71st Pacific Fisheries Technologists Conference

The Queen Mary
Long Beach, California, USA
March 1-4, 2020

Trading into the Future

PFT 2020 PROGRAM BOOK

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Welcome to the 71st PFT Conference!

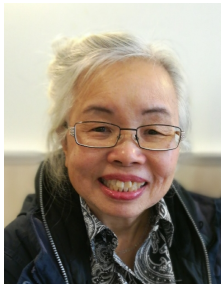
Seventy-one years ago, Neil Carter presided the 1st PFT Conference held in British Columbia (Canada). I wonder if Neil, and the other PFT Presidents serving during those founding years of PFT such as Ray Clough (1952 President, WA), Norm Armstrong (1953, BC), Russ Sinnhuber (1956 President, OR), and the first California PFT President, Harold Alcott (1959), would have predicted their legacy would live on to this day. PFT rotated yearly between British Columbia, Washington and Oregon for thirty years until 1984, when Alaska entered the rotation with Don Kramer being the President. In 1995 Ramon Pacheco-Aguilar presided the first PFT Conference in Mexico and since then, the PFT Conference has move between Pacific States and Provinces of Canada, Mexico and USA. It is safe to say that PFT attendance, and the card games afterhours, have become a tradition to many, including myself.

This year our keynote speakers will address our theme of **"Trading into the Future"** and we are planning an exciting line up of plenary speakers to stimulate new thinking and discussions across a multitude of technical, scientific, and ecological topics of importance to the seafood and aquaculture industries worldwide. It is not possible to speak about this years' program without recognizing Rosalee Hellberg (Chapman University), 2020 PFT Program Director, and Laurice Churchill (NOAA Long Beach Office), 2020 PFT Advisor, for going the extra mile in identifying so many talented and accomplished professionals to join our Technical Program. Many others played an essential part in making this years' PFT a successful event. The Oregon State University team has proven indispensable in logistics and much more with Angee Hunt, Craig Holt, Jae Park, Jung Kwon, and Sue Hansell working on the checkbook, website, student competition, program announcements, and finances. Hart Schwarzenbach (Peter Pan Seafoods) and Pam Tom (Emerita UC Davis) worked tirelessly to secure conference sponsors and to collect donations and swag for the PFT raffles. In the end, the work of a President becomes easy when supported by this wonderful and hardworking group of people that volunteered their time to serve in the 2020 Organizing Committee.

I hope you will enjoy the technical program and that you can make time to partake in the social activities we carefully planned for the conference evenings aboard the Queen Mary. I could not think of a better place to hold a PFT Conference during my presidency!

Alex Oliveira
PFT President

ORGANIZING COMMITTEE

Alex Oliveira President 	Laurice Churchill Advisor 	Pamela Tom Senior Advisor 	Rosalee Hellberg Program Director 
Jung Kwon Assistant Program Director 	Lin Koh Treasurer 	Lilian Ribeiro Secretary 	Hart Schwarzenbach Sponsorship 
Jae Park Student Competition chair 	Kate Abraham Past President Reception MC 	Joe Frasier Holder of the Chips 	Angee Hunt Holder of the Checkbook 
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KEYNOTE SPEAKERS

Douglas L. Marshall, Ph.D., CFS
Eurofins Microbiology Laboratories, Inc.,

Dr. Marshall is Chief Scientific Officer with Eurofins Microbiology Laboratories, Inc., a division of the global life sciences company Eurofins Scientific. He also is cofounder and Director of the Food Safety Institute, LLC, an integrated consulting and analytical services company affiliated with Eurofins. His former positions include Associate Dean and Professor of Public Health, College of Natural and Health Sciences, University of Northern Colorado, Adjunct Professor with the Colorado School of Public Health, Professor of Food Science, Nutrition, and Health Promotion at Mississippi State University, Assistant Professor of Food Science at Louisiana State University, Contributing Editor for the peer-reviewed scientific journal Food Microbiology, and four consecutive terms on the editorial board of the Journal of Food Protection. He is a frequent volunteer and consultant to trade associations, NIH, WHO, FAO, USDA, and other government agencies and private companies. His research and expertise has been featured in popular press venues such as Consumer's Reports, Fine Cooking, USA Today, Fitness, Health, Men's Health, Chemtech, Nature Science Updates, and ASM Journal Highlights. He is a frequently invited speaker and a prolific book chapter writer. With over 250 publications and over 180 invited presentations, his scientific research and outreach interests focus on improving the microbiological quality and safety of foods. Among these was the completion of the 4 volume Handbook of Food Science, Technology, and Engineering, which he Co-Edited. He has been the recipient of a number of awards for his scholarly efforts including the Mississippi Chemical Corporation Award of Excellence for Outstanding Work, the International Association for Food Protection Educator and Harold Barnum Industry Awards. He is a Fellow and former member of the Board of Directors of the Institute of Food Technologists, former Chair of the International Food Science Certification Commission, and former member of the Board of Directors of the American Spice Trade Association. On a personal note, early in his career he served as a deck hand on an Alaskan fishing vessel (well before Deadliest Catch) and prefers to spend his free time lost on a trail in the Colorado Rocky Mountains.

Jon Bell, Ph.D.
National Seafood Inspection Laboratory,
National Marine Fisheries Service

Dr. Jon Bell has been the Director of the National Seafood Inspection Laboratory for the National Marine Fisheries Service for over 5 years now. NSIL is an ISO 17025 certified laboratory, and is the only seafood laboratory for the agency responsible for management and regulation of our national fisheries. NSIL provides microbiological and chemical analytical services to ensure seafood product quality and safety in support of the agency's fee for service Seafood Inspection Program, Office of Law Enforcement, Animal Bi-products Program, and other NOAA goals and objectives. NSIL, through its Trade Monitoring Program and participation in CCAMLR and ICCAT, provides fisheries trade and data monitoring of imports and exports of fish species that are managed by these international RFMOs. NSIL has recently invested in analytical systems to improve abilities to identify and quantify veterinary drug residues, metals and minerals, biotoxins, bacterial pathogens and other safety hazards in seafood products.

Previously Dr. Bell supported the shellfish and seafood industry in Louisiana as a SeaGrant seafood specialist and Extension Professor in the LSU AgCenter Food Science Department for over a dozen years. Jon's interests focused on seafood handling and processing for both seafood safety and quality improvement. Jon also has extensive experience in canned tuna and other seafood industry positions.

Steven Wilson, M.B.A.

Office of International Affairs and Seafood Inspection, National Marine Fisheries Service

Mr. Wilson is a lead figure for seafood inspection in NOAA. He holds a BS degree in Food Science and Industry and a Master of Business Administration, and has worked in the seafood industry and as an inspector or manager in the Seafood Inspection Program for over thirty-five years including the positions of HACCP Program Manager, Deputy Director of Field Operations, Chief Quality Officer, Assistant Director for Quality and Technology and Deputy Director. He is now the Director of Seafood Commerce and Certification for the NMFS Office of International Affairs and Seafood Inspection. This position includes the duties of Director of the Seafood Inspection Program.

Mr. Wilson has served on the Conference for Food Protection and the HACCP Library Steering Committee for the National Center for Food Safety and Technology. He has also served as the representative of the United States in several international workshops and seminars as an expert in HACCP and Quality Systems for the seafood industry. He participates as one of the US experts in the development and maintenance of the ISO 22000 family of standards. Mr. Wilson is active in the Institute of Food Technologist and the American Society for Quality. He is an ASQ Fellow and a lifetime member of Phi Tau Sigma, the honorary food science society.

INVITED SPEAKERS

Marcel van Dijk
Port of Los Angeles

Marcel van Dijk is the Marketing Manager for the Port of Los Angeles since 2001. Where he is responsible for the business development of the Port and where he maintains relationship with key individuals in the logistic chain as well as beneficial cargo owners.

His focus is on the bulk and break-bulk cargo handling and has responsibility as an account manager for bulk and containerized terminals at the Port of Los Angeles. With his knowledge of the major import and export cargoes, he is keen to develop the Port as a major gateway for containerized and non-containerized cargo.

Prior to joining the Port of Los Angeles, Marcel worked for 15 years in the private sector, a career that spanned many phases of corporate management. His career in the USA started with Honeywell Transportation and Power Systems in 1997, where he was the After-sales business manager for their turbocharger product line. Prior to Honeywell, Marcel worked for Renault Cars in The Netherlands.

Marcel received a Bachelor's degree from the Economic and Administrative College in Utrecht, The Netherlands. He and his wife, Nicky, lives in San Pedro California.

Jana Hennig, M.S., M.B.A.
Positively Groundfish

Jana leads Positively Groundfish, a non-profit trade association with the mission to revitalize market demand for underutilized sustainable West Coast groundfish. Before moving into the world of seafood she gained many years of valuable marketing and sales experience at large food consumer goods companies where she launched over 300 new products and ran countless market and consumer studies. She also worked on the London Olympic Games and 3 start-up accelerators helping young organizations find their product-market fit. She holds an MBA and a Masters in Marine Resource Management, as well as a Certificate in Public Policy from Stanford University.

Sarah Mesnick, PhD

Ecologist and Science Liaison for Strategic Initiatives, External Relations, and Communication
Southwest Fisheries Science Center, National Marine Fisheries Service, National Oceanic & Atmospheric Administration (NOAA)

Adjunct Professor
Scripps Institution of Oceanography, UC San Diego

Sarah Mesnick is an Ecologist at the Southwest Fisheries Science Center (SWFSC), NOAA Fisheries, and adjunct professor at Scripps Institution of Oceanography, UC San Diego. Her research focuses on the behavioral ecology of marine mammals. The main goal of these studies is to provide a behavioral framework within which to investigate population identity, population trends and fishery interactions in cetaceans (whales, dolphins and porpoises). In recent years, she coined the idea of "culinary conservation," merging ocean conservation with a vision for a healthy, responsibly sourced, seafood supply chain. She works strategically with chefs, fishers, scientists, conservationists, processors, and students to build support for bottom-up, incentive based approaches that can reduce seafood waste and bycatch, promote full utilization, and eliminate illegal fishing, while supporting local communities. Sarah is one of the founding members of the Center for Marine Biodiversity (CMBC) and Conservation at Scripps Institution of Oceanography, UC San Diego. She teaches *Sustainable Seafood: Science, Management, and Public Perception* and leads the Sustainable Seafood Initiative at CMBC and SWFSC together with a great number of colleagues, industry professionals, and students.

Haejung An, Ph.D.
U.S. Food and Drug Administration

Haejung An obtained a Ph.D. from the University of Florida in Food Chemistry in 1989. She worked as a faculty member at the Oregon State University, Auburn University, and the University of Southern California from 1991 to 2008 working on assuring food qualifies and safety. In 2008, she began working for the US FDA as a Regulatory Analytical Chemist on various projects to secure food sources free from chemical contaminants. The regulatory levels of some of the contaminants are very low into ppb range and this low level requires the use of highly effective analytical instrument for the detection and analyses. She is responsible for developing, validating, and conducting the regulatory analytical methods for the screening of prohibited chemical contaminants in both domestic and import foods.

