2017

Aquaculture Innovation Workshop

An International Summit on Fish Farming in Closed-Containment Systems

November 29 – 30, 2017

SFU's Morris J. Wosk Centre for Dialogue | 580 W. Hastings St | Vancouver, BC

Aquaculture Innovation Workshop

#AIW2017

THE CONSERVATION FUND
FRESHWATER INSTITUTE

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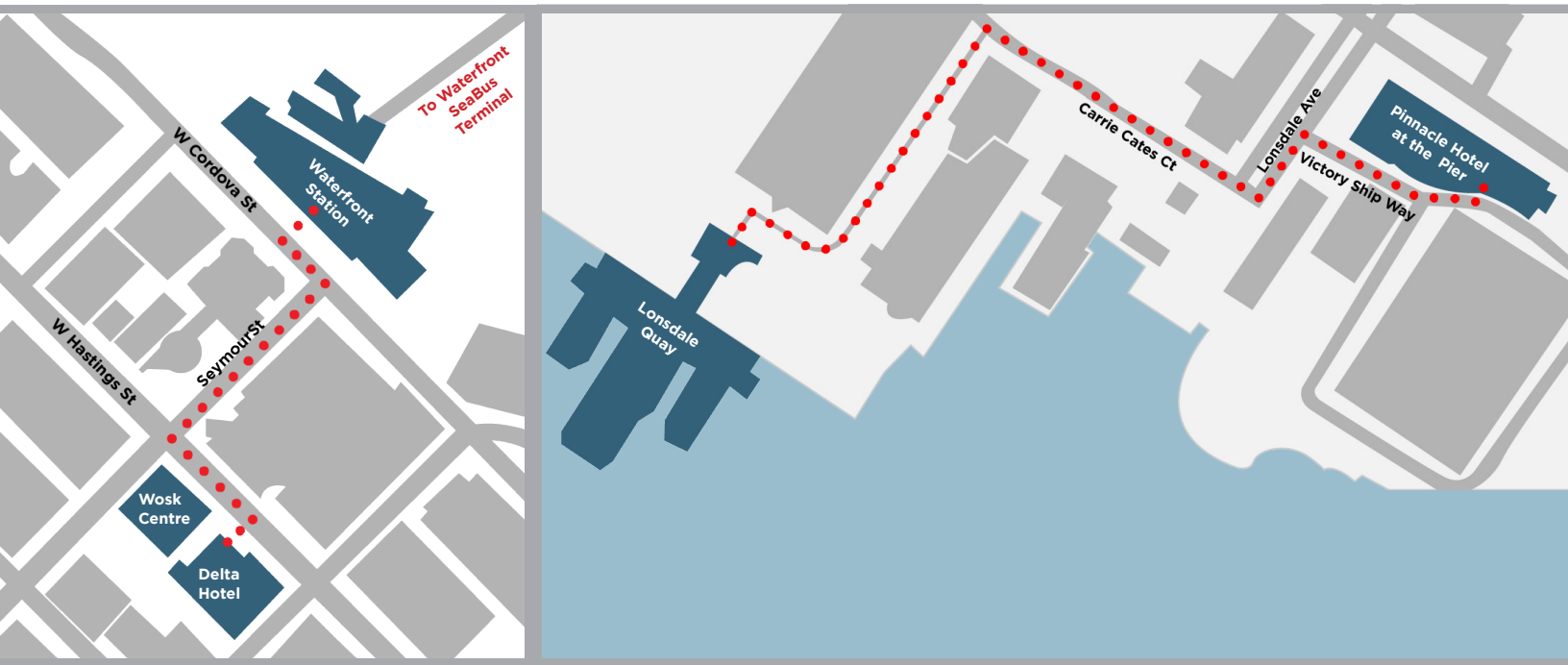
Walking Directions from Delta Hotel to Pinnacle Hotel at the Pier

(550 W Hastings St, Vancouver to 138 Victory Ship Way, North Vancouver)



Head NW on W Hastings St toward Seymour St; Turn right on Seymour St;
Turn left on Cordova St; Walk half a block;
Turn right, enter Waterfront Station; Take the N Vancouver, BC - Vancouver BC ferry to North Vancouver (with purchase of ticket)
Depart Waterfront Seabus Terminal
Arrive Lonsdale Quay Seabus Terminal
Exit Lonsdale Quay Station; Turn right and follow walk way; Turn right onto Carrie Cates Ct;
Carrie Cates Ct turns left and becomes Lonsdale Ave;
Turn right onto Victory Ship Way; Pinnacle Pier Hotel is on the left

Workshop Agenda

Wednesday, November 29th

Breakfast - 7:30 am

Welcome and Opening Remarks

8:00 - 8:20 am

Steve Summerfelt, The Conservation Fund's Freshwater Institute
Eric Patel, Advisor to Tides Canada - Salmon Aquaculture Innovation Fund

Opening Keynote Speaker

8:20 - 8:50 am

Mark Retzloff, Chairman of the Board, Alfalfa's Market
Lessons on building an industry from a food pioneer

Opening Session: Investment and Economics of Land-based Aquaculture

Moderator: **Eric Patel,** Advisor to Tides Canada - Salmon Aquaculture Innovation Fund

8:50 – 10:00 am

8:50 **Tone Bjørstad Hanstad,** DNB Markets
Deep dive into land-based farming: prospects for non-conventional farming

9:20 **Gary Robinson,** GRV Consulting
3000 MT/yr model

9:40 **Jon Fitzgerald,** Stope Capital Advisors
Risk and return in land-based salmon aquaculture

