#### **Fish, farms, and shared futures:** Understanding perceptions of land-based recirculating aquaculture system (RAS) facilities

#### Dr. Laura N. Rickard











Johnson





#### Gurney





#### Houston

# **Today's Talk**

- Why study *perceptions* of landbased recirculating aquaculture systems (RAS)?
- Public support for aquaculture: key concepts
- Project: Perceptions of landbased RAS in the U.S.:
  - Example 1: Stakeholder interviews
  - Example 2: Resident survey
- Next steps
- Q&A



#### Why study perceptions of land-based RAS?



Whole Oceans adds processing facility to its plans for an Atlantic salmon farm in Bucksport





## **Public Support for Aquaculture**

- Is it "social license to operate" (SLO)?
- *Civic:* Voting for aquaculture policy, expansion; (lack of) opposition in public forum
- Consumer: Purchasing; boycotting
- Predicted by perceptions, attitudes, values, etc.

(Alexander, 2021; Moffat & Zhang, 2014; Rickard et al., 2020; Runge et al., 2021)





## **Risk & Benefit Perception**

- Related to risk attributes, affect
- Inverse relationship
- Perceived naturalness
- Related to aquaculture support

(Feucht & Zander, 2015; Rickard et al., 2020; Slovic et al., 2004; Witzling et al., 2020)



#### Trust

- Influences risk/benefit perception
- Salient values or past performance?
- Mechanism of SLO

(Earle & Siegrist, 2008; Moffat & Zhang, 2014; Runge et al., 2021; Tuler & Kasperson, 2014)





## **Sense of Place**

- Cognitive, emotional, & social linkages to specific places
- Potentially different in "amenity-rich" vs. "working landscapes"
- Related to SLO?

(Dalton et al., 2017; Eaton et al., 2019; Hall et al., 2013; Hanes, 2018; Lewicka, 2011)



#### Macro Level (U.S.)

 $\checkmark$  Examine similarities and differences in how perceptions

✓ Examine change in public discourse over time

**Compare across sites to:** 

explain support for RAS

#### **Project Overview**



## **RAS Facility Sites**







Bucksport, ME



Belfast, ME



Samoa Peninsula, CA

NORDIC



Homestead, FL ATLANTIC SAPPHIRE.

NORDIC

**Example #1:** Stakeholder interviews

How do key stakeholders think about the risks and benefits related to landbased RAS?



#### N = 76 interviews (M = 56 min.)

Government, corporate, journalist, pro/anti-RAS advocate, university affiliates



# RAS as complementing or threatening local industry

"This is a strong marine resources state and aquaculture is a hybrid between the two... Maine wants to be the major, major U.S. food producer it used to be and this is **a totally natural fit** in my opinion."

-RAS advocate, Belfast, ME

"...By having an **artificial system**, it makes it even harder and harder and harder to push politicians and other groups that have no interest in preserving those natural systems into doing any of that stuff."

-Fisherman, Samoa, CA

#### RAS as unsafe/harmful or safe/beneficial







"No wild fish should be put in a tank and his whole life is swimming in circles, with no other lifeforms in the tank. That's torture. **So I think they're torturing the salmon**, and I don't want to eat torture."

-Anti-RAS advocate, Belfast, ME "Our fish have a nutritionist on staff. Wild fish don't.... But also, because we treat, and disinfect, and clean the water so effectively, so efficiently, we don't need to use any antibiotics, any medications. **It's a cleaner, healthier product.** 

-Corporate representative, Belfast, ME

#### RAS as "natural" extraction or unprecedented risk



"[Nordic Aquafarms is] yanking out...1.7 million gallons a day of freshwater, six million gallons a day of saltwater and they're spewing out 7.7 million gallons a day of wastewater. That sounds like a flow through system to me... **So they're damaging the salinity that impacts the fishery**."

-Environmental advocate, Belfast, ME

"It's a **well-established regulation** for the wastewater disposal."

-Corporate representative, Homestead, FL

#### **RAS as relative restoration**

"So when you talk about clean and renewable and better for the property, it's gone from a tannery, which is probably one of the worst things to have; to a paper mill, which was better; to land-based – **it's gotten better**."

-Local official, Bucksport, ME





Takeaways

- Stakeholders express sometimes conflicting perceptions of benefits/risks and what counts as "natural" in the context of RAS
- Community environmental & development history (e.g., industry, other forms of aquaculture) matter for RAS facility acceptance
- Implications for future research: role of sense of place?

#### **Example #2:** Resident survey

What are the effects of trust and confidence on judgment that project benefits will exceed its risks, and overall project support?