Amit Morey, Ph.D.
Auburn University

Dr. Amit Morey is an Assistant Professor in the Department of Poultry Science at Auburn University in Alabama. He works on developing innovative technologies to improve food safety and reducing food waste throughout the supply chain. He has a strong background in food safety, especially on Salmonella, Campylobacter and Listeria as well as food spoilage microbiology and biochemistry. He recently won the coveted New Innovator in Food and Agriculture Research, a National Award, for his concepts termed “Functional Ice” and “First Expire First Out”. He has also worked on developing novel methods to detect poultry meat quality issues. His research has been commercially accepted by the food industry.

Jung Kwon, Ph.D.
Oregon State University

Dr. Jung Kwon is an Assistant Professor of Food Science & Technology at Oregon State University and a faculty member of the Coastal Oregon Marine Experiment Station (COMES)-Astoria. She received a Ph.D. in Food Science at Purdue University and completed postdoctoral training in Nutritional Sciences & Toxicology at UC Berkeley and Program in Molecular Medicine at UMass Medical School. Kwon’s research focuses on exploring unique and valuable biomedical functions of natural molecules derived from marine species through an interdisciplinary approach combining food and biomedical science. She has a particular research interest on the modulatory effect of bioactive dietary constituents in obesity and associated metabolic syndrome, with an emphasis on the regulation of adipose lipid metabolism and inflammation. In addition to research, she is involved in extension and outreach activities to communicate the impact of seafood research with stakeholders as well as the broader public and community.

Rosalee Hellberg, Ph.D.
Chapman University

Rosalee Hellberg is an Associate Professor in the Food Science Program at Chapman University. She teaches several courses, including Food Fraud, Food Microbiology, and Food Industry Tour. Dr. Hellberg received an M.S. and Ph.D. in Food Science and Technology at Oregon State University, where she studied seafood safety and fish mislabeling. She completed a post-doctoral fellowship at the FDA working on the development and optimization of DNA-based methods for the detection of food pathogens and food mislabeling. In 2017, Dr. Hellberg was selected as a recipient of the Emerging Leaders Network Award from the Institute of Food Technologists. She was also a recipient of the 2017 Faculty Award for Excellence in Research from Chapman University. She has published over 40 peer-reviewed articles.

Susan Marks
Alaska Seafood Marketing Institute

Susan is the Sustainability and Certification Advisor for the Alaska Seafood Marketing Institute (ASMI). In this role, she serves as the internal leader and subject matter expert on sustainability and certification in the seafood marketplace, represents Alaska at industry conferences and speaks to relevant issues that help leverage and expand ASMI's sustainability thought leadership. She also works on the Alaska's Responsible Fisheries Management (RFM) Certification Program for seafood sustainability and manages all marketing, outreach and communications and implements strategies for global awareness and recognition.
Susan's seafood career started with the Marine Stewardship Council (MSC) as a Commercial Manager where she promoted the use of the MSC ecolabel throughout the seafood supply chain and increased awareness of the MSC program in the North American market. She later joined the Monterey Bay Aquarium's Seafood Watch program as Senior Partnership Manager. There she oversaw the business relationships with major seafood buyers in the retail and foodservice sectors and consulted with corporate partners and their supply chains to develop and implement sustainable seafood programs, initiatives and commitments.
Susan’s experience in both for profit businesses and NGOS, affords her the unique view of all stakeholders when it comes to understanding how seafood certification and assessment programs are integrated into corporate sustainability policies. A Seattle native, Susan has a BA in Communications from Washington State University.

John Burrows, M.S.
Alaska Seafood Marketing Institute

Mr. Burrows has been the Seafood Technical Coordinator at the Alaska Seafood Marketing Institute for roughly 1.5 years. Currently, he acts a technical and scientific resource for industry, consumers, and other ASMI staff and programs. He synthesizes scientific information into industry reports, guides ASMI strategy and messaging for nutrition, quality, safety, and handling of Alaska Seafood, and provides support for RFM/Sustainability initiatives.

Prior to joining ASMI, he performed research at BioPol ehf., a marine biotechnology entity in Northwest Iceland. With the support of the Icelandic Regional Development Institute (Byggðastofnun) and Food Iceland (Matís) he worked to find new marketing methods for the Icelandic lumpfish fishery after the suspension of its MSC certification, honing in on alternative ecolabels, nutritive qualities, and high consumer perceptions of the point of origin. He has served as a NOAA Saltonstall-Kennedy Grant panelist, and holds numerous seafood quality, safety, and nutrition certifications. Mr. Burrows received his Master's Degree from the University of Akureyri in Iceland.

Sirilak Suwanrangsi, M.S.
Thai Union Group

Ms. Sirilak has been the Regulatory Leader at the Global Innovation Center, Thai Union Group PCL for 5 years now. Her current role is leading the quality system harmonization and the food fraud mitigation and food defense strategy of the business. She provides regulatory supports to Thai Union Innovations and to business globally.
Previously, she worked with Thai Fisheries Department for over 30 years, in the 80s -90s she involved in the MOU on Canned tuna and Frozen shrimp with the Canadian Fisheries and Oceans and eventually these became the Mutual Recognition Agreement on Fish Inspection System between Thailand and Canada. She introduced HACCP to Thai fish inspection and the fishery industry. Her works on fish inspection system and HACCP have been shared among Asian countries. She served as Director of Fish Inspection and Quality Control Division and General Inspector at Thai Department of Fisheries, during 2011-2013. She also served as Thai Agriculture Attache to Japan during 2003-2011. She was the of the past president of the International Fish Inspector Association (IAFI) in 2002-2003, and now served as the Regional Board and Directors At large of IAFI.
Sirilak received a Master Degree from the Technical University of Nova Scotia, Canada.

John DeBeer, M.B.A.

John DeBeer retired in 2019 as the Vice-President of Quality Assurance for Chicken of the Sea. He has 48 years in the tuna business as a scientist, Program Manager of a large-scale tuna/porpoise research program, Operations Manager, VP of Operations and QA for COSI. He started his career with the IATTC in 1971, and has essentially 20 plus years in the fish capture and procurement side of the business, and 25 plus years in the canning factory operations side of the business. He has co-authored multiple papers (8) on HACCP, and using HACCP principles in processing tuna, as well as, salt penetration in tuna.

Clare Winkel, B.App.Sc & M.B.A.
Executive Manager- Technical Solutions
Integrity Compliance Solutions

Clare has worked in the food industry since 1987, from the meat processing floor up including at CSIRO, Queensland Dept Primary Industry, a private consultant and as a GFSI auditor & trainer. Clare has audited in 13 countries: in Europe, North America, the Caribbean and ANZ with experience across numerous sectors of the industry including: meat processing, seafood processing (including canning in Alaska), farming, fresh produce and the egg industry. Clare has substantial knowledge of the seafood chain in Australia & North America, particularly the Alaskan wild salmon chain. She has lived in 4 countries including in a one street fishing village in Ireland.
From 2006-2008 Clare worked on EU project FP6- 518451 'Developing a Stakeholders Guide on the vulnerability of food/feed chains to dangerous agents & substances' with the scientists at Wageningen University & Research (WUR The Netherlands) & developed a method to assess the farmed Atlantic Salmon food supply chain for to identify vulnerabilities to food safety contaminants, loss of traceability & failure to detect contaminants, all of which are conditions that can lead to food fraud.
From 2010 to 2015, Clare trained US/ Canadian seafood processors in the 'Risk Assessment of the Supply Chain'. In 2016 she developed a method of ranking raw materials at risk of fraud and has been undertaking consultancies and training using this method since then. To date Clare has personally assessed in excess of 600 raw materials using this method.
Clare has audited in 14 countries: in Europe, North America, the South Pacific (tuna sector), the Caribbean and Australia with experience across numerous sectors of the industry.

Hilary Cole, M.B.A.
U.S. Department of Agriculture

Hilary Cole was appointed as Branch Chief of the Livestock, Poultry and Fish (LPF) Branch within the Agricultural Marketing Service in March of 2018. Hilary is responsible for directing commodity procurement activity associated with Branch Operations totaling over $1 billion annually. Ms. Cole spent ten years in USDA Dairy commodity procurement prior to working on National Defense contracts as part of the U.S. Department of Energy. Her youth spent on her family farm in Central Missouri heavily influenced her desire to participate in the AMS Commodity Procurement Mission. Hilary is a native of Prairie Home, Missouri and has a bachelor's degree in marketing and an MBA from the University of Central Missouri.

Dan Solis, M.H.A.
U.S. Food and Drug Administration

Mr. Solis started his career with FDA in 1998. Prior to working in FDA, Mr. Solis worked in the R&D field focusing on Medical Device and Drug Application Products with Biotechnology firms. Mr. Solis has held many positions within FDA that includes working at the FDA lab in Irvine, Ca, HQ positions with the Division of Import Operations in Rockville, MD, working at FDA HQ – IT branches and working in the FDA Los Angeles District Office Enforcement
Operations. Mr. Solis was selected to be the Division Director for the Division of West Coast Imports on February 9, 2018. Prior to that, he was the Director of Import Operations for the Los Angeles District since 2009. He now runs one of the largest Import Divisions in the FDA's Office of Enforcement and Import Operations. The Division of West Coast Imports manages all FDA Air and Sea Port Offices and FDA Import employees in the states of Washington, Oregon, Nevada, California, and Hawaii. Mr. Solis holds a Masters Degree in Healthcare Administration from the University of LaVerne and a Bachelor's Degree from University California of Irvine.

Trevor Findley, LL.M.
U.S. Department of Agriculture

Trevor Findley is the Deputy Director of the Food Disclosure and Labeling Division at USDA. Before joining AMS to help draft the National Bioengineered Food Disclosure Standard, he worked on production agriculture programs with the USDA's Farm Service Agency and Risk Management Agency. Prior to joining USDA, he completed his Masters of Law in Food and Agricultural Law at the University of Arkansas and worked as an attorney in private practice where he represented clients throughout the food supply chain.

