper matjes herring quality. In this study, the effect of salting procedure and the presence of calanus on the protein changes in fillet were investigated. North Sea herring caught in June 2012 was subjected to 2 different treatments: salted as gibbed (traditional matjes herring) and salted as gibbed and gutted. The salting procedure lasted approximately 18-24 hrs.
Fillet samples (n=10) of raw material, as well as the two salted products, were frozen at -80°C. After thawing, samples were taken from within the muscle (below the dorsal fin), homogenized in buffer and centrifuged. The supernatant was analysed by 2D gel electrophoresis. The gels were fixed and stained with Coomassie blue. Gel images (CCD camera) were subjected to image analysis (Progenis SameSpots).
The image analysis showed 660 protein spots that could be quantitatively compared between all the 30 analysed gels. Statistical analysis (ANOVA, $p<0.01$) revealed 75 spots differing in volume between the 3 herring groups and 64 of these spots differed between the raw herring and the traditional matjes herring. Using these 64 spots in a principal component analysis plot grouped the samples from the raw herring and the two products along the first principal component, with the product that was salted as gibbed and gutted in between the raw herring and the traditional matjes. Based on this and examination of the individual spot volumes, demonstrated that some of the protein changes occurring during the traditional matjes production also were taking place when gutted fish were used, meaning that not all these protein changes were dependent on intestinal or gut enzymes but were caused by inherent muscle enzymes.

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Title

Identification of Ling (*Molva molva*) in Commercial Products Using Real-Time PCR

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Abstract

Detection and identification of fish species in highly processed products is a very difficult task, since the morphological characteristics are lost and proteins can be denatured during processing and heating, resulting in the subsequent loss of analytical availability. Thus, for many fish species the possibility of fraudulent or accidental species substitution could be occur.
These mislabeling can be caused for economic gain, adding undeclared cheaper fish species under the name of higher price and higher quality fish species. Another form of fraud for economic gain may be the selling of fish species that have a defined fishing quota, and are captured by on them, under the name of other species.
Molva molva is a gadoid species belonging to the Family Lotidae which, due to its morphological and organoleptic characteristics, is a species susceptible to be found in some of the cases mentioned above.
This work describes the development of a rapid and precise method for identifying Ling (Molva molva) based on TaqMan real-time PCR technology,which is a really fast and simple test and can be applied to fresh, frozen, and processed products to detect the fraudulent or unintentional mislabeling of this species. In developing methodology, a set of specific primers and probe were designed using Cytochrome b gene as molecular marker. For the validation, this method was applied on 30 commercial samples. A positive Ct value of about 19 was obtained when Molva molva was present; however, the fluorescence signal was not detected (Ct value 40) or presented significantly higher Ct values (38.3±2.8) for the non-ling species. The methodology herein developed is useful to check the fulfilment of labeling and traceability regulations for seafood products in commercial trade and for fisheries control.

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Title: A genetic traceability tool for the Atlantic mackerel (*Scomber scombrus*, L.) through NGS transcriptome-derived SNP discovery

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Abstract
Abstract should be no more than 300 words and should contain brief background information, key methods and major findings
The reduced cost provided by newly developed SNP genotyping platforms, along with the possibility of discovering large numbers of SNPs through NGS technologies lead to the possibility of the design of panels of SNP for authentication of seafood products in non-model species. The development of accurate tests for assigning geographical origin, increasingly use transcriptome-derived SNPs as the resource of choice because they are located in exons of genes, thus they are more likely to be under diversifying selection than other genomic regions and, therefore, they have a greater potential to differentiate populations (*outlier* SNPs). Transcriptome-derived *outlier* SNPs are able to assign 93-100% of individuals to their population of origin in commercially important species such as cod, herring, sole and hake; and the 60-70% of individuals of European anchovy with total certainty. This study aims to discover new transcriptome-derived SNPs in the Atlantic mackerel, a small pelagic schooling species from the North Atlantic Ocean, having major research interest due to its economic importance.

Transcriptome-derived SNPs were discovered in Atlantic mackerel following the same procedure as in European anchovy. A transcriptome high-quality reference of 4,463 *contigs* was assembled, and 951 SNPs were discovered in 552 *contigs*. We identified 4,676 intron-exon boundaries (IEBs), locations that must be avoided during SNP genotyping primer design. Finally, a subset of SNPs with high genotyping success probability (distant from IEBs) and high validation rate (polymorphic SNPs) was selected. Thereby, 479 SNPs suitable for genotyping with SNPtype™ assays were identified, and a subset of 96 SNPs will be validated in a sample of 94 individuals.

In the current study the first genomic resource for the Atlantic mackerel has been generated (479 SNPs, 356,304 transcriptome reads, and 599,294,349 genomic reads). Based on discovered SNPs we expect to develop a highly discriminative tool to designate geographical origin. Conservation studies and aquaculture approaches may also benefit from the discovered SNPs in this work.

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To be sent to meritxel.gonzalez@azti.es before April 1st 2014

Title: A genetic tool for traceability of European anchovy (*Engraulis encrasicolus*, L.) and albacore (*Thunnus alalunga*, Bonn.) fisheries derived food products

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Abstract

Illegal, Unreported and Unregulated (IUU) fishing has played a major role in the overexploitation of global fish populations. The European anchovy (*Engraulis encrasicolus*) and the albacore tuna (*Thunnus alalunga*) fisheries have great economical and cultural importance in the Bay of Biscay. The high commercial value of these species makes them highly vulnerable to fishing impacts and commercial frauds. Genetic traceability tools can result in a positive impact on marine ecosystems through conservation of fish stocks, because the designation of origin maintains the sustainability of the population combining the economic productivity.

