Recirculating Aquaculture Salmon Network (RAS-N) Building Capacity of Atlantic Salmon Production in the U.S.

Yonathan Zohar and Catherine Frederick University of Maryland and Institute of Marine and Environmental Technology (IMET) and many others...



RECIRCULATING AQUACULTURE SALMON NETWORK

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Recirculating Aquaculture Salmon Network (RAS-N) Background

- >90% of salmon consumed in the US (~500,000 tons) come from overseas, at a value of ~\$3.2 B (20% of seafood trade deficit)
- >\$ 3 billion investment in land-based Atlantic salmon production in the US
- Covid accelerated interest in local, safe, land-based production
- Maine, Florida, Virginia, Wisconsin, Indiana, Ohio, Texas, New-York, Washington, California, Maryland, Nevada



Projected Land Based Salmon Production

Global Proposed Volume, MT



USA Production Trend, MT





Overall Goal of RAS-N

- Establish a national, <u>public-private</u> holistic and collaborative <u>hub</u> of knowledge
- Build capacity for the land-based Atlantic salmon sector towards successful
 - Growth
 - Stability
 - Environmental compatibility
 - Economic feasibility





Recirculating Aquaculture Salmon Network (RAS-N) Specific Objectives

- 1. Engage stakeholders, solicit input
- 2. Identify gaps and barriers, prioritize R&D and other areas to address them
- 3. Develop a White/Concept Paper
- 4. Economic analysis and feasibility
- 5. Education, Career & Workforce Development (ECWFD)
- 6. Extension and technology transfer
- 7. Demonstrate technology (R&D) and hands-on training projects















RAS-N to enable/'spawn' future projects



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Sustainable Aquaculture Systems Supporting Atlantic Salmon (SAS²)

RECIRCULATING AQUACULTURE SALMON NETWORK

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Sustainable Aquaculture Systems Supporting Atlantic Salmon

\$10M, 5-year funding from USDA/NIFA for national program

RAS-N Mantra: Engage with Industry Stakeholders





RECIRCULATING AQUACULTURE SALMON-NETWORK

RAS-N

2019 WORKSHOP DECEMBER 10th – 11th, WASHBURN, WISCONSIN

DING CAPACITY OF LAND BASED ATLANTIC

Research and Industry Updates

Stakeholder Sessions, Panels and Surveys

Panels on Areas of Priority

Education Needs and Programming

Also: WAS and other meetings

2nd Annual RAS-N Workshop (October 8-9, 2020*)

Hosted by the Institute of Marine and Environmental Technology (IMET) and Maryland Sea Grant

Workshop Registration: https://bit.ly/RASNWorkshop2020

*All times are Eastern Standard Time (EST)

Wednesday October 7th

6:30PM – 7:30PM: Virtual Social Hour (Register for Social Hour: https://bit.ly/RAS-NSocialHour)

Thursday October 8th

10:00AM - 10:01AM: Call to Order - Yoni Zohar (IMET, MD)

10:01AM - 10:05AM: Welcome - Russell Hill (IMET - University of Maryland, MD)

CONSERVATION FUND Off-flavor Research at the Freshwater Institute

- > Develop and refine SOPs to optimize depuration
- > Two peer-reviewed articles (2020-21) and trade press publications resulted from Sea Grant-funded work
- Freshwater Institute and IMET have also developed research (USDA-NIFA) to help the salmon RAS industry tackle this important challenge





Figure courtesy Davidson et al. (2020). Aquacult. Eng. 90, 102104



Insect Digestibility:

Protein 89% ± 3.84 Lipids 92% ± 3.84



Atlantic Salmon Alternative RAS Feeds



Superworms: Zophobas morio

Allen Place, IMET, in collaboration with Skretting

Converting RAS Organic Waste to Fuel Grade Methane (Biogas)



Kevin Sowers and Keiko Saito, IMET

Converting RAS Organic Waste to Fuel Grade Methane (Biogas)





Kevin Sowers and Keiko Saito, IMET



Stochastic Economic Simulation Model

Exploring the economics of RAS Atlantic salmon production from egg to market in the U.S.