PROGRAM OUTLINE

SUNDAY MARCH 1, 2020

4-6 pm	**Registration** – Mauretania Room (M Deck)
6-8 pm	**PFT President's Reception: Celebrating PFT Past-Presidents** – Verandah Grill (Sun Deck)
8-9 pm	**PFT Executive Meeting** - Mauretania Room
9 pm-Midnight	**Cards and Social Hour** - Mauretania Room

MONDAY MARCH 2, 2020

8-11 am	**Registration** – adjacent to Royal Salon
8-9 am	**Breakfast** – Verandah Grill

SESSION 1 – Global Seafood Trade - Royal Salon

Moderator – Christina DeWitt (Oregon State University)

9-9:10 am	**Opening Remarks** - Alexandra Oliveira, PFT President
9:10-9:55 am	**Can Seafood Science Alter Prevailing Paradigms?** - Douglas Marshall (Eurofins Scientific), *Keynote Address*
9:55-10:30 am	**Challenges of Large Ports** - Marcel van Dijk (The Port of Los Angeles), *Invited Speaker*
10:30-10:45 am	**Coffee Break**

SESSION 2 – Seafood Safety, Quality, and Traceability - Royal Salon

Moderator – Necla Demir

10:45-11 am	**Leveraging Molecular Genetics Tools to Modernize Seafood Traceability at Multiple Levels of the Global Supply Chain** - Demian A. Willette (Loyola Marymount University)
11-11:15 am*	**Multimode Spectral Fusion Using Artificial Intelligence for Mislabeling Fish Species** - Ray Duran (University of North Dakota) *Student competition
11:15-11:30 am	**Fleet Manager Training/Outreach: USDA-NIFA Grant Funded Project to Improve Food Safety and Quality** - Angee Hunt (Oregon State University)

11:30–11:45 am	**Estimation of Post-Harvest Losses of Fish Transported Using Ice-Chilled Carrier Boats from High Seas Pocket** - Ulysses M. Montojo (National Fisheries Research and Development Institute, Philippines)
11:45 am-Noon	**Global Seafood Trading – An Australian Perspective** - Mark Boulter (Seafood Importers Association of Australasia)
12-1 pm	**Lunch** - Verandah Grill

SESSION 3 – Seafood Utilization and Marketing - Royal Salon

Moderators – Amit Morey (Auburn University) and Lin Koh (BluWrap)

1-1:35 pm	**A Culinary Engineering Approach to Reducing Waste and Increasing the Value of Local Fisheries: Reducing Discards at Sea and Promoting Full Utilization – A San Diego Seafood Collaboration** - Sarah Mesnick (NOAA Fisheries), *Invited Speaker*
1:35-2:10 pm	**From "Overfished" to "Underutilized" - Now How to Get Groundfish to "Optimized"** - Jana Hennig (Positively Groundfish), *Invited Speaker*
2:10-2:25 pm	**A Method for Evaluating Consumer Preferences for Farmed Oysters** - Barry Nash (North Carolina Sea Grant)
2:25-2:40 pm	**Coffee Break**
2:40-2:55 pm	**Health Benefits of Surimi Seafood** - Jae Park (Oregon State University)
2:55-3:10 pm	**Cephalopods Skin Protein and Pigments: Antioxidant activity and structure by nuclear magnetic resonance** - Josafat Marina Ezquerra Brauer (University of Sonora, Mexico)
3:10-3:25 pm*	**Nucleotide Content of Alaska Pollock (*Gadus chalcogrammus*)** - Kevin A. Nelson (Oregon State University) *Student competition
3:25-3:40 pm	**Co-products from Indian Fish Processing Industry Reveals their Suitability for Production of Value Added Products** - Nutan Kaushik (Amity University, India)

SESSION 4 – Poster Session & Wine and Cheese – King's View Room

4-5:30 pm, *Moderator – Jung Kwon (Oregon State University)*

Antiproliferative Compounds Obtained from White Shrimp (*Litopenaeus vannamei*) in Human Cancer Cell Lines - María de Guadalupe Ruíz Almada (University of Sonora, Mexico)

Poster Session (cont'd)

Inactivating Viruses with Ultralow Temperature HPP - Christina DeWitt (Oregon State University)

Ultralow Temperature High Pressure Processing for Inactivation of *Listeria monocytogenes* in Frozen Ready-to-Eat Shrimp - Christina DeWitt (Oregon State University)

Production and Characterization of a Novel Beverage from Laver (*Porphyra dentata*) through Fermentation with Kombucha Consortium - Jong-Bang Eun (Chonnam National University, South Korea)

Shotgun Metagenomic Reveal Compositional Structure and Metabolic Pathways of Bacteria in Hongeo, a Korean Traditional Fermented Skate During Fermentation - Jong-Bang Eun (Chonnam National University, South Korea)

Anti-Inflammatory Potential of a Bioactive Fraction Isolated from Wild Shrimp (*Litopenaeus stylirostris*) Muscle - Armando Burgos-Hernández (University of Sonora, Mexico)

Expanding Markets for Local Proteins: Training Wholesale Buyers, Developing New Products, Aggregating Demand and Scaling Up in the Pacific Northwest - Angee Hunt (Oregon State University)

Structural Changes in Cathepsin D from Japanese Clam (*Ruditapes phillipinarum*) at Different Conditions of pH and Temperature - José Luis Cárdenas López (University of Sonora, Mexico)

Total Nucleotides as Nucleotide Monophosphates Method Development - Kevin A. Nelson (Oregon State University) *Student competition

Labeling Compliance, Species Authentication and Net Weight Identification of Frozen Fish Fillets in Southern California - April M. Peterson (Chapman University) *Student competition

Antiproliferative Compounds from White Shrimp (*Litopenaeus vannamei*) Induce Caspase Activation and Apoptosis in Murine Lymphoma Cells - Carmen Maria Lopez Saiz (University of Sonora, Mexico)

Use of DNA Barcoding Techniques for the Identification of Fish Species in Fish Balls - Anthony J. Silva (Chapman University)

DINNER ON YOUR OWN

8 pm-Midnight **Cards and Social Hour** - Mauretania Room

TUESDAY MARCH 3, 2020

8-11 am **Registration** – adjacent to Royal Salon

8-9 am **Breakfast** - Verandah Grill

SESSION 5 – Analytical Testing of Seafood - Royal Salon

Moderator – Angee Hunt (Oregon State University)

9-9:45 am **The National Seafood Inspection Laboratory: Status and Future** - Jon Bell (NOAA National Seafood Inspection Laboratory), *Keynote Speaker*

9:45-10:20 am **Chemical Contaminant Screening to Ensure the Safety of Seafood Products** – Haejung An (U.S. Food and Drug Administration), *Invited Speaker*

10:20-10:35 am **Coffee Break**

SESSION 6 - PFT President's Session - Royal Salon

Moderator – Josafat Marina Ezquerra Brauer (University of Sonora, Mexico)

10:35-11:05 am **Building a Technological Future for the Seafood Industry** - Amit Morey (Auburn University)

11:05-11:35 am **Marine-derived Bioactive Molecules and Functional Food Material** - Jung Kwon (Oregon State University)

11:35 am-12:05 pm **Seafood Fraud and Mislabeling** - Rosalee Hellberg (Chapman University)

12:05 - 1:05 pm **Lunch** - Verandah Grill

SESSION 7 – Industry Perspectives - Royal Salon

Moderator – Virginia Ng (Seafood Products Association)

1:05 -1:40 pm Title pending - Roxanne Nanninga (Thai Union North America), *Invited Speaker*

1:40 - 2:15 pm **What is Sustainable Seafood? – Exploring Certification and Beyond** - Susan Marks and John Burrows (Alaska Seafood Marketing Institute), *Invited Speakers*

2:15 - 2:50 pm	**Combating Food Fraud and Food Defense: A Global Business Initiative** - Sirilak Suwanrangsi (Thai Union Group), *Invited Speaker*
2:50-3:05	**Coffee Break**

SESSION 8 – Seafood Safety and Processing - Royal Salon

Moderator – Jae Park (Oregon State University)

3:05-3:40 pm	**21st Century Tuna Processing**- John De Beer (Chicken of the Sea Intl.), *Invited Speaker*
3:40-4:15 pm	**Salmonella in Raw Fish Fillets – Why do We Not Consider it a Food Safety Hazard?** Clare Winkel (Integrity Compliance Solutions), *Invited Speaker*
4:15-5 pm	**PFT General Meeting** - Mauretania Room
6-7 pm	**Cocktails** – Royal Salon
7-9:30 pm	**PFT Banquet & Student Awards** – Royal Salon
9:30-Midnight	**Cards and Social Hour** - Mauretania Room

WEDNESDAY MARCH 4, 2020

8-9:30 am	**Registration** – adjacent to Royal Salon
8-8:30 am	**Continental Breakfast** - The King's View

SESSION 9 – Seafood Compliance and Commodity Acquisitions - Royal Salon

Moderator – Laurice Churchill (NOAA)

8:30-9:15 am	**Trends in Seafood Compliance and Certification** - Steve Wilson (U.S. Department of Commerce, NOAA), *Keynote Address*
9:15-9:50 am	**Commodity Procurement Program Overview** - Hilary Cole (U.S. Department of Agriculture), *Invited Speaker*
9:50-10 am	**Coffee Break**

SESSION 10 – Regulatory Updates and Panel Discussion - Royal Salon

Moderator – Bruce Odegaard (Seafood Products Association)

10-10:30 am	**FDA Seafood Importation Updates** - Dan Solis (U.S. Food and Drug Administration), *Invited Speaker*
10:30-11 am	**Country of Origin Labeling (COOL) Overview and Updates** – Trevor Findley (U.S. Department of Agriculture), *Invited Speaker*
11-11:30 am	**National Bioengineered Food Disclosure Standard** - Trevor Findley (U.S. Department of Agriculture), *Invited Speaker*
11:30 am-Noon	**Panel Discussion** with FDA, USDA and NOAA
Noon	**Closing Remarks**

ORAL ABSTRACTS

Can Seafood Science Alter Prevailing Paradigms?

Doug Marshall, *Keynote Address*
Eurofins Scientific

This talk will address a few “set in stone” beliefs about seafoods, either held by consumers or held by producers and processors. Such convictions occasionally fly in the face of scientific facts, having origins as pass-down folklore or as political fodder placing blame on the innocent. This talk will discuss two examples that the presenter addressed in his former research program. The first conversation will address the food safety implications of consuming raw molluscan shellfish and present research data showing how a simple change in consumption behavior may reduce vibriosis risks. The second topic will focus on the long trail of poor decisions that some US aquaculture producers have followed in an attempt to maintain market share against a tide of foreign imports.

Challenges of Large Ports

Marcel van Dijk, Invited Speaker
The Port of Los Angeles

The two largest Ports in North America are the Port of Los Angeles and the Port of Long Beach. These two ports are handling 38% of all containerized cargo in the USA. With the manufacturing of many consumer goods in Asia, these ports have seen a tremendous increase in cargo volume in the last 20 years. This tremendous growth in cargo has brought many challenges to the Ports of L.A. and Long Beach.
We see now on a regular basis container ships that carry 13,500 containers. To facilitate these large vessel we have engage in infrastructure improvements, participate in cargo process managements and introduced technology to facilitate cargo conveyance. One of the investments the port made is the construction of the first fully automated container terminal on the West Coast. The total investment for this terminal was $ 510 million. On a regular basis we discuss with our partners in the transportation sector, how we can improve the efficiency of cargo transportation through the port. These efforts are all supported by the introduction of technology that provide the freight community a forecast of the containers that will arrive to our port 14 – 20 days in advance.
Through these measures, we will build a first class port system that can handle fluctuations of cargo in the future.