After the collapse of the European anchovy fishery in the Bay of Biscay last decade, a protection of the eco-label of origin for this anchovy ("Anchoa del Cantábrico") has become necessary. A previous patent designed by our research group of the University of the Basque Country (UPV/EHU) and AZTI-Tecnalia (patent ES 2 392 610 B1), assigned -using 16 SNPs- the geographic origin of the 53% of Bay of Biscay individuals tested with 94.4% of reliability. Recently, hundreds of transcriptome-derived SNPs have been validated for the species, and have been used for improving the previous traceability tool. By applying 14 highly informative transcriptome-derived SNPs we found that 70% of Bay of Biscay individuals is assigned to its origin with 100% of reliability. These results demonstrates that transcriptome-associated SNPs are highly informative for assigning individuals to their geographic origin with unprecedented high accuracy levels; these type of markers can revolutionize food traceability and become a helpful tool for fighting illegal fishing and mislabeling.

This successful methodology will be applied on albacore species for geographic origin assignment. We will use 128 SNPs previously discovered from genes (using EPIC primers), and 115 transcriptome-derived SNPs, discovered by cross-species amplification using arrays designed for a closely related species, the Atlantic bluefin tuna (*Thunnus thynnus*).

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Title: *Product information at your fingertips*

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Abstract
WhiteFishMaLL (North Atlantic Whitefish Marine Living Lab) is a tree year RTD project funded by Nordic Innovation that is coming to a conclusion at the end of this year. The project has two objectives; firstly to develop a branding concept for whitefish from the N-Atlantic that differentiates in terms of sustainable production and superior consumer benefits; and secondly to demonstrate how Living Lab can be established in the marine sector.
In order to identify consumer perception and preferences of N-Atlantic whitefish products, fish consumers and other stakeholders in the value chain have been approached through direct interviews, focus group sessions, large-scale qualitative surveys and other Living Lab approaches. The main outcome reveals consumer willingness to buy whitefish products from the N-Atlantic given certain communication parameters and product attributes like value chain sustainability and transparency, integrity, health benefits and personalized buying experience. In order to fulfil consumer's demands for product story from catch to plate, the project work is now directed at information gathering and building a web based solution accessible with smartphone through QR-codes on product packaging to disseminate those information on a batch/catch level. Project prototype is now ready and accessible through http://whitefishtest.herokuapp.com/2

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PRODUCT INNOVATION, CONSUMER ACCEPTANCE AND EXPECTATIONS

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Title: Evaluation of the properties of blue whiting mince during frozen storage.

Presenting author, co-authors, affiliations, E-mail for the presenting author
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Abstract

The recent decline in fish stocks, reduction in fishing quotas and increasing price for landed fish calls for a more effective utilization of existing fish resources. Currently Ireland has a large quota of Blue whiting (*Micromesistius poutassou*) which is primarily sold as whole-frozen with little value-added processing. This species of fish presents an interesting opportunity to develop food products using a sustainable and cost effective raw material. This project will investigate the potential for using mince from Blue whiting for developing a range of reformed fish cakes and convenience product offerings. The product has two work packages; 1. To determine effects of frozen storage (-18°C) with and without cryoprotectants on mince quality over 12 months and 2. To thaw and use mince (+/- cryoprotectant) on months 0, 6 and 12 and develop reformed products to be held for up to 6 months frozen storage. A suite of quality tests will be used for both work packages including microbiological, chemical, texture, organoleptic and protein quality assessment techniques. The project is being conducted in close collaboration with ingredients suppliers, Irish seafood processors, market end-users and equipment suppliers to ensure results are market-led and reformulation technologies are scalable from both small to medium (e.g. Deighton) and larger (e.g. Marel) processing lines.

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Post-catch survival amongst brown shrimp (Crangon crangon L.) in the Flemish shrimp fishery

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Introduction:

The Flemish brown shrimp fisheries traditionally deliver a fresh product that is processed and cooked at sea. The shrimps are caught at night using a twin beam trawl with towing times that are typically one to two hours. The freshly caught live shrimps are sieved immediately after emptying the nets in order to separate commercial sized shrimp from unwanted by-catch and are then cooked in seawater and stored on ice. This action is repeated after each haul until sunrise. Recently the Flemish fishermen showed interest in the commercialization of live brown shrimp, thus keeping the sieved shrimps from the last haul alive by storing them under humid atmospheric conditions in shallow crates on the ship's deck.

Methodology and experimental setup:

In order to evaluate the survival rate amongst brown shrimp during and after handling on board recovery experiments were conducted where the shrimps were placed in tanks with natural seawater after a well-defined period of atmospheric exposure at different ambient temperatures.

Results:

Our results have shown that mortality amongst sieved shrimp may be as high as 90% when no particular care is undertaken to manipulate the shrimp accordingly, while a mortality as low as 20% is seen when greater care is taken and the mechanical sieving process is replaced by manual sorting. A number of environmental parameters such as temperature and humidity during stocking also play a key role in shrimp survival. In order to further develop the live brown shrimp as a new product in the Flemish fishery, every step during the early handling and sieving process must be executed following good handling practices to prevent damage to the shrimp and for the live brown shrimp to be stored on board under optimal conditions.

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Changes during production of hot smoked carp (Cyprinus carpio) and rainbow trout (Oncorhynchus mykiss): fresh vs frozen raw material

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Hot smoked fish is a healthy and popular dish both in Scandinavia and Balkan Countries. Consumption of fish, such as carp and trout, provides numerous important nutrients, such as lipids (rich in LC omega-3 polyunsaturated fatty acids), proteins and vitamins. Small enterprises usually use the production model "upon the demand''. After processing of fresh raw material, possible excessive material is frozen for later processing when demanded, but frozen storage is no longer than one month. The present research compares quality changes in carp and rainbow trout during production of hot smoked products using fresh and frozen raw material.
The smoked fish samples were produced in cooperation with the company AHILEAS, Podgorica, Montenegro. The fresh fish was purchased from one of the industry partner's suppliers. Two type fish: rainbow trout from local fish farms and wild carp from catches on Skadar lake, were used in this study. At the delivery day, part of the fish was used for hot smoked fish production, whereas the rest was frozen at -20^{0}C for one month before processing to hot smoked products. The changes in yield, composition (amount of lipid, water and salt), pH, color, water holding capacity, microbiological and lipid quality were followed through the process. The sampling of fish was performed as follows: (1) raw material, and after (2) salting, (3) smoking, and (4) storage of vacuum-packed product for three months. The results from these analyses will be presented and discussed.