Break

10:00 - 10:20 am

Opening Panel: Q & A

Moderator: **Eric Patel,** Advisor to Tides Canada - Salmon Aquaculture Innovation Fund
Panelists: **Mark Retzloff, Tone Bjørstad Hanstad, Gary Robinson, Jon Fitzgerald, Johan Andreassen**

10: 20 – 11:00 am

Industry Innovation

Moderator: **Steve Summerfelt,** The Conservation Fund's Freshwater Institute

11:00 am – 12:10 pm

11:00 **Trond Rosten,** Marine Harvest
New approaches to closed-containment at Marine Harvest

11:30 **Frode Mathisen,** Grieg Seafood
The business proposition for land-based production of post-smolt at Grieg Seafood

11:50 **Sean Wilton,** AgriMarine Holdings
Steelhead production in Agrimarine tanks at Lois Lake

Workshop Agenda

Wednesday, November 29th *continued*

Lunch

12:10 - 1:30 pm

Industry Innovation — Land-based Growout

Moderator: **Steve Summerfelt,** The Conservation Fund's Freshwater Institute

1:30 - 2:45 pm

1:30 **Garry Ullstrom and Eric Hobson,** Kuterra
Kuterra's land-based Atlantic salmon RAS project

1:45 **Kirk Havercroft,** Sustainable Blue
Sustainable Blue's land-based Atlantic salmon RAS project

2:00 **Terry Brooks,** Golden Eagle Aquaculture
Golden Eagle Aquaculture's land-based coho salmon RAS project

2:15 **Justin Henry,** Henry Aquaculture Consult Inc.
Northern Divine's land-based sturgeon RAS project

2:30 **Samuel Chen,** Hudson Valley Fish Farm
Hudson Valley Fish Farm's land-based steelhead RAS

Break

2:45 - 3:15 pm

Industry Innovation — Land-based Growout *continued...*

3:15 - 4:00 pm

3:15 **Brandon Gottsacker,** Superior Fresh
1st Commercial land-based Atlantic salmon farm in the USA, also includes leafy greens

3:30 **Johan Andreassen,** Atlantic Sapphire
Atlantic Sapphire in Denmark and the USA

Compelling Market Messages

Moderator: **Joe Hankins,** The Conservation Fund's Freshwater Institute

4:00 - 5:00 pm

4:00 **Guy Dean,** Albion Farm and Fish
Compelling market messaging, key learning from the marketplace

4:20 **Jen Paragallo,** Fishpeople Seafood
Sustainability and seafood marketing

4:40 ***Damien Claire,*** *Atlantic Sapphire*
Sustainability matters when marketing farmed salmon

Dinner

6:30 **Pinnacle Hotel at the Pier**
Dinner Speaker: Ned Bell, Chefs for Oceans/Oceanwise Chef
(see walking directions from the Delta Hotel/Wosk Centre on page 2)

Workshop Agenda

Thursday, November 30th

Breakfast - 7:30 am

Innovations in Technology & Husbandry Research

Moderator: **Chris Good,** The Conservation Fund's Freshwater Institute

8:00 - 10:05 am

8:00 **Colin Brauner,** University of British Columbia
The effect of salinity and photoperiod on Atlantic and coho salmon growth, maturation and physiological performance in RAS (24 h and 12:12)

8:30 **Lill-Heidi Johansen,** Nofima
Overview of CtrlAQUA research to optimize RAS for Atlantic salmon post-smolt production

9:00 **Sigurd Handeland,** Uni Research
Overview of CtrlAQUA research in post-smolt welfare, performance, and water quality in commercial scale, floating, semi-closed containment systems: CtrlAQUA Preline, Neptune, and Eco-Cage

9:30 **Jelena Kolarevic,** Nofima
Post-smolt welfare, performance, and water quality in commercial scale, floating, semi-closed containment systems: CtrlAQUA Flexibag and concrete

9:50 **Steven Summerfelt,** The Conservation Fund's Freshwater Institute
Performance of all-female Atlantic salmon in freshwater closed-containment systems

Break

10:05 - 10:30 am

Innovations in Technology & Husbandry Research *continued...*

10:30 - 11:45 am

10:30 **Trine Ytrestøyl,** Nofima
Health and performance of Atlantic salmon post-smolt when using novel production protocols

10:45 **Vasco Mota,** Nofima
CO_2 tolerance of Atlantic salmon post-smolts in RAS

11:00 **Chris Good,** The Conservation Fund's Freshwater Institute
Effects of photoperiod on Atlantic salmon post-smolt in freshwater closed-containment systems

11:15 **Yonathan Zohar,** University of Maryland, Baltimore County
Production of reproductively sterile fish to eliminate maturation

11:30 **Astrid Buran Holan,** Nofima (now with Aqua Optima)
Effects of seawater quality on treatment of intake water for use in closed-containment aquaculture systems

Lunch

11:45 am - 1:00 pm

Innovations in Technology & Husbandry Research *continued...*

1:00 - 1:15 pm

1:00 **John Davidson,** The Conservation Fund's Freshwater Institute
Is continuous peracetic acid dosing in RAS really as good as ozone?