Leveraging molecular genetics tools to modernize seafood traceability at multiple levels of the global supply chain

Demian A. Willette[1]*, Samantha H. Cheng[2], Zack Gold[3], Jerry Greenberg[4], Gabriela Navarrete-Forero[5], Dan Solis[6], Paul H. Barber[3]

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Global seafood consumption now exceeds 20 kg/person/year, commands a value of $143 billion on the global market, and sustains the livelihoods and nutrition of nearly 4.5 billion people. Under this pressure, wild-caught fisheries continue to decline, pushing the need for long-term sustainability to the forefront of national and regional priorities. The effectiveness of conventional monitoring and surveillance tools are limited as they are time-consuming and require expertise in fish identification. In contrast, emerging molecular genetic methods are creating new opportunities to expand capacity for seafood identification throughout the supply chain. Here, we present a case study from the Los Angeles Seafood Monitoring Project, an effort to co-design a city-wide solution to reducing mislabeling at point of sale. This unique collaboration of science, industry, government, and the private sector, is working together to revise seafood labeling regulation using robust molecular genetics methods and build dialogue around *how* to go about reducing instances of fraud (egregious) vs. mislabeling (disconnect between practice and regulation). We also describe a novel, approach for profiling commercial fish catch composition, employing eDNA metabarcoding analysis on melt water in fish holds to demonstrate that actual hold contents can differ substantially from crew-reported catch composition. For example, from one vessel seven of 16 species (tunas, wahoo, dolphinfish) identified in the eDNA analysis were reported by the crew, with most of those not reported identified as typical by-catch species. We describe lessons learned from these two case studies and outline future directions and promising opportunities for seafood mislabeling technology.

Multimode Spectral Fusion Using Artificial Intelligence for Mislabeling Fish Species

Ray Duran[a], Khouyar Tavakolian[a], Fartash Vasefi[b] Alireza Akhbardeh[b,c], Jianwei Qin[d], Chansong Hwang[d], Insuck Baek[d], Walter F. Schmidt[d], Moon S. Kim[d], Rosalee S. Hellberg[e], Ayse Gamze Yilmaz[e]

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1. Introduction

The marriage of multiple sensory spectroscopy, computing power and statistical learning or artificial expert intelligence is really something that until quite recently was not feasible enough for widespread commercial applications in food safety and identification. Advances in all the above disciplines have allowed the synergy of methodologies and technologies in new and exciting ways.

2. Objective

Our goal is to use multimode spectral imaging data acquired from multiple optical imaging systems and derive statistics to help us identify fish species from the multimode fusion of data.

3. Method

The first stage of our system is a group of PCA data reduction modules, by variance or components, that perform dimensional reduction. This is followed by two types of Support vector Machines that are cubic and quadratic polynomial kernels. We then compile average and variance tables for each fish, sensor and class. Next, we apply a weight to these tables, and learn the value of our policy (weighting) by assigning a reward for a correct decision and an extra reward if no nonzero contributions from any possible mismatch. With a learned" system we apply

fresh data and then add up all the sensor components.

4. Results

Our analysis results are broken down into two broad categories: Fish labeled from single sensors or fish from multiple sensors. When reporting single sensor results, we again divide into two categories, training size = 150 or 175 samples.

5. Conclusions

Contrast the single senor scenario, with the results of the Fusion of sensors. With the usage of at least three sensors, we never had any sensitivity readings that would show less than 98.75% accuracy. With a training size of at least 175 samples and the use of four sensors we had no miss classifications at all. Even when we only fused two sensors we still had very respectable sensitivity readings, albeit with Fluorescent and Raman sensors. Overall, for most sensor usage numbers the accuracy of our results remained robust for our training experiments. To the best of our knowledge the unique contribution of the LearnFish algorithm is applying reinforcement learning to the acquired statistical tables that we formulated from unsupervised and supervised learning.

Student Competition Participant

Fleet Manager Training/Outreach: USDA-NIFA grant funded project to improve food safety and quality

*Angee Hunt, Oregon State University Seafood Research & Education Center
Christina DeWitt, Oregon State University Seafood Research & Education Center

With the quota system well established to maintain seafood harvests at sustainable levels, the most impactful way to influence food safety and quality is to ensure best practices are observed and implemented from harvest to plate. Food product quality is strongly associated with initial handling, therefore proper handling at the beginning is critical. However, seafood harvesters are a difficult audience to target and reach, therefore, the role of frontline communicators to educate fishermen is essential to ensure harvests are handled in a way to maximize food safety and quality.

During the 2019 OSU Better Seafood Processing School, a significant topic of discussion that came to light was the lack of education of seafood industry frontline communicators, including fleet managers, dock managers, buyers, etc. with regards to food safety and best practices. A proposal was then developed and submitted to the USDA-NIFA Food Safety Outreach Competitive Grants Program.

Collaboration is key to developing an outreach program and incorporating relevant content. A planning committee including members associated with the seafood industry, Seafood Products Association and Oregon State University Seafood Research & Education Center are currently working to establish the timeline for development and implementation of this Fleet Manager Training Program.

This presentation will highlight the value of continuously engaging constituents/stakeholders to identify areas of need/concern, as well as, the impact of interdisciplinary collaboration in serving the needs of the greater seafood industry to ensure safe, high quality, and sustainable seafood harvests that are maximally utilized.

Estimation of Post-Harvest Losses of Fish transported using Ice-chilled Carrier Boats from High Seas Pocket [1]

Ulysses M. Montojo*[1], Virginia H. Delos Santos[1], Camille M. Narida[1], Ivy Y. Febreo[1], Deserie M. Peralta[1]

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Introduction. Access of Philippines' fresh/ice-chilled seining vessels to High Seas Pocket 1(HSP1) of the Pacific Ocean lessens fishing effort in catching tunas in the country's Exclusive Economic Zone, however, catch landed are observed to be of reduced quality that fetch lower value in the market.

Objective. To know the capacities of ice-chilled carriers to preserve and maintain the freshness of oceanic tuna caught from HSP1, and estimate the magnitude of post-harvest losses of their catch.

Materials and Methods. Exploratory Fish Loss Assessment Method and Questionnaires Loss Assessment Method were used to estimate quality losses. Species observed were yellowfin, big eye, and skipjack.

Results and Discussion. A total of 17.25% was recorded as loss. Losses were observed from reduced fish quality having lacerated flesh, skin loss, or belly burst. Highest loss was observed in species of skipjack at 14.59% which is also the major species caught. Low quality of catch are commonly processed into canned goods. Others are processed as smoked or fishmeal, and command much lower value. As a compliance to Article 11.1.8 of the CCRF, improvement of the current fish preservation technique and facilities in carrier boats is important to reduce fish loss.

Conclusion. Estimated loss recorded a total of 17.25% or equivalent to USD4.29 M financial loss. Losses can be reduced if carrier boats can preserve the quality of fish before it is landed. This may be possible if HSP1 vessels be allowed to use carrier boats with freezing capacity to maintain the quality of catch throughout the fishing duration.

Global Seafood Trading – An Australian Perspective

Mark Boulter, Executive Officer, SIAA, Seafood Importers Association of Australasia
safesustainableseafood@gmail.com

Mark Boulter is the Executive Officer of the Seafood Importers Association of Australasia. The Association represents 15 companies that import about 50% of the seafood that comes into Australia from overseas, valued at approximately $1Billion AUD/pa.

In this presentation Mark will outline the current seafood trading 'rules framework' operating in Australia including outlining some of the recent changes that have had an impact on industry, such as tighter biosecurity rules, stronger weights and measures legislation enforcement and new Modern Slavery legislation requirements.

In this presentation he will also discuss what further changes we can possibly expect in the near future that will impact global seafood trading.

A Culinary Engineering Approach to Reducing Waste and Increasing the Value of Local Fisheries: Reducing Discards at Sea and Promoting Full Utilization – A San Diego Seafood Collaboration

Sarah Mesnick (*Invited Speaker*), Heidi Dewar, and Oriana Poindexter (Southwest Fisheries Science Center, NOAA Fisheries); Mark Helvey (Sustainable Seafood Consultants); Dave Rudie (Catalina Offshore Products); Davin Waite (chef/owner, Seabasstropub restaurants); Kelly Fukushima (F/V Three Boys)

There are multiple opportunities to add value and reduce waste across the seafood supply chain. We will share the approach taken by the San Diego Seafood Collaboration to develop markets for under-loved species and under-valued cuts of fish. We focused on fish from two U.S West Coast fisheries: deep set long line and drift gillnet for swordfish. This project addressed waste at both the harvesting and processing stages by using a culinary engineering approach to convert at-sea discards and in-plant processing discards into edible products. Project fishermen were tasked with special discard handling instructions at sea, the project processor with breakdown and distribution, and project chefs with multiple kitchen experiments. A focused culinary test event and a large public tasting event were conducted to gauge response to the new recipes and products. The project involved 13 fishermen providing technical advice and/or catching nine different fish species and 18 chefs collectively producing 47 different recipes for six of the species. The species included opah, thresher shark, blue shark, low-grade bigeye tuna, swordfish parts, and Pacific mackerel. Efforts to create recipes for mola mola and lancetfish were deemed not worth pursuing. One chef continues experimenting with snake mackerel as a culinary item for his restaurant. The project also produced four information/recipe cards to be used by fishermen, chefs, and the public in order to provide recipes “for the rest of us” as well as factual information with which to educate the public, as well as buyers and restaurants, about the sustainability of local fisheries and to correct misinformation. Chefs created exciting new recipes, such as tuna bloodline yakitori, opah “flank” burgers, and swordfish bone marrow shooters. Together, we show that it is possible, desirable and delicious to diversify local palates and to “think beyond the filet” as an actionable way for consumers concerned about oceans to do something tangible for conservation. Eating more of the landed catch also supports local fishing communities, reduces our ecological and carbon footprint, and increases access to healthy protein at a greater range of price points. While our starting point is a culinary one, there is much more that can be done and for which collaboration with the Pacific Fisheries Technologist community would be of great value, such as dedicated processing for tuna bloodline and specialized methods of preservation including smoking and jerky. Next steps also include pursuing non-culinary uses including biopharmaceuticals, biomedical applications and novel materials for fish skin. The San Diego Seafood Collaboration aims to promote ocean conservation and support local fishing communities by taking what is currently undervalued and using a culinary engineering approach to diversifying palates and product bases without increasing harvest.

From “Overfished" to “Underutilized” - Now How to Get Groundfish to “Optimized”

Jana Hennig, *Invited Speaker*
Positively Groundfish

The West Coast IFQ trawl groundfish fishery has experienced a remarkable ecological recovery since its collapse in 2000. Key commercial species of rockfish and sole are now considered sustainable and have earned accreditation by the Marine Stewardship Council (MSC) and “Best Choice” ratings by Seafood Watch. However, the fishery has quickly tipped from “overfished” to “underutilized and is still struggling economically. During the two decades the fishery was being rebuilt, the market demand for these species has vanished, foreign imports surged, operating costs increased, and infrastructure and fishing capacity declined. In a bid to unlock the economic potential of the groundfish fishery, a new cross-sector collective, Positively Groundfish, is now on a mission to spark renewed interest and regenerate market demand for these underutilized species. This new non-profit carries out crucial market research, and runs impactful promotional campaigns targeting the foodie public, chefs and retail buyers, and is seeing signs of market success.