Smoked fish production company AHILEAS and the financial support from the Norwegian Ministry of Foreign Affairs (MFA) under the Programme in Higher Education, Research and Development in the Western Balkans (HERD) (project No. 61902) is gratefully acknowledged.

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Title: Does information affect consumer liking for farmed and wild fish?

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Global fish consumption has greatly increased over the last decades. Given these circumstances, aquaculture is the most suitable alternative, complementary to traditional fishing, to gradually satisfy the global consumer demand. However, little is known about consumer´s perception on the sensory characteristics of both kinds of fish. Even less is known about whether information might affect consumers liking. Therefore, the main goal of the present study was to determine consumers' liking for both, farmed and wild fish, and to evaluate the effect of the information regarding the specie and the obtaining method (extractive fishing/aquaculture) on it.

Two groups of approximately 300 usual fish consumers showing similar socio-demographic distribution were selected in 3 Spanish regions (Catalonia, Madrid, and Basque Country). Four different species (black spot sea bream, gilthead sea bream, sea bass and turbot), each of them from both extractive fishing and aquaculture, were evaluated by the two groups of participants. One group evaluated the samples in blind condition and the other in informed condition.

Results indicate that in informed condition participants preferred wild fish but, interestingly, when information was not provided to them the scenario was just the opposite. The number of consumers preferring wild fish in informed condition was almost three times higher than the one preferring farmed fish. In contrast, the number of consumers preferring farmed fish in blind condition represented the double of those who preferred wild fish. It is noticeable that in this condition almost the 80% of the participants perceived the sensory characteristics of farmed fish similar or more acceptable than the wild fish ones. These findings constitute a valuable insight and provide an optimistic scenario for aquaculture sector since the improvement of the sensory characteristics of farmed products seem not to be necessary. However, it is essential to improve the aquaculture image among consumers.

JACUMAR project 2008-2012 "Caracterización de la calidad del pescado de crianza"

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SAFETY EVALUATION AND EMERGING RISKS

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Use of Growth Inhibitors for Controlling Some Specific Bacterial Pathogens in the Seafood Industry

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Total consumption of fish, mollusks and crustaceans has been increasing all over the world as seafood is considered a healthy alternative to poultry and livestock products. On the other hand, seafood is also starting to be associated with several foodborne illnesses. Many food-borne illnesses may appear in seafood either as a result of contaminated water or it becomes contaminated during the processing. Seafood products can contain many bacterial pathogens and/or their toxins have been a vital concern to public health. *Listeria monocytogenes, Staphylococcus aureus, Clostridium botulinum, Salmonella spp.* are some of the detrimental pathogens which cause food borne illnesses after the tainted seafood is consumed. A number of methods and ingredients have been used against the growth of bacterial pathogens in the seafood industry. However, new methods are being continuously developed on this important subject across the seafood industry. The new trends and methods in the seafood industry have been evaluated and summarized in this review.

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Live bivalve molluscs produced and marketed in Portugal: main microbiological hazards

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Abstract

Bivalve molluscs retain and accumulate several microorganisms from their environment, making its microbiological safety closely related to the quality of the harvesting waters. The risk of contamination of live bivalves with pathogens is primarily assessed through the microbiological monitoring of production areas. This assessment, based on *Escherichia coli* levels in mollusc flesh and intervalvar liquid, results in the classification of the production areas into three classes, which determines the level of treatment (e.g. purification, relaying, cooking) required before human consumption of bivalves.

During the last decade, Portuguese bivalve mollusc production areas have been monitored and marketed products evaluated, being the purpose of this work to disseminate the main obtained results. In general, the classification of production areas has remained relatively stable, with some quality improvements, such as C areas being upgraded to class B, due to better environmental conditions and area redelimitation. Most areas are classified as B, whereas all class A are located in the coast. Estuaries or lagoons represent the most contaminated areas. Concerning bivalves placed in the market, several non compliant results have been observed and associated with high levels of *E. coli* and the presence of *Salmonella*. Marine vibrios have also been frequently detected. These findings support the need to changes in national land and water management practices, requalification of food business operators and better enforcement.

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Effect of cryoprotectants and frozen storage on Anisakis allergens in surimi processing

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Surimi is a myofibrillar protein concentrate in which minced muscle is washed to remove sarcoplasmic proteins, lipids, etc., stabilized with cryoprotectants and mostly commercialized frozen stored. Many fish species heavily infected with Anisakis spp. L3 larvae present a high allergen concentration in the muscle thus posing a potential problem for Anisakis sensitive patients even when larvae are killed by e.g. freezing. Previous results have shown that washing of muscle in surimi processing significantly reduced the allergen concentration, but raw surimi still can have residual allergens that may be carried on in the subsequent steps. To design strategies to reduce the allergenic capacity of processed products, it is necessary to know if additional factors related to surimi production can have an effect on the concentration of Anisakis allergens. The aim of this work was to determine the presence of Anisakis allergenic proteins in surimi as affected by the washing solutions, cryoprotectant blends, and frozen storage.

Hake muscle infected under controlled conditions (50 L3 larvae/100 g mince) was washed [3 cycles, muscle:washing solution, 1:4 (w:v)] with water, sodium phosphate buffer, sodium bicarbonate, or sodium hypochlorite. Two cryoprotectant blends were added to each of these four raw surimis: 4% sucrose+4% sorbitol and 4% sucrose+4% sorbitol+0.2% sodium pyrophosphate, thus making a total of 8 combinations. The impact of these factors on the allergenic proteins was studied during frozen storage (-20°C) for 90 and 180 days, with chilled surimi (5°C) used as control. Ani s 4 and Anisakis simplex antigens were quantified by immunodetection (Dot blot).

No significant differences ($p<0.05$) were found between different surimi lots. The major changes were observed along frozen storage since the detection of Ani s 4 was gradually reduced. This behavior was not observed in the detection of antigens from A. simplex crude extract.