Workshop Agenda

Thursday, November 30th *continued*

Innovations in Feed

Moderator: **John Davidson,** The Conservation Fund's Freshwater Institute

1:15 - 1:55 pm

1:15 **Roar Scandvik,** Skretting
Optimizing Atlantic salmon and steelhead/trout feeds for closed-containment systems

1:35 **Jason Mann,** Evaqua Farms
Challenging the status quo: a farmers perspective on feed ingredients

Challenging the Status Quo — Innovations in RAS Design

Moderator: **Steve Summerfelt,** The Conservation Fund's Freshwater Institute

1:55 - 2:15 pm

1:55 **KC Hosler,** Pentair AES
Progressive improvements in salmon RAS design

Break

2:15 - 2:35 pm

Challenging the Status Quo — Innovations in RAS Design *continued...*

2:35 - 3:35 pm

2:35 **Frederic Gaumet,** Kruger/Kaldness/Veolia
Progressive improvements in salmon RAS design

3:05 **Bjarne Hald Olsen,** Billund Aquaculture
Progressive improvements in salmon RAS design

Closing Keynote Speaker

3:35 **Fred Haberman,** Urban Organics
Applying lessons learned from the natural food industry

Closing Panel: Taking Advantage of the Opportunity

Moderator: **Eric Patel,** Advisor to Tides Canada - Salmon Aquaculture Innovation Fund

Panelists: **TBD**

4:05 – 4:45 pm

Wrap Up / Closing Remarks

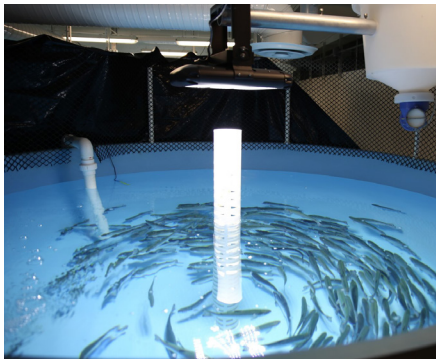
Eric Patel, Advisor to Tides Canada - Salmon Aquaculture Innovation Fund

4:45 - 5:00 pm

Workshop Agenda

Friday, December 1st

University of British Columbia InSEAS Tour *(optional)*



Delta Hotel Departure: 7:30 am tour bus pickup, arrival at UBC 8-8:30 am
Tour of InSEAS: 8:30-10:30 am
UBC Departure: 10:30-11 am, tour bus arrival at Delta Hotel before noon

About the Facility

InSEAS, the **In**itiative for the **S**tudy of the **E**nvironment and its **A**quatic **S**ystems, is a state-of-the-art, flexible aquatics research facility. The South and West wings of the Biological Sciences building house a total of 13 new independent recirculating aquaculture systems (RAS; 12-15,000 l capacity each), 10 environmental chamber rooms, and 2 analytical laboratory rooms equipped with facilities for physiological, biochemical, and behavioural analysis. The RAS systems consist of 7 high density systems and 6 low density systems which employ state of the art technology. Each high density system is capable or rearing fish at a density of up to 100 kg/m^3 and consists of 2-8 ft diameter (5.6m3) and 2-42" diameter (0.7m3) tanks. The low density systems are capable of rearing fish at a density of up to 20 kg/m^3 and consist of 10-42" diameter (0.7m^3) tanks and two wet tables (2mx1m). Each RAS system is capable of precise control of water O_2, temperature, salinity, CO2, ammonia and pH in real time and recorded on a central facility computer with remote access. The facility is run by our two full time aquatics technician.

InSEAS was designed to systematically test the effects of variation in rearing conditions on growth and performance of salmon reared in RAS at multiple life stages, including from smolt to market size, to identify optimal conditions for production. Optimal conditions for production are not solely defined by growth, and we also routinely measure indices of fish welfare, early maturation, physiological robustness of the fish and product quality. The goal of *InSEAS* is produce scientifically grounded data that the aquaculture industry can use to enhance productivity and economic viability.

For more information on past AIW conferences, including presentations, program, summary notes, and attendee lists, visit:

https://www.conservationfund.org/our-work/freshwater-institute/aquaculture-innovation-workshop/past-aiws

AIW 1: January 17th-18th, 2011; Shepherdstown, WV, USA

AIW 2: September 26th-27th, 2011; Campbell River, BC, CA

AIW 3: May 15th-May 16th, 2012; Seattle, WA, USA

AIW 4: November 5th-November 6th, 2012; Comox, BC, CA

AIW 5: September 4th-September 6th, 2013; Shepherdstown, WV, USA

AIW 6: October 27th-October 28th, 2014: Vancouver, BC, CA

AIW 7: October 13th-October 15th, 2015; Shepherdstown, WV, USA

AIW 8: August 19th-August 21st, 2016; Roanoke, VA, USA

Speaker Biographies

Johan Andreassen
Johan Andreassen is the founder/CEO of Atlantic Sapphire. They are currently building a large land based salmon facility in Florida and have an existing pilot project in Denmark. Johan has a very long history in salmon farming in Norway, having co-founded organic salmon farming pioneer Villa Organic and managed it as the CEO until 2011.

Ned Bell
Founder of Chefs for Oceans, and Ocean Wise Executive Chef, Ned Bell is a popular Canadian chef and personality. Ned founded Chefs for Oceans in 2014 to raise awareness and advocate for responsible seafood choices while highlighting the importance of healthy oceans, lakes and rivers. He launched this commitment with an 8,700km bike ride across Canada, staging dozens of awareness building events along the way. Bell's commitments to seafood stewardship has continued ever since. Bell is well known for his ability to excite, inspire and educate individuals looking to make a broader commitment to sustainable seafood. In September 2017, Bell was awarded the SeaWeb Seafood Champion for Advocacy Award for his advocacy through leadership, innovation, vision and activism - an award he was also nominated for in 2015. Bell is part of Seafood Watch's Blue Ribbon Task Force and works tirelessly with sustainable seafood organizations OceanWise, SeaChoice and Marine Stewardship Council. Bell continues to make sustainable seafood his mission and is always looking for ways to strategize opportunities. As the father of three sons, Fin, Max and Jet, Chef Bell is dedicated to inspiring Canadians to become part of the solution for healthier oceans for today's children and generations to come.