A Method for Evaluating Consumer Preferences for Farmed Oysters

Barry Nash*, North Carolina Sea Grant, Chuck Weirich, National Sea Grant Office, and Ben Watrous, Poole College of Management at North Carolina State University

Introduction: The demand for oysters is growing in North Carolina, yet the state's nascent shellfish aquaculture industry remains relatively unknown to seafood consumers as it competes with oysters that are cultivated in other states.

Objectives: The purpose of this project was to: 1) determine attributes of North Carolina cultured oysters that might enhance the public's understanding of and appreciation for shellfish mariculture: and 2) learn the attributes that might increase the economic value of North Carolina cultured oysters.

Materials & Methods: Qualitative and quantitative market research was conducted with select North Carolina shellfish growers and shellfish consumers to determine the attributes of cultured oysters both growers and their customers prioritize.

Results & Discussion: Consumers ranked product safety, flavor and the quality of growing waters as extremely important while sustainable production practices, harvest locale and supporting growers' livelihoods were deemed important attributes of North Carolina oysters.

Conclusions: Shellfish customers prioritized product safety as the most important of twelve characteristics profiled. These results shows consumers are likely receptive to information on proper practices for handling, storing and preparing shellfish safely in the home. North Carolina Sea Grant has developed an outreach program to emphasize the factors that enhance the safety and quality of cultured oysters.

Health Benefits of Surimi Seafood

Jae Park
Oregon State University Seafood Research and Education Center, Astoria, OR 97103, USA

Surimi production in a commercial scale started in 1960s when the positive role of sugar as a cryoprotect was discovered. While surimi seafood has been popular with its unique texture and flavor, its health benefits were seldom discussed.
This presentation will review the health benefits of surimi seafood and the role of surimi as fat blocking agent in fried fish cake.

After 30 min intake of surimi seafood, the blood glucose decreased from approximately 225 mg/dl to 190 mg/dl resulted from the blood insulin increased from 3 to 6.5 ng/mg at 15 min. When surimi seafood (8g/kg) was added to the diet of glucose (1g/kg), blood insulin released 3 times more (1.0 to 3.0 pg/ml). Systolic blood pressure (230 to 195 mmHg) and triglyceride level in blood (1200 to 750 mg/dl) decreased significantly by intake of surimi seafood. Antioxidation effect, cerebral function improvement, and suppression of cancer cell growth were also noted significantly as more surimi seafood was fed.

Unlike other fried foods, the fat content in fried surimi seafood was enormously low: 2-3% fat. During processing exterior oil is removed and no breading is used for fish cake. In addition, its unique gelling behavior formed a film blocking the migration of oil from outside to inside, resulting in a significantly low fat content. We found sugar/sorbitol in surimi pushed off oil, resulting in reduced oil uptake.

Health benefits of surimi seafood were reported very positively. Fried surimi seafood contains less than 3% fat and is a very healthy food.

Cephalopods skin protein and pigments: Antioxidant activity and structure by nuclear magnetic resonance

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The search for antioxidants, especially from natural origins, has notably increased in recent years. Seafood skin is an important source of antioxidants compounds. The main idea of this work is to discuss some reports where nuclear magnetic resonance of proton (^{1}H NMR) was used to establish the effect of some process conditions during the production of bioactive squid skin peptides, and to identify the pigments responsible for the antioxidant activity detected in skin cephalopods. Work 1: Three fractions were obtained [> 10 kDa (F1), 5-10 KDa (F2), < 5 kDa(F3)] by ultrafiltration after enzymatic hydrolysis of squid fins. Antioxidant and antimutagenic activities went as it follows: F3>F2>F1. Band at lower field observed in proton-peaks observed at higher NMR fields, associated to antioxidant amino acids, may explain F3 bioactivity. Work 2: Pigments from squid' (S) and octopus' (O) skins were extracted by two systems: methanol-HCl (1%) (M) and ethanol-HCl (1%) (E). Antioxidant activities order: PM>SM>PE=SE. ^{1}H RMN spectra evaluation showed that the pigments present in both extracts belong to the ommochrome family. The difference in antioxidant activity may be due to the difference in proportion that exists in the amino aromatic groups detected by RMN. Work 3: Antioxidant compounds were obtained from methanol-HCl (1%) squid pigments fractionated by open column chromatography and grouped by thin-layer chromatography. The chemical structure identified by ^{1}H RMN of the highest antioxidant fraction obtained from squid pigments was xanthommatin. NMR technique was very useful tool in studies concerning the cephalopods skin bioactive compounds analysis.

Nucleotide Content of Alaska Pollock (*Gadus chalcogrammus*)

Kevin A. Nelson*[1], Christina M. DeWitt[1], Michael Kohan[2], Alina Fairbanks[3], Quentin Fong[3]

[1]*Seafood Research and Education Center, Oregon State University, Astoria, OR*
[2]*Alaska Seafood Marketing Institute, Juneau, AK*
[3]*Department of Fisheries, University of Alaska-Fairbanks, Kodiak, AK*

Introduction: Pollock milt meal has been shown to have significant concentrations of nucleotides. Nucleotides have been described as semi-essential under conditions of ill-health, poor diet or stress. They are utilized frequently in products such as nutritional supplements, baby formula and aquaculture feed. Milt and roe samples were processed as a function of: 1) storage time, 2) temperature and 3) processing conditions to understand how these variables affect nucleotides and the generation of unwanted anti-nutritional compounds.

Objectives: Determine nucleotide content on unprocessed milt and roe. Determine effect of heat processing on nucleotide content in milt. Determine if heat processing creates anti-nutritional compounds in sufficient amounts to negate nutritional benefits of nucleotides in milt.

Materials and Methods: Samples were stored at -70ºC and -18ºC (n=2), stored for 1 or 2 years (n=2) and dried at -40ºC (freeze dried), 70ºC, 100ºC and 120ºC (n=4). DNA was extracted using commercial DNA extraction kits and then analyzed using reversed-phase HPLC. Anti-nutritional compounds were analyzed using a modified k-value method.

Results & Discussion: Concentrations of DNA did not vary based on any of the given variables ($p<0.05$). Results from modified k-value indicate that oven drying may produce significantly ($p>0.05$) larger concentrations of hypoxanthine and inosine than freeze-drying methods.

Conclusion: Different heat processing conditions did not affect concentrations of total DNA as nucleotide monophosphates. UV-VIS may be a viable method for estimating total DNA as nucleotide monophosphates. Oven drying may produce larger amounts of inosine and hypoxanthine than freeze-drying.

Student Competition Participant

Co-products from Indian Fish Processing Industry Reveals their Suitability for Production of Value Added Products

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Introduction

The fish processing industry generates a huge amount of co-product such as head, viscera, skin, and bones, which are expected to possess different industrially important value added biomolecules of nutritional importance. Therefore, co-product exploitation is required to investigate its component molecules in economical and ecologically sustainable way.

Objective

Present study focused on assessment of fish co-product obtained from Indian fish processing industry through its proximate composition analyses for their further use in value added components exploration.

Materials and methods

Co-products such as head, viscera, skin, and bones were analyzed for moisture, protein, fat and ash content along with heavy metal and bacterial analyses as per AOAC methods .Enzymatic hydrolysis was done to obtain protein hydrolysate. The obtained hydrolysates were analyzed for various parameters to assess their suitability for development of value added products.

Results and discussion

The proximate analysis revealed 78% and 74% moisture; 2% and 2% fat; 6% and 10% protein and 6 % and 8% in head and viscera and skin and bones respectively through wet weight basis analysis; whereas, no pathogenic bacteria such as *E. coli and Salmonella* sp. were observed in the co-products. Microbiological analysis indicated total plate count of 15.5 X 10^6 and 14 X 10^6 CFU/ml in head and viscera and skin and bones respectively. Ash content of before mentioned samples were analyzed by Scanning Electron Microscopy (SEM) equipped with Energy Dispersive X-Ray spectroscopy (EDX) for understanding of its mineral composition; which confirmed presence of oxygen, phosphorous and calcium as major element; sodium, carbon, magnesium, potassium, aluminium, silicon, chlorine and tungsten in minor quantity and no toxic heavy metal were detected in these samples. Further enzymatic hydrolysis of head & viscera and skin & bones were performed by using endogenous enzyme and four commercial enzymes (alcalase, bromolein, papain and trypsin) from different sources (microorganism, plant and animal). Protein hydrolysate obtained after hydrolysis with bromolein + papain combination and alcalase was found to contain high amount of total essential amino acids (such as valine, leucine, histidine, lysine, methionine, threonine, phenylalanine and tryptophan) and having antioxidant properties.

Conclusion

The present study revealed that co-product from fish processing industry are valuable source of protein, fats and absence of toxic heavy metals and pathogenic bacteria facilitate by-product utilization such as food nutrient fortification. Studies on protein hydrolysis indicate high yield and good nutritional quality of hydrolysate which can be used for development of different value added products.

The National Seafood Inspection Laboratory: Status and Future

Dr. Jon Bell, *Keynote Speaker*

Director, National Seafood Inspection Laboratory, NOAA Fisheries

The National Seafood Inspection Laboratory (NSIL) is a Division in the Office of Sustainable Fisheries (OSF), which is part of NOAA Fisheries (aka National Marine Fisheries Service) in the U.S. Department of Commerce. NSIL is located in Pascagoula, MS, with laboratories and office space in the MS Laboratory building of the South East Fisheries Science Center. NSIL has two main components, the Analytical Program and the Trade Monitoring Program.

The Trade Monitoring Program (TMP) began development in 2000 at NISL, and now includes 7 staff who are responsible for the monitoring and reporting of harvest, transport, and trade data and documentation for the import and re-export of fisheries products from species managed by Regional Fisheries Management Organizations to meet U.S. obligations. Working with the offices of International Affairs, Law Enforcement and other governmental organizations, NSIL's TMP currently monitors compliance to RFMO requirements for the trade of Bluefin tuna, swordfish, toothfish, and frozen bigeye tuna. Recent improvements in technological systems and cloud-based databases has increased monitoring efficiencies and compliance with the seafood industry.

The Analytical Program contains both microbiology and chemistry sections, comprising of 10 staff scientists and technicians. A primary responsibility is the testing seafood samples for bacterial pathogens and chemical compounds and potential food safety hazards in support of NOAA Fisheries' Seafood Inspection Program (SIP) systems and programs and OSF priorities. The Analytical Program provides testing and expertise to the Office of International Affairs and Seafood Inspection to support NOAA's Aquatic Animal Bi-Products program and export certification of these products. NSIL provides seafood science and technical expertise to the agency, and leads NOAA's representation on the Interstate Shellfish Sanitation Conference (ISSC). NSIL also is actively involved with the AOAC, NACMCF and other governmental and industry food safety organizations.