Acknowledgements: This work has been financed by the Spanish project Plan Nacional de I+D+i AGL2009-12485-C03-01/02/03 (ANIDET) and FP7-312068 EU PARASITE. Dr Fabiola Olivares carried out her work at the ICTAN-CSIC on a grant provided by Science and Technology Program of the Government of Peru (FINCyT) and managed by LASPAU.

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Chemical contaminants associated to the consumption of bivalve molluscs produced in Portugal

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Abstract

Bivalve molluscs have an important role in the Portuguese socio-economy and are very much appreciated due to their intrinsic sensory attributes. As filter-feeding organisms they are able to concentrate in their soft tissues various chemical contaminants from ambient water and sediments due to the bioaccumulation process and if chemically contaminated and eaten there could be a risk to the consumer's health. Therefore, these species can only be commercially harvested from approved production areas, which are monitored to ensure they meet the chemical and microbiological criteria.

Under the IPMA regular activities the bivalve molluscs producing areas are regularly monitored in what regards the levels of mercury (Hg), cadmium (Cd) and lead (Pb). Thus, the primary purpose of this study was to collect quantitative information over the last decade on these heavy metal concentrations in bivalves from the different producing areas and tentatively identify potential hot spots. In addition, the levels of the three contaminants in live bivalves collected from several marketplaces were also assembled.

The levels of Hg, Cd and Pb in all species of commercial bivalves collected from the most producing areas did not exceed the limits set by EU. As exceptions the levels of Pb in peppery furrow (*Scrobicularia plana*) from Tagus Estuary and oysters (*Crassostrea* spp.) from Sado Estuary are noteworthy. Regarding live bivalves collected from seafood marketplaces, the percentage of contaminated samples is lower than 1 %. Therefore, there is no evidence that the human chemical risk due to Hg, Cd and Pb arising from the consumption of shellfish harvested from Portuguese waters is significant.

Acknowledgments: The authors acknowledge to the project "BISUS" (PROMAR Program ref. 31-03-01-FEP-0031).

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Title Microplastics in the food chain? Occurrence of microplastics in brown shrimp (C*rangon crangon*) and blue mussel (*Mytilus edulis*)

Presenting author, co-authors, affiliations, E-mail for the presenting author

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Abstract
Abstract should be no more than 300 words and should contain brief background information, key methods and major findings

Synthetic fibres, mainly originating from degradation of plastic debris such as rope and packaging materials, and washing of synthetic clothing, form the most abundant type of microplastics in the marine environment. Depending on the occurrence and characteristics, micro-debris can be ingested by marine benthic species when mistaken as food. Ingestion, accumulation and translocation of microscopic synthetic particles were demonstrated for diverse marine species such as plankton, nematodes, deposit feeders and crustaceans. This also suggests the potential risk of microplastics to accumulate in higher trophic levels by feeding on plastic-contaminated seafood or plankton.

This research presents the occurrence of synthetic fibers in brown shrimp and mussels. Mussels were collected from groynes and quaysides along the Belgian coast and in retail stores. Shrimps were caught on the Belgian part of the North Sea (BPNS) during 2013. The extraction of micro plastics from the samples was performed using an acid destruction of the tissues. The acid digest was filtered and the fibres were visualized under a stereo microscope.

Microscopic synthetic fibres ranging from 200 µm up to 1000 µm size were detected in the bodies of the examined mussels and shrimps, including black, red, blue, purple, translucent, transparent, orange, green and yellow fibres. A mean prevalence of 3.5 fibres/10 g wet weight (w.w.) was established for consumption mussels, 2.6 fibres/10 g w.w. for the groyne mussels and 5.1 fibres/10 g w.w. for the quayside mussels. An average concentration of 7 synthetic fibres /10 g w.w. of tissue was noticed in shrimps of the BPNS. A large intraspecies variation was observed between all the investigated organisms.

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ABSTRACTS
POSTERS

SUSTAINABLE USE OF CATCHES AND FARMING

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Title: **MARMED Project: Development of innovating biomedical products from marine resources valorisation**

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Abstract
The oceans continue to provide new opportunities for the discovery of marine-derived medicines. These compounds encompass a wide variety of chemical structures and functionalities. Marine capture fisheries contribute over 50% of total world fish production and more than 70% of this production has been utilized for processing. As a result, every year a considerable amount of by-products, comprising fins, heads, bones, skin and viscera, are generated in land and usually it is utilized as raw material for fish meal and oil production. In addition, the implementation of the new Common Fisheries Policy will force to land a big amount of biomass nowadays discarded at sea. In this perspective, ***MARMED*** *project aims the valorization of these underutilized marine resources to obtain compounds (marine origin biopolymers and ceramics) with potential biomedical applications. The primary focus of our effort in this area is to research and develop products and applications to be applied in the biomedical area, with particular emphasis in engineering cells and tissues.*
IIM-CSIC, as a partner of MARMED, is trying to reach the isolation and purification of biomolecules and biopolymers from different sources with potential biomedical application and sharing them with others MARMED partners to develop naturally inspired materials to be applied in the context of pharmaceutical, medical and nutraceutical areas.
This work describes the processes employed by the research group of IIM in obtaining the following products:
1.- Extraction of chitin from discarded crustaceans and squid pen
2.- Production of chitosan from previously extracted chitin
3.- Extraction of collagen from skin of several fish species
4.- Production of collagen hydrolysates using the previously extracted collagen
5.- Extraction of chondroitin sulfate from shark cartilage
Analytical characterization was carried out to check the purity and quality of obtained products. *In some cases, several bioactivities were tested.*

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Title

Influence of feed composition on the shelf-life of gilthead sea bream.