Colin Brauner
Colin Brauner is a Professor in the Department of Zoology at the University of British Columbia. He studies how fish acclimate and adapt to changing environments that are altered naturally or anthropogenically. He is the Director of InSEAS, the Initiative for the Study of the Environment and its Aquatic Systems, where he and his team are investigating the optimal environmental conditions for fish growth and physiological performance.

Terry Brooks
Terry has been directly involved in aquaculture production for 30 years, starting in the mid 80's in British Columbia with one of the first salmon farming companies. Terry has spent time in Norway, Chile, and Maine learning how different areas of the world approach solving the many challenges of aquaculture production. In the past 10 years, Terry has been focusing on solving the challenges of bringing sablefish production from a research species to a viable economic production species. Golden Eagle Sablefish has become a world leader in cultured sablefish production and marketing. In the last 5 years, Terry has also been focusing on land-based Coho salmon production (with Golden Eagle) and the challenges in the production and marketing of this new type of aquaculture grow out. Applying the many lessons learned from his experience in the net pen industry, Terry has been focusing on well trained farm staff and good bio planning to help solve the land-based production puzzle of matching production, marketing, and economics.

Samuel Chen
Samuel Chen has lead the corporate and business development for Sustainable Seafood Inc., since 2013 beginning with the purchase, clean-up and planning for a shrimp and barramundi farm in Las Vegas. More recently, he has been responsible for overseeing the development of another acquisition in upstate New York, which is now Hudson Valley Fish Farms – a 1200MT Steelhead Farm with a commercial pilot for Pacific White Shrimp. Prior to aquaculture, Sam has had experience in corporate strategy, M&As, and organization development. As part of his corporate development work, he has also evaluated acquisition opportunities for over 15 aquaculture operations. Sam has an International MBA from Temple University and is currently pursuing a Doctor of Education program through Simon Fraser University. He is also a Chartered Human Resource Professional (CHRP).

Damien Claire
Mr. Claire has 10 years' experience in seafood production, import and distribution and is in charge of the offtake, sales and marketing for Atlantic Sapphire's salmon from Denmark and soon from the US based

Florida farm. He is also currently the president of Platina seafood, a large Miami based importer and distributor whose product lines include fresh and frozen salmon from Norway, Chile and Scotland as well as Steelhead, Arctic Char and a full line of value added seafood products. Platina Seafood currently imports and distributes Atlantic Sapphire's products in North America.

John Davidson
John Davidson is a Senior Research Associate at the Conservation Fund's Freshwater Institute in Shepherdstown, West Virginia. He conducts research that is focused on advancement of aquaculture production system technologies and sustainable fish production. John has conducted research and published on a variety of topics including: the effects of ozone on water quality in RAS, off-flavor remediation techniques, nitrate toxicity to salmonids, and alternate ingredient diets fed to fish in RAS.

Guy Dean
Guy Dean graduated from University of British Columbia with a degree in Marine Zoology and has been involved in the seafood Industry for almost 30 years from Farmer, Harvester, Fisher, Processor and Distributor. He started his seafood career involved in helping operate an independent salmon farm and hatchery on the West Coast of Vancouver Island and has worked on fishing vessels in Canada and Australia as well as a commercial diver and harvester in Japan. He worked for over 15 years in the Primary Processing side of the West Coast seafood industry - including stints in production, sales and management. He's currently the Vice President and CSO of Albion Farms and Fisheries – the largest center of the plate distributor in Western Canada. Passionate about supporting and promoting the consumption of sustainable seafood and particularly the long-term viability of the seafood industry, he sits on the board of a number of industry led foundations within North America including Sea Pact, of which he is a co-founder. Guy regularly travel's globally where he is an acknowledged speaker and advisor and most recently has advised on SDG 14 at the United Nations as well as contributing to a working paper for the UN-FAO on "Implications of Climate Change for Aquaculture."

Jon Fitzgerald
Mr. Fitzgerald is an investor and investment banker with 25+ years of experience in which he sourced and executed a wide variety of transactions across multiple industries and capital markets. Following his return to Toronto in 2012, Mr. Fitzgerald co-founded Stope Capital Advisors, Inc. ("SCA"). SCA engages in a variety of merchant banking transactions in the mining, energy and agriculture sectors. Mr. Fitzgerald is also the Chairman of Anaconda Mining, an expansion stage gold mining company. He is a Member of the Board of Directors of Sampage Inc., a venture-backed telemedicine business and is a founding shareholder and Treasurer of Hesat Acquisition Corporation, an investment company specializing in the agricultural sciences. Mr. Fitzgerald is a member of the Board of Directors of Epcylon Technologies Inc., a development stage technology company in the Financial Service s sector. Mr. Fitzgerald was Co-Head of Capital Markets Origination for North America at Dresdner Kleinwort Wasserstein ("DrKW") where he oversaw the origination of all loan, bond and equity products for the firm's key corporate relationships across multiple industry sectors. Before joining DrKW, he worked in a senior banking capacity in New York and London at Credit Suisse First Boston and Lehman Brothers International where he won multiple Deal of the Year awards on behalf of his clients. Mr. Fitzgerald received a B.A. with Distinction from Bowdoin College, a MSc. (Econ) from The London School of Economics and an M.B.A. from the Wharton School, University of Pennsylvania. Mr. Fitzgerald is a Canadian and British citizen and lives in Toronto, Ontario and Ketchum, Idaho.