Chemical Contaminant Screening to Ensure the Safety of Seafood Products

Haejung An, *Invited Speaker*

FDA/Pacific Southwest Food and Feed Laboratory
Irvine, CA 92612

Chemical contaminants such as antibiotics, pesticides, and industrial chemicals can have a short-term and a long-term effect on the health. Antibiotics have been used in the intensive aquaculture and they need to be monitored to prevent antibiotic resistance and ensure the human health. Detection of antibiotics can be challenging because the low regulatory action levels at or near parts per billion (ppb). Use of highly advanced instrument such as liquid-chromatography tandem mass spectrometry (LC-MS/MS) and good quality controls systems are necessary to ensure the detection and the true measurement analyte levels in the products.

Building a Technological Future for the Seafood Industry

Amit Morey, *Invited Speaker*
Department of Poultry Science, Auburn University, AL 36849

Paradigm shifts in consumer demographics and demands combined with a complex supply chain, food waste and food safety issues will have an ever increasing effect on the seafood industry. The industry has made significant strides to improve production efficiencies, quality and safety and needs modern technologies to strengthen the future. Emerging technologies such as blockchain are being used in conjunction with IOT and data analytics to not only track the products from farm-to-plate but also ensure food safety, antimicrobial use, authenticity and regulatory compliance of seafood. Blockchain capabilities can be used to implement new concepts such as “First-Expire-First-Out” to replace the traditional “First-In-First-Out” in supply chain to reduce food waste. Augmented Reality application in processing environments reduces communication errors leading to reduced downtime and increased productivity by 50-75%. Technologies can be expensive and need a well-developed ecosystem for their adoption which is unavailable in several seafood trading communities. There is a need to develop low-cost, easy-to-use and cost effective technologies for the benefit of the global seafood industry. A low-cost concept termed as “Functional Ice” (FICE) was developed and validated to study improvements in shelf-life, food safety and quality during post-harvest handling and storage. Studies on shrimp stored on FICE in the wet-markets in Honduras and Nigeria indicate reduced seafood waste due to spoilage. The seafood sector should invest, develop and adopt technologies to build a strong future for industry.

Marine-derived Bioactive Molecules and Functional Food Material

Jung Yeon Kwon,[1,2] *Invited Speaker*

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[2]Seafood Research and Education Center, Oregon State University, Astoria, OR, USA

The interests of consumers in utilizing natural dietary components and functional foods as a strategy to improve health or prevent disease are increasing. This trend stems from accumulating scientific reports and evidence that elucidate bioactive functions of dietary components and molecules for human health by regulating specific genes and molecular pathways important for health and certain diseases. Marine species are an imperative source of nutrition for humans as well as a rich reservoir of unique chemical constituents with potential biological effects that have not been fully identified. There are needs for research to explore the biological functions of various marine materials and their implications in diseases to assess the values and develop applications of these molecules for human health promotion and disease prevention.

Furthermore, this research approach can tackle the crucial issue most seafood products harbor with a high rate of underutilization. Currently, only 25-50% of harvested seafood is used for human consumption and a major portion of raw materials is discarded during processing as waste or low-value by-products. This not only leads to a substantial loss of valuable food resources and revenue but also generates environmental impacts. A significant portion of discarded materials during seafood processing retains nutritional value and contains biologically active compounds. Illuminating the functional value of such underused materials would provide opportunities for the seafood sector to stimulate their better utilization and add value to the otherwise minimally valued or wasted resources.

This research area holds critical importance in recognizing the health benefits of a variety of bioactive molecules that derive from marine environment and may be of great interest in biomedical applications for human health. Additionally, the research focused on underutilized raw materials will contribute to promoting efficient utilization of the harvested marine resources and reducing waste.

Seafood Fraud and Mislabeling

Rosalee Hellberg, *Invited Speaker*
Chapman University

Food fraud or economically motivated adulteration (EMA) is defined as the intentional misrepresentation of the identity or contents of a food ingredient or product for economic gain. Food fraud can have significant impacts in areas such as food safety, consumer confidence, food quality, brand integrity and business revenue. Seafood is a major target of food fraud. It is susceptible to a variety of fraudulent practices, including species substitution, transshipment, and short weighting. This presentation will discuss the global seafood industry and the ways in which it is vulnerable to fraud. Common categories of seafood fraud will be discussed, along with the potential consequences and negative health impacts of fraud. Specific research conducted at the Food Protection Laboratory at Chapman University will be highlighted, including a recent study that investigated fish species labeling, use of acceptable market names, and Country of Origin Labeling (COOL) compliance for fresh fish fillets sold at grocery store seafood counters in Southern California.

What is Sustainable Seafood? – Exploring Certification and Beyond

Susan Marks and John Burrows, *Invited Speakers*
Alaska Seafood Marketing Institute

The definition of 'sustainable seafood' is a moving target and the numerous seafood ecolabels and assessment programs can often lead to further confusion. As consumer awareness increases, so does the number of ways people define sustainable seafood. While seafood certification programs have primarily focused over the last ten years on criteria for *environmental* impacts, new areas such as social responsibility are starting to gain more attention. The proliferation of eco-labels and seafood guides has caused ample confusion for seafood buyers. Recognizing the challenge this posed, the Global Sustainable Seafood Initiative (GSSI) developed a global benchmarking tool in 2015, which has helped to better understand seafood certification programs and identify which are credible. This session will provide a brief background on seafood certification and explore the impacts of GSSI's multi-stakeholder platform which has provided confidence in certified seafood, promoted improvement in certification schemes and established the importance of 'choice in certification'. We will also provide an overview of the Alaska Responsible Fisheries Management (RFM) Program, and discuss the program's future. Alaska RFM was the first program to be successfully benchmarked by GSSI in 2016, and serves as a verification of fishery-wide best practices that are inherent to Alaska. Independent third-party certification is required to sell seafood into many parts of the world; however, it is sustainability that emerges as a primary selling attribute for Alaska seafood. We will look at how the Alaska Seafood Marketing Institute (ASMI) conveys Alaska's complete sustainability story, and has adapted our messaging to accommodate the variations people have when asked 'What is Sustainable Seafood?'

Combating Food Fraud and Food Defense: A Global Business Initiative

Ms. Sirilak Suwanrangsi, *Invited Speaker*

Global Regulatory Leader
Thai Union Group PCL
Bangkok, Thailand

Every day, Thai Union produces healthy and nutritious food for customers around the world. Ensuring our products are safe and pose no risk to the health of our customers is a top priority. With this in mind, Thai Union has developed a new strategy to protect our food supply chains from any risk of intentional contamination.

Our Combating Food Fraud and Food Defense Strategy incorporates a series of robust programs that will strengthen our ability to combat food fraud. Food fraud includes the deliberate and intentional substitution, addition, tampering or misrepresentation of food, food ingredients or food packaging, along with false or misleading statements made about a product, for economic gain. Thai Union already has a number of measures in place to combat food fraud, which will be enhanced by the Combating Food Fraud and Food Defense Strategy, which will allow our teams to assess any vulnerabilities in our supply chains.

We have also created a Manual of Mitigation Measures to Combat Food Fraud and Intentional Adulteration, an in-depth guide on developing measures to mitigate any threats specific to each of our business unit worldwide.

The presentation will discuss the key steps taken in developing the Thai Union Global Combating Food Fraud and Food Defense Program, lesson learnt and future tasks.

21ST Century Tuna Processing

John DeBeer, *Invited Speaker*

Former Vice-President of Quality Assurance for Chicken of the Sea

Although processing tuna for long term preservation (canning) has been around for about 150 years, there has been substantial knowledge has been added with the changes made in the last decades of the 20th century and the first decades of the 21st century. All of the knowledge gained, and changes made have made for better, safer, and more efficient tuna processing. Sometimes the safety changes are forced on the industry, and, also, it takes time for the knowledge and changes to be spread through the industry, but in the end, the changes get made.

The species of tuna and their life-history and habitat usage impact tuna handling and tuna processing. Each of the predominate tuna species is unique in the capture and usage. Changes in tuna sourcing and processing in the 1970's and 1980's forced changes in tuna preservation techniques that had many upside benefits with some possible downside risks. Sustainability plays in huge role in sourcing the tuna thus driving the catch of smaller skipjack higher, as other species are restricted by the regulators or the customers (market). Additionally, "full retention" of all edible fish will have some impact on the average fish size processed.

The most significant changes in processing have been the results of implementation of HACCP principles for processing seafood introduced in 1995 and mandated in 1997. (Actually, the first usage of HACCP principles were the Low Acid Canned Food regulations [1977] but that was not specially for tuna processors.) The HACCP principles for processing tuna forced the tuna processing business to analyze processing times and temperatures closely and make the requisite alterations. These are primarily to control the formation of histamine and *Staph. aureus* enterotoxin. The alternative time/temperature scenarios of processing tuna are covered in detail in this presentation. In the last 20 years, university graduate students have also contributed unique knowledge that is useful for optimally processing tuna (calpains and cathepsins). The practical F-subzero values used for safety in retorting will be discussed and the energy usage by ton of fish and by hours will be explored.

In addition, the label changes for 2020 has an impact on the nutrient contents per serving size, as the serving size has been changed from 2 oz to 3 oz per serving of seafood starting in 2020. This means more calories, protein, lipids, and sodium per serving size as declared on the label.

Salmonella in Raw Fish Fillets – Why do We Not Consider it a Food Safety Hazard?

Clare Winkel[1*] (*Invited Speaker*) & Jasmine Lacis-Lee[2]

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Salmonella is considered a potential food safety hazard in farmed prawns/shrimps but not for farmed fish. Contaminated whole fish & portions can cross contaminate equipment & premises, even when the end product is to be cooked. But in reality, many fish species are being used in “raw fish” recipes beyond the traditional sashimi species i.e. in ceviche.

The case for the identification of *Salmonella* within processing HACCP plans will be considered, utilizing the results of an actual case study where 3 serotypes of *Salmonella*, sourced from one farmed species, cross contaminated processing equipment & 2 other fish species. The root source of contamination has been analysed & compared to actual food borne illness results in that region from the specific *Salmonella* serotypes. The review has also taken into consideration the presence of native reptiles, bats, & bird species, along with fish meal, rodents & soil, at the source farm.

Worldwide recall & rejection notices were reviewed to identify the real levels of *Salmonella* occurrence in commercial raw fish portions for both fresh/saltwater species, farmed & wild caught. This work will lead to potential control measures identified for use within the whole supply chain.

If the hazard of *Salmonella* is not considered within the risk assessment for any part of the raw fish supply chain, cross contamination will not be identified within the processing sector & no control measures will be put into place, leading to *Salmonella* becoming background flora within the processing environment, to become a food safety pathogen risk.