Presenting author, co-authors, affiliations, E-mail for the presenting author

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Abstract

The production of fish meal and fish oil is decreasing at annual average rates of 1.7 and 2.6 percent, respectively. Consequently, alternatives to the fish proteins in the elaboration of feed are necessary. In this sense, the partial or total replacement of fishmeal by vegetable protein could be interesting; however, these changes in the feed formulation might have different effects on fish quality. The aim of this work was to study the influence of different feed composition on the evolution of the physico-chemical and microbiological quality of aquacultured sea bream stored under refrigeration. For this purpose, different physico-chemical and microbiological analysis were carried out during cold storage of aquacultured sea bream fed with 3 different feed, being the main difference the content of fish meal and vegetable meal. The evolution of total volatile basic nitrogen was similar in the three cases. The low values of the TBA (thiobarbituric acid) index showed that no lipid oxidation took place in the samples during the storage, with no significant differences between the different feeds. The evolution of ATP-related compounds showed that degradative changes (autolytic and microbiological) occurred in all samples, so that the K_1 value gradually increased during the study, similar in the three types of sea bream. The low mesophilic counts obtained at the beginning of the study in the three formulations progressively increased, to reach the acceptability limits at day 9 of study in all cases. In this study it can be concluded that the replacement of fishmeal by vegetable meal had no significant effect on the self-life of aquacultured sea bream stored under refrigeration.

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Title Valorisation of shrimp cephalotorax waste by obtaining and encapsulating a lipid extract rich in astaxanthin: broadening its utilization as a food ingredient

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Abstract
The crustacean processing industry produces a high amount of wastes, including cephalotorax with a considerable amount of astaxanthin, which possess a high coloring capacity, as well as biological activity. However, its uses as food colorant and functional ingredient are restrained owing to its low solubility in water. The present work is an attempt to give value to such waste by obtaining and encapsulating a lipid extract rich in astaxanthin (LEA) by spray-drying to increase its water solubility and thus broadening its utilization as food ingredient. After obtaining the LEA (≈0.5 mg astaxanthin/100 g) from the cephalotorax of shrimp (Litopanaeus vannamei), three oil-in-water emulsions were prepared using partially purified phosphatidylcholine as emulsifier, and maltodextrin, arabic gum or a mix of both as encapsulating agents. The emulsions were dried by spray-drying to form microparticles, which were characterized in terms of morphology, oxidative stability, color, water solubility and antioxidant activity. There were obtained round shaped microparticles partially collapsed with broad size distribution (2-15 μm), in which the oil was in the form of droplets. Particle surface was smooth for maltodextrin particles, however, those containing arabic gum showed small pores. There was found some lipid oxidation derived from heating during spray-drying process, especially in the samples containing arabic gum; however further oxidation was not revealed after two months of chilled storage in darkness. The particles were highly soluble in water (>90%), rendering an emulsion with an intense red color. The ferric reducing ability, which could not be determined in the oil sample used as control due to its low water solubility, was ≈35 μM $FeSO_4 7H_2O$/mg encapsulated astaxanthin. The extraction and encapsulation of the LEA from shrimp cephalotorax is an effective means to give value to such waste, increasing its water solubility and antioxidant activity and thus broadening its utilization as a food ingredient.

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Recovery of Marine Proteins and Lipids from Herring (Clupea harengus) Processing Water Using Flotation with Microbubbles, Electroflocculation and Ultrafiltration

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Abstract

The ultimate aim of the Nordic Innovation-funded project "Pelagic Industry Processing Effluents Innovative and Sustainable Solutions (PIPE)" is to add value to the large volumes of liquid side streams generated during the processing of herring (Clupea harengus) into a marinated end product. Currently, all the valuable marine biomolecules of these side streams are wasted. In the first part of the PIPE-project, side streams generated from the refrigerated sea water (RSW) storage step on board the boats up to the last maturation step in barrels have been characterized in terms of total proteins, fatty acids, polypeptide profile, total amino acids and trace elements. In a second project step; pilot scale trials have been carried out on site at two local herring processing plants in order to recover valuable biomolecules from the side streams being richest in organic material. Prior to the maturation step, the richest streams were the "pre-salting brines" (3-8% NaCl), which after 25h incubation with herring of different cuts reached up to 12.7 mg protein.ml-1 and 2.5 mg fatty acids.ml-1. During the maturation in barrels, brines with up to 56.7 mg protein.ml-1 and 20 mg fatty acids.ml-1 emerged. Separation techniques evaluated were electroflocculation (EF), flotation with microbubbles (FL) and ultrafiltration (UF); alone and in combination. Data will be presented on the recovery of proteins and total fatty acids using these different techniques. Initial results will also be presented from testing the functional properties of the recovered material.

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Stabiliy Of Fish Protein Hydrolysate From Heads of Gilthead Sea Bream (Sparus aurata), European Sea Bass (Dicentrarchus labrax) and Rainbow Trout (Oncorhynchus Mykiss Walbaum, 1792) Durin g Storage

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Abstract

During the fish filleting, visceral organs, skins, backbones, heads etc. can be occured as wa stes. In Turkey, the wastes aren't sufficiently recovered except feed plants. Protein hydrolysates ha ve nutraceutical potential and economic value and have highly essential amino acid ingredients. P rotein hydrolysates are used as flavour improver, functional ingredients and/or nutrition additive t o low quality foods. As a protein supplement, it can be used in energy drinks, age products, diet of athletes and weight control products. Many researches have been done that the protein and other food ingredients can be obtained from the fish processing wastes using various methods. Fish pro tein hydrolysates consist of enzymatic hydrolysis of raw material that is rich in protein. In the most general sense, fish protein hydrolysates consist of enzymatic hydrolysis of raw material that is ric h in protein. Also, other important point is the stability of fish protein hydrolysate during storage a fter producing. Fish protein hydrolysates have some functional and antioksidative properties and t o determine these properties of fish protein hydrolysates during storage is important issue.

The objective of the present study is to determine the stability of fish protein hydrolysate f rom heads of gilthead sea bream, european sea bass and rainbow trout after 6 months storage. F or the hydrolysates, degree of hydrolysis was measured and analyses of protein solubility, emulsio n properties, foaming properties, color properties, water holding capacity (WHC), DPPH (1,1 –diph enyl-2-pic-ryhydrayl) free radical scavenging capacity, antioxidative activity and metal chelating w ere carried out after 6 months storage. Analyses were performed in triplicate and data were evaul ated with statistical analyses.