Frederic Gaumet
Frederic Gaumet is a fish biologist, with a PhD in fish physiology from IFREMER (France). During the last 27 years, he has been working with intensive aquaculture and RAS technology, from research & development to design and building of pilot plants, RAS technical and scientific management in commercial farms. Working in several countries, he had the chance to work on a broad range of species (from Salmon, via European marine fishes like Turbot, sea bass, to sub tropical species like red drum, Cobia, seriola), from broodstock management, intensive larviculture in RAS and pseudo-green-water systems, to intensive Growout in land-based RAS farms. Since 2012, he has been in charge of International business development for RAS technology for Krüger Kaldnes in Norway. Krüger Kaldnes is a subsidiary Business Unit of Veolia Water

Technology, the world largest company in water and wastes treatment. Krüger Kaldnes is the application business unit and center of competencies for Veolia WT in regard of RAS technology and aquaculture.

Chris Good
Christopher Good, D.V.M. Ph.D., is the Director of Aquatic Veterinary Research at The Conservation Fund's Freshwater Institute in Shepherdstown, West Virginia. Chris joined the Freshwater Institute's aquaculture research team in 2007, and has been involved with both internal research projects and external consultation, evaluating the health and welfare of cultured fish raised in a variety of production settings. His regular activities include authoring peer-reviewed and industry publications, conferences presentations, and frequent interactions with stakeholders.

Brandon Gottsacker
As the Chief Operations Officer (COO), Brandon is responsible for providing the leadership, management, and vision necessary to ensure that Superior Fresh has the proper operational controls, administrative and reporting procedures, and people systems in place to effectively grow our organization and to ensure financial strength and operating efficiency. Brandon chose to attend the University of Wisconsin – Stevens Point because of their comprehensive biology and natural resource curriculum. It was there that Brandon raised his first fish, yellow perch, in a recirculating aquaculture system and fell in love with the possibility of managing his own aquaculture operation. His hard work, charisma, and passion to learn created opportunities that he took full advantage of. Brandon's mission has been to find the people that could change his life by believing in him and his passion. Less than one year after graduating college, Brandon moved to Shepherdstown (WV) where he worked at The Conservation Fund's Freshwater Institute. There, he managed multiple aquaculture systems including a research project that evaluated the performance of walleye when fed alternative protein diets in a RAS, attended conferences and workshops around the world, and took many online continuing education courses in business and management. After this year of professional growth, Brandon returned to Wisconsin and began to build the team and infrastructure for what has now become Superior Fresh.

Fred Haberman - Closing Keynote Speaker
Fred Haberman is a social entrepreneur, an agent for change in the good-food movement, and the CEO of a mission-driven marketing agency. In the last 20 years he and his agency have helped bring organic food into the mainstream, spurring the growth of brands like Annie's, Organic Valley and Earthbound Farm, and supporting the work of the Organic Trade Association, National Cooperative Grocers Association, and the McKnight Foundation's food-security programs. As one of the co-founders of Urban Organics, a USDA-certified-organic aquaponics farm, Fred's on the leading edge of a movement for more sustainable agriculture. Speaking of movements, Fred's started a few from scratch, namely the U.S. Pond Hockey Championships and employer-sponsored gardens.

Sigurd Handeland
Dr. Sigurd Handeland holds a position as a principal scientist at Uni Research AS and a Professor II position at University of Bergen, Department of Biology. He has been working with the industry since 2000 and has extensive experience in experimental fish biology, including studies of water quality and physiological, behavioural and health effects in marine and anadromous fish species in intensive rearing systems. Handeland combines both academic and applied research experience with a deep knowledge of the technical problems in marine and fresh water aquaculture. He has been the project leader of several Norwegian research projects and has published 50 scientific peer-review papers, technical reports and books. Handeland is leading the large scale activities in the SFI Ctrl Aqua.

Tone Bjørstad Hanstad
Tone is an Equity Research Analyst in Seafood at DNB Markets. She worked as a management consultant for Accenture Strategy before DNB Markets. She started in the Investment Banking Division at DNB Markets, working primarily with seafood. As an seafood equity research analyst she has used a lot of her time

performing research and analysis on the development within land-based salmon production. Together with Alexander Aukner she covers salmon farming companies listed on Oslo Stoxk Exchange, including Marine Harvest and Lerøy Seafood Group. Tone has bachelor's and master's degrees from Norwegian School of Economics (NHH), including exchange semester to University of California, San Diego and courses taken at London School of Economics.

Kirk Havercroft
Kirk Havercroft holds a B.Sc. in Applied Accounting and Financial Analysis and has worked on the Sustainable Blue project since 1995 in the role of Chief Financial Officer. He transferred with the project from the UK to Canada in 2007 and now serves as Chief Executive Officer. He is responsible for executive management and control of Sustainable Blue's current operations and has presided over the launch of Sustainable Blue Atlantic Salmon into the marketplace. He also sits on the Management Board which oversees the future strategic development of the Sustainable Blue project.