Trends in Seafood Compliance and Certification

Steve Wilson, *Keynote Speaker*

Director of Seafood Commerce and Certification
Office of International Affairs and Seafood Inspection
NOAA Fisheries

Seafood is one of the most traded commodities in the world. As production and trade routes get more sophisticated, certification processes and ultimately compliance gets more complicated. Trading partners with the United States are scrutinizing more frequently the seafood and fishery products that are entering their country at the various border inspection posts. Food safety is no longer the only concern with quality factors associated with the eating patterns of the importing country growing in importance. Governments, ushered into traceability requirements for their exports, are requesting more in the certification and are asking for traceability information in their export health certification. Shipments that are destined to other countries through the United States will soon see more requirements before they can enter the USA just to be stored. Confusion as to country of origin is growing with the increase in the trade patterns to include confusion with product stored in economic free trade zones. All certification bodies must now be more cognizant of these growing trends.

Commodity Procurement Program Overview

Hilary Cole, *Invited Speaker*

Branch Chief/Contracting Officer, Livestock Poultry and Fish Branch
United States Department of Agriculture/Agricultural Marketing Service/Commodity Procurement Program

Commodity Procurement Programs (CPP), inside USDA's Agricultural Marketing Service, facilitates the marketing of 100% domestic agricultural products through the purchase of food for International and Domestic nutrition assistance programs…feeding the hungry around the world. This procurement entity purchases a variety of commodities for both international and domestic food assistance programs. Supporting a broad scope of National Programs, CPP conducts acquisitions for three main objectives; entitlement/meal package programs, market development (Section 32 and trade mitigation activities), and disaster/emergency food assistance. This presentation will highlight current USDA expenditures by program and discuss ongoing Trade Mitigation efforts.

Country of Origin Labeling (COOL) Overview and Updates

Trevor Findley, *Invited Speaker*

Deputy Director
Food Disclosure and Labeling Division
USDA Agricultural Marketing Service

The USDA's Country of Origin Labeling (COOL) presentation will provide a broad overview of the country of origin labeling requirements for all covered commodities, with an emphasis on fish and shellfish. Along with identifying and properly labeling the country of origin, the discussion will include labeling aspects specific to the fish and shellfish industry, such as properly identifying the method of production. The discussion will also include exclusions to COOL, such as processed food items.

National Bioengineered Food Disclosure Standard

Trevor Findley, *Invited Speaker*

Deputy Director
Food Disclosure and Labeling Division
USDA Agricultural Marketing Service

The USDA's presentation on the National Bioengineered Food Disclosure Standard (BE Standard) will provide a broad overview of the requirements of the new law, including: what entities are responsible for making a BE food disclosure, what foods are considered bioengineered foods, what exemptions exist, how the disclosure can be made, what records must be maintained, and what compliance and enforcement will look like. The discussion will also include recent updates on topics like validating a refining process and selecting a test method for detectability testing.

POSTER ABSTRACTS

Antiproliferative Compounds Obtained from White Shrimp (*Litopenaeus vannamei*) in Human Cancer Cell Lines

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Cancer is a chronic degenerative disease with high morbidity and mortality worldwide; therefore, science has focused their efforts in the discovery of natural compounds with biological activity that could help human health through the inhibition of carcinogenic processes, these activities include antimutagenic, antioxidant, and antiproliferative activities. Specifically referring to the last one, white shrimp muscle has been proved to be able to intervene in the cell cycle of murine cancer cells, nevertheless these compounds have not been reported in human cancer cell lines. Therefore, the aim of this research was to study the effect of lipidic fractions of white shrimp muscle on the proliferation of human cancer cell lines. Shrimp samples were collected from a commercial market and transported to the University of Sonora to be processed. Shrimp muscle was cleaned and the lipophilic compounds extracted with $CHCl_3$, then partitioned with methanol and hexane, and the methanolic fraction was further separated using a chromatographic column. Samples were analyzed using RP-HPLC; those with similar signals were collected and tested for antiproliferative activity using the MTT standard assay. Fraction F1 was the one that exerted the highest antiproliferative activity on HCT116 cell line; concentrations analyzed were 200, 100, 50, and 25 µg/mL. At the highest F1 concentration, cells only proliferated 44.8 ± 4.1 % compared to a control; the inhibition was similar to that exerted by cisplatin. In conclusion, white shrimp is a source of antiproliferative compounds; however, further research is needed for further biological characterization.

Inactivating Viruses with Ultralow Temperature HPP

Christina DeWitt*[1], Kevin Nelson[1]

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Introduction: Both norovirus and hepatitis A are significant health risks in ready-to-eat products. High pressure processing at ultralow temperatures (HPP_{ULT}) has been demonstrated to be an effective means of reducing bacteria pathogens such as Listeria. Pressurization at temperatures below negative 20C can cause ice phase changes under pressurization. Therefore the potential effects on inactivation of viruses as ultralow temperature have been evaluated as a prelude to evaluating HPP inactivation within a frozen food matrix.

Objectives: In this study, inactivation studies were conducted on both tulane virus (norovirus surrogate) and hepatitis A to determine efficacy of HPP_{ULT} on virus inactivation.

Materials and Methods: Each virus was placed in 1 mL aliquots in double sealed pouches where initial temperature of pressurization fluid was sufficient to keep samples below -22 C at time of pressurization. Samples were pressurized at 200 to 500 MPa and held at pressure for 5 min. Tulane virus plaque assay and hepatitis A plaque assay was utilized to measure virus survival.

Results & Discussion: The untreated control tulane virus titer was 3.3×10^5pfu/ml. 200 MPa treated virus titer was 2.67×10^1, representing > 4 log reduction. At 300 MPa and above there was >5 log reduction. In contrast for hepatitis A limited inactivation was observed at 500 MPa (about 1 log) with no observed inactivation at 400 MPa or below.

Conclusion: This data suggests that high pressure processing at very low freezing temperatures may be more effective than refrigeration or room temperature as a means of inactivating noroviruses but perhaps not hepatitis A.

Ultralow Temperature High Pressure Processing for Inactivation of Listeria monocytogenes in Frozen Ready-to-Eat Shrimp

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[1]Seafood Research and Education Center, Oregon State University, Astoria, OR,
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Introduction: *Listeria monocytogenes* is a potential health risks in ready-to-eat (RTE) products. Ultralow temperature processing has been demonstrated to impact pathogen survival by membrane damage using ice phase shifts.

Objectives: In this study, inactivation studies were conducted on Listeria monocytogenes in frozen pink shrimp to determine efficacy of HPP_{ULT}.

Materials and Methods: RTE shrimp were inoculated with a 6 strain cocktail of L. monocytogenes, frozen and pressurized at 250 and 400 MPa for 0.5 and 3 min. Temperature of pressurization fluid was sufficient to keep samples below -22° C at time of pressurization. Palcam agar overlaid with Tryptone Soy Agar was used for the enumeration of survivors. Color was also evaluated.

Results & Discussion: Time at pressure significantly reduced *Listeria monocytogenes* ($p<0.05$, $n=6$). Visual color differences were not evident.

Conclusion: This data suggests HPP_{ULT} can achieve a 2.7 log reduction of *Listeria monocytogenes* in frozen cooked pink shrimp.

Production and Characterization of a Novel Beverage from Laver (*Porphyra dentata*) through Fermentation with Kombucha Consortium

Thinzar Aung and Jong-Bang Eun*

Department of Food Science and Technology, Graduate School of Chonnam National University, Gwangju, 61186, South Korea

Introduction

Dried laver (*Porphyra dentata*), also known as red seaweed, is rich in bioactive nutrients and can either be directly consumed as sea vegetables and snacks or used in cooking traditional Asian dishes. Laver fermentation using Kombucha consortium is an innovative way of seaweed consumption.

Objective

The aim of this study is to establish novel functional Kombucha beverages from laver with competitive physicochemical characteristics, antioxidant effect and nutraceutical properties.

Brief Materials and Methods

Laver Kombucha from infusion extraction (KIE) and ultrasound-assisted extraction (KUAE) were prepared by fermentation for 14 days at 25 °C using Kombucha consortium. Their physicochemical characteristics (pH, titratable acidity, color, yield of biofilm, reducing sugar content, organic acids), nutraceutical properties (total phenolic and flavonoid content, antioxidant activities) and microbial count were compared with those of conventional black tea and green tea Kombucha.

Results and Discussion

Laver Kombucha from both extraction types showed comparable physicochemical and microbiological properties with control samples. KUAE exhibited a pink color with indices L*, 55.04; a*, 5.82 and b*, 2.33 while KIE showed a pale color with indices L*, 61.05; a*, -0.3 and b*, 3.05, respectively. Their antioxidant activities were enhanced by fermentation, as evaluated by 2,2-diphenyl-1-picrylhydrazyl (DPPH) scavenging activity and ferric reducing antioxidant power (FRAP) assays in accordance with increased total phenolic and flavonoid contents.

Conclusion

Laver has a significant potential as a novel substrate for developing a new fermented beverage and through ultrasound-assisted extraction, functionality and antioxidant activities of laver Kombucha could be optimized.

Shotgun Metagenomic Reveal Compositional Structure and Metabolic Pathways of Bacteria in Hongeo, a Korean Traditional Fermented Skate During Fermentation

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Hongeo, skate is a popular traditional fermented fish product in Korea, which was made of fresh skate without any additives. The aim of this study was to investigate the changes of microbial diversity and microbial metabolic pathways using a metagenomic approach in *hongeo* samples during fermentation at 10℃. Bacterial community analysis revealed that the dominant genera were *Psychrobacter*, *Sporosarcina* and *Pseudomonas* at the initial fermentation. The abundances of most of the initially dominant genera, except for *Sporosarcina*, significantly decreased. while, members of the genus *Sporosarcina* showed a slowly increased during the early fermentation stage and becoming stable. The most abundant OTUs detected in final fermented *hongeo* samples were belong to *Psychrobacter* such as *Psychrobacter* sp. *DAB_AL43B*, *Psychrobacter arcticus* and *Psychrobacter cryohalolentis*. The microbial gene function was studied in the eggNOG database indicated that the top three categories are S (function unknown), L (Replication, recombination and repair) and M (cell wall/membrane/envelope biogenesis). The high expression gene of L and M might be related with the bacterial DNA and membrane repair systems to cope with extreme conditions under high pH and ammonia nitrogen conditions. The metabolic pathways were amino acid metabolism, followed by carbohydrate metabolism and inorganic ion metabolism. This study could provide an important information for understanding the mechanism of quality characteristics and ammonia flavor formation in *hongeo* products during fermentation.

Anti-Inflammatory Potential of a Bioactive Fraction Isolated from Wild Shrimp (*Litopenaeus stylirostris*) Muscle

Joel Said García-Romo[1], Juan Manuel Martínez-Soto[6], Martín Samuel Hernández-Zazueta[1], Edgar Sandoval-Petris[2], Maribel Plascencia-Jatomea[1], María Guadalupe Burboa-Zazueta[2], Rosario Maribel Robles-Sánchez[1], Josué Elías Júarez-Onofre[3], María del Carmen Candia-Plata[6], Javier Hernández-Martínez[4], Hisila del Carmen Santacruz-Ortega[5], Armando Burgos-Hernández[1]*.