Key words: *Rainbow trout, Gilthead sea bream, European sea bass, Protein hydrolysate, Fish head s, Storage, Functional and Antioxidant properties*

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Comparision Of Different Production Methods Of Fish Protein Hydrolysates And Effects On Functional and Antioxidative Properties and Storage Stability

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Abstract

Aquaculture production of Turkey was 167.141 tones in 2010. 47% of aquaculture production was in inland-water and 53% of it was in marine water. Most important aquaculture species in inland-water was rainbow trout with 46.77% and in marine water was european sea bass and gilthead sea bream, 30.39% and 16.85%, respectively. One part of cultured gilthead sea bream, european sea bass and rainbow trout are filleted and they are exported. Therefore, during filleting process of sea bream, sea bass and rainbow trout considerable amount of by product such as backbone, viscera, skin and head occur. Nowadays, these by products are sent rendering facilities and produced low quality fish meal or they are throw away as unsuited, so it cause environmental pollution.

In Turkey, fisheries by products are used to produce fish oil, fish meal, fertilizer, pet food and fish silage. But most of these recovered products have low economic value. Nowadays, maximum profitability are expected from bioactive compounds. These bioactive compounds are extracted and purified with several technologies from simple to complex. These type of compounds include preparation and isolation of bioactive peptides, oligosaccharides, fatty acids, enzymes, water soluble minerals and biopolymers for biotechnological and pharmaceutical applications.

Fish protein hydrolysate are important for researcher because of properties of hydrolysate, but it cannot be suitable for using human consumption because of bitter flavor, fish odor and taste. For this reason, production methods are important. Many researchers continue their research to remove and change these undesired elements. In last 10 years, important methods about this subject were came out and protein concantrate is used as a additive and fortification material for human foods.

***Keywords**: Fish protein hydrolysate, different methods, functional and antioxidative properties.*

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Differential scanning calorimetry analysis of structured acyglycerols obtained from caprylic acid and omega-3 concentrates of rainbow trout (Oncorhynchus mykiss) belly oil

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Abstract
The thermal behaviour of structured acylglycerols prepared by lipase-mediated esterification of caprylic acid and omega-3 PUFA concentrates from rainbow trout (Oncorhynchus mykiss) belly oil by differential scanning calorimetry (DSC) was studied. The basic objective of the work was to determine the effect of process variables such as caprylic acid/omega-3 PUFA ratio, reaction temperature, reaction time, pressure during carbon-dioxide supercritical extraction and glycerol content in the structured acylglycerols. For it, changes occurring in parameters such as melting profile, melting range, melting onset, enthalpy and melting peak were analysed. A central composite design 2^{5-1} + star of five factors including 28 runs and based on response surface methodology (RSM) was employed for analysing the esterification mediated by immobilized-1,3-specific lipase (Lipozyme TL IM) obtained from Thermomyces lanuginosus under supercritical carbon dioxide conditions. The melting curve was obtained from the program temperature from -80 to 60°C at 2°C/ min. Belly oil used as control showed a melting peak of -7.30°C with an enthalpy value of 123.2 J/g; meantime, melting point of omega-3-PUFA concentrate was -49.47°C, being its enthalpy score 18.7 J/g. The thermal conditions of structured acylglycerols showed to be significantly affected by all esterification process variables. Structured acylglycerols showing the highest properties were obtained when applying a low temperature and a high pressurization value, which led to a melting peak of -36.67°C and to an enthalpy value of 54.1 J/g.

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Title: **Bioactive peptides from Boarfish: Protein extraction and generation of health beneficial peptide hydrolysates using established techniques**

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Abstract
In Europe, the quota system – known as the Total Allowable Catche (TAC), will be replaced with an eco-friendly system based on maximum sustainable yields (MSY). This will limit the catch for each species based on its reproduction rate. MSY is to become the benchmark in 2015.The MSY system emphasises the importance of total use of all catch. Fish species without huge current commercial value such as *Capros aper* (Boarfish), blue whiting and herring may also be viewed as a novel resource for new ingredient and product development and this resource is often overlooked and wasted at present. Over the last number of years, Ireland has seen an increase in Boarfish numbers and Ireland currently has a catch quota of 56,000 boarfish per annum. The 2012 season produced some of the highest numbers of Boarfish on record.
The aim of this work was to extract muscle proteins and gelatin from minced Boarfish using a variation on the chemical shift method. Furthermore, extracted proteins were dried and the Water activity values (A_w) and total protein content of generated extracts calculated along with the percentage yield of gelatin and total extracted muscle proteins. Extracted, soluble and dried muscle proteins were then used as a substrate for the generation of a peptide rich hydrolysates using a number of proteolytic enzymes. Molecular weight fractionation and RP-HPLC was employed to enrich for peptide containing fractions. Fractions were screened for their biological activities including ACE-I, Renin and DPP-IV inhibitory activities. The amino acid profile of the extracted proteins was also determined.
Results obtained demonstrated that Boarfish are a suitable source of proteins and that the crude, extracted protein was a suitable substrate for use in the generation of bioactive peptides with health benefits in relation to the diseases associated with Metabolic Syndrome.

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Title Fuel usage and sustainability impact calculation – case studies from the Norwegian fisheries.

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Abstract
Sustainable and responsible harvesting of fish is achieved by having regard to the overall environmental situation. However this impact is poorly documented and the information is not currently either easily available to or easily maintained by stakeholders in the supply chains. A method for assessing the sustainability of fisheries is by using Life Cycle assessment (LCA). Assessing the situation using this method can be a challenging process because of the many and complex data elements involved. In order to address these challenges a simpler tool which could be used often internally by all actors in the supply chain would be advantageous.

One major environmental factor requiring consideration is the fuel usage of fishing boats, this being the fishing fleet's single greatest contributor to greenhouse gas emissions. In addition to fuel usage a number of other factors impact upon the sustainability of seafood products. In order to address these challenges a method for calculating and communicating the 'Sustainability Impact' required development. Appropriate information needs to be calculated and made available to companies in the seafood supply chain.