- **Key Model Inputs:** Operating and capital costs for hypothetical 5,000MT facility (based on an industry survey)
- Accounting for Uncertainty: in key production parameters (e.g., feed; mortality) and market parameters (e.g., head-on gutted price)
- **Key Deliverable:** Obtain ten-year Net Present Value (NPV) for hypothetical 5,000MT facility



The University of Wisconsin-Stevens Point Northern Aquaculture Demonstration Facility

Outreach, Education and Workforce Development Program Includes:

- K-12 education initiatives incorporate aquaculture into the classroom
- Virtual tours and presentations showcasing facility, species, systems, and projects
- Interactive technical or educational demonstration tours for all audiences
- UWSP Aquaculture Minor and Aquaponics Certificate Program
- Intensive apprenticeships & internship training programs with nearly 100% job placement rating into the industry.



1. Experiential Courses for All Learners



Health course





3. UMaine Aquaculture Micro-Credentials





2. Industry Partnered Internship Program

Interns work within a wide diversity of aquaculture organizations learning skills sets desired by the industry





4. 4-H Aquaponics Program

Virtual program that allows youth to design, build and maintain their own aquaponics system at home









Scarlett Tudor, UMaine

Maryland Sea Grant and University of Maryland Extension



Aquaculture in Action

TOOLS FOR TEACHING SCIENCE

- Uses aquaculture to provide K-12 learning opportunities meeting science education standards
- Student-Driven Science



Aquaculture in the classroom (Biology, Chemistry, Physics)



Teacher Professional Development Workshops



Adam Frederick, MDSG

RAS-N Extension: Develop a White Paper (now Concept Paper)

Building Capacity of Land-based Atlantic Salmon (Salmo salar) Aquaculture in the United States

Prepared by

The Recirculating Aquaculture Salmon Network (RAS-N) A National Sea Grant-funded Private-Public Network

October 2021



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Recirculating Aquaculture Salmon Network (RAS-N) Delivering on objectives- Targeted Working Groups





Recirculating Aquaculture Salmon Network (RAS-N) Delivering on objectives- Targeted Working Groups





RAS-N Extension: Develop a White Paper (now Concept Paper) Involved Work Groups: R&D, ECWFD, Extension, and Economic



RAS-N Extension: Concept Paper Status



RAS-N Extension: Survey of Salmon RAS Priorities Involved Work Groups: Extension and Research



RAS-N Extension: Website for Outreach and Information Sharing Involved Work Groups: Web Development w/ PMT and Communications











Emma Wiermaa



John Stubblefield



Lisa Tossey

RAS-N Extension: Website for Outreach and Information Sharing



Website: ras-n.org

ABOUT US 👻 SALMON RAS 👻 RAS-N OUTCOMES 👻 NEWS AND EVENTS 👻

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LEARN MORE

Averaging 1,500-2,000 views a week

Mission

Vision

Goals

To support a growing domestic salmon production industry, the Recirculating Aquaculture Salmon Provide food security and reduce trade deficits associated with salmon imports by facilitating the

The overarching goal of RAS-N is to build capacity and establish a holistic hub of knowledge that will

RAS-N Extension: Communicating Information with Targeted Audiences

RAS-N

RECIRCULATING AQUACULTURE SALMON NETWORK Building Capacity for Land Based Salmon Aquaculture in the US

Summary of RAS-N land-based salmon stakeholder priorities

Background and Rationale

The US faces a significant and growing seafood trade deficit (\$16.8B in 2018; NOAA Current Fisheries Statistics, 2019) with nearly 90% of consumed seafood originating from abroad and over 50% of products coming from foreign aquaculture (NOAA Office of Aquaculture, 2020). Furthermore, many importing countries do not possess regulatory frameworks that meet US standards. Atlantic salmon consumption has risen in the US over the last decade at about 7-10% per year and currently is at a level of 493,000 tons annually. To meet consumer demands, Atlantic salmon imports to the US have grown in parallel to a record of 470,000 tons in 2018 valued at \$3.4 billion (US-DOC, 2018). Domestic production of Atlantic salmon accounts for only $\sim 4\%$ of US consumption (NOAA-NMFS, 2017) and is confined to a relatively small industry off the coasts of Maine and Washington; however Atlantic salmon production in ocean cages in Washington has been banned by state legislation after their current permits expire. These staggering statistics mean that ~ 96% of consumed Atlantic salmon is imported, contributing over 20% to the \$16.8 billion US trade deficit in edible seafood. Thus, there is an urgent need and opportunity to promote domestic aquaculture development and increase Atlantic salmon production in the US.