Justin Henry
Justin is passionate about fish: catching, cooking, eating, studying, farming, and talking fish. He studied Aquaculture at the University of British Columbia and Aquaculture Biotechnology at Aalborg University in Denmark. He is a Registered Professional Biologist in British Columbia. Justin is experienced at managing all stages of aquaculture including broodstock, hatchery, farms, processing, marketing, and sales. He carried out his first recirculating aquaculture system projects in 1995 and has been operating RAS since 1998. Under Justin's management, Target Marine Hatcheries and Northern Divine Aquafarms developed a coho salmon broodstock program that offers monosex female coho eggs year round with disease free certification. Nationally, Justin chairs the Canadian General Standards Board committee that developed the Canadian Organic Aquaculture Standard. He launched the first Canadian certified organic seafood on the market with Northern Divine's sturgeon and caviar in 2012. Internationally, Justin sits on the OIE World Organization for Animal Health ad hoc group on aquatic animal biosecurity. After studying and practicing aquaculture for almost 3 decades, Justin now offers consulting and advisory services to clients around the globe including commercial producers, investors, government, ENGOs, and enhancement facilities. You can check out his website (www.aquacultureconsult.com).

Eric Hobson
Eric Hobson is the Chair of Kuterra GP, and an engineer with forty years of experience in the energy, telecommunications, and technology industries. Through Northridge Canada, a private equity firm, Eric co-founded numerous companies, including Northridge Petroleum Marketing (acquired by TransCanada Corp.) and Metronet Communications (acquired by AT&T Canada). Eric is a member of the Institute of Corporate Directors and an experienced director of public and private organizations. He is also an active philanthropist. He was founder and president of the SOS Marine Conservation Foundation, which signed a memorandum of understanding with the 'Namgis First Nation in 2010 to develop a land-based closed containment aquaculture project to grow Atlantic salmon for market at a commercial scale. This became the 'Namgis-owned, Kuterra salmon facility, located near Port McNeill, British Columbia.

Astrid Buran Holan
Dr. Holan's field of interest is within the technological and biological aspects of controlled environment aquaculture. She focuses on developing and integrating new or already existing water treatment technologies in recirculating aquaculture systems (RAS), with a simultaneous focus on the requirements of fish in such systems. After working as a researcher in Nofima for several years, she is now with the supplier company AquaOptima AS in Norway working with design and dimensioning of RAS, R&D, counselling and training.

KC Hosler
KC is a Professional Engineer with 20 years' experience in the field of aquaculture systems engineering and construction. He is currently the manager of the Project Delivery Team for Pentair Aquatic Eco-systems, Inc. (PAES), a global services, equipment and technology provider for the aquaculture industry. KC leads a team of engineering and project management professionals in development and deployment

of custom-engineered water treatment solutions with an emphasis on Recirculating Aquaculture Systems (RAS). KC has been project manager and/or lead consultant on an extensive list of projects in aquatic laboratory, fisheries enhancement, and commercial aquaculture applications. KC specializes in aquaculture facility planning and development, and in working with all project stakeholders to develop technically and economically sound solutions that deliver successful project outcomes. KC frequently speaks or participates in technical discussion panels at aquaculture conferences and courses, providing him the opportunity to educate regarding modern aquaculture techniques and to share his extensive project experience. He currently serves as the President of the Aquaculture Engineering Society.

Lill-Heidi Johansen
Lill Heidi, educated at University of Tromsø, is a research scientist at Nofima. In February, 2017, she joined the Centre for Research-Based Innovation in Closed-Containment Aquaculture (CtrlAQUA) as leader of the Department for Preventive Fish Health. She has background in fish health, specifically pathogen-host interactions and immunology. Her focus of research has been on viral diseases in Atlantic salmon and effects of smoltification and environmental conditions on immunological status at seawater transfer. In recent years she has also worked with fish health related issues in ballan wrasse and lumpfish, species used as cleaner fish to control salmon lice.

Jelena Kolarevic
Jelena has a PhD degree from the Faculty of Biology, University of Bergen. She is a research scientist at Nofima and the leader of Department for Technology and Environment in the Centre for Research-Based Innovation in Closed-Containment Aquaculture (CtrlAQUA). She has background in population ecology, fish physiology, molecular biology and fish reproduction biology. Since 2008, she has been working with the topics related to the recirculating aquaculture systems and since 2013 with semi-closed containment systems in the sea, with the focus on fish welfare and performance, the environment and fish monitoring and equipment testing in above mentioned systems.

Jason Mann
Jason is the Director of Nutrition for Evaqua Farms, one of the USA's largest Steelhead fish producers, based in the Hagerman Valley of Idaho. His practical skills in fish nutrition, combined with practical farming learned, will play a key role in helping with the expansion of domestic farmed steelhead and salmon sectors. At the end of 2016, after working for 29 years with Norwegian-based EWOS, Jason retired from one of the world's largest salmon feed producers. Jason was Managing Director for the North American fish feed market. In earlier roles, Jason developed the Quality Assurance program, led Plant Operations, was Research and Development Manager, and was responsible for Purchasing and Nutrition for over fifteen years. Jason joined EWOS in 1987 after studying Animal Nutrition at UBC's Faculty of Agriculture and obtaining his B.Sc. (Agr) and M.Sc. in Protein Chemistry. Jason was born on Vancouver Island and now lives near Vancouver BC with his family.

Frode Mathisen
Frode Mathisen holds a Candidate Scientist degree in Aquaculture from University of Bergen. He has worked with land-based smolt production for almost 20 years and has experience from Norway, Scotland, Canada and Chile. Frode is a leader implementing RAS and post-smolt strategy at Grieg Seafood since 2007. He is currently chairman of the board in CtrlAQUA.