The initial investigation showed that devising a tool to calculate SI that was also easily communicable was considered important by stakeholders within the supply chain. By using Life Cycle Assessment it would be possible to create a tool with a limited number of relevant factors which would allow companies to calculate the SI for their products on individual trip level.

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Valorization of shrimp (*Litopenaeus vannameis*) farm byproducts for the production of chitin and chitosan

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During the last decade numerous studies have been carried out to evaluate the incorporation of novel ingredients in fish feeds, such as byproducts, in order to enhance the quality of fish meals and reduce the cost for producers. Chitin and Chitosan are natural polymers with antioxidant and antimicrobial activity that can be extracted from shellfish with very interesting characteristics to be incorporated on fish meals.

The aim of this work has been to extract these products and to characterize the ingredients obtained. The development of environmental friendly methodologies minimizing the cost of extraction and maintaining the functional properties have been the main aim of this research.

Shrimp (*Litopenaeus vannamei*) waste provided by "Gamba Natural S.L.", Valladolid, Spain was used for the extraction of chitin and chitosan. Four bathes of raw material, at different growth stages were used. The shells were thawed and washed with water to remove traces of feed, feces and other materials. The isolation procedure constists on a desproteinization using sodium hydroxide, discoloration and demineralization using hydrochloric acid for the extraction of chitin. Chitosan was obtained through deacetylation of chitin obtained; different times and concentration of alkaline solution were used to produce chitosan with different molecular and hydrolysis degrees. Fourier Transform Infrared (FTIR) and proximal analysis were used to evaluate the purity and yield of the different extracts.

Results showed that the purity of chitin increased with the age of the individual shrimp waste showing lower levels of protein in the outer shell. The method of extraction of chitosan had highest yield than chitin since the chitin was partial purified. Important variability between batches in the chitin extracted was observed due to the effect of the age and station. Responding to the deacetylation process, FTIR showed different profiles for chitosan but no differences in yield were observed.

The study showed that the waste of shrimp is viable for the production of natural polymers which can be potential antioxidants and antimicrobials in fish meals. Further studies are necessary to clarify the potential antioxidant and antimicrobial effect of fish.

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Title

Edible films enriched with active peptides from crustacean waste encapsulated in nanoliposomes

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Abstract

Whole prawns (*Penaeus notialis*) with no commercial value were subjected to enzymatic hydrolysis with trypsin and the peptide fraction of molecular weight <3 kDa was isolated (ST1). The freeze-dried peptide fraction presented noticeable radical scavenging capacity (ABTS value of 69.12 mg Vitamin C eq/g), antihypertensive capacity (ACE-inhibition, IC_{50} = 69 µg/mL) and hypoglycaemic capacity (DPP-IV-inhibition, IC_{50} = 0.46 mg/mL). ST1 was encapsulated in liposomes produced from partially purified phosphatidylcholine (PC) using concentrations of 5 % PC, 5 % glycerol and 5 mg/mL peptides dissolved in phosphate buffer (pH7) (L-ST1). For comparison purposes, liposomes without peptides were prepared under similar conditions (L-E). The peptide fraction was encapsulated with an efficiency of 52.37 ± 2.38 %. The average size of L-ST1 and L-E was, respectively, 99.98 ± 4 nm and 94.4 ± 2 nm. The stability of L-ST1 nanovesicles at pH 7 was high, as revealed by the measurement of the zeta-potential (-53.87 ± 2.9 mV), being slightly lower in the case of L-E (-44.37 ± 2.85 mV). The liposome suspension of nanovesicles containing the peptide fraction was incorporated in the formulation of an edible sodium caseinate film, showing uniform distribution and well preserved structure along the film matrix. The resulting films became more water soluble, but no changes were observed in thickness or transparency.

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Title
Chemical characterization of brown crab (*Cancer pagurus*) shells from Scotland and France

Presenting author, co-authors, affiliations, E-mail for the presenting author
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Abstract
The crustacean shells are one of the most important chitin resources and they are also a source of carotenoids. Chitin and carotenoids have many industrial applications including pharmaceutical, medical, cosmetic and biomedical fields. Dried shells from brown crab males and females (*Cancer pagurus*) imported from Scotland and France and collected in different seasons were used in this study. Chitin, protein, carotenoids, ash, macro and trace elements and contaminants of shells were evaluated.
The recovery of chitin from brown crab shells varied between 10 and 12%. In general, the chitin content of males shell caught off in Scottish waters in different seasons was very similar but significantly higher than that of males from France. The protein content was in the range of 8.0 to 9.0%. The male shells showed relatively lower protein content than female shells. Ash was the major constituent of the carapace of brown crabs and accounted for more than 70%. The total carotenoid content in different extracts ranged between 1.0 and 2.5 μg astaxanthin/ g of shells. No significant differences in carotenoid content were recorded in samples from Scotland and France and the highest level of total carotenoids was observed in females. The percentage of astaxanthin in relation to total carotenoids varied between 18.5 and 68.2%. Calcium and phosphorus were the most abundant elements in the brown crab shells. The shells from Scotland presented higher levels of all macro and trace elements, with the exception of Sr, than those from France. The male shells from France presented higher contents of all macro and trace elements than female shells. The levels of contaminants (arsenic, cadmium, lead and mercury) in carapaces were relatively low with exception of lead. The level of this contaminant in the muscle was below the detection limit suggesting its accumulation in the shell of this crustacean.

These data were obtained in the frame of the ACRUNET project.

MEETING CONCLUSIONS

"Seafood science for a changing demand"

was the focus of the WEFTA 2014's international meeting

- **The 44th international meeting of the West European Fish Technologists Association, WEFTA 2014, was hosted by AZTI-Tecnalia from the 9th till the 11th June in Bilbao.**

Any company that forgets to tackle the changes that the market is facing is doomed to fail. Adapting to the changes through the scientific knowledge, the innovation and the technology development will be the only way to achieve this. Therefore, the 44th international meeting of the West European Fish Technologists Association, WEFTA 2014, which was held this year in Bilbao was focus on "SEAFOOD science for a changing demand".