Benefits of the emerging land-based salmon industry to US seafood production, national food security and local economic development

The current strategy for supporting the future growth of US acuaculture production relies on th

Maryland-led Land-based Salmon **Aquaculture Advancement**

The Recirculating Aquaculture Salmon Network (RAS-N), · Identified industry barriers and research needs for exfunded by the National Sea Grant College Program, coled by the University of Maryland Baltimore County and Maryland Sea Grant, and in collaboration with Maine and Wisconsin Sea Grants, supports the growing domestic Atlantic salmon production industry.

This national network of scientists, economists, educators, and industry experts are working together to advance land-based salmon aquaculture technology and create a clear, national action plan to meet economic, environmental, and community goals. In the first year of work this network has:

- panding successful land-based salmon aquaculture.
- · Completed first steps in creating an economic model to predict RAS economic feasibility.
- Expanded our network to include several more domestic and international industry partners.
- Defined levels of public engagement and avenues for recruitment of skilled personnel.
- Drafted a policy paper "Building Capacity of Land-based Atlantic Salmon Aquaculture in the United States."

Building Maryland Capacity in Land Based Aquaculture

Land-based farm- ing is considered a more sustainable way to produce Atlantic salmon and is identified by Monterey Bay Aquarium's Seafood Watch as a Best Choice (green). A land-based salmon aquaculture farm	Reuses 90-99.9% of water. In Maryland, we will reuse over 99.9% of water.	Moves production close to markets, which lowers costs, reduces footprint, and provides product transparency.
	Brings jobs and career opportunities to rural Maryland.	Reduces pollution discharge and recovers nutrients by controlling and treating fish waste.
	Creates opportunity to convert aqua-	Grows fish in fully contained rearing

October 8-9, 2020: Second Annual RAS-N Workshop (virtual meeting)

Institute of Marine and Environmental Technology (IMET), Baltimore, Maryland

- + Program and Welcome
- + Plenary presentations

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- Off-flavor and Mitigation updates
- Off-Flavor & Mitigation: Industry Perspective Steve Summerfelt, Superior Fresh

Exciton Technology for Removing Geosmin- Jack Holland, Exciton Clean

RAS-N Extension: Collaboration Efforts for Traditional Extension Products

CONSERVATION FUND Freshwater Institute



Kata Sharrer (not pictured)

1865 THE UNIVERSITY OF MAINE



UNIVERSITY OF MARYLAND EXTENSION



Allen Patillo

(including SAS2 efforts)

Laura Rickard

Recirculating Aquaculture Salmon Network (RAS-N) A Final Deliverable: Road Map/Strategic Plan

An extensive analysis of the status of the industry, projected growth, biological and technological gaps, R&D priorities, mechanisms to promote public-private partnerships.

Help policymakers, federal and state agencies and industry identify and responsibly allocate resources to promote an economically feasible and environmentally sustainable landbased Atlantic salmon industry in the US.



RAS-N Hub Aquaculture Roadmap:

Addressing NSGO, NOAA and U.S. Goals & Policies

- NSGO
 - Stakeholder partners: academia, industry, government, consumers
 - Sea Grant partners (MD, ME, WI)
 - Integrate Sea Grant extension, communications and education networks
- NOAA- national marine and economic policy goals
 - Increasing sustainable marine aquaculture
 - Workforce development
 - Increasing diversity in marine science
- U.S. federal policy goals:
 - Sustainable seafood production
 - Reducing pressure on wild fisheries
 - Climate change mitigation and adaptation
- Congress's goal: Increase U.S. aquaculture production



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Our Network Welcomes Questions and Insights



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