Vasco Mota
Vasco C. Mota is a research scientist at the Norwegian Institute of Food, Fisheries and Aquaculture Research - Nofima, in Sunndalsøra. Dr. Mota earned his Biology B.Sc. from the University of Lisbon, Portugal, his Aquaculture M.Sc. from the University of Algarve, Portugal, and his Ph.D. from the Wageningen University, The Netherlands. Dr. Mota has dedicated his research to aquaculture with major focus on fish - production systems interaction, in particular fish physiology and water quality of recirculating aquaculture systems (RAS). His current research focuses in the improvement of Atlantic salmon post-smolts rearing in RAS as part of CtrlAQUA SFI and he is involved in lectures at conferences and workshops and peer-review and industry publications.

Speaker Biographies

Bjarne Hald Olsen
Bjarne is CEO at Billund Aquaculture in Denmark. He is environmental engineer and has 31 years of experience within RAS. He has experience within design and implementation of RAS; biological filtrations techniques; fish nutrition and fish feed, reproduction of the European eel and farm management in RAS for salmon, trout, eel, turbot, sea bream, sea bass and sturgeon.

Jen Paragallo
Jen Paragallo is VP of Marketing at Fishpeople Seafood where she leads all marketing & product development related activities for the sustainable & traceable seafood company. Jen started her career as a management consultant for Bain & Company in New York, where she worked for Fortune 500 clients on projects ranging from developing overseas outsourcing strategies to driving new product launches. She then moved west to join Method Products as the brand manager of its line of eco-chic cleaning products. During Method's rapid growth, she developed and commercialized several new product lines and grew the consumer base while lowering product costs. Inspired by Revolution Foods' mission of increasing access to healthy food for America's children, Jen joined as Business Innovation Director to create new revenue streams. She conceptualized and launched their CPG business and developed multiple product lines across different grocery categories. Jen received her BS in Marketing from Georgetown University and her MBA from The Stanford Graduate School of Business. She lives in Portland, OR with her husband Brad and their imaginary pug.

Eric Patel
With a background in finance and business strategy, Eric Patel has 35 years of business experience in the US, Canada and Europe. Eric currently serves on the Board of Ritchie Bros. Auctioneers and Mobify, Inc., and Chairs the Boards of ACL Services and Daiya Foods. Additionally, Eric consults to companies across a variety of industries in the US and Canada. His not for profit activities include serving on the Board of the Vancouver Farmers Market Society and the Tides Canada Aquaculture Innovation Fund. Prior to his current roles, Eric was CFO of software company Crystal Decisions (where he helped guide its turnaround and sale to Business Objects/SAP), and held positions ranging from strategy consultant to finance and operational roles in companies in the retail, industrial and consumer products industries. Eric holds an M.B.A. from Stanford University and B.A. from Brown University.

Mark Retzloff - Opening Keynote Speaker
Mr. Retzloff is a pioneer in the organic and natural foods industry with a 48-year career starting and managing successful companies. He is co-founder and chairman of Alfalfa's Markets, Boulder-based natural foods stores. He also co-founded Aurora Organic Dairy in 2003, and currently acts as a senior advisor to the company. He was the University of Michigan's School of Natural Resource and Environment Practitioner in Residence for 2014/2015 and 2015/2016. He is former senior partner of the Boulder Farm Team consulting firm which works with companies in the Natural, Organic, Local and Sustainable food and sector. He is also Chairman of the Board of Natural Habitats Group, a Netherlands based, fully integrated leader in organic sustainable palm oil production, processing, and distribution.

Mr. Retzloff started his career in natural foods retail, as co-founder of Eden Foods, Rainbow Grocery, and the original Alfalfa's Market, which merged with Wild Oats Markets in 1996. In 1990 Mr. Retzloff was chairman of the Organic Food Alliance which was instrumental in passing the 1990 Organic Food Production Act in D.C. Mr. Retzloff went on to become one of the co-founders of Horizon Organic Dairy. There he served as Chairman, CEO and President International. He then became Chairman of Rudi's Organic Bakery where he helped execute a successful turn-around.

He lends his knowledge as a board member and advisor to emerging companies, which have included Blue Horizon Organic Seafood, BlueSun BioDiesel, Boulder Ice Cream, Crocs Footwear, Evol Burritos, Goddess Garden, Haystack Mtn. Goat Cheese, Sambazon Acai, Traditional Medicinals, Tempt Hemp Milk, and Uncle Matts Organic Juice. Mr. Retzloff is a founding partner at Greenmont Capital Partners, and founder and

former Chairman of The Organic Center and he is a past 11 year board member of RSF Social Finance. Mr. Retzloff sits on the University of Michigan's School for the Environment and Sustainability, SEAS, Dean's Visiting Committee and is chairman of the Advisory Board for the University of Michigan's Center for Sustainable Systems, CSS. He also serves on the Board of the Center for Education and Social Responsibility, CESR, at Leeds school of business at the University of Colorado, Boulder and also is Co-chair of advisory board of CU's Masters in the Environment school, MENV, and is Member of Blackstone Entrepreneur Network leadership group.

Mr. Retzloff received his B.S. degree in Environmental Studies from the University of Michigan and has received several awards, including the Organic Trade Association's Lifetime Leadership award, the Boulder Chamber of Commerce's Lifetime Achievement Award and Entrepreneur of the Year award, Naturally Boulder's Lifetime Achievement Award. He was inducted into the Boulder County Business Hall of Fame and New Hope Natural products Hall of Legends.

Mr. Retzloff lives outside Boulder, Colorado on a farm with his wife Terry where they raised their three children. In his free time, he enjoys gardening, golf, and visiting his home in Hanalei Kauai, Hawaii.