The event was focused in the R+D+i oriented to global societal needs, looking for innovative solutions to meet the new demands. Global Seafood Markets in 2030 are expected to be characterized by:

- The demand for seafood is expected to increase strongly, as is product innovation, mainly due to an increase in the world population requesting for high quality animal protein
- The value of attributes and information are increasingly important.
- The presence of aquaculture products continues its growth. The innovations in this sector are leading to rapid technological progress making aquaculture products more competitive.
- There are some data suggesting that seafood prices will rise by up to 70% between now and 2050 due to shortage of supply and wage growth.

The WEFTA 2014's program "SEAFOOD Science for a changing demand" was covered through six scientific sessions: Safety evaluation and emerging risks; Seafood quality reassurance; Integrity, authenticity and differentiation of products; Sustainable use of catches and farming; Advances in seafood processing technology and smart control; Product innovation, consumer acceptance and expectations.
The program this year included key lectures coming from academia and from the industry, and as a novelty, the program of the meeting did offer a special session with specific presentations coming from the industry. It was attended by 125 delegates coming from 18 countries, 21% from the industry, and more than 100 contributions were received.

The first key lecture on "Health benefits and risks of seafood: simply fatty acids and mercury?" was presented by the 2013 WEFTA winner, Dr. Maria Leonor Nunes, scientific coordinator of the Division of Aquaculture and Seafood Quality and Upgrading at IPMA, the Portuguese Institute for Sea and Atmosphere.

Session 1 on Seafood quality reassurance covered important achievements regarding seafood quality and innovative reliable methodologies for its measurement. Some of the strategies proposed represent new ways to improve quality of seafood and to be aware about effects (intrinsic or extrinsic) that can compromise seafood quality.
The presentations covered the following themes:

I. New methods for seafood quality evaluation, including the quantification of fish partial voltaic basic nitrogen by SPME-GC-MS, a novel method (no-destructive) also for volatiles amines determination, a Nuclear Magnetic Resonance (NMR) tool for identification of quality changes on marine raw materials, and the potential of Surface Enhanced Raman Spectroscopy for histamine detection in fish.
II. Quality evaluation strategies for different species such as iced sea bream, scallops, Norway lobster, Atlantic horse mackerel, cod and salmon.
III. Fish oil and nutrition, specially the role of lipid bioactive oxygenated mediators.
IV. New tools for spoilage control in seafood based on the use of bacteriophages, as viable alternative to chemical antimicrobials against food pathogens and as food preservers.

Session 2 on Safety evaluation and emerging risks included five presentations, three of them dealing with the state of the art on the evaluation of marine chemical and biological contamination and a fast approach for the detection of allergen parasites. A final talk covered the benefits and risks of aquaculture products.

The second day begun with two interesting key note lectures coming from the industry: “The Power of Branding – Bringing New Consumers to Fish”, that was presented by Charles Boardman, Business Manager at Icelandic Seachill and responsible for the overseas expansion of The Saucy Fish Co., the UKs leading seafood brand. The second industrial key lecture on “Key hot prepacked fish categories in the chilled and frozen EU Retail Shelves“ was given by Gonzalo Campos, who works transforming fish commodities in value-added product categories in Sealed Air, the company that is helping the development of the fish packaging sector in Europe.

During **session 3 on Advances in seafood processing technology and Smart control** we had the opportunity to learn about different advances in fish processing, including the different effects and possible uses of natural extracts for storage of mince fish, and the effectiveness of modified atmosphere packaging and active technologies on the quality preservation and shelf life extension of different fish and shellfish species. We learnt about the importance of the bleeding process on overall quality, and the improvement observed when ice slurry was used during the bleeding process. Another presentation explained how the denaturation occurs in fish muscle during thermal treatment, thus providing the necessary information for the optimization of these values for different species.
The utility of hydrostatic high pressure technology was showed for reducing spore contamination in fish products and for elaborating new products. Novel freezing technologies for freezing Albacore tuna were discussed. And the use of Process

Analytical Technology (PAT) approach for the discrimination (based on Near Infrared spectroscopy signals) between fresh and defrozen hake was explained.

In **session 4 on Product innovation, consumer acceptance and expectations**, there were several presentations with interesting conclusions related to consumers' perception and knowledge about different seafood aspects and products. Some of the conclusions showed that benefit perception seems more important than risk perception, and that fish quality is the main driver that influences buying behavior in European consumers. Several innovations were discussed, from the use of natural extracts for melanosis treatment in shrimps, to the design of seafood products for enhancing their beneficial effects on health, and the optimization of heat treatments for creating better products.

The third day began with a presentation on "Seafood innovation in Spain: a need, not an option" by Javier Arán, the R+D Manager of Isidro de la Cal, a company devoted to the development of seafood value added products. His lecture made it very clear that innovations of the seafood products is an ongoing process and that staying at status quo, is not an option for seafood industry.

The contributions in **session 5 on Integrity, authenticity and differentiation of products** covered subjects from seafood fraud or misinformation on the labels (some results showed up to 30% mislabeling), to different genetic techniques for differentiation of products. Results applying novel methodologies for authentication of different tuna species in the processing industry were very promising.

Session 6 on Sustainable use of catches and farming had its main focus on the new EU Common Fisheries Policy (CFP) and specifically on the near future of the discard ban or landing obligation. Some presentations mentioned that, when the landing obligation is in function, the focus will be on how to control the obligation, for example by the use of different on board observation techniques (e.g. CCTV camera technology) in combination with automatic sorting of the catch. Different studies have made estimations on the amount of new raw-material that will be part of the seafood value chain, and the prediction is that an important part will end as fish meal/fish oil or fish feed, mainly for aquaculture. Results from the southern part of the Bay of Biscay showed that there are different alternatives for the new raw-material, either as feed or pulp for surimi production. In addition, the number of products that this new raw-material can be used for goes from new products for human consumption to active biomolecules.

For completing the oral sessions, 55 posters were exhibited during the conference showing different studies regarding the advances done in the different areas.

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