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The marine ecosystem represents the majority of the planet's surface and comprises a continuous resource of compounds with many biological activities which may include anti-bacterial, anti-viral, anti-mutagenic, anti-proliferative, anti-inflammatory, anti-tumor, and anti-neoplastic, among others. Our research group previously evaluated cellular protective activity of a bioactive fraction (fraction M) isolated from wild shrimp (*Litopeaneus stylirostris*) muscle, which was also found to be composed of dioctyl phthalate (DOP), eicosapentaenoic acid (EPA), and a novel indolocarbazole alkaloid derivative (IAD). However, a complete biological characterization of this fraction is not yet carried out. That is why the objective of this work is to investigate fraction M (fM) as a possible anti-nitrosative and anti-inflammatory agent. The capability of fraction fM to inhibit reactive nitrogen (RNS) and oxygen (ROS) species was tested using the sodium nitroprusside and NCF-DA assays, respectively. Regulation of anti- and pro-inflammatory interlukins by fM was determined using a mouse anti-human antibody assay. Results suggests that fM (composed of EPA, DOP and IAD) at a concentration of 50 µg/mL, is not cytotoxic for RAW264.7 transformed cell line but is capable of inhibiting NRS and ROS production, possibly being EPA the compound responsible for this activity. Results from the mouse anti-human antibody assay suggest that fM (also at 50 µg/mL) up-regulates anti-inflammatory processes by increasing the production of anti-inflammatory IL-4 and IL-10. Based on the above, fraction fM from *Litopeaneus stylirostris* might be considered as anti-inflammatory; furthermore, EPA could be the compound responsible for this bioactivity.

Expanding Markets for Local Proteins: Training Wholesale Buyers, Developing New Products, Aggregating Demand and Scaling Up in the Pacific Northwest

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Sarah Masoni, Food Innovation Center (Oregon State University)
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Jason Ball, Food Innovation Center (Oregon State University)
Lauren Gwin, Niche Meat Processor Assistance Network
Amy Gilroy, Oregon Department of Agriculture
Aaron Vargas, EcoTrust

The traditional placement of meat as the “center of the plate” protein in our food system has significant ecological and economic impacts. To build a more climate-responsive and responsible food system requires changing the dynamics of protein on the plate with alternative proteins or meat-vegetable blended products. Increasing utilization of locally sourced sustainable seafood proteins for consumption in institutions is one strategy embraced by EcoTrust. In a collaborative project with EcoTrust, the OSU Seafood Research & Education Center, Food Innovation Center and Niche Meat Processors Assistance Network are working to ideate and develop seafood or blended-meat products for distribution in institutions, including schools, hospitals, and senior care facilities.

Some of the challenges that prohibit utilization of seafood products in institutions include, availability, cost, and labor. An ideation session was hosted that included representatives from various institutions in Portland, OR to identify potential product concepts to develop as prototypes. Some ideas included: a fish protein based lasagna noodle, seafood Shepard’s pie, fish in a chip (potato based seafood croquette), fish as a chip (like chicken nugget), etc. For the prepared prototype products, a nutrition facts panel, as well as ingredient and allergen statements were prepared. In addition, prototypes were subjected to sensory testing.

Buying locally harvested product and shortening the supply chain supports local economies while reducing carbon emissions. Developing food service food products from sustainably sourced seafood or blended-meat/vegetable proteins provides tasty and nutritious food options as food service institutions work to reduce environmental impacts.

Structural Changes in Cathepsin D from Japanese Clam (*Ruditapes phillipinarum*) at Different Conditions of pH and Temperature

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Japanese clam (*Ruditapes philippinarum*), is one of the main clams consumed in Mexico, with 13,000 tons of harvest/capture in 2018. Worldwide, the production is almost 4 million tons. These marine invertebrates have enzyme systems that are very active in acid pH. Cathepsin D is one of the most important aspartic enzymes, it participates in protein turnover and many metabolic processes involve this kind of acid proteolysis, with a possible involvement in protein digestion. Cathepsin D from hepatopancreas of Japanese clam was purified using pepstatin agarose affinity chromatography and changes in secondary structure were determined at different values of pH and temperature using circular dichroism. Drastic changes occur in the content of □ helix and □ sheet secondary structures of the enzyme at pH 7 and at 60°C. The thermal denaturation of the enzyme was determined at 70°C using differential scanning calorimetry. These parameters are important due to the role of cathepsin D for metabolism and consequently the culture of the Japanese clam.

Total Nucleotides as Nucleotide Monophosphates Method Development

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Introduction: Total nucleotides can be extracted and analyzed measured using a variety of techniques. While UV-VIS has been traditionally used as a good low-cost estimate for nucleotides or DNA, reverse-phase HPLC may be a more accurate means of determining total nucleotide content.

Objectives: Develop a method for extracting genomic DNA and quantifying the nucleotide monophosphates that comprise that DNA using modern HPLC techniques and equipment.

Materials and Methods: Samples were extracted using QIAGEN DNeasy *mericon* foot kits and digested using a mixture of sodium acetate buffer, $ZnCl_2$ and an endonuclease. Extracts were analyzed using a Thermofisher C18 column attached to a reverse-phase HPLC Shimadzu system.

Results & Discussion: Dried samples should be blended and homogenized using a tissue blender prior to extraction to achieve maximum extraction efficiency. Additional proteinase K is required to decrease the overall viscosity of the extract. Nuclease S1 may be used in the place of nuclease P1 as a lower cost alternative enzyme.

Conclusion: DNeasy *mericon* food kits are highly selective for DNA and yield pure extracts. Total nucleotide values as determined by HPLC differ greatly from UV-VIS methods. Increased sensitivity of the detector was required for proper quantitation of nucleotides.

Student Competition Participant

Labeling Compliance, Species Authentication and Net Weight Identification of Frozen Fish Fillets in Southern California

A. Peterson*, S. Jhita, G. McBride, R.S. Hellberg

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Proper labeling of seafood is important to prevent economic deception, promote consumer awareness, and prevent exposure of at-risk groups to certain allergens and toxins. The focus of this study was to investigate prepackaged frozen fish sold in Southern California for Country of Origin Labeling (COOL) compliance, species authentication, use of acceptable market names, net weights, and percent glaze. A total of 111 frozen fish fillets from 13 different fish categories were purchased from grocery stores in Southern California. The fish categories targeted for this study were: catfish, cod, flounder, halibut, mahi-mahi orange rough, pollock, salmon, swai, swordfish, tilapia, tuna, and whiting. Samples were determined to be COOL compliant if they reported both procurement method and country of origin at the point of sale. Species authentication and acceptable market names were determined by comparing the species identification based on DNA barcoding to the labeling recommendations in the FDA *Seafood List*. Net weights and percent glaze were determined by recording the weight of each product before and after deglazing. Of the 111 samples, 3 were non-compliant with COOL: 2 were missing country of origin and 1 was missing the procurement method. Possible short-weighting and/or overglazing was observed in a small portion of samples. The net weights were close to the declared weights for the majority of samples; however, 8 samples had a net weight that was <95% of the declared weight on the package. The average percent glaze was 5%, with a range of 0% to 34%, and 7 samples had >10% glaze. The results of DNA barcoding allowed for a total of 106 samples to be identified to the species or genus level. Among these samples, 3 were found to be mislabeled on the basis of species and 19 had unacceptable market names. Overall, the results of this study indicate a high level of COOL compliance and minimal species substitution in prepackaged frozen fish fillets sold in Southern California. However, the results do suggest a need for increased focus on practices involving short-weighting and/or overglazing of frozen fish products, as well as the use of unacceptable market names.

Student Competition Participant

Antiproliferative Compounds from White Shrimp (*Litopenaeus vannamei*) Induce Caspase Activation and Apoptosis in Murine Lymphoma Cells

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Cancer is the leading cause of death worldwide; therefore, research efforts are turning to the search for naturally obtained chemopreventive/chemoprotective compounds. White shrimp has been studied as a source of antiproliferative compounds and its compounds have been proved as antiproliferative compounds in murine lymphoma cells, nevertheless the mechanism by which these compounds act in the cell is still unknown. Therefore, the aim of this study was to determine the effect of white shrimp bioactive fraction in murine lymphoma cell death mechanism. A bioactive triglyceride was isolated from shrimp muscle by chloroformic extraction followed by solvent partition, and RP-HPLC fractioning. M12.C3F6 murine cell line was subjected to the effect of bioactive triglyceride, with an IC_{50} of 55.0 ± 7.7 μg/mL. The effect of bioactive triglyceride on cell apoptosis was analyzed by flow cytometry and fluorometric caspase analysis where apoptosis induction was observed. Both, early and late apoptosis signals, had a significant increase from 10.5 ± 4.9 to 17.7 ± 5.0 percent and 9.0 ± 2.1 to 15.0 ± 3.0. On the other hand, caspase activation was detected in both, executer and initiator groups. The activation of caspase 3 had a significant increase compared to the negative control, and the signaling pathway activated was the extrinsic via caspase 8. These results suggest that the bioactive triglyceride isolated from chloroformic extract of white shrimp muscle induces the apoptosis of murine cancer cells via caspase activation.

Use of DNA Barcoding Techniques for the Identification of Fish Species in Fish Balls

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Introduction
DNA barcoding is a powerful tool for fish species identification. A portion of the cytochrome oxidase subunit I (COI) gene of an unknown fish is compared to the known DNA sequences of documented fish species. The full-length DNA barcode is a ~655 base pair (bp) region of COI, while DNA mini-barcodes are generally 100-220 bp in length.

Objective
The objective of this study was to examine DNA barcoding techniques for the identification of species in a processed product (i.e., fish balls) containing various mixtures of fish species.

Materials & Methods
Fifteen fish ball mixtures were prepared from varying amounts of Nile tilapia (*Oreochromis niloticus*), Pacific cod (*Gadus microcephalus*), and walleye pollock (*Gadus chalcogrammus*). DNA was extracted from each sample using the DNeasy Blood and Tissue Kit (Qiagen). The DNA extracts then underwent full and mini-barcoding of the COI gene. Successfully sequenced samples were identified at the species level through the Barcode of Life Database (BOLD).

Results & Discussion
Out of the 15 fish balls tested, 8 were identified with at least one successful full barcode and 6 were identified with at least one successful mini-barcode. All fish balls made of just one species tested positive for that species (i.e., tilapia, cod, or pollock). However, all successfully sequenced fish balls that contained species mixtures were identified as tilapia.

Conclusion
Overall, this study revealed that DNA barcoding preferentially identifies specific fish in mixtures, even after processing. Future testing should focus on the use of alternative techniques, such as NGS techniques, to identify multiple species within a mixed sample.