Gary Robinson
Gary Robinson is a salmon aquaculture specialist and biologist with over 35 years of experience in salmon farming operations management, project management, financial analysis and research. This includes 22 years managing marine salmon farm operations that included up to 40 farms on the BC coast producing 40,000mt per year. Over the last seven years Gary has focussed exclusively on land based salmon farming which has included development of and ongoing support for the Kuterra land based RAS salmon farm. Gary has also supported land based salmon farm business development activities for a number of clients locally and internationally. This work included the development of detailed biological and financial models as well as cost analysis. Recently, his focus has included the development of land based Aquaculture Parks as a pathway to catalyze the development of all land based aquaculture industries.

Trond Rosten
Trond W. Rosten is the group manager of freshwater and closed production technology in the Global R&D and Technical Department Marine Harvest ASA. He is educated as a fish physiologist from the Norwegian University for Science and Technology (NTNU) with a master thesis in stress, photo manipulation and smoltification of Atlantic salmon. Mr Rosten comes from a role as senior adviser at SINTEF OCEAN AS, where he, since 2011, has worked within research and consulting for smolt production (RAS and FTS) and closed floating systems. He has previous positions as research manager at Norwegian Institute for Water Research (NIVA) and business consultant within KPMG and Akva Instituttet AS. Trond has 30 years' experience in the field and has participated in several risk assessments for The Norwegian Scientific Committee for Food Safety on topics like smolt production, closed live fish transport and RAS technology, in addition to many research and development projects for the industry.

Roar Sandvik
Roar has worked as Global Product Group Manager at Skretting since June of 2015. Earlier, Roar served Skretting in several other positions, including: Product and Sales Manager (2009 to 2015), Product Manager (2001 to 2009), and Sales Consultant (1999 to 2001).

Steven Summerfelt
Steve is Director of Aquaculture Systems Research at The Conservation Fund's Freshwater Institute. He is a Professional Engineer and holds B.S., M.S., and Ph.D. degrees in Chemical and Environmental Engineering. He is a recipient of the Aquacultural Engineering Society Award of Excellence. He is working on innovative technologies to increase farmed fish production in closed-containment systems that practically eliminate water pollution, minimize water use, improve freshness and safety, and allow the farm to be located adjacent to the market.

Garry Ullstrom
Garry Ullstrom is a CPA, CA and the CEO of Kuterra, North America's first commercial scale land-based, recirculating aquaculture system fish farm for growing Atlantic salmon to harvest size. Over the past

25 years Garry has managed the finances for the 'Namgis First Nation, helped create and manage their commercial portfolio of seven businesses and strategic partnerships, and for the past five years has been immersed in land-based aquaculture through the development of Kuterra. He currently resides in Campbell River, British Columbia.

Sean Wilton

Sean Wilton, P.Eng., has been involved in many aspects of the environmental engineering, construction and aquaculture industries for over twenty years. His engineering experience has encompassed the design of complex municipal water systems to the most advanced fish hatchery systems in the world in their time. In heavy construction, his experience ranges from project management on major civil works for the Department of National Defense, to building many of the first large scale cold-water fish hatcheries in North America. His experience in aquaculture and environmental engineering spans from implementation of some of the first grey water recycling projects in schools and resorts to recirculating aquaculture projects around the world. He also has worked in other advanced water treatment firms utilizing membrane and advanced oxidation technologies for the solution of difficult water treatment problems such as processing plant effluent. Over 100,000,000 gallons of water are recycled every day in projects designed or built by Sean and his firms over the years. A graduate of the Royal Military College of Canada with significant corporate experience, Sean Wilton is frequently invited to act as a company advisor, director or officer and currently has Board of Director positions on companies, including AgriMarine Holdings Ltd.. Sean Wilton is currently working with AgriMarine Technologies to continue to develop and prove out at commercial scale its floating closed containment technology. This exciting bridge containment technology is employed in two active production farms, one at West Coast Fish Culture in BC producing over 1,000 MT of Steelhead annually and the other at Benxi in China where over 5 crop cycles have been successfully produced in the system. One of the more exciting applications of these large floating tanks is in their use as economical protected rearing space for post-smolt production and they are currently in active production trials in Norway now.

Trine Ytrestøyl

Trine works as a research scientist in the department for feed and nutrition in Nofima. She has a master's degree in biology from the Norwegian University of Science and Technology (NTNU) in Trondheim, with focus on fish physiology. She has worked for Nofima since finishing her PhD in 2006 at the Norwegian University of Life Sciences (NMBU) outside Oslo. Trine's doctoral research focused on flesh pigmentation in Atlantic salmon, studying how factors such as feed intake and growth affected the utilization of astaxanthin. In later years, she has worked more with sustainability in Aquaculture, both in terms of utilization of feed resources, but also with optimizing production of salmon, using indoor RAS in combination with seawater pen culture. Trine's focus is on the physiology, performance and welfare of salmon in RAS and how the conditions in such systems affect the performance of salmon after transfer to seawater pens.

Yonathan Zohar

Yonathan Zohar is Professor at the Institute of Marine and Environmental Technology, Chair of the Department of Marine Biotechnology and Head of the Aquaculture Research Center at the University of Maryland Baltimore County. His expertise covers the application of biotechnology in sustainable aquaculture and fisheries. The primary focus of his research is on basic and applied aspects of fish reproductive physiology and endocrinology. He uses endocrine, biochemical and molecular approaches to study interactions along the brain-pituitary-gonadal axis leading to reproductive development, gamete maturation, ovulation and spawning. He builds upon his basic research to develop applied technologies for broodstock management and for generating reproductively sterile fish. Professor Zohar has published over 230 peer-reviewed papers and book chapters and is the inventor of 10 issued international patents in aquaculture and biotechnology.

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