- Belfast, ME; Samoa, CA; Homestead, FL
- Mail + online; Oct 2020-Mar 2021; nonrespondent (phone) May 2021
- *n* = 523 (56% ME, 34% CA, 11% FL); 11.9% response rate
- Sense of place; community change; expected project impacts; information seeking; ratings of project sponsor; trust/confidence; behavioral intentions (cooperation); demographics



Cornell University Survey Research Institute

(Johnson & Rickard, under review)

## Survey sampling



Q17. People who work for this corporation are \_\_\_\_\_\_ me.
O Very different from
O Somewhat different from and similar to
O Equally different from and similar to
O Somewhat similar to
O Very similar to
Q18. Historically, this corporation has done its job very well.
O Strongly disagree
O Disagree

#### Trust & Confidence



#### Cooperation

O Strongly agree

O Agree

O Neither agree nor disagree



(Earle & Siegrist, 2008; Johnson & Rickard, under review) Q25. If an election were held tomorrow on the future of this land-based aquaculture project, I would O Vote against having the project in or near my community O Vote for having the project in or near my community O Not vote

Q26. If this land-based aquaculture project built in or near my community sells fish locally, I would

- O Buy or eat fish from the project
- O Not buy or eat fish from the project

	California	Florida	Maine
Demographics			
Gender	1.65 (0.63)	1.67 (0.59)	1.76 (0.64)
Age	56.41 (18.36) <sup>a</sup>	51.50 (20.23) <sup>a</sup>	61.70 (16.52) <sup>b**</sup>
Education	5.30 (1.37) <sup>a</sup>	4.94 (1.65) <sup>a</sup>	5.79 (1.36) <sup>b**</sup>
Income	3.34 (1.43)	3.80 (1.23)	3.53 (1.33)
Non-Hispanic White	0.81 (0.39) <sup>a***</sup>	$0.52 (0.51)^{b^{***}}$	$0.97(0.17)^{c^{***}}$
Ideology	$3.42(1.34)^{a^{**}}$	2.98 (1.26) <sup>a***</sup>	3.84 (1.17) <sup>b</sup>
<b>Behavioral Intentions</b>			
Vote	$(0.47(0.77)^{a})$	0.06 (0.93) <sup>b*</sup>	0.12 (0.91) <sup>b***</sup>
Influence	$0.15(0.51)^{a}$	<b>02 (0.58)</b> <sup>a, b</sup>	02 (0.69) <sup>b**</sup>
Project Expansion	02 (0.49) <sup>a***</sup>	02 (0.47) <sup>a*</sup>	(21 (0.57)))
Project Fish	$0.72 (0.45)^{a^{**}}$	$(0.47(0.50)^{b})$	0.64 (0.48) <sup>a</sup>

#### • Familiarity

- RAS\* (*M* = 2.68, *SD* = 1.15; 45.5% slightly or not at all familiar)
- Specific project<sup>\*\*</sup> (M = 2.45, SD = 0.90; 47.4% slightly or not at all familiar)
- Sponsoring corporation\* (M = 2.14, SD = 1.08; 63.1% slightly or not at all familiar)
- **Risk/benefit perception**\* (*M* = 3.10, *SD* = 1.40)



Q25. If an election were held tomorrow on the future of this land-based aquaculture project, I would O Vote against having the project in or near my community 55.6%

O Vote for having the project in or near my community 32.5%

O Not vote 11.8%

Q26. If this land-based aquaculture project built in or near my community sells fish locally, I would
 O Buy or eat fish from the project 64.5%
 O Not buy or eat fish from the project 35.5%

Q27. I plan to try to influence state or local decisions about land use related to this land-based aquaculture project

O To prevent its operation 17.9%

O To support its operation 21.5%

O Do not plan to influence these decisions in either direction 60.6%

Q28. Suppose in the future this corporation proposes an expansion of its project, or another corporation proposes another large land-based aquaculture project, in or near your community. Citizen groups form to urge decision-makers to approve or reject that expanded/new project. How would you *most likely* react in this situation? (please select **ONLY ONE** response)

O Do nothing, because I don't care about the issue 2%

O Do nothing immediately, because I would want more information before I decide 67.3%

**O** Join the group urging approval 9.0%

O Join the group urging rejection 21.8%

### **Results: SEM**



**χ2** = 3.68, df = 2, *p* > .05, **χ2/df** = 1.84, **RMSEA** = .046 (90% confidence interval [CI] = .00, .12); **CFI** = .99, **TLI** = .99

 $p < .10 \quad p < .05 \quad p < .01 \quad p < .01 \quad p < .001$ 

(Johnson & Rickard, under review)



- Takeaways
- Trust is more important than confidence in predicting risk/benefit perceptions and cooperation
- Project familiarity matters somewhat for cooperation but whether corporation or topic familiarity matter is less clear
- Implications for future research:
  - Whose voice(s) (should) count when gauging SLO?
  - Role of procedural fairness



- Interview data analysis sense of place & SLO
- Survey data analysis sense of place & information-seeking
- Website material; community presentation
- Follow-on funding domestic and international contexts?

#### Next steps

## Acknowledgments



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# Thank you!

laura.rickard@maine.edu



