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 ~ 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 aquaculture production relies on the development and use of multiple types of farming practices. In particular, land-based production using recirculating aquaculture system (RAS) platforms offer the industry a viable and environmentally sustainable means to expand domestic production, while capitalizing on the many benefits of this approach. RAS offers the ability to effectively capture wastes (thus alleviating environmental impact), enhance biosecurity to prevent fish escapement, minimize pathogen entry to the farmed fish or disease dissemination into the surrounding environment, control the rearing environment for significantly increased fish performance, and improve the flexibility of site selection (proximity to markets, low land prices/utility rates, etc.)

Currently, there are only a few commercial ventures in the US producing market-size salmonids in land-based closed-containment facilities, and at least a half-dozen or more in the advanced planning and permitting phases. Collectively, this represents over **$2.5 billion** in investment in this emerging US industry.

Ensuring success: Barriers and areas of need for land-based commercial production

This is a stakeholder-generated list of barriers and needs that would ensure the success of land-based ventures in the US.

Biology and Technology (initial ranking)

- Eliminate off-flavor - understand causes and develop innovative mitigation technologies.
- Develop genomic/microbiome-based detection of detrimental compounds (geosmins, sulfides)

- Reduce early maturation in RAS - understand (environmental, genetic) and reduce (mono-sex, triploidy, sterility).
- Advance sterile fish production with new technologies and improve public perceptions.
- Create RAS-specific domestic broodstock for optimally performing offspring.
- Design RAS-specific feeds and alternative feeds/ingredients (non-marine, organic).
- Identify parameters for optimized growth, performance, and overall health at all life stages.
- Improve smoltification process with techniques to support better synchronization and reduce stress.
- Improve health management - biosecurity, pathogen detection and risk mitigation for opportunistic pathogen introductions as well as those of regulatory concern.
- Study and optimize microbiome in RAS - biofiltration, waste removal, overall system and fish health.
- Develop technologies to increase containment, waste processing and environmental compatibility.
- Explore cost-effective treatments of organic waste.
- Generate engineering solutions that limit energy costs.

Career & Workforce Development

- Determine educational entry points for RAS/salmon content.
- Collaborate with educators, industry, and existing programs.
- Identify concepts/skills and build well-rounded educational opportunities.
- Create academic/industry partnerships for training programs to suit stakeholder needs.

Economics and Marketing

- Evaluate profitability and economic feasibility.
- Explore value-added products and by-products.
- Identify and develop new and future markets.
- Market economic development potential to leverage investment and build local/regional support industries.

Education and Outreach

- Engage local communities as facilities are permitted and built, address environmental sustainability.
- Establish a constructive dialog with local residents to address concerns.
- Educate and engage consumers about traceable, healthful salmon RAS product(s).
- Define sustainability of salmon RAS and translate added value to consumers.
- Leverage private-public partnerships to catalyze education/training opportunities.
- Compile social science on perceptions and how it feeds